

University of Colorado Law School

## Colorado Law Scholarly Commons

---

Resource Law Notes: The Newsletter of the  
Natural Resources Law Center (1984-2002)

Newsletters

---

4-1986

### Resource Law Notes Newsletter, no. 8, Apr. 1986

University of Colorado Boulder. Natural Resources Law Center

Follow this and additional works at: [https://scholar.law.colorado.edu/resource\\_law\\_notes](https://scholar.law.colorado.edu/resource_law_notes)



Part of the [Energy and Utilities Law Commons](#), [Energy Policy Commons](#), [Environmental Law Commons](#), [Environmental Policy Commons](#), [Indigenous, Indian, and Aboriginal Law Commons](#), [Natural Resources and Conservation Commons](#), [Natural Resources Law Commons](#), [Natural Resources Management and Policy Commons](#), [Oil, Gas, and Energy Commons](#), [Oil, Gas, and Mineral Law Commons](#), [Public Policy Commons](#), [Water Law Commons](#), and the [Water Resource Management Commons](#)

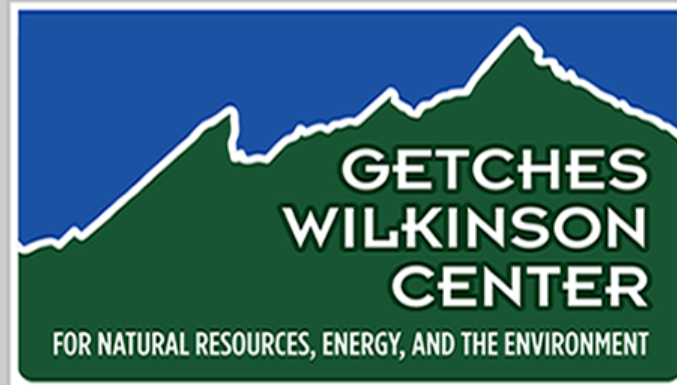
---

#### Citation Information

Resource Law Notes: The Newsletter of the Natural Resources Law Center, no. 8, Apr. 1986 (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law).



William A. Wise Law Library  
COLORADO **LAW**  
UNIVERSITY OF COLORADO **BOULDER**



Getches-Wilkinson Center Collection

RESOURCE LAW NOTES: THE NEWSLETTER OF THE NATURAL RESOURCES LAW CENTER, no. 8, Apr. 1986 (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law).

Reproduced with permission of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (formerly the Natural Resources Law Center) at the University of Colorado Law School.

# Resource Law Notes

The Newsletter of the Natural Resources Law Center  
University of Colorado, Boulder • School of Law

Number 8, April 1986

## Two Conferences Scheduled for June

The Natural Resources Law Center will present its seventh annual summer program this June, 1986. Once again this year the program will feature two conferences. The first, June 2-4, 1986, is **Western Water: Expanding Uses/Finite Supplies**. This program addresses the ways in which the demands for water are shifting, and the problems and opportunities in adjusting to these changes.

### PROGRAM

#### June 2, 1986

- 9:15 David H. Getches, *Changing Patterns of Water Use in the West: Pressures on the System*
- 10:00 Thomas Stetson, *Opportunities for Improving the Way We Use Water*
- 11:05 Zach Willey, *Least Cost Approaches for Satisfying Water Demand: An Alternatives Analysis*
- 11:55 Governor Richard D. Lamm, Luncheon Speaker
- 1:30 James R. Gilley, *Potential Improvements in Irrigation Management Practices: Water Savings and Costs*
- 2:15 Tom Griswold, *Water Development and Acquisition for a Municipal Supply*
- 3:15 Dennis B. Underwood, *A Case Study: Imperial Valley, California*
- 4:00 David Engels, *Augmenting Municipal Water Supplies Through Agricultural Water Conservation*

#### June 3, 1986

- 8:45 George Gould, *Water Use and the Prior Appropriation Doctrine*
- 9:30 Bruce Driver, *Policies to Enhance Western Water Use Efficiency: Best of the West*
- 10:35 Harrison C. Dunning, *Toward Optimal Utilization of Water Resources: The "Physical Solution"*
- 11:20 Betsy Rieke, *The Arizona Solution to the Allocation and Use of Groundwater*
- 12:00 Ann McLaughlin, Luncheon Speaker
- 1:45 Gary Weatherford, *Water Transfers and Exchanges: Using the Market to Improve Water Use—A Legal/Institutional View*
- 2:30 Charles W. Howe, *Innovative Approaches to Water Allocation: The Potential for Markets*
- 3:30 James T. Markle, *California Laws and Programs Which Encourage Efficient Water Use by Facilitating Voluntary Transfers*
- 4:15 John Wittemyer, *Changing the Use of Water Rights in Colorado: Recent Experience*

#### June 4, 1986

- 9:00 Raphael J. Moses, *Keep the Farmer Farming—How to Eat Your Water Cake and Have It, Too*
- 9:45 Timothy De Young, *Special Water Districts: Their Role in Western Water Use*

- 10:50 John D. Leshy, *After the Concrete Sets: The Future Role of the Bureau of Reclamation in Western Water Management*

#### 1:15 Panel:

- Mohamed T. El-Ashry, *Policy Options for Improved Water Management in the West*
- Gary Weatherford, *Proposals for Promoting Water Reallocation and Efficiency*
- Steven J. Shupe, *Water Conservation Through Integrated, Basinwide Implementation*

The second conference, June 9-10, 1986, is **Getting a Handle on Hazardous Waste Controls**. During the past ten years Congress has made the regulation of hazardous waste a priority. This conference focuses on the Resource Conservation and Recovery Act, as amended in 1984, and the Comprehensive Environmental Response, Compensation and Liability Act.

### PROGRAM

#### June 9, 1986

- 9:15 Gene A. Lucero, *A RCRA Overview*
- 10:00 Hal Winslow, *The New Small Quantity Generator Rules: RCRA Reaches Small Business*
- 10:50 James R. Spaanstra, *1984 Amendments: Land Disposal Limitations*
- 11:20 J. Kemper Will, *Underground Storage Tank Regulation*
- 11:50 John G. Welles, Luncheon Speaker, *Hazardous Waste Regulation: Where We Stand*
- 1:30 Frank B. Friedman, *Reduction of Hazardous Waste: Pay Me Now or Pay Me Later*
- 2:15 Richard L. Griffith, *Colorado's Hazardous Waste Program: Current Activities*
- 3:05 David Lennett, *An Evaluation of RCRA*
- 3:50 Panel: Questions and answers involving earlier speakers

#### June 10, 1986

- 9:00 Panel: *The New CERCLA Amendments—What Are They? What Do They Mean?* David R. Andrews, Phillip T. Cummings, Maggie Fox, Alan J. Gilbert, and Gene A. Lucero
- 10:50 Stephen D. Ramsey, *Update on CERCLA Litigation and Settlements*
- 11:40 Michael Donovan, *Natural Resources Damage Litigation*
- 1:45 Panel: *Lowry Landfill*. John D. Faught, Timothy R. Gablehouse, Sharon Metcalf, Lauren Stiller Rikleen, and Linda L. Rockwood.
- 3:20 Rob Walline, *EPA Regulation of Mining Wastes*
- 3:50 John D. Fognani, *The Revised Definition of Solid Waste*
- 4:20 Mine Waste Regulation—*Questions and Discussion*

The conferences will be held at the University of Colorado School of Law in Boulder. For further information, please contact the Center at (303) 492-1286.



## Center Cosponsors Section 404 Program

On March 8, 1986 the Center cosponsored a half-day program on **The Section 404 Dredge And Fill Permit Program** with the Environment and Natural Resources Section of the Boulder County Bar Association. The program began with an overview of legislative and judicial developments by **Nancy Rice**, Deputy Chief of the Civil Division in the Denver office of the Justice Department. Then **Chris Meyer** of the National Wildlife Federation addressed the scope of jurisdiction under Section 404. **Bruce Ray**, Assistant Regional Counsel with the E.P.A., discussed the E.P.A.'s 404(b)(1) guidelines. **John Morton**, Chief of the Corps of Engineers Regulatory Branch in the Omaha Division, described the Corps' permitting procedures. Finally, **Gregg Hobbs** of Davis, Graham & Stubbs talked about how to advise developers needing a 404 permit.

---

## New Members Appointed To Center Advisory Board

At the January 1986 meeting, nine new members joined the Center's Advisory Board, replacing seven retiring members. The retiring members who have been on the Board since its inception are **John U. Carlson**, **Stanley Dempsey**, **Ruth Maurer**, **Robert Pasque**, **Robert E. Sievers**, **Leo N. Smith**, and **Ruth M. Wright**.

The new Board members are **David R. Andrews**, McCutchen, Doyle, Brown & Enersen, San Francisco, California; **Gary L. Greer**, Sherman & Howard, Denver, Colorado; **Professor Charles W. Howe**, University of Colorado, Boulder, Colorado; **Dr. Jay Hughes**, Dean, College of Forestry and Natural Resources, Colorado State University, Fort Collins, Colorado; **Harris D. Sherman**, Arnold & Porter, Denver, Colorado; **Professor John Tilton**, Colorado School of Mines, Golden, Colorado; **Gretchen VanderWerf**, Hawley & VanderWerf, Denver, Colorado; **Professor Charles Wilkinson**, University of Oregon School of Law, Eugene, Oregon; and **William Wise**, El Paso Natural Gas Co., El Paso, Texas.

**Ray Moses**, Moses, Wittemyer, Harrison & Woodruff, Boulder, Colorado, has taken over the Chair position of the Board, replacing **Clyde Martz**, Davis, Graham & Stubbs, Denver, Colorado.

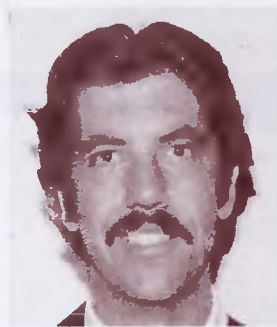
---

## Center Schedules Park Conference

Plans are now underway to hold a conference on the topic of **Incompatible Development Affecting The National Parks: Preserving "The Best Idea We Ever Had."** The conference is scheduled to begin the evening of September 14, 1986 and end the afternoon of September 16, 1986. Appropriate to its theme, the conference will be held in Estes Park, Colorado, adjacent to Rocky Mountain National Park. The program will include presentations regarding the history and purposes of the national parks, case studies of situations where adjacent development conflicts with management of the parks, and discussion of alternative proposals for addressing such situations.

## Emerging Forces in Western Water Law

by  
Steven J. Shupe



Steven Shupe

*Steven J. Shupe combines a legal and engineering background as a lawyer and water resources consultant in the western United States. After receiving a Masters Degree in Environmental Engineering from Stanford University, Mr. Shupe worked in the Water and Land Resources Department of Battelle Northwest. He attended the University of Oregon School of Law, then joined the Denver firm of Davis, Graham and Stubbs. In 1983, he became an Assistant Attorney General for Colorado, representing the state in various areas of water law. Mr. Shupe lectures and writes extensively on western water issues, with particular emphasis on efficiency needs, Indian water rights, instream flow uses, and water marketing. He recently cofounded Watershed West, an interdisciplinary consulting network of water resources professionals. During the 1985 fall semester he was a Fellow at the Natural Resources Law Center.*

There was a time when the sum of western water law could be expressed in that oft-quoted phrase, "first in time, first in right." As picks and plows began penetrating the lands of the arid West, the new courts generally adopted the local custom recognizing that those miners and settlers who first utilized a limited water supply had a continuing right to its use. This concept of prior appropriation was straightforward to administer, and consistent with a young nation's desire to open the West to new settlement.

Much has changed in the century since the doctrine of prior appropriation was adopted in the western United States—changes which have severely complicated the administration of water rights. Ground water came to play an important role in agricultural and municipal water supplies. Vast tracts of federal land reserves were withdrawn from the public domain, carrying with them significant reserved water rights. Streams that once harbored thriving fisheries dried up as their waters were overappropriated. Water quality degradation occurred as a result of growing populations, industries, and other activities. And, as competition grew intense for limited supplies, the 19th-century ethic of resource exploitation gave way to a recognition of the need for conservation and wise use.

These and other trends of the past decades have overlayed, if not subsumed, the simplistic notion of "first in time, first in right." In 1986, we are at a point where many of these currents in western water law are breaking to the surface with broad ramifications. Although priority of appropriation remains a basic tenet, a thorough grasp of modern water law requires knowledge of recent developments emanating from courtrooms, administrative offices, and legislatures.

This article briefly discusses many of the forces that are shaping the future of western water law. These range from how states are grappling with ground water regulation to how the Public Trust Doctrine is beginning to impact the



use of surface streams. The article concludes with a summary of the potential impact that these developments may assert on the course of water management and use in the West.

### **Mining of Ancient Aquifers**

One of the most significant developments in recent decades regarding western water resources has been the increased utilization of ground water. Underground supplies have been the key to the opening of new farmlands in areas where overappropriated streams were unable to fulfill growing demands. Wells also have been used to meet existing demands during the latter part of the irrigation season when surface flows typically wane.

The boom in ground water use followed the advent of improved pumping technology, advanced drilling techniques, and cheap electricity in the post-World War II era. For instance, in the Ogallala aquifer extending from the Dakotas to Texas, ground water irrigation tripled between 1950 and 1980. Currently, more than 20 million acre-feet are pumped from the Ogallala annually to irrigate 15 million acres of farmland. Similar trends, in which the agricultural economy became dependent on ground water, occurred in the Southwest, California, and many other western states. Currently, ground water accounts for approximately one-third of western irrigation and for half of household use.

Much of the ground water supply comes from ancient aquifers which accumulated over the centuries and which receive very little recharge. As a result, these aquifers, such as the Ogallala, are being rapidly depleted by over-pumping. This results in a drop of the water table which in turn increases pumping costs and requires the deepening of wells. In these days in which many farmers are operating on the economic margin, the additional costs associated with declining aquifers can push them over the brink.

Only recently have state officials begun seriously wrestling with the many questions associated with ground water mining. Should the concepts of first in time, first in right apply to this finite resource? Do overlying landowners have a special right to the water, or is it a supply available for appropriation by any potential user? And to what extent, if any, should the needs of future generations be considered in regulating and preserving this precious supply?

In most states, the answers to many of these types of questions have yet to be finalized. A few legislatures, however, have begun addressing the problem. Several of the states overlying the Ogallala aquifer currently have laws regulating well spacing, pumping rates, and other features designed to minimize interference between competing users. Also, in parts of Colorado, pumping from ancient aquifers has been restricted to a rate designed to ensure at least a one hundred year life to the supply. In addition, that state's supreme court has recently ruled that these supplies are not subject to general appropriation, but instead are tied to overlying land ownership. *Colorado v. Southwest Colo. Water Cons. Dist.*, 671 P.2d 1294 (Colo. 1983). Such regulations and rulings, however, leave many issues unresolved.

Arizona is the only western state comprehensively to address the long-term problem of ground water overdraft. It is estimated that Arizona's users annually pump 2.5 million acre-feet more ground water than is replenished; a trend whose continuation, according to Arizona Department of Water Resources, "would be disastrous to the state's expanding population and economy."

In 1980, the Arizona legislature passed the Groundwater Management Act in order to control the overdraft problem. Under the Act, the state's management goal is to balance aquifer depletions with recharge within 45 years. This goal is pursued through requiring existing users to implement conservation methods, prohibiting new acreage from being irrigated with ground water, developing sources of augmentation, requiring detailed monitoring and reporting by pumpers, and purchasing and retiring existing irrigation rights. In addition, ground water users are charged a fee (currently one dollar per acre-foot) in order to generate funds to support the activities of the Arizona Department of Water Resources.

### **Conjunctive Administration of Surface and Ground Water Use**

The mining of the ancient aquifers is an issue which increasingly will face states in the West. The concerns created by the recent boom in ground water use, however, extend beyond impacts on nonrenewable underground supplies. In many areas, pumping of ground water results in increased depletions to surface streams. As a consequence, senior surface rights are frequently unable to obtain their full water entitlement due to the pumping by junior wells.

State officials have begun addressing this issue, but with limited success. Mitigation of this problem is frustrated by the complex interface between surface and ground water hydrology. Pumping from a tributary well typically takes many days or even decades before it begins depleting a nearby surface stream. Likewise, the residual impact on the stream will continue for a long period after the pumping is terminated. Consequently, curtailing junior wells when senior irrigators call for water during a late-season shortage will usually not be effective in making the additional supply available. The effect of past ground water pumping typically continues to deplete the stream until well after the irrigation season has ended.

Various strategies have been attempted in order to protect senior surface rights from depletions caused by junior well pumping. In one region, a state enacted rules for prospectively curtailing well pumping in anticipation of a late season call by senior surface users. Another strategy involved shutting down wells for a specified number of days each week, thereby allowing the aquifer to recover to a degree. Neither of these approaches, however, proved

(continued on page 5)

### **The Natural Resources Law Center**

The Natural Resources Law Center was established at the University of Colorado School of Law in the fall of 1981. Building on the strong academic base in natural resources already existing in the Law School and the University, the Center's purpose is to facilitate research, publication, and education related to natural resources law.

For information about the Natural Resources Law Center and its programs, contact:

Lawrence J. MacDonnell, Director  
Katherine Taylor, Executive Assistant  
Diane Fenick, Secretary  
Fleming Law Building  
Boulder, Colorado 80309-0401  
Telephone: (303) 492-1286



# "On the Ground" Along the Colorado River

Driving along the lower Colorado River from Hoover Dam to Imperial Dam it seems possible to remember a time when the answers to water problems were provided by engineers. An "unruly giant" like the Colorado River could be "tamed" by dams. Stored water could be moved by canals through the deserts to thirsty metropolitan and agricultural areas in Arizona and California. Structures like the Hoover Dam and the All-American Canal are the products of this approach.

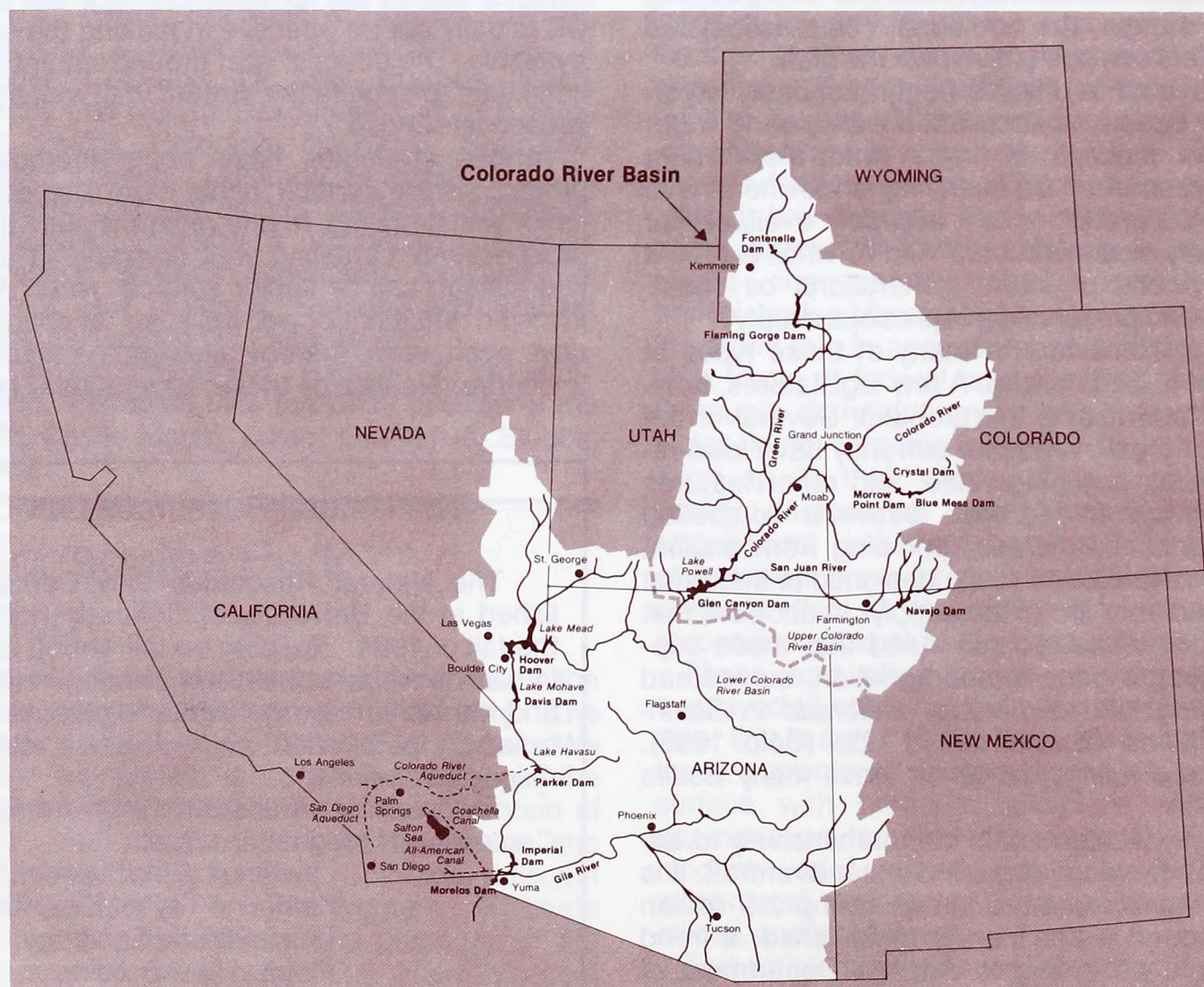
The Southwest continues to face water problems. The population in the South Coast basin of southern California has grown from 2.9 million in 1940 to over 12 million today. Arizona's rate of population growth has been similar. After many years the Central Arizona Project is now bringing water from the Colorado River to Phoenix. Southern California continues to look to the northern part of the state to meet its long-term needs. For its more immediate requirements discussions are underway between the Metropolitan Water District, southern California's major water supplier, and the Imperial Irrigation District to explore ways in which conserved water can be transferred from agricultural use to urban use.

As a resident of the state in which the Colorado River originates and as a person concerned about water issues, these are matters of direct interest. So when Dennis Underwood of the Colorado River Board of California called to ask if I could join a tour they were hosting of the lower Colorado River, it didn't take me long to respond.

The tour started in Las Vegas with the first stop at Hoover Dam, thirty miles away. Over the next three days we took a bus down along the Colorado River nearly to the Mexican border, then turned west into the Imperial Valley and ended up in the Coachella Valley. Along the way we visited major water facilities including the intake points for the Central Arizona Project and the Metropolitan Water District's Colorado River Aqueduct. We visited a lettuce packing plant in the Palo Verde Valley. We watched ditches being lined with concrete in the Imperial Valley. And we saw space-age water management systems in the Coachella Valley. It was the kind of tour that brings real meaning to the phrase: "seeing how things work on the ground."

Winter is a beautiful time in the deserts of the Southwest. It's easy to understand the reason for the rapid growth of this area as we stand in the crisp sunshine looking out at one small part of the backed-up Colorado River called Lake Mead. The clear blue sky adds depth to the color of the water. The contrast of so much water against the burnt earth tone of the surrounding desert landscape is striking. The short drive from Las Vegas to Hoover Dam provided all the evidence anyone would ever need that this is desert country. The sunshine, the dry clear air, the very things that draw so many people to this area—I was reminded that they exist in abundance here because this area is a desert. It is no wonder that the

(continued on page 8)





### Emerging Forces, continued

effectual in protecting surface users and in eliminating the conflicts resulting from this problem.

Colorado officials have recently enacted rules that flatly prohibit pumping from a junior well unless its depletions to the stream are offset in some manner. Such offset may be pursued through buying and retiring senior water rights, storing excess spring runoff and releasing it during times of shortage, importing water from another basin, or some other manner of augmentation.

Ground water users in the South Platte basin of north-eastern Colorado agreed to the enforcement of this program and focused their efforts on identifying sources of augmentation water. In the southern part of the state, however, well owners fought implementation of the rules, taking their case to the Colorado Supreme Court. They argued that the state engineer, in drafting the rules, had erred in assuming that the prior appropriation doctrine mandated that senior surface rights be protected from junior well pumping.

In the landmark case of *Alamosa-La Jara Water Users Association v. Gould*, 674 P.2d 914 (Colo. 1983), the court stated that "the prior appropriation doctrine is not a legal barrier to the concurrent consideration by the state engineer of the various methods of implementing the state policy of maximum utilization." It agreed with the well owners that the state engineer had improperly assumed that he had to curtail their diversions that interfered with senior surface rights. The court recognized that it would be inefficient in some regions to prevent the use of vast ground water supplies simply to keep a ribbon of water flowing on top for use by senior surface appropriators. In such instances, surface appropriation could be deemed an unreasonable means of diversion, and senior rights holders would have to drill wells in order to obtain their lawful supply.

The court in *Alamosa-La Jara* did not actually mandate this radical result wherein senior appropriators would have to drill wells as junior pumping dried up the streams. Rather, it remanded the rules back to the state engineer to consider this approach as well as other means for maximizing the utilization of both surface and ground water resources in the basin.

### Maximum Utilization and Efficiency

As demonstrated by the preceding case, the concept of maximum utilization promises to become a strong force in the future of western water law. States and water users are increasingly aware of the many problems associated with inefficient use of senior water rights that were established under 19th-century practices. Although most overapplied irrigation water eventually returns to a stream or aquifer for reuse, in many instances, a large portion of the excessive diversion is irretrievably lost. Also, when the return flows do reach the stream or aquifer, their quality is often degraded and in some cases they return after the irrigation season and the need for water is over. Additional problems created by inefficient diversions can include erosion of valuable topsoil, diminishment of instream flow values, and the creation of marshy and saline soil conditions when excessive return flows exceed the local drainage capacity.

The volumes of state supreme court decisions are replete with language preaching against the problems of wasted water and inefficient use. Historically, however, very little has been done to actually implement a shift from 19th-century practices to the modern need for efficiency and conservation. State officials are only beginning to

openly talk of reform and assess strategies for approaching this controversial issue. In the Imperial Valley of California, however, talk has finally been translated into action that promises to carry a significant impact.

The Imperial Irrigation District annually diverts 2.5 million acre-feet (maf) of the Colorado River to support a variety of agriculture. Roughly one maf of this total is not used by the crops, and drains into the Salton Sea, a saline lake with no outlet. These massive return flows not only raise the level of the Salton Sea to the detriment of adjacent landowners, but they also represent a significant loss of usable water in this region where supplies are scarce.

In 1984, the California Water Resources Control Board deemed that the practices of the Imperial Irrigation District contravened the constitutional prohibition against the waste of water. After finding that "regulation to prevent waste and unreasonable use of water is a clearly established element of California water law," the Board ordered that the District submit a plan to reduce the amount of water lost through leakage, spills, and other inefficient practices. Calif. Water Res. Control Board, Decision 1600, June 1984. Currently, the District is in the midst of identifying potential sources for financing the necessary improvements.

### Water Marketing and Transfers

In the Imperial Valley, state administrative actions were applied to require the water to be utilized more efficiently. State regulation, however, is only one of the forces that can be used to reduce excessive diversions. As water resources become more valuable in the arid West, the market system also can be a potent force in promoting water use efficiency. For instance, new appropriators may be willing to finance the modernizing of a senior irrigation system in order to apply the salvaged water to their own needs. Efficiency can be promoted as well through simply the buying out and transfer of senior water rights to fulfill modern demands.

In the western states, various impediments constrain the marketing and transfer of water rights. Most significant is the tenet that a senior water right cannot be changed or transferred to the detriment of other users on the stream. Thus, return flows which have historically been reused by junior appropriators cannot be marketed or transferred by the senior rights holder. Consequently, there is little economic incentive for the senior to modernize and reduce return flows.

Disincentives and uncertainties also exist around the ability of senior rights holders to market and transfer the consumptive component of their right. Some jurisdictions follow the appurtenancy rule and prohibit any use of a water right except on the land to which it was originally applied. Others allow transfer of the right to alternative use, but variously constrain the amount transferable. In many jurisdictions, the law regarding the transfer and marketing of water rights is unclear, thereby creating uncertainty which inhibits investors from pursuing the transaction. Additional impediments to the market system are created by the high transactional costs (i.e., attorney and engineering fees) that are typical of water rights changes.

States are looking at ways to facilitate the workings of the market system in order to promote water use efficiency. State legislators have introduced bills to allow the salvage and marketing of the component of a water rights that historically had been irretrievably lost. Means for easing impediments to water rights transfer are also being considered, including ways of reducing the transactional costs

(continued on page 6)



to both buyers and sellers. As the value of water continues to rise throughout the western states, additional attention can be expected to be focused on the issue of the free marketing of all or part of senior water rights.

State Instream Flow Protections

The free market system holds much promise for improving the efficiency of western water use. It also, however, harbors potential problems. Of particular concern is how public interest values can be adequately accounted for in an unconstrained water market. Many feel that state laws must be applied in order to protect public values in water, including the numerous benefits derived from free flowing rivers and streams.

Several western states have recognized the importance of instream flows to their citizens and economy, and have implemented programs for maintaining necessary flow levels. These programs involve different strategies which have met with varying degrees of success. Some simply empower the state water administrator to consider instream flow needs when issuing and conditioning water use permits. Others operate to remove designated streams from further appropriation in order to protect their free-flowing values. Another strategy involves delegating the power to a state agency to establish water rights for instream flows in important stretches of rivers and streams.

The recognition of the many intangible and economic values of freeflowing waters has grown in recent years and can be expected to significantly impact the future of western water law. Additional states are looking at instream flow legislation, while those with existing programs are assessing means for more effective enforcement.

Enforcement of instream flow rights creates a very complex administration problem due to their unique elements (i.e., instream flow rights are typically year round rather than seasonal; they extend for long stretches instead of being diverted at a single point; they require the construction and monitoring of stream gages in order to prevent depletion by junior users). These attributes of instream flow rights can also make them particularly constraining to subsequent water development. As a result, many future controversies can be expected over the establishment and extent of instream flow protections.

The Public Trust Doctrine

Some western state legislatures may be tempted to ignore instream flow needs and thereby avoid the constraints they place on other water uses. Such an approach, however, may prove implausible due to the recent reach of the Public Trust Doctrine into inland waters.

The Public Trust Doctrine is an ancient concept arising in England and carried by common law into American jurisprudence. It reflects the historical importance of coastal navigation and fishing to the general populace, and prohibits the sovereign from alienating these public rights in the coastal zone. Starting in the 1800s, American courts have used the Doctrine to limit the extent to which states may allow private development to impinge upon the public interest in tidelands.

In 1976, the North Dakota Supreme Court raised the idea that the public trust duty on state sovereigns extends as well to considering the public interest in inland waters. *United Plainsmen v. North Dakota State Water Cons. Comm.*, 247 N.W.2d 457 (1976). This concept took root in California and bloomed in 1983, in *National Audubon Society v. Superior Court of Alpine County*, 658 P.2d 709 (Cal. 1983). In this case, the California Supreme Court

assessed the values of Mono Lake that were being adversely impacted by diversions for the City of Los Angeles. It determined that the Doctrine bars water diversions "once it becomes clear that such diversions harm the interests protected by the public trust." The court then remanded the case for a determination of the extent to which Los Angeles' water rights may need to be curtailed in order to protect the public interest in the Mono Lake environment.

The potential impact of the Public Trust Doctrine over existing and future water use in the West remains to be determined. No other state supreme court has dealt directly with a Mono Lake type claim, although the Idaho Supreme Court recently acknowledged that the Doctrine applies to that state's waters as well. *Kootenai Environmental Alliance v. Panhandle Yacht Club*, 671 P.2d 1085 (Idaho 1983). Many parties, however, are considering how the Public Trust Doctrine could be innovatively asserted to further their positions. As a result, the Doctrine promises to be a factor in the future course of western water law.

The Influence of Federal Statutes

The Public Trust Doctrine represents the potential for impacting western water users and diminishing the control of state government over the allocation of water. Such control can be diminished as well by various federal statutes. Although the United States long ago deferred to state control over water allocation, the secondary impact of certain federal programs may alter the pattern of water use in the West. Foremost among these programs is the protection of endangered species.

The impact of the Endangered Species Act has already been felt by various water users. In eastern Colorado, a reservoir project has been delayed due to its potential effect on whooping crane habitat in Nebraska. Although the applicant is entitled to a conditional water right for the project under state law, federal approval of the necessary permits may be withheld if further studies show that the effect of the storage project on the cranes cannot be adequately mitigated. *Riverside Irrigation District v. Andrews*, 758 F.2d 508 (10th Cir. 1985). Similarly, water development in the upper Colorado River basin may be constrained due to the potential impact of additional depletions on endangered fish species. Further west, the Act has caused the Bureau of Reclamation to regulate a reservoir in favor of endangered fish to the detriment of municipal and industrial supplies. *Carson-Truckee Water Conservancy District v. Clark*, 741 F.2d 257 (9th Cir. 1984).

A main objection of headwater states to the Endangered Species Act is that it is reallocating water between the states in contravention of existing interstate compacts. For example, Colorado users have the legal right to develop additional waters of the South Platte River under its compact with Wyoming and Nebraska. The Endangered Species Act will undermine compact allocation if it prevents further reservoir development upriver of the whooping crane habitat.

A similar fear of headwater states is fueled by the federal salinity control program for the upper Colorado River basin. In order to protect downstream water users from salts carried from the upper Colorado, the federal government is assessing various control measures, including reducing diversions from the high quality headwaters. Upstream states are concerned that the impact of this policy may eventually result in their being unable to utilize their lawful entitlements under the Colorado River Compact of 1928.

Further federal impact on the future of western water allocation can be found in the national programs for water



quality control. In fact, as both natural and human-generated sources of contamination are found in an increasing number of water sources, the role of water quality in western water law and administration will undoubtedly become more complex.

### Federal Reserved Water Rights

The impact of federal environmental statutes on water allocation is only one way in which state water users will be impacted by the federal interest in water. In 1963, the Supreme Court established that the United States held dormant, but potentially significant, water rights in its lands reserved from the public domain such as national forests, military bases, recreational areas, national parks, etc. *Arizona v. California*, 373 U.S. 546 (1963). Subsequent cases have established that the amount of water thus reserved is the quantity necessary to fulfill the primary purpose of the land reservation. The priority of the reserved water right corresponds with the date that the land reservation was established.

Since many national forests and other federal reservations were established early in the history of the West, reserved water rights often have a senior priority relative to many state water users. Only recently have attempts been made in court to quantify the extent of these rights and thereby establish precisely who has what right to various water sources.

The quantification of federal reserved water rights will be a pervasive factor in western water adjudication for many years. Also, major issues regarding the lawful extent of reserved rights remain unresolved. For instance, the Supreme Court has yet to determine whether ground water supplies are reserved under the doctrine. Another unresolved issue with significant repercussions is the current claim for instream flows in the national forests. The Forest Service asserts that large instream flows are needed to maintain viable stream channels, which in turn are necessary to fulfill a primary purpose of the national forests of "securing favorable conditions of water flow." In the watersheds of Wyoming and Colorado where the United States has asserted these instream flow claims, they amount to more than half the total average annual runoff from the basin.

Controversy also exists over the extent of instream flow rights in Wilderness Areas. After the United States failed to claim any such rights, the Sierra Club filed suit to compel the government to do so. A federal district court recently gave Sierra Club a favorable ruling, but the controversy is far from over. *Sierra Club v. Block*, 622 F. Supp. 842 (1985).

### Indian Water Rights and Jurisdiction

The reserved water rights of Indian tribes will also play a significant role in the future of western water law. Not only do these reserved rights typically have very senior priority dates (i.e. the date that each reservation was established), but their quantity also can be significant. In many western states, assertion of reserved Indian water rights holds the potential of dislocating non-Indian users who have relied upon local water supplies for decades.

Various strategies are being pursued by tribes and states in order to assimilate powerful Indian rights into the western water allocation picture. In southern Arizona, the Ak Chin and Papago have agreed to waive their legal claims to reserved water rights in exchange for a guaranteed delivery of water to them through the Central Arizona Project. In addition, each tribe will receive several million dollars of fed-

eral funds as part of their settlements. Another example of a negotiated solution occurred in early 1985 between the tribes of the Fort Peck Indian Reservation and the state of Montana. The major provision of this agreement was that the tribes receive a diversion entitlement of over one million acre-feet annually from the Missouri River, and in turn, will allow non-Indian junior irrigators to continue diverting from the Milk River.

The vast quantity of reserved water rights is only one aspect of future Indian water controversies. Jurisdictional conflicts are also beginning to arise over the administration and management of water flowing through reservation lands. Many tribal governments are currently developing administration strategies to assert control over the management of reservation waters. For instance, the Navajo Nation in 1983 created the Division of Water Resources which now employs more than 200 people to manage, administer, and develop water resources on its reservation. It also required that water users, both Indian and non-Indian, apply to the tribe for water use permits.

Not surprisingly, some states have challenged tribal jurisdiction over non-Indian water use. (See *Colville Confederated Tribes v. Walton*, 647 F.2d 42 (9th Cir. 1981); *United States v. Anderson*, 736 F.2d (9th Cir. 1984).) Cooperation as an alternative approach, however, is also beginning to grow between state and tribal governments. Water knows no political boundaries, and in order to effectively manage this mobile resource, intergovernmental cooperation is needed. The state of Washington and the Colville tribes recognized this fact in entering a water quality agreement in August, 1985. Under the agreement, representatives from each government will work together to standardize existing tribal and state water quality standards. After completing this process, a single water quality administrator (jointly appointed, but employed by the tribes) will have the authority to enforce all water quality regulations over both Indian and non-Indian activities on the reservation.

### Meeting the Challenge

The complicated framework of western water law promises to grow more complex in the future. Dormant reserved water rights, the Public Trust Doctrine, and the several other factors summarized in this article each make effective water management difficult. In addition, the landmark decision in *Sporhase v. Nebraska*, 458 U.S. 941 (1982), complicates state control of interstate exports since water was deemed a commodity that falls under the limitations of the Commerce Clause.

States are responding to the challenge of effective water management in a variety of ways. Many are considering innovative methods of asserting authority over the use and control of unappropriated waters. For instance, Montana recently enacted legislation providing that any proposed appropriation greater than 4,000 acre-feet per year had to be *leased* from the state. Under this leasing requirement, the state can assert broad control over the proposed diversion and maintain long-term control of the water resource.

The current New Mexico legislature is also considering means of maintaining authority over valuable water resources. A recent, state-sponsored report indicated that more than 150 million acre-feet of unappropriated, retrievable groundwater exists under New Mexico lands, representing a potential value in the billions of dollars. The report recommends that the state lay claim to this water supply and enter the regional water market.

(continued on page 8)



## Emerging Forces, continued

As water becomes more scarce and valuable in the arid West, additional innovative ideas undoubtedly will be proposed. Innovation, however, often is characterized by controversy. The ways in which water users, states, tribes, and the federal government respond to such controversy remains to be seen. With dialogue, knowledge, and cooperation, perhaps the cycle of conflict that has characterized the history of western water rights can finally be broken.

## References

For related readings by the author, see "Administration Of Ground Water Rights: A Darkening Cloud Over Irrigated Agriculture," 20 Gonzaga Law Rev. 729 (1985); "Reserved Instream Flows in the National Forests: Round Two," Western Natural Resources Litigation Digest, Spring Commentary, 1985; "Waste in Western Water Law: A Blueprint for Change," 61 Oregon Law Rev. 483 (1982); "Water in Indian Country: From Paper Rights to a Managed Resource," (publication pending in the Spring 1986 issue of the U. of Colo. Law Rev.).

See also, Wilkinson, "Western Water Law in Transition," 56 U. Colo. Law Rev. 317 (1985); Tarlock, "The Endangered Species Act and Western Water Rights," 20 Land and Water Law Rev. 1 (1985); Dunning, "The Public Trust Doctrine and Western Water Law: Discord or Harmony?" 30 Rocky Mt. Min. Law Inst. 17.1 (1984).

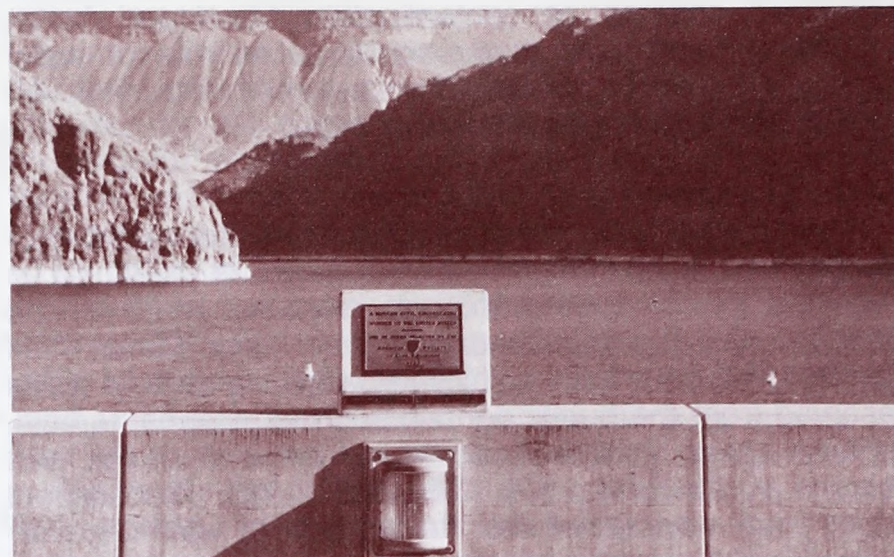
## Colorado River, continued

muddy, salty water of the Colorado River is fought over like some kind of treasure. In this arid world it is indeed a treasure.

The personnel of the Bureau of Reclamation, giving us a tour of the Hoover Dam, are clearly proud of this now venerable facility. The visitors' Center houses a diorama providing a three-dimensional look at the Colorado River system from its headwaters in Wyoming and Colorado to the Gulf of California in Mexico. The narrated show takes us on a tour with controlled lighting used to move our attention from place to place. We are reminded that Hoover was the first major structure on the River, that it was authorized by Congress in the Boulder Canyon Project Act of 1928 and completed in 1935, that before it was built the Colorado River flooded periodically causing major damage to agricultural activities adjacent to the River—an agriculture that existed because of the rich sediments deposited in these areas over thousands of years of such flooding.

The precipitating event apparently leading to Congressional approval of the Boulder Canyon Project Act was a massive flood in 1905 in which the Colorado River actually changed course and ended up flowing into what is now known as the Salton Sea rather than down to the Gulf of California. The Boulder Canyon Act not only included construction of Hoover Dam, but also authorized the All-American Canal as a means of moving Colorado River water through a system totally within the U.S. to the Imperial and Coachella Valleys.

The elevator takes us hundreds of feet down into the dam structure. The terrazzo floors, decorated with Indian designs by artisans working as part of a WPA project, have seen millions of visitors over the fifty years since Hoover was completed. Yet the entire underground area has a feeling of cleanliness and maintenance that reminded me somehow of being aboard of a Navy ship.



Lake Mead and Hoover Dam

Construction of the Hoover Dam was an unparalleled engineering feat. The statistics are boggling. The dam itself is more than 700 feet high, with a thickness of 660 feet at its base and 45 feet at its crest. It stretches nearly a quarter of a mile between the Nevada and Arizona walls of the Black Canyon. The capacity of Lake Mead is more than 28 million acre-feet, making it the largest reservoir in the U.S.

With Hoover and the other dams that have been built, there is no question that the Colorado is a different river. Booklets by water agencies are fond of referring to it as "harnessed." Philip Fradkin has called it "A River No More." Yet the floods of 1983 in which the Hoover spillways were forced into action for the first time ever, showed that the Colorado has not been totally tamed. One of the things I noticed as we moved south along the River was the large amount of commercial and residential development directly adjacent to its banks and clearly within the flood zone. Much of this development was badly damaged in 1983, but it appears to have been reestablished and additional development continues to take place.

It is not surprising that many in the desert country are drawn to the banks of its major river. Large retirement communities such as the one at Bullhead City, Arizona have been established in this area. After leaving Hoover, we stopped for lunch at a resort in Laughlin, Nevada. It was filled with people throwing quarters into slot machines. We were told that the resort sends boats across the river to Bullhead City to bring people back.

As we travelled south along the river, Vern Valentine, chief engineer for the Colorado River Board of California, provided a recount of the "Law of the River." Beginning in 1922, a series of compact agreements, federal laws, and judicial decisions have been established which collectively govern the allocation of the water of the Colorado River. The 1922 Colorado River Compact apportioned the Colorado between the Upper Basin states (Colorado, Utah, Wyoming, and New Mexico) and the Lower Basin states (Arizona, California, and Nevada). Based on mistaken assumptions regarding the flow of the River, the Compact guaranteed the Lower Basin states a flow of 75 million acre-feet over a series of 10-year periods. It was thought that this apportionment provided roughly equal shares to the two basins. However, since the annual average flow appears to be about 13.6 million acre-feet, and since the treaty obligation to Mexico is 1.5 million acre-feet annually, the Upper Basin share is actually considerably less.



The apportionment of water among the Lower Basin states was accomplished in the case of *Arizona v. California*, decided by the U.S. Supreme Court in 1963. The Court affirmed prior Congressional action in the Boulder Canyon Project Act, allocating 4.4 million acre-feet to California, 2.8 million acre-feet to Arizona, and 300,000 acre-feet to Nevada. In addition, the Court recognized the existence of reserved water rights on behalf of a number of Indian tribes located on reservations along the River or its tributaries and allocated 900,000 acre-feet annually to five tribes located on the mainstem. This water, and other reserved rights subsequently quantified, come out of the share of the state in which the reservation is located.

In 1931 California allocated its share of Colorado River water in the "Seven-Party Agreement." Priority positions and quantities were established so that the agricultural users (Palo Verde, Yuma, Imperial, and Coachella) had first priority to 3.85 million acre-feet of water, with the Metropolitan Water District taking the remaining 550,000 acre-feet of the 4.4 million share. Surplus flows available to California have been taken primarily by the MWD.

This surplus water had been available largely because Arizona had not been able to take its share. In 1985, water began to move to Phoenix through the Central Arizona Project. As Arizona moves toward taking its full entitlement, MWD's share will move back to its 550,000 acre-foot allocation—about 425,000 acre-feet less than it diverted annually between 1971 and 1981.

The MWD provides water to 27 member agencies in a service area that extends from north of Los Angeles to south of San Diego. It was formed in 1928 and its first major project was the construction of the Colorado River Aqueduct. Initially completed in 1941, subsequent additions to the system now provide a capacity of more than one million acre-feet per year. Another example of engineering excellence, the aqueduct traverses 242 miles of desert and mountains from the outtake at Lake Havasu on the Colorado River to the terminal reservoir near Riverside, California. Bonds to finance construction of the aqueduct and construction of Parker Dam, the dam that forms Lake Havasu, were approved by southern California voters in the severe depression year of 1931—an indication of the importance attached to obtaining water in that region.

As we approached Lake Havasu City, we were reminded that this is now the home of the London Bridge. The bridge itself is a rather unprepossessing affair—no towers or turrets. It does have an attractive brownstone foundation, simple, and originally very functional for permitting movement across the Thames. Now it is a tourist attraction with a channel dug under it to make it function like a bridge. As seems so often the case in this part of the world, it is the incongruity that is remarkable—the London Bridge in a desert.

Lake Havasu is not an especially large reservoir (600,000 acre-feet), but it serves as the take-out point not only for the Colorado River Aqueduct, but also for the Central Arizona Project. Water from the Colorado River must initially be lifted 600 feet before it can begin its journey to Phoenix. We stopped at the CAP pumping station and got a brief overview of the Project. Looking at the slides of the fabulous system of concrete lined canals moving the water through the Arizona desert, I was reminded of the tracings that have been found of earlier irrigation systems constructed by pre-Columbian cultures in this area. The scale is much bigger and the techniques more sophisticated, but the basic process is the same: bring the water to the people.

The rapid decline of the Anasazi culture remains a mystery. One line of speculation focuses on evidence of a prolonged drought during that time. Today climatologists at the National Center for Atmospheric Research speculate about the possible consequences of the "greenhouse effect" — the gradual warming of the earth's surface caused by a buildup of carbon dioxide in the atmosphere. Relatively minor changes in average temperature can have major effects on such things as the availability of water. Denver's semi-arid climate can become as dry as that of Tucson. As I look at an area where the population growth is already forcing the development of things like the Central Arizona Project, I wonder what the conditions in the 21st century will require.

It is already dark when we arrive at Gene Village, MWD's field headquarters, where we will spend the night. Established at the time of construction of the Colorado River Aqueduct, Gene Village is now a comfortable field office and guest lodge. Meals are served family style, with large quantities of the kind of hearty fare appropriate for people building aqueducts, though perhaps more than is necessary for people who have been sitting in a bus all day.

We begin the next morning with a tour of the pumping facility at Lake Havasu which lifts the water from the Colorado River up 290 feet to begin the journey to MWD users. On the way to the pumping facility, we pass palm trees planted long ago in narrow ravines where there is water. There is a characteristic look to MWD structures with which I became familiar years ago during time spent in southern California. The pumping station comes right out of the mold. It was built in the 1930s, and, like the Bureau of Reclamation facilities we have seen, is beautifully maintained. The control room gadgetry appears rather quaint compared to the modern digital equipment we had seen the night before at the CAP pumping plant.

As we passed south through the Parker Valley, we saw land in the Colorado River Indian Reservation under cultivation. We were told that these lands were leased by non-Indians and irrigated with water allocated for use on the reservation under the 1963 *Arizona v. California* decision. In that decision the Supreme Court adopted the "practically irrigable acreage" standard for quantifying Indian reserved rights. The quantification and use of Indian water rights have proceeded somewhat slowly since 1963. Especially for Arizona, the magnitude of these rights looms large. One option being discussed is to permit the leasing of such rights for off-reservation uses.

Next we entered the Palo Verde Valley in California. The Palo Verde Irrigation District holds the number one priority from the Colorado River among the California appropriators. Driving through this rich agricultural area, we saw fields in the process of being levelled using a laser device as a means of improving irrigation efficiency. An astounding average of more than 10 acre-feet of water is applied to each acre of agricultural land in the district. In part this large amount of water is needed because of the natural high salt content in the soils and the salinity of the water from the River. Irrigators pay a flat fee of \$40 per acre of land irrigated, so a typical cost of water is about \$4 per acre-foot. The main crop is alfalfa. With year-round growing conditions, it is possible to have ten cuttings a year.

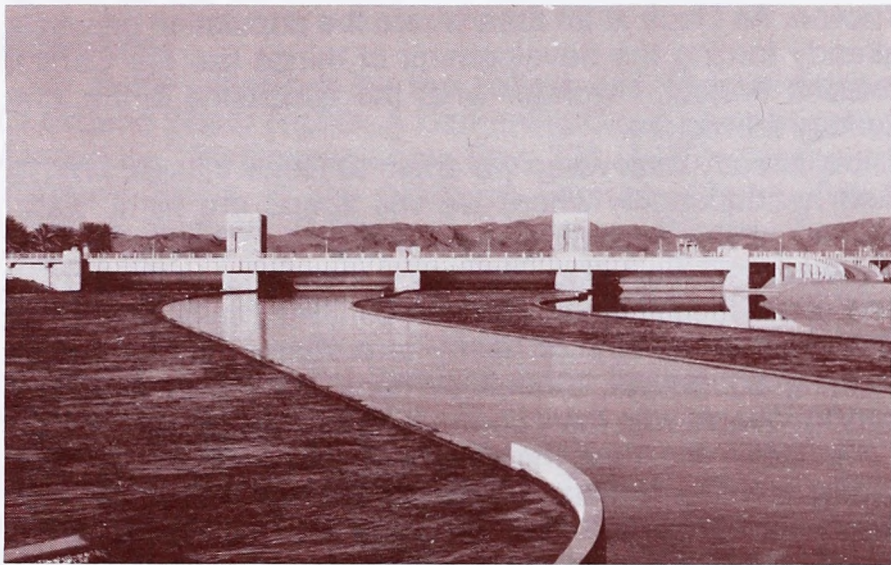
As we continued south towards Yuma, we passed scattered encampments of snowbirds—wintertime refugees from cold weather states who come to this area in their motor homes and RV's. In some cases there were gatherings of just a few vehicles, in others there were hundreds

(continued on page 10)



## Colorado River, continued

of such vehicles together. Some sites are located in scenic spots adjacent to the river, but many are out in areas with little around other than sagebrush. I had heard of snowbirds, of course, but the sheer numbers surprised me. Yuma, Arizona actively courts these wintertime visitors, since their presence brings a major boost to the economy. With the "graying" of our population, this trend seems likely to increase.



Imperial Dam—Takeout for the All-American Canal

Late in the afternoon of our second day we came to the Imperial Dam, 300 miles downstream from Hoover. This point marks the beginning of the All-American Canal through which Colorado River water is transported to the Imperial and Coachella Valleys. A desilting works has also been constructed at this point to take out most of the undesired sedimentary materials in the river water.

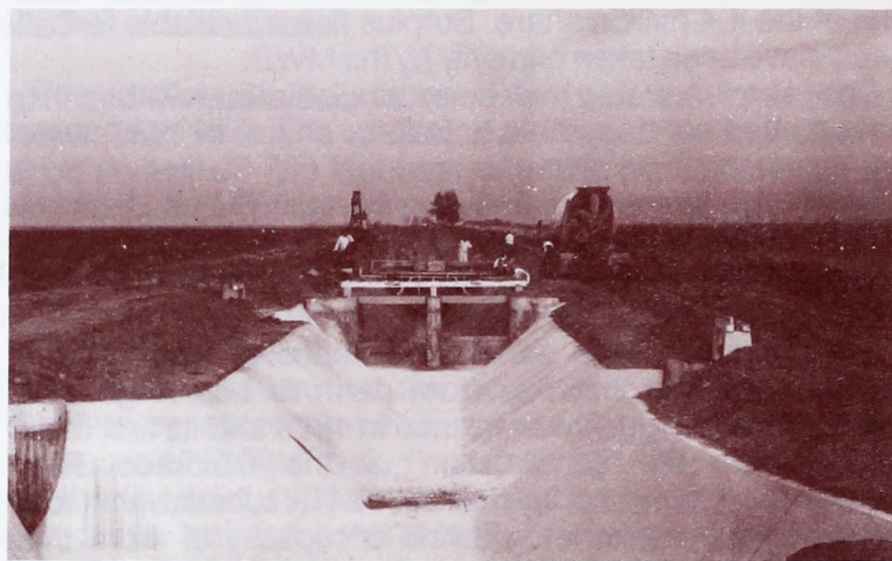
Another undesirable constituent in the water in very substantial quantities at this point is salt. The salinity of the river increases progressively downstream, primarily because of loadings from natural sources and because of salts gained when diverted water is used for irrigation and other purposes. Salinity concentrations as measured at the Imperial Dam have been generally increasing over the years. As the costs associated with this increasing salinity were recognized, measures were undertaken aimed at reversing this trend. A cooperative federal-state program, known as the Colorado River Basin Salinity Control Forum, was established. This organization develops water quality standards and works toward implementation of programs to reduce river salinity. In addition, Congress enacted legislation in 1974 under which specific physical measures are being implemented to address the salinity problem, including construction of the Yuma Desalting Plant which treats water returning to the river from the Wellton-Mohawk valley in southwestern Arizona and makes it directly available to Mexico.

On the final day of our tour we visited the Imperial and Coachella Valleys. The remarkable agricultural productivity of these areas again reminds me of how far we have gone to change natural conditions for our own benefit. Once little more than desert, the income from agriculture in the Imperial Valley in 1984 was \$762 million. Irrigation water truly has made the desert bloom.

The Imperial Irrigation District has been taking up to 3 million acre-feet of water annually from the Colorado River — nearly a quarter of *all* net diversions from the river. The cost for farmers in the district for this water is about \$9 per acre-

foot. Drainage in the Imperial Valley is to the Salton Sea, now an inland lake 35 miles long, 15 miles wide, and 40 feet deep. It has a salinity content slightly higher than that of ocean water.

Encroachment on his land caused by the increasing size of the Salton Sea prompted a district farmer to file a complaint in 1980 with the California Department of Water Resources. He alleged that the inefficient irrigation practices of the district were causing wasted flows of water to the Salton Sea and that such waste was prohibited by a provision in the California constitution. An investigation by the California agency revealed that annual losses of water in the Valley are about 901,000 acre-feet, about a third of the water taken from the Colorado River. A number of conservation measures were considered which, if implemented, could conserve about 437,000 acre-feet of water per year.



Lining ditches with concrete in the Imperial Valley

The costs of these measures vary, but one good estimate indicates that the average cost for achieving the full amount of conservation available would be \$235 per acre-foot. Since irrigation water presently costs \$9 per acre-foot, there is clearly no economic incentive for the district itself to make these kinds of investments. However, for the Metropolitan Water District such a cost compares favorably with other alternative sources of supply. Consequently, discussions have been underway between Imperial and the MWD to work out an arrangement whereby MWD will provide the needed investments in return for the water that is conserved. In the meantime the district is itself pursuing a conservation program that includes the lining of ditches and construction of a reservoir to allow better regulation of supplies.

Prior to this trip I knew of the Coachella Valley mainly as the location of Palm Springs. I now know that it also is the location of a space-age water management system. It seems that our tour leaders were saving the best for last. In fact, one of our leaders was Lowell Weeks, general manager and chief engineer of the Coachella Valley Irrigation District.

The Coachella Valley takes about 350,000 acre-feet of Colorado River water annually through the All-American Canal and the Coachella Branch. A 48-mile section of the Coachella Branch was concrete-lined in 1980. A soil-cement lined reservoir at the terminus of the canal provides storage for the system. The water distribution system is entirely underground. Completed in 1954, the system



delivers water to the high point within each 40-acre farm area in the district through concrete pipelines. Drip irrigation and other forms of controlled applications are widely used in the Coachella Valley. Monitoring and control of water throughout the system is maintained through computerized remote control, although individual daily farm deliveries are still handled manually.

Still another example of innovative water management is provided by a recent water exchange arrangement between Coachella and the MWD. Colorado River water is presently being taken from the Colorado River Aqueduct and "banked" through recharge into the aquifer underlying the upper Coachella Valley. MWD paid the \$4 million needed to establish the spreading basin used to feed the aquifer. In return, MWD is able to take the water Coachella is entitled to from the State Water Project.

Seeing the water management system in the Coachella Valley made me realize that we have only just begun to tap the possibilities for making good use of our water. As the opportunities for responding to water needs through construction of major storage projects diminish we will increasingly turn to other kinds of opportunities.

In many respects the Imperial Valley is a unique situation since the unused water flowing into the Salton Sea is no longer usable for irrigation. Yet, as the Coachella system demonstrates, there are many ways in which water can be managed so that only that amount actually needed is used. Water no longer needed can then be made available for other uses.

The prospects are encouraging. In part it seems to me that the engineers still do have the answer. But solutions are complicated because changes in existing patterns of use, changes in laws and institutions, even changes in attitudes are necessary. Solutions, in some ways, will be smaller in scale. Yet greater cooperation will be required. Not an easy set of problems to be sure, but many of the answers are already in evidence.

— Larry MacDonnell

## Publications and Materials of the Natural Resources Law Center

### Books

- *Special Water Districts: Challenge for the Future*, James N. Corbridge, ed. Book containing edited papers from the workshop on Special Water Districts, Sept. 11-13, 1983. \$15.

### Conference Materials

- *Western Water Law in Transition*, 415-page notebook of outlines and materials from 3-day, June 1985 conference. \$60.
- *Public Lands Mineral Leasing: Issues and Directions*, 472-page notebook of outlines and materials from 2-day, June 1985 conference. \$40.
- *Management of National Forests in the Rocky Mountains*, 130-page notebook of outlines and materials from 1-day, March 1985 forum. \$15.
- *The Federal Impact on State Water Rights*, 365-page notebook of outlines and materials from 3-day, June 1984 conference. \$60.

- *The Federal Land Policy and Management Act*, 350-page notebook of outlines and materials from 3-day, June 1984 conference. \$60.
- *Groundwater: Allocation, Development and Pollution*, 450-page notebook of outlines and materials from 4-day, June 1983 water law short course. \$55.
- *New Sources of Water for Energy Development and Growth: Interbasin Transfers*, 645-page notebook of outlines and materials from 4-day, June 1982 water law short course. \$55.

### Occasional Papers

- "The Rights of Communities: A Blank Space in American Law," Joseph L. Sax, Professor of Law, University of Michigan, NRLC Occasional Papers Series. 16 pgs. \$2.50.
- "Nuisance and the Right of Solar Access," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 54 pgs. \$5.
- "Tortious Liability for the Operation of Wind Generators," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 74 pgs. \$5.
- "The Access of Wind to Wind Generators," Adrian Bradbrook, Reader in Law, University of Melbourne, Australia. NRLC Occasional Papers Series. 77 pgs. \$5.

### Research Reports

- "The Endangered Species Act and Water Development Within the South Platte Basin," Lawrence J. MacDonnell, Colorado Water Resources Research Institute (Completion Report No. 137). \$6.
- "Guidelines for Developing Area-of-Origin Compensation," Lawrence J. MacDonnell, Charles W. Howe, James N. Corbridge, W. Ashley Ahrens. NRLC Research Report Series. 70 pgs. \$5.

### Reprints

- "Implied Covenants in Oil and Gas Leases," reprint of two articles by Stephen F. Williams, Professor of Law, University of Colorado. 40 pgs. \$4.50.

### Audio Tapes

- *Western Water Law in Transition*, cassette tapes of speakers' presentations. Full 3 days--\$150. Half-day segments--\$35 each.
- *Public Land Mineral Leasing: Issues and Directions*, cassette tapes of speakers' presentations. Full 2 days--\$100. Half-day segments--\$35 each.

### Newsletter

- *Resource Law Notes* is available without charge. Write or call the Center to add your name to the mailing list.



# Natural Resources Law Center Advisory Board

**Raphael J. Moses, Esq., Chairman.** Moses, Wittemyer,  
Harrison & Woodruff, Boulder.

**David R. Andrews, Esq.** McCutchen, Doyle, Brown &  
Enersen, San Francisco.

**Gary L. Greer, Esq.** Sherman & Howard, Denver.

**Professor Charles H. Howe,** Department of Economics,  
University of Colorado, Boulder.

**Dr. Jay Hughes,** Dean, College of Forestry and Natural  
Resources, Colorado State University, Fort Collins.

**Guy R. Martin, Esq.,** Perkins, Coie, Stone, Olsen & Williams,  
Washington, D.C.

**Clyde O. Martz, Esq.,** Davis, Graham & Stubbs, Denver.

**Charles J. Meyers, Esq.,** Gibson, Dunn & Crutcher,  
Denver.

**Laurence I. Moss,** Energy Design and Analysis, Estes Park.

**David P. Phillips, Esq.,** Executive Director, Rocky  
Mountain Mineral Law Foundation, Boulder.

**Harris D. Sherman, Esq.,** Arnold & Porter, Denver.

**Professor Ernest E. Smith,** School of Law, University of  
Texas, Austin.

**Professor A. Dan Tarlock,** Chicago/Kent Law School,  
Illinois Institute of Technology, Chicago.

**Dr. John Tilton,** Department of Mineral Economics, Colorado  
School of Mines, Golden.

**Gretchen VanderWerf, Esq.,** Hawley & VanderWerf,  
Denver.

**Professor Gilbert F. White,** Department of Geography,  
University of Colorado, Boulder.

**John G. Welles,** Regional Administrator, Environmental  
Protection Agency-Region VIII, Denver.

**Professor Charles Wilkinson,** School of Law, University of  
Oregon, Eugene.

**William Wise, Esq.,** El Paso Natural Gas Co., El Paso.

**Marvin Wolf, Esq.,** Wolf Energy Company, Denver.

## Faculty Advisory Committee

**Betsy Levin,** Dean, University of Colorado, School of Law

**James N. Corbridge, Jr.,** Professor of Law.

**David H. Getches,** Associate Professor of Law (on leave).  
Executive Director, State of Colorado Department of Natural  
Resources.

**Stephen F. Williams,** Professor of Law.

---

Resource Law Notes  
Natural Resources Law Center  
University of Colorado  
School of Law  
Boulder, Colorado 80309-0401

Nonprofit Organization U.S. POSTAGE <b>PAID</b> Boulder, Colo. Permit No. 257
--