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Newsletters

Winter 2001

Resource Law Notes Newsletter, no. 51, winter/spring issue, Mar. 2001

University of Colorado Boulder. Natural Resources Law Center

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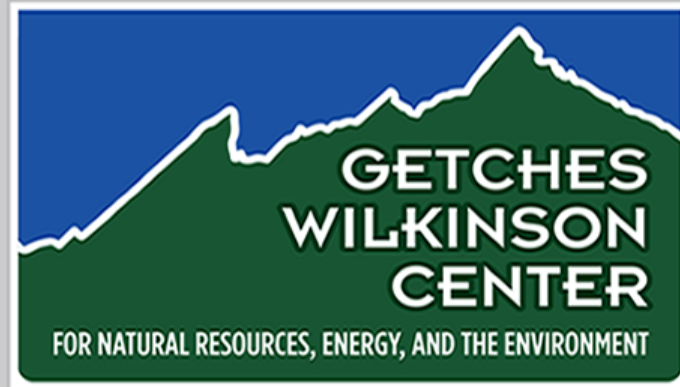
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RESOURCE LAW NOTES



Natural Resources Law Center

School of Law

University of Colorado at Boulder

Number 51

Winter/Spring Issue, March 2001

Calendar of Events

March 5: Hot Topics

"The natural resource agenda of the Bush Administration and the Interior Department"

Perry Pendley, Mountain States Legal Foundation, **Maggie Fox**, Sierra Club

March 12: NRLC Forum

"Corporate Disclosure of Environmental Risks"

Robert Repetto, University of Colorado at Denver, **Cynthia Williams**, Georgetown University Law Center

March 14-15:

NRLC/Indian Law Clinic Guest Fellow
Tom Goldtooth, Indigenous Environmental Network (see p.3)

April 26: Hot Topics

"*Messages from Frank's Landing*", readings from a new book by Charles Wilkinson and a discussion of the Indian sovereignty movement.

Charles F. Wilkinson, University of Colorado School of Law

May 14: Hot Topics

"Mining and Sustainable Development: A Global Perspective"

Cecelia Dalupan, NRLC El Paso Energy Corporation Law Fellow

June 4-7: "Climate Change, Sustainability and Energy Policy"

NRLC & American Association of Petroleum Geologists, Denver. (p. 4)

June 13-15: 22nd Summer Conference

"Two Decades of Water Law and Policy Reform: A Retrospective and Agenda for the Future"

Conference agenda
and registration form
inside, p. 5-8.

Annual June Conference:

Two Decades of Water Law and Policy Reform: A Retrospective and Agenda for the Future

June 13-15, 2001

The next conference in the Center's annual series will take place June 13-15, 2001 at the University of Colorado School of Law. The conference will examine the agenda for reforming and improving water law that has developed during the past two decades in the West, assesses what has (and has not) been accomplished by pursuing these reforms, and explores lessons and implications for future water law and policy. The papers and discussion will provide analysis and lessons that can guide the new administration, Congress, federal agencies, state governments, and communities as they seek to find policy solutions to the challenges posed by the tremendous economic and demographic changes occurring in the West, in order to ensure the sustainability of the region's unique environment. Specific sessions will focus on reforms such as improving the scientific and technical basis for water management, water conservation and efficiency, protecting environmental values in meeting water demands, and creating new models of governance for water issues. The full agenda is enclosed.

Natural Resources Law Center Forum

Corporate Disclosure of Environmental Risks

March 12, 2001

12:00 p.m.

University of Colorado School of Law

Robert Repetto, Wirth Chair in Environmental and Community Development Policy, University of Colorado at Denver
Cynthia Williams, Georgetown University Law Center

Robert Repetto and Cynthia Williams are two leading scholars working on issues of disclosure to investors by corporate officials of their companies' environmental risks. The forum will focus on their recent research as well as future applications. Contact the Center at (303) 492-1272 for further information.

El Paso Energy Corporation Law Fellow Spring 2001

We are pleased to announce that the El Paso Fellowship for 2001 at the Natural Resources Law Center has been awarded to Ma. Cecilia G. Dalupan, a lawyer and legal consultant who works in the area of mining, climate change, and renewable energy in the Philippines.

Ms. Dalupan's research will focus on international environmental legal developments and their implications for the mining sector generally and specifically in terms of sustainable development and mining. She will be preparing an analysis of how principles of international environmental law can be used to produce a clear formula for sustainable mining. Her project will complement nicely other work going on at the Center on energy and mining law and on the implementation of the idea of sustainability to natural resource law and policy making.

Ms. Dalupan has been a consultant to the Mining, Minerals, and Sustainable Development project, the Asian Development Bank, the United Nations Environment Programme, the Philippine Department of Energy, and the National Renewable Energy Laboratory. She has published reports on environmental law and resource development, the mining industry and the rights of indigenous peoples, and mining in the Philippines, and has served as an attorney and as undersecretary for legal and legislative affairs in the Philippine Department of Environment and Natural Resources.

The El Paso Energy Corporation Fellow spends the spring semester in residence at the University of Colorado School of Law working on a research project on oil and gas, mineral, energy, public lands, or other areas of natural resource law and policy. The emphasis is on legal research, but applicants from law-related disciplines, such as economics, engineering, and the natural and social sciences, as well as lawyers, are also considered. Candidates may come from business, government, legal practice, or universities. While in residence, the Fellow has opportunities to exchange ideas with faculty and students at the Law School, as well as the broader university and legal and policy making community in the Denver-Boulder area.

The fellowship includes a stipend of \$25,000, administrative and part-time research assistance, office space in the Law School, and use of University libraries and other facilities. Fellows are expected to produce a written project suitable for publication in a professional journal, present at least two lectures or seminars on their research, and participate with center staff on projects and activities at the Center relevant to their research. The Center has applied for funding for the fellowship for 2002 and will invite applications for next year's fellowship as soon as we hear about funding.

We are most grateful to the El Paso Energy Foundation for their generous support of the fellowship since 1988.



Ma. Cecilia G. Dalupan
2001 El Paso Energy Corporation Law Fellow



Exploring the Effect of Continuing Increases in Water Demands on the Sustainability of Limited Water Resources

by Dr. James F. Booker
NRLC Visiting Fellow

Upcoming Event

NATURAL RESOURCES LAW CENTER INDIAN LAW CLINIC GUEST FELLOW

The Center is very pleased to join with the Indian Law Clinic to host **Tom Goldtooth**, National Coordinator of the **Indigenous Environmental Network**. He will be speaking at events in Boulder and Denver on March 14th and 15th. Please contact the Center at (303) 492-1272 for further details.

Current and past issues of *Resource Law Notes* are available on-line in PDF format at www.colorado.edu/Law/NRLC/recentpubs.html. Send an e-mail message to nrlc@spot.colorado.edu if you would like to be removed from the RLN mailing list and read our newsletter on-line.

The Rio Grande originates in the southern Colorado Rocky Mountains, flows through New Mexico, and forms the border between Texas and Mexico on its way to the Gulf of Mexico. Like many western rivers, the Rio Grande is both the dominant and limiting water resource throughout most of its watershed. Under dry conditions human claimants to basin water exceed the available supplies, and emerging demands for environmental protection (in the form of instream flows) further increase competition for access to scarce river flows.

A three-state (Colorado, New Mexico, and Texas) research team with legal, economic, and hydrologic expertise was formed to address the ability of the watershed and its institutions to cope with extended drought. My role has been one of integrating the disciplinary findings of the project researchers. I chose an optimization model incorporating the linkages between law, water flows, and economic impacts to perform the analysis. This modeling effort focuses on the Upper Rio Grande basin, from Colorado through New Mexico to Fort Quitman, Texas just below El Paso.

The Upper Rio Grande and its associated aquifers serves over one million acres of irrigated land and the municipal and industrial needs of Albuquerque and El Paso (and Ciudad Juarez in Mexico). Sixty years ago, the Rio Grande Compact was approved by Congress, dividing the annual water flow among the three states. In developing the Compact, the three states considered the likely flow regimes and the capabilities and limitations of storage facilities in order to craft an operating agreement for the river which protected the water uses existing at that time. Conditions six decades ago could hardly have predicted the growth in the basin's demand for water associated with an explosion in population, nor new policies toward fish and wildlife habitat emphasizing endangered species. The formal modeling work incorporates these new realities in order to test the fundamental hypothesis of this research: that new institutions for coordination of surface water withdrawal, groundwater management, and reservoir operations, could reduce economic and environmental losses resulting from water shortfalls, particularly in periods of severe and sustained drought.

In modeling a basin such as the Rio Grande I am most interested in working at the border of disciplines. I seek to demonstrate in a quantitative way the relationship between the rules governing allocation (the law) and the response of the physical system (hydrology). In between lies economics which helps us understand the reaction of water users to the incentives established by the law. That is, the law establishes the incentives under which water users operate; it is their actions in response to these incentives, however, which ultimately determine hydrology. It is within this framework in which I proceed to model the possibility of increasing the ability of the system to cope with drought.

This work starts with the basic water supply, which includes all major tributaries, interbasin transfers, and hydrologically connected groundwater. Water demands (current and projected up to 40 years into the future) include agricultural water uses (representing from 86% to 98 % of surface, and 47% to 56% of groundwater use), municipal and industrial demands in Albuquerque and El Paso (the balance of the demand for consumptive use), recreation at the major basin reservoirs, and environmental demands for instream flow protection. Each component is represented in a yearly time-step over a forty year planning horizon.

The institutions governing water allocation in the basin begin with the Rio

Continued on page 9

CLIMATE CHANGE, SUSTAINABILITY, AND ENERGY POLICY

The Natural Resources Law Center is working with the American Association of Petroleum Geologists to organize sessions on energy law and policy issues at the Association's annual meeting, June 4-7, 2001, in Denver. The title of the conference is "Integrating Environmental Solutions Into Business Operations." The two sessions are:

June 5th: APPROACHES TO REDUCING GREENHOUSE GAS EMISSIONS

Introductory Remarks, G. C. Bryner

Global Warming is Happening, K.E. Trenberth

Cool Companies: How the Best Businesses Boost Profits and Productivity by Cutting Greenhouse Gas Emissions, J. Romm

Global Warming and the Oil Industry - A viable Path Forward?, J. H. Shinn

The Role of Geologic Options in a National Carbon Management Strategy, D. Beecy, V. A. Kuuskraa

Global Climate Change as a Business Differentiator, A. M. Burke

BP's Emissions Trading System: Harnessing Market Forces to Meet Environmental Goals, Cost-Effectively, J. S. Morgheim

The Clean Development Mechanism: Institutional Breakthrough or Institutional Nightmare, R. Repetto

June 6th: SUSTAINABILITY FORUM: INTEGRATION OF METRICS AND APPLICATIONS

Introductory Remarks, E. R. Beaver and F. R. Beloff

Carbon-Based Renewables: Options for Use in Managing Carbon, G. R. Peterse, H. L. Chum

The Idea of Sustainability and its Implications for Energy Law and Policy, G. Bryner

Shell's Strategy for Operationalizing Sustainable Development, A. M. Burke
Metabolism-Based Sustainability Metrics, G. Friend

Sustainability Metrics of Process Industry Performance, E. R. Beaver, B. R. Beloff

The Application of a Sustainable Development Model, J. M. Snyder
Towards Improved Environmental Performance in West Africa (A Comparative Approach), O. B. Ogunsanya

Usable Management Tools for a More Sustainable Industry, B. R. Beloff, E. R. Beaver

Nonmembers of the association are invited to attend these and other sessions. For more information, please contact the Center or visit the AAPG conference website, <http://aapg.confex.com/aapg/de2001/techprogram/meeting.htm>.

NRLC Welcomes New Board Members

Patricia Beneke works on legal, legislative and strategic counsel in natural resources, energy, environmental, agriculture and technology matters with Van Ness Feldman, Washington, DC. Before joining Van Ness Feldman, Patty served as Assistant Secretary of the Interior for Water and Science and was also the Associate Solicitor for Energy and Resources. From 1985 to 1993, she served as Counsel to the Senate Committee on Energy and Natural Resources. Patty has also handled environmental and public lands litigation at the U.S. Department of Justice and served in the General Counsel's Office at the U.S. Department of Agriculture. A 1979 graduate of Harvard Law School, she received her B.A. in political science from Iowa State University in 1976, where she was the Top Graduating Scholar in the College of Sciences and Humanities. She is admitted to practice law in Iowa and the District of Columbia.

James Corbridge is emeritus professor of law at the University of Colorado School of Law. Jim began teaching in the law school in 1965 and also served the university as Vice President for Student Affairs, Vice-Chancellor for Academic Affairs, and Chancellor of the Boulder campus from 1986 to 1994. He is the co-author of *Water Resource Management*, *Colorado Water Law*, and numerous other studies. Not only is he a distinguished scholar and administrator, Jim is an outstanding teacher and was recipient of the University's Teaching Excellence Award. He was also instrumental in the founding of the Natural Resources Law Center.

Guy Martin is a partner in the DC office of Perkins Coie, and chair of the firm's Environmental and Natural Resources Group. Guy has previously served as Assistant Secretary of the Interior for Land and Water Resources, Commissioner of Natural Resources for the State of Alaska, and Director of the Washington Office of the Governor of Alaska. He was on the founding Board of the Natural Resources Law Center, and completed both his undergraduate and law degrees at the University of Colorado.

TWO DECADES OF WATER LAW AND POLICY REFORM: A RETROSPECTIVE AND AGENDA FOR THE FUTURE

UNIVERSITY OF COLORADO
SCHOOL OF LAW



**22nd
Summer Conference
June 13-15, 2001**

**Fleming Law Building
Boulder, Colorado**



NATURAL RESOURCES LAW CENTER

Two Decades of Water Law and Policy Reform: A Retrospective and Agenda for the Future

June 13 -15, 2001

The purpose of the conference is to examine the agendas for reforming and improving water law that emerged during the past two decades, to assess what has (and has not) been accomplished by pursuing these reforms, to explore lessons and implications, and to prognosticate on the future of water law and policy.

Each of the nine sessions will feature an approximately 45 minute "keynote" presentation that provides an overview of the relevant issues within that thematic area. Each presentation will examine the experience of reform proposals as well as explore the implications for future law and policy.

Each session will include two or three panelists - other keynote speakers and additional water law and policy experts - who will respond to the presentations and offer additional insights. Sessions will also include a discussion period featuring audience comments and questions.

A special NRLC publication will be produced, based on a synthesis of the keynote papers, panelists' contributions, and other information/insights from the event.

DAY 1 - Wednesday, June 13

OPENING ADDRESS:

Two Decades of Reform Proposals

Larry MacDonnell, Lawrence MacDonnell, P.C.

SESSION 1:

Using Water More Efficiently

Barton H. "Buzz" Thompson, Jr., Robert E. Paradise Professor of Natural Resources Law, Stanford Law School

Panelists: Other keynote speakers, David Harrison

LUNCHEON ADDRESS:

The Road to Water Policy Reform: Where We've Been

Bruce Babbitt (invited)

SESSION 2:

Getting Water for Changing Federal Water Policy Objectives

John Leshy, former Interior Department Solicitor

Panelists: Other keynote speakers

SESSION 3:

Acquiring Water For The Tribes

Susan Williams, Williams Janov & Cooney

Panelists: Other keynote speakers, Jeanne Whiteing (invited), Tracy Labin

COOKOUT ON FLAGSTAFF MOUNTAIN

DAY 2 - Thursday, June 14

SESSION 4:

Water For The Environment

Tom Graff, Senior Attorney, Environmental Defense (invited)

Panelists: Other keynote speakers, David Robbins(invited)

SESSION 5:

Strategies To Facilitate Changes In Water Use

Bonnie Colby, Agricultural Economics, University of Arizona

Panelists: Other keynote speakers, David Robbins (invited), Dan Luecke

LUNCH

SESSION 6:

Clarifying State Water Rights And Adjudications

John Thorson, Attorney-at-law, formerly Special Master for the Arizona General Stream Adjudication

Panelists: Other keynote speakers, Jim Corbridge, Justice Greg Hobbs

SESSION 7:

Integrating Science and Technology into Water Management

Keynote Speaker: Brian Richter, Director of Freshwater Initiative, The Nature Conservancy

Panelists: Other keynote speakers, Ken Strzepek (invited), Lee Rozaklis

HOSTED RECEPTION

DAY 3 - Friday, June 15

SESSION 8:

Creating Better Governance

Denise Fort, Professor, University of New Mexico School of Law

Panelists: Other keynote speakers, Betsy Rieke

SESSION 9:

Water Policy Reform: Promises, Realities, and the Agenda for the Future

David Getches, University of Colorado School of Law

Panelists: Other keynote speakers

LUNCHEON ADDRESS:

The Bush Administration's Agenda For Water Law And Policy

Gale Norton, Secretary, Department of the Interior (invited)



Register Early!

Conference Registration Form

Name _____

Affiliation _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

e-mail: _____

How did you hear about this event? _____

Return this form with payment to:

Natural Resources Law Center
University of Colorado School of Law
401 UCB
Boulder, CO 80309-0401
Phone: (303) 492-1272
FAX (303) 492-1297
e-mail: nrlc@spot.colorado.edu

You may fax (303) 492-1297 your registration form if you are paying by credit card or purchase order.

*One Day Only registrants will receive a conference notebook on CD-ROM following the conference.

Fees

	Regular Rate	Gov't/Academic & Nonprofit	One Day Only*	
Received By May 11	<input type="checkbox"/> \$515	<input type="checkbox"/> \$250	<input type="checkbox"/> \$75	\$ _____
After May 11	<input type="checkbox"/> \$565	<input type="checkbox"/> \$290	<input type="checkbox"/> \$85	\$ _____

	3 days	1 day	
Parking	<input type="checkbox"/> \$15	<input type="checkbox"/> \$5	\$ _____

(permits are required to park on campus)

Cookout Wednesday (must sign up to attend):

Self (\$10) \$ _____

Adult guests @ \$10 \$ _____

Extra notebook of speakers' outlines and materials \$75 \$ _____

Notebook on CD-ROM \$10 \$ _____

Tax (within Colorado) on notebooks or CD 7.36% \$ _____

Postage/handling on notebooks or CD \$5 \$ _____

Total amount \$ _____

Method of Payment:

☐ Check enclosed payable to University of Colorado

☐ Purchase Order No. _____
(please provide copy of authorized PO)

Charge my credit card: ☐ Visa ☐ MasterCard

Card No. _____

Exp. Date _____ Signature _____

General Information

Registration Fees: Please register early. The total cost of the event is \$515 if received by May 11, and \$565 thereafter. For registrants employed by any level of government-federal, state, tribal, or local- and for academics or not for profit groups the fee is \$250 (\$290 after May 11).

Discounts and Scholarships: The Center will offer a number of partial registration scholarships.

Location: Sessions will be held in the Fleming Law Building, University of Colorado, Boulder. Parking permits are available for \$5 per day.

Continuing Legal Education: 21 hours of general CLE credits will be requested from Colorado's Board of Continuing Legal and Judicial Education. CLE credit for other states may also be available.

Transportation: Boulder is served by Denver International Airport in Denver, 45 miles away from campus. The SuperShuttle (303) 227-0000 leaves hourly from DIA 8:10 a.m. to 11:10p.m. on level 5 (across from the Hertz counter). No reservations are necessary except for returns from hotels to DIA. Cost of the SuperShuttle is \$18 to \$22 one way. RTD ("AB") buses leave DIA hourly at 20 past the hour. Exact change fare is \$8 one way/\$13 round trip.

Conference Notebooks and CD-ROM Disks: Conference participants will receive conference notebooks as part of their registration package. Following the conference, notebooks will be sold for \$75 each, and \$10 for a notebook on CD-ROM, plus handling, and tax if applicant lives in Colorado.

Refunds and Substitutions: Conference fee refunds, less \$25, will be available through Friday, May 25. Cancellations received through June 8 will receive a refund, less \$50. There can be no fee refunds after the conference begins. Participant substitutions are allowed at no cost.

Hotel/Dorm Accommodations: Blocks of rooms have been reserved for registrants at several hotels. Please make your reservation directly by May 10, 2001, as all reservations made after this date are subject to availability. Mention the NRLC Water Law Conference to take advantage of special rates. A deposit or credit card number is required to hold a reservation.

In order to make attendance of the conference more affordable, the Center will attempt to match individuals in double accommodations please call Geri at (303) 492-1286 for details.

Boulder Broker Inn - 555 30th St., Boulder, CO 80303; Phones: (303) 444-3330; Toll-Free: (800) 338-5407; Rates \$90/night for single or double occupancy, reserve by 5/11/01.

Courtyard by Marriott - 4710 Pearl East Circle, Boulder, CO 80301; Phones: (303) 440-4700; Toll-Free (800) 542-0304; Rates \$145/night for single or double occupancy; reserve by 5/14/01.

Ramada Inn - 800 28th St., Boulder, CO 80303; Phones: (303) 443-3322; Toll-free (800) 542-0304; Rates: \$80/night for single, double, triple or quads; reserve by 5/10/01.

Days Inn - 5397 South Boulder Road, Boulder, CO 80303; Phones: (303) 499-4422; Rates: \$89 Single; \$94-Double.

Kittredge Dorm - located near the Law School on the Boulder campus; Phone: (303) 492-515; e-mail: lodginghousing@colorado.edu; Rates: 3-night rate (including tax): single - \$172.52, doubles may also be available.

University Club - located on the Boulder Campus at 972 Broadway, Boulder, CO 80309-0120; Phone: (303) 492-6509; Rates: \$64/night for single occupancy, doubles and suites also available.

NATURAL RESOURCES LAW CENTER

University of Colorado School of Law
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Grande Compact. The Compact establishes schedules relating each states' obligation to the next on the basis of available water inflows to the state.

Colorado's total obligation to New Mexico ranges from only 20% of inflows at very low flow levels, to about 30% at the mean flow level; at about 50% above the mean flow level, all additional inflows must be passed on to New Mexico. The Compact schedules thus specify a right for Colorado which is not too dissimilar to a senior right for about 70% of the Rio Grande.

New Mexico's obligation is to water users below Elephant Butte Reservoir. While flows to satisfy these downstream uses are typically called "Texas" water, the majority is actually used by irrigators in the state of New Mexico! The upstream water right for New Mexico starts at 43% of inflows, but rapidly decreases with inflows, reaching a maximum "right" of 395,000 acre-feet at approximately the mean inflow level. Thus New Mexico's rights under the Compact are very similar to a senior water right of about 400,000 acre-feet annually. (In addition, New Mexico has the sole right to use imported San Juan - Chama inflows of nearly 100,000 annually).

The Rio Grande Compact does not specify the disposition of "Texas" water. Bureau of Reclamation contracts for use of water from Elephant Butte Reservoir lead, however, to water users in the state of Texas receiving about 43% of available supplies, while those in the state of New Mexico (Elephant Butte Irrigation District) receive about 57%. In addition, Mexico receives, by treaty, 60,000 acre-feet annually.

A baseline is needed to address the basic research hypothesis, that new institutions for coordination of surface water withdrawal, groundwater management, and reservoir operations, could reduce losses. I term this baseline the "Law of the River." It incorporates not only the operation of the Rio Grande Compact, but equally importantly water allocation, including the use of groundwater, within each of the three states. Modeled impacts of drought under the baseline then serve as a basis of comparison for the performance of alternative institutions.

I will briefly discuss four alternative institutions, and the general performance of each in comparison to the baseline "Law of the River." I will restrict myself here to institutions consistent with the Compact; while losses from water shortages could perhaps also be reduced through Compact changes, any alteration of the negotiated Compact would be exceedingly difficult at best. I am most interested here in addressing the more likely innovations which are possible at the state, or even local, level.

The first alternative looks at increasing coordination of surface and groundwater usage. The Upper Rio Grande has extensive groundwater resources. These include both large quantities of deep groundwater (present but only lightly used in the San Luis Valley of Colorado, and present and used by Albuquerque and El Paso), and extensive regions of shallow groundwater. This latter type of groundwater is successfully utilized in the San Luis Valley to mitigate the impacts of limited surface water storage; in low flow years it is extracted to supplement surface supplies, and in high flow years the aquifer is intentionally recharged by surface water. This conjunctive use capability is partially developed by New Mexico's Elephant Butte Irrigation District, and to a much lesser extent by the Middle Rio Grande Conservation District in central New Mexico, and by Albuquerque. I can demonstrate that increasing these conjunctive use capabilities in the state of New Mexico can substantially reduce losses during drought, though the costs of developing and maintaining the necessary additional pumping capacities (including avoiding overuse during normal and high flow periods) may not in all cases justify benefits. Conjunctive use strategies may also involve aggressive use of Albuquerque and El Paso deep groundwater resources during drought, with corresponding increases in surface water use during high flow periods.

A second alternative addresses increasing the efficiency of irrigation practices. For example, it is often noted that diversions to satisfy irrigation in the Middle Rio Grande Conservation District may exceed 10 acre-feet per acre annually. With a consumptive use

A Cartography of Governance:

Exploring the Province of Environmental NGOs



Presented By:

*The Colorado Journal of International
Environmental Law and Policy*

April 7th & 8th, 2001

University of Colorado School of Law
Fleming Law Building
Boulder, CO

Join us in discussing the role played by
environmental NGOs in shaping
domestic and international policy law.
Specific topics to be addressed include:

Genetically Modified Organisms
Indigenous Peoples
Dam Dismantling
Biodiversity

For more information visit the website at
www.colorado.edu/law/cog

demand by crops of only 2-3 feet annually, the proportion of diverted water actually supporting crop growth is very small. Diverted water not consumed by crops either percolates to the shallow groundwater, or returns through drains to the river. I find that an increase in irrigation efficiency which reduces the annual diversion to 8 acre-feet per acre does little to reduce overall drought damages. The reasoning is clear: percolation to the shallow groundwater causes increased river flows within a period of only a few years, while return flows through drains are immediately available to satisfy downstream demands.

Increased irrigation efficiency can substantially increase instream flows under very specific circumstances. First, for short time periods reductions in diversions would make available for instream flows water (temporarily) lost to percolation. Second, if drains bypass a river reach where instream flows are critical (as may be the case with the endangered Silvery Minnow above Elephant Butte Reservoir), then reducing diversions will tend to increase flows in these reaches.

The third alternative considers management or structural changes to increase carryover storage. This alternative is found to provide few benefits during the flow sequences which we examined. The primary limitations on New Mexico use in particular is the Compact limitation on use of inflows in any particular year. Adequate storage capacity is available in Elephant Butte Reservoir to capture deliveries for use downstream. While there may be some advantage in reduced evaporation losses to transferring storage from Elephant Butte to upstream reservoirs, this was not examined due to its difficulty of implementation under the Compact.

The fourth alternative considered an expansion in the use of water markets, particularly under anticipated future demand conditions (resulting from population growth). Under the baseline scenario, Albuquerque satisfies future demand growth through construction of facilities to utilize its right to 48,200 acre-feet of San Juan-Chama water annually. Otherwise, Albuquerque is limited to groundwater use. El Paso has demonstrated market purchases of surface water from the local irrigation district; future purchases to increase surface water capacity, an element of the city's stated water development planning, are included in the baseline "Law of the River." These purchases do not provide for a secure senior right; instead the purchases provide El Paso with a proportion of irrigation district supplies. A water market policy alternative considers both Albuquerque purchases of additional (senior) surface water supplies, and El Paso purchases to upgrade its rights to senior rights. In each case, such market purchases result in a reduction in reliance on pumping non-sustainable, deep groundwater at modest cost.

The approach of integrating the legal, economic, and hydrologic environments in a quantitative model allows me to demonstrate that substantial reductions in drought damages are possible for the Upper Rio Grande. While losses may be inevitable in a region of scarce and highly variable water supplies, the level of these losses can be greatly reduced. Most important in the Upper Rio Grande Basin is expansion of coordinated conjunctive use, and the selective use of markets to address municipal reliance on non-sustainable groundwater.

A report on the full project, Institutional Adjustments for Coping with Prolonged and Severe Drought in the Rio Grande Basin will be available in February 2001 from the New Mexico Water Resources Research Institute. Report authors are Frank Ward, Robert Young, Ronald Lacewell, J. Philip King, Marshall Frasier, J. Thomas McGuckin, Charles DuMars, James Booker, John Ellis, and Raghavan Srinivasan. Primary funding for this project was provided by the U.S. Geological Survey, with supplemental support by the Water Resources Research Institutes, and the Agricultural Experiment Stations of the three states.

NRLC Visiting Fellow Dr. James F. Booker is spending his sabbatical year working on water allocation in the major river basins of the West. Dr. Booker is on sabbatical leave from Alfred University (New York) where he is Associate Professor of Economics and Environmental Studies. His past work includes research on drought in the Colorado River Basin, on the sustainability of water resource use in Arizona, and future water supply paths for Las Vegas.

The following article highlighting the work of Hydrosphere Resource Consultants was published in the Colorado Plateau Advocate Express, a publication of the Grand Canyon Trust, October 2000 and is being reprinted here with permission. Hydrosphere Resource Consultants is a frequent contributor to NRLC programs.

TRUST STUDY: LAKE POWELL TO ST. GEORGE PIPELINE NOT NEEDED, UTAH DEPARTMENT OF WATER RESOURCES DELAYS PROJECT FOR DECADE

In early August the Trust released a study by the Hydrosphere Resource Consultants showing that cost-effective water conservation measures preclude the need for a proposed water supply pipeline from Lake Powell to Washington County, Utah. After reviewing the study's well-researched population growth estimates, the Utah Department of Water Resources decided to push back this controversial, possibly growth-accelerating pipeline project for 10 years. The Trust is also working with Utah's Department of Natural Resources to see that they require water conservation and growth planning for Washington County (it includes the St. George area in southwestern Utah). Also after release of the study, Utah Governor's Office of Planning and Budget will use our report as a reference in their future efforts. The trust remains vigilant. We are considering additional high-leverage efforts, as necessary, to deal with the pipeline threat. For more information, visit the Grand Canyon Trust press release archive at grandcanyontrust.org then click on Hot News.

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