

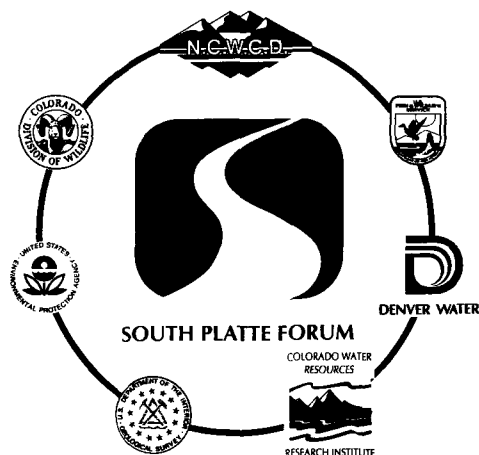
Grow with the Flow: Growth and Water in the South Platte Basin

*Proceedings of the 1997
South Platte Forum
October 29-30, 1997
Longmont, Colorado*

Jennifer Mauch, Editor

October 1997

Information Series No. 87



Colorado Water

Resources Research Institute

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**October 29 - 30, 1997
Raintree Plaza Conference Center
Longmont, Colorado**

The research upon which this report is based was financed in part by the U.S. Department of the Interior, Geologic Survey, through the Colorado Water Resources Research Institute. The contents of this publication do not necessarily reflect the views and policies of the U.S. Department of the Interior, nor does mention of trade names or commercial products constitute their endorsement by the United States Government.

**Colorado Water Resources Research Institute
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Fort Collins, Colorado 80523-2018
Robert C. Ward, Director**

Preface

The South Platte River Basin Forum was initiated in 1989 to provide an avenue for the multi-disciplinary exchange of information and ideas important to resource management in the South Platte River Basin. Its stated mandates are “to enhance the effective management of natural resources in the South Platte River Basin by promoting coordination between state, federal and local resource managers and private enterprise” and to “promote the interchange of ideas between disciplines to increase awareness and understanding of South Platte River Basin issues and public values.”

This year’s South Platte Forum will focus on the timely issue of growth in the Basin. The rapid growth along the South Platte River leads to many unanswered water questions and numerous growing tensions. Everyone has their own view of where the water should go and how it should be used. Agriculture, industry, municipalities, development, recreation, and habitat are the suggestions that top the list. It is easy to see that some compromises and unique thinking will be necessary to accommodate all of these values. The first step is dialogue and the exchanging of ideas and information.

The goal for this forum is to present many of these tough issues and some of the differing views. While a quick solution is not likely and the problems are deeply imbedded in history, politics and law, the process has to start somewhere. Opening our ears and minds is the best starting place I can think of. Take this chance to begin your thought process on the way to the compromise or unique thinking that will make a difference.

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The State's Role in the South Platte Basin

James S. Lochhead¹

The South Platte Basin faces a wide array of challenges in the future. Sprawl growth threatens the aesthetic qualities and community identities of Northern Colorado cities. Oil and gas development often conflicts with the desires of surface owners. Water owners face conflicts with federal agencies over the issuance of federal permits. Declining, threatened and endangered species issues will affect current and existing water uses. Water is being transferred from agricultural to urban use. The South Platte River has been designated for potential wild and scenic status by the U.S. Forest Service.

Jim Lochhead will discuss the role of the state of Colorado in the resolution of these issues, and in assisting the communities of the South Platte Basin in Colorado to retain community values, economic opportunity and a sustainable environment.

¹Executive Director, Colorado Department of Natural Resources, 1313 Sherman Street, Room 718, Denver, CO, 80203, 303-866-4902.

Developing Public Policy for Colorado Resources

Senator Hank Brown¹

Senator Brown will talk about water storage and its role in improving Colorado's environment. He will also discuss the role of long term planning to maximize our scarcest resource.

¹Former Colorado Senator, Co-director, Center for Public Policy and Contemporary Issues, University of Denver, 2050 East Iliff, Denver, CO, 80208, 303-871-4923.

South Platte Development Issues

Senator Don Ament¹

It continually amazes me that during the past century western water projects have provided a mechanism for flood control, hydroelectric power, irrigation, metropolitan water supplies, recreational and environmental uses and an overall improved quality of life. Now, further development of this precious resource has been nearly halted by our inability to balance all the competing demands for additional water. Our challenge is to resolve these conflicts. It really is our future.

- History tells us that in the early years, the river would quit running after the spring snowmelt. Let me recount some history of the river.
- In the development years of the river, our predecessors, without the use of computer models or demographers, intuitively knew we must store water and put it to beneficial use. Let's trace some of the phenomenal development.
- Further development deals with not only population growth, but an endangered species act driven by a new environmental agenda. I would like to discuss with you some of these issues.
 1. American Heritage Rivers
 2. Wild and Scenic River Designations
 3. Special Use Permits and Bypass Flows
 4. South Platte M.O.U.
 5. Downstream States' Demands
 6. Municipal Use and Transfers

Your quality of life depends on the resolution of these issues.

¹State Senator, Route 1, Box 142, Iliff, CO, 80736, 970-522-8205.

Water and Wise Growth: A Federal Perspective

Mark Schaefer¹

Mr. Schaefer's talk will highlight the following topics:

- How can we work together to better manage a watershed for the good of all that reside within it now and in the future?
- What are some important ways the Federal Government can help local efforts to achieve a healthy, diverse, and desirable watershed (environment)?
- What is the Federal "Vision of the Future" for growth and water resources in the West? Will there be a balance between growth and environmental protection or just conflict? Can we sort through the conflicts and protect our environment while sustaining wise growth?

¹Deputy Assistant Secretary for Water and Science, U.S. Department of Interior; Interim Director, U.S. Geological Survey.

A Pictorial History of the South Platte Basin

Paul D. McIver¹

- I. Geology: the source of the South Platte
 - A. The Mosquito Range
 - B. The Front RangeEarly Humans
 - A. An archeological site: bones of 7,000 to 10,000-year-old human from a Folsom site north of Fort Collins
 - B. Ute Trail in Rocky Mountain National Park
- II. Forts, fur trappers and explorers
 - A. Pierre Esperance from Quebec, Canada, in 1814, trapped along the Poudre
 - B. The Long Expedition of 1819 - 1820, Valley in the west Plum Creek drainage
 - C. Fort Vasquez south of Platteville, 1837 - 1842
 - D. Fort St. Vrain (both the old fort site and the present day power plant)
- III. Towns and ranches
 - A. Horace Greeley's name in the rock along the Poudre
 - B. Mining towns - Blackhawk/Central City
 - C. McGregor Ranch National Historic Site
- IV. 1940's to the Present
 - A. Cities and towns in the South Platte Basin - then and now
 - B. Water projects
 - C. Development
 - D. Floods
- V. Future?
 - A. Population
 - B. Other??????

¹Public Outreach Coordinator, Ecosystems Protection Program, U.S. EPA, Region 8, 999 18th Street, Suite 500, Denver, CO, 80202-2466, 303-312-6056.

Denver Basin Water Resources / Douglas County

James R. Sullivan¹

Overview of talk:

1. Growth and Douglas County
2. Douglas County Water Resource Authority and long range plans
3. Water in Colorado

¹Douglas County Commissioner, 101 3rd Street, Castle Rock, CO, 80104, 303-660-7401.

A Basin-Wide Municipal Perspective

Lee Rozaklis¹

Approximately 2.6 million people live and work within the South Platte Basin of Colorado today. That population is expected to increase by over 1 million people in the next 30 years. Meeting the Basin's future municipal water supply needs will involve six basic categories of water supply sources: water conservation, water reuse, transfers from irrigation use, transbasin imports, in-basin surface water development and nontributary groundwater development. Each of these sources offers significant water supply potential and will be used to varying degrees by local water providers to meet their future needs. Together these six sources provide ample opportunities to meet the basin's future water supply needs. However, none of these sources can be implemented without some degree of economic, environmental and social cost. The challenge will be to achieve the right mix of these sources.

¹Principal Engineer, Hydrosphere Resource Consultants, 1002 Walnut Street, Suite 200, Boulder, CO, 80302, 303-443-7839.

A Developer's Perspective

Joe Knopinski¹

Mr. Knopinski will speak to issues related to securing sufficient water supplies to serve development projects. What do developers look for in water providers to assure that a sufficient source of water is available to serve a project to buildout and beyond? Drawing on his experience having worked for both water utilities as well as developers, Mr. Knopinski will be able to relate anecdotally how water supply is viewed as an essential element of development.

Mr. Knopinski's comments will include a discussion of the developer's, builders' and homeowners' perception of water supply.

¹Director of Land Development, Alpert Companies, 4643 South Ulster Street, Suite 1130, Denver, CO, 80237, 303-773-3400.

An Environmental Perspective

Daniel F. Luecke¹

The South Platte basin is Colorado's most urbanized watershed, one of its most intensively irrigated, and the recipient of the largest share of water diverted from west of the Continental Divide in the Colorado basin. Some of its tributaries (most notably, Clear Creek) also show the scars and poor water quality associated with abandoned mining operations that have their origins in the gold rush of the mid-nineteenth century. Despite the level of development, the upper basin contains stream reaches of very high quality, remarkable fisheries, and valuable recreation areas. The lower basin serves an important role in supplying a portion of the water that sustains the Big Bend reach in Nebraska, critical habitat to endangered bird species.

The challenge for all those with a stake in the basin is the development of institutional structures and management plans that will make it possible for the full range of the river's values to be supported in the face of growing demands from all interests. This presentation will suggest some ways this can be accomplished.

¹Senior Scientist, Environmental Defense Fund, 1405 Arapahoe, Boulder, CO, 80302, 303-440-4901.

Two Forks - The Good, the Bad and the Rest of the Story

Max H. Dodson¹

The Section 404 veto of the proposed Two Forks Dam was the most visible, controversial and consuming issue that EPA Region VIII has participated in during its 27 years of existence. It still is perceived by the students of environmental history as the most significant 404 decision since the passage of the Clean Water Act (PL 92-500). The post mortem on the veto is still yet to be written because as Yogi Berra states, "it is not over until it is over." Two Forks will continue to be debated and discussed for years to come. Several observations have been offered by proponents and opponents as to why this event occurred. Proponents obviously speculate that the decision was based on incorrect assumptions, flawed legal bases, and a misguided federal regulatory agency. Opponents, on the other hand, point to the availability of alternatives, the quality of the environment, and bad economics. Regardless of the respective position that observers take, I think it important to provide my take on what was some rather innovative, positive outcomes of the process that led up to the veto. I will also offer some observations on what were some of the compelling reasons for the ultimate decision made by the Administrator of EPA to accept the decision of Region VIII.

¹Assistant Regional Administrator, Office of Ecosystems Protection and Remediation, U.S. EPA, Region 8, 999 18th Street, Suite 500, Denver, CO, 80202-2466, 303-312-6598.

The Challenge of Meeting Metropolitan Denver Water Supply: Can we balance this need with other needs in the state?

Marcia M. Hughes, P.C.¹

We can all agree that the Denver metropolitan area is growing. What that growth means and how we are going to meet the water supply need of the metropolitan area is uncertain. The degree of cooperation occurring in the metropolitan area has been radically affected by the EPA veto of the permit the Corps of Engineers was prepared to issue for the Two Forks dam. With Two Forks, most large water suppliers around the metropolitan area had agreed to a structure and process for working together. That process was eliminated with the veto. Now each entity is meeting its needs on its own or perhaps in a small collaborative fashion. A sampling of tools and strategies used by metropolitan water suppliers will be reviewed as a part of this talk. She will also look at the implications to other users in the state, the primary concern, of course, is on the viability of maintaining agricultural water. Marcia will review new ways the metropolitan area is coming together such as the Douglas County Water Resources Authority and the Metropolitan Water Suppliers who have developed a Wild and Scenic Task Force to address the Forest Service consideration of designating the South Platte below Denver as a wild and scenic river. Such action would have impact on all water users in Colorado. Thus, the interaction between state, local and federal government in going to play a substantial role in whether there is enough water for all the uses in the state.

¹390 Union Boulevard, Suite 415, Lakewood, CO, 80228-1556, 303-980-8668.

Buying and Selling of Water Rights

(i.e. the transfer of water from Agricultural to Municipal and/or Industrial)

Barton E. Woodward¹

- Agricultural/Municipal partnerships: Are they..
 - A. A political correct way to tie up old agricultural water rights?
 - 1. When was the contract negotiated? During an economic downturn in Agriculture?
 - 2. Who ended up owning the water right?
 - 3. Are the values based on the price of corn or the price of developing like water?
 - B. A way to get the development rights to a farm without really buying them?
 - 1. Producing farms make good green belts.
 - 2. Farms with occasional dry-up contracts don't get developed quite so fast.
- What is the real value of Agricultural water?
 - 1. Location, Location, Location.
 - 2. Quality, Quality, Quality.
 - 3. Senior Decree Date.
 - 4. Existing facilities with exiting permits.
- An honest to goodness City/Agricultural partnership.
 - 1. Work together to solve the Endangered Species Act.
 - 2. Finish developing the remaining portion of Colorado's water under the Compacts.

¹Superintendent: Riverside Irrigation District, Riverside Reservoir and Land Company;
27444 Road Y, Snyder, CO, 80750, 303-842-2935.

Fort Lupton's Quest for a New Water Supply

Dick Wolfe, P.E.¹

The city of Fort Lupton (Ft. Lupton) has been evaluating alternative water systems for over thirty years. With an increasing concern over water quality and an aging water system dating to 1910 with high system losses, Ft. Lupton (population 6,000) was mandated to sign a contract with the Northern Colorado Water Conservancy District to provide raw water (i.e., Southern Water Supply Pipeline Project). This \$28 million water project was completed in 1997 to essentially replace its existing well water system. This project comes at the completion of a new \$4.5 million wastewater treatment system. These systems were mandated by the Colorado Department of Health for water quality reasons and noncompliance with the Safe Water Drinking Act. Ft. Lupton is experiencing its greatest housing and population growth. With a need to balance industrial and commercial growth with residential growth, Ft. Lupton also embarked into a major golf course and housing development to generate additional revenue and create an amenity to attract additional industrial and commercial development. These projects culminated at a time when Ft. Lupton was establishing new water and sewer rates. In an attempt to address the higher water and sewer rates that became effective January 1, 1997, the electorate of Ft. Lupton passed two tax measures prior to implementing the new rates. The first measure was in 1991 when the electorate voted for a 1% sales tax increase to be dedicated solely to water capital projects and water acquisition. The second measure was passed in 1993, in response to the TABOR Amendment passed in 1992, which dedicated all excess revenues, as defined under TABOR, to water and sewer projects and water acquisition. This measure was anticipated to generate in excess of \$300,000 per year as a result of a new large industrial facility in Ft. Lupton. This industrial facility is served only well water and consumed about 25% of the total water used in Ft. Lupton when this facility and Ft. Lupton were both using well water. This facility is now the primary user of well water. However, this facility was provided very low water rates recognizing the additional tax revenues generated by this facility. This facility alone doubled the assessed valuation for Ft. Lupton. A new ballot issue is on the November 1997 ballot asking voters to approve an increase in property tax mill levy to generate additional revenue to pay off water debt. A similar and almost identical measure was voted down 2-1 in November 1996. If this measure passes, approximately 75% of the tax revenue generated will come from this industrial facility and other commercial and industrial customers in Ft. Lupton. The citizens have always been in favor of a new water system but divided on how, exactly, to pay for it. The question was and still remains — how to balance the revenues needed between user fees and taxes. The financing for these systems was complicated by the TABOR Amendment and the Gallagher Amendment. The water and sewer systems are operated as enterprises under the TABOR Amendment and primarily financed through low interest loans and grants from the State and Federal governments. Although the overall water project construction was completed under budget, the cost to purchase

¹Former Mayor, City of Fort Lupton, 1009 Trapper Drive, Fort Lupton, CO, 80621, 303-857-4680.

Colorado Big Thompson (CBT) units has risen from around \$1400 per unit in 1991 when Ft. Lupton started purchasing water to around \$2600 per unit today. As a result, Ft. Lupton has had to purchase over \$4 million of CBT water just to serve existing demand. All new development is required to purchase or pay cash in-lieu-of at existing market rates. Water conservation in Ft. Lupton, along with an above average rainfall in 1997, have caused water usage to decrease by approximately 40% from prior years when water was billed at a flat rate. With an unknown liability of augmentation for well pumping, that could be millions of dollars, and an unknown future growth rate and water usage, Ft. Lupton is faced with some of its greatest challenges.

The Growing Conflicts with Ag-Urban Water Transfers

Barbara Kirkmeyer¹

The urban encroachment into traditionally rural areas occurring with growth in the South Platte Basin is causing tension. The developing tensions result from conflicts not only between the agricultural and urban water users but also from conflicts within the agricultural community. Farm owners are faced with the decision of selling their land and water rights or holding out to preserve the rural areas. With many different motivations for either choice and a split in views, tensions are high.

As a farm owner living on the fringe of urban development, Barbara can help to describe the feelings of the ag community. As a county commissioner, she can talk about the considerations made when approving or disproving land use permits. From her unique perspective, she can also offer insight into possible future resolutions.

¹Weld County Commissioner, PO Box 758, Greeley, CO, 80632, 970-356-4000 x4205.

Fish Assemblage Response to Human Population Growth in the South Platte River Basin

Kevin R. Bestgen¹

Declines in the distribution and abundance of fishes in the South Platte River Basin are generally attributable to an expanding human population but specific causes vary depending on the proximity of the assemblage to urban areas. Transition-zone stream assemblages historically contained several unique glacial-relict species and occupied a narrow band of habitat along the Front Range urban corridor. Transition streams were cool, clear, had silt-free substrate, and maintained stream-floodplain links. At present, sensitive species such as northern redbelly dace *Phoxinus eos* that are geographically restricted and require specialized habitat, persist in a few undeveloped areas upstream of expanding cities and many populations have been extirpated. Siltation, reduced water quality and quantity, and floodplain modifications in urban stream reaches are thought to be primary factors responsible for declines. In contrast to transition-zone streams, plains streams supported mostly widespread species that are habitat generalists. Some species such as plains minnow *Hybognathus placitus* have evolved specialized reproductive strategies in response to the historically variable hydrologic regime. Basin-wide changes in annual and seasonal stream discharge patterns, caused by human demands for water, may affect specialized plains stream species even though they are far from urban areas. Because of differences in the spatial scale of perturbations that affect transition and plains stream fishes, conservation strategies for each may have different emphases. Conservation efforts are hindered by lack of information on historical and present distribution patterns, and the response of these fishes to changes in habitat and discharge regimes. Basic ecological research is needed in order to guide appropriate management actions.

¹Larval Fish Laboratory, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO, 80523, 970-491-1848.

Preble's, What's All the Fuss About?

Peter Plage and Lee Carlson¹

The Preble's meadow jumping mouse is a small rodent found in riparian habitats along the front range of Colorado and Wyoming from Cheyenne to Colorado Springs. It was proposed for listing as a Federally endangered species on March 28, 1997 because of its rarity. Loss of riparian habitats is the major problem. This listing has caused quite a stir in both Colorado and Wyoming because of the possible ramifications for home and industrial developments, gravel mines, trails, farming and ranching practices, and other human uses of riparian habitats. The mouse is important because: (1) it is faced with possible extirpation and (2) it is an indicator of a larger problem of riparian habitat loss, a habitat important to many species of mammals, birds, amphibians, reptiles, fish and plants. Riparian zones are also important to us as humans for recreation, aesthetics, water quality and quantity, and property values.

While the problems for Preble's may seem insurmountable in the face of human development that continues to escalate, there are, in fact, solutions that are being explored to resolve the conflicts. The Service has several tools to work with including section 7, candidate conservation agreements, safe harbor policy, no surprises policy, and habitat conservation plans. The state of Colorado, with leadership from Jim Lochhead and Doug Robotham and many public and private organizations including the Colorado Division of Wildlife and the Service, has initiated a Habitat Conservation Plan (HCP) to address impacts and mitigation for the mouse and the riparian habitats along the front range of Colorado. Wyoming is investigating a similar HCP process. Should the mouse eventually be federally listed, then the Service anticipates issuing an incidental take permit which would allow some level of take on private lands and would cause protection and mitigation of riparian habitats for other lands.

¹United States Department of the Interior, Fish and Wildlife Service, Ecological Services, Colorado Field Office, 755 Parfet Street, Suite 361, Lakewood, CO, 80215, 303-275-2370. Mailing Address: PO Box 25486, Denver Federal Center, Denver, CO, 80225-0207.

Some Observations on Minnows, Mice and Men

Deborah L. Freeman¹

1. Consideration of “people” under the Federal Endangered Species Act.
 - A. Endangered Species Act was intended by Congress to afford listed species “*the highest of priorities.*”

Tennessee Valley Authority v. Hill, 437 U.S. 153, 174 & 184 (1978)
 (“[t]he plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, *whatever the cost*”) (emphasis added).
 - B. The underlying goal of the ESA is to protect our “genetic heritage.”
 - C. As the majority of federally listed species are dependent on riverine and wetland habitat, conflict between these species and the diversion and use of water to meet municipal and agricultural needs in the South Platte basin is inevitable.
2. Practical effect on water use activities in the South Platte Basin.
 - A. The “track record” of compliance under Section 7 of the ESA is not good.
 - B. Resulting avoidance or delay of new water projects; delay of repair work on existing ones; unacceptable degree of planning uncertainty.
3. The search for a “proper balance.”
 - A. The Recovery Program and Habitat Conservation Planning experience.
 - B. The alternatives.

¹ Trout and Raley, P.C. 1775 Sherman Street, Suite 1300, Denver, CO, 80203, 303-861-1963

The South Park Conjunctive Use Project - A Replacement for Two Forks?

Michael F. McHugh¹

Even before the Two Forks Dam project was finally vetoed, The City of Aurora turned to alternative sources for its raw water supply. The Aurora City Council has developed a set of policy guidelines that mandate the Water Resources Division develop new sources of water to provide for Aurora's future.

The South Park Conjunctive User Project (SPCUP) is one of the first municipal water projects based on the principle of conjunctive use in Colorado. Conjunctive use recognizes that natural surface water and ground water systems function together and the use of those resources is coordinated in water resources development. Typically, surface water is collected and delivered to an aquifer, by injection or infiltration, for storage and later use.

The South Park Aquifer occupies a basin nearly 20 miles long, five miles wide and is up to 6,000 feet thick. The aquifer is estimated to contain 16 million-acre feet of water. The project consists of two parts - a surface water collection and recharge (i.e. infiltration basins) system, and a well field for ground water withdrawal.

The City of Aurora is taking a very deliberate and reasonable approach to the project. Like all water projects, the SPCUP must secure the necessary water rights and prove that there will be no harm to senior water rights holders. In an unusual move, the City of Aurora notified area residents and local governments of the City's intentions concurrent with the filing for the water rights needed for the project.

Technical reports are being prepared to answer the concerns of project opponents. These reports are designed to answer the following questions: Can the proposed recharge work? What quantity of unappropriated surface water is available to recharge the aquifer? What are the hydrological effects of the project? How will the project be designed?

So far, the following reports about surface water availability and the recharge aspects of the project have been produced: Lower South Park Aquifer Test Report, Percolation Test Report, Historic Hydrology and Water Usage in the Upper Tarryall Basin; and Surface Water Availability Preliminary Engineering Report.

These reports have answered the first two questions satisfactorily. They have also provided valuable data that is being incorporated into a ground water computer model of the entire South Park project area. That model will be the basis to answer the third question and provide the design parameters for the last question. It is our goal to produce and make available a Preliminary Ground Water Modeling Report and a Preliminary Engineering Report before the end of the year.

To keep people informed, a mailing list was created. Currently there are more than 1800 interested contacts that receive project updates three or four times a year. The City of Aurora also established information repositories at the Fairplay and Bailey Branches of the Park County Library to house collections of technical documents about the project. Reports are released as they are produced in an attempt to keep the community informed of the projects' progress. The City has also used the local newspaper to inform residents of Park County of the latest developments. Press releases, reporter and editorial briefings, letters to the editor and paid advertising have all been used in the efforts to keep the community up to speed. We have also offered to brief local officials and

¹Project Manager, South Park Conjunctive Use Project, City of Aurora, Water Resources Division, 1450 South Havana Street, Suite 232, Aurora, CO, 80012, 303-739-7275.

interest groups of current activities.

The City of Aurora has also been working with the Upper South Platte Water Conservancy District, Park County, the United States Geological Survey and Park County Water Preservation Coalition to collect pre-project data. The data will be useful in documenting pre-project conditions in the project area. So far, a stream gage has been installed on Tarryall Creek, a network of existing water wells established to monitor changes in the water table, and sit-specific water quality and geophysical data collected. Future efforts will include the continuation and expansion of these efforts.

Once the conditional water rights needed for the project are obtained and the terms and conditions of a decree are known, then the project will enter a permitting phase. Environmental permits from a variety of federal, state and local entities will be sought. Only after the necessary permits are obtained, can the final project design and construction phases begin. Finally, after construction is complete, the project can be integrated into Aurora's raw water supply and begin operations.

The City of Aurora is committed to keeping the interested parties informed and avenues for dialogue open. This approach allows for considerable input and negotiation, despite the adversarial nature of the early legal proceedings. The City of Aurora has consistently stated that we will not go forward with the project if it is not technically sound, and if we can't mitigate possible project impacts to Park County and nearby residents. We will continue to explore mutually advantageous solutions to real concerns.

The South Park Conjunctive Use Project - Historical Background and Contemporary Context

Cathy E. Kindquist¹

This brief presentation will provide information on the historical background and present context of the controversy over the South Park Conjunctive Use Project. Details will include some of the history of agricultural to municipal water transfers in South Park, their impact on the area, and current trends in terms of population and growth in Park County. Concerns of county residents regarding Trident/Aurora's proposed project will be discussed, and the relevance of these concerns to other areas in Colorado and elsewhere in the dry west will be addressed.

¹Consultant and Historical Geographer, Kindquist Environmental Research, PO Box 1208, Radford, VA, 24141-0208, 540-633-2246.

The South Park Conjunctive Use Project - Unanswered Questions

Stephen Spann¹

Park County has been the target of the front range communities for water supplies since 1915 when the City of Denver purchased the Antero Reservoir. Since 1968, over 75% of the water in the South Park has been transferred to downstream municipalities. Once all the water rights have been transferred out of a community to municipalities, what are the future economic opportunities for that community?

Planning for growth in the front range communities is an uncoordinated, uncooperative effort that forces the communities to compete for limited resources and an uncontrolled bidding operation that synthetically increases the value of water. Why is it the sum of the front range planning exceeds the growth?

Today, the City of Aurora is trying to purchase ground water from the county and use it for emergency water supplies. Given that the aquifer under the front range communities is ripe for a conjunctive use project, why is Aurora looking to the Park? Rumor has it that the water under the cities in the front range is not available for developing a conjunctive use project. This, I understand, is only a matter of trying to change Colorado Statutes. Why is it the most powerful voting block in the State Legislature (the front range communities) is not able to pass the required statutes with the help of those mountain communities that want to protect their future?

Is there a leader in our midst to stand up and do the right thing?

¹President, Upper South Platte Water Conservancy District; Senior Partner, Spann Engineering, 4801 South Galapago Street, Englewood, CO, 80110, 303-781-2430.

South Platte Wild and Scenic River Study: A Model for the Future

Rick D. Cables¹

Rick Cables will focus on an innovative approach to the study of the South Platte River as mandated by the Wild and Scenic Rivers Act. The Wild and Scenic River Study Report and draft legislative EIS is unique because it identifies both a preferred course of federal action while leaving room for local interests to craft their own proposal that might also protect the river's values. Providing opportunities for communities of interests, concerned about critical water resources, will become the most constructive way to work through these issues in the future.

¹Forest Supervisor, Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands, 1920 Valley Drive, Pueblo, CO, 81008, 719-545-8737.

Wyoming Water Planning: Visions of the Future

Mike Besson¹

Wyoming has a state wide water plan that documents the location and availability of the resource, projects anticipated water use, and estimates growth and development. Why, then is the state conducting feasibility studies to embark on a new state planning process? The answer in part can be explained by noting the age of The Wyoming Framework Water Plan. The Framework Plan is over twenty years old and was completed by the State Engineer's Office in 1973.

The Framework Water Plan is a useful document when quantifying the availability of the resource, however, the further removed we are from the plan's completion date, projections of how water may be developed become increasingly inaccurate. Planning in the late 1960's and early 1970's was driven by federal, state, and private demand projections that indicated a need to develop low sulfur coal to general power. Wyoming, a state rich in natural resources and the nation's largest coal producer, envisioned a tremendous expansion in the production of coal powered electrical generation facilities in northeastern Wyoming. While several coal powered electrical generation plants exist in Wyoming, the actual growth did not keep pace with projections described in Wyoming's Framework Water Plan. According to the Framework Plan, by the year 2000, 228,000 acre-feet of water would be needed annually to cool newly constructed coal powered electrical generation plants in northeast Wyoming. The Framework Plan described several transbasin water diversion schemes to fuel the expected demand. However, the demand in 1997 for "cooling" water is less than a third of the projected use and not one transbasin diversion scheme has materialized in northeastern Wyoming.

Wyoming, a state large in surface area, supported a population of only 332,000 people in 1970. Wyoming's population has grown to 490,000 people, forty-eight percent (48%) increase over a span of 27 years. Overall water is relatively abundant in Wyoming. The trick is delivering the water from where it is available to where it is most needed. Annually, some 16 million acre feet of surface water originates within Wyoming. An additional two million acre-feet of stream flow enters Wyoming from other states. Of the eighteen million acre feet of surface water, Wyoming is entitled by interstate compact and court decree, to deplete or use 4 million acre feet of the available surface supply. To date Wyoming has beneficially used approximately 2.8 million acre feet of the resource. The largest single user by category is irrigation. To document trends and to help with future water demand projections and because of the increase in population, we need to quantify the municipal and industrial use and compare existing irrigation demand to the irrigation use in 1973. In order to meet water demands associated with future growth and development, we also must defend existing compacts and decrees so that Wyoming's right to develop the balance of the state's entitlements remains intact.

The demands of the Federal Water Pollution Control Act Amendments of 1972 (the Clean Water Act), the Federal Reserved Rights Act and the Endangered Species Act has restricted Wyoming's ability to put the state's entitlement water to beneficial use. The Safe Drinking Water Act heretofore has stressed the budgets of municipalities, special districts, and the state when addressing compliance issues associated with the act. The existing Wyoming Framework Water Plan was written before the Endangered Species Act or the Safe Drinking Water Act were approved by Congress. In addition, most of the "Framework Water Plan was drafted prior to passage of the Clean Water Act in 1972. Therefore, Wyoming's water plan does not recommend strategies or outline approaches to develop Wyoming's water resources which address the ubiquitous federal regulation

¹Wyoming Water Development Commission, 122 West 25th, Herschlery Building West, Cheyenne, WY, 82002, 307-777-7626.

associated with the above mentioned acts. A new approach to water planning may unify and prioritize needs among the various water user groups, more effectively comply with environmental law, more economically address water needs and increase water development opportunities within the state.

Over the past twenty years, Wyoming has been involved in litigation of water issues in two major river basins, the Wind/Big Horn River Basin (Yellowstone River Basin), and the North Platte River Basin (Platte River Basin). Not only has litigation proven to be expensive, but during the process of defending the state's positions, a need to quickly access an accurate data base has been repeatedly reinforced. The state has expended considerable funds contracting with water resource consultants to document existing use and water availability. One of the first assignments undertaken, if a new planning process is implemented, will be to review and update existing data. The data base will be re-structured in order to attain a more readily accessible and friendlier data retrieval system.

The 1973 Wyoming Framework Water Plan was a "snapshot" of the existing socioeconomic conditions of the time. With the availability of computer aged technology and with the advent of the "World Wide Web" and the internet, implementation of a new process can facilitate a more comprehensive, dynamic approach to water planning and a process which will encourage and facilitate the updating of the plan as conditions change.

Because of the needs and issues previously mentioned, the Wyoming Water Development Commission recommended in the 1996 Omnibus Water Bill that the Wyoming Legislature and the Governor appropriate funding to embark on a two phase feasibility study to further define planning needs and to identify resources needed to embark on a comprehensive, dynamic approach to planning. Funds have been appropriated and the Water Development Office has initiated the first phase of the feasibility study.

The Wyoming Water Development Office has recently mailed a survey throughout the state to assist with defining issues that should be addressed in a plan. Once the survey results are compiled, a draft 1998 "framework issues" document will be assembled and circulated throughout the state for review and comment. Simultaneously, the second phase of the feasibility study will begin. The second phase will identify a planning process, recommend a methodology, and identify manpower resources needed to implement a comprehensive, dynamic approach to planning. We anticipate that a "Geographical Information System" (GIS) based approach which utilizes state-of-the-art computer technology will be employed and plan to demonstrate system capabilities by undertaking a small pilot project during the second phase of the study.

Once the 1998 framework issues document has been defined, accepted and the funds appropriated for program implementation, Water Development Office personnel anticipate that a basin by basin, grassroots approach to water resource planning will be established. Basin Advisory Groups will be formed to provide a forum for discussion and input in the process. Basin Advisory Groups will become the heart of the water planning effort and will assist state planners by identifying water development opportunities within the basin, by identifying issues that require the greatest attention, and by identifying possible solutions to those issues.

Access to water determines the quality of life for all cultures. Wyoming is no exception. Competition for water within arid or semi-arid climates such as exist in Wyoming emphasizes the need for cooperation among water user groups. Water planning, through utilization of Basin Advisory Groups provides state planners and water users the opportunity to build consensus on how to manage and develop the resource. A computer based GIS system can be quickly amended to reflect changing conditions. Therefore, the proposed planning effort will lead to a written plan that will not become a "snapshot" representative of a few months or at best a few years which eventually loses its value with the passage of time. The plan will be updated periodically to remain focused and on target. It is envisioned that implementation of a new planning process will lead to increased water development opportunities.

Colorado Water Development Study

Buford Rice¹

PROJECT GOALS

In 1996 the Colorado Farm Bureau (CFB) initiated the Colorado Water Development Study to provide an overview of current and projected water resources conditions in the State of Colorado. The information provided in this study will assist Colorado water interests and the public in evaluating proposed Colorado water projects, prioritizing those projects, and formulating recommendations and strategies for funding and implementing preferred projects.

The project scope included: Project Colorado water supply needs and uses to the year 2100, Prepare an overview of existing Colorado water supply, Inventory water development agencies, growth projections and water supply projections, Inventory proposed water development and storage projects, Prepare a report summarizing the findings of the study.

1996 COLORADO WATER NEEDS SURVEY

A 1996 Colorado Water Needs Survey was prepared by Montgomery Watson on behalf of the CFB. The survey was distributed to 150 agencies representing all of the significant water users in the state. This included 60 municipal water development agencies, 49 water conservancy districts, 3 conservation districts, 24 water districts, 9 state agencies, and several private water developers.

The purpose of the survey was to gather information on the following subjects:

Agency characteristics (service area, population, type of customers), Existing and projected water demands, Normal and dry-year yields of existing sources of supply, Estimated future water requirements, Currently proposed water development projects, Threats to present sources of supply, Interest in participating in statewide water planning efforts.

Of the 150 surveys distributed, 53 were returned (35% return rate). Due to the nature of the questions, not all respondents fully completed the survey. Contacts were made with the larger municipalities and water agencies (those serving populations over 10,000) in order to improve the return rate from these larger users. Surveys were received from 79% (33 of 42) of these larger agencies, and from eight of the 10 largest water agencies.

POPULATION PROJECTIONS

Population projections were developed from the state and for the seven Water Divisions using data from the State Demography Section.

Statewide population is projected to increase from 3.7 million in 1995 to nearly 9 million in 2100, with the largest growth to occur in the Front Range communities located in Water Division I.

EXISTING COLORADO WATER SUPPLIES

An overview of existing Colorado water supplies was prepared based on the best information available from State water resources agencies. Most evaluations are based on 1970 and 1985 data.

The Colorado Water Conservation Board (CWCB) has estimated the total available state water supply to be 15.6 million acre-feet. Current annual consumptive use is about 6.1 million acre-feet in an average year. Interstate

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compacts and anticipated water requirements for endangered species instream flows may limit increases in future consumptive use to as little as 450,000 acre-feet.

Seven basins are currently near the limits of depletions or consumptive use on the basis of in-state use or interstate compacts: Arkansas River Basin, La Plata River Basin, Costilla Creek Basin, Laramie River Basin, Rio Grande River Basin, Republican River Basin and the North Platte River Basin.

The Colorado River Basin and South Platte River Basin have the potential for additional depletions based on estimates of current use under the compacts. However, future water requirements for endangered species recovery programs mandated by the Department of the Interior in both basins may affect the quantity and timing of new water development in these basins. Water requirements for these environmental programs are currently being negotiated by several federal and state agencies and environmental groups.

Agricultural Water Use Trends

Acreage of irrigated land has remained fairly constant in Colorado since the mid-1970's. Nonetheless, irrigation water use has declined by about 15 percent over the past 15 years due to a combination of generally favorable climatic conditions and improved irrigation practices. Statewide agricultural water use is not expected to increase through the year 2100.

Municipal & Industrial Water Use Trends

Population projections were used to project future municipal and industrial (M&I) water requirements. M&I water usage was estimated based on the assumption that 1 acre-foot of water will support 4 persons for one year. Statewide M&I use is projected to increase from 930,000 acre-feet in 1995 to 2.2 million acre-feet in 2100 if present per capita use factors continue.

REQUIREMENTS FOR ADDITIONAL WATER SUPPLIES

Requirements for additional statewide water supplies will be primarily generated from three areas: M&I demands from an increasing instate population; environmental constraints associated with endangered species recovery programs; and increased agricultural use and M&I demands in downstream compact states utilizing Colorado River, South Platte River and Arkansas River flows. Agricultural water use in Colorado is not expected to increase in the future. Impacts on future Colorado water requirements of interstate compact issues and environmental programs currently being negotiated cannot be estimated at present, but could prove to be significant in the next century.

The need for additional M&I water was estimated by Water Division based on the projected population, water demands, and the 1996 Colorado Water Needs Survey results. A range of dry-year yields for existing water supply projects was developed based on low- and high-yield estimates for water agencies not providing this information in returned surveys.

Although it is not possible to develop precise projections of future regional or statewide water requirements, the following observations can safely be made.

1. An additional 500,000 to 1,000,000 acre-feet will be needed to meet growing M&I demands in Colorado by the year 2100.
2. Agricultural demands are not expected to increase through the year 2100.
3. Demands for environmental programs (e.g., endangered fish recovery programs) may impact when and where future water development can occur.
4. Increasing demands in downstream states may put additional stress on Colorado water resources, particularly in the Upper Colorado River, South Platte River and Arkansas River Basins.
5. Water conservation practices, while important, are not expected to satisfy future water supply needs alone.
6. Projected demand will exceed currently developed supplies in some regions in the next 20 years. Given the time required to implement water development projects, efforts are warranted to expedite currently proposed

projects and encourage planning of new projects.

The Colorado Water Needs Survey identified over 50 significant water development projects or strategies which are currently being considered by the state's water agencies. These include options from construction new reservoirs to enhancing wastewater reclamation opportunities. The majority of these projects will require inter-agency and often inter-regional coordination, planning and funding to become a reality.

The current trend is toward developing multiple smaller projects for meeting future demands rather than a few large projects (such as Two Forks Dam). Further research into specific projects is recommended to assess which have the most potential for furthering the goals of the Farm Bureau and its constituents.

Another trend is toward developing databases and decision support systems to better understand and manage resources on a watershed basis. State agencies are currently using or developing these tools now, including the Colorado River Decision Support System, the South Platte Water Rights Management System, and HydroBase. The Colorado Water Conservation Board and the Division of Water Resources plan to integrate these tools into one statewide "Colorado Water Decision Support System."

THREATS AND OPPORTUNITIES

Several threats to existing water supplies and opportunities for developing new supplies were identified in the 1996 Colorado Water Needs Survey. A factor which is seen as a threat to one agency may be perceived as an opportunity to another.

Threats to Water Development: Unpredictability of weather-related or catastrophic events, Additional federal and state environmental regulations, Degradation of water source quality, Drawdown of aquifer water levels, Lack of reservoir storage space, Restrictions on water use due to interstate compact requirements, Exportation of water from the Western Slope to the Front Range, Unsustainable growth, Reduction of return flows due to conversion of irrigation use to domestic use.

Opportunities for Water Development: Greater efficiency in the use of water, Development of reuse supplies, Creation of storage space, Conjunctive use of ground- and surface-water supplies, Water conversion, Use of non-potable water for landscape irrigation, Transbasin transfers, Purchase of senior irrigation water rights, Artificial recharge of groundwater aquifers.

POTENTIAL STATEWIDE WATER DEVELOPMENT ALTERNATIVES

In order for the State of Colorado to meet future water demands, the state's water users and managers will consider a mix of several potential alternatives.

1. Develop unappropriated supplies. At least 450,000 acre-feet has been identified as new developable surface water supplies.
2. Transfer senior water rights from the agricultural sector to the M&I sector.
3. Implement conservation practices, including demand management strategies.
4. Develop additional groundwater supplies.
5. Improve water use efficiency by improved irrigation practices and reduced transmission losses.
6. Expand wastewater reuse for agricultural irrigation and non-potable urban areas.
7. Upgrade existing surface water collection and delivery systems and wellfield capacities.
8. Enhance and expand management tools such as computer databases and decision support systems to better manage existing supplies.

Potential Farm Bureau Policies

1. Continue supporting cooperative water resources planning in efforts among local, regional and state agencies. The Farm Bureau's statewide presence provides it with a platform from which to be a facilitator of inter-agency and inter-regional projects.

2. Continue supporting water education efforts. This applies to educating both agricultural and municipal water users on the importance of efficient operations as well as educating the public on the importance of water resource development to the state's economy.
3. Continue supporting large and small water development projects across the state. Some of these projects will benefit both M&I and agricultural users.
4. Seek legislative support for planning for the state's water needs. This should thoroughly document future water supplies, demands and potential shortages to assure the development of an aggressive long-term (50 to 100 year) strategy to develop water supplies.
5. Explore alternatives for further State of Colorado funding of water project development.

Role of Partnerships in the Future of Water

Neil S. Grigg¹

While some say that the South Platte is the most over-appropriated basin in Colorado, others say there is plenty of water if agricultural supplies are simply moved to other uses. That statement alone sets the stage for plenty of conflict. Add to that the accounting problem of keeping up with thousands of water rights, environmental needs, water quality and special exchanges, and the complexity of the situation is clear. Then, when the interstate compact problem and the intervention of federal agencies enter the picture, it isn't clear who makes the water management decisions, but one thing is certain: there isn't a "water czar" and no one wants one. What we have is a tight water management environment with possibilities for cooperation within the boundaries of many complex legal, regulatory, and political constraints. Partnerships already exist in this environment. One that is cited for success is the Poudre Water Users Association. Other partnerships, large and small, revolve around exchange agreements which are worked out between the users and agreed to formally or informally by the Division of Water Resources and Water Court. However they are managed, they are still partnerships. Moving this up a level the question arises "are there other such partnerships that can be win-win?" One that is often mentioned is city-agriculture cooperative ventures. Recently, groups have met in Northern Colorado to explore collaboration and/or the concept of a regional water bank. Such a venture would be a good example of a region working together in partnership. Of course, not all such ventures are welcomed by everyone. I believe that new partnerships are needed. They would help us to follow in the tradition of the pioneers who developed water and made the Basin what it is today. The Bottom line questions are: what can and will today's leaders do to implement them? What are the roles and who should be taking initiatives? To identify needed partnerships, these leaders must assess the water-based challenges, show how growth depends on water, answer questions about mutual dependence on water, identify how the Basin can benefit from partnerships, face squarely the increasing demand of the Metro Area for water, develop a vision, identify roles of key players, propose partnerships, and pursue the most promising ones. There are many key roles for the players, including districts, cities, agricultural interests, environmentalists, civic officials, and the educational community. One where the University can help is in the educational arena and in organizing events, serving as neutral ground for discussions, and facilitating partnerships.

¹Colorado State University, Department of Civil Engineering, Fort Collins, CO, 80523, 970-491-5048.

Survey of Management Practices on Colorado Irrigated Cropland

Marshall Frasier¹, Reagan Waskom and Kristy Ring

Land grant institutions have a long history of evaluating irrigation practices and technologies. Research efforts have resulted in technological advances that improve many facets of crop production efficiency. At this point, however, we find ourselves at a crossroads regarding the current state of knowledge, how it is used, and where future research efforts should focus. There has been some evidence that producers are not garnering the benefits that research suggests are available. This seems to beg the question: *Is there a gap between what research provides and what farms need?*

Casting the problem as a “research-farm” gap is a strong statement. The question has two parts: *is there a gap*, and, secondly, *why* does it persist? With these questions largely unanswered, it is not possible to assess the appropriateness of our research agenda or how effective any irrigation-related policy might be. In attempt to answer these questions, we conducted a survey of irrigated agriculture in eastern Colorado to *determine the management practices that producers are currently using, how those management decisions are made, and the relative importance of various factors in those decisions.*

An intensive survey was mailed to 3,250 irrigators across Colorado following Dillman’s total design method. Over 40 percent of those individuals contacted responded to the survey. The poster will present a summary and analysis of the findings of the survey including a comparison of the prevalence of technology adoption across different regions in the state. The results should prove useful to both academics and practitioners. This information provides the critical feedback in technology transfer and can serve as an important component in developing strategic plans for both irrigation research and extension programs. Farmers should find the information of direct use in seeing how others use current technology in real-world settings and the trade-offs that others have identified. Policy analysts will also find the results useful in verifying the true set of costs and benefits that producers face under a variety of circumstances.

Given the nature of the program, special efforts will be made to focus on results directly relevant to the South Platt region.

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Water Diversion and Transfer - South Park, Colorado: 1859-1994

Cathy E. Kindquist¹

Using photographs, maps and line drawings, this poster presentation depicts the transformation of South Park, a high basin in the midst of Colorado's Rocky Mountains, from 1859 to the present. South Park was transformed through the use and the control of water. In the mid nineteenth century water was diverted for the purpose of mining and applied to the land to irrigate fodder crops and support a ranching industry that became the economic backbone of the region. In the twentieth century control of South Park's water changed hands. In the 1930s the city of Denver acquired some small but strategic water rights in the high basin. The water rights were transferred to municipal use and several thousand acres of haylands were retired from production in South Park. Ranching survived.

In the 1960s and 70s Denver's rapidly expanding suburbs developed an interest in the headwaters basin. Over the past three decades the drying up of South Park has proceeded at an accelerated pace. Today less than 25 percent of the water rights originally decreed for the purpose of irrigation remain in use in South Park. Many of those are junior water rights and of limited use or value. Over 40,000 acres of hayland have been retired from production. A handful of ranches remain.

Materials for this poster have been assembled from photographic collections, archives, state and municipal records and through field work.

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An Interactive CD-ROM of Colorado Riparian Plant Associations as part of The Nature Conservancy's Preliminary Vegetation Classification of the Western United States

**Gwen Kittel¹, Ron Osborn², Steve Kettler, RenJe Rondeau,
Erika VanWie and Mary Damm**

The Colorado Natural Heritage Program is developing a state-wide classification of riparian plant associations. To date, we have described approximately 145 plant associations based on 1200 quantitative plots. On the CD-ROM, we present plant association descriptions that include: 1) species list and abundance table, 2) soil, geomorphology and stream channel information, 3) management information on grazing, fire and restoration, 4) cross-sectional diagrams and color photographs, and 5) reference reach locations. The CD-ROM will also show the distribution of each riparian plant association in Colorado and, at a broader scale, the presence of the associations in other western states. The plant associations are a part of the hierarchical Preliminary Vegetation Classification of the Western United States, compiled by The Nature Conservancy's Western Regional Conservation Science Department. The Biological Resources Division of the USGS is developing this interactive CD-ROM that will include an overview of the western states vegetation classification as well as the Colorado riparian information. The CD-ROM is scheduled for completion in 1998. A prototype will be demonstrated at the poster session.

¹The Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO, 80523, 970-491-3774.

²Biological Resources Division, USGS, Ft. Collins, CO 80525.

Arapahoe Aquifer Water Levels: 1958-1996

Dennis McGrane, Jon Ford, and Heather Bollacker¹

The Denver Ground Water Basin underlies a 6,700 square mile area extending from Greeley to Colorado Springs, and the Front Range to Limon. There are four major aquifers that occur in the basin: the Laramie-Fox Hills Aquifer, the Arapahoe Aquifer, the Denver Aquifer, and the Dawson Aquifer. The Arapahoe Aquifer is the primary source of drinking water for many metropolitan water suppliers and golf course irrigators in the Denver Area. The continued increase in population in the southern metropolitan area has increased the demand for ground water supplies. As a result pumping in the Arapahoe Aquifer has increased causing regional ground water declines.

Our poster will consist of a set of four figures showing historical water levels, recent water levels, and changes in the water levels over time. Figure 1 will be a reproduction of a U.S.G.S. 1958 water level map. Figure 2 will represent our interpretation of the 1996 Arapahoe Aquifer water levels reported by the Colorado Division of Water Resources. Figure 3 will show the change in water levels from 1958 to 1996. During this period, the water levels have dropped 700 to 800 feet around some municipal pumping centers in the southern metropolitan area. Figure 4 will display the change in water levels from 1995 to 1996 which range from 20 to over 60 feet.

The effects of water level declines can be significant for all well owners. As water levels decline, the amount of available drawdown decreases and the height a pump must lift the water increases. The result is that well yields decline and pumping costs increase. This means that to recover the lost well yield, higher horse power (more expensive) pumps will need to be set deeper in wells. Eventually, the high cost of operating a well field may force some municipal suppliers to use other Denver Basin Aquifers to implement creative means of prolonging aquifer life such as artificial recharge, or force them to develop alternative water supplies.

¹Leonard Rice Consulting Water Engineers, Inc., 2401 15th Street, Suite 300, Denver, CO, 80202-1143, 303-455-9589.

Drought in Colorado 1890-1996

Thomas B. McKee and Nolan J. Doesken¹

Drought is a frequent visitor to Colorado. The potential for sustained and widespread drought presents an obstacle to growth and development in parts of Colorado. Results of a recently completed detailed study of drought in Colorado will be presented. Statistics show that since 1982 Colorado has been enjoying a relatively drought-free period similar to the wet regime experienced in the state from 1905 to 1929. Based on past experience, it is more likely that more widespread and longer duration drought will return to Colorado in the future.

¹Colorado Climate Center, Department of Atmospheric Science, Colorado State University, Fort Collins, CO, 80523-1371, 970-491-8545.

Construction Best Management Practices Educational Video

Susan Strain Mockert¹

The Denver Metropolitan area is experiencing the highest rates of growth of any major city in the Rocky Mountain region. This translates into high rates of housing, business and road development. All of this construction is taking place in an area that historically experiences short duration and intense storm runoffs, has steep terrain and thin, rocky soils, and is not heavily vegetated. These factors and others attribute to the unique environment that makes Best Management Practices typically used at construction sites in the eastern United States inadequate to deal with the problems in the Rocky Mountain Region. Representatives of state, regional and local governments have joined together to create an educational video that demonstrates the correct usage and installation of BMPs during each stage of construction: pre-construction planning, overlot grading, utility installation, building construction and final stabilization. Focus questions in the video include: what is the purpose of installing BMPs at each level of construction?; when is innovation needed?; how should BMPs be maintained once they are installed?

The goal of the educational video is to *acquaint construction professionals, municipalities, and other agencies with the proper design, installation and maintenance of erosion control and construction site management BMPs as recommended in the Urban Storm Drainage Criteria Manual, Volume 3.*

The poster session consists of a brief outline of the goal of using best management practices during construction and the video being played on a VCR. Still photos will be used to illustrate different types of BMPs and the different stages of construction. Posters will be simple in appearance, yet full of relevant and useful information that could attribute to the conservation of water quality and quantity on construction sites and newly constructed housing, business and road construction.

¹Water Quality, Development Service Division, Denver Regional Council of Governments, 2480 West 26th Avenue, Suite 200B, Denver, CO, 80211-5580, 303-480-6740.

The South Platte Corridor: A Vital Landscape Link

Jean C. Smith¹

From Beaver Creek to the confluence with the North Fork, the South Platte River and its surrounding environment provides a vital link across a series of roadless areas. It is both a Land of Plenty and a Land of Depletion. Pristine waters for wild trout and river otter habitat, winter range for deer, canyons for raptors and ponderosa slopes for Pawnee montane skippers are found here. The river is a favorite recreation destination for anglers, kayakers, picnickers and campers. But the fragile riparian areas and steep slopes, along with water flows for metropolitan areas, face depletion from many sources. Ranging from erosion on the Buffalo Creed fire to motorized recreation in Wildcat Canyon, the river resource is under increasing pressure to produce more and more for more of us. How we choose to respond will determine the future for wildlife and human uses of the river.

¹Coordinator, Upper Arkansas and South Platte Project, 1308 St. Paul, Denver, CO, 80206, 303-388-3378.