

Summary Report

WATER AND GROWTH IN COLORADO

A REVIEW OF LEGAL AND POLICY ISSUES

by

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Water and Growth in Colorado identifies an extremely diverse and complex set of water law and policy issues associated with this current period of unprecedented growth in the state. Based on interviews with approximately 70 key Colorado water leaders as well as an extensive review of recent water studies and legal documents, the report describes existing water problems and potential solutions. The issues identified range from highly specific legal concerns to broader issues about the appropriate relationship of people to their environment. The range of potential solutions identified is equally diverse, including management strategies based on legal reforms, market tools, and technological innovations.

This *Summary Report* provides a preview and overview of material and findings explored in detail in the full report, which will be available in November 2001. The full report features approximately 200 pages of text supported by 13 pages of maps and figures, a detailed index, and more than 900 footnotes citing over 400 sources.

For questions regarding report availability, please contact the Natural Resources Law Center at (303) 492-1286 or (303) 492-1272, nrlc@spot.colorado.edu, or visit www.Colorado.Edu/Law/NRLC/. Page 16 contains additional information and an order form. (*Note: Interviewees will receive complimentary copies.*)

INTRODUCTION

Recent census figures rank Colorado as the nation's third fastest growing state by percent, trailing only Nevada and Arizona. Eight of the nation's eighteen fastest growing counties are in Colorado, led by national leader Douglas County. State population projections suggest an additional 1.7 million residents (approximately a 41 percent increase) can be expected over the next two decades. While most of these new residents will locate along the Front Range, population growth on the West Slope is also expected to rise sharply, actually surpassing the growth rate of the Front Range in percentage terms. These trends raise several difficult questions, including:

- Are Colorado water providers prepared to meet future water demands?
- Is Colorado's form of water law and administration ready to meet the modern challenge of growth?
- How will longstanding conflicts between state and federal law be resolved?

“There is no place in the country where water is a limitation on growth.”

-- HAMLET J.
“CHIPS” BARRY,
III, General
Manager, Denver
Water

The relationship of water and growth in the modern West is often misunderstood. Historically, it has been assumed that water development was a necessary precursor to growth and, similarly, that a lack of water development could act as a deterrent to growth. While these premises may have been true at one time, recent experience in Colorado and other western states shows both ideas are now unsupportable. To the contrary, many of the regions showing the highest rates of

growth in the West—from Douglas County, Colorado to Las Vegas, Nevada—show the opposite trend; growth is actually highest in some of the driest regions. Similarly, the veto of the proposed Two Forks dam on the Front Range by the Environmental Protection Agency in 1990 certainly did not deter growth in the Denver-Metro area. Examples also suggest that an abundance of water is often insufficient to stimulate growth. The experience of Pueblo is illustrative. These observations suggest that, in the modern West, water policy does not appear to be a useful tool for growth management. Growth management (or a lack thereof), however, can play an important role in shaping the behavior of

water providers who strive to provide nearly 100 percent reliable water supplies to meet all foreseeable demand.

In many locales in Colorado, the result of growth is increased competition for limited water supplies between the municipal, agricultural, and environmental sectors. Among Front Range municipal water providers, the nature and intensity of this competition varies greatly from

city to city due to different water rights portfolios and infrastructures. Many of the associated legal and policy issues involve trans-basin diversions, environmental protection, water quality management, and interstate obligations. Coping strategies generally focus on new development of surface and groundwater, reallocating supplies from agriculture to municipal use, and conservation and efficiency.

KEY WATER ISSUES IN COLORADO

Understanding Colorado's water challenges requires, at a minimum, a familiarity with the following four issues.

TRANS-BASIN DIVERSIONS

Growth along Colorado's Front Range has prompted several large water diversions from the West Slope. Many factors suggest that the Front Range will continue to look toward the West Slope for additional trans-basin diversions. These factors include the potential availability of water on the West Slope, opposition to agricultural-to-urban water transfers along the Front Range, groundwater mining in the Denver Basin, and potentially, water quality and endangered species problems along the Front Range. An additional benefit to the Front Range of imported water is its legal status. Under Colorado law, diverting water over the mountains for use in other basins creates so-called "foreign" water. The developer of foreign water can generally use this supply entirely (to extinction), whereas the return flows associated with the use of native water are subject to appropriation by other users. A further advantage of foreign water is that changes in use are often possible without costly court proceedings.

Despite these benefits to the Front Range communities, new trans-basin diversions are highly problematic, as basin-of-origin issues ensure that such proposals are extremely time consuming, expensive, and uncertain. Legal and policy issues of particular concern include:

- To what extent would future trans-basin diversions affect West Slope water supplies (particularly in headwater communities), environmental resources, and interstate obligations? Are Front Range water needs sufficient to justify these impacts? Can Front Range demands be met without Gunnison River water?
- Will future trans-basin diversions be possible without explicit West Slope consent? What will the West Slope be looking for in future deals? Is some form of compensation needed?
- Will trans-basin diversions be required to be used more efficiently? If so, how will this impact water supplies/demands on the Front Range and on the West Slope?

"[The rhetoric is] 'every last drop' versus 'not one drop.' The challenge is to strike a balance ... to find a way to balance needs of the Front Range and basins-of-origin."
-- DAVID C. HALLFORD, former General Counsel, Colorado River Water Conservation District

ENVIRONMENTAL PROTECTION

Concern for the environment gained popular support in the 1960s and has since escalated to the point that environmental regulations can prevent water development or redistribution of water resources, or even demand the removal of previously constructed projects. Environmental issues are case specific, but several—such as minimum stream flows, endangered species, public lands, and wilderness areas—can almost always be expected to arise in the context of water and growth.

One of the primary environmental needs in the West is the maintenance of instream flows for environmental, aesthetic, scenic, and recreational purposes. Colorado was one of the first states to respond by enacting a statute that allows the Colorado Water Conservation Board to appropriate minimum stream flows “to preserve the natural environment to a reasonable degree.” Most instream flow rights are comparatively junior, however, and cannot maintain water levels during times of drought. These rights can also impair the ability of headwater communities to meet growing demands for resorts and recreational industries.

“Growth drives changes in the way in which water is allocated, producing consequential effects on the environment and economy of the state.”

-- DAVID W. ROBBINS, Hill & Robbins

Some degree of environmental protection is also provided by the federal Endangered Species Act, which requires water managers to consider the flow and habitat needs of listed species. Endangered species issues can be found in all of Colorado’s major river

basins. A large-scale recovery program is already in place in the Upper Colorado basin; a multi-state endangered species effort is also evolving in the Platte River basin. Water dedicated to endangered species can effectively be removed from the state’s appropriation system and is not available for other uses, such as the demands of growth. This is a particular concern in the Upper Colorado River basin. The relationship between endangered species and growth, however, is not always an obvious one. For example, endangered species in the central Platte generally benefit from the return flows associated with trans-basin diversions from the Colorado River to the South Platte system—a paradoxical and exceedingly complicated relationship in which Front Range growth can harm Upper Colorado species while benefiting Platte basin species.

The most salient legal and policy issues associated with environmental protection include:

- Are existing water laws and programs sufficient to protect and restore water-related environmental resources in Colorado, or are fundamental reforms needed? For example, should (and will) Colorado’s minimum stream flow program evolve over time to include more senior water rights and/or water dedicated to recreational purposes? To what extent would these changes limit the ability of Front Range municipalities and headwater communities to meet future demands?
- What is the future of the Endangered Species Act in Colorado? How will compliance with the Endangered Species Act

influence land-use patterns, water project maintenance activities, and/or the privatization of federal projects? What are the water yield implications?

- Will the Upper Colorado recovery program succeed, thereby making more water available for development than envisioned in the Programmatic Biological Opinion (PBO)? How will the Upper Colorado and Platte recovery programs reconcile their competition for the same water supplies?
- Will the maturation of Colorado's minimum stream flow program and the Upper Colorado PBO unduly accelerate water development?
- Where will the water come from for the Upper Colorado and Platte recovery programs? Will these environmental water needs come from existing rights holders? Will the ability of the state to develop remaining compact entitlements be impaired?

WATER QUALITY

At one time, western water issues focused exclusively on issues of quantity. Today, water quality issues are often of equal prominence, and are highly intertwined with issues of supply augmentation and conservation. Growth raises water quality issues through a number of mechanisms. For example, growth can encourage improvements in efficiency to stretch existing supplies. Increased efficiency means that each user consumes less water, but that pollutants are more concentrated in

the smaller return flows. Successive use (and reuse) by downstream appropriators compounds this effect, potentially contributing to increased water treatment costs or an overall decline in water quality. Additional water quality impacts can be associated with water reallocation, particularly from agricultural to municipal and industrial uses. Perhaps most importantly, land-use changes associated with growth can modify sediment loads and flood dangers in urban streams.

“Water quantity and water quality are intertwined; it is kind of strange thinking to believe we can modify water quantity without impacting water quality.”

-- JOHN WOODLING, Colorado
Division of Wildlife

The interplay of water supply and water quality issues is often problematic in Colorado. Not only are these two separate areas of law, but also state law primarily guides the former while federal law dominates the latter. These two bodies of law are being reconciled slowly and incrementally, in part through mechanisms such as exchange cases involving the substitution of wastewater effluent for clean upstream water, and evolving federal water quality initiatives, including the total maximum daily load (TMDL) process. Some of the more pressing legal and policy issues include:

- How will the courts reconcile state water allocation law with federal and state water quality law? To what extent are water management strategies and tools—such as trans-

basin diversions, water exchanges, conservation, and water reuse—shaped by the failure to consider water quantity and quality in a coordinated framework?

- Will the Endangered Species Act (e.g., Section 9 Takings) and/or the Clean Water Act (e.g., 401 Certification) ultimately control hydrological modifications and force a re-regulation of flow regimes?
- How will growing municipal and ISDS (e.g., septic system) wastewater streams, changing land use patterns, rising water reuse, and increasing efficiency impact the quality and quantity of surface water and groundwater supplies?
- How will water quality management goals influence efforts to expand water supplies? How will TMDL implementation influence water supplies? How will the non-degradation policy influence future water development and use?
- How will the major water quality impacts of pollution from non-point sources, primarily agriculture and abandoned mines, be addressed?

INTERSTATE OBLIGATIONS

Interstate compacts, judicial equitable apportionments, and congressional acts create interstate obligations for Colorado. Colorado is a party to interstate compacts on the Arkansas, Colorado, Costilla Creek, La Plata, Rio Grande, Republican, South Platte, and Upper Colorado Rivers. In most of Colorado's river basins, all of the state's

apportioned water has been put to beneficial use. The major exception is the Colorado River, where the state has approximately 450,000 acre-feet/year left of its entitlement. These waters, however, may not be practical to develop further due to their location or temporal occurrence, and/or due to environmental, economic, or political considerations.

“Colorado, as a headwaters state, has plenty to worry about with its neighbors’ water needs.”

-- WILLIAM A. PADDOCK, Carlson, Hammond and Paddock

Water decisions in Colorado are occasionally influenced by the goal of rapidly putting the state's unused Colorado River apportionment to use, largely to quell fears that downstream states—especially California—may somehow acquire this water in violation of the Compact. This goal can influence water management in two ways. The first is to discourage water use efficiency reforms. Inefficiency allows the state to maximize use of its compact entitlement, presumably protecting these flows against other possible claimants. Second, the fear of losing compact apportionments is occasionally used to bolster support for new water developments being pursued for other purposes.

Parties concerned about meeting the water demands of growth are particularly concerned about unresolved legal and policy issues on the Colorado River system, including:

- How much of the state's Colorado River entitlement will ultimately be available for development in the

- state given errors in the compact’s projected yield estimates, evolving federal environmental regulations, the needs of California and Nevada, unquantified Indian water rights, and the presence of senior rights holders near the Utah state line?
- How will eventual interpretations of vague language and omissions in the Colorado River Compact influence Colorado water users? In what context will these issues be addressed? Do similar uncertainties surround other compacts to which Colorado is a party?
 - Can (and should) Colorado sell (or lease) its unused Colorado River entitlements to downstream interests? Will the Indians sell or otherwise market their water?

RESPONSES AND STRATEGIES

The challenges facing water managers can be addressed through a variety of strategies. In most instances, the strategies selected are those that offer the least resistance and overall costs. In some cases, the transactions costs associated with water court activities are particularly salient in shaping behavior, as evidenced by the strong preference among municipal providers for agricultural-to-urban water transfers that involve foreign, rather than native, water supplies, as the former does not require the same judicial review as the latter. The extent to which these procedural costs influence behavior is an important issue overlying most water management decision processes.

Three main types of strategies exist for coping with the water demands of growth. The first category is new development. New development relates to the construction of

facilities for the greater utilization of surface water, groundwater, and/or the conjunctive use of both surface and groundwater. The second strategy is water reallocation. Most water rights reallocations (i.e., transfers) in Colorado are from the agricultural to municipal sectors, although some mining to municipal transfers are occasionally seen. Finally, the third strategy focuses on increasing efficiency through demand reduction, reuse programs, and the improved operation of water systems.

“What is going to happen with respect to water supplies to meet the needs of those additional one million residents [who will reside in the Denver-Metro area by 2025]?”

-- KEN SALAZAR, Colorado Attorney General

NEW DEVELOPMENT

The development of new water supplies is the traditional response to growth. Construction of major new dam and reservoir projects, however, is often impossible in the modern era due to environmental and area-of-origin considerations. Despite the challenges, some new water development is still occurring and is contemplated in Colorado. Currently viable alternatives to big dams and trans-mountain diversions tend to involve an expanded use of small and unconventional reservoirs (e.g., gravel pits), and Front Range projects that also provide benefits to the basins-of-origin. With few exceptions, waters from the Upper Colorado, Gunnison, and South Platte systems are the targets of additional development; other basins in the state are already at or near their development capacity.

An increasingly common source of new supplies is groundwater reserves, especially the aquifers of the Denver Basin. Groundwater is particularly useful for serving low-density residential development, a type of growth that has been on the rise. Nowhere is this more evident than in Douglas County, which has little in the way of surface water supplies, but features thousands of individual domestic groundwater systems. The long-term reliability of this groundwater source is a growing concern as demands escalate rapidly. One option for utilizing the resource more efficiently may entail the conjunctive use of groundwater with surface water, likely involving currently unneeded trans-basin water rights held by Denver Water.

Some of the specific legal and policy issues in Colorado associated with new development include:

- Does the existence of vast senior conditional water rights unduly prevent the full utilization of active junior rights or the full utilization of compact entitlements? Similarly, will environmental restrictions and West Slope opposition block full development of the remaining Colorado River entitlement, or will the needs of headwater communities prompt an era of win-win water development deals between the East and West Slopes?
- Will non-traditional storage mechanisms on the South Platte (e.g., gravel pits, conjunctive use) be sufficient to offset the vetoed Two Forks project? Will Two Forks be revived?
- What role will groundwater development and conjunctive use play in meeting future water demands, particularly in the Denver Basin? Do legal uncertainties limit the potential for groundwater storage and large-scale conjunctive use projects?

REALLOCATION

One of the most effective strategies for augmenting municipal water supplies is the reallocation (or transfer) of water from one user to another. While these transfers take on several forms, in the vast majority of cases existing transfer activities move water from the agricultural to the municipal sector. Several factors encourage these water transfers. Most important is the rapid growth of municipal water demands at a time when traditional regional economies based on agriculture, livestock, and mining are flat or declining. These traditional

western enterprises use most of the water—over 90 percent of consumption in the western states—and control the most senior water rights. It is frequently argued that a reallocation of just 10 percent of agricultural water to municipal uses could augment municipal supplies West-wide by 50 percent. Other factors encouraging water transfers include the higher economic, political and environmental costs of other options, especially new dam and reservoir projects.

Water transfers can take several forms. Under Colorado law, water rights can be sold or leased, meaning that transfers can be permanent or temporary, perhaps based on various types of contingency arrangements. This variety of tools brings great flexibility to the transfer option, further stimulating interest in water reallocations. Transfers of foreign water are generally preferred, as these transfers minimize impacts on other rights holders and thus limit the necessity of costly water court proceedings.

“The last alternative should be drying-up of agricultural lands.”

-- STEVE ARVESCHOUG, General Manager, Southeastern Colorado Water Conservation District

Many transfers create negative economic, social, and environmental impacts for the area losing water. These impacts are normally borne by “third parties,” a term used to describe any potentially affected interest to a water transfer other than the buyer or the seller. Protecting these interests is an essential responsibility of policy-makers, even though attempts to internalize costs otherwise borne by third parties is

likely to increase the transactions costs associated with water transfers.

Water reallocation raises several difficult legal and policy issues, including:

- Are water transfers the most promising and acceptable means for augmenting municipal water supplies? Do legal and political obstacles to new water developments and trans-basin diversions unduly promote agricultural-to-urban water transfers? How do transactions costs influence water transfers?
- Can temporary transfer mechanisms—such as leases, subordination agreements, dry year options, lease-back arrangements, and water banking—provide municipalities with drought protection while maintaining rural agricultural economies? Will these arrangements become more popular, or will municipalities continue to buy agricultural rights outright?
- Are legal reforms needed to protect rural agricultural communities and water systems from the negative consequences of water transfers? To what extent do water transfers threaten environmental resources and water quality?

CONSERVATION AND EFFICIENCY

Existing water supplies can be stretched to serve growing populations through a variety of management strategies, including demand reduction, efficiency improvements, wastewater reuse, and improved system operations. Water conservation practices are

not the sole solution to future water supply needs in Colorado, but they are an important piece of the puzzle, largely since they allow water providers to escape—or at least delay—the economic and political costs associated with new developments and reallocations.

*“We have potable reuse now—
just don’t tell anyone.”*

-- JAMES R. “JAY” MONTGOMERY,
Moses, Wittemyer, Harrison &
Woodruff

Conservation and efficiency measures, however, are not a quick fix, and raise their own legal and policy issues. For example, strategies based on managing growth, limiting demand through pricing, or wastewater reuse all face difficult political and public relations obstacles. Additionally, legal, economic, and cultural factors often provide disincentives for water conservation and efficiency. Further problems are associated with strategies that modify the magnitude and timing of diversions and return flows. Such alterations of the hydrologic regime can cause injury to other water rights holders as well as affecting environmental resources and water quality. None of these problems is insurmountable, however, and the opportunities for conservation and efficiency remain high.

One of the most promising opportunities for meeting changing needs is through a more coordinated operation of existing water facilities and systems. Most of the existing infrastructure of dams, reservoirs, and pipelines was constructed decades ago, and evolved in an incremental fashion. Due to legal innovations (e.g., exchanges) and enlightened provider perspectives, it is now possible to coordinate operations of multiple systems to increase efficiency. Denver

Water and other Front Range water providers are presently engaged in coordinated operations projects with several entities on both sides of the Continental Divide. Additional opportunities, however, remain to be explored.

Several questions surround efforts to utilize conservation and efficiency strategies to meet emerging water demands in Colorado, including:

- To what extent can demand management strategies, such as growth management and water pricing mechanisms, be utilized to minimize municipal water demands?
- How can the full potential of agricultural water efficiency be realized given existing legal and economic disincentives? What are the effects of increased efficiency on water users?
- Can the use of bluegrass landscaping be discouraged given its strong cultural preference?
- Can wastewater reuse provide a significant water source given issues of cost and public acceptance?
- How can improved water system operations—including the re-operation of storage facilities, regional coordination, and water exchanges by and between providers—be used to stretch existing supplies further? How will improvements affect other water users?

EMBARKING ON THE FUTURE: A REVIEW OF PROMISING STRATEGIES

In reviewing the literature, interviews, and case studies featured in this study, some tools and management strategies are apparent that, collectively, may hold answers to dealing with the water demands of continued growth. At the heart of these strategies are increased cooperation, an attempt to minimize adverse impacts of water development and use, and a commitment to stretch existing supplies further. In some cases, Colorado water managers are already actively employing the strategies listed; in others, significant endeavors have only begun. Thirteen key areas of innovation are listed below:

- **Cooperative/Joint Water Developments.** To the extent that new water development is pursued, the most promising alternatives appear to be those that evolve in a cooperative framework sensitive to the distribution of costs and benefits among different interests and geographic locales. Projects serving multiple interests often enjoy greater political viability than would otherwise be possible. Promising examples include Wolford Mountain Reservoir, the Eagle River MOU, Clinton Gulch, Pueblo Reservoir enlargement, Aurora's irrigation conversions in Lake County, and the Tri-Party Alliance's investigation of Denver Basin conjunctive use.
- **Small-Scale and Off-Stream Water Storage.** Many of the liabilities of traditional storage projects can be effectively avoided by limiting development to small-scale projects, especially those featuring off-stream storage. The conversion of gravel pits into small storage reservoirs in the South Platte basin is a prominent example. Others are Clinton Gulch and Eagle Park Reservoirs. Expansion of existing facilities (as planned for the Pueblo and Turquoise reservoirs) is another option that limits negative impacts. Off-stream reservoirs under consideration include Jasper and Ruder-Hess.
- **Market-Based Water Reallocation.** The reallocation of some water from agricultural to municipal uses is generally acknowledged as the inevitable result of the changing demographics and economics of Colorado. While many of these efforts have negative third-party impacts and entail significant transactions costs, systems with clearly defined rights, willing buyers and sellers, and an adequate water conveyance infrastructure efficiently reallocate water to higher-value uses. Undoubtedly the best example in the United States is the active market associated with the Colorado-Big

Thompson Project, although Twin Lakes provides another simple illustration.

- **Temporary Water Transfers.** Arrangements that provide for temporary water transfers—e.g., only during dry years—are a particularly promising way to accommodate municipal demands while minimizing the disruption to other sectors and regions (e.g., third party impacts). Mechanisms such as leases, subordination agreements, dry year options, lease-back arrangements, and water banking hold great promise if transactions costs can be contained. The pilot water bank for the Arkansas River provides an opportunity to test the concept to simplify and to improve the approval of water leases, loans, and exchanges, including interruptible supply agreements, and to reduce the costs of such transactions.
- **Groundwater Development and Conjunctive Use.** Much of Colorado, including the Denver Metro area, features groundwater reserves that will be further tapped to serve expanding populations. Using these reserves conjunctively with available surface water resources can allow water managers to extend aquifer life (perhaps indefinitely), allow full utilization of surface water rights, manage drought, and minimize the need for new traditional storage reservoirs. The South Metro area is the focus of a few small-scale conjunctive use projects (e.g., the Centennial Water and Sanitation District program). The so-called Tri-Party Alliance is

exploring a much more ambitious project for the Denver Basin.

- **Integration and Coordinated Operation of Water Systems.** Cooperative operation and/or planning arrangements among water providers can potentially enhance the yield and/or reliability of individual water systems. Examples include the Denver-Boulder agreement regarding the use of Gross Reservoir, efforts to accommodate Colorado Springs' storage needs using excess Fry-Ark reservoir capacity, and ongoing discussions associated with the Northwest Cooperative Agreement and the Tri-Party Alliance. Denver Water's invitation for cooperative proposals is an approach that could lead the way this century, much as the agency led the way with bricks and mortar projects last century.

“We can't stop people from coming here, but we can be prepared for it.”
-- STEVE ARVESHOUG,
General Manager,
Southeastern Colorado Water
Conservation District

- **Efficiency and Wastewater Reuse.** The efficient use of existing supplies is a spreading mantra that is epitomized in several ways, including exchanges—another area where Colorado is a leader—and wastewater reuse. Municipal wastewater is increasingly viewed as a valuable resource that can be utilized to meet additional water demands. While legal, political, and

economic constraints typically limit full reuse of municipal wastewater streams, significant potential remains. Colorado Springs has a long-standing program that uses wastewater to irrigate public green space. Aurora has an established reuse program for green space irrigation, and Denver Water recently broke ground on the first phase of a substantial reuse program.

- **Conservation and Demand Management.** Instead of focusing exclusively on supply-side solutions to balance water budgets, several opportunities exist to limit demands and consumption. Agriculture is leading the way in Colorado. Irrigated acreage has remained fairly constant since the mid-1970s while irrigation use has declined by about 15 percent, a trend expected to continue throughout this century. Some of the tools available to municipal providers include new technologies, metering and pricing mechanisms, modified lifestyle choices, and public education. Xeriscape programs in Denver and Aurora are among the most visible examples of conservation programs.
- **Cooperative Solutions to Environmental Problems and Endangered Species.** Water development and management can have significant negative impacts on environmental resources, particularly wildlife. Similarly, regulations intended to protect environmental values can constrain water development and management. Increasingly, water managers are working proactively

with governmental and environmental interests to avoid problems, and to address threatened and endangered species through cooperative and integrated programs. Proactive successes include the boreal toad, and, hopefully, the Preble's jumping mouse. Cooperative mitigation programs include the Colorado River endangered fishes recovery program, coordinated reservoir releases for 15-mile reach fish flows, and the Tri-Party Agreement for central Platte River habitat. Formal state programs foster a proactive approach. Colorado's minimum stream flow program to preserve the natural environment continues to grow with substantial support from others, such as the City of Boulder. State funding to support species of concern is another example of proactive legislation to accommodate environmental values within the prior appropriation doctrine.

- **Accommodating Recreational Flows.** Coloradans increasingly value and recognize instream recreational flows. The state's water law has accommodated this movement, at least to a point. The *Fort Collins* case established that stream flows could be appropriated for recreational uses, although some believe the recent *Golden* case may have pushed the doctrine too far. The *Gunnison* case similarly established that reservoir releases could be used for piscatorial purposes. Recreational flows are now legislatively recognized uses, although the new review process may hamper rather than foster new

appropriations. Cooperative agreements involving water providers do an impressive job of maintaining rafting flows through Brown's Canyon on the Arkansas River, and on the South Platte through Metro Denver.

- **Water Quality and Quantity Integration.** Water development inevitably affects water quality. For most of its history, however, Colorado has steadfastly maintained that water quality issues are independent of, and therefore properly subservient to, the right to use the waters of the state. This myth is being challenged on several fronts, most notably in the context of exchanges. EPA and environmentalists also continue to challenge the bifurcation as fundamentally inconsistent with the Clean Water Act.
- **Reserved Rights Settlements.** Colorado was blessed with the patience and magnanimity of the Ute Mountain Ute and Southern Ute Tribes in the settlement of their Indian reserved water rights claims. Similarly, the willingness of the Forest Supervisor of the Rio Grande National Forest to work with other interests led to the first and only global settlement of national forest reserved water rights in the United States.

- **Controlling Interstate Demands.** California's 4.4 plan to reduce its use to its legal entitlement is a hopeful sign that other states will be able to meet their future needs without exacerbating demands for Colorado's water resources.

These water management tools and strategies figure to play a prominent role in shaping how Colorado deals with growth pressures. In highlighting these innovations, however, it should not be overlooked that some of the development, reuse, and efficiency strategies allowing more and more people (and uses) to be served by water systems can have the long-term effect of reducing the availability of undeveloped and unappropriated water in the state, while diminishing the excess—including the drought cushion—that currently exists in many water systems. These concerns generally do not surround strategies emphasizing reallocation and demand management; however, no strategy is without potential complications or drawbacks. Giving adequate consideration to all options can implicate issues that are outside of the normal purview of water managers, such as land-use management and the behavioral incentives provided to water users through law, policy, and even culture. If these and related issues are to be seriously considered in devising future water management programs, decision processes may need to feature more political leadership, planning, and public involvement than is currently seen.

THE CHALLENGE AHEAD

The influence of rapid population growth on water resources is often profound, but remains largely unappreciated by parties debating the merits and patterns of growth in Colorado. If growth projections prove to be even remotely accurate, then the next decades figure to be highly challenging for Colorado water interests. Front Range municipal water providers aggressively continue to explore a highly varied and complex set of strategies for acquiring and managing additional water supplies. The pace of legal and technological innovation is accelerating, yet in some cases—namely the South Denver Metro region—may only be sufficient to keep pace with demand due to the cushion provided by groundwater reserves and the continuation of unusually wet years. The challenge faced by headwater communities is, arguably, even greater than that faced by Front Range cities in some cases. Rapidly growing Summit County, for example, has a physical abundance of water, but most is unavailable for local use due to senior or conditional rights held by parties outside the county. The challenge for agricultural advocates, meanwhile, primarily entails trying to retain water for irrigation in the face of more economically attractive uses. Statewide, agricultural-to-urban water transfers have not had a huge impact on agriculture yet, but in some locations, such as the lower Arkansas Valley, serious economic disruption has already occurred. More widespread are

“For change to occur, there either has to be a crisis or an initiative, but there is a vested interest to resist change.”

-- JIM MARTIN,
Environmental Defense

environmental impacts associated with past water developments. Environmental advocates will undoubtedly be challenged to win remedies for historic ecological effects; just holding the line on additional impacts is already a demanding agenda.

Growth in the West is not simply a matter of population increases, but is also about changes in lifestyles, land-uses, politics, economics, and values. Ultimately, it is about raised expectations—especially where our water systems are concerned. For water managers to satisfy the increasingly diverse and lofty demands that confront them,

innovation must continue. Managing water in a period of sustained growth will likely require finding mechanisms for exploiting advances in engineering and management, recognizing the true economics of water development and use, adapting laws that may unnecessarily limit progress, and perhaps reconsidering

how we, as westerners, value and use our limited water resources. Fortunately, recent years have produced several innovative management strategies to build upon. These water management tools and strategies figure to play a prominent role in shaping how Colorado deals with growth pressures.

For the approximately 81 percent of Coloradans living along the Front Range, real water shortages do not seem likely in the foreseeable future. This grand

conclusion is not based on any sophisticated regional “water accounting” comparing supplies and demands; by that standard, relatively few Front Range water providers—notably Denver Water and its contractors—have a water system already in place to ensure a balanced future water budget. Rather, this conclusion is based on other considerations. First and foremost is the western truism that *water flows to money*. While wealth and political power are insufficient to pull water from the sky (notwithstanding modern cloud seeding techniques), they are more than adequate when married to technical expertise to move existing precipitation between regions, seasons, uses, and users. Additionally, by mining water deep below the ground, water can effectively be moved between years, decades, and even millennia. The ability of engineers, lawyers, politicians, and business leaders to keep water in the taps of Front Range cities should not be underestimated.

“The very nature of the fact that you have more people means that there are more people to pay for a way to bring in renewable water.”

-- JAMES R. SULLIVAN, Douglas County Commissioner

For Front Range municipalities, the issue is probably not future shortages, but rather future costs. As a rule, every new water source is more expensive to develop than the previous one. This is predictable and indisputably logical; the least expensive options are pursued first. This general rule becomes complex when distributional issues are considered, as the distribution of costs are often not closely linked to the distribution of benefits. Rural agricultural communities and environmental resources, for example, tend to bear much of costs associated with water transfers and new developments, respectively, with benefits concentrated in the cities. What is best (i.e., lowest cost) for a particular water provider, therefore, is not necessarily what is best for other water users, or for society as a whole. This problem, typical of mobile resources like water, prompts a steady stream of legal and policy responses that further modify costs and their distribution. With each change, the suite of possible water management tools is reshuffled, yielding a new order of management priorities, tied to a new set of costs, and, ideally, reflecting an evolving set of public values. The declining viability of trans-mountain diversions as the solution to Front Range water needs is just one of several important trends. The future of Colorado’s water resources is closely tied to these larger trends in law and policy.

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