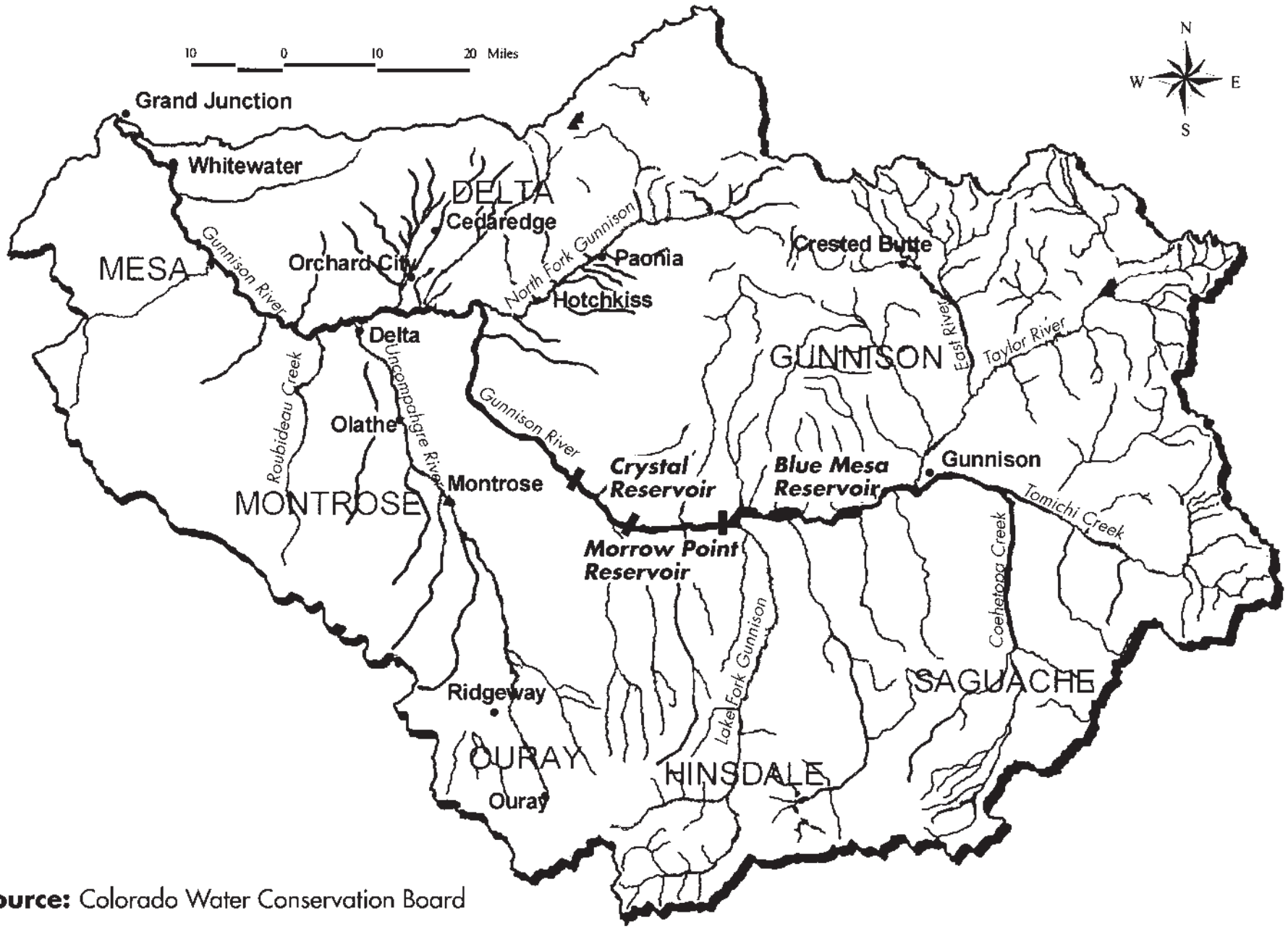
Gunnison Basin Water:

No Panacea for the Front Range

An analysis prepared by
The Land and Water Fund of the Rockies

Gunnison River Basin



Source: Colorado Water Conservation Board

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Cover Photo by Jeff Widen

Foreword

This report was made possible by a grant from Jay Kenney and the Jay P.K. Kenney Foundation. Jay Kenney is an avid whitewater enthusiast and conservationist who cares deeply about the Gunnison basin. We are extremely grateful for this financial support. Supplemental funding helping us learn about the Gunnison basin and river came from the General Service Foundation.

Bruce Driver, Executive Director of the Land and Water Fund of the Rockies (LAW Fund), conceived of the report. He and Bart Miller, the LAW Fund's Water Program Director, were primary authors. LAW Fund staff who provided research assistance include staff attorney Melissa Decker, and Smart Water Project analysts Eli Feldman and Don Wojcik. Leslie Kaas-Pollock and Claudia Putnam provided editing and production assistance. Interns who provided essential background research include Nicole Allard, Adrienne Allen, Matt Kristofco, Jillian Lloyd, Mike Meleady, Patrick Nackley, Brad Schaeppi, and Makayla Shannon.

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Any factual inaccuracies are the sole responsibility of The Land and Water Fund of the Rockies. In addition, the views and opinions expressed herein are those of the LAW Fund and do not necessarily reflect the views of the funders, researchers, or reviewers.

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EXECUTIVE SUMMARY

The Gunnison River Basin is one of Colorado's greatest treasures. From its origin on the ridgeline of the Continental Divide to its mouth near Grand Junction, the basin is home to a wide variety of people and livelihoods in a breath-taking landscape. It is hard not to fall in love with its majestic mountain peaks, green valley bottoms, and unhurried pace of life.

Among the basin's most valuable assets is water. Water's rhythm and the life it brings can be found everywhere: in hay meadows, hydropower turbines, and tumbling down streambeds—to be enjoyed by anglers, rafters, local communities, and the plants, fish, and other animals the river supports.

In contrast to the rural Gunnison is the growth and sprawl on Colorado's Front Range. As the Denver metro area expands its web of houses, highways, strip malls, and business parks, its population could climb to an estimated 3.2 million people by 2040. This unchecked growth may create an annual municipal water demand of over 870,000 acre-feet in the Denver metro area, roughly doubling today's demand. Water providers along the Front Range are anxious about how to meet this demand. Some suggest importing water from the Gunnison River is the answer.

For decades, proponents of a trans-mountain diversion from the Gunnison hoped to find "free" unappropriated water available. Many early proposals died under the sheer weight of cost and absurdity. More recently, the Union Park Project died when the Colorado Supreme Court upheld a water judge's ruling that there is not enough "free" water available for a large-scale export. But, because the Court hinted that some water might be available for purchase from the United States at Blue Mesa Reservoir, some still believe that Gunnison water is the answer to Front Range needs.

This Report challenges that belief. It explains what is becoming clearer by the day, that the waters of the Upper Gunnison already are fully appropriated and fully put to use within the basin. This leaves little, if any, available for use elsewhere.

The Report provides a snapshot of how the Gunnison River watershed works today. It explains how much water the major drainages create and how that water is used, both in- and out-of-stream, as it makes its way down valley to join the Colorado River at Grand Junction. It highlights the major facilities constructed by humans along the Gunnison in the past 100 years, including the oldest federally supported irrigation project in the country, the State's largest reservoir, and towns and cities that can't help but grow in the midst of such a spectacular landscape.

The Report also takes us back in time, explaining how water has shaped the basin's history and the people and places that make that history. It explains the basin's water rights, delving into an area of law steeped in tradition older than the State itself.

The Report also takes a look forward. It describes the new uses of water already on the drawing board. It offers an explanation of what new uses of water should be made and how they will affect the basin.

Inside the Report you will find the big picture as well as a detailed analysis of what is at stake in the Gunnison and why it needs protection. You'll find information that demonstrates that:

- Gunnison water supports a century-old tradition of irrigation that continues to provide a backbone to the basin's rural landscape.
- Gunnison water slakes the growing thirst of in–basin residents and over a million tourists who visit during all seasons of the year.
- Gunnison water is the lifeblood of a recreation industry—including skiers, anglers, boaters, and others—the new economic engine driving the basin.
- Gunnison water generates millions of dollars worth of hydroelectric power supplied to homes and businesses all over the southwest.
- Gunnison water is a critical component of Colorado's water delivery obligations to downstream states under the Colorado River Compact.
- Gunnison water plays an invaluable role in recovering endangered fish species and protecting the Black Canyon of the Gunnison National Park, national treasures that we must protect in their own right and for future generations to enjoy.

To take water away from any of these uses is legally questionable, and certain to harm them. It simply is not good policy for sprawling Front Range growth to count on water the Western Slope depends on for its present and future needs.

Fortunately, the Gunnison is not the only possibility for quenching Front Range thirst. Other sources of water will cost less, be less damaging to the environment, and still meet the needs of the Front Range for many decades to come. The Front Range needs to rely first on more efficient use of existing water supplies, including water conservation and creative water supply options, rather than taking water from the Gunnison. There is hope for a reasonable amount of growth along the Front Range without endangering one of Colorado's invaluable gems.

In the pages that follow, you will find:

Chapter One describes and analyzes existing water uses in the Gunnison Basin. It details the quantities and locations of stored water, as well as the economic and social implications of water use. Chapter One concludes with a description of the decade-long lawsuit over the proposed Union Park Project and the important final ruling by the State Supreme Court: that virtually all of the Gunnison Basin's water is already in use.

Chapter Two explores the argument, advanced by advocates of diverting Gunnison Basin water to the Front Range, that a significant amount of water somehow might be available as a "marketable yield" from Blue Mesa Reservoir. It closely reviews other uses of water—for irrigation, hydropower, endangered species, Black Canyon of the Gunnison, and deliveries under the Colorado River Compact—that must be factored in before a marketable yield determination can be made. The chapter concludes with an explanation of the principal legal requirements for any proposed trans-mountain diversion even if one were to assume that some small marketable yield exists.

Chapter Three explains why Colorado's Front Range future water needs can be better met without using water from the Gunnison. It estimates the enormous cost that would be involved in any trans-mountain diversion scheme. It details how the Front Range's growth in water demand can and will be met by a litany of other sources, including conservation and creative supply-side options that have worked elsewhere in the southwest and are just beginning to be investigated in Colorado. It concludes that a safe, secure water future for the Front Range does not require the trans-mountain diversion of Gunnison water.

The Gunnison: A Basin In Balance

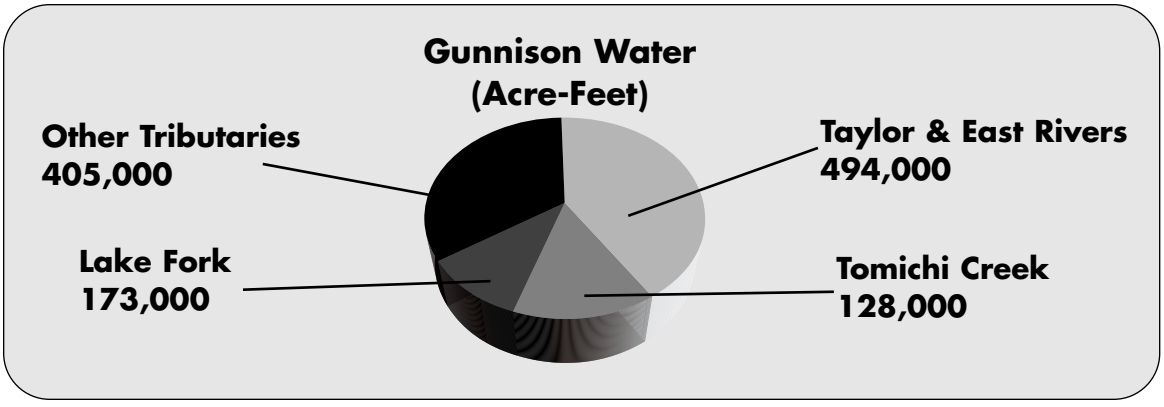
1

The Gunnison Basin, located in the central western part of the state, drains nearly one-quarter of Colorado's West Slope, running from headwaters against the continental divide to a confluence with the Colorado River near Grand Junction. The basin is cradled by some of the state's most spectacular high country, including the Grand Mesa Plateau and Elk range to the north, Sawatch Range to the east, San Juan mountains to the south, and Uncompahgre Plateau to the southwest. (See map inside of front cover of this report.)

The Gunnison Basin embodies what many people love about Colorado—a rural feel, a slower and more peaceful lifestyle and spectacular scenery. In short, it is a well-balanced ecosystem that supports a diverse agriculture—and recreation-based economy and provides irreplaceable habitat for riparian, wetland, and woodland species.

The Upper Gunnison Basin (defined here as the mainstem Gunnison and all its tributaries upstream of Cimarron, Colorado) is the source of most of the basin's water. On average, even after human-related consumption of water, the Upper Gunnison produces over 1,227,000 acre-feet (AF).[1] After the North Fork, Uncompahgre, and other tributaries join the mainstem in the lower reaches of the Basin, the Gunnison's volume totals approximately 1,800,000 AF when it meets the Colorado River at Grand Junction. The natural flow of the Gunnison—if we add back the consumptive uses of water due to human use and evaporation—is considerably higher, estimated to be over 2,378,000 AF.[2]

The Gunnison River forms at the confluence of the Taylor and East Rivers in Almont. In an average year, the heavy snowfalls in these two tributary basins contribute 494,000 AF.[3] Tomichi Creek enters the river at the City of Gunnison, adding, on average, another 128,000 AF.[4] Several dozen more miles downstream, the Lake Fork adds another 173,000 AF.[5] Other tributaries add to the Upper Basin total of just over 1.2 million AF.



1 The Gunnison: A Basin In Balance

The Gunnison River no longer flows unimpeded through the valley. A number of major structures built by the United States Bureau of Reclamation (Bureau)—the facilities of the Uncompahgre Project and the Colorado River Storage Project's Aspinall Unit—hold and divert water along its course. Hundreds of smaller storage, diversion and conveyance structures also are found on the Upper Basin's tributaries.[6] In the basin as a whole, these facilities enable an annual consumption (including human use and evaporation) of 475,000 AF.[7] This consumption equals almost 25% of what would be the River's "natural flow" of 2,378,000 AF.

A. The principal water facilities in the Upper Basin and their water rights.

Like all rivers in Colorado (and most western states), Gunnison Basin water use is governed by a system of prior appropriation, also called "first in time, first in right." In times of water shortage, water rights are satisfied in a ranking based on the date of their first use ("appropriation"), often referred to as the priority date. Older, "senior" rights are satisfied ahead of more recent, "junior" rights. Applicants for water rights may obtain a conditional water right that will "date back" to when efforts were first made to put the water to use. Conditional rights holders, however, must show continuing efforts—what courts call "due diligence"—to develop these rights in a water court proceeding every six years. [8] Through a court decree, a conditional right can mature into an absolute water right after the water is actually used.

Water rights must be applied toward a "beneficial use," defined by statute to include irrigation, hydropower, municipal use, protection of instream flows, and many other uses. Water rights are measured either as a volume, measured in acre-feet (AF), or as a rate of flow, measured in cubic feet per second (cfs). In the Gunnison basin, as elsewhere, there is a complex web of water rights that govern how water is allocated and dictate how much water might be available for new uses, either inside or outside of the Basin. In order to understand the current water uses, we examine the basin's principal projects and their associated water rights.

1. Uncompahgre Project

The Uncompahgre Project, the first major federal reclamation project constructed under the Reclamation Act of 1902,[9] is designed to impound water arising in the Upper Gunnison and deliver it to farmers and ranchers in the Uncompahgre Valley. In an average year, the project diverts between 325,000 and 365,000 AF immediately below Crystal dam, roughly 27–30% of the annual volume of water exiting the Upper Basin.

The project consists of two major facilities: the Gunnison Diversion Dam and 5.8 mile-long Gunnison Tunnel and Taylor Park Dam and Reservoir, all owned by the United States but operated by the Uncompahgre Valley Water Users Association (UVWUA).[10]

Uncompahgre Project

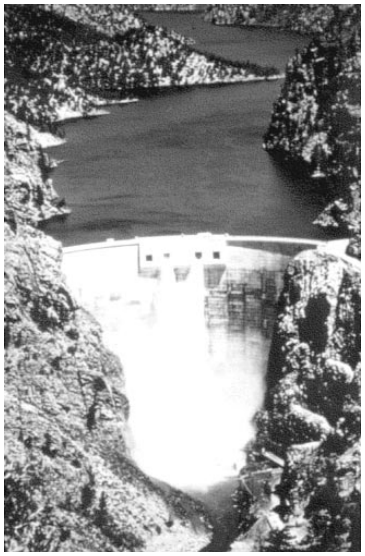
- Facilities: Gunnison Diversion Dam and Gunnison Tunnel
- Year: Completed 1909
- Location: 35 miles west of Gunnison, just below Crystal Dam
- Water Use: Average diversion 365,000 AF

- Facilities: Taylor Park Reservoir
- Year: Completed 1937
- Location: 25 miles northeast of Almont, on the Taylor River
- Water Use: Average releases 154,000 AF

The UVWUA operates these facilities to divert water into the Gunnison Tunnel for delivery to farmers and ranchers in Ouray, Delta, and Montrose counties, where it is used as a supplemental supply for irrigation of about 76,000 acres of land.[11] The UVWUA and others hold conditional water rights that, if developed, will increase the flow of water through the Tunnel. They are described in Chapter 2.

The second component of the Uncompahgre Project, Taylor Park Reservoir, was constructed by the Bureau of Reclamation on the Taylor River west of Cottonwood Pass to provide a supplemental supply of water for the Gunnison Tunnel and the UVWUA. It is now operated not only for irrigation but also for flatwater recreation and for the release of water to "enhance the fishery and recreational uses of the Taylor and Gunnison Rivers above Blue Mesa Reservoir."[12]

The initial storage water right for Taylor Park, for the reservoir's "first fill," was decreed in 1941 for 111,260 AF with a priority date of December 18, 1933, for irrigation and other purposes. In 1986, the 1904 decree was modified to eliminate non-irrigation uses, except for a minimal hydroelectric right. The average annual volume of water discharged from Taylor Park for the period from 1952 to 1988 was approximately 154,000 AF.[13] In 1990 a decree was issued in Water Division 4 to clarify the rights to the "second fill" of Taylor Park reservoir. This decree ratified practices in place under an exchange agreement with the Aspinall Unit and is described after this report's explanation of the Aspinall Unit.



Morrow Point Dam
Source: Bureau of Reclamation

2. Aspinall Unit

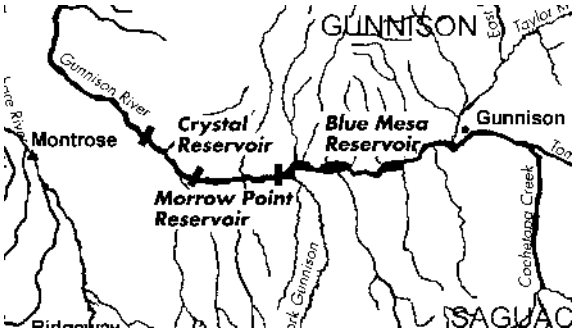
The Aspinall Unit, constructed in the 1960s and 1970s, includes three dams and their like-named reservoirs: Blue Mesa, Morrow Point, and Crystal. Together, they back up the Gunnison for forty river miles, from ten miles below the City of Gunnison all the way to the Gunnison Tunnel. These facilities provide water for, among other things, hydroelectric power, flat-water

recreation, irrigation, fish and wildlife use (both in the reservoirs and in the river downstream), and meeting Colorado River Compact requirements for providing water to downstream states.

Aspinal Unit

- Facilities: Blue Mesa Dam, Morrow Point Dam, Crystal Dam
- Year: Completed 1966, 1968, and 1976 respectively
- Location: Beginning 10 miles west of Gunnison to the Gunnison Tunnel
- Water Use: Average storage capacity of 1.2 million AF

Blue Mesa Dam is located about 30 miles west of Gunnison. Blue Mesa Reservoir, backing upriver to the east, has a maximum storage capacity of about 940,000 AF and is the largest reservoir in the state. Twelve miles further downstream is Morrow Point Dam. Morrow Point Reservoir can store roughly 120,000 AF. Six miles below are Crystal Dam and Reservoir, which re-regulate the river, smoothing out the spike flows of Blue Mesa and Morrow Point so there is a more stable release into the river below the Aspinall Unit.



Aspinall Facilities
Source: CWCB

The Aspinall Unit holds enormous water rights in the basin and governs the release of water for most of the in-stream uses described in Section B, below. It has greatly changed water management in the basin and holds the potential to better meet in-stream needs through re-operation of its storage and release schedule.

Aspinall was authorized by the Colorado River Storage Project Act ("CRSPA"), wherein Congress directed the Bureau to construct dams and storage facilities to initiate the comprehensive development of the water resources in the Upper Colorado River Basin for several purposes, including irrigation, storage, flood control, and hydropower.[14] In 1968, the Colorado River Basin Project Act amended CRSPA to establish recreation and fish and wildlife uses as primary purposes of all CRSPA reservoirs.[15]

The Colorado River Water Conservation District ("River District") obtained conditional Colorado water rights for the Aspinall Unit (priority date November 13, 1957) through water court decrees in 1960 and 1961.[16] The decrees were obtained for

the in-basin purposes of: domestic and municipal; irrigation and stockwatering; industrial; electric energy development; flood control; fish, wildlife protection and preservation; and recreation. In 1962, the River District assigned these water rights to the United States. In 1980, the United States was decreed the following absolute rights for the Aspinall Unit:

Reservoir storeage rights	**1,212,510 Acre-feet**
Blue Mesa first fill	940,755 AF
Blue Mesa refill	122,702 AF
Morrow Point	119,053 AF
Crystal	30,000 AF
Hydropower flow rights	**10,950 cubic feet per second**
Blue Mesa	2500 cfs
Morrow Point	5450 cfs
Crystal	3000 cfs

Each year the Bureau operates the Aspinall Unit—storing and releasing Gunnison water—to satisfy several purposes at the same time, thereby juggling many competing demands for a finite water supply. Typically, the Bureau draws down reservoir storage levels during the fall and winter months, and then lets them rise again with the run-off from melting snow in late spring. During the summer, it attempts to keep reservoir levels steady to maximize flat water recreation on Blue Mesa while also releasing enough water to meet the needs of downstream water users.

Throughout the year, the Bureau maximizes electrical generation by releasing water through penstocks that have hydropower turbines (rather than through by-pass tunnels or "spilling" over the top) and keeps an eye on flood control for downstream cities. More recently, it has implemented releases of water to benefit federally endangered fish in the lower Gunnison and Colorado Rivers. In the future, the Bureau will re-operate the Aspinall Unit to better meet the needs of endangered fish and Black Canyon of the Gunnison National Park.

3. Taylor Park Reservoir/Aspinall Unit Exchange

Prior to construction of the Aspinall Unit, Taylor Park Reservoir was operated as a typical irrigation storage reservoir, with heavy releases during the irrigation season and closing of the gates in fall and winter to maximize storage for the next irrigation season. Many people realized that the existence of Aspinall (primarily Blue Mesa Reservoir) presented an opportunity for Taylor Park Reservoir to be operated in a new way, to improve conditions for other water uses, without infringing upon flows at the Gunnison Tunnel for the UVWUA.

In 1975, several parties entered into an Exchange Agreement involving Taylor Park Reservoir and the Aspinall Unit.[17] The Exchange Agreement allows UVWUA's storage in Taylor Park (securing UVWUA's Gunnison Tunnel diversions) to be exchanged for storage and release from the Aspinall Unit. As a result, Taylor Park

water releases throughout the year can be evened out to provide supplemental irrigation deliveries and to optimize fishery and recreation conditions in Taylor Park Reservoir and below Taylor Park in the Taylor and Gunnison Rivers.[18]

In 1990 the Upper Gunnison River Water Conservancy District (Upper Gunnison District) was granted a right to re-fill Taylor Park Reservoir in the amount of 106,230 AF (appropriation date 1975). This right was premised on the Exchange Agreement. Water held under this right, which was conveyed to the United States in 1992, is decreed for recreational purposes while stored in the reservoir, and is to be released to enhance the fishery and recreational uses in the Taylor and Gunnison rivers above Blue Mesa Reservoir. Specific flow rates below Taylor Dam were decreed in this case to optimize fishery conditions. In addition, 19,200 AFA of the second-fill are decreed for irrigation purposes below Taylor Dam.

B. Existing Water Uses in the Upper Gunnison

Existing water use in the Upper Basin breaks cleanly into two major categories: out-of-stream uses (for irrigation and drinking water for cities) and in-stream uses (for hydropower, recreation, the environment, and meeting Compact requirements). In the Union Park litigation, described below and in Appendix 1, the courts decided that all of these uses legally qualify as beneficial uses of water.

1. Out-of-Stream Uses

Out of stream uses of Gunnison River water are nothing short of enormous. In sum:

Water Use	Average Amount (in acre feet anually)
Upper Basin Agriculture	668,000 AFA
Gunnison Tunnel	365,000 AFA
Redlands Canal	530,000 AFA
Municipal Use	14,000-17,000 AFA

a. Upper Basin Agriculture

Agriculture has been a cultural and an economic underpinning in the basin for over a century and continues to dominate the diversion and consumptive use of Gunnison water today. Irrigation accounts for 97% of the current out-of-stream water diversions in the Upper Basin[19] and requires huge water deliveries at the Gunnison Tunnel (annual average of 365,000 AF) and Redlands Canal (530,000 AFA) in the lower basin. In the Upper Basin, irrigators within the Upper Gunnison District[20] apply 668,000 AFA[21] to grow hay and irrigate pasture on over 63,000 acres of land.[22] The Upper Gunnison District reports that the market value of agricultural crops (including hay produced as well as cattle and other animals sold) was $8.4 million in 1997.[23]

Irrigated land is supported by some of the oldest water rights in the Basin. The Spann and Trampe Ranches hold the largest irrigation water rights in the East

River drainage. Both Spann and Trampe hold absolute water rights totaling in excess of 300 cfs, with priority dates going back as far as the late 19th Century; they typically divert more than 250 cfs out of the East River. The Upper Gunnison District reports a total of 6,458 cfs of decreed absolute rights for irrigation purposes within the District;[24] many of these rights date to back to the 19th Century as well.

Just counting the decreed rights, irrigators divert more water than required by the consumptive needs of hay and pasture.[25] Ranchers maintain, however, that most of the water diverted in excess of actual irrigation needs is not lost to the river system, but replenishes groundwater tables and/or rejoins the river system above Blue Mesa, likely within two to three weeks and certainly in the same year it was diverted.[26]

Construction of the Aspinall Unit had a great impact on the basin. Throughout its consideration of CRSPA, Congress recognized that construction and operation of the Aspinall Unit would inundate over forty miles of prime trout habitat and valley bottom. Many in the Upper Basin also were concerned that the magnitude of Aspinall's water rights would preclude future development premised on water rights obtained subsequent to those of the Aspinall Unit, including certain additional "participating projects" contemplated in CRSPA.

As a result of these concerns, Upper Basin interests received a commitment from the United States allowing development of reservoirs and other facilities even if Aspinall water rights left little water available for appropriation subsequent to November 13, 1957. This commitment was finally formalized in a "Subordination Agreement," also known as the "depletion allowance," in which the United States agreed to subordinate its Aspinall rights up to 60,000 AFA of depletions in the Upper Basin: 10,000 AFA between Crystal and Morrow Point dams, 10,000 AFA between Morrow Point and Blue Mesa dams and another 40,000 above Blue Mesa Dam.[27] To date, about 8,373 AF of this depletion allowance is in use, 7,126 AF of it upstream from Blue Mesa.[28]

b. Lower Basin Agriculture

An average of 365,000 AFA of water arising in the Upper Basin is delivered to the Uncompahgre Valley through the Gunnison Tunnel (absolute decree of 1175 cfs with priority date 1905). In an extremely dry year, the UVWUA could divert as much as 475,000 AFA. The portion of water diverted that is not consumptively used by crops returns to the Uncompahgre River and then rejoins the Gunnison River at Delta.

In the Lower Gunnison Basin, just upstream from Grand Junction, the Redlands Canal holds three absolute water rights for off-stream diversion: 670 cfs (priority date 1911) for irrigation and power generation, 80 cfs (priority date 1944) for irrigation, power and domestic uses, and 100 cfs (priority date 1994) for power generation. Redlands' two more senior rights can divert 750 cfs and an average of over 530,000 AFA.[29] Due to their senior priority dates, these rights can affect water use in the Upper Basin.

In the severe drought of 2002, the UVWUA placed a "call" for the Gunnison Tunnel in April. Use of the Taylor Park Reservoir refill right kept the Division Engineer from having to enforce the call until July 9th. After that time, he was forced to curtail a significant number of irrigation diversions in the Upper Basin. Also in 2002, Redlands placed a "call" on the river as early as April. Because Blue Mesa storage was projected to drop below 400,000 AF by years' end, pursuant to provisions in a 1995 Memorandum of Agreement, Redlands and other interested parties adopted a plan to share water shortages. Redlands agreed not to call for more than 600 cfs and, in return, the River District agreed to reimburse Redlands for lost power generation revenue (not to exceed $85,500).[30] These events reveal the Gunnison to be heavily utilized (even over-utilized during drought years).

c. Municipal Use

Municipal use comprises a considerably smaller, but nonetheless important use of water in this growing area of the state. The population of the entire Gunnison River Basin grew by 35% during the past decade, from 58,700 in 1990 to 79,300 in 2000.[31] The total full-time population of the Upper Basin is close to 14,000.[32] The two major population centers in the Upper Basin are the Upper East River Valley (pop. 2,300, including the towns of Crested Butte and Mount Crested Butte which can swell to as many as 10,000 people during winter and summer tourist seasons) and the City of Gunnison (pop. 5,000).

The Town of Crested Butte has a water right for 6 cfs and currently diverts 3 cfs, using roughly 1 AF per day, or 365 AFA. At "build out" it is expected to use its full diversion amount. The City of Gunnison holds three absolute rights, the largest for 64 cfs (priority date 1880). The City also holds numerous conditional water rights, including a decree for 85 cfs for municipal and irrigation purposes (1954 priority date) and four storage rights totaling 84,000 AF (1981 priority). In the entire Gunnison Basin, municipalities divert between 14,000 and 17,000 AFA.[33]

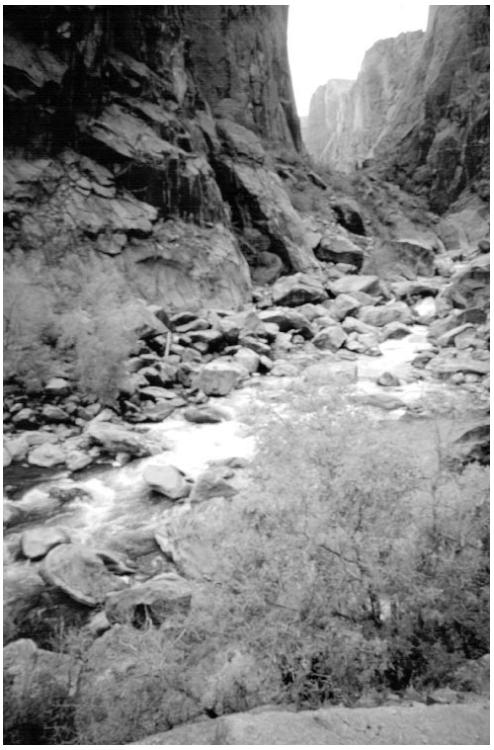
2. In-stream Uses

In addition to out-of-stream uses, there are a host of in-stream uses of Gunnison water. Unlike water rights that involve the diversion of water out of the channel, in-stream flows recognize the beneficial use of water that stays in the stream.

Some in-stream uses have been assigned water rights, and are thus entitled to a specific quantity and priority date, just like out-of-stream uses. Other in-stream uses have more tenuous protection, or none at all, due to the fact that they have not been granted a water right under state law. In-stream uses are an essential part of the region's economy and an important reason why Front Range residents visit the Gunnison Basin so frequently. Even those not legally protected must be considered as we evaluate the ethics and costs of diverting water from our West Slope neighbors.

a. Recreation and the Environment

In the Upper Basin, where tourism is the predominant industry, the Gunnison River supports a burgeoning recreation economy. Fishing, kayaking, rafting, and flat-water recreation (on Blue Mesa and Taylor Park Reservoirs) together generate tens of millions of dollars and hundreds of jobs for the local and state economies. One local expert estimates 60% of the basin's residents have jobs somehow related to tourism: "That two of the top three activities are boating and fishing tells you how important rivers are to us here."[34] Clearly, the Gunnison River and its tributaries are a treasured resource for people from all over the state and country.



The spectacular Black Canyon of the Gunnison depends on adequate stream flows to support its channel character and fisheries.
Photo by Jeff Widen

Recent figures reveal that each year rafters make 20,000 day trips and contribute $4 million to the local economy.[35] Some of the most popular streams in the entire state, Taylor River and Lottis Creek, get roughly 8,000 anglers during the summer alone.[36] The National Park Service found that in 1995, Black Canyon of the Gunnison National Park generated $12.3 million in annual revenues, $1.1 million in increased tax revenue, and 307 jobs.[37] In the same year, the Curecanti National Recreation Area, surrounding and including Blue Mesa Reservoir, generated $21 million in sales, $1.8 million in increased tax revenues, and 533 jobs. Visitors in 2001 numbered 200,000 at the Black Canyon and close to 1 million at Curecanti.[38] From an economic standpoint, the recreational values of the basin outperform agricultural contributions many times over.

Sample of Tourism and Recreation Economic Benefits

Area	Black Canyon Park	Curecanti Recreation Area
Visitors	200,000	1,000,000
Revenue	$12,300,000	$21,000,000
Sales Taxes	$1,100,000	$1,800,000
Jobs	307	533

In-stream uses, both above and below Aspinall, are supported by a variety of institutions and statutory authority. They include in-stream flow water rights, other water rights, CRSPA and other federal law, including the Endangered Species Act.

(1) In-stream Flows Above Aspinall

In-stream flows are the environmental and economic lifeblood of the Upper Basin. Some are afforded protection through water rights held by the State of Colorado and private entities. The Taylor Park Reservoir second-fill described above provides releases for fish and recreational uses below Taylor Dam.

In-stream flow rights held by the state of Colorado are administered by the Colorado Water Conservation Board (CWCB). Under state law, amended in 2002, the CWCB is allowed to hold instream flow rights to preserve or improve the natural environment.[39] According to the CWCB, as of March 2002, throughout the entire Gunnison basin the CWCB has in-stream appropriations on 195 river segments (totaling 1,219 stream miles) and on 83 natural lake levels.[40] In 2002, the CWCB proposed to add over 8 more miles of in-stream protection and a new lake level for the rare Iron Fen outside Crested Butte.[41] The CWCB also has an in-stream right for 300 cfs running through the Black Canyon, just below the Aspinall Unit.

The Upper Basin also has a number of relatively rare private in-stream flow rights. The largest of these (445 cfs) is held by the Cockrell Trustees on the Taylor River below Taylor Park. Others include private rights to 225 cfs in the Taylor River above Taylor Park (below the confluence with Illinois Creek), 90 cfs in Copper Creek, and 46 cfs in the East River.[42] Due to a change in state law in 1987, for the past 15 years the CWCB has had exclusive authority to acquire new in-stream flow rights for environmental purposes on rivers and streams in Colorado.

A state law enacted in 2002 allows for improved in-stream protection. A coalition of groups sponsored a bill that would have allowed private water rights holders to dedicate their rights in-stream. The resulting legislation, Senate Bill 156, struck a compromise by expanding the CWCB's authority to secure "appropriate" rather than "minimum" flows that "preserve or improve" the natural environment, and to acquire such rights by donation (in addition to other avenues already at the CWCB's disposal).[43]

Another form of in-stream water use is a recreational in-channel diversion (RICD). The Upper Gunnison River Water Conservancy District recently applied for a RICD for whitewater boating near the City of Gunnison. The District applied for flow rates ranging from 270 c.f.s. to 1500 c.f.s. in two-week intervals from May 1–Sept. 30. At a hearing in front of the Board of the CWCB in September 2002, Gary Lacy, designer of the whitewater course, testified that the quality of the recreational experience improves as flows increase. While the Board voted to recommend the District be decreed only 250 c.f.s. from May 1–Sept. 30, the District plans to litigate the case before the water court.

(2) Flat-water Recreation

Water from the Gunnison River also provides extensive flat-water recreation that draws hundreds of thousands of visitors each year. Blue Mesa Reservoir, the largest body of water in the state, hosts motorboats, anglers, and other recreationists,

mostly in the summer months. Curecanti National Recreation Area, which surrounds Blue Mesa, was created through a Memorandum of Agreement between the Secretary of the Interior and the Bureau of Reclamation in 1965.[44] It relies on the expansive water rights of the Aspinall Unit (including Blue Mesa's second fill) to fulfill its purposes. Taylor Park Reservoir also hosts thousands of visitors each year and relies on the significant quantities of water secured to it under decrees and agreements.

(3) Recreational and Environmental Uses Below Aspinall

The Secretary of the Interior and Bureau of Reclamation have the authority and obligation, under several federal statutes, to operate the Aspinall Unit for the benefit of fish and wildlife below the Aspinall Unit. Section 8 of CRSPA, the Act authorizing the construction of the Aspinall Unit, directed the Secretary of the Interior to operate and maintain CRSPA facilities to mitigate the loss of and improve conditions for fish and wildlife and to provide recreational facilities.[45] In 1968, the Colorado River Basin Project Act established recreation and fish and wildlife uses as primary purposes of all CRSPA reservoirs, including the Aspinall Unit.[46] In addition, the Fish and Wildlife Coordination Act requires that federal agencies consult with the Fish & Wildlife Service and local fisheries agencies to improve wildlife resources and give those resource "equal consideration" with other features of water development projects.[47]

In addition to these federal authorities, there are distinct quantities of water that already have been dedicated to preserve the river environment in the lower Gunnison. Below are brief descriptions of three environmental flows already in existence: (a) mitigation flows for the Dolores and Dallas Creek projects; (b) a minimum instream flow for Black Canyon of the Gunnison National Park; and (c) bypass flows at the Redlands diversion dam for the benefit of federally endangered fish.

(a) Mitigation flows for Dolores and Dallas Creek Projects

The Dolores and Dallas Creek Projects are storage and diversion facilities in southwestern Colorado that create water release obligations from the Aspinall Unit. The Dolores Project, located in the Dolores and San Juan River Basins, utilizes water that would otherwise contribute to the flow of the Colorado River, just across the state line in Utah. This project is comprised of McPhee Reservoir, formed by McPhee Dam and Great Cut Dike, and the Dawson Draw Reservoir, which was constructed specifically for fish and wildlife enhancement and is supplied primarily from irrigation return flows. When first proposed for construction, the Dolores Project was expected to deplete an average of 131,000 AFA. The Dallas Creek Project, named for its location along Dallas Creek, a tributary of the Uncompahgre River, is comprised of Ridgeway Dam and Reservoir. When this Project was conceived, it was expected to result in additional annual depletions of 17,000 AFA.

In the 1979 and 1980 Biological Opinions on these proposed projects, the FWS concluded that the cumulative effects of this proposed depletion of 148,000 AFA, along with the cumulative impact from related CRSPA projects, "is likely to jeopardize the continued existence of the Colorado squawfish [now called the pike minnow],

bonytail chub, and humpback chub."[48] FWS therefore imposed, as reasonable and prudent alternatives to compensate for loss of water from the river system, that a volume equal to the Dolores and Dallas Creek projects' depletions must be released to the Gunnison.[49]

While these Biological Opinions did not expressly note the source of water supply for the compensation, the only clear source is the Aspinall Unit. When the Bureau was going through consultation with the FWS over a sizing and power modification study on Crystal Dam, FWS wrote: "By proceeding with construction of the Dallas Creek and Dolores projects, FWS assumes that [the Bureau] has adopted the reasonable and prudent alternatives"[50]—i.e., the proposal to release an equal amount of water from the Gunnison.

In his opinion in Union Park I, Judge Brown acknowledged the responsibility of the Aspinall Unit to mitigate for these depletions by releasing up to 148,000 AFA from the Aspinall Unit each year.[51] He also found that this amount is to be in addition to the amount of water (assumed at the time to be 300 cfs) to be passed through Aspinall for the benefit of the Black Canyon.[52]

(b) Minimum flows in the Black Canyon of the Gunnison

The Aspinall Unit also releases minimum stream flows for Black Canyon of the Gunnison National Park, located immediately below the Aspinall Unit. The Park currently has minimum flows of at least 300 cfs year-round.[53] This in-stream right was gifted to The Nature Conservancy, who then donated it to the CWCB.[54] Due to the drought of 2002 the Bureau of Reclamation dropped flows in the Black Canyon to 250 cfs beginning in mid-October.

In 1978, the United States was granted a conditional water right to satisfy the purposes of the Black Canyon. In January 2001, the United States filed to quantify and make absolute this federal reserved right. Negotiations surrounding this filing may result in re-operation of the Aspinall Unit to provide an instream right with seasonal fluctuations much more like the river's natural hydrograph. Chapter 2 includes a more detailed discussion of this federal reserved right.

(c) Bypass flows at Redlands for Endangered Fish

Aspinall storage also facilitates stream flows critical to the recovery of endangered fish species in the lower Gunnison, hastening the time in which these species may be taken off the endangered species list and their populations restored. Pursuant to USFWS biological opinions and the Upper Colorado River Fish Recovery Program, explained in greater detail in Chapter 2, the Bureau is required to meet the needs of these species. This commitment, while not firmly quantified in the Gunnison except for the flows below the Redlands fish ladder, comes before meeting other water demands. As Chapter 2 explains, ESA requirements are outside of the prior appropriation system and can curtail other water uses if needed to avoid jeopardizing the existence of species.

The Bureau has agreed to release sufficient water to maintain a 300 cfs minimum in-stream flow from July through October between the Redlands diversion and the confluence of the Gunnison River with the Colorado River.[55] This minimum flow was deemed necessary to make the fish ladder functional. These flows appear to be getting results. Many pike minnow have used the ladder since its construction and several razorback suckers, recently re-introduced into the river above the ladder, made it over the dam, into the lower Gunnison River, and back up the ladder in 2001.[56]

Severe drought conditions in 2002 led to a failure to meet these target flow levels. As part of an agreement to share water shortages,[57] the minimum flows were:

June	200 cfs
July	250 cfs
August	250 cfs
September	100 cfs
October	0 cfs

It is unclear what impact these shortages (and a continued drought) will have on species' recovery. In any event, the underlying agreements permitting the sharing of shortages expires in 2005.

3. Hydropower

The dams of the Aspinall Unit generate significant hydroelectricity:[58]

Blue Mesa	96 megawatts
Morrow Point	165 megawatts
Crystal Dam	28 megawatts

The Aspinall Unit's net generation for fiscal year 2000 was 819 GigaWatt-hours (GWh).[59] Sales of this power generated over $15 million.[60] Replacement power—the true measure of the "worth" of Aspinall generation—could cost considerably more than $15 million, especially during an energy crunch. Moreover, we note that the $15 million does not include the additional value Gunnison water has as a major component of the flow of the Colorado River, where it generates additional hydropower at other federal dams downstream.

Since CRSPA was passed in 1956, the Colorado Supreme Court has interpreted provisions of the statute in at least two important ways. First, although CRSPA states hydropower is an "incident" of satisfying other project purposes, at the Aspinall Unit, hydropower generation has been identified as a "primary" purpose because of its important contribution to the economic feasibility of the Unit.[61] Second, while CRSPA states that hydroelectric power at Aspinall is subordinate to "domestic and irrigation uses," the Supreme Court has confirmed a Water Judge's ruling that this subordination applies only on an inter-state basis, so that hydropower uses of

Aspinall are not subordinate to domestic and irrigation uses inside Colorado.[62] As a result of these rulings, the Aspinall Unit can "call out" (forcing a stop of use by) junior water rights in Colorado to protect its hydropower uses. In times of drought, when flows are lower, this protection may mean that less water is available for newer uses, such as proposed diversions to the Front Range.

4. Colorado River Compact Deliveries

Perhaps the most important purpose of the Aspinall Unit is to store water that can be released to help meet delivery requirements to the Lower Basin without infringing upon consumptive uses in the Upper Basin.

The southwestern states share the Colorado River. Through the 1922 Colorado River Compact, the Upper Basin States (Colorado, New Mexico, Wyoming, and Utah) agreed to provide the Lower Basin States (Arizona, Nevada, and California) an annual average delivery of 7,500,000 AF plus half of the 1.5 MAF owed by treaty to Mexico.[63] This requirement exists regardless of flow conditions at Lee Ferry, the dividing point between the Upper and Lower basins.

A 1948 Compact between the Upper Basin states allocates whatever water is left over after required deliveries to the Lower Basin for use each year by the Upper Basin, giving Colorado 51.75%, New Mexico 11.25%, Utah 23%, and Wyoming 14%.[64]

Through storing water in the Aspinall Unit, Colorado is able to put its Compact entitlement to beneficial use and to make its delivery obligations to downstream states. There has not yet been a "compact call" by downstream states. However, storage for compact deliveries constitutes an existing, albeit "standby," use of water from the Gunnison that will certainly become even more important as Colorado approaches full beneficial use of its Compact entitlement in the Gunnison or elsewhere in the state. The current drought increases the importance of this use, indeed calls into question whether Colorado has much water remaining un-used from its apportionment. Chapter 2 contains a more detailed discussion of this issue.

5. Water Quality

Colorado law does not yet recognize the benefit of keeping water in-stream solely for the purpose of diluting pollutants. Whatever the law, water kept in the stream is useful for this purpose. The Lower Gunnison Basin is on the state's 303(d) list for selenium, a toxic pollutant, partly as a result of return flows from irrigation in the Uncompahgre Valley. Clean water flowing from the Upper Basin is instrumental in diluting the effects of selenium pollution.

C. Outcome of the Union Park Litigation

A single lawsuit—over the proposed Union Park project—provides much of the "law of the river" in the Gunnison. In 1986, the Natural Energy Resources Company (NECO) filed an application for water rights in Water Division 4 in Montrose to construct and operate the Union Park Project.[65] This was the opening

salvo in a bitter and tortuous struggle for control of a significant share of the waters arising in the Upper Gunnison Basin.

The Board of County Commissioners for Arapahoe County later acquired NECO's interests and, in 1988, filed an amended application for water rights for the project. Judge Robert Brown in Water Division 4 later denied this application in 1991, after a six-week trial. Arapahoe County appealed to the Colorado Supreme Court and won a reversal. A second trial was held in water court and again Arapahoe County's application was denied. Arapahoe appealed again, but this time the trial court's denial was sustained.

Arapahoe was seeking to store about 900,000 AF in Union Park Reservoir for transport to the Front Range by means of a pipeline capable of carrying over 300,000 AFA. West Slope interests saw the obvious threat of such a massive export of water from its basin of origin: a dramatic change in the current way-of-life and limits on the basin's future. This threat united basin groups with often disparate interests—irrigators; cities; fishing, rafting and other tourist industries; the United States; the Upper Gunnison District and River District; and conservationists—to mount a coordinated defense of the Upper Gunnison basin.

The big question in this decade-long litigation was whether there was sufficient unappropriated water available in the Upper Gunnison to support Arapahoe's application. The answer given by the Colorado Supreme Court was a resounding "no." A detailed account of this serpentine litigation can be found in Appendix 1, the Saga of Union Park. Here, we summarize the key findings of fact and conclusions of law that are now the law of the Gunnison River and of the state of Colorado.

In short, the Union Park litigation established that:

1. Notwithstanding that as much as 1,800,000 AFA leaves the basin annually, there is less than 15,000 AFA of unappropriated water available in the Upper Basin at the points of diversion for which Arapahoe County had applied. This is far less than needed to support even a small trans-mountain project.
2. The Bureau is entitled to use the full decreed rights it holds under state law for the Aspinall Unit, including for fish and wildlife, recreation, and hydropower. The Bureau puts all of the water that it is entitled to use under its state decrees to beneficial uses.
3. The Bureau does not release water from the Aspinall Unit for any single purpose, but for the multiple purposes authorized in CRSPA and by the Unit's water rights. To do so is a lawful use of the Bureau's state decrees.
4. With the exception of water available under the 60,000 AFA subordination for in-basin use only, Gunnison water is unavailable to other users with more junior priorities.
5. The UVWUA's water rights for the Gunnison Tunnel do not have to be satisfied by releases from Aspinall Unit storage. This means that the

Gunnison Tunnel's rights may call out any rights junior to it, including those of the Aspinall Unit, when natural flows in the river fall below the UVWUA's direct flow rights.

6. The biological opinions for the Dallas Creek and Dolores projects commit up to 148,000 AFA from the Aspinall Unit to help recover endangered fish populations. This water is separate from and in addition to the 300 cfs assumed in this case to be committed to the Black Canyon reserved right.
7. Federal approval is required before relying on the use of Taylor Park Reservoir as a forebay to serve hydroelectric pumping facilities, as Arapahoe had proposed.
8. Both the first- and second-fill decrees for water stored in Taylor Park, including the conditions for release designed to optimize fish conditions below Taylor Park, are entitled to full recognition when determining water available for appropriation above Taylor Park.
9. The private instream flow rights in the Basin must be factored into the computation of water availability.

These findings and conclusions are binding on all parties, whether or not they participated in the Union Park litigation. They establish conclusively that there is insufficient unappropriated water available from the Upper Gunnison to support even a small trans-basin export of water to the Front Range.

D. Conclusion

The Upper Gunnison is a basin in balance between traditional and economically productive irrigation and other uses, including the production of hydroelectricity, recreation, the environment, and enabling Colorado to use its share of Colorado River water while standing ready to meet downstream compact calls. In short, existing, legally exercised water rights make use of virtually all of the water that arises in the Basin.

Yet some still look to the Gunnison for water to meet the growth and sprawl on Colorado's Front Range. They do so because of a concept called "marketable yield." Marketable yield refers to water stored in Blue Mesa Reservoir already put to use to meet the purposes of the Aspinall Unit, water that some believe may be available for purchase from the United States. In the next chapter, we show why the concept of Blue Mesa's marketable yield as a source of water for Colorado's Front Range is an illusion.

Moving Blue Mesa's Marketable Yield to the Front Range: A Myth

2

The Upper Basin's water has long been eyed for its transmountain diversion potential.[66] Most of these projects were proposed during the 1940s and 1950s—the heyday of huge federal water projects—near a time when Floyd Dominy (an outspoken advocate of large dams subsidized by the federal government) ran the Bureau and the "Iron Triangle" (comprised of the Bureau, members of Congress, and local project sponsors) was at the height of its influence. Anything seemed possible, whether or not economically or ecologically justified, because federal tax revenues would pay for it. These proposals ultimately foundered because of their huge cost and absence of economic need and also because Congress decided to build the Curecanti Unit (later renamed the Aspinall Unit) as part of the Colorado River Storage Project.

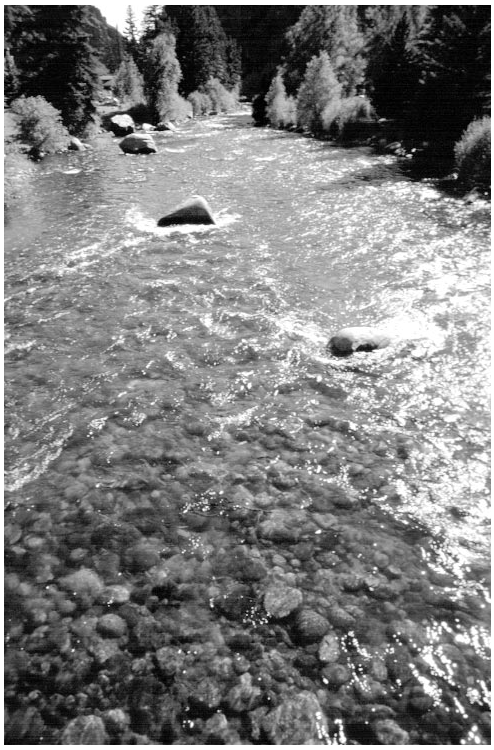
By the mid-1980s, only two proposals remained: the Collegiate Range Aurora Project and the Union Park Project. Both have been put to rest: the water rights application for the Aurora Project was dismissed by Water Judge Brown in 1991[67] and Judge Brown's dismissal of the Union Park application was upheld by the Colorado Supreme Court in November 2000.[68] The Union Park case made it clear there is insufficient unappropriated water in the Upper Gunnison Basin to support a transmountain diversion.

But is there enough "surplus" appropriated water available for sale? Some contend there is, that 240,000 AFA of water, or even more, is available out of a "marketable yield" from the Aspinall Unit.[69] Our close review of the question reveals that, due to legal, political, and other reasons, it is unrealistic for Colorado's Front Range to rely on a "marketable yield."

All water arising in the basin already is being put to full beneficial use, as Chapter 1 describes. Exporting this water from the basin would compromise these uses, especially in a prolonged drought. Exporting water from the Gunnison from the alleged "marketable yield" is likely unlawful under-water right decrees for the Aspinall Unit, which contemplated that water stored by the Aspinall Unit would be used in-basin only. Gunnison water must meet environmental purposes required by law, uses that would be infringed upon by an export of water to the Front Range. In a prolonged drought, our State's delivery obligations under the Colorado River Compact will leave little or no water on which to rely, rendering the economics and financing of an export of marketable yield extremely problematical. In addition, a water export to the Front Range would face daunting procedural hurdles under federal and local law. The common thread underlying all these issues: exporting Gunnison water leaves no return flows in the basin. In contrast, new in-basin uses leave much or all of the water in the basin to support additional, downstream uses.

2 Moving Blue Mesa's Marketable Yield: A Myth

Fortunately, as Chapter 3 shows, there is a wide array of less-expensive and more practical alternatives available to Front Range water providers that obviate the need to tap into the basin's so-called "marketable yield." Even if export of water from the marketable yield were lawful, the existence of these alternatives makes it poor public policy for the Front Range to let its uncontrolled and water-wasteful growth injure the existing and future uses of water in the Gunnison basin.



The Gunnison River: enriching the Basin environment and its communities
--photo by Jeff Widen

A. Origin of Marketable Yield

The concept of "marketable yield" first appeared (at least in public) in the 1991 trial court proceedings in Union Park I. Ron Johnston, from the Bureau's Grand Junction office, testified that the United States could sell water out of Aspinall from within its storage rights in Blue Mesa Reservoir, an amount that he estimated to be 240,000 AF. Although Mr. Johnston sometimes described the 240,000 AF as a "firm yield"[70] (i.e., a dependable supply of water every year), he also indicated that marketable yield easily could be reduced to zero due to Colorado's delivery obligations under the Colorado River Compact.[71] Mr. Johnston also could have added that Aspinall has obligations to release water for the recovery of endangered fish, satisfying water rights for the Black Canyon, and other project purposes. Elsewhere in his testimony, Mr. Johnston offered a useful definition for marketable yield—water left over in the Aspinall Unit after all other project purposes have been met.[72]

B. Award and Assignment of Decrees for the Aspinall Unit

The water rights decrees for the Aspinall Unit—when first awarded to the River District and when later assigned by the River District to the United States—reveal an intent that water developed by the Aspinall Unit stay inside the Gunnison basin to meet the Basin's needs.

CRSPA makes no statement about Aspinall's marketable yield; it neither requires nor prohibits the use of water impounded by Aspinall for trans-mountain diversion. Because state water law applies to the issue of marketable yield [73] (with the exception of pre-emptive federal environmental statutes discussed below) we must look to the decrees the United States holds for the Aspinall Unit to establish the legal limits for use of water impounded in the Aspinall Unit.

The River District obtained water rights for the Aspinall Unit through water rights decrees issued on: (1) March 30, 1960[74]; (2) January 27, 1961[75]; and (3)

December 15, 1961.[76] These water rights are to serve multiple purposes, including domestic and municipal, irrigation and stock watering, industrial, hydropower development, flood control, fish and wildlife protection, and recreation.

In Union Park II, the Water Court for Division 4, in the context of determining whether the 60,000 AFA subordination was available to Arapahoe County, addressed the place of use of water developed by the Aspinall Unit as follows:

> It is clear from reading the decrees for the Curecanti [Aspinall] Unit and the Upper Gunnison Basin Project, that the findings contemplated uses and development of water within the Upper Gunnison Basin, and no mention is made in any of the decrees of any intention to develop water resources for trans-basin diversion.[77]

As established in the Union Park litigation, virtually all of the water impounded by the Aspinall Unit already is in use. Thus, any diversion of water to the Front Range, without return flows, will of necessity hurt in-basin interests and would be inconsistent with the decrees for the Aspinall Unit.

On January 26, 1962, the River District transferred to the United States all the Aspinall Project water rights it had acquired under the above decrees. This put the U.S. in the same position, with the same rights and obligations that were vested in the District by the decrees, which were to meet purposes within the basin. Moreover, the assignment states as follows :

> This assignment is made by the District and accepted by the United States upon the condition that the water rights assigned will be utilized for the development and operation of the Curecanti [Aspinall] Unit in a manner consistent with the development of water resources for beneficial use in the natural basin of the Gunnison River.[78]

The decrees and assignment create a legal presumption that use of water impounded by the Aspinall Unit is restricted to the Gunnison Basin.

C. Marketable Yield and the Union Park Opinions

In the Union Park I litigation Judge Brown found that the marketable pool was to be put to use inside the Gunnison basin:

> CRSPA accomplishes its purpose of "storing water for beneficial use" by having developed a marketable yield that is available for sale within the upper basin for irrigation, domestic, municipal or industrial use or for release to the lower basin for beneficial consumptive use within that basin.[79]

In Union Park II, the Judge initially stated: "The Court finds that the BUREC has a marketable yield of 240,000 acre-feet of stored water for sale to water users throughout the state."[80]

2 Moving Blue Mesa's Marketable Yield: A Myth

Several parties to the case argued that the finding in Union Park II was unjustified. The River District, the Upper Gunnison District, and others submitted post-trial legal motions to Judge Brown to amend this "finding." They noted that, during the trial in Union Park II, although one witness mentioned the existence of a "marketable pool," he did not expressly quantify the pool.[81] The River District and the Upper Gunnison District reminded the Court that the concept originated in testimony by J. Ronald Johnston in the first Union Park trial. They went on to argue that any quantification of the pool is "subject to change or even elimination based upon a variety of factors."[82] Another party argued that the evidence at trial as to where the marketable yield might be used was conflicting and, in any event, this had not been an issue in the case.[83]

Judge Brown was persuaded that his earlier "finding" had gone too far. In a post-trial order, he specifically rescinded his earlier finding as to the marketable yield:

> After studying the foregoing concerns expressed by the parties, the Court does not withdraw its basic finding that the BUREC has a separate "marketable pool" of water available for sale to water users beyond the water which is available through the BUREC's subordination policy. However, the Court acknowledges that specifics with respect to the quantity of the marketable pool and conditions which the BUREC may be entitled to impose with respect to the sale of said water to any particular water user are dicta which the Court used to amplify its analysis. Therefore the Court does not consider its findings and conclusions in this regard to be preclusive in any subsequent litigation between the parties.[84]

Judge Brown's opinion in the second Union Park trial was appealed to the Colorado Supreme Court. Although marketable yield was not among the six specific issues on appeal in the case, the Court spent some time discussing it. While it appears to have concluded that a marketable yield exists, it made no findings of fact, conclusions of law or holdings on marketable yield itself or its magnitude. Instead, it depended on the Water Court's non-existent "factual finding" that there was a marketable yield of 240,000 AF as well as on representations of counsel for the U.S. that a marketable yield exists. The context for the discussion was the Court's rejection of Arapahoe's claim that it could appropriate water, without paying for it, out of Aspinall's water rights.

The Court first set out a definition:

> The marketable pool represents water that could be available for beneficial use by other water users. The original decrees adjudicate the full amount of water to the United States for a number of decreed purposes, and BUREC has been using the full amount for those decreed purposes since the issuance of the decrees.[85]

This definition deflates any notion that the pool "shall" be available; instead, it is more akin to what Mr. Johnston noted in his testimony in the first Union Park trial (i.e., that the marketable pool "could" be available for other water users if the water in the pool is not otherwise in use to meet other Aspinall purposes).

The Supreme Court's reliance on a "factual finding" by Judge Brown that Aspinall's marketable pool consisted of 240,000 AF[86] is simply inaccurate in light of Judge Brown's post-trial order. There is no such finding anywhere in the record of the Union Park proceedings.

As to the Court's reliance on representations of counsel for the United States, the Court's opinion quoted the federal attorneys as follows:

> The marketable yield pool is water that is currently being used for hydropower. In the future, they can sell it off and use it for other purposes. It could be diverted over the hill. It could be diverted upstream and it wouldn't affect the economic feasibility of the unit. [and]
>
> If [the 240,000 acre-foot marketable pool] was to be used for the other uses . . . [BUREC] would have to make elections and change the way the uses are allocated—after the NEPA process and all other environmental laws were complied with—and would most likely [mean] that the hydropower waters would be lessened. The marketable yield is a pool sitting there for use by anybody in Colorado, [including] trans-basin diversion.[87]

Notably, counsel for the United States avoided altogether a discussion of whether Aspinall's decrees permit trans-basin diversions, an issue that was not briefed to the Court. As indicated, we find these decrees limit the use of Aspinall Unit water to the Gunnison. Counsel for the United States did note that federal environmental laws would condition the size of any marketable yield. And he noted that other beneficial uses would be adversely affected if water were "diverted over the hill."

The Supreme Court's statements about the marketable yield are mere legal dicta, not binding precedent. Dicta are statements by a court "which do not embody the resolution or determination of the court and made without argument, or full consideration of the point, [and] are not the professed deliberate determinations of the judge."[88]

The Supreme Court did not ask for or hear full argument on the quantity of any marketable yield because the issue was not one of the issues on appeal from the second Union Park trial. The quantification did not receive the deliberate determination of the Supreme Court. Notably, when the same issue was given close consideration by Judge Brown, he expressly refused to quantify it due to a lack of information. The Supreme Court, however, failed to note the existence of Judge Brown's post-trial order and the subtle examination of the issue in testimony in the first Union Park case. Because the issues of the quantity and the place of use of any marketable yield clearly was not before the court, pronouncements on the issue are dicta.

By comparison to the misconception over quantity, the definition of marketable yield from the Union Park litigation remains useful: it is water that is left over after all other purposes of the Aspinall Unit have been met. In other words, the many purposes of the Aspinall Unit, explained previously, should be satisfied first before any marketable yield can be quantified. As the River District noted in an August 2001 letter to Secretary Gale Norton: "The amount of water available [as marketable yield] after meeting these commitments, other priorities, and the Park needs, cannot yet be determined."[89] The following sections discuss "these commitments and other priorities" beyond the existing uses that were discussed in Chapter 1.

D. Future Uses of Water Released from the Aspinall Unit

Chapter 1 explains that virtually all of the water arising in the Upper Basin is already being beneficially used under valid water rights. In this section we describe the many additional uses which Gunnison Basin water will be asked to meet, including conditional water rights. After these uses are met, it is inconceivable that there would be enough water to support an economic and financially feasible trans-mountain diversion from the Gunnison, even if Aspinall Unit decrees allowed water impounded by Aspinall to be exported to the Front Range.

1. Major Conditional Water Rights and Their Relationship to the Aspinall Unit

The priority of the marketable yield, for uses of water that are consistent with the Aspinall decrees, is the same as that of the Aspinall Unit—November 13, 1957. Thus, any water that could be put to use under conditional water rights senior to Aspinall's rights will reduce the amount available as marketable yield as long as it is used before the marketable yield water is used. This is true even if the water is not presently in use. Even conditional water rights with a priority equal to that of Aspinall may cut into the magnitude of the marketable yield because it will be up to the United States whether to meet these rights before making water available to the marketable yield.

Major Conditional Rights Prior or Equal to the Aspinall Unit's Priority Date				
Holder	**Flow (cfs)**	**Storeage (AFA)**	**Date**	**Use**
UVWUA	125		1901	Irrigation
United States	Yet to be quantified		1933	Black Canyon of the Gunnison National Park
Tri-State: Tri-County Hydro Project	6000	73,000	1980; 1948	Hydroelectric and other
Upper Gunnison District	1562	88,083	1957	Various

Several conditional rights have a priority date preceding or equal to the Aspinall Unit. The UVWUA holds a conditional decree for 125 cfs (priority date 1905) for additional agricultural diversions at the Gunnison Tunnel. If tunnel capacity is expanded and water is put to use, the UVWUA's absolute right will total 1300 cfs, senior to the Aspinall Unit.

The United States has been decreed a conditional water right to satisfy the purposes of the Black Canyon National Park (first designated as a National Monument in 1933). In 2001, the United States filed in water court to quantify that right. The filing and the ongoing negotiations surrounding it are described in greater detail below.

Tri-State Electric Generation and Transmission Inc., the company that generates and transmits power to rural electric co-operatives in Colorado and several other states, holds conditional water rights for the Tri-County Hydro Project.[90] These rights consist of a storage right for a reservoir of about 73,000 AF, with a priority date of 1948, and two direct flow rights totaling about 6,000 cfs, with a priority date of 1980. Six thousand cfs is equivalent to 4,344,000 AFA, an amount of water many times greater than the total amount that flows into Blue Mesa Reservoir in an average year.

The Upper Gunnison River Water Conservancy District has large conditional direct flow and storage rights as part of the Upper Gunnison Project. In the most recent diligence proceeding in 1999, the Upper Gunnison District applied for diligence on 14 conditional rights with a combined direct flow equal to 1,562 cfs and storage rights of 88,083 AF.[91] These conditional rights are for a broad range of purposes, including domestic and municipal use, irrigation and stock watering, industrial, development of electrical energy, flood control, and piscatorial, wildlife protection and preservation, and recreation.[92]

There are other large conditional water rights in the basin, but their priority dates fall after those of the Aspinall Unit.[93]

2. Endangered Species Requirements

The Endangered Species Act (ESA) is comprehensive federal legislation to protect and recover threatened and endangered plant and animal species. Among its many and powerful provisions is the requirement that agencies consult with the U.S. Fish & Wildlife Service over the potential impact of certain proposed federal actions.[94]

The consultation requirement, together with other provisions of the ESA, is the basis for the required releases from Aspinall to make up for depletions resulting from the Dallas Creek and Dolores Projects described in Chapter 1, as well as for the bypass flows below Redlands Dam. However, these releases constitute only a fraction of the releases that are likely to be required as a result of consultation already underway as part of the FWS's Endangered Fish Recovery Implementation Program (Recovery Program or RIP). In addition, the consultation that would be required for any proposed transport of marketable yield to the Front Range will further affect marketable yield.

2 Moving Blue Mesa's Marketable Yield: A Myth

The Aspinall Unit is a crucial element of the Recovery Program, a multi-agency partnership created in 1988 to recover four federally endangered fishes in the Upper Colorado River (the pikeminnow, razorback sucker, humpback chub, and bonytail chub), while still allowing some water development to continue. Resulting from a consultation with the FWS, the Recovery Program was created to achieve naturally self-sustaining endangered fish populations and to protect habitat on which they depend. Meeting these goals will result in removal of the four species from the endangered species list.[95]

This endangered pikeminnow depends on Gunnison Basin Water to survive
Source: U.S. Fish & Wildlife Service

The Recovery Program consists of two principal parts. The first part, consisting of the Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement (Section 7 Agreement), was developed to clarify how consultations pursuant to Section 7 of the ESA will be conducted in reference to water depletion impacts in the Upper Colorado River Basin. The second part, the Recovery Implementation Program Recovery Action Plan (RIPRAP), developed to support the Section 7 Agreement, identifies specific actions and timeframes necessary to recover the endangered fishes in the Upper Basin. The RIPRAP will measure progress and accomplishments. FWS will determine whether the Recovery Program's progress provides a reasonable and prudent alternative to avoid jeopardizing the existence of the endangered fishes.[96]

A key piece of the RIPRAP involves flows in the Gunnison River below Aspinall. The Gunnison River is currently occupied by Colorado pikeminnows and is historical habitat for the razorback sucker and bonytail chub. Unrestricted migration for these fish has been limited by the 10-foot high Redlands diversion dam, two miles above the mouth of the Gunnison. Several larval pikeminnows have been collected in the reach of the river just downstream from the Redlands diversion. Recovery activities outlined for the Gunnison River have been focused on operating and evaluating a fish ladder constructed at the Redlands diversion dam in 1996, re-operating the Aspinall Unit to improve flow and habitat conditions in the Gunnison, and restoring flooded bottomland habitats near Delta, Colorado.

The Aspinall Unit may soon release additional water under another element of the Recovery Program, the "Flow Recommendations to Benefit Endangered Fishes in the Colorado and Gunnison Rivers" (also called the "Synthesis Report"). The report, which has been out in draft form since January 2000, calls for moving back toward operating the river in a way that more closely mimics the natural hydrograph, or flow

pattern, of the Gunnison, including spring peak flows and winter-time base flows. This natural flow system will benefit all life phases of these fish and their habitat and have related benefits to other fish and wildlife species.

The recommended flows are tied to six different "types" of water years in the basin: dry, moderately dry, average dry, average wet, moderately wet, and wet. Meeting these flows will require a new way of operating the Aspinall Unit. The Bureau awaits the outcome of the USFWS flow recommendations to begin an Environmental Impact Statement ("EIS") to analyze re-operation of the Aspinall Unit to meet the flows. The timeframe for completing this process is uncertain.

In a related effort, beginning in 2000, the FWS and many other stakeholders in the basin began the process of Section 7 consultation for all existing and potential future water development projects under the umbrella of a Programmatic Biological Opinion ("PBO"). This PBO, another part of the larger Recovery Program for endangered fish, is designed to recover the four endangered fishes in the Upper Colorado River basin while providing ESA compliance for existing and some future water depletions in the Upper Colorado basin. Though it will be a daunting task, water users hope to wrap a large number of water development projects into a single "consultation" package, thereby streamlining the approval process for any single development. Similar efforts have been launched on the Upper Colorado River and South Platte. PBO efforts in the Gunnison, however, were postponed in June 2001, due to the fact that much uncertainty surrounds the expected re-operation of the Aspinall Unit to meet the water rights for the Black Canyon of the Gunnison and the Recommended Flows for Endangered Fish. The PBO process will resume when these other processes are further along.

A trans-mountain diversion would constitute a new depletion of significant magnitude. Certainly in the absence of a PBO, and perhaps even with an approved PBO, a proposal of this magnitude would require individual consultation with FWS and an additional Biological Opinion, perhaps similar to the ones for the Dallas Creek and Dolores Projects. This is because, after the 2000 Union Park II decision, any proposed trans-mountain diversion would need a contract with the Bureau to use water stored in Blue Mesa Reservoir. Such a contract from the Bureau qualifies as a federal action, thus triggering ESA's Section 7 consultation.

The above commitments related to federally endangered fish currently require releases and soon may require additional releases from the Aspinall Unit. Before we can assess the quantity of any marketable yield, these release obligations must be satisfied. To meet future endangered fish needs, the Aspinall Unit will be re-operated from the current status quo. This re-operation will include releases of water beyond the capacity of hydroelectric turbines and may alter the standard "summer high, winter low" storage paradigm. The result of the re-operation scenarios currently being considered will dip further into any existing marketable yield.

3. Water Rights for the Black Canyon of the Gunnison

The Black Canyon of the Gunnison (see map located on inside cover) has substantial water rights in the basin dating to 1933, the year the United States reserved it as part of the National Park system. Though the specific quantity and timing of these rights has yet to be finalized by the Water Court, the Gunnison River system may be re-operated so that the Black Canyon will again receive its legal entitlement to some of the spring peak flows and winter base flows that created it and that will keep it healthy for future generations.

The Black Canyon and the Gunnison Gorge (immediately downstream from the Canyon) were carved by the forces of the Gunnison River over millions of years. Unobstructed by any human-made features, in average and above-average years, the river received spring peak flows—torrents that in wetter years were as great as 20,000 cfs or more. These spring peaks cleared out woody debris and carried sediment, gravel, and large boulders down-canyon. This natural hydrograph developed a canyon environment every bit as dramatic as the Grand Canyon. Though only half as deep, the Black Canyon is many times narrower from rim to rim, an impressive gash of dark purple rock in a landscape of spare piñon and juniper forest.

As a result of these natural processes over the millennia, the Black Canyon is home to a host of plants and animals, including bighorn sheep, deer, river otters, beaver, eagles, peregrine falcons, and several species of waterfowl. Listed as "gold medal waters" by the Colorado Division of Wildlife, the canyon is thought by many to be the best trout fishery in the state. It has tremendous cliffs, banks, beaches, and other wilderness features.

The Black Canyon is a boon for human uses, too. Hundreds of thousands of people visit the area each year to sightsee, hike, camp, rock climb, kayak, raft, and fish. Visitors bring their pocketbooks, with undeniable economic benefit to the surrounding communities. According to National Park Service records, in 1995 the Black Canyon generated $12.3 million in sales, $1.1 million in tax revenue, and 307 new jobs.[97] In short, the Black Canyon is a spectacular national treasure deserving of the water it needs to carry it into the next century.

But the past century has brought increasing consumptive use of water upstream of the Canyon. And, since the mid-1960s, the Aspinall Unit has moderated flows substantially, cutting off the top of spring peak flows (to the point where the Gunnison River no longer transports significant quantities of sediment) and increasing winter flows to roughly twice their natural levels.

These modifications in the natural hydrograph result from the Aspinall Unit release schedule, which maximizes hydropower generation at the expense of biological function. Blue Mesa and Morrow Point are "peaking facilities," and maximize releases during periods when power is in greatest demand and has the highest value. Crystal Reservoir's re-regulating releases tend to even out the flows; nonetheless, current operations of the Aspinall Unit create a huge irregularity in the River's heartbeat.

Efforts to secure federal reserved water rights and restore the Black Canyon have been in progress for several decades.[98] In 1972, as part of a basin-wide adjudication, the Park Service applied for a federally reserved water right for the Black Canyon. In 1978, the water court granted the Black Canyon a conditional water right. The court determined the purposes behind reserving the Black Canyon's water right were to protect fish and wildlife resources and to preserve the Canyon's scenic, aesthetic, natural, and historic attributes. The water court issued a conditional decree granting the United States conditional water rights for the maintenance of minimum stream flows in the Gunnison River necessary to fulfill those purposes. The conditional decree instructed the Park Service to return to court to quantify its reserved right, making its conditional right absolute.

In January 2001, the United States filed its claims for quantification. The filing includes the Park Service's best estimation of the amount and timing of the water flows needed to protect the Park for "present and future generations," the obligation required of the Park Service for each of its Park units. Supported by dozens of ecological studies and academic literature, it claimed base flows and spring peak flows based on the natural hydrograph. As a result, like the Recommended Flows for Endangered Fish explained above, the Park Service filing would have the Black Canyon receive a share of the water both in "wet" years, when there will be relatively large spring peak flows and base flows, and in "dry" years, when flows are considerably smaller. Also like meeting the Recommended Flows for Endangered Fish, meeting Black Canyon flow requirements may involve releasing water that decreases the Aspinall Unit's marketable yield.

The United States has expressed sensitivity to other water uses in the basin: on the cover page of its water rights filing, it states its desire to negotiate with all interested stakeholders. The negotiations may lead to a new protocol for storage and release at the Aspinall Unit, to provide a year-round flow regime that provides for the Park's needs by more closely mimicking the natural hydrograph. In the fall of 2002, the United States was granted an additional six months to negotiate the case before litigation begins. The United States also suggested it is poised to significantly revise its initial filing to assure protection for existing private water use in the Upper Basin and to avoid contributing to flooding in the town of Delta. Significant discussion remains related to how flows for the Black Canyon will inter-relate with the "yield" of the Aspinall Unit.

4. Deliveries and Entitlements Under the Colorado River Compacts

No compact calls have been made requiring the release of Aspinall water to lower basin states. Past consumption patterns for Colorado River Basin water are not a reliable guide for the future, however. Water flows were exceptionally high when the apportionment was made, so it turns out that Upper Colorado River Basin states are entitled to a smaller apportionment than was originally estimated.

When apportioning water between the Upper and Lower Basin states eighty years ago, hydrologists chose an unusually wet period of record to measure precipita-

tion inflow. As a result, it was believed then that the long-term average water supply at the bottom of the Upper Colorado Basin, Lee Ferry, was greater than 15 million acre-feet (MAF) and that there would be at least 7.5 MAF available for use in the Upper Basin on an average annual basis.[99] At the same time, it was estimated that there was at least enough water originating in the Lower Basin to satisfy the Mexican Treaty obligation to deliver 1.5 MAF and satisfy an additional 1.0 MAF of annual consumptive use in the Lower Basin. Under these assumptions, Colorado would have as much as 3.8 MAF of annual consumptive use available.[100]

It is now apparent that long-term water supply conditions were greatly overestimated in 1922. The average annual water supply at Lee Ferry is considerably less than 15 MAF. A new hydrologic determination conducted by the Bureau in 1988 found that there were only 6.0 MAF available to the Upper Basin states.[101] This estimate entitles Colorado to use less than 3.1 MAF. In the words of a workgroup that looked closely at the subject, Colorado "needs to be aware that it could be taking significant [legal] risks if it makes extended use of more than 3.079 MAF annually."[102]

The workgroup referenced above, called the Endangered Fish Flow and Colorado River Compact Water Development Workgroup, was assembled by the Colorado Water Conservation Board ("CWCB"). The CWCB hoped the Workgroup would provide "input on how much water can be appropriated for endangered fish recovery instream flow purposes within the various [Colorado River] sub-basins . . . without impairing Colorado's ability to fully develop its compact apportioned waters."[103] This workgroup determined Colorado's current consumptive uses and remaining, undeveloped entitlement from the Colorado River. [104] Taking data on water use from the years 1981–1985, it found the current average annual consumptive use of Colorado River water was 2.3 MAF and the maximum use was 2.6 MAF. Thus, considering the lowered entitlement estimate, the range of what Colorado has left to develop runs from a minimum of 450,000 AF to a maximum of 1.5 MAF.[105]

The workgroup then recommended an approach that distributed Colorado's remaining Compact apportionment among the State's tributary basins using the ranges above. After distributing the state's apportionment surplus among the seven major sub-basins according to each sub-basin's contribution to the natural flow of the Colorado River, it estimated future water development capacities for each sub-basin. Based on this scheme, it found the upper limit on future development in the Gunnison to be 225,213 AF and the lower limit to be 99,227,[106] with the remainder of the river's 1.8 MAF annual discharge needed to meet downstream delivery requirements.

Under this approach, even if we assumed away all of the many other uses of Aspinall water that compete for its yield, there is a maximum of 225,213 AF available for consumptive use out of Aspinall's marketable yield. Adopting a conservative and prudent approach, strongly suggested by the drought, would establish a marketable yield far lower. And, of course, there are other uses competing for this water, including the in-stream uses for endangered fish and Black Canyon National Park, as well as hydropower and future in-basin development.

E. 60,000 AF Subordination for Upper Gunnison In-Basin Development

The 60,000 AFA subordination, set aside out of Aspinall Storage for post-1957 water use, is the mainstay of the Upper Basin's water development future. Already it is estimated that over 8,000 AFA of this subordination amount has been committed to serving in-basin needs.[107] As development relying on the subordination increases, this will further reduce the amount of water in Aspinall's marketable yield. In fact, to carry out the intent of CRSPA and its prior commitments under the Subordination Agreements, the Bureau should subtract the entire 60,000 AFA from any yield of the Aspinall Unit, just as it should for instream flows for the Black Canyon and endangered fish.

F. What the Drought Tells Us about Marketable Yield

As described above, the Upper Colorado River Basin owes the Lower Basin an average of 7,500,000 AFA. In 2002, during the primary runoff months of April through July, only 1,110,000 AF flowed into Lake Powell, the Upper Basin's first line of defense against a compact call by the Lower Basin. This left Lake Powell with 15,200,000 AF in storage, 62% of its capacity, and only two years of the annual average the Upper Basin owes the Lower Basin.[108] If the current drought is a long-lasting one, it may not be too long before Lower Basin states will require water from storage in the Upper Basin beyond Lake Powell, specifically from Blue Mesa Reservoir. Releases from Blue Mesa for compact purposes would trump use of the marketable yield by the Front Range.

It has also been exceptionally dry in the Gunnison Basin itself in the last three years, but especially so in 2002. July's unregulated flow in Blue Mesa was only 13,000 AF or 10% of average.[109] Blue Mesa's storage in early August was only 364,000 AF, less than half its capacity, and it went much lower than this level thereafter. Water was released out of Aspinall to serve UVWUA's Gunnison Tunnel right, but, even so, the UVWUA received only 60% of its entitlement. The Redlands Irrigation District had to curtail some of its diversions. The Western Area Power Administration (WAPA) has been experiencing difficulties in meeting the electrical demands of its customers.[110]

This is simply not a basin with water to spare, especially in a drought.

G. Other Hurdles to the Use of the Marketable Yield by the Front Range

Even if a small amount of marketable yield were legally available, there are many additional federal, state, and local permits and approvals, beyond compliance with the ESA, that a potential trans-mountain diversion project would have to obtain. We describe two of these approvals in this section: the need to obtain federal approval (through a Clean Water Act §404 permit and the National Environmental Policy Act); and the approval required under County land use regulations.

1. Veto Authority under Section 404 of the Clean Water Act

A trans-mountain diversion project almost certainly would require a Section 404 permit by the Army Corps of Engineers (Corps) pursuant to the Clean Water Act (CWA).[111] Constructing a dam or building a pipeline that impacts a stream nearly always requires such a permit.[112] A permit for discharging dredged or fill material into the nation's waters may be obtained only if there is no feasible alternative that would be less damaging to the environment.[113]

The U.S. Environmental Protection Agency (EPA) is heavily involved in the permit process, too. An applicant for a permit must show compliance with the EPA guidelines, under CWA § 404(b)(1), which include: (1) Avoiding impacts to aquatic resources and wetlands where practicable (2) minimizing potential impacts, and (3) providing compensation for any unavoidable impacts.[114] Under § 404(c), the EPA reviews all permits issued by the Corps, and has the authority to overrule a Corps decision if it "will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas."[115] Though rarely used, this provision of the act grants the EPA tremendous veto power.[116]

The EPA's veto authority is perhaps most significant with respect to the section 404(b)(1) mandate of considering less-damaging alternatives to the proposed action. These guidelines require not only that less-damaging alternatives be examined, but dictate that the Corps may only issue a permit for the least damaging practicable alternative.[117]

The proposed Two Forks Project, an ill-fated dam proposal on Colorado's Front Range, supplies an excellent example of the reach of EPA's veto power, and illustrates the complex interplay of environmental laws and government entities when section 404 is triggered. When it was all over, the Two Forks controversy spanned several decades, cost more than $50 million, and ultimately was defeated because the EPA determined that there were potential alternatives to the dam proposal that would be far less damaging to the environment.[118] The Two Forks story hints at the significant challenges any proposal to divert Gunnison Basin water to the Front Range likely would face.

In the case of Two Forks, the Denver Water Board had held water rights since 1902 to construct a dam in the river valley downstream from the confluence of the South Platte River and the North Fork of the South Platte.[119] Denver also had a dam construction right obtained from the Forest Service in 1931.[120] But the most important authorization needed to construct the dam was a § 404 permit. Although the EPA concluded independently that Two Forks could not be permitted under § 404 because it didn't satisfy EPA guidelines, the Corps thereafter announced that it would issue the permit because it found the environmental damage could be mitigated.[121] The EPA, however, had the final say, and that was a blunt denial.[122]

The EPA determined that mitigation was simply not enough to comply with the demanding guidelines of § 404.[123] Noting that the dam would have flooded more

than 30 miles of irreplaceable resources of the South Platte River (the proposed dam site was one of the most prized trout fisheries in the nation), the EPA barred issuance of a permit by the Corps, invoking its § 404(c) veto powers.[124] The EPA concluded that the significant damage to fishery and recreation areas that the dam would produce was avoidable, because there were less-damaging alternatives available that could supply Denver with an equivalent amount of water.[125] Moreover, even if no alternatives did exist, the agency concluded that the damage that would result from the dam was too extensive to allow.[126]

The EPA's veto authority has been upheld in federal court. Following a federal court challenge by proponents of Two Forks, Federal District Court Judge Richard Matsch upheld the EPA's veto, holding that (1) the EPA did not exceed its authority under the CWA, (2) the EPA's approach to analyzing alternatives was reasonable, (3) the EPA and Corps were required independently to review and define the project's overall purpose, and (4) the record supported EPA's conclusion that project would result in unacceptable adverse environmental impacts even after mitigation.[127]

Taking water from the Gunnison for Front Range development raises many of the same issues addressed in the Two Forks debate. Given that there are less damaging, practicable alternatives to the use of Gunnison Basin water, the result for an import of Gunnison water may well be the same as it was for Two Forks.

Added to this burden for any dam proposal are the extensive requirements imposed by the National Environmental Policy Act (NEPA).[128] NEPA mandates that the federal government undertake and publish environmental analyses on proposed major federal actions, such as issuance of a § 404 permit by a federal agency.[129] Major federal actions require preparation of an Environmental Impact Statement (EIS) to provide the agency, the public, and Congress information about the environmental effects of the proposed action.[130]

Any proposed trans-mountain diversion would have to meet the requirements of NEPA. The "action agency"—either the Bureau, the Corps, or both—would need to create a draft EIS and incorporate public comment on that draft into a final EIS. While nothing in the provisions of NEPA dictates whether or not a project should go forward, the analysis in an EIS process may result in a drastically different project or the termination of the project altogether. The EIS process for a large project often takes many years to complete. A critical element of an EIS is the analysis of alternatives to the proposed action. In the case of a proposed trans-mountain diversion, this analysis would include how the project proponent might otherwise satisfy its water needs, including the water efficiency measures noted in Chapter 3.

NEPA frequently works in concert with other laws that regulate a project proposal, as it did with the proposed Two Forks Project. During the Two Forks dispute, the Corps considered alternatives to the dam in its EIS analysis, and that formed the basis for the more stringent section 404 alternatives test.[131] Failure of the latter test meant the dam could not proceed.[132]

2. County Regulation of Facilities With a Statewide Impact

Another consideration regarding trans-mountain diversion is the 1974 "H.B. 1041 Act."[133] H.B. 1041 encourages local governments to take the lead in permitting and regulating matters that are of concern beyond the local level and/or matters that have statewide impacts.[134]

In 1990 Gunnison County adopted regulations under the authority of the Act that subject all newly proposed "special development projects," such as large-scale water projects, to a permitting requirement.[135] These regulations seek to "promote the health, safety, and general welfare of the citizens of Gunnison County," and to "protect the beauty of the landscape and the rural character of the county [and] enhance recreational opportunities for residents and visitors."[136] Significantly, these regulations govern "municipal or industrial water projects" and would thus apply to any newly proposed trans-mountain diversion.[137]

The Gunnison Regulations require water project applicants to satisfy a number of requirements designed to prevent adverse effects on environmental and socioeconomic conditions. Before any permits can be issued for special development projects by the Board of County Commissioners of Gunnison County, applicants must comply with an application process that requires submitting detailed project plans and costs, an outline of "project alternatives," payment of fees, a "comprehensive analysis" of all environmental and socioeconomic impacts, and, most importantly, an explanation of "the need for the proposed project in the County."[138] This information "must be submitted not only for the proposed project, but also for a no-action alternative and for . . . other reasonable alternatives," including "alternative locations outside the county."[139]

The regulations provide six pages of conditions under which applications may be reviewed.[140] A sampling of grounds upon which trans-mountain diversions could be denied includes: projects that will have a significantly adverse net effect on water rights, or on the capacities or functioning of streams, lakes, reservoirs, floodplains, wetlands, and/or riparian areas "within the impact area" (which is defined to include Gunnison County and, under certain circumstances, adjoining counties).[141]

H. Conclusion

Exporting Gunnison water to the Front Range faces enormous challenges. As a result, the Front Range should look elsewhere for water. Fortunately, it will find that there are alternatives that are less costly and less controversial. Indeed, as Chapter 3 shows, part of the solution to the problem lies no farther, literally, than the Front Range's backyards.

Meeting Front Range Water Demand Without Gunnison Water Basin

3

There are many ways for the Front Range to meet future water demand with more reliability, less controversy, lower costs and less environmental impact than importing water from the Gunnison. Indeed, the Front Range can meet its future water needs through more efficient use of existing water supplies, through water conservation, and a wide range of Front Range supply-side efficiency measures. Taken together, improvements in water use efficiency[142] can provide the Front Range with the water it needs for decades to come, leaving the waters of the Gunnison River to meet the Basin's present and future needs.

A. Cost of Imported Gunnison Basin Water

As the Front Range looks at a full range of water options, it needs to consider the potential cost of a trans-mountain project from the Gunnison. The cost of facilities to move large quantities of Gunnison water to the Front Range depends on many variables:

- Would water be taken from Blue Mesa or above Blue Mesa?[143]
- Would water be pumped over the Divide or transported through a tunnel?
- Would additional storage be needed on one or both sides of the Divide?
- What would be amount and cost of electricity to pump water up thousands of feet? (including the cost of new power stations and other infrastructure).

One scenario would be to pump water from Blue Mesa Reservoir over the Continental Divide, across the Arkansas River Basin, to Antero Reservoir. But even this scenario, if compared to the cost of recent pipeline projects, would be extremely expensive.

Based on the Green Mountain Project costs, adjusted for inflation, we estimate illustratively that the construction, mitigation and permitting costs of a pipeline from Blue Mesa Reservoir over the Continental Divide and to Antero Reservoir would be at least $1.2 billion for a pipeline capable of carrying 120,000 AFA. This figure does not include any cost of preparing Antero or any other Front Range reservoir to receive Gunnison water. Nor does it include any new storage reservoirs in the Gunnison Basin to hold water at a high elevation for delivery to the Front Range. Annual operating costs for pumping energy and purchasing water from the United States may reach $50 million or more, depending on the cost of energy, including new transmission facilities, and pumping equipment efficiencies. Using a discount rate in the range of 3%–4% to bring future annual operating costs back to the year in which project operations commence, this is water that might cost in the neighborhood of $20,000–23,000 per acre-foot, not counting any additional storage reservoir costs.

This is very expensive water. We repeat our belief that there is nowhere near 120,000 AFA of water available to transport to the Front Range from the Gunnison. As quantities of water available from the Gunnison are reduced below 120,000 AFA, costs per-acre-foot are correspondingly higher.

When compared to conservation strategies that cost as little as $10 per acre-foot saved,[144] imported Gunnison water is an unappealing economic choice. Even when more expensive supply-side efficiency strategies are considered, importing Gunnison water appears to be the least economic choice.

B. Alternatives for Meeting Front Range Water Demand

The 1999 Report of the Metropolitan Water Supply Investigation ("MWSI") set the foundation for increasing the efficiency of Denver Metro water use through an exploration of available supply-side options.[145] When we refine these options and consider incremental conservation measures that were not included in the original study, we see that the Front Range can meet its foreseeable needs without the need for large new trans-mountain diversions.[146]

1. Overview

The MWSI reports that water demand in the Denver metropolitan area at "build-out" could reach 877,000 AFA by 2045—enough water to quench the thirst of 3,269,000 people.[147] Because water providers have a "reasonably certain future supply" of 763,000 to 802,000 AFA, there is a future unmet need of 75,000 and 114,000 AFA.[148] The MWSI, however, concluded the Denver metro area could make up this shortfall and safely meet its projected water demand in 2045—without any large new trans-basin diversions—by relying on the following creative supply-side options:

- Conjunctive use (making use of groundwater storage): 60,000 AFA
- Reuse of water (re-treating municipal waste water): 120,000 AFA
- Interruptible supply (dry-year leases of water from irrigators): 190,000 AFA
- Other system integration opportunities: 20,000 AFA

The MWSI set the "floor," not the "ceiling," for the Denver area's future water options. The recommendations of the MWSI should be supplemented to present the Denver metro area with an even wider range of options for meeting future water demand.

First, the MWSI expressly did not examine potential savings from additional water conservation.[149] Water conservation figures in the MWSI—assumed to be 159,900 AFA by 2045—rest on an extrapolation of only expected savings from conservation programs in place at the time of the study.[150] As explained in detail below, additional conservation measures (inverted rate structures, rebates for Xeriscaping, appliance replacements, and more), some of which were implemented during the summer of 2002, have the potential to reduce metro-wide water demand by an additional 100,000 AFA or more on a sustained basis without affecting quality of life.

Second, Denver could secure significant additional water through re-use of the 120,000 AFA of return flows that will pour from wastewater treatment facilities by 2045.[151] If these return flows are re-purified and recycled through the normal distribution system, only about 35% of the water would actually be consumed. By recycling return flows over and over again, losing 35% each cycle, 120,000 AFA eventually could yield 300,000 AFA of supply.

Third, the conjunctive use scenario (capturing wet years' surplus water in underground storage) depicted in the MWSI projected a potential yield of up to 60,000 AFA in the south Metro area.[152] More recent modeling efforts estimate a somewhat smaller yield, namely 27,000 AFA. However, water providers may be able to use some of this yield to extinction, as the water used will originate mostly with reusable supplies. As a result, in our MWSI-plus scenario we believe that conjunctive use may develop 40,000 AFA or roughly 50% more than the first-use amount.

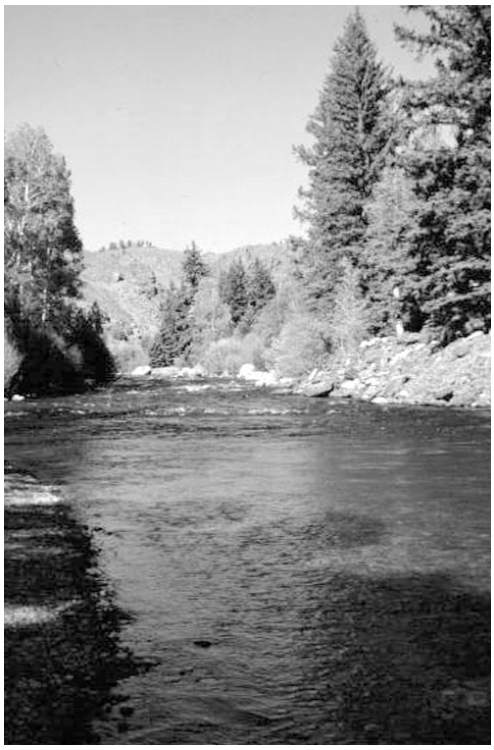
Fourth, for "dry-year leasing" and other interruptible supply arrangements (whereby cities lease water from irrigators to get through dry years or stages when other supplies are being developed), the MWSI suggests that 190,000 AFA could be made available in times of need. But there is enormous additional potential here, too. The gross volume of water used for irrigation in the South Platte basin is nearly 3,000,000 AFA, of which 495,000 AFA are potential dry-year supplies for agriculture with diversions above Greeley.[153] Potentially a great deal of these supplies could be available for interruptible supply.

Fifth, the MWSI also includes an estimate that "other system integration opportunities" have the potential to supply 20,000 AFA. The MWSI later notes that these types of creative management practices could produce up to 50,000 AFA. The MWSI again offers a range, rather than an absolute, for quantities of supply options.

Sixth, the MWSI did not include an estimate of the gains in storage capacity attributable to repairs and improvements of existing dams serving the Denver Metro area. A recent study by the Colorado State Engineer indicated that these measures might develop about 132,000 AFA of new storage capacity in Colorado.[154] How much of this capacity might be available for use by Front Range cities is unknown.

	MWSI Projection	MWSI Plus
Supply-side Measures		
Conjunctive use	60,000 AFA	40,000 AFA
Reuse of water	120,000 AFA	300,000 AFA
Interruptible supply	190,000 AFA	190,000 AFA
Other system integration	20,000 AFA	50,000 AFA
Dam repair/improvement	n/a	X AFA
Additional water conservation		
Outdoor water savings	n/a	100,000 AFA
Indoor water savings	n/a	50,000 AFA
TOTALS:	390,000 AFA	730,000 + X AFA

Information on the cost of these conservation and supply-side efficiency measures is variable but the measures compare quite favorably with cost estimates for a pipeline from Blue Mesa.



The Gunnison River: too precious to divert
--photo by Jeff Widen

For example, in 1997 the Denver Water Department, through its Integrated Resource Plan ("IRP") estimated that the cost of conjunctive use was $5,400/AF for 20,000 AF. Water rights purchases to develop a few thousand acre-feet were estimated at $2,600 to $3,200/AF. This suggests that dry-year leases may cost considerably less. Enlarging Gross Reservoir, west of Boulder, might cost $3,900/AF to develop 7000 AF and $6,600/AF to develop 20,000 AF more. Re-use to develop almost 300,000 AFA was estimated to cost from $4,900/AF for one small project to as much as $9,600/AF for a larger project. The IRP cautioned that its cost estimates were "preliminary," but the estimates did include estimates of permitting, mitigation, engineering, construction and operation and maintenance costs.[155] Estimates of the costs for water conservation, by comparison, range from nearly costless (changing watering schedules) to as much as $4,500/AF (rebates to encourage irrigation efficiency improvements).[156]

2. Water Conservation

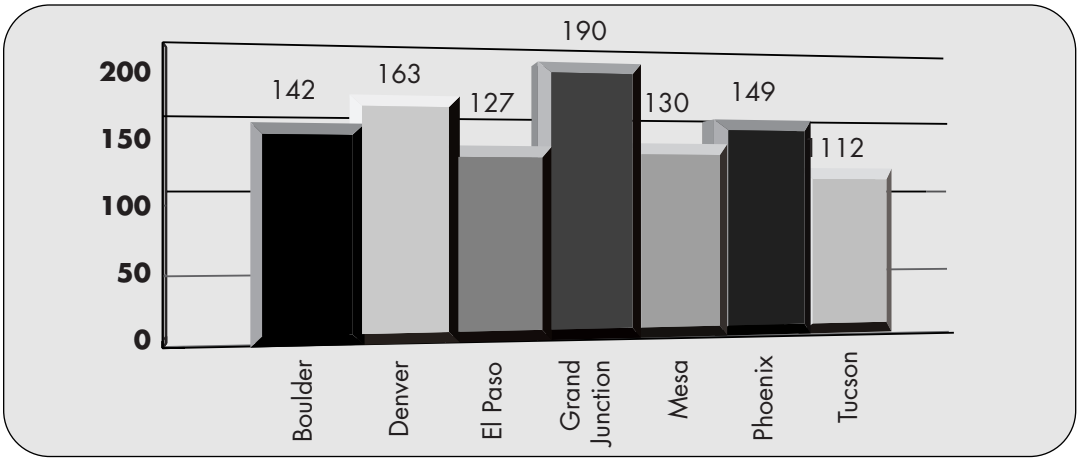
The drought of 2002 has been a reminder, for water providers and citizens alike, that we live in an arid climate with an unpredictable water supply. Some have argued that we, as a community, have done as much as we can to conserve water and that we must build more dams as soon as possible.

There is considerable evidence to the contrary. Based on a review of metro-area conservation programs as well as the conservation strategies of other urban water providers in the southwest, the Denver area clearly can do much more. Indeed, we likely can conserve 100,000 AFA or more (beyond what providers already plan to conserve within the next several decades) through a mix of outdoor and indoor water conservation measures, making it possible to meet most of our incremental needs for "new" water completely through water conservation.

a. Brief Comparison

An initial indication that we can do more is available from comparing per capita water use between Denver and other regional water providers. We note that the data for "Denver" is taken from the Denver Water Department, a provider that has

a more advanced water conservation program than most other providers in the larger metro area. If other area providers were included, the efficiency of water use in the metro area, as measured by per capita consumption, would show even more room for improvement.



2001 Single Family Residential Daily Per Capita Water Use. [157]

As the above graph makes clear, Denver residents use considerably more water per-capita than residents in several other southwestern cities.[158] In 2001, Denver's single-family residential (SFR) use was 163 gallons per capita per day (gpcd). By comparison, in the same year El Paso had a SFR use of 127 gpcd. Tucson had an even lower SFR use figure: 112 gpcd. We focus on the residential sector, and SFR use in particular because it represents a large percentage of urban water demand and cities have more consistent accounting data available for this sector than for others.

Importantly, cities that have lower per capita use than Denver have even hotter average temperatures and sometimes receive half as much precipitation as Colorado's Front Range. Yet they still have achieved excellent water efficiency as a result of aggressive price structures, rebates and incentives, and landscape regulations. The gap between Denver's performance and cities that have pioneered better water efficiency means Denver has many options left to explore.

Following the lead of these cutting-edge cities, it is entirely reasonable to believe that the Denver area could reap conservation savings of a minimum of another 100,000-150,000 AFA over the next several decades through several avenues.

b. Outdoor Conservation Savings

In the Denver metro area outdoor uses comprise about 54% of urban water uses.[159] Most of this water goes to irrigate bluegrass and other water-loving turf.[160] A portion of this water can be conserved through more wide-spread use of urban Xeriscape™.

Xeriscaping offers a much lower water-using alternative to bluegrass lawns. Xeriscape incorporates seven principles to promote quality landscapes, water conser-

vation, and environmental protection: (1) planning and design; (2) soil analysis; (3) appropriate plant selection; (4) practical turf areas; (5) efficient irrigation; (6) use of mulches (to retain soil moisture); and (7) appropriate maintenance. Skeptics may assert xeriscapes are dull and dry, but well-designed xeriscapes are beautiful, incorporating the native textures and colors of Colorado's grasses, evergreens, ground covers and flowers. Xeriscaping offers enormous promise for saving water in the Denver metro area.

In addition to saving water, xeriscape landscaping adds color and texture to lawns and yards
--source: Dave Shows & Associates, Landscape Architects

Drip irrigation, as a substitute for water-wasting sprinklers, also saves water. And, because plant needs are sensitive to the weather, rain sensors and soil moisture detectors are good, localized means of making sure we apply no more water than plants truly need. Especially for large water users, internet-available weather information on a real-time basis can also help save water.

To our knowledge, no one has made an estimate of the amount of water that might be saved by means of xeriscaping and related outdoor water conserving measures along the Front Range or in the Denver metro area, although Denver Water has estimated outdoor water savings attributable to its revised Irrigation Efficiency Program. Denver estimates that its program might save 9,500 AF/year at a cost per acre-foot saved of $4,500, much less than the cost of most new water supply options. However, we think that the Denver estimate merely scratches the surface of what is possible.[161]

The potential in the entire Denver Metro area is much higher. By 2030 outdoor urban water use in the Metro area is likely to be at least 400,000 acre-feet per year, absent water conservation beyond that already the subject of programs that exist today. The Denver Water Department estimates that savings from xeriscaping are a 20% reduction in outdoor use for a single-family residence for a 50%-xeriscaped yard and 40% for a 100%-xeriscaped yard. Assuming that single-family residential savings from xeriscaping are available throughout all outdoor water uses in the metro area in 2030, if 50% of the areas using water out of doors in the Denver metro area are xeriscaped, we could save 80,000 AF/year (20% x 400,000). If all such areas were converted to xeriscape, the potential savings would be 160,000 AF/year.

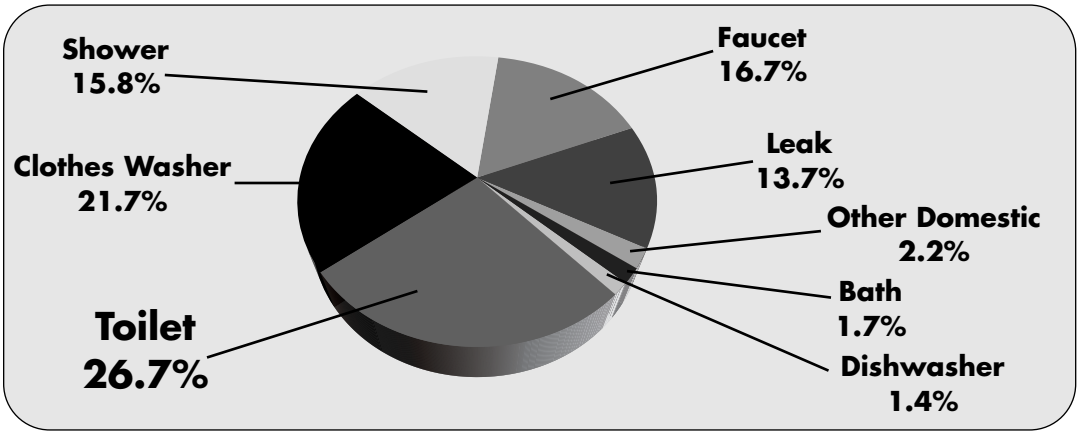
These potentials based on rough assumptions. However, we think these estimates give an idea of the magnitude of potential savings from a large-scale switch

from bluegrass turf to less water-intensive plants over a 30-year period. Achieving these savings will require that metro-area residents find acceptable or prefer a landscape that is 50-100% xeriscape. We think that they will prefer it because it is more natural, can be stunning in appearance, and is consistent with living sustainably in a semi-desert.

c. Indoor Conservation Savings

Indoor urban water uses may be less discretionary than outdoor water uses and, thus, there may be less water to be saved. Nonetheless, there are opportunities, including appliances, such as clothes washer and dishwashers, plumbing fixtures and toilets.

Indoor use breaks down as follows:



National indoor per capita use percent by fixture (Mayer et al. 1999).

To improve indoor water use efficiency, the 1992 Energy Policy Act set maximum flow ratings for residential plumbing fixtures like toilets, showerheads and faucets.[162] Since the law came into effect in 1994, new toilets sold cannot use more than 1.6 gallons per flush.

Denver Water had an incentive program from 1990 through 1993, offering a rebate for residents who replaced older toilets with ULF toilets. Lacking significant customer participation, Denver Water dropped the program in 1993 and since has relied on "natural replacement" of toilets. Interestingly, a 1999 study by the AWWA found the average Denver residence still uses 3.84 gallons per flush and only 10.8% of the homes were fully equipped with ultra low flow (ULF) toilets.[163] The "natural" transition to ULF remains a slow process. To help address the drought, Denver recently re-instituted a rebate program for toilet replacement.

An innovative practice adopted by Santa Monica and other California cities requires non-ULF toilets to be upgraded to current standards when selling a property. This takes the financial burden and participation problem off the water utility's shoulders and accelerates the conversion process.

Clothes washers comprise the second largest indoor water use. New horizontal axis machines are now available that use 50% less energy and 30-50% less water than traditional models.[164] Offering rebates toward the purchase of these machines could also have significant impact on the build-out demands of the Front Range. Showerhead replacement programs also have reaped great savings in Seattle and elsewhere.[165]

An EPA and Seattle-funded study showed that replacing conventional toilets and washing machines in residences with water-efficient versions would reduce per capita indoor household water use by 37% at low costs.[166] In the Denver Metro area, a 37% reduction in indoor residential water use would reduce indoor water use by between 50,000 and 100,000 in 2030.

d. Incentives to Save Water

There are many incentives that can encourage urban water users to conserve water, whether outdoors or indoors. They fall into four broad categories:

(1) Water rate structures that communicate the costs that an urban water provider can avoid if water is conserved. The most common rate structure of this nature is inverted rates, in which water users pay more per unit of water as their demands increase.

(2) Rebates from water providers to encourage water users to enhance their water use efficiency. Examples include cash payments by water providers: to help customers buy down the cost of water-efficient appliances like dishwashers and washing machines; to replace bluegrass turf with lower water-using plants; and to encourage customers to replace older, higher water-using toilets in buildings existing before 1992 with more efficient toilets.

(3) Rules/Ordinances that require that customers alter their behavior, such as by watering only during certain hours.

(4) Public education, such as through bill inserts, model xeriscape gardens and public service announcements.

If all Metro area water providers were already implementing these incentives and still forecast a demand of 877,000 AFA in 2045, it would be reasonable to contend that there is not much more water that can be saved in the metro area beyond what is already assumed in long-run water demand forecasts. But it is clear that we have only just begun to encourage residential users to conserve water in the metro area.

The Land and Water Fund will soon finish a study of water use efficiency by water providers across the southwest. Cities under review include several water providers on Colorado's Front Range. We have reviewed the Water Conservation Act of 1991 and what it tells us about how serious the State is about promoting water use efficiency. On the basis of what we know so far, Colorado's attention to urban water

conservation is uneven and not as aggressive as other areas in our region. We can do much more.

Rate Structures

Many Front Range urban water providers have now implemented inverted rate structures to communicate to their customers that the more they consume, the higher the cost they impose on the provider. While we have not completed our analysis of the rate structures of Front Range water providers, we have not yet come across one that is as effective as that of the Irvine Ranch Water District in California. We describe it here to give an idea of the power of rate structures to encourage cost-effective water conservation.

The Irvine Ranch Water District (IRWD) sets a base allocation for each property based on historic use, landscape area, number of residents, evapo-transpiration (ET) rates, crop coefficients and irrigation efficiency. For customers who exceed their base allocation by 50%, rates are doubled; by 50-100%, rates are quadrupled; by more than 100% rates are eight times higher.[167] There are rewards as well as penalties. If a customer manages to use less than 40% of the base allocation, a 25% discount is awarded. The IRWD has found their rate structure to be "very defensible" and a means to nurture positive working relationships with their customers.[168] Perhaps most importantly, this rate structure reduced residential water use by 19% during its first two years.[169] We know of no rate structure in Colorado that has produced such results over a sustained period of time. Indeed, our initial review of rate structures suggests that they are too flat to make much of a difference, especially among high-income/high-water using customers.

Rebates

Some Front Range providers, including Aurora and Boulder, offer incentives for residents to replace turf with xeriscape. Most providers do not. And, strangely, there are still municipalities and Home Owners Associations that force residents to pour water on water-using turf through bluegrass-only covenants. In Colorado we could do much more to reduce outdoor water use. Regional leaders do. For example, El Paso, Texas, offers $1.00 per square foot of grass replaced with water-efficient landscapes. El Paso's program led to replacing almost 1 million square feet of grass and saved over 20 gallons per square foot removed each watering season.[170]

Most urban water providers in Colorado offer no direct incentives to their customers to install drip instead of sprinkler-based irrigation. Neither do they offer incentives to increase the efficiency of indoor water-use other than inverted rate structures. And there are still urban water providers who do not regulate outdoor water use to reduce waste through such measures as restricting application of water use to the cooler hours of the day.

Rules/Ordinances

Most Front Range providers—Aurora being a notable exception—do not use their regulatory powers to regulate landscaping to save water. By contrast,

Albuquerque requires that all landscaping associated with new residential construction include no more than 20% high-water using plant coverage or be subject to a water budget that limits landscape irrigation.[171] Albuquerque says that this ordinance yielded a 28% reduction in single-family residential water use.[172]

Some water providers in the Denver metro area achieved savings of this magnitude in response to mandatory restrictions in the face of the 2002 drought. But we doubt that those savings are sustainable without these restrictions, some of which are draconian and inefficient. What is needed and, based on experience elsewhere, entirely possible, is a set of incentives, through rebates and rate structure reform, that encourages water users to make long-term investments in water use efficiency improvement.

3. Supply-side efficiency measures

There is a wide variety of measures the Front Range can take beyond water conservation to stretch existing, developed water further.

a. Effluent Re-use or Management

In general, less than 50% of the water used for municipal purposes is actually consumed. In densely settled regions like Denver and Boulder, only 35% is consumed. The remainder returns to the stream in the forms of treated waste water, return flows from irrigation of lawns, parks and golf courses, and subsurface losses from the treated water distribution grid. Effluent Re-Use refers to any arrangement that uses municipal return flows to increase municipal water supplies. There are two ways to accomplish this goal: return flows can be treated and physically reused for potable and non-potable purposes, and return flows can be reused under substitution or exchange arrangements.

At present, the Denver metropolitan area generates return flows in excess of its current reuse needs of about 80,000 AFA. These undeveloped flows are expected to increase to 120,000 by 2045.[173] Under Colorado water law, much of this return flow can be reused again and again to extinction.[174] In suburban systems, about 50% is consumed and 50% goes back into the municipal supply each time return flows are reused. Assuming that this process continues until all reusable return flows have been exhausted (losing 50% each time it cycles through the municipal system) 120,000 AFA could produce 240,000 AFA of supply. If recycled through Denver Water's distribution system, consumption would be closer to 35%, allowing the 120,000 AFA to produce 300,000 AFA of supply.

Non-potable reuse is being implemented by Denver Water, on a small scale, through the construction of a web of "purple pipes" that carry treated wastewater (below drinking water standards) to businesses and city properties for cooling and irrigation.[175] These "purple pipe" systems could be expanded to many new development sites and can sometimes be retro-fitted to large irrigated properties like golf courses and parks.

Potable reuse refers to the physical treatment of wastewater to drinking water standards and re-circulating it through the regular distribution system. This can be accomplished by treating the effluent and directly releasing it into the distribution system or by blending treated effluent with raw water, then treating this mixture to meet drinking water standards.

Substitution arrangements—taking the form of exchanges, plans of augmentation, first-use agreements, and water trades—allow for the delivery of effluent to downstream water users in exchange for Denver's use of upstream water. For example, a downstream farmer may not mind that the water he diverts is below drinking water standards. He might be willing to exchange a more permanent supply of return flows from a city's water system for rights he has to water stored in a pristine headwaters area (water that would require less treatment by the city). Both parties must agree to the quantity and quality of the exchanged water and must, in order to comply with Colorado law, keep stream flows between the points of exchange at sufficient levels to protect intervening water users.

Technical and political feasibility of large-scale potable reuse have been demonstrated or are planned in other parts of the country. A plant in Fairfax County, Virginia, has re-purified water for human consumption since 1978, without health problems. The San Diego County Water Authority proposes to construct a 20 million gallon/day water re-purification facility."[176] The town of Cary, North Carolina has invested $10 million in a reclaimed water system to supply irrigation water to its residential and commercial customers.[177] Notably, conventionally treated wastewater from upstream cities makes up a good portion of the stream flow from which most Denver providers currently draw supplies.[178]

Large-scale effluent re-use as a Front Range water supply strategy is not without its own challenges, including public acceptability and potential impacts on downstream water users. However, the enormous potential of re-use to help meet demand at costs and with impacts that are less than those of a Gunnison Basin import suggest that it must be part of a any sound Front Range water supply strategy.

b. Conjunctive use

Conjunctive use means the coordinated use of ground and surface water resources. In a nutshell, in "wet" and average years, surface supplies would be tapped to the fullest extent possible, even storing some extra water in groundwater aquifers that would then be available for drought years. Denver's southern suburbs, some of which already rely heavily on groundwater,[179] are some of the best candidates for conjunctive use.

The Denver Basin aquifer system, although not a source of supply that will last forever, is likely to provide a significant portion of southern suburbs' water supply for many centuries. The Denver Basin Aquifers contain approximately 300 million AF of drainable water storage.[180] This volume of water amounts to a reservoir 15 times greater than the active storage of Lake Powell (20 million AF), and 400 times greater than the active storage of Colorado's Blue Mesa Reservoir (750,000 AF).

The estimated total pumping of groundwater from the Denver Basin Aquifers in 1996 was 56,000 AF, virtually all in the South metropolitan areas of Douglas and Arapahoe Counties. Just over half of this use (24,500 AF) was for municipal purposes.[181] Pumping 56,000 AF is less than 2% of the annual allowable pumping quantity assuming a 100-year aquifer life.[182] Though there has been some localized well pumping drawdowns and loss of hydrostatic pressure, the overall lifetime of the Denver Basin aquifer at this level of production (56,000 AF/yr) may exceed 1000 years. Simplified projections of well development and population growth to the year 2100 result in groundwater production estimates of about 300,000 AF per year, approximately 10% of the annual allowable pumping from the Denver Basin aquifers.[183]

Despite the potentially long life of Denver Basin groundwater supplies, there are several factors that caution against the use of groundwater as a sole source of municipal supply. First, pumping costs tend to increase over time. As basins are depleted, underground water levels and hydrostatic pressure drop, leading to increased electricity consumption for the same water harvest. Second, the chance of surface subsidence grows as groundwater tables are lowered. Third, pumping water from aquifers drains a non-renewable water supply.[184]

To help deal with the south metro area's long-term water needs, Douglas County, the Denver Water Board, and the Colorado River Water Conservation District have been exploring the South Metro Conjunctive Use and Interruptible Supply Project. The project potentially would link groundwater systems serving parts of Douglas and Arapahoe Counties with Blue River and South Platte River water supplies conveyed by the Denver Water Department, with a resulting net reduction in the total volume removed from the Denver Basin aquifers.[185] If carried out, excess surface water available through storage and delivery infrastructure managed by Denver Water would, in average and wet years, supply water to the Douglas County Water Resource Authority (DCWRA) and, in some cases, recharge Denver Basin aquifers. In dry years, groundwater sources would be available to satisfy DCWRA demands in peak summer months and used to payback "borrowed" water to Denver Water in the fall. Conjunctive use essentially allows storage underground, minimizing evaporative loss and obviating the need for new surface supply structures.

Preliminary studies showed that conjunctive use could yield up to 60,000 AF of supply. More recent studies, based on new modeling of the speed of groundwater recharge, estimate a yield of 27,000 AF. Whatever the ultimate yield produced, a stipulation requiring multiple re-use of any new surface supplies delivered to DCWRA members could leverage the yield by a factor of 1.7 or 2.[186] For our MWSI plus scenario, this reort uses a factor of 1.5.

Conjunctive use may depend partly on increased imports for the mainstem Colorado River. As such, there may be legitimate opposition to some portion of the conjunctive use potentials we estimate.

c. Interruptible supply arrangements

Interruptible supply arrangements, like dry-year leases, allow cities temporarily to obtain for municipal needs water that would otherwise be earmarked for agricultural use. From an economic standpoint, such leases are beneficial to both irrigators and the cities.[187] Especially when faced with a dry year that will see shortfalls in water deliveries to their farms and ranches, irrigators can benefit from obtaining cash for their water when growing crops may be a risky venture. For cities, leasing can be far less expensive than developing their own new supplies to meet drought-year conditions. From a public-policy perspective, dry-year leases are often seen as more desirable than transactions which permanently dry up irrigated agriculture.

The MWSI estimated that "high quality water potentially available for interruptible supply arrangements is approximately 190,000 AF."[188] Elsewhere, however, the MWSI notes South Platte Basin dry year supply potential for interruptible arrangements may be as high as 495,000 AF,[189] simply a staggering amount of water for future municipal supply.

There are a number of impediments to dry-year leasing on the Front range, including the irrigators may fear that they will have been construed to have abandoned their water rights if they enter into such leases. These and other legal impediments can be addressed by the General Assembly. To implement dry-year leasing on a large-scale basis may require additional storage upstream of irrigated lands on the Front Range. If so, the true cost of dry-year leases will exceed the price paid by urban water providers for these leases.

d. Minor systems integration

This category of supply was separately enumerated in the MWSI to include ideas not adequately developed for inclusion in the report at the time of its initial scoping.[190] Opportunities explored in MWSI include: effluent management between Northeastern and Northwestern metropolitan sub-regions; joint storage projects for regulation of Windy Gap and Moffat systems with use of Colorado Big Thompson facilities; and the creation of a market for conserved water. The conservative conclusion presented in MWSI is that projects listed under this title would supply about 20,000 AFA, however, MWSI also recognized that these opportunities could provide up to 30,000 to 50,000 AFA of municipal water at build-out.[191]

C. Conclusion

Even if only about one-seventh of the apparent potential of Front Range water use efficiency measures can be harvested in the next two to three decades, there is no market for Gunnison Basin water in the Denver Metro area. Together with the enormous legal, environmental, cost and practicality problems confronting an import of Gunnison water to the Front Range, these effective measures suggest that Front Range providers should abandon the notion of importing water from the Gunnison. Indeed, importing Gunnison water to the Front Range is truly a pipe-dream in more ways than one.

A

Appendix: The Saga of the Union Park Project

A. Background

In 1986, the Natural Energy Resources Company (NECO) filed an application for water rights in Water Division 4 in Montrose to construct and operate the Union Park Project.[192] This was the opening salvo in a bitter struggle for control of a significant share of the waters arising in the Upper Gunnison Basin. The big question: would they remain in the Basin or be transported to the Front Range? The first act of this struggle drew to a close in November 2000 with an opinion by the Colorado Supreme Court upholding Judge Robert Brown's second Union Park opinion in Water Division 4 dismissing a related application by Arapahoe County.

In August 1988, NECO conveyed all of its interest in the larger Union Park Project to the Board of County Commissioners of Arapahoe County ("Arapahoe"). In December 1988, Judge Brown dismissed most of what was then Arapahoe's application.

Before the end of 1988, Arapahoe filed a new application (Case No. 88-CW-178) aimed at preserving the claims lost in the earlier dismissal. In 1989, Arapahoe filed an amendment to this new application seeking conditional water rights for a number of new diversions. As described in its amended application in this case, the Union Park Project consisted of the following facilities:

1. The Union Park Reservoir and Dam, with a capacity of 900,000 AF;
2. The Taylor Park Pumping plant, to lift water from TPR to Union Park and to generate power when water is released from Union Park to TPR;
3. The Willow Creek Collection System and Bertha Gulch Tunnel;
4. Six diversion structures located in the East River drainage;
5. Five diversion structures in the Taylor River drainage; and
6. The Union-Antero Conduit (capacity 450 c.f.s.), to transport water by gravity by means of a tunnel through the Collegiate Range into the Arkansas River drainage and up to Antero Reservoir in South Park, for ultimate delivery to Arapahoe County.

The ultimate capital cost of this massive project was estimated by Arapahoe's expert to be as high as $800 million in 1991. In 2002 dollars, that cost is close to $1.1 billion.

West Slope interests saw this application for what it was: an attempt to build the capacity to transport almost 330,000 AF each year from the Upper Gunnison to Arapahoe County for additional growth and sprawl on the Front Range. The threat

was obvious—to irrigation interests in the Gunnison and Uncompahgre valleys; to the city of Gunnison and towns within the Basin; to fishing and rafting and related tourist-based investment; to the United States, and its Aspinall and TPR reservoir rights; to the Gunnison District and River District (both of whom have responsibility to maintain and develop the waters of the Basin for the benefit of the region); and to environmentalists concerned about the impact of the project on natural systems and to the establishment of a principle that water necessary to maintain the web of life in the Gunnison could be taken to feed water-inefficient growth and sprawl on the Front Range. These interests, who at times had been in conflict with one another within the Basin, came together to mount a coordinated defense of the Upper Gunnison basin.

B. Legal Context

An applicant for conditional water rights in Colorado must, among other things, convince a water judge that it meets the following requirements: (1) that it has the requisite intent to put the water to beneficial use on the date on which it seeks to establish a priority for the water rights; (2) that its application is not speculative; and (3) that it can meet the requirements of the "Can and Will" statute. Absent meeting this burden of proof, the applicant may not obtain a decree for the water rights it seeks.

The "Can and Will" statute became the focus of the court proceedings adjudicating Arapahoe's application. Issues related to "intent" and "speculation" were postponed to a later phase of the judicial proceedings. The "Can and Will" statute provides:

> No claim for a conditional water rights may be recognized or a decree therefore granted except that it is established that the water can be and will be diverted, stored, or otherwise captured, possessed, and controlled and will be beneficially used and that the project can and will be completed with diligence and within a reasonable time.[193]

The question in the Union Park litigation triggered by Arapahoe's filing in Case No. 86-CW-178 was whether its filing met this "Can and Will" test.

C. The First Trial—Union Park I

Pre-trial motions filed by lawyers on all sides of the case revealed a long list of issues to be addressed by the Court in order to ascertain compliance with this statute. These issues included: the project's economic and financial feasibility; the need for the project; the time frame in which the project was to be built; and the availability of water for the project. Judge Brown decided to address these issues in two phases. Phase 1 consisted of a trial on water availability and closely related permitting issues regarding three federal approvals bearing on water availability, namely Bureau permits, Forest Service permits and approvals required under the Endangered Species Act ("ESA"). Consideration of all other issues were postponed until Phase 2, which, because of the rulings to come on water availability, did not and will not occur.

A nearly six-week trial on whether there was sufficient water available to Arapahoe for the Union Park Project began in early June 1991. Models were used by both Arapahoe and Arapahoe's opponents to estimate physical water availability at Arapahoe's points of diversion. Existing water rights and other "law of the river" were applied to physical water availability totals to estimate legal water availability.

Arapahoe's experts estimated that there were 295,000 AFA physically available at Arapahoe's points of diversion. Opponents' experts estimated that there was 278,000 AFA physically available. Judge Brown determined that the opposers' experts estimate was more reliable. However, for purposes of determining how much water was available to the project, this difference was not significant.

What mattered more were the differences in assumptions between opposers' and Arapahoe's experts regarding the legal availability of water, the amount of water available after taking into account water rights senior to those Arapahoe was seeking. On this score, the applicant estimated that there were between 97,000 AFA and 139,000 AFA legally available to Arapahoe at its points of diversion. Opposers' experts estimated that there were between 6,310 AFA and 48,950 AFA legally available. Judge Brown found that the opposers' evidence better reflected the law of water availability in the Basin. On the basis of this evidence, Judge Brown found that the water legally available to the project would not exceed 20,000 AFA. Arapahoe conceded that it would not go forward with the project with the amount of water, at which point Judge Brown dismissed Arapahoe's application for water rights.

Judge Brown's opinion in Union Park I contains a number of findings of fact and conclusions of law that remain the "law of the Upper Gunnison," notwithstanding Arapahoe's subsequent appeal of this opinion, reversal of portions of the opinion by the Colorado Supreme Court, another trial on water availability (Union Park II), and a final Supreme Court opinion. Below is a summary of the key holdings in Union Park I, including those from pre-trial rulings, which remain the law of the river to this day.

1. An applicant for conditional water rights must prove, as a threshold element of its burden of proof under the Can and Will statute, that there is sufficient water available for its project on the date for which it seeks a priority.
2. The Bureau is entitled to use the full decreed rights it holds under state law for the Aspinall Unit, including for fish and wildlife, recreation, and hydropower.
3. The Bureau puts all of the water that it is entitled to use under its state decrees to beneficial uses.
4. The Bureau does not release water from the Aspinall Unit for any single purpose, but for the multiple purposes authorized in CRSPA and by its water rights. To do so is a lawful use of the Bureau's state decrees.
5. The UVWUA's water rights for the Gunnison Tunnel do not have to be satisfied by releases from Aspinall Unit storage. This means that the

Gunnison Tunnel's rights may call out any rights junior to it when natural flows in the river fall below the UVWUA's direct flow rights.

6. The biological opinions for the Dallas Creek and Dolores projects commit up to 148,000 AFA from the Aspinall Unit to help recover endangered fish populations. This water is separate from and in addition to the 300 cfs assumed in this case to be committed to the Black Canyon reserved right.
7. Federal approval is required before relying on the use of Taylor Park Reservoir (TPR) as a forebay to serve hydroelectric pumping facilities, as Arapahoe had proposed.
8. Both the first and second fill decrees for water stored in TPR, including the conditions for release designed to optimize fish conditions below TPR, are entitled to full recognition when determining water available for appropriation above TPR.
9. The private instream flow rights in the Basin must be factored into the computation of water availability. A county does not have the power to condemn private instream flows to show water availability in the Basin.

D. Arapahoe's First Appeal

Arapahoe appealed Judge Brown's opinion in Union Park I to the Colorado Supreme Court. In 1995, the State Supreme Court upheld the Water's Court's dismissal of the application Arapahoe had acquired from NECO. It also upheld its opinion that water availability must be shown as a threshold element of an applicant's burden of proof. However, the Colorado Supreme Court reversed the Water Court on two key issues concerning water-availability modeling.

Judge Brown had required that, to determine the availability of water to the Union Park Project, existing absolute decrees must be considered on the basis of the face amount of the decree and the decreed purpose(s). He had also ruled that existing major conditional rights should be assumed to be perfected in the amount set forth in the decree. The Court ruled that absolute water rights should be considered only to the extent of historical diversions, not to the maximum amount for the decreed purposes. It also ruled that conditional water rights should not be considered at all for determining water availability.

E. The Second Trial—Union Park II

Judge Brown concluded that the Colorado Supreme Court's rejection of his opinion in Union Park I was so pervasive and fundamental to the outcome of the litigation that a new trial was required. The second trial was preceded by a number of pre-trial orders. The most important of these, for purposes of determining water availability—still the only issue in the second trial—was an order regarding section 620(f) of CRSPA. Section 620(f) states:

> Subject to the provisions of the Colorado River Compact, neither the impounding nor the use of water for the generation of power and energy at the plants of the Colorado River Storage Project shall preclude or impair the appropriation of water for domestic or agricultural purposes pursuant to applicable state law.[194]

This section requires the Bureau to subordinate a call for water for hydroelectric purposes at the Aspinall Unit to domestic or agricultural purposes, defined in the Colorado River Compact, to which reference is made in CRSPA, to include municipal and industrial purposes, stated purposes of the Union Park Project. Judge Brown ruled in Union Park II that the subordination contemplated in section 620(f) has interstate application only. This means that use of water to generate hydroelectric power at the Aspinall Unit is not subordinate to Union Park or for that matter, any domestic or agricultural use within Colorado. This was a very significant holding for this case; it means that Aspinall may call out any junior water rights holders in Colorado to meet its large hydroelectric rights.

The most significant issue in the second trial was whether the 60,000 AFA subordination is available for trans-basin diversion. Arapahoe had conceded at trial that, if it could not rely on the subordination, there was insufficient water available for Union Park, largely because of the magnitude of the Aspinall Unit's water rights. The lion's share of the testimony, as well as of Judge Brown's opinion in the second Union Park trial, address this issue.

Judge Brown held that the subordination is limited to 60,000 AFA, 40,000 AFA of which may be depleted above Blue Mesa, and that the subordination is available to junior users but only for in-basin development. He confirmed his earlier ruling that a contract was essential to use the subordination. And he ruled that restricting the subordination's use to in-basin development did not constitute an unlawful selective subordination.

As in Union Park I, the Judge was confronted with varying sets of estimates of how much water was available. On the basis of legal rulings from Union Park I case that had not been overturned by the Colorado Supreme Court and in light of his resolution of the issues described here, Judge Brown found that there was no more than 15,700 AFA available to the Union Park Project. Given the fact that Arapahoe had conceded in Union Park I that 20,000 AFA was insufficient to assert feasibility of the project, the Judge dismissed Arapahoe's application with prejudice, meaning that Arapahoe may not re-apply for water rights for this project.

The result was ironic. After the Colorado Supreme Court ordered Judge Brown to reconsider the effect of absolute and conditional water, many expected more water to be available. But just the opposite happened. After looking closely at all the evidence (with a new magnifying glass supplied by the Supreme Court), Judge Brown determined that water rights junior to the Aspinall Unit for out-of-basin diversion are left with virtually no water.

Judge Brown also noted that the Aspinall Unit provided a marketable yield of 240,000 AFA that could be purchased by in- or out-of-basin diverters. However, in a post-trial order dated June 18, 1998, he amended his conclusion on marketable yield to be dicta only.[195]

F. Arapahoe's Second Appeal

Arapahoe appealed Judge Brown's opinion in Union Park II to the Colorado Supreme Court. Arapahoe first challenged the opinion on the ground that the Colorado Supreme Court's 1995 opinion should have caused the Water Court to have found more water available than it did in 1991, not less. The Colorado Supreme Court answered this by saying that it did not mandate any particular outcome, and that Judge Brown's finding in Union Park II on water availability was supported by the record. Arapahoe contended that CRSPA, because one of its purposes is to assist Upper Basin states to develop their Colorado River compact apportionments, should allow those who want to divert Gunnison Basin water to do so without regard to Aspinall Unit water rights. The Court denied this claim by holding that:

1. Aspinall's stored water provides Colorado with the ability to satisfy Compact deliveries to downstream states without eroding other water rights decreed for beneficial use in the state.
2. This benefit must be paid for, and is, through the generation for sale of hydroelectric energy generated at Aspinall.
3. The subordination of hydroelectric power uses to other uses in section 620(f) of CRSPA applies only to interstate compact entitlements, as Judge Brown had held, since Congress did not intend to pre-empt state law, which provides the basis, in Aspinall's state decrees, for hydroelectric purposes.
4. Aspinall's water rights for flood control are valid and do not result in a waste of water.
5. Fish, wildlife, and recreational uses of water by Aspinall are valid.
6. The 60,000 AFA subordination is available to in-basin uses only.

These findings clarified that Arapahoe cannot use water that the Aspinall Unit uses under its state decrees.

Arapahoe next contended that the accounting conditions contained in the opinion in Case No. 86-CW-203 do not reflect historic conditions and, thus, should not apply to the determination of water available from the TPR. The Colorado Supreme Court answered this contention by saying that this issue had been resolved against Arapahoe in another case, In re Application for Water Rights of the Upper Gunnison River Water Conservancy District.

The Court also stated that Arapahoe had shown little evidence to prove that the U.S. and the UVWUA would grant Arapahoe the right to use TPR as it had proposed in its application and, thus, Arapahoe had failed to meet its burden under the

"Can and Will" statute to show water availability from TPR. Finally, the Court held that Arapahoe's claim that it could condemn water rights was moot, as there was insufficient unappropriated water available for the project.

The Court discussed the marketable yield of the Aspinall Unit, stating that Arapahoe could purchase water from the United States from the yield even if there is insufficient unappropriated water available for its project. The Court stated that Judge Brown had made a "factual finding" that Aspinall's marketable pool consisted of 240,000 AFA of water available for consumptive use. However, Judge Brown issued a post-trial order indicating that his "finding" was dicta—unnecessary to his ruling in the case and therefore not a "law of the river" for future litigants. The Colorado Supreme Court itself, made no findings or holdings regarding the marketable yield.

G. Conclusion

The Union Park litigation shows that, notwithstanding that the Gunnison delivers 1.8 million AFA to the Colorado River at Grand Junction, there is virtually no unappropriated water available in the basin. The principal reason is the enormous water rights held by the United States for the Aspinall Unit.

Notably, the holdings of Judge Brown and of the Colorado Supreme Court are binding on any applicant for conditional water rights in the basin because water rights proceedings are in rem proceedings, meaning that they apply to anyone, even those not a party to the litigation. Thus, any other applicant for water rights in the basin is bound by the litigation's establishment of the "law of the river" as described above.

Glossary of Terms

Absolute Water Right: a water right that has been put to beneficial use; see also "conditional water right."

Acre-Foot (AF): the volume of water required to cover one acre to a depth of one foot; the equivalent of 326,000 gallons and enough to satisfy the annual water needs of approximately eight people.

Acre Feet Annually (AFA): the volume of water, measured in acre-feet, over the course of a year.

Adjudication: a judicial proceeding in which water rights are decreed priority dates based on their date of first use.

Administration: the act of ensuring that, in times of water shortage, water rights are satisfied in order of their priority; through administration, senior water rights holders are satisfied before water is delivered to junior water rights holders. This activity is overseen by the State Engineer and his subordinate Division Engineers.

Annual Yield: see definition of "Firm Annual Yield."

Appropriation: the application of water from a stream, tributary, or aquifer for beneficial use at a specified rate of flow; appropriations can be for out-of-stream use, in-stream use, or storage; usually evidenced by a water court decree.

Aquifer: an underground deposit of sand, gravel, or rock through which water can pass or is stored. Aquifers can be "confined" (trapped by non-porous layers of rock) or "unconfined" (seepage to adjoining layers possible) and are often the source of water for wells and springs.

Beneficial Use: the application and use of an amount of water that is reasonable and appropriate (e.g., without waste) for human or natural benefit; Colorado's policy is to maximize beneficial use of all of the waters of the State.

Build Out: the estimated extent of residential, commercial, and industrial development in a given geographic area; usually related to upper limit of population to be served by water resource development.

Call: in times of water shortage or scarcity, the exercise of senior water rights that forces curtailment of junior water rights.

Compact: a contract between states, tribes, or other governmental entities that apportions water from a river system crossing jurisdictional boundaries.

Colorado River Compact: a contract between Upper Basin States (New Mexico, Colorado, Wyoming, and Utah) and Lower Basin States (Arizona, Nevada, and California) that apportions water from the Colorado River.

Upper Basin Compact: a contract that apportions Colorado River water among the Upper Basin States.

Conditional Water Right: the legal preservation of a priority date that provides a water user time to develop his or her water right, but reserves a more senior date (the date upon which the holder first manifested an intent to appropriate). A conditional right becomes absolute when water is actually put to a beneficial use.

Conjunctive Use: the combined use of surface water and groundwater to achieve the optimal beneficial use; often used in areas where available water resources have been nearly fully developed and/or appropriated. Conjunctive use involves carefully coordinating the storage, timing and delivery of both resources. Typically, surface water is used to the fullest extent possible when flows are available, while ground water is retained to meet demands when surface flows are low. Benefits of conjunctive use may include: better management capabilities with less waste; greater flood control capabilities; greater control over surface reservoir releases; and more efficient operation of pump plants and other facilities.

Cubic Feet/Second (cfs): a measurement of volume of water passing by a fixed point each second. One cfs is equal to 7.48 gallons per second, 448.8 gallons per minute, and 646,300 gallons per day (equal to 1.98 acre-feet per day).

Decree: an official document issued by a water court which defines the amount, priority, use, and location of a water right. The document serves as a mandate to the State Engineer to administer the water rights involved in accordance with the decree.

Depletion: the amount of water lost to the river system by the exercise of a water right; diversion of a particular water right is often many times greater than its depletion because much of the water diverted later returns to the river, either through surface run-off or underground seepage.

Depletion Allowance: in the Gunnison Basin, the additional amount of water which the Upper Gunnison River Water Conservancy District is entitled to deplete without being "called out" by the Aspinall Unit's 1957 water right.

Diligence: see "Due Diligence."

Ditch: a trench cut into the surface of the ground to transport water from a stream, canal, or storage facility to an actual point of use.

Diversion: removal of water from its natural course or location; or controlling

water in its natural course or location by means of a ditch, canal, flume, reservoir, bypass, pipeline, conduit, well, pump or other device.

Division Engineer: subordinate officers under the State Engineer; Division Engineers perform the functions of the State Engineer—administering water rights—in each of Colorado's seven water divisions. The Gunnison watershed is in Division 4.

Due Diligence: the requirement for holders of conditional water rights to demonstrate to the water court that they are making good faith efforts toward constructing the facilities (e.g., ditch, reservoir, etc.) to apply the water right within a reasonable time. In Colorado, conditional water right holders must show due diligence to the water court every six years.

Effluent: liquid attributed to human waste, i.e., sewage, arising from various uses of water; also often refers to water discharged after use, such as water leaving a wastewater treatment plant or industrial plant.

Exchange: a process by which water rights in one part of a river (or other water supply) system are traded for the use of water rights in another part of the river system.

Firm Annual Yield: The yearly amount of water that can be dependably supplied from the raw water sources of a water supply system.

Fish Ladder: an inclined water channel structure with a series of baffles or weirs that helps fish gain upstream passage around dams. These baffles interrupt and slow the flow of water, simulating pools and rapids. Fish swim up the ladder just as they would swim up natural rapids.

Giga-Watt Hour (GWh): a measurement that represents one thousand million watts used in an hour.

Ground Water: water found below the earth's surface.

Headgate: a human-made structure on a stream, canal, or other water channel through which water is diverted into a ditch or canal.

Headgate Management: see "Administration."

Hydrograph: a graph showing the seasonal flow pattern of a river at a given point along its course; usually measured in cubic feet per second (cfs).

Instream Flows: water left in its natural stream channel to maintain the existing aquatic resources and associated wildlife and riparian habitat. In contrast to out-of-stream uses, this kind of water use does not require diversion.

Lower Colorado River Basin: the Colorado River and its tributaries in

Arizona, Nevada, and California.

Marketable Yield: the amount of water the United States can provide after meeting all other purposes of the Aspinall Unit.

Megawatt Hour: a megawatt hour is 1,000 kilowatts of electricity used continuously for one hour. It is equivalent to the amount of electricity used by about 330 homes during one hour.

Natural Hydrograph: a river hydrograph (see "Hydrograph") representing the natural seasonal flows of a river without the moderating influence of human-created features (dams, canals, etc.); in many western streams, this will often be a bell-shaped curve, with snow-melt causing a peak flow in the spring or early summer months, and lower flow levels throughout the remainder of the year.

Perfection: the process of meeting all of the legal requirements for establishing a legal right to the use of water. Once perfected, a conditional water right becomes an absolute water right.

Prior Appropriation: also called "first in time, first in right," a method (used in many western states) of allocating water between competing users. In times of water scarcity, senior water rights are satisfied ahead of junior water rights. See definitions for "Priority" and "Priority Date." A senior water user who wants to divert water from a surface or underground source of water may force the curtailment of upstream junior use; i.c. See "Call."

Priority: the seniority of a water right as determined by its adjudication date and/or its appropriation date. The priority of a water right determines its ability to divert in relation to other rights in periods of limited supply, i.e., junior water rights defer to more senior water rights.

Priority Date: the date of establishment of a water right. A non-technical term, a "priority date" can be the date of appropriation (when water is first put to use), the date of adjudication (when the court issues a water right decree), or the date when a user first intended to appropriate water (in the case of a conditional decree).

Raw Water: untreated water.

Re-operation: an investigation of the additional water supply or water timing benefits that could result from the revised and more efficient usage of large water storage facilities, with an eye toward improving water supply reliability, environmental benefits, or both.

Re-regulation: in a multi-dam system, regulating the dramatic peak flows generated by upstream dams through the measured release of water from the dam farthest downstream.

Riparian: located or living along or near a river or stream.

River Basin: a physiographic region bounded by a drainage divide; consists of a drainage system comprised of stream and often natural or man-made lakes. See "Watershed."

Second Fill: a legal allowance for a reservoir or other storage right to be re-filled.

Senior Rights: water rights with a relatively early priority date. See "Priority Date."

Storage Right: a water right defined in terms of the volume of the water which may be stored in a reservoir or lake to be released and used at a later time either within the same year or during a subsequent year.

Subordinate: a process through which a senior water rights holder allows junior water rights holder(s) to be satisfied out of priority.

Subordination Agreement: a legal document by which a senior water right agrees to subordinate his water use to a junior right. See "Subordinate."

Transmountain Diversion: the conveyance of water from one drainage basin to another. In Colorado, the term often refers to water being transported over or through the Continental Divide sometimes called "trans-basin diversion."

Tributary: a stream that flows into another stream or body of water.

Unappropriated: water in a river system for which no water rights have been claimed.

Upper Colorado River Basin: the Colorado River and its tributaries in New Mexico, Colorado, Wyoming, and Utah.

Water Court: a state district court that hears matters related to water. To obtain a judicially recognized water right, change in water right, or augmentation plan, persons or entities file applications with a water court to be issued a decree or order. There are seven water courts in the state, one for each water division, corresponding to each major drainage basin.

Water Right: a right to use, in accordance with its priority, a certain portion of the waters of the state for irrigation, power, domestic use or another similar use. See also "Absolute Water Right," "Conditional Water Right," "Appropriation," and "Priority."

Watershed: an area from which water drains to a single stream or river or river system or other body of water. See also "River Basin."

End Notes

1 See Bureau's Operation Plan for Colorado River System Reservoirs (Jan. 8, 2001). The "Upper Gunnison Basin" figure used here is the average inflow above Crystal Dam. It is not "natural flow" and thus reflects current consumptive depletions made above Crystal. In an average year, the entire Gunnison River, down to its confluence with the Colorado, produces an average natural flow of 2,378,700 AF." See Colorado River Compact Water Development Projection - Final Report (hereinafter "Final Report"), prepared by the Endangered Fish Flow and Colorado River Compact Water Development Workgroup (Nov. 2, 1995), at 10. The "natural flow" is the "undepleted and unregulated flow which would have occurred absent the activities of man." Id. at 9. The foregoing report derived these statistics from the Bureau of Reclamation's 1906-1985 Natural Flow Data Base - CRSS. Id. Bureau personnel and USGS data indicate consumptive use in the entire Gunnison basin (including its many tributaries) is about 475,000 AFA.

2 Id.

3 See Upper Gunnison River Water Conservancy District Draft Water Management Plan ("Draft Management Plan") (Jan. 25, 2002), at 3-1, Table 3-1 (based on USGS data).

4 Id.

5 Id.

6 Id.

7 Final Report, at 10.

8 A conditional water right is "a right to perfect a water right with a certain priority upon the completion with reasonable diligence of the appropriation upon which such water right is based." § 37-92-103(6) Colorado Revised Statutes ("C.R.S.").

9 See Colorado Water Division No. 4, Case Nos. 86-CW-226 and 88-CW-178, Findings of Fact, Conclusions of Law, and Judgment & Decree in re: Applications for Water Rights by the Board of County Commissioners for Arapahoe County for the Union Park Project: Phase I on Water Availability (hereinafter "1991 Water Court Opinion") (Oct. 21, 1991), at 32, ¶69.

10 Draft Management Plan, at 3-4, 3-5, 4-19.

11 Id. at 3-3. Although the Draft Management Plan (at 4-19) states average annual diversions are approximately 325,000 AF, more recent operational forecasts by the Bureau of Reclamation and planning studies by the Western Area Power Administration indicate the quantity is closer to 365,000 AF. Correspondence from Ralph E. Clark, III, to the Land and Water Fund of the Rockies (Feb. 21, 2002). The quantity of diversions through the Gunnision Tunnel has grown over the past 30 years. In a dry year diversions through the Gunnison Tunnel have recently been near 430,000 AF and could be more in the future. Id.

12 Draft Management Plan, at 3-4 (citing 1990 re-fill decree).

13 1991 Water Court Opinion, at 33, ¶73.

14 When passed in 1956, Colorado River Storage Project Act ("CRSPA") purposes included:

* Regulating the flow of the Colorado River;
* Storing water for beneficial consumptive use;
* Making it possible for the states of the Upper Basin to utilize the apportionments made to them in the Colorado River Compact and the Upper Colorado River Compact;
* Providing for reclamation of arid and semi-arid lands;
* Controlling floods;
* Generating Hydroelectricity as an incident of the foregoing purposes.

See 43 U.S.C. § 620. Section 620(g) directs the Secretary to operate and maintain CRSPA facilities to mitigate the loss of and improve the conditions for fish and wildlife and to provide recreational facilities.

15 See 43 U.S.C. §§ 1501-1556.

16 See March 30, 1960 decree issued in Case No. 6981 (for rights in former Water District No. 62); January 27, 1961 decree issued in Case No. 5590 (for water rights in former Water District No. 59); December 15, 1961 decree issued in Case No. 5591 (for rights in former Water District No. 28). The District filed for these rights because, at the time, the United States did not recognize the state Water Court's authority to determine federal water rights. See Colorado Water Division No. 4, Case No. 88-CW-178, Findings of Fact, Conclusions of Law, and Judgment & Decree in re: Application for Water Rights by the Board of County Commissioners for Arapahoe County for the Union Park Reservoir Project: Phase I on Water Availability (hereinafter "1998 Water Court Opinion") (April 6, 1998), at 35-36, ¶83.

17 Authorization for the Exchange Agreement came from the 1968 Colorado River Basin Project Act and the Recreation Project Act of 1965. Signatories included the River District, Gunnison District, UVWUA, and the United States.

18 Draft Management Plan, at 4-20.

19 Id. at 2-3.

20 District boundaries include lands adjoining the Gunnison and its tributaries down to Blue Mesa Dam.

21 See Helton & Williamsen, "Engineering to Support Upper Gunnison Plan for Augmentation." (June 1, 2001 DRAFT), at 2 & Table 1. The Helton & Williamson report studied diversions and consumptive use in the Upper Gunnison River Water Conservancy District during the years 1990 to 1997, inclusive. By comparison, the Draft Management Plan found that for the years 1990-2000, diversions averaged 589,000 AFA. See Draft Management Plan at 3-2.

22 Draft Management Plan, Executive Summary, at 2. One local resident notes, however, that irrigated acres reported for property taxation vary but are about one-third less than the 60,000+ acres frequently estimated. Correspondence from Ralph E. Clark, III (Jan. 11, 2002).

23 Draft Management Plan, Executive Summary, at 2-3.

24 Id. at 2.

[25] Many irrigators in the Upper Basin have diversion rights to 1 cfs per 40 acres decreed roughly 100 years ago. These irrigators typically also have diversion rights decreed in the 1940s for an additional 3 cfs/40 acres. Irrigators assert that most of their consumptive water needs are satisfied from the older 1 cfs/40 acres decrees and the more recent 1940s diversions are essential to build up the water table in the fields and to enable the consumptive use of the crop to occur. See Helton & Williamsen, supra; based also on several conversations between the Land and Water Fund and water experts in the basin (August 2001).

[26] The Upper Basin has an average consumptive use of 101,219 AFA and a stream depletion of 102,094 AFA. Assuming roughly 63,000 AF are under irrigation and 668,000 AF are diverted, for each acre, diversions are roughly 10 AF and consumption is about 1.5 AF. Helton & Williamsen, at Table 1. Recent analysis indicates that diversions per acre-feet irrigated may be significantly less.

[27] In 1963, the Commissioner of Reclamation authorized the Bureau's Regional Director in Salt Lake City to execute contracts with in-basin users junior to the Aspinall Unit, permitting the assignment to them of 60,000 AFA of Aspinall unit water. The second Union Park trial court decision 1998, along with the Supreme Court's November 2000 decision that affirmed the trial court, judicially confirmed the subordination. See Board of County Commr's of the Cty. of Arapahoe v. Crystal Creek Homepowners' Ass'n, 14 P.3d 325, 341 (Colo. 2000) ("Union Park II").

On June 1, 2000, the State of Colorado, Bureau, Upper Gunnison District, and the River District renewed a contract first signed in 1995 that outlines procedures to allocate the subordination amounts. The United States renewed its commitment to subordinate to a "depletion allowance"—capping the quantity of water that may be consumed as opposed to diverted—of up to 60,000 AF of new use in the Upper Basin. The Upper Gunnison District and River District agreed to submit annual reports to Bureau listing the names, priority numbers, and diversion and depletion amounts of all diversion or storage facilities that qualify for the depletion allowance.

[28] 2000 Annual Report on Subordination of the Wayne N. Aspinall Unit Water Rights Within the Upper Gunnnison Basin (October 1, 2001), at 3.

[29] See http://cdss.state.co.us (data from March 2002).

[30] See Memorandum of Understanding Regarding Accounting Procedures for Gunnison River Administration (June 1, 2002).

[31] See Colorado Water Control Board ("CWCB"), Gunnison River Fact Sheet, on-line at http://cwcb.state.co.us.

[32] Draft Management Plan, Executive Summary, at 1; see also Gunnison County Chamber of Commerce on-line references at www.ci.gunnison.co.us/community.develop/Demographics/ Demographics.htm (noting that 1998 population of Gunnison County was 13,322).

[33] See CWCB Gunnison Basin Fact Sheet at http://cwcb.state.co.us.

[34] Phone conversation with Mark Schumacher, owner of the Three Rivers Resort in Almont, Colorado (June 28, 2002).

[35] Draft Management Plan at 2-5.

[36] Id.

37 See NPS Draft General Management Plan for Black Canyon National Monument and Curecanti National Recreation Area (1997) (data from 1995).

38 Id.

39 Colorado Revised Statutes ("C.R.S.") § 37-92-102(3) (2002).

40 See www.cwcb.state.co.us/isf/programs/highlights

41 Id.

42 See 1991 Water Court Opinion, at 38, ¶86(c), and at 48, ¶122.

43 C.R.S. § 37-92-102(3), as amended by Senate Bill 156.

44 See 16 U.S.C. § 410fff-9. Curecanti NRA was not established as a recreation area by legislation, but rather by a Memorandum of Agreement between the Secretary of the Interior and the Bureau of Reclamation on Feb. 6, 1965, an agreement based on CRSPA.

45 See 43 U.S.C. §620(g).

46 See 43 U.S.C. §§ 1501-1556; see also the 1965 Federal Water Project Recreation Act, 16 U.S.C. § 460l-12, which requires the Bureau to give full consideration for ways federal dams can afford outdoor recreation and fish and wildlife enhancement.

47 See 16 U.S.C. §662(a), §661.

48 Biological Opinion for the Dolores Project (June 9, 1980), at 4; see also Biological Opinion for the Dallas Creek Project (hereinafter "BiOp") (Nov. 16, 1979), at 7.

49 Dallas Creek BiOp, at 8; Dolores Project BiOp, at 4-5.

50 Letter from FWS Field Supervisor to the Bureau's Regional Director (June 14, 1984). The Dallas Creek and Dolores projects are to provide water for irrigation.

51 1991 Water Court Opinion, at 74, ¶ 210.

52 Id.

53 See id. at 43, ¶ 103 ("for purposes of these cases the flow shall be quantified at 300 c.f.s.").

54 See the National Water Rights Digest's Colorado website at http://www.ridenbaugh.com/nwrd/nwref/co.htm

55 Memorandum of Agreement ("MOA") between Bureau, FWS, and CWCB (Aug. 16, 1995), at 8. This agreement was extended by the signatory parties on June 30, 2000. Note, this flow is separate from and in addition to the 300 cfs minimum flow assumed for the Black Canyon during the Union Park litigation.

56 Telephone conversation with FWS biologist, Chuck McAda (Dec. 11, 2001).

57 See MOA between USFWS Director of the Recovery Program, Director of the Colorado Water Conservation Board, and Area Manager of the Bureau (June 5, 2002).

58 See Western Area Power Administration ("WAPA"), 2000 Operations Summary, at 33 (available on-line at http://www.wapa.gov.media/pdf/2000Ops.Sum.pdf).

59 Id. at 33, 140.

60 The three hydropower plants are part of WAPA's Salt Lake City Integrated Projects. As a collective, the Integrated Projects generated $146 million in revenue in FY 2000 based on 7.63 million MW-hours generated. WAPA 2000 Operations Summary at 140. This translates to $19.14 per Megawatt-hour or $19,140 per Gigawatt-hour. If we assume that the value of energy generated by the Integrated Projects is averaged across the system, the three dams of the Aspinall Unit created roughly $15,675,000 in revenue ($19,140/GW-hour multiplied by 819 GWhours).

61 Union Park II, 14 P.3d at 337; see also 1991 Water Court Opinion, at 29, ¶ 62.

62 Union Park II, 14 P.3d at 338.

63 See §37-61-101, C.R.S., Art. III(a).

64 Id., Art. III(a)(2).

65 This should be distinguished from NECO's interest in the decree in Case Number 82CW340, which supports the smaller project in Union Park described above, which it also conveyed to Arapahoe.

66 An early concept, known as the Gunnison-Arkansas Project ("Gunn-Ark"), was proposed by the Bureau in 1946. The Bureau suggested 835,000 AF could be exported annually from the Gunnison River to the Arkansas River and Rio Grande, with 460,000 AFA to come from the Upper Gunnison River above the City of Gunnison. A later version of the Gunn-Ark Project proposed to build a 400,000 AF reservoir at Almont, as well as enlarging Taylor Park Reservoir to hold 750,000 AF (about seven times its present size), all for export to the Arkansas River. Early configurations of yet another Bureau concept, the Fryingpan-Arkansas Project ("Fry-Ark"), also contemplated a massive trans-mountain diversion from the Gunnison to the Arkansas River. A 1953 report on the Fry-Ark concluded that that 500,000 AFA might be transported from the Gunnison Basin.

67 Draft Management Plan, at 4-32.

68 Union Park II, 14 P.3d at 345-46.

69 Rod Kuharich, director of the CWCB, claims that there is 300,000 AFA in Aspinall "set aside" for consumptive use in Colorado. See Letter from Rod Kuharich to Secretary of Interior Gale Norton (Aug. 20, 2001).

70 Trial Transcript from Union Park I, at 160.

71 Ron Johnston stated: "[I]f Colorado decided to develop its full entitlement [under the Colorado Compact] without marketing any of this water, then the full 240,000 would be required to meet Compact [delivery] requirements during the drought cycle." Id. at 124. During the trial court phase of Union Park II, the Upper Gunnison River Water Conservancy District and Colorado River Conservation District reminded the court that

the pool is "subject to change or even elimination based upon a variety of factors." Motion for Amendment of Findings, May 18, 1998, at 3.

72 At one point in the Union Park I trail, the testimony went as follows:

> Q: Where does that 240,000 acre-feet come from?
>
> A [Mr. Johnston]: It is a number that was developed by Reclamation looking at the amount of water that was available to the Aspinall Unit and subtracting off the historical depletions and the other flow requirements and project purposes, and you end up with a marketable yield in that approximate range.
>
> Q: Just testing my understanding of that, Mr. Johnston. The 240,000 acre-feet is water that's l left over after the other purposes of the Aspinall Unit have been met; is that right?
>
> A: Yeah, that's the amount that could be marketed, yes.

Trial Transcript from Union Park I, at 159-60.

73 The majority of justices in the Supreme Court case California v. United States held that section 8 of the 1902 Reclamation Act (the Bureau's Organic Act) requires the Bureau to conform to state water law, both in when appropriating or purchasing water and in its distribution of water. California v. United States, 438 U.S. 645, 678 (1978).

74 The water rights governed by this decree, issued in Case No. 6981, are those for the Aspinall Unit (formerly called the Curecanti Unit) and are comprised of the storage and direct flow rights for the Blue Mesa, Morrow Point, and Crystal Reservoirs and Power Plants. These water rights are located in the former Water District No. 62, encompassing that portion of the Gunnison River Basin lying generally south of the Gunnison River between the City of Gunnison and the Town of Cimarron, and also including the course of the Gunnison River through the Black Canyon to the boundary between the Counties of Delta and Montrose. See March 30, 1960 Decree in Case No. 6981; see also 1998 Water Court Opinion at 48.

75 The water rights governed by this decree, issued in Case No. 5590, include not only the Curecanti Unit features described in endnote 1, but also the Fruitland Mesa Unit, which is comprised of: Soap Park Reservoir, Soap Park Bench Flume, Crystal Creek Tunnel; the Ohio Creek Unit comprised of: Castleton Reservoir, Ohio Creek Canal, Taylor River Canal; the East River Unit comprised of: East River Canal, Fruitland Highline Canal Enlargement and Extension. These water rights are located in the former Water District 59, encompassing that portion of the Gunnison River Basin lying north and east of the Gunnison River (from a point near the town of Cimarron), and includes the drainages of the East River and the Taylor River. See Jan. 27, 1961 Decree in Case No. 5590; see also 1998 Water Court Opinion at 48.

76 The water rights governed by this decree, issued in Case No. 5591, include those in the Tomichi Unit and the Cochetopa Unit. The Tomichi Unit included four projects: Ohio City Reservoir, Monarch Reservoir, Quartz Creek Canal and South Crookton Canal. The Cochetopa Unit included eight projects: Banana Ranch Reservoir, Flying M Reservoir, Upper Cochetopa Reservoir, Cochetopa Meadows Ditch Enlargement, Cochetopa Canal, Pass Creek Canal, Los Pinos Canal and Stubbs Gulch Canal. These water rights are located in former Water District 28, essentially encompassing the natural drainage of the Tomichi River (the eastern border of which drainage is the Continental Divide). The Tomichi River, after being intersected by its tributary, Cochetopa Creek, joins the Gunnison River near the City of Gunnison. District 28 is bounded on the north by District 59 and on the west by District 62. See December 15, 1961 Decree in Case No. 5591; see also 1998 Water Court Opinion at 48.

[77] See 1998 Water Court Opinion, at 49, ¶86 (emphasis added).

[78] Assignment at 2 (emphasis added).

[79] 1991 Water Court Opinion, at 26, ¶52 (emphasis added).

[80] 1998 Water Court Opinion at 9, ¶14.c.5; id. at 67, ¶121.c.

[81] Motion for Amendment of Findings in Case No. 88CW178 (May 18, 1998) at 3.

[82] Id. at 4.

[83] Crystal Creek's Response to Motion for Amendment of Findings (June 3, 1998) pp. 2-3.

[84] Order Regarding Motion for Amendment of Findings (June 18, 1998) at 2 (emphasis added).

[85] Union Park II, 14 P.3d at 341.

[86] Id. at 342.

[87] Id. at 341-42.

[88] Black's Law Dictionary (6th ed. 1990).

[89] Letter from River District to Secretary Norton (Aug. 15, 2001) at 5.

[90] Tri-State's rights, with a conditional priority date of April 5, 1948, have survived their most recent diligence proceedings, with their next one scheduled for June 2003. See 95CW54 (Civil Action No. 3503).

[91] Draft Management Plan, at 4-16; 1998 Water Court Opinion, at 40, ¶ 92.

[92] Id.

[93] The Uncompahgre Valley Hydroelectric Project has a conditional right to 900 cfs (priority date 1981) for the use of the Gunnison Tunnel for hydroelectric purposes. See 1998 Water Court Opinion at 33, ¶70(c); at 40, ¶91. Arapahoe County also holds a large conditional decree, acquired from the Natural Energy Resources Company (NECO), to store 325,000 AF (priority date 1982) in the proposed Union Park project, above and to the southeast of Taylor Park, and associated direct flow and hydroelectric power generation rights. Because this conditional decree relied upon the now defunct Union Park project, it will be dismissed at its next diligence proceeding.

The AB Lateral Hydroelectric Project holds a conditional right at the Gunnison Tunnel for 235 cfs (priority date 1984). During the irrigation season, these hydroelectric projects would, for the most part, use water already flowing through the Tunnel to meet UVWUA irrigation demand. But during the six months of the year with little or no irrigation, these rights, if developed, would cause significant additional diversions through the Tunnel, dramatically decreasing flows below the Aspinall Unit during the time of year with naturally low flow.

[94] ESA §7(a)(2) requires that all federal agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or

threatened species." ESA, §7(a)(2). To ensure against causing jeopardy to listed species, ESA §7 requires agencies to complete consultation with the U.S. Fish & Wildlife Service (FWS) before proceeding with any action that may adversely affect or jeopardize a listed species. If there is a "may affect" finding by the action agency, the FWS will issue a Biological Opinion on the impact of a proposed action on the species in question. Consultation may result in a determination that the proposed action may not go forward because it would jeopardize the continued existence of a species, or it may lead to a set of "reasonable and prudent alternatives" to the proposed action that will prevent jeopardy to the species.

95 See generally Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (revised version, Mar. 8, 2000), including Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement and Recovery Action Plan (RIPRAP).

96 Id.

97 See NPS Draft General Management Plan for Black Canyon National Monument and Curecanti National Recreation Area (1997).

98 Federal reserved water rights are based on the Property Clause of the federal Constitution. When the federal government reserves land for a federal purpose, it impliedly reserves water needed to accomplish the purpose of the reservation. There is close to a century of Supreme Court precedent recognizing reserved rights for National Park units, Indian Reservations, and wildlife refuges. A federal reserved rights is a unique legal creature, born outside state water law but living its life inside the state prior appropriation system. Federal reserved rights are unique from rights created under state law. They vest on the date of federal reservation and cannot be lost through abandonment or forfeiture. They are entitled to full protection just like any other right inside the state law priority system.

99 Final Report: Colorado River Compact Water Development Projection (hereinafter "1995 Final Report") (Nov. 2, 1995) at 11.

100 Id.

101 1995 Final Report, at 12; 1998 Water Court Opinion, at 13.

102 1995 Final Report, at 12.

103 Id. at 6. The Workgroup's Report did not seek to recommend a specific distribution of future water development to any particular sub-basin. Instead, it proposed a recommended a range of future compact development for each sub-basin.

104 The ad hoc group, called the Endangered Fish Flow and Colorado River Compact Water Development Workgroup, first met in October 1994 and published its final report in November 1995. Id. at 6-7.

105 Id. at 13 and Table 4. The minimum remaining available of 450,000 AF equals lower range of total entitlement (3.079 MAF) minus the maximum estimate of current use (2.6 MAF). The maximum remaining available of 1.5 MAF equals the higher range or total entitlement (3.8 MAF) minus the minimum estimate of current use (2.3 MAF).

106 The lower limit of this range distributes the State's 450,000 AF of remaining apportionment among the seven major sub-basins based on the proportionate share each sub-basin contributes to the natural flow of the Colorado River. For the Gunnison basin, the estimate is 22 percent of 450,000 AF, which equals 99,227 AF. See Final Report at 15, Table 4 (column E), and Table 4 footnotes.

The upper limit was computed by allowing one-half of the remaining compact apportionment (225,213 AF) to occur in each basin except where doing so would exceed the available water supply of the basin. Taking this approach allowed for the uncertainty in assumptions made concerning the "Law of the River" (e.g., whether or not the Upper Colorado Basin states is responsible for delivering half of the 1.5 MAF owed to Mexico) by providing for the total consumptive use of water state-wide to reach 3.855 MAF. Id. at Table 4 (column F), and Table 4 footnotes.

107 Draft Management Plan, p. 4-27, Figure 4.7.

108 Memo from Water Resource Group to All Colorado River Annual Operating Plan (AOP) Recipients (August 6, 2002).

109 Id.

110 Interview with Steve Glazer, member Board of Directors, Upper Gunnison River Water Conservancy District (September 1, 2002).

111 Clean Water Act ("CWA"), 33 U.S.C. §1344.

112 Indeed, nearly all work on nearly all waters of the United States triggers the permit requirement under Section 404. Id.; see generally Oliver A. Houck, Hard Choices: The Analysis of Alternatives Under Section 404 of the Clean Water Act and Similar Environmental Laws, 60 U. COLO. L. REV. 773 (1989).

113 CWA, 33 U.S.C. §1344 (b).

114 Id.

115 CWA, 33 U.S.C. §1344 (c).

116 According to EPA Senior Environmental Engineer Gene Reetz, this section of the Act has been invoked by EPA no more than a dozen times since passage of the Clean Water Act in 1972. Telephone interview with Gene Reetz, Senior Environmental Engineer for EPA, Region 8 (June 28, 2002). See also Daniel F. Luecke, "Two Forks: The Rise and Fall of a Dam," 14 NAT. RES. & ENV'T (from ABA'S ENV'T, ENERGY 2 RES.) 24, 27 (1999) (hereinafter "Two Forks: Rise and Fall").

117 Telephone interview with Gene Reetz, Senior Environmental Engineer for EPA, Region 8 (June 28, 2002).

118 See Alameda Water & Sanitation Dist. v. Reilly, 930 F. Supp. 486, 489 (D. Colo. 1986).

119 Luecke, "Two Forks; Rise and Fall," at 24.

120 In 1931, Denver purchased a right-of-way for a 300,000 AF reservoir on U.S. Forest Service land. For more than 60 years, the Denver Water Board planned to build a dam on this site. Id.

121 Id. at 27.

122 Id.

123 Alameda Water, 930 F. Supp. at 489.

124 Id.

125 Less-damaging alternatives to Two Forks included increasing the storage capacity of several existing reservoirs, as well as the construction of a series of smaller water projects. And EPA believed that other practicable alternatives, such as purchase or lease of irrigation rights, had not even been considered. Telephone interview by Jillian Lloyd with Gene Reetz, Senior Environmental Engineer for EPA, Region 8 (June 28, 2002).

126 Alameda Water, 930 F. Supp. at 489.

127 Id. Judge Matsch granted the defendants' motion for summary judgment and dismissed the case.

128 42 U.S.C. § 4321 et seq.

129 42 U.S.C. § 4332.

130 Id. For a project with fewer potential impacts than a dam, the less-comprehensive analysis of an Environmental Assessment ("EA") might satisfy the requirements of NEPA.

131 The latter is the test under Section 404 (b)(1), as discussed supra.

132 In Two Forks, Section 404 and the EIS happened to be very closely intertwined. However, for a project where an EIS was not required, the Section 404 alternatives analysis would be undertaken independently.

133 See Colorado Land Use Act, C.R.S. § 24-32-111, § 24-65.1-101 *et seq.* and local Gunnison County regulations implementing it.

134 See Michael D. White & Raymond L. Petros, Land Use Legislation: H.B. 1034 and H.B. 1041, 6 Colo. Lawyer 1686 (Oct. 1977), at 1687. The Act defines several "areas" and "activities" that localities may designate as "matters of state interest." It then authorizes localities to design and administer permit programs to control and manage the development of the areas and activities that they choose to designate. See id. at 1697. Notably, the "efficient utilization of [public and private] municipal and industrial water projects" is an activity of state interest under H.B. 1041. See C.R.S. § 24-65.1-204(8).

135 See Gunnison County Regulations for Special Development Projects (hereinafter "Gunnison Regulations"), Dec. 19, 1990 (amended 1994), § 1-105, at 3. According to section 1-104, these regulations are authorized by, inter alia, the following sections of the Colorado Revised Statutes: sections 24-32-111, 24-65.1-101 et seq., 29-20-101 et seq., 30-11-101 et seq., 30-20-101 et seq., 30-28-101 et seq., and 30-30-101 et seq. See Gunnison Regulations at 2.

136 See id., § 1-102, at 1 (setting forth purposes and intent of these regulations).

137 See id., § 1-105, at 3.

138 Id., §§ 4-401 to 4-404, at 22-37. The applicant must also make a payment of fees, and participation in a public conference. Id., §§ 4-301 to 4-307, at 19-22. The application process does not even begin until after an initial payment of $20,000 is made "toward the application fee." The actual application must include not only (a) an extensive litany of information on plans, specifications, schedules, permits, consultation correspondence, "the need for the proposed project in the County," and a technical/financial feasibility report, but also (b) a "comprehensive analysis" of all impacts on surface water, ground water, floodplains,

wetlands, riparian areas, air quality, terrestrial and aquatic vegetation/habitat impacts, threatened or endangered species, soils, geology, and socioeconomic impacts (e.g., recreation, tourism, agriculture, grazing, population, and employment, just to name a few. See id., §§ 4-401 to 4-404, at 22-37.

139 Id. at § 4-33(3), at 20; id. § 4-402(2), at 23.

140 Id., § 5-102, at 45-51.

141 Id., § 5-102(e), (g), and (h).

142 A working definition of "water use efficiency" is: stretching existing, developed water supplies so that they meet a larger portion of the need for water than at present without an appreciable loss of amenity value, i.e. loss of quality of life, and taking into account economic, environmental and social costs. In other words, getting more "bang for the buck" out of water we have already developed.

143 To export water from the Gunnison above Blue Mesa would require an exchange of water in Blue Mesa with water in Taylor Park Reservoir or some other yet-to-be-constructed reservoir. Such an exchange would violate the existing Taylor Park/Aspinall Unit exchange as well as the Bureau's operation of Taylor Park. It would also likely harm both private and CWCB instream flows. Exchanging water from Blue Mesa upstream would require the consent of the Upper Gunnison District, UVWUA, Bureau of Reclamation, state of Colorado and the owners of the intervening private instream flow rights, among others. The likelihood of modifying these existing institutions and obtaining consent from these agencies and others is low, even if copious quantities of money are used to secure these outcomes.

144 Denver Board of Water Commissioners, "Water For Tomorrow, The History, Results, and Projections of the Integrated Resource Plan"("IRP") (July 1997) at 3.

145 The MWSI, initiated by Governor Romer and the Colorado General Assembly in 1993 and conducted by Hydrosphere Resource Consultants explored cooperative solutions to future water needs of the Denver metropolitan area. MWSI's primary focus was supply-side options—conjunctive use, effluent management, interruptible supply arrangements and other system integration opportunities—that would enhance water yields. Metropolitan Water Supply Investigation ("MWSI"), Executive Summary, at vi.

146 Although, in theory, water from the Gunnison might be transported for use in Colorado Springs or Pueblo, these cities already have plans for reliable water supplies that do not include the Gunnison Basin.

Colorado Springs, representing the largest municipal water user in the Southeastern Colorado Water Conservancy District (SECWCD), has enough existing water rights and supplies to satisfy expected demands through 2042. Over the next decade or more, Colorado Springs will construct new storage and delivery systems to utilize its existing Arkansas and Ark-Fry water rights. See Philip Saletta and Edward Easterlin, "Briefing on Cooperative Water Development in the Arkansas River Basin," Colorado Water and Power Development Authority ("Briefing") (June 7, 2002) at 4.

To tackle the problem of adding additional storage and conveyance facilities in the Arkansas basin, the SECWCD has undertaken a district-wide cooperative effort called the Preferred Storage Options Plan. The major infrastructure component of this plan is the Southern Delivery System. From 2001 to 2042, Colorado Springs Utilities in cooperation with Pueblo and other SECWCD members, plan to enlarge Pueblo and Turquoise Reservoirs; construct two new reservoirs at Williams Creek and Jimmy Camp Creek; and establish about 50 miles of a 60-84" pipeline. These amendments to the water supply system are expected to cost $730,000,000 and may yield a total of over 1 million AFA. See Briefing at 32.

The most critical period of development for the Southern Delivery System is between 2001 and 2008 when the joint use pipeline from Pueblo to Colorado Springs is expected to be built, re-operations of Pueblo Reservoir are to take effect and a new water treatment facility is to go online. Once these additions are suc-

cessfully implemented, Southeastern Colorado should have a good deal of confidence in their long-term water supplies and, as a result, no immediate interest in importing water from the Gunnison Basin.

147 MWSI, at ix and 34-35, Table 3, fn. 2. The projected raw water deliveries for "build out" are 834,000 AFA. Id. at 34-35. The "projected future water demand" of 877,000 AFA is higher because it includes, among other adjustments, a 30,000 AF "safety factor" for Denver Water. According to a principal author of MWSI, as of August 2002 projected future raw water deliveries for the metro area are now expected to be 844,000 AFA. Telephone interview with Lee Rozaklis Hydrosphere (Aug. 23, 2002).

148 MWSI, Executive Summary, at ix. "Reasonable certainty" means that this water will be available even in a drought of the magnitude of the severe drought the mid-1950s.

149 Id. at ix & 35.

150 Hydrosphere conducted a survey of the water conservation practices of Aurora, Boulder, Denver Water, and the Centennial Water & Sanitation District. Hydrosphere assumed that the estimated water conservation savings realized to date by Denver Water are representative of the savings being achieved by other suppliers throughout the metropolitan area. Given this assumption, existing and future conservation savings were estimated, based upon current and projected levels of demand. Current water conservation measures in the Denver metro area were said to yield about 97,400 AFA and were projected to have the potential to yield 159,900 AFA at build-out.

151 MWSI, at viii.

152 The opportunities and flexibility available to the South Metro region may be greater and more economically attractive than other regions because of the pumping capacities and wells that already exist.

153 MWSI at 89, and .107, Table 11.

154 Colorado Division of Water Resources, 2001 Annual Report at 2.

155 IRP, supra, Table V-2, at 36.

156 "Water for Tomorrow, an Integrated Resource Plan, Conservation Appendix," Denver Water Department (February 2002) at 2. These estimates are based on Denver's relatively modest plans and may not reflect the cost of more ambitious measures.

157 The 2001 Single-Family Residential Daily per capita Water Consumption chart, is based on responses to a water use survey conducted by the Land and Water Fund of the Rockies' Smart Water Project and uses the local housing occupancies based on the U.S. Census, as described in the table that follows.

City / Water Provider	2000 U.S. Census: Total Population in Detached Single-family Housing Units *a	2000 U.S. Census: Total Single-family Detached Housing Units *a	Average Household Occupancy (people/HH) *b
Boulder, CO	45,258	17,906	2.53
Denver, CO	311,885	119,432	2.61
El Paso, TX	395,546	124,596	3.17
Grand Junction, CO	28,580	11,907	2.40
Mesa, AZ	250,293	85,073	2.94
Phoenix, AZ	852,681	285,575	2.98
Tucson, AZ	269,684	102,023	2.64

Sources and Notes:

(a) 2000 U.S. Census. These data are the totals for the primary incorporated municipality in each water service area. In most cases, the water service areas do not coincide with the urban boundaries and Census zones.

(b) Derived by dividing the Total Single-Family Detached Housing Units by the Total Population in Single-Family Detached Units. Since the water service areas do not directly coincide with the Census zones, these figures do not represent the exact SFR occupancy rate in each water district. They are solely intended to provide a localized, average figure for the primary municipalities served by each particular water district.

158 This report uses Single Family Residential (SFR) use figures as a basis for inter-city comparison. Other studies use "system-wide" use information (total water delivered divided by population in a specific area). System-wide figures encompass water use across many sectors (e.g. residential, commercial, industrial etc.). Because these sectors comprise different proportions of water use in each city, system-wide comparisons offer less reliable comparisons of water use.

159 1997 Denver Water Conservation Master Plan at 4.

160 Nichols, Peter D., Murphy, Megan K., and Kenney, Douglas, S., Water and Growth in Colorado: A Review of Legal and Policy Issues, Natural Resources Law Center, University of Colorado School of Law 27 (2001).

161 Denver Water is the largest water provider in the Denver metro area, delivering water to 1,081,000 municipal users in 2001. It was among the first large providers on the Front Range to embrace water conservation as a dependable resource and, over the past decade, it has implemented a number of conservation programs, starting with universal metering in the 1980s. It is clear, however, that there is room for more aggressive conservation. Denver Water recently commissioned a "Qualitative Review of Water Conservation Programs." The review, published in 2001, assessed the progress Denver Water has made toward its goal of saving 29,000 AF through conservation by the year 2045. The review found several weaknesses in Denver Water's approach that limited conservation success:

- It focused on education rather than incentives.
- Incentives offered were small in proportion to the savings obtained, and were inadequate to motivate user participation.
- Programs were understaffed.

Maddaus et al., "Qualitative Review of Water Conservation Programs" (May 2001) at pp. 1-2.
The Qualitative Review also noted, that for big water users, there is "an inherent inconsistency between an

incentive payment of $2,250 per acre feet for water saved, and a System Development Charge of $9,565 per acre feet for new connection to the system." During the summer of 2002, Denver Water doubled the incentive payments for reductions by large water users, but the repayments are still less than half the hook-up charge for new connections. We think that Denver could do more. And, if Denver could do more, many other metro water providers can do much more.

162 Energy Policy Act of 1992, Public Law 102-486, 106 Stat. 2776, 102d Congress (Oct. 24, 1992).

163 Mayer et al., "Residential End Use of Water," AWWA Research Foundation, at 109 (1999).

164 Vickers, Amy, Handbook of Water Use and Conservation 121 (WaterPlow Press 2001).

165 "Regional Water Conservation Accomplishments, 1990-1998," Seattle Public Utilities and Purveyor Partners; see also Vickers, supra, at 88-94.

166 Id.

167 Arlene Wong, "Promoting Conservation with Irvine Ranch Water District's Ascending Block Rate Structure," in Sustainable Use of Water: California Success Stories (Pacific Institute, 1999), at 27-35.

168 Id. at 31.

169 Id. at 34.

170 Anai Padilla, El Paso Water Conservation Program (April 22, 2002), at 8.

171 Ordinance 6-1-1-1.

172 Vickers, supra, at 169-70, 176.

173 MWSI, at viii.

174 Legally reusable water available to metro Denver can generally come from five sources: (1) water imported to South Platte basin from other river basins; (2) nontributary groundwater from Denver Basin Aquifers; (3) historically consumed portion of water rights changed from one use to another; (4) water diverted under a water right that has been decreed to allow reuse; (5) water diverted under an exchange or plan of augmentation that has reusable water as its supply source. See MWSI, at 68.

175 See www.denverwater.org

176 MWSI, at 85.

177 Vickers at 150 (citing "Drought Has North Carolina Residents Thinking Twice About Water Reuse," U.S. Water News, vol. 17, no. 8 (August 2000) at 21.

178 MWSI, at 70.

179 The Douglas County Water Resource Authority members, for example, are currently about 90% reliant on groundwater from the Denver Basin Aquifer.

[180] The Denver Basin Aquifer system consists of the Dawson (upper and lower), Denver, Arapahoe (upper and lower), and Laramie-Fox Hills aquifers. The aquifers underlie an area of about 6,700 square miles extending from Colorado Springs on the south to Greeley on the north, and from the foothills on the west to Limon on the east.

[181] MWSI, Table 2, at 30.

[182] Simpson and Lile, "Denver Basin Technical Study," at 2. All groundwater in the four Denver Basin aquifers is governed by detailed statutory rules found at C.R.S. § 37-90-137(9)(c). If water is "non-tributary," groundwater permits allow pumping at such a rate that would not deplete the water underlying the land owned by the applicant in less than 100 years. Withdrawing water that is not "non-tributary" requires a plan for augmentation.

[183] Simpson and Lile, "Denver Basin Technical Study," at 2.

[184] There is evidence, related to increasing urbanization, that the need to rely on groundwater may not grow proportionately with population. Urbanization of the region is increasing impermeable surfaces all along the Front Range of Colorado, leading to increased stream flows from which water might be withdrawn in lieu of groundwater withdrawals.

[185] MWSI, at viii. The South Metro Conjunctive Use and Interruptible Supply Project may include: constructing an unlimited capacity pipeline connecting DCWRA members to Denver Water's Conduit 26; building a 12,000 AF peaking reservoir in Douglas county; and streamlining the operation of Denver's biggest reservoirs. MWSI, at 55.

[186] Hypothetically, DCWRA would contract to receive surface water or reclaimed wastewater (in the form of exchanges or physical non-potable or potable effluent) from Denver Water or Aurora and be required to reuse it to extinction, enacting a multiplier effect on any new sources utilized.

[187] MWSI, at 103.

[188] Id. at ix.

[189] Id. at 89, 107 table 11.

[190] Id. at 109.

[191] Id. at 132.

[192] This should be distinguished from NECO's interest in the decree in Case Number 82CW340, which supports the smaller project in Union Park described above, which it also conveyed to Arapahoe.

[193] See C.R.S. § 37-92-305(9)(b).

[194] See 43 U.S.C. § 620(f).

[195] Legal "dicta" are matters side notes made by a judge or panel of judges that are not necessary to the determination of issues then being considered. Dicta is not "binding" legal precedent on litigants in later cases, i.e., it is not "law of the river."

Notes

Notes

"This report shows that we on the Front Range have better choices than draining the Gunnison Valley to fuel our growth. After all, we're citizens of the whole state who share in the treasures of the West Slope when we visit to fish, ski, boat, hike, camp - or even dream of the next time we will. We expect to see the Gunnison and the Taylor flowing free, surrounded by pastoral landscapes that support Colorado's ranching heritage and vibrant ecosystems. With smaller lawns, good land use, and modern plumbing here, we can grow wisely and leave the Gunnison alone."

—**David Getches,** University of Colorado Law Professor and formerly Executive Director, Colorado Department of Natural Resources.

"This is a thorough, credible discussion of the dynamics and legal framework of the Gunnison River. A "must read" for those thinking the waters of the Gunnison are an easy fix to Front Range water needs. The report shows why the Front Range would be well-advised to find solutions to its water problems in its own back yard."

—**Ken Spann,** Rancher, Spann Ranches, Almont, Colorado

"Diverting water to the Front Range would jeopardize the ecological health of our rivers and the life they support. Denver must use every option in its own basin first, and this report shows how it can be done."

—**Steve Glazer,** Board Member of the Upper Gunnison River Water Conservancy Distrct and Water Program Director, High Country Citizens' Alliance.

The Land and Water Fund of the Rockies

photo by Jeff Widen