
3. Overview of Each Basin

Introduction

This chapter examines the river basins in the context of the larger river systems that they comprise. While we are one state, each river basin is unique. An understanding and recognition of each basin's particular landscape, historical context, and current issues provide the necessary basis to explore Colorado's complete water picture.

The following descriptions were provided by basin residents. Members of the basin roundtables and the Colorado Water Conservation Board (CWCB) members reviewed and updated these descriptions, working from the Statewide Water Supply Initiative report released by the CWCB in 2011. Basin descriptions, concerns, and challenges have been updated with this most recent request for feedback.

Basin Descriptions and Challenges

Arkansas Basin

Basin Description: The Arkansas River begins in the central mountains of the state near Leadville, at an elevation of more than 14,000 feet. The river travels eastward through the southeastern part of Colorado toward the Kansas border, dropping more than 10,000 feet to an elevation of 3340 feet at the Colorado-Kansas line. Several tributaries flow from the high southern mountains toward the mainstem of the Arkansas, and drainage from the higher plains to the north also contributes to the flows. The Arkansas River Basin is spatially the largest river basin in Colorado, covering slightly less than 1/3 of the state's land area (28,268 square miles or 27 percent of the state's total surface area).

Grassland and forest cover approximately 67 percent and 13 percent of the basin, respectively. More than 20 percent of the land is publicly owned. A large amount of the grassland is devoted to agriculture with 1/3 of agricultural lands requiring irrigation. Increasing urbanization is occurring throughout portions of the Arkansas River Basin. Over the last few years, persistent drought has affected the basin heavily.

The Arkansas River Compact of 1948 apportions the waters of the Arkansas River between Colorado and Kansas, while providing for the operation of John Martin Reservoir. The compact is "not intended to impede or prevent future beneficial development... as well as the improved or prolonged functioning of existing works: Provided, that the waters of the Arkansas river... shall not be materially depleted in usable quantity or availability..."¹ The primary tool for administering the Arkansas River Compact is the 1980 Operating Principles, which provide for storage accounts in John Martin Reservoir and the release of water from those accounts for Colorado and Kansas water users.

Colorado and Kansas have litigated claims concerning Arkansas River water since the early 20th century, which led to the negotiation of the Compact. In 1995, Colorado was found to have depleted stateline flows in violation of the Compact through the use of tributary groundwater. As a result, the Colorado State Engineer developed well-administration rules to bring Colorado into compliance with the compact, and Colorado compensated Kansas for damage claims (about \$34 million). Recently, the Colorado State Engineer developed irrigation-efficiency rules, which require augmentation for any upgrades to water delivery systems, such as drip irrigation or sprinkler systems.



Arkansas River

Basin Challenges: The Arkansas Basin will face several key concerns and challenges pertaining to water management issues and needs over the next 40 years, which are identified as follows:

- Arkansas River Compact requirements, existing uses, and water rights result in little-to-no water availability for new uses. All new uses, and many irrigation efficiency improvements, require augmentation.
- Growth in the headwaters region will present challenges to securing augmentation water for new demands.
- Concerns over agricultural transfers and the effects on rural economies are substantial in the lower portion of the basin downstream of Pueblo Reservoir.
- Recreational in-channel diversions or water rights for recreation will have an influence on the development of augmentation plans for agricultural transfers. The Arkansas River has been called the most rafted river in the world, but those recreational flows could be threatened unless there is continued, thoughtful collaboration on water resources.
- Concerns over water quality and suitable drinking water exist in the lower basin.
- Possible federal listing of the Arkansas darter fish as a threatened or endangered species could affect water management in the basin.
- Replacement of existing municipal supplies, plus growth in urban areas will result in an increase in the demand for municipal water supplies.

Specific projects and methods identified for meeting the future water needs of the Arkansas Basin are identified in the Arkansas Basin Implementation Plan (BIP).

Basins of the Colorado River System

The Colorado River system (including tributary basins) drains more than 1/3 of the state's area. Originating in the north central mountains, the main stem of the Colorado River flows southwesterly and is met at Grand Junction by the Gunnison River before flowing west into Utah. The Yampa River and the White River move westward across the northwest quadrant of the state to the Utah border where they join the Green River, another tributary of the Colorado. The San Miguel River and the Dolores River begin near the southwestern corner of Colorado and travel north along

the western border into Utah. The San Juan River and its tributaries collect the water in the southernmost regions west of the Continental Divide and flow into New Mexico.

Less than 20 percent of the entire Colorado River Basin lies inside Colorado; however, approximately 75 percent of the water in the entire river basin originates in the state. In the State of Colorado, transbasin diversions account for approximately 5 percent of the total water supply, or approximately 500,000 acre-feet per year. Most of these transbasin diversions move water from west to east, supplying water to the Front Range.

Mainstem Colorado River Basin

Basin Description: The Colorado River Basin in Colorado encompasses approximately 9830 square miles. Elevations in the basin range from greater than 14,000 feet in the headwaters areas, to about 4300 feet at the Colorado-Utah state line. The basin's mountainous upper reaches gradually give way to a series of canyons and gentler terrain, as the river flows along the Interstate 70 corridor toward Grand Junction and the Utah border.



Colorado River

Snowpack in the elevations above 9000 feet is an important water source for human use on both sides of the Continental Divide in Colorado. This water is also important for compliance with legal obligations: as much as 70 percent of the river flows out of state.

A substantial portion of the basin is composed of federally-owned land. Rangeland and forest are the predominant landscapes in the Upper Colorado River Basin (about 85 percent). Livestock grazing, recreation, timber harvesting, and gas drilling are the leading uses of the federal lands. Active and inactive mines can also be found within the basin.

Basin Challenges: The Colorado River Basin will face several key challenges pertaining to water management issues and supply needs over the next 40 years, some of which are as follows:

- Recreational use and the environment are major drivers in the basin and are important for economic health and quality of life. There is some concern that many of these areas are vulnerable for various reasons, including competition with other water needs.
- Agriculture is important in the basin, especially in the lower basin (Grand Valley). Despite its importance, agricultural lands continue to be urbanized as communities expand, which could affect 20 percent of irrigated lands in the basin.
- The success of the Upper Colorado River Endangered Fish Recovery Program is vital to the future of the river. The program is designed to address the recovery needs of the endangered fish in the Colorado River while protecting existing water uses and allowing for the future use of Colorado River water in compliance with interstate compacts, treaties, and applicable federal and state law.

- There is concern over a potential compact shortage during severe and sustained drought and the potential effects to in-basin supplies.
- The development of water rights associated with transbasin projects are a concern, and their effect on in-basin supplies must be considered.
- Water quality is a concern, particularly related to selenium and salinity issues.

Gunnison River Basin

Basin Description: The Gunnison River Basin stretches more than 8000 square miles of western Colorado, extending from the Continental Divide to the confluence of the Gunnison and Colorado Rivers near Grand Junction. The Gunnison River Basin is defined by the Elk Range to the north, the Sawatch Range to the east, the San Juan Mountains to the south, and the Uncompahgre Plateau to the southwest. Water traveling from the headwaters to Grand Junction experiences more than 9500 feet of elevation change.

The Gunnison River Basin is largely forested. Forest area is distributed throughout the basin and covers approximately 52 percent of the total basin area. About 5.5 percent of the land in the basin is classified as planted/cultivated land and is primarily concentrated in the Uncompahgre River Valley between Montrose and Delta, with additional pockets near Gunnison and Hotchkiss.



Gunnison River

Basin Challenges: Several water-management issues have been identified that will present challenges to Gunnison River Basin water users over the next 40 years. They include:

- Growth in the headwaters region will require additional water-management strategies.
- Addressing agricultural water shortages in the upper portion of the basin is an important goal of the community; lack of financial resources is an impediment.
- There is concern over possible future transbasin diversions and the potential effect this might have on existing uses within the basin.
- The area between Ouray and Montrose is rapidly growing. Tourism is important in the headwaters areas, but agriculture is dominant in the Uncompahgre Valley. A rapid influx of retirees and growth in the Uncompahgre Valley may dramatically change the agricultural uses and other land uses in the area.

Yampa River, White River, and Green River Basins

Basin Description: The Yampa River, White River, and Green River Basins cover roughly 10,500 square miles in northwest Colorado and south-central Wyoming. The basin is defined, in part, by the Continental Divide on the east. The elevation in the basin ranges from 12,200 feet (Mount Zirkel) in the Park Range, to about 5100 feet at the confluence of the Yampa and Green Rivers at Echo Park within Dinosaur National Monument. The basin contains diverse landforms including steep mountain slopes, high plateaus, rolling hills, incised sandstone canyons, and broad alluvial valleys and floodplains.

Large portions of land in the basin are federally-owned. Livestock, grazing, and recreation are the predominant land uses. Near the towns of Craig, Hayden, Steamboat Springs, Yampa, and Meeker, much of the land is dedicated to agricultural use. The mountains are densely covered by forest. The valleys and plateaus are mostly covered by shrubland with some forested areas. The Steamboat Springs area, featuring a destination ski resort, is likely to experience continued and rapid population growth.



Yampa River

Basin Challenges: For the Yampa River, White River, and Green River Basins, key water management issues for the next 40 years include:

- The emerging development of gas and oil shale resources is affecting water demand both for direct production and the associated increase in municipal use.
- Agriculture, tourism, and recreation are vital components of this basin's economy. As the needs of communities and industry grow, competition among sectors could increase.
- Industrial uses, especially power production, are a major water use. Future energy development is less certain.
- While rapidly growing in some areas (Yampa River/Steamboat Springs area), the basin as a whole, is not developing as rapidly as other portions of the state. This has led to concern that the basin will not get a "fair share" of water use afforded to Colorado under the Colorado River Compact in the event of a compact call.
- Implementation of a successful Upper Colorado River Endangered Fish Recovery Program is vital to ensuring protection of existing and future water uses.
- Agricultural producers in the basin would like to increase the amount of irrigated land by 14,000 to 18,000 acres, but the lack of financial resources is an impediment.

Dolores River, San Juan River, and San Miguel River Basins

Basin Description: The San Juan River, Dolores River, and San Miguel River Basins are located in the southwest corner of Colorado and cover an area of approximately 10,169 square miles. The Upper San Juan River and its tributaries flow through two Native American reservations—the Ute Mountain Ute Reservation and the Southern Ute Indian Reservation, in the southern portion of the basin. What is also known as the Southwest Basin is actually a series of nine sub-basins, eight of which flow out of state before they join the San Juan River in New Mexico or the Colorado River in Utah. The water history of the Southwest Basin has been



Dolores River

shaped by the Colorado River Compact issues, the Colorado Ute Indian Water Rights Settlement, and several U.S. Bureau of Reclamation (BOR) storage projects.

Basin Challenges: In addition to the three compacts governing water use across the broader Colorado River Basin, there are other compacts, settlements and species issues specific to the San Juan/Dolores/San Miguel region:

- The Colorado Ute Indian Water Rights Settlement Act of 1988 settled the reserved water right claims of the Southern Ute and Ute Mountain Ute Tribes concerning quantity, priority, and administration on all streams that cross the reservations of the two tribes.
- The Dolores Project was integral to the Ute Mountain Ute portion of the Indian Water Rights Settlement. Construction of the Dolores Project was allowed to proceed in 1977, by order of the Secretary of Interior, because it provided potable water for the first time to the Ute Mountain Ute community of Towaoc and irrigation water for a highly productive 7600 acre Tribal farm in exchange for subordinating senior Tribal water rights claims that could have dried up the Mancos River Valley.
- Tribal water allocations out of the Animas-La Plata Project component of the settlement provided the Tribes with a municipal and industrial (M&I) water source to supply and augment future depletions of the San Juan River system that are constrained by the San Juan Recovery Program for Endangered Native Fish. The Animas-La Plata Project also provided the City of Durango and surrounding areas with a long term M&I supply.
- The Southwest Basin includes numerous instream flow segments. Instream flows have served as a tool to balance valued agricultural uses with in-stream water to support recreational and environmental values, all of which combine to support the economic and aesthetic values that drive settlement and commerce in the Southwest Basin.
- Land in the Southwest Basin is extensively owned by the U.S. Forest Service (USFS) and Bureau of Land Management (BLM). Most Southwest Basin headwaters originate on federal land. These federal agencies have worked with the CWCB Instream Flow Program to secure substantial flow protection at high elevations throughout the basin. As stream flow protections have increasingly focused on lower elevation streams that are below stored water and communities, instream flow appropriations have become more complex and challenging.

Agriculture and ranching prevail in the lower elevations of La Plata, Montezuma, Dolores, San Miguel, and Montrose Counties as they have for many generations. Tourism and recreation have become more established in the region as the Animas, Piedra, Dolores, and San Miguel Rivers offer both fishing and rafting opportunities along with flat water recreation on the region's many reservoirs.

This multiple-basin area of the state is extremely diverse and is experiencing changing demographics:

- The Pagosa Springs-Bayfield-Durango corridor is rapidly growing while experiencing areas of localized water shortages. This area is transitioning from oil and gas, mining and agricultural use to tourism, recreation, and a retirement or second-home area.

- The Cortez and Dove Creek area remains strongly agricultural, supplemented by energy production, but it is also seeing growth with an increase of retirees moving to the area.
- The San Miguel area is a mix of recreation and tourism along with a strong desire to maintain agriculture in the western part of the county.

Overall, water supply is available in the Southwest Basin as a result of numerous storage projects built primarily to supply irrigation water. Several of these storage projects have been able to allocate or carve out small amounts of M&I water to supply domestic growth. Resulting revenues from M&I sales are being re-invested in delivery system efficiencies that will yield the water necessary to meet future M&I needs without diminishing agricultural deliveries. The remaining challenge is the development of sufficient infrastructure to get M&I water to where it is needed. There is also a need for new storage to meet long-term supply needs in the Pagosa Springs area, as well as in Montrose County.

The Southwest Basin Roundtable takes very seriously the need to reconcile a strong commitment to maintaining a balance between a vibrant agricultural sector and healthy streams to support environmental and recreational values. In keeping with this philosophy the Southwest Basin is organizing Identified Projects and Processes (IPPs) by sub-basin with one IPP list that addresses agricultural, municipal, industrial, environmental and recreational values and needs. This approach is intended to reveal opportunities for multi-benefit projects to address water supply gaps.

South Platte River Basin

Basin Description: The South Platte River Basin is the most populous basin in the state. Per Statewide Water Supply Initiative 2010, the South Platte Basin population is expected to nearly double from about 3.5 million people to 6 million people by 2050. Approximately 85 percent of Colorado's population resides in the South Platte Basin, and the Front Range area of the basin is Colorado's economic and social engine. The South Platte River Basin also has the greatest concentration of irrigated agricultural lands in Colorado.

The topographic characteristics of the South Platte River Basin are diverse. Its waters originate in the mountain streams along the Continental Divide in the northern portion of the Front Range. The river emerges from the mountains southwest of Denver and travels north through the Denver area where numerous tributaries such as Cherry Creek, Clear Creek, Coal Creek, Boulder Creek, St. Vrain Creek, the Big Thompson River, and the Cache La Poudre River join the South Platte; then cross northeast across the High Plains. The western portions of the basin and its montane and subalpine areas are mostly forested, while the High Plains region is mainly grassland and planted/cultivated land. Approximately one-third of the South Platte Basin land area is publicly owned, with most of these lands in the forested mountains. The South Platte River crosses the



South Platte River

Colorado-Nebraska state line near Julesburg and merges with the North Platte River in southwestern Nebraska to form the Platte River.

The hydrology of the South Platte Basin is highly variable, with an approximate average annual native flow volume of 1.4 million acre-feet. Water supply in the South Platte Basin is supplemented by about 400,000 acre feet of transbasin diversions from the Colorado River Basin and by approximately 100,000 acre feet from the Arkansas, North Platte and Laramie River Basins. In addition, more than 30,000 acre feet are pumped from nontributary groundwater aquifers to supplement supplies. Yet surface water diversions in the South Platte Basin average about 4 million acre-feet annually, with an additional average annual 500,000 acre-feet of groundwater withdrawals. The amount of diversion in excess of native flow highlights the return flow-dependent nature of the basin's hydrology, and the basin-wide efficient use and reuse of water supplies. On average, only 400,000 acre feet of water leaves the basin.

The South Platte River Compact of 1923 establishes a legal framework within which the water of the South Platte River is allocated to water users in both Colorado and Nebraska. Specifically, the Compact requires the Colorado State Engineer to curtail diversions east of the Washington County line that are junior to June 14, 1897 when flow in the river is less than 120 cubic feet per second from April 1 through October 15.

The Platte River Recovery Implementation Program (PRRIP) and the Upper Colorado River Endangered Fish Recovery Program provide limited Endangered Species Act (ESA) coverage for program participants. Participation in these programs protects existing uses and allows continued water development.

Basin Challenges: The South Platte Basin is Colorado's most economically diverse basin. Urban sector businesses and industries within the South Platte Basin provide for most of the state's overall economy, and agricultural production is the highest among basins across Colorado. The basin also supports a wide range of ecological systems and important water-dependent ecological and recreational attributes. Coloradans and tourists regularly take advantage of the South Platte's recreational opportunities provided by the basin's many environmental features. Willing water transfers from the agricultural sector to the M&I sector have proven reliable, though viewed as unsustainable if the South Platte, and the State of Colorado, are to continue to have a high quality of life and diverse economy, as the population continues to grow. The challenge of preserving the M&I, agricultural, and recreational economies, as well as preserving the basin's environmental features, makes water management in the South Platte Basin especially complex. These complexities include:

- Agriculture is the dominant water use in the basin, accounting for 85 percent of total water diversions. Conversion of agricultural water to M&I uses (agricultural transfers) will continue to be an important option for meeting future M&I needs, especially in those areas where agricultural land will be urbanized. These agricultural transfers are likely to have negative effects on rural communities, open spaces, wetlands and recreation areas that are tied to irrigated lands. Loss of irrigated agricultural lands will negatively affect the local economy and the state's economy, as well as the state's food security.
- Competition for additional M&I water supplies is substantial, and in some cases, multiple M&I suppliers have identified the same water supplies as future water sources. Competition

increases the costs to M&I customers, and competition for the same water supplies could result in some M&I suppliers lacking enough water in the future.

- A substantial amount of the basin's water supply originates in the Colorado River Basin. As such, compliance with the Colorado River Compact, and avoiding a compact curtailment, is critical to the South Platte Basin.
- The lack of new major water storage in recent decades (aside from the recent construction of Reuter-Hess Reservoir) has led to reliance on nonrenewable groundwater in Douglas and Arapahoe Counties. Strong economic and population growth in these counties, coupled with the lack of surface water supplies, led the need to develop renewable surface water supplies and additional water storage for the South Metro area.
- Conjunctive use of surface water and alluvial groundwater, as well as use of alluvial aquifers for storage, offer opportunities to expand sustainable water use. Aquifer storage is generally considered to have fewer environmental effects, and water stored in alluvial aquifers is not subject to evaporation losses. Aquifer storage poses control and administrative issues that will need to be addressed to ensure that other water rights are not injured.
- Water quality will continue to be a challenge as more water is diverted for use, and point and non-point sources discharge to the basin's waters. Salt content of soil and water in the South Platte River valley, and sedimentation/erosion in parts of the basin, are likely to continue to increase over time, which will negatively affect the ability to use this water for agricultural and M&I purposes. Technological solutions are expensive and non-sustainable because of high energy demands and issues associated with disposal of concentrated treatment residuals.
- The South Platte Basin is leading the state on M&I water use efficiency. Efficient use of the basin's resources, through water reuse and conservation, is a critical component to meet future water needs. Nevertheless, increased M&I water-use efficiency will reduce the quantity of water availability for agriculture, ecological resources, and other uses because M&I return flows will be diminished.
- The urban environment is an important component of the quality of life for many South Platte Basin residents. Judgments about the value of the urban environment, including the need to provide water for irrigated landscape, make discussions about water supply-development needs all the more difficult. The environmental and recreational features within the basin, including amenities such as mountain streams and rivers used for fishing and rafting, city green ways, flatwater reservoirs, wetlands and open space, are all extremely important to Colorado's tourism economy and quality of life for its residents.

Specific projects and methods identified for meeting the future water needs of the South Platte Basin are identified in the joint BIP, completed with the Metro Basin Roundtable.

Republican River Basin

Basin Description: The Republican River Basin in Colorado is located on the Northeastern High Plains. The headwaters of the North Fork and South Fork of the Republican River, and the Arikaree River, originate in the northeastern High Plains of Colorado near Wray, Cope, and Seibert, respectively. The Republican River is formed by the confluence of the North Fork of the Republican

River and the Arikaree River just north of Haigler, Nebraska, with the South Fork of the Republican joining just southeast of Benkelman, Nebraska. Other major drainages within the Republican River Basin include Frenchman Creek, Beaver Creek, and Red Willow Creek. The Republican River Basin in Colorado encompasses approximately 7760 square miles, which represents 31 percent of the total Republican River Basin located in Colorado, Nebraska, and Kansas.

The topographic characteristics of the Republican River Basin, which are similar to the High Plains region of the South Platte River Basin, consist mainly of grassland and planted/cultivated land. The Republican River Basin in Colorado is underlain by the High Plains or Ogallala aquifer, which is one of the largest water bodies in the United States and extends from South Dakota to Texas.

The Republican River Compact of 1942 apportions the waters of the Republican River Basin among Colorado, Nebraska, and Kansas. The compact defined the Republican Basin, for purposes of the compact, as “all the area in Colorado, Kansas, and Nebraska, which is naturally drained by the Republican River, and its tributaries, to its junction with the Smoky Hill River in Kansas”. It also states that beneficial consumptive use is the basis and principle upon which the allocations made in the compact are predicated.



Republican River

The Compact quantified the average virgin water supply (defined as the water supply that is “undepleted by the activities of man”) originating in the Republican River Basin upstream of the Nebraska-Kansas state line as 478,900 acre-feet per year. Based on this quantification, the Compact dictates allocations for beneficial consumptive use in each state. Colorado was allocated 54,100 acre-feet, which was further allocated as follows: North Fork of the Republican River drainage basin, 10,000 acre-feet; Arikaree River drainage basin, 15,400 acre-feet; South Fork of the Republican River drainage basin, 25,400 acre-feet; and Beaver Creek drainage basin, 3300 acre-feet. In addition, Colorado receives the entire water supply of the Frenchman Creek and Red Willow Creek drainage basins in Colorado.

In 2004, the Republican River Water Conservation District was established for cooperating with and assisting Colorado with compact compliance. The Republican River Water Conservation District recently completed the construction of the Republican River Compliance Pipeline to assist in compact compliance.

Administration of surface water in the Republican River Basin is separate from groundwater administration. The water courts have judicial authority regarding surface water rights, whereas the Colorado Ground Water Commission has regulatory and an adjudicatory authority regarding the management and control of designated groundwater. The Colorado Ground Water Commission is responsible for adjudicating groundwater rights and issuing large-capacity well permits. Much of the groundwater located within the basin has been authorized as being in a designated groundwater basin. The Colorado Groundwater Commission has established eight designated

basins and 13 groundwater management districts within such basins. Groundwater management districts are local districts that have additional administrative authority. Much of the Republican River Basin lies within the Northern High Plains Groundwater Management District.

Basin Challenges: The Republican River Basin will face several key issues and challenges pertaining to water management issues over the next 40 years, which are identified as follows:

- Republican River Compact compliance.
- Depletions to the Ogallala Aquifer continue to reduce the amount of readily available water supplies for the agricultural economy in the basin; in some cases presenting a feasibility issue of providing adequate water supplies for crop irrigation or in some cases no water supply.
- Continued detailed coordination and communication among multiple water rights and administrative authorities (e.g. Colorado Ground Water Commission, Department of Water Resources, Ground Water Management Division, Water Court, among others).

North Platte River Basin

Basin Description: The North Platte River Basin, also known as North Park, is a high altitude valley covering about 2000 square miles in north central Colorado, adjacent to Wyoming. The basin includes all of Jackson County and the small portion of Larimer County that contains the Larimie River watershed.

Both the North Platte and Laramie Rivers flow north into Wyoming, and are subject to use limitations stemming from Supreme Court decrees. Water use in the basin is dominated by irrigated pastures associated with ranching operations, with more than 400 irrigation ditches diverting water from the mainstem and the numerous tributary streams throughout the basin. Total irrigated acreage in the basin, based on 2001 estimates, is approximately 116,000 acres. A portion of North Platte water is exported to the Front Range via the Michigan Ditch and Cameron Pass Ditch, which combined divert about 4500 acre-feet per year out of the basin. The basin also contains a major wildlife refuge along with numerous public lands and the recreational opportunities they offer.



North Platte River

Water use in the basin is also governed by the Three State Agreement of the Platte River Recovery Implementation Program, related to endangered species recovery efforts on the Platte River in Central Nebraska. The agreement employs a “one-bucket concept” for the North Platte Basin of Colorado, which currently limits water use in the basin to depletions associated with the irrigation of up to 134,467 acres, while allowing for flexibility in the type of water use.

Basin Challenges: The North Platte River Basin will face several key issues and challenges pertaining to water management over the next 40 years, which include:

- Maintain compliance with the equitable apportionment decrees on the North Platte and Laramie Rivers that quantify the amount of available water and lands that can be irrigated.
- Increase economic development and diversification through strategic water use and development.
- Continue to restore, maintain, and modernize critical water infrastructure to preserve current uses and increase efficiencies.
- Gain knowledge of the basin's consumptive uses and high-altitude crop coefficients.
- Quantify and strategically develop available unappropriated waters within the basin.
- Successfully resolve endangered species issues on the Platte River in Central Nebraska through the Platte River Recovery Implementation Program in a manner that does not put pressure on water users to reduce existing uses.
- Maintain healthy rivers through the strategic implementation of projects that meet prioritized nonconsumptive needs.
- Promote water rights protection and management through improved streamflow gaging data.
- Enhance forest health and management efforts for wildfire protection and beetle kill effects.

Rio Grande Basin

Basin Description: The Colorado portion of the Rio Grande drainage basin is located in south central Colorado and encompasses less than 10 percent of the State's land area (approximately, 7700 square miles). The San Juan Mountains to the west, the Sangre de Cristo range to the north and east, the Culebra range to the southeast, and the Colorado-New Mexico state line to the south define the boundaries of the Rio Grande Basin within Colorado. Between the San Juan Mountains and the Sangre de Cristo Mountains lies the San Luis Valley, a principal feature of the Rio Grande Basin, with an average elevation of 7500 feet, and precipitation of less than eight inches per year.



Rio Grande River

Basinwide, land is evenly divided between public and private ownership. Nevertheless, most of the land in the San Luis Valley is privately owned. The primary use of more than 600,000 acres of irrigated land is for agricultural use in the central portion of the basin, producers in the valley are the second largest provider of fresh potatoes in the United States. Areas in the valley that are not irrigated are mostly classified as shrubland (24 percent) and grassland (31 percent). The San Juan and the Sangre de Cristo mountain ranges are largely forested. The northern one-third of the basin is considered to be a "closed basin" and does not contribute any surface flows to the Rio Grande.

Interstate compacts and international treaties affecting water use in the Rio Grande Basin include the Rio Grande, Colorado, and Tijuana Treaty of 1945 between the U.S. and Mexico, the Rio Grande Compact of 1938, and the Amended Costilla Creek Compact of 1963. In particular, the Rio Grande Compact establishes Colorado's obligations to ensure deliveries of water at the New Mexico state

line and New Mexico's obligation to ensure deliveries of water at Elephant Butte Reservoir, with some allowance for credit and debit accounts. The obligations are calculated based on the amount of flow at indexed stations, which then, as dictated in the compact, determine the amount of flow that must be delivered to the downstream states during that year. The Rio Grande Compact established the Rio Grande Compact Commission to administer the terms of the agreement. The Commission consists of one representative from each state and a non-voting federal representative.

Basin Challenges: The Rio Grande Basin will face several key issues and challenges with water management issues and needs over the next 40 years, such as:

- The Rio Grande Compact and the effects of sustained drought make the objective of sustainability difficult.
- Groundwater use for agriculture is currently at unsustainable levels.
- Economic effects of reducing irrigation use of groundwater supplies will be difficult, but working on community-based solutions offers the best hope of minimizing the effects.
- Residential growth, primarily in the form of second and vacation homes, especially in the South Fork area, is creating a need for additional water supplies.
- Groundwater is a key component of water use in the basin for both M&I and agriculture. Groundwater management presents an ongoing challenge.

Basin Implementation Plan Themes

Throughout the BIP process, roundtables engaged in public outreach, targeted technical outreach with basin entities, and a series of discussions regarding the priorities and values within the respective basins. While the BIPs identify projects and methods by which water supply needs may be met, they also serve as an up-to-date summary of the issues of concern and greater water policy management themes within each basin. In the following section, some of the major themes identified in each draft BIP will be presented, by basin. The goals and measurable outcomes generated by each roundtable are discussed in more detail in Chapter 6, along with projects and methods identified in the respective BIPs. The discussion in this chapter is limited to major themes and points of consideration that guide the work of the BIPs.

Arkansas Basin

A major emphasis of the Arkansas Basin Roundtable was a public outreach program that aspired to reach all corners of the basin. A series of public meetings were held, with information about Colorado's Water Plan and the BIP process presented by roundtable members. In addition to these public meetings, the annual Arkansas River Basin Water Forum served as a point for receiving major input into the BIP.²

The roundtable identified several important points of consideration that underpin the BIP document. These points represent the major challenges and opportunities that the roundtable faces in planning for the water supply future of the Arkansas basin. The roundtable first identified "the interdependence of all water usage types," recognizing the connections among agricultural use, environmental and recreational uses, and the effects of M&I supplies.³ As an importing and exporting basin, the roundtable faces complex hydrology, and the complicated administration of water mandated under the *Kansas v. Colorado* lawsuit. Moving forward, declining levels of

groundwater will represent a major challenge to basin users, in addition to the demand for augmentation water.⁴

The BIP process has also continued the robust discussion regarding conservation within the basin, recognizing the variety of needs and abilities of water providers and municipalities. Another emphasis of the roundtable, coming on the heels of a year in which Colorado saw record wildfires, drought, and floods, was the Watershed Health Working Group, which brought together stakeholders to discuss the ways that agencies and effected parties can collaborate before, during, and after such natural disasters.⁵

During the public outreach process, the roundtable solicited input forms to gather ideas and project or method concepts from basin residents.⁶ As part of the roundtable's organization of basin needs, projects, and methods, a comprehensive database was created. Projects which met a basin Need were categorized as follows within the database:

- All Input List
- Preliminary Needs List
- Master Needs List
- IPP List

These different classifications range from a broader range of total input received to a more rigorous definition of IPP, as defined by the CWCB for the next iteration of the Statewide Water Supply Initiative.⁷ The roundtable also commissioned the creation of a Simplified Water Allocation Model, which demonstrates at a large-scale level water availability and potential future shortages, with an eye to future demands.⁸ The creation of the project database and this high-level model are useful tools for future planning efforts in the basin, as well as evaluation of projects and methods by the roundtable.

Click to review the [Arkansas Basin Implementation Plan](#).

Colorado Basin

In the creation of the BIP, the Colorado Basin Roundtable looked within the basin's boundaries to enumerate the projects and processes by which stakeholders plan to meet future water needs. Interviews were conducted with water providers, and roundtable members were asked to provide information about identified projects or methods.⁹ This process resulted in a comprehensive list of ongoing and planned efforts within the basin: the first aggregation of its kind. Projects and methods, as well as overarching concerns and challenges, were organized by subregion within the BIP.

The roundtable also articulated a set of prevailing basin themes, reflecting the concerns of stakeholders around the basin, as well as roundtable members. Within the Colorado Basin, a major concern is the development of a new transmountain diversion, beyond those addressed within the Colorado River Cooperative Agreement.¹⁰ This theme is driven by concerns regarding the Colorado River Compact, as well as issues of environmental health within the mainstem and tributaries. The

BIP identifies the relationship among various water uses, and the potential negative effects to uses from overdevelopment of the river.

The roundtable identified six themes, which represent the overarching messaging of basin stakeholders, gathered through the public input process and roundtable discussion. The themes are as follows:

1. Protect and restore healthy streams, rivers, lakes, and riparian areas.
2. Sustain agriculture.
3. Secure safe drinking water.
4. Develop local water conscious land use strategies.
5. Assure dependable basin administration.
6. Encourage a high level of basinwide conservation.¹¹

Within each theme, the roundtable identifies potential actions and strategies to accomplish these areas of importance. For example, a Stream Management Plan is suggested as a path forward to achieving the first theme, and major water rights such as the Shoshone Hydroelectric Plant are identified as crucial to meeting the fifth theme.¹²

The BIP is divided into several sections, each focusing on a different subregion within the greater basin. Within each subregion, concerns and challenges were identified, in the greater context of the basinwide themes. Roundtable members went on to take a closer look at identified projects and methods within the subregions, identifying a few representative “Regional Top Projects” which meet basin themes and criteria proposed by subregion stakeholders.¹³ These Top Projects were examined in more detail, with project information sheets providing more information about proponents and the basin needs these projects and methods seek to meet.¹⁴ Looking forward, roundtable members have identified several future actions, such as supporting implementation of stream management plans basinwide, and a modeling effort to gain greater understanding of potential larger-scale hydrologic impacts to the basin.

Click to review the [Colorado Basin Implementation Plan](#).

Gunnison Basin

The Gunnison Basin Roundtable began with one primary goal: “Protect existing water uses in the Gunnison Basin.”¹⁵ From this foundation, the roundtable established eight additional complementary goals and six statewide principles.¹⁶ The roundtable completed targeted technical outreach activities throughout the basin with the goal of identifying ongoing and planned projects and methods. Additionally, the roundtable built upon previous public outreach and education efforts, ensuring that the established goals and principles reflected the concerns of basin citizens and stakeholders.

The roundtable selected projects and methods by highlighting those that met (or reflected the concerns and priorities of) basin goals and further sorted them according to their schedule for implementation. The roundtable then identified those that were “likely feasible by 2025” and represented an “excellent job of meeting basin goals” and classified them as Tier 1 projects.¹⁷ The identified projects and methods are intended to provide solutions to basin water needs, as

enumerated within the BIP: agricultural shortages; M&I needs; and environmental and recreational needs.

The statewide principles identified in the BIP are intended to provide the roundtable's position on interbasin issues in Colorado, for the reference of other roundtables and Colorado's Water Plan. As part of the Colorado River system, the statewide principles include a few points regarding the development of water supply from that system. The Gunnison Basin Roundtable primarily emphasizes the variability of Colorado River supply, as well as the importance of the prior appropriation system to protecting existing uses from adverse effects.¹⁸ Additionally, the statewide principles advocate for local solutions to water needs and the equitable application of conservation strategies.¹⁹

The Gunnison BIP also includes several basin evaluations: hydrologic modeling and mapping of potential projects and methods, as well some case studies in water management.²⁰ This modeling exercise aided an assessment of water availability under current hydrology and legal administration. The major emphasis of this BIP is the identification of projects and methods, and the relationships among these proposed projects and basin goals. To that end, the roundtable recommends a path to implementation that takes under consideration "securing project acceptance and demonstrating project feasibility."²¹

Click to review the [Gunnison Basin Implementation Plan](#).

North Platte Basin

The North Platte Basin Roundtable BIP identified eight basin goals, which reflected the unique water management challenges and values within the basin. The projects and methods identified by this roundtable must operate within two major legal frameworks, as expressed in the basin goals: "Maintain and maximize the consumptive use of water permitted in the Equitable Apportionment Decree and the baseline depletion allowance of the Three State Agreement."²² Within these boundaries, the roundtable goes on to identify further goals, informed by ongoing public outreach and education efforts.

Of primary importance in the North Platte BIP is the maintenance of agricultural uses within the basin. Basin goals reflect this concern, identifying the need to strategically develop water, while maintaining and upgrading existing critical infrastructure. Additionally, the roundtable recognizes the importance of environmental and recreational attributes, analyzing the benefits to these attributes provided by agricultural uses, as well as maintaining healthy rivers and wetlands.²³ The BIP also speaks to statewide issues, advocating for the management of forest health through wildfire and beetle-kill efforts, as well as the "equitable statewide application of municipal water conservation."²⁴

The North Platte Basin Roundtable also used hydrologic modeling and mapping to provide a technical assessment of the effect of projects and methods within the greater basin. Through these basin evaluations, roundtable members were able to gauge the feasibility of particular identified projects and methods and identify situations where implementation of multiple projects or methods would present a challenge.²⁵

The North Platte Basin Roundtable chose to address their basin goals through the identification of projects and methods that meet those identified needs and concerns. In their analysis of projects, the roundtable determines which specific basin goals each project may address, and generally outlines potential challenges to implementation. The roundtable also provides a list of planned environmental and recreational projects, which address specific attributes that the roundtable has identified as important to basin citizens and stakeholders.

Click to review the [North Platte Basin Implementation Plan](#).

Rio Grande Basin

The Rio Grande Basin Implementation Plan provides an in-depth look at the basin's issues and proposed solutions, beginning with a comprehensive overview of the basin itself. The processes for Colorado's Water Plan and the Basin Water Plan are discussed, with an explanation of the Rio Grande Basin's unique challenges and subcommittee approach to BIP development. The basin overview includes an analysis of factors within the basin affecting water management, including geography, the history of development, and legal frameworks such as the Rio Grande Compact and the administration of water rights.²⁶ This overview provides a backdrop for the parts of the plan to follow, and describes the landscape in which the plan intends to establish solutions for water-management challenges.

The plan goes on to define goals and measurable outcomes, which were informed by the public outreach process that the roundtable undertook, as well as by discussions at the roundtable level. The goals seek to address the key attributes of the basin: "a resilient agricultural economy, watershed and ecosystem health, sustainable groundwater resources, the encouragement of projects with multiple benefits, and the preservation of recreational activities."²⁷ The goals and accompanying measurable outcomes are supported by modeling efforts and scenario planning, with the idea of preventing "harm to existing water rights while maximizing Colorado's entitlement under the Rio Grande and Costilla Creek compacts."²⁸ Goals are further explored, by identifying the particular water needs that each goal meets, be it agricultural, M&I, environmental and recreational, or related to water administration.²⁹ The Plan discusses these various needs, analyzes how these needs interrelate, and looks to the future of each sector.

After setting the stage with the basin overview and the goals, which look to the future of the basin, the plan explores solutions. Projects and methods are examined and compared to the list of basin goals. Certain projects, which meet multiple basin goals, are selected for review in a project fact sheet.³⁰ The fact sheet provides a closer look at the project, with information such as project proponent, estimated budget, and an indication of which the basin goals the project meets. The plan also provides an estimate of funding needs for these identified projects and includes a list of projects that meet environmental and recreational information gaps, paving the way for more informed project identification in the future.³¹

After project and method identification, the plan examines the means by which implementation may be possible. First, the outreach and educational efforts of the roundtable are summarized, with a plan for future efforts. Then, strategies for implementation are discussed.³² These strategies include stakeholder involvement, future modeling improvements, and cooperative in-basin water

management efforts.³³ The Rio Grande Plan is intended to remain a living document, with updates and additions by the roundtable providing meaningful input into the water management future of the basin.

Click to review the [Rio Grande Basin Implementation Plan](#).

South Platte Basin (including Metro)

Recognizing the common geography and pertinent issues, the South Platte and Metro Basin Roundtables chose to work together on a BIP. In preparing this BIP, both roundtables seek to provide a reference for other basin roundtables (as well as stakeholders statewide) regarding the challenges and opportunities present in the South Platte Basin. Facing future population growth, a wide variety of needs, and numerous constraints, the roundtables plan to find solutions balancing these various factors. Challenges identified for the water supply future include: limited native supply, groundwater and aquifer administration and management, interstate water commitments, project-permitting concerns, environmental and recreational values, and water quality issues.³⁴

With this host of challenges, the roundtables recognized that solutions must be carefully crafted and selected to maximize benefits and use. To that end, the roundtables have identified three major guidelines for assessing solutions:

1. Minimize adverse impacts to agricultural economies;
2. Develop new multipurpose projects that either offset transfers from agricultural uses or provide additional water to reduce current agricultural shortages;
3. Proactively identify and implement methods to protect and enhance environmental and recreational water uses.³⁵

Additionally, in preparing for future needs, the roundtables have incorporated the “four legs of the stool” approach posed by the IBCC, consisting of: conservation and reuse, IPPs, agricultural transfers, and new Colorado River supplies.³⁶ Specifically, 11 implementation strategies are listed within the BIP. These strategies mostly follow the “four legs of the stool” discussion, focusing on maximum implementation of IPPs, as well as advancing conservation and reuse efforts.³⁷ Other strategies address maximizing native basin supplies, while minimizing traditional buy-and-dry of agricultural lands for municipal supply, through use of alternative transfer methods.³⁸ Regarding transmountain diversions, the roundtable advocates the following action: “Simultaneously advance the consideration and preservation of new Colorado River supply options.”³⁹

The roundtables believe that this suite of strategies is the best approach to meet the varied needs within the basin while addressing the identified challenges presented. Looking to the future, the roundtable evaluated three representative portfolios, each portraying a different vision of future South Platte/Metro supply and demand, to demonstrate the challenges inherent in meeting future needs while maintaining basin values.⁴⁰ The roundtable also identified conceptual projects, for which there is no current project proponent, but the members believed well demonstrated the intent of the basin implementation strategies.

Click to review the [South Platte Basin Implementation Plan](#).

Southwest Basin

Through the BIP process, the Southwest Basin Roundtable sought to address the many complexities of that basin: nine sub-basins, various compacts and treaties, and the disparate interests of stakeholders within that corner of Colorado.⁴¹ Agricultural, M&I, environmental, and recreational needs all play a role in the Southwest landscape, and the roundtable seeks to address them with equal attention through the BIP process.

As a Colorado River system basin, the Southwest Basin Roundtable expresses concern regarding new development from that system as part of a new transmountain diversion.⁴² Compact concerns, as well as potential future needs within the Southwest basin itself, underpin this issue. To this end, the roundtable has set forth seven factors to be considered before development, as well as a commitment to remain involved in statewide discussions on the matter. Interwoven with these transmountain diversion policies is a commitment to higher levels of conservation for water providers receiving any new diversion.⁴³

Interaction between state and federal entities is also identified as a key concern and opportunity by the roundtable. The BIP specifies that “the roundtable encourages and supports creative solutions sought through collaborative efforts” regarding federal policies and actions, as well as the issue of tribal water rights.⁴⁴ Recognizing the importance of environmental and recreational attributes to the basin, the roundtable has placed an emphasis on a greater understanding of the water needs for maintaining these values, identifying two methods to address the need for data and assessment.⁴⁵

The Southwest Basin Roundtable also undertook an ambitious public outreach process, soliciting input from basin stakeholders. From this public outreach and roundtable discussions, the Southwest Basin Roundtable adopted 21 goals and 30 measurable outcomes.⁴⁶ The basin took an aggressive approach to listing new identified projects and processes, identifying 80 new projects and methods through the input process, bring the total list of IPPs for all sub-basins to about 160 proposals for meeting future water needs.⁴⁷

Click to review the [Southwest Basin Implementation Plan](#).

Yampa/White/Green Basin

The Yampa/White/Green Basin Roundtable views the BIP process as an opportunity to articulate stakeholder viewpoints from northwest Colorado, informing ongoing statewide discussions and the Colorado's Water Plan process.⁴⁸ To that end, the roundtable encouraged dialogue at the roundtable level and in the public outreach process to set a vision for the basin moving forward. This basin vision includes an assessment of meeting in-basin future needs at the M&I, agricultural, and environmental and recreational levels. Also, the roundtable examines the Yampa/White/Green Basin's role within Colorado and establishes statements of policy on interbasin and interstate concerns.

Of key concern to the roundtable is the basin's role in the Colorado River system. The roundtable emphasizes the role of the Colorado River Compact and the competing needs of “downstream states, the needs of the urbanized eastern slope of Colorado, and its own in-basin needs.”⁴⁹ The roundtable advocates for an “equitable allocation of native flow in the Yampa, White, and Green

rivers to meet existing and future in-basin water demands including PBO depletion allowances.”⁵⁰ This concept is discussed in more detail in Chapter 8.

The primary goal of the roundtable is to ensure the “maintenance and protection of historical use in the Yampa/White/Green Basin as well as the protection of water supplies for future in-basin demands.”⁵¹ To that end, the roundtable members identified eight primary basin goals.⁵² Within basin goals, the roundtable seeks to address potential shortages and improve the current infrastructure, with an emphasis on water quality and nonconsumptive uses.⁵³

The roundtable integrated ongoing studies into the BIP process, using their 2014 Projects and Methods Study to analyze potential water-supply solutions under various hydrologic scenarios. This study, along with the BIP outreach process, resulted in a list of potential projects and methods within the basin, and an analysis of water availability, with implementation of identified projects and processes and their effect on nonconsumptive values.⁵⁴ Moving forward, the roundtable will continue to refine ongoing studies, seek additional projects and methods, and continue the outreach and education efforts initiated within the basin.⁵⁵

Click to review the [Yampa/White Basin Implementation Plan](#).

Conclusion

As demonstrated in this brief overview, each basin features its own remarkable opportunities and its own distinct challenges that make planning for Colorado’s water future difficult. Solutions will affect not only one basin, but basins throughout Colorado. Though each area is characterized by unique issues and concerns, our water future is connected statewide. Every basin grapples with drought, interstate compacts and agreements, growing populations, important environmental and recreational values, and sustaining agriculture. Because of so many shared interests, we need to continue working together to collectively solve our water-supply gaps, so that the Colorado we value can continue to flourish.

¹ Arkansas River Compact, Art. IV, para D, 1948.

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⁶ WestWater Research, *Arkansas Basin Implementation Plan*.

⁷ WestWater Research, CDM Smith, CH2MHILL, Peak Facilitation, *Arkansas Basin Implementation Plan* Executive Summary.

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⁹ SGM, *Colorado Basin Implementation Plan* (Glenwood Springs: SGM, 2014), 1.

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¹¹ SGM, *Colorado Basin Implementation Plan*, 3-5.

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¹³ SGM, *Colorado Basin Implementation Plan*, 125.

¹⁴ SGM, *Colorado Basin Implementation Plan*, 125.

¹⁵ Wilson Water Group, *Gunnison Basin Implementation Plan* (Denver: Wilson Water Group, 2014) Executive Summary.

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