VOLUME 1 • JANUARY 2022

SOUTHWEST

Basin Implementation Plan

Basin Implementation Plan at a Glance

The Southwest Basins Roundtable (BRT) will continue to provide balanced solutions to address water supply and drought while respecting each unique community, culture, and environment.

KEY ACHIEVEMENTS

A wide variety of projects achieved results that support the Southwest BRT's goals. Water Supply Reserve Fund grants supported:

- Agricultural projects ranging from infrastructure improvements, investing in innovative management practices, measurement stations, and reservoir studies.
- Municipal and industrial projects ranging from water supply studies, waterline extensions and improvements, development of raw water supplies for municipalities, and infrastructure development to previously unserved communities.
- Environmental and recreational projects, including stream management plans and restoration.
- Innovative and multipurpose action-driven projects that support multiple goals in the Southwest Basin.

CHALLENGES

The Southwest Basin has geographic, political, economic, and legal complexities that are complicated by looming, long-standing drought.

Since the early 2000s, persistent drought conditions have led the Southwest Basin to face major challenges of balancing valued agriculture and instream water uses while also supporting economic and aesthetic values. Additionally, each tribal reservation and subbasin has distinct community, social, economic, and environmental needs and challenges. The projected water scarcity associated with climate change will compound existing challenges and may affect all water sectors in the future.

OUTREACH STRATEGIES

The Public Education Participation and Outreach workgroup seeks targeted groups, including local community members, urban audiences, and recreational visitors, to communicate Southwest Basin values on the importance of agriculture, water management, collaboration among partner agencies, and natural resource stewardship. Key outreach activities include the Southwest BRT website, handbook, social media, and partnering with the Water Information Program.

Photo from Stacy Beaugh

GOALS + OBJECTIVES

The Southwest BRT has

7 GOALS

centered around:

- ✓ **Balance all needs and reduce conflict**
- ✓ **Support the needs of agriculture**
- ✓ **Meet municipal and industrial water needs**
- ✓ **Meet recreational water needs**
- ✓ **Meet environmental water needs**
- ✓ **Promote healthy watersheds**
- ✓ **Manage risk associated with Colorado River Compact**

DEMAND, SUPPLY, POTENTIAL WATER NEEDS

Municipal and Industrial:
The Southwest Basin currently includes about 2 percent of the statewide population, which is projected to grow between 16 percent and 161 percent between 2015 and 2050. The Southwest Basin is projecting the largest percentage increase in population in the state, which would result in increased municipal and industrial demand in all future scenarios. The highest future projected gap is in the Hot Growth scenario.

Agriculture:
The Southwest Basin is home to a diverse set of agricultural demands. Urbanization in the Southwest Basin will likely have a limited impact in the future. Hydrologic scenarios impacted by climate change severely affect agricultural water supplies, but with implementation of efficiencies and innovative technologies these impacts can be reduced.

Water Supply and Storage:
Basinwide storage supplies vary widely and are especially impacted in the Hot Growth scenario. Available flows are projected to diminish, and peak flows could occur earlier in the runoff season under planning scenarios with climate change impacts.

Environment and Recreation:
Along many tributaries in the Southwest Basin, spring runoff peak flows are projected to occur earlier for the climate-impacted scenarios compared to the Baseline, Business as Usual, and Weak Economy scenarios. The risk of detrimental effects to peak-flow-related riparian/wetland plants and fish habitat is currently high and may increase under climate-impacted scenarios. Summer flows are projected to be lower and stream temperatures are projected to be higher, affecting fish habitat. Stream flows throughout the Southwest Basin are not likely to meet environmental and recreational flow needs in many years under climate-impacted scenarios.

STRATEGIC VISION

Southwest BRT created principles to guide their vision for the Basin Implementation Plan

The principles center on:

- **Fostering cooperation and collaboration**
- **Acknowledging legal constructs**
- **Defining their role and regional position**
- **Facing challenges and threats**

Implementing projects is a key strategy for meeting future needs.

FUTURE PROJECTS

$790 million
total estimated costs for project implementation*

148 Total Projects

48 Tier 1 Projects

70 Multi-purpose Projects

67 Projects meet agricultural needs

83 Projects meet environmental and recreational needs

89 Projects meet municipal and industrial needs

** Total cost based on projects that provided cost information. Future basin projects include both consumptive and nonconsumptive projects that span all sectors of water use in the basin and are at various levels of development from conceptual to implementing.*

List of Roundtable Members

The CWCB thanks the members of the Southwest Basins Roundtable for their efforts in updating its Basin Implementation Plan and contributions to the update of the Colorado Water Plan.**

- **Bob Wolff –** *Animas - La Plata Water Conservancy District**
- **Robin Young –** *Archuleta County*
- **Justin Ramsey –** *Archuleta Municipalities*
- **Brandon Johnson –** *At-large Agricultural Representative*
- **Mely Whiting –** *At-large Environmental Representative**
- **Ken Beegles –** *At-large Industrial Representative*
- **Ed Tolen –** *At-large Local Domestic Water Provider Representative**
- **Carolyn Dunmire –** *At-large Recreational Representative**
- **Gigi Richard –** *At-large Representative**
- **Ken Curtis –** *At-large Representative**
- **Bill Frownfelter –** *At-large Representative*
- **Gretchen Rank –** *At-large Representative**
- **Greg Black –** *At-large Representative*
- **Susan Behery –** *Bureau Of Reclamation (Liaison)*
- **Rob Genualdi –** *CO Division Of Water Resources (Liaison)*
- **Peter Barkmann –** *CO Geological Survey (Liaison)*
- **Ryan Unterreiner –** *CO Parks & Wildlife (Liaison)**
- **John Currier –** *CO River Water Conservation District*
- **John Ott –** *CO Water Quality Control Commission*
- **Daniel Fernandez –** *CSU Extension Service (Liaison)*
- **Celene Hawkins –** *CWCB Board (Liaison)*
- **Chadd Dagan –** *Dolores County*
- **Sam Stein –** *CWCB Staff Support*
- **Sonny Frazier –** *Dolores Municipalities*
- **Glen Fish –** *Dolores Water Conservancy District**
- **John Ey –** *Florida Water Conservancy District*
- **Becky Guilliams –** *Hinsdale County*
- **Ellen Roberts –** *La Plata County*
- **Jarrod Biggs –** *La Plata Municipalities*
- **Guy Stees –** *La Plata Water Conservancy District*
- **Steve Harris –** *Legislative Appointment*
- **Gary Kennedy –** *Mancos Water Conservancy District*
- **Val Valentine –** *Mineral County*
- **Phil Johnson –** *Montezuma Municipalities**
- **Keith Caddy –** *Montrose County**
- **Kenny Heldman –** *Montrose Municipalities*
- **Elaine Chick –** *PEPO (Liaison)**
- **Nathan Van Schaik –** *Rocky Mountain Restoration Initiative (Liaison)*
- **Charlie Smith –** *San Juan County*
- **Anthony Edwards –** *San Juan Municipalities*
- **Al Pfister –** *San Juan Conservancy District**
- **April Montgomery –** *San Miguel County*
- **Karen Guglielmone –** *San Miguel Municipalities*
- **Jim Wells –** *San Miguel Water Conservancy District*
- **Kathy Rall –** *Southern Ute Indian Tribe**
- **Steve Wolff –** *Southwestern Water Conservation District*
- **Kara Hellige –** *U.S. Army Corps Of Engineers (Liaison)*
- **Kelly Palmer –** *U.S. Forest Service (Liaison)*
- **Steve Anders –** *U.S. Geological Survey (Liaison)*
- **Peter Ortego –** *Ute Mountain Ute Tribe*

** BIP Subcommittee Members*
***as of July 1, 2021*

Table of Contents

DISCLAIMER

The Analysis and Technical Update to the Colorado Water Plan and the Basin Implementation Plan (BIP) provide technical data and information regarding Colorado's and the basin's water resources. The technical data and information generated are intended to help inform decision making and planning regarding water resources at a statewide or basinwide planning level. The information made available is not intended to replace projections or analyses prepared by local entities for specific project or planning purposes.

The Colorado Water Conservation Board (CWCB) and basin roundtables intend for the Technical Update and the BIP to help promote and facilitate a better understanding of water supply and demand considerations; however, the datasets provided are from a snapshot in time and cannot reflect actual or exact conditions in any given basin or the State at any given time. While the Technical Update and BIP strive to reflect the CWCB's best estimates of future water supply and demands under various scenarios, the reliability of these estimates is affected by the availability and reliability of data and the current capabilities of data evaluation. Moreover, the Technical Update and BIP cannot incorporate the varied and complex legal and policy considerations that may be relevant and applicable to any particular basin or project; therefore, nothing in the Technical Update, BIP, the associated Flow Tool, or Costing Tool is intended for use in any administrative, judicial, or other proceeding to evince or otherwise reflect the State of Colorado's or the CWCB's legal interpretations of state or federal law.

Furthermore, nothing in the Technical Update, BIP, Flow Tool, Costing Tool, or any subsequent reports generated from these datasets is intended to, nor should be construed so as to interpret, diminish, or modify the rights, authorities, or obligations of the State of Colorado or the CWCB under state law, federal law, administrative rule, regulation, guideline, or other administrative provision.

What is the Basin Implementation Plan?

The Basin Implementation Plan (BIP), developed in a collaborative process by basin stakeholders, focuses on the current and future water needs in the Southwest Basin, the vision for how individuals and organizations can meet future needs, and the goals and projects that provide a pathway to success. The initial Southwest BIP was completed in 2015, and this is the first update of that plan.

THE SOUTHWEST BIP CONSISTS OF TWO VOLUMES:	
VOLUME 1:	A summary of the Southwest Basin and its current and future water resources, focusing on goals, projects, and a strategic vision to meet future water needs.
VOLUME 2:	A more detailed description of the nine individual subbasins that comprise the Southwest Basin and their nuances in the form of a web-based story map. Volume 2 includes a comprehensive look at technical update results and project data by subbasin.

Section 1. Basin Overview

The Southwest Basin consists of nine river subbasins, eight of which flow out of the state before they join either the San Juan River in New Mexico or the Colorado River in Utah. The nine subbasins include the San Juan, Piedra, Pine, Animas (including the Florida River), La Plata, Mancos, McElmo Creek, Dolores, and San Miguel Rivers. The Southwest Basin is unique in hydrographic complexity, political diversity, water compacts and treaties, and distinct communities that it encompasses. The Colorado River Compact, the Colorado Ute Indian Water Rights Settlement, and several U.S. Bureau of Reclamation (BOR) storage projects have shaped the water history in the Southwest Basin. Figure 1 shows an overview of the Southwest Basin.

Many communities, agricultural producers, and natural systems depend on the water produced by these subbasins. The Southern Ute Indian Tribe (SUIT) and the Ute Mountain Ute Tribe (UMUT), the only two Tribal Reservations in Colorado, call the Southwest Basin home. Neighboring these tribal lands are nine major counties—Archuleta, La Plata, San Juan, Montezuma, Dolores, San Miguel, and portions of Mineral, Hinsdale, Montrose, and Mesa. Each of these tribal areas and counties represent distinct communities and landscapes, with their own social, economic, and environmental values, challenges, and opportunities.

The Southwest Basin is a region of diverse natural systems, agricultural heritage, outstanding beauty, and extensive recreational opportunities. Many communities within the area rely heavily on the tourism and recreational industries as a primary economic driver. Agriculture and the open spaces it maintains contributes to the culture, economy, and quality of life of the Southwest Basin. Municipal and industrial activities round out the economic and social values and help support the diverse and vibrant communities of the region.

Nine basin roundtables (BRT) were formed as part of the **Colorado Water for the 21st Century Act** in 2005, which states, in part "to facilitate continued discussions within and between basins on water management issues, and to encourage locally driven collaborative solutions to water supply challenges, permanent basin roundtables are hereby created in Colorado's eight water basins and in a demographically unique subregion within Water Division."

Additional characteristics of the Southwest Basin are summarized on the following page.

The Southwest BRT's BIP development brought together leaders from the Southwest to map out their subbasin's future water needs, to engage in facilitated discussion on water issues, and to develop locally driven, collaborative solutions. The BIP gives the Southwest BRT a chance to review how future planning scenarios could affect the watersheds in the Southwest Basin and allows them to set goals, strategies, and support projects that would promote mitigating adverse effects.

AGRICULTURE

- BOR project reservoirs, including McPhee, Jackson Gulch, Lemon, and Vallecito provide a means to develop and store agricultural water for many irrigators in the region. Irrigators that receive water from the BOR projects primarily produce grass and alfalfa.
- Agriculture outside of BOR projects generally produce grass meadows for cattle operations along rivers and tributaries. These irrigators typically rely on supplies available during the runoff season.

WATERSHED

- Remote towns and rural communities set in irrigated valleys surrounded by public lands have shaped the way of life in Southwest Colorado.
- Recreational activities are abundant and diverse. Water-based recreation and tourism are primary economic drivers for many communities in the Southwest Basin including Durango, Telluride, and Pagosa Springs.
- Rivers and streams in the area support a diverse assemblage of native warm- and cold-water fish. The species of highest conservation priority for Southwest Colorado are:
  - Three warm-water fish: roundtail chub, flannelmouth sucker, and bluehead sucker
  - Two cold-water fish: Colorado River Cutthroat Trout, San Juan linage of Cutthroat Trout
- There are four water-dependent species in the Southwest Basin that are listed as threatened and/or endangered by the U.S. Fish and Wildlife Service. These include the New Mexico meadow jumping mouse, southwestern willow flycatcher, yellow-billed cuckoo, and Gunnison sage-grouse.
- The Upper Colorado River Endangered Fish Recovery Program and the San Juan River Basin Recovery Implementation Program provide Endangered Species Act compliance for water projects. These two programs are charged with using adaptive management and other conservation measures to recover four species of endangered Colorado River and San Juan River fishes while allowing water development activities to continue to meet the needs of the people. Of the four species, the Colorado pikeminnow and razorback sucker may be found in the San Juan Basin while the Upper Colorado River Basin is home to these species as well as the bonytail and humpback chub.
- Only two of the nine rivers in the Southwest Basin remain free flowing to the stateline.

MUNICIPAL AND INDUSTRIAL

- Population centers are characterized as many prominent towns surrounded by rural communities.
- Major industries include natural gas, ski resorts, mining, manufacturing, brewing, food processing, and geothermal production, specifically in Pagosa Springs.

COMPACTS, ADMINISTRATION, AND REGULATORY

- All nine subbasins are tributary to the Colorado River and therefore fall under the Colorado River Compact and the Upper Colorado River Basin Compact.
- A treaty and settlement with both SUIT and UMUT pertain to waters within specific subbasins. These settlements have helped shape many projects (e.g. Lake Nighthorse, McPhee Reservoir) in the Southwest Basin. Tribal water rights are further explained in the following subsection.
- The La Plata River Compact apportions La Plata River water between Colorado and New Mexico.
- The San Juan-Chama Project delivers transmountain water from subbasins of the San Juan River in Colorado to the Rio Grande River in New Mexico.
- The Animas-La Plata Project provides diversion and storage of flows for use by UMUT, SUIT, Navajo Nation, and municipalities in both Colorado and New Mexico.

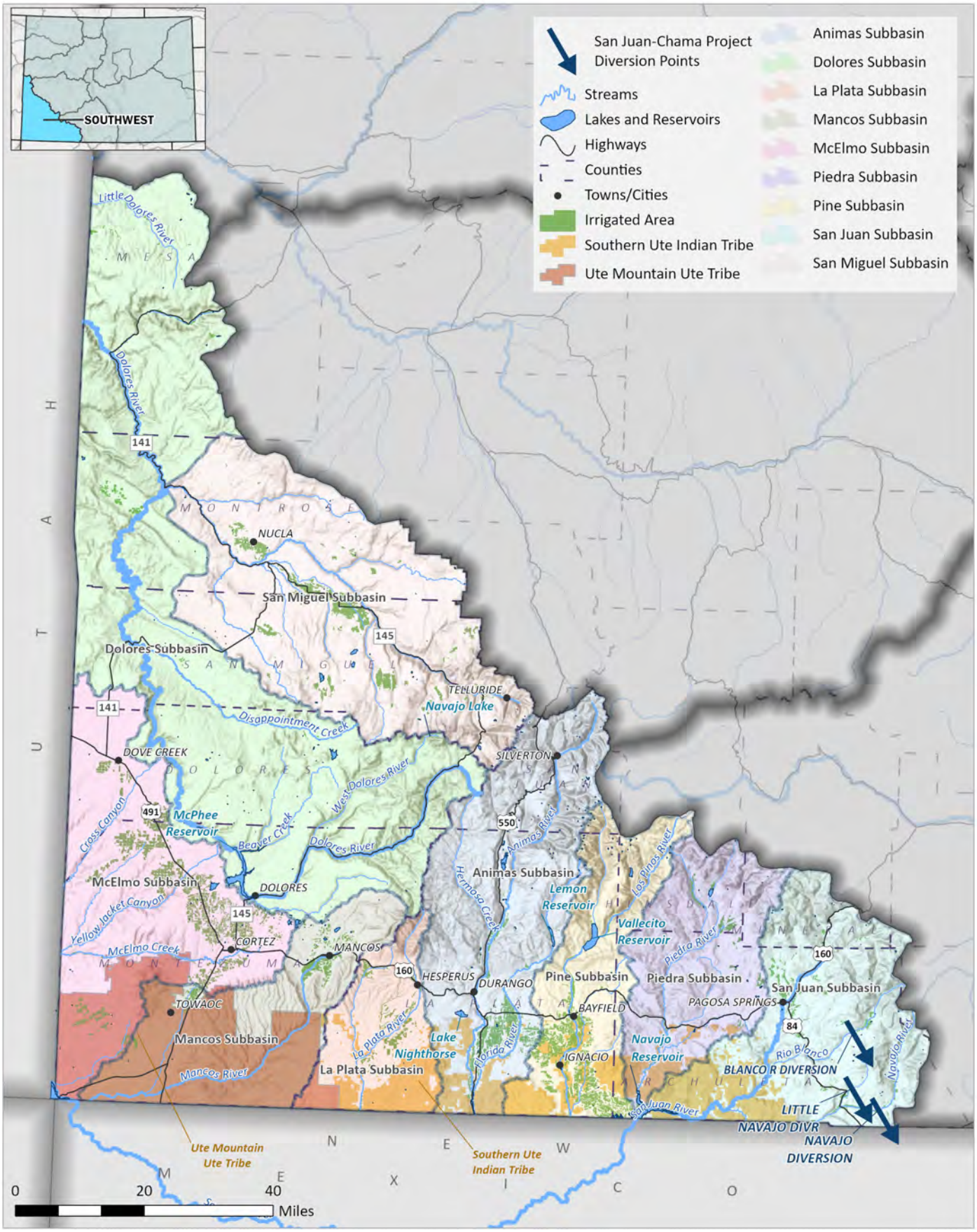


Figure 1. Map of the Southwest Basin

Tribal Water Rights

Tribal federal reserved water rights were made absolute as part of the Colorado Ute Indian Water Rights Final Settlement Agreement (December 10, 1986) with the entry of the consent decrees in state court on December 31, 1991. The parties to the 1986 Settlement Agreement agreed that the Tribes may change their "reserved water rights from the types of use, places of use, amounts, times of use or location of points of diversion" if the Tribes and the U.S. file an application for a change of water rights in state water court. Further, the parties agreed that the Tribes may sell, exchange, lease, use, or otherwise dispose of any of its water rights within the state, so long as such uses comply with state and federal law, interstate compacts, and international treaties. These unique characteristics of the federal reserved water rights allow the Tribes to "grow into" their water rights without having to define the future use type or location of use.

Irrigated Lands below the Sleeping Ute Mountain –
Photo Credit: Eric Whyte - Ute Mountain Ute Tribe Farm & Ranch Enterprise

Water is the giver and sustainer of life. The Creator instilled in the First Peoples the responsibility of protecting the delicate, beautiful balance of Mother Earth for the benefit of all living creatures. Native American people embrace the stewardship of water and lead from a spiritual mandate to ensure that this sacred water will always be protected, available and sufficient for cleansing, for growing and cooking food, and for sustaining native wildlife and plants.

"Water is life" is the basis of the vision of the Ten Tribes Partnership.

In 2018, when the state of Colorado updated projected water demands to support the planning scenarios investigated for the Technical Update to the Colorado Water Plan, BOR had nearly completed, but not yet published, the Tribal Water Study (it was published in December 2018). Both the SUIT and the UMUT participated in the Tribal Water Study and quantified their current use of federal reserved water rights as well as their projected full use of federal reserved water rights under various scenarios through 2060. Note that although a similar approach to represent changing climate and values was used to define future scenarios for the Tribal Water Study, they do not directly translate to the five planning scenarios developed for the Colorado Water Plan. Furthermore, the purpose of the Tribal Water Study was to understand how future use of water rights by the 10 participating Colorado River Tribes could potentially impact the entire Colorado River system. The SUIT and UMUT did not estimate demands, location of use, use type, or timing of development. As such, even after the Tribal Water Study was published, these non-specific future uses could not be incorporated into water availability analyses or included as projects in the BIP update.

The Tribal federal reserved water rights have the potential to play an important role in not only addressing water management issues for the Tribes themselves, but also serving the greater interests of the community of Southwest Colorado. Furthermore, the special nature of tribal water rights may provide opportunities in the future that other water rights do not allow. Both Tribes are members of the Southwest BRT and recognize the importance of planning for future water use in the Southwest Basin. To that end, each of the Tribes have included a "Federal Reserved Water Rights Options Study" in the Project Database. The purpose of the studies is to explore viable options to develop their unused federal reserved water rights and identify specific near-term uses, including uses from storage in the Animas–La

Plata Project. As specific uses are identified as part of the studies, separate projects will spin off for further analyses that explore more detailed economic benefits, infrastructure needs, and marketing opportunities. Based on the further analyses, viable projects identified will then be included in future updates to the Project Database and may be included in more detail in future water availability analysis.

The SUIT government organization includes a Water Resources Division that provides for the management, conservation, and use of the Tribe's water resources; including strategic planning for the continuing development of water resources to benefit the Tribal membership. The UMUT Tribal Council formed a Water Resources Committee in 2021, with a primary goal of establishing a Water Resources Department that will assist the Tribal Council in managing and developing their water resources. Building the capacity to develop a UMUT Water Resources Department is included in the Project Database.

In addition to the Tribal federal reserved water rights, both Tribes also have "non-reserved" water rights within the Colorado water rights system. The UMUT owns four ranches with non-reserved water rights in the Southwest Basin and the Pinecrest Ranch and associated water rights in the Gunnison Basin. The continued beneficial use, development, and diligence of the water rights on the four ranches will also be explored as part of the UMUT Water Rights Option Study, and specific projects related to the ranches will be included in future updates to the Project Database.

The SUIT and UMUT are part of the Ten Tribes Partnership, a coalition of Colorado River basin Tribes that have come together to claim their seat at the table and raise their voices in the management of the Colorado River. Water is sacred to the Colorado River Tribes.

Section 2. Basin Challenges

The Southwest Basin faces several water resource challenges to balance agricultural uses while supporting environmental and recreational (E&R) values—all of which support the economic and aesthetic values that support a high quality of life. Water quality is also a major concern. Each tribal area and subbasin represents distinct communities and landscapes with their own social, economic, and environmental values, challenges, and opportunities. Table 1 describes the Southwest Basin challenges. The categorization found in Table 1 corresponds to the four action areas that will be described in the updated Colorado Water Plan: Thriving Watersheds, Robust Agriculture, Vibrant Communities, and Resilient Planning. The challenges presented in Table 1 exist basinwide, however some specific examples are provided by subbasin. Volume 2 provides a more in depth look at challenges by subbasin.

Photos from Stacy Beaugh

WATERSHED

For the purposes of Table 1 the 'Watershed' category includes E&R water uses, and important resources such as: water quality, wildlife, and healthy forests.

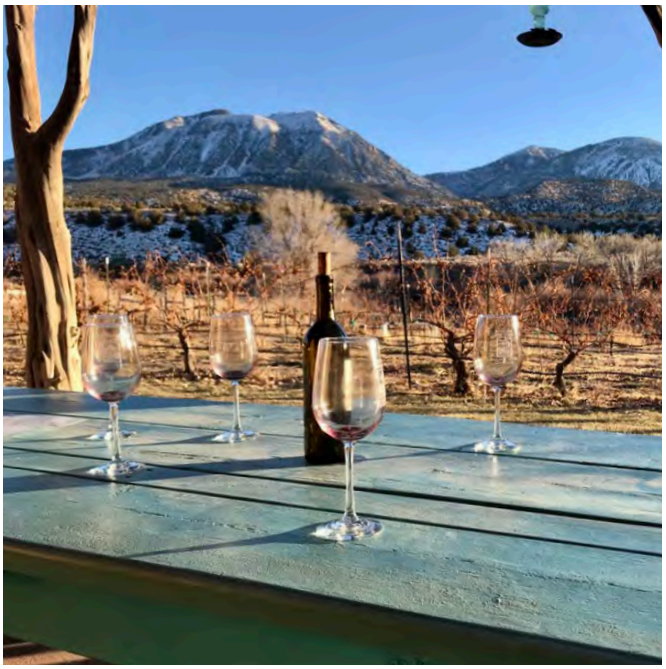


Photo from Danielle Snyder

Table 1. Key Future Water Management Issues and Challenges

AGRICULTURE

- The Cortez and Dove Creek area traditionally has had a strong agricultural community that was supplemented by energy production. Recent population growth due to retirees moving to the area has caused urbanization of these irrigated lands and altered traditional agricultural practices.
- Drought has severely impacted available supplies in McPhee Reservoir, which is a part of BOR's Dolores Project. Portions of the McElmo Subbasin rely on the return flows of this transbasin water and may be impacted in the future by changes upstream due to climate change or changes in agricultural practices.
- Persistent drought conditions and new drought projections do not suggest improvement to existing agriculture demand gap and show increased gaps.

WATERSHED

- Drought and large, uncontrolled forest fires have had a devastating effect in many areas of the Southwest Basin. Forest health initiatives are needed for community wildfire protection, increased watershed resiliency, water quality protection, source water protection planning, and to mitigate negative impacts from past forest management practices.
- A full understanding of environmental and recreational water supply needs continues to lag behind the understanding of agricultural, municipal, and industrial water supply needs within most areas of the Southwest Basin.
- Providing sufficient water supplies for environmental and recreational uses while allowing consumptive use to continue.
- Drought and warming climate trends have an impact on the number of recreation days on the river, significantly affecting businesses that depend on river recreation. These same trends have a significant impact on aquatic habitat, particularly cold-water fisheries, as stream temperatures increase both in magnitude and duration.
- Balancing the needs of communities and water users with the valuable environmental protections provided by the CWCB's instream flow (ISF) program is complex.
- There is need for consistent improvement of water quality impairment due to historic mining operations, natural geology, water temperature variability, and nonpoint source pollutions. The Animas Subbasin is home to the Bonita Peak Superfund Site.

MUNICIPAL AND INDUSTRIAL

- 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 agriculture to tourism and recreation, and to retirement or a second-home communities.
- Developing sufficient infrastructure to deliver municipal and industrial water where it is needed is a challenge. Existing reservoirs storing M&I water lack infrastructure to deliver water to treatment plants and distribution systems.

CROSS-SECTOR CHALLENGES

- The Southwest Basin has a mix of recreation and tourism activities, along with a strong desire to maintain agriculture in the subbasins.
- Balancing current water uses and practices with impending drought impacts brought on by a changing climate is a challenge and may affect all sectors of water use.
- Increased population growth, due partly to increased second home purchases and retirees relocating, in many communities puts pressure on water supplies and agricultural urbanization. New residents to the area may lack understanding of water use and supply availability in the Southwest Basin.
- There is uncertainty existing on potential impacts from the SUIT and UMUT growing into their full allocations of currently unused water supplies.
- Southwest Basin communities currently rely heavily on grant funding for projects due to the rural nature of the communities.
- Maintenance and replacement of aging water infrastructure is expensive.

COMPACTS, ADMINISTRATION, AND REGULATORY

- All nine subbasins are tributary to the Colorado River and, therefore, fall under the Colorado River Compact and Upper Colorado River Basin Compact.
- In addition to the Colorado River Compact, the La Plata Subbasin is also subject to the daily requirements per the La Plata River Compact. The La Plata River is over-appropriated, which complicates meeting multiple compact requirements.
- The projected water scarcity associated with climate change makes it increasingly difficult to comply with the different compact requirements.

Section 3. Achievements

The Southwest BRT has been engaged in a wide variety of projects and activities since the Southwest BIP was issued in 2015. The ongoing and completed projects have achieved results that further the goals of the Southwest BRT and improve water management in the basin. These projects have provided benefits to agricultural, environmental, recreational, and municipal water users. Several of these achievements are summarized in this section and organized by category, alphabetically. State and Basin Water Supply Reserve Fund (WSRF) grants awarded for each project are outlined below. Note that the funds do not reflect total project cost, because many projects also have extensive partner match that are not reflected in the BRT's project tracking.

AGRICULTURE

A total of 18 agriculture-focused projects received WSRF grants in six of the nine subbasins. These projects ranged from infrastructure improvements, innovative management practices investigations, measurement stations installations, reservoir studies, and development of water supplies.

Montezuma County Russian Olive & Saltcedar (Tamarisk) Waterway Management

Photo from Montezuma County

PROJECT PROPONENTS: **Montezuma County Noxious Weed Department (MCNWD).** The program's mission "is to implement a coordinated undesirable plant program using integrated management methods to ensure that all lands within Montezuma County are effectively managed to meet the intent of the Colorado Noxious Weed Act. Management methods include, but are not limited to, education, prevention, good land stewardship, and biological, chemical, cultural, and mechanical treatments."

TIMELINE: Awarded September 2019

COST: $16,840 (Southwest Basin)

The MCNWD hired a two-person crew to help landowners along McElmo Creek treat invasive/nonnative phreatophytes. Since May of 2019, the crew has treated 2,923 Russian olives and 158 saltcedars. The total water savings of these 3,081 treated trees was estimated to be 34 acre-feet (AF). The MCNWD has a 5-year management plan (2020-2024) that expects to treat thousands more trees and reduce the tree populations by 30 percent in McElmo Creek and its tributaries.

Railroad Siphon Replacement Project

Photo from WSRF Report by Morrison Consolidated Ditch Company

PROJECT PROPONENTS: **Morrison Consolidated Ditch Company (MCDC).** MCDC formed in 1910 as a mutual irrigation company responsible for delivering irrigation water to more than 165 shareholders.

TIMELINE: Funded in September 2020; completed May 2021

COST: $58,875 ($25,000 Southwest Basin, $33,875 State)

MCDC replaced an existing siphon south of Oxford, Colorado. The old siphon consisted of two 24-inch pipes, one made of corrugated metal and the other concrete. MCDC removed the failing structures and rebuilt an open ditch where the siphon previously existed. The new ditch was filled and stabilized, and upstream transition zones were smoothed out to connect the old ditch with the new ditch section. The new ditch is operating correctly and is adequately delivering approximately 60 cubic feet per second (cfs) of water during the irrigation season. Along with the siphon, the concrete structures on the ends of siphons and the trash rack removed.

Rehabilitation of Montezuma Valley Irrigation Company Historic Flume

PROJECT PROPONENTS: **Montezuma County with many local partners**

TIMELINE: April 2017 – 2019

COST: $20,000 (Southwest Basin)

The McElmo Creek Flume is the last surviving flume of the original 104 flumes on the Montezuma Valley Irrigation Company system. The original wooden flume system was started in the late 1890s and completed in the 1920s when the Montezuma Valley Irrigation Company finished 150 miles of canals and the 104 wooden flumes. This irrigation system brought water to the Montezuma Valley, which influenced the growth of large scale ranching and farming in the region, as well as the growth of the City of Cortez. The McElmo Creek Flume remained operational until 1992. Upon construction of McPhee Reservoir, underground laterals were built. These underground laterals replaced the canals and wooden flumes. In 2011, the McElmo Creek Flume was listed on Colorado Preservation Inc.'s Endangered Places List, and in 2012 was listed on the National Register of Historic Places. The Southwest BRT helped fund stabilization work for the McElmo Creek Flume's foundation.

MUNICIPAL AND INDUSTRIAL

A total of seven municipal and industrial focused projects received WSRF grants in four of the nine subbasins. These projects ranged from water supply studies, waterline extension improvements, and construction of instruction to previous unserved communities.

La Plata West Water Authority Raw Water Pipeline

PROJECT PROPONENTS:
La Plata West Water Authority (LPWWA) with many partners

TIMELINE: The Southwest BRT funded the raw water pipeline from the Animas-La Plata Project intake to the Lake Durango water treatment plant in September 2015.

COST: Raw water pipeline costs: $550,000 ($50,000 Southwest Basin, $500,000 State); additional historical funding provided by the Colorado Water Conservation Board (CWCB)

Photos from La Plata West Water Authority

The LPWWA works to provide domestic water supply to rural southwest La Plata County. The LPWWA was one of the first to use water from the Animas-La Plata Project via construction of a raw water delivery system to Lake Durango's treatment plant, completed in 2019. Future expansions of the treated water system continue, with the initial phase of 32 miles of pipeline completed at the end of January 2020.

ENVIRONMENT AND RECREATION

In the 2015 BIP, the Southwest BRT recognized that significant gaps exist in the data regarding the water supply needs to sustain E&R values. The 2015 BIP also recognizes that the tools available to help maintain beneficial flow and important ecosystem services are limited and development of cooperative projects is critical to meet the E&R needs. The following projects are examples of how the Southwest Basin is addressing the E&R values and gaps.

Stream Management Plans

STREAM MANAGEMENT PLANS: Mancos Watershed Stream Management Plan – Phase 1, San Miguel Stream Management Plan, Upper San Juan Watershed Enhancement Partnership

TIMELINE: April 2016 - Present - work is on-going

COST: $134,453 (Cost per project is $90,115 for San Juan with 75% provide from the Southwest Basin and 25% from the State, $0 for Mancos from the Southwest Basin, and $44,338 for San Miguel from Southwest Basin)

Photo courtesy of the Mancos Conservation District

San Miguel River: The Southwest BRT formed an E&R subcommittee in 2015 to pilot a stream management planning process in the San Miguel Subbasin. The process evolved in 2018 and is now led by a diverse and local stakeholder group, the San Miguel River Partnership, which is sponsored by the Southwest BRT. Project accomplishments include bringing together diverse stakeholders to identify community water values and producing an E&R water supply needs assessment. The stakeholder group is currently in the process of identifying cooperative, voluntary, multi-benefit project opportunities.

Mancos River: Phase 1 began in 2020 with objectives to engage irrigators and other stakeholders to improve understanding of hydrology, identify opportunities to improve river health and flow, assess recreational needs and opportunities, expand data collection of key variables, develop a coordinated monitoring strategy, and recommend management options.

Upper San Juan River: Started in 2018, and envisioned as a three-phase process, the ultimate purpose is to implement a stream/integrated water management planning process that seeks opportunities to conserve San Juan subbasin streams and their uses, with wide-ranging community support and decisions based on local input and current scientific analysis. The aim is to convene an active, local stakeholder group that guides a watershed assessment and works with the community to interpret findings and identify cooperative projects to benefit agricultural, E&R, and municipal water uses.

San Miguel River Restoration Project

PROJECT PROPONENTS: Valley Floor Preservation Partners was formed as a partnership between the Town of Telluride, Sheep Mountain Alliance, The National Trust for Historic Preservation, The Telluride Institute and regional citizens.

TIMELINE: Reach One in 2016; Reach Two in 2019; work is on-going in other reaches.

Photos taken from the Reach One – Valley Floor River Restoration WSRF Grant Application

COST: Reach One: $444,021 ($45,000 Southwest Basin, $399,021 State); Reach Two $275,000 ($25,000 Southwest Basin, $250,000 State)

In 2011, The Town of Telluride adopted the Telluride Valley Floor Trails and Conceptual Stream Restoration Plan, which identifies key stream system improvements along the San Miguel River. The Plan divides the San Miguel River into six reaches based on observed characteristics. The Town has completed the stream restoration work in Reaches 1, 5, and 6. Valley floor restoration of its historic river channel involves riparian habitat restoration and maintenance of existing flows to protect wetlands. Continued work is planned to include restoration and improvements within Reaches 2, 3, and 4.

INNOVATIVE AND MULTI-PURPOSE

The 2015 Southwest BIP identified the need to develop and fund more multi-purpose projects with the idea that it could help support multiple goals and strategies identified in the Southwest Basin. The following projects represent novel and multi-purpose projects.

Forest to Faucets (F2F): My Water Comes from the San Juan Mountains Teacher Training Workshops

Photo from Mountain Studies Institute: Teachers learn about beetle kill and forest health on Wolf Creek Pass.

PROJECT PROPONENTS: The Forest to Faucets (F2F) Team: Mountain Studies Institute, San Juan Mountains Association, Fort Lewis College, and the Water Information Program. This team has been working together since 2012 to bring the Forests to Faucets: *My Water Comes from the San Juan Mountains* teacher training workshop series to the educators of Southwest Colorado.

TIMELINE: There is a long-standing history of funding for this project. The current funding period is 2021-2023.

COST: WSRF Costs: March 2021 approved $15,622 (Southwest Basin); March 2019 approved $17,500 (Southwest Basin)

The training workshop series instructs teachers annually on ways to teach their students the importance of water supplies and the interconnection of healthy watersheds. This training provides teachers with place-based learning, hands-on field experiences, and expert speakers to help their students think critically about Colorado's water resources. Funding for the workshop supports three years of training at different locations in the Southwest. This training reaches 45 to 60 teachers, and by extension educates more than 900 students.

Geothermal Greenhouse Partnership Project

Photo from Geothermal Greenhouse Partnership

PROJECT PROPONENTS: Geothermal Greenhouse Partnership, a nonprofit

TIMELINE: 2015 to 2020

COST: $75,000 ($25,000 Southwest Basin, $50,000 Statewide); granted in May 2014

The project included construction of three 42-foot agricultural greenhouses in downtown Pagosa Springs heated by geothermal and solar energy. The Geothermal Greenhouse Partnership's mission "is to educate the community in sustainable agricultural practices by producing food year-round using local renewable energy." A Southwest BRT WSRF grant funded installation of the greenhouses' water system infrastructure.

Mancos River Habitat and Diversion Project – Phase 3

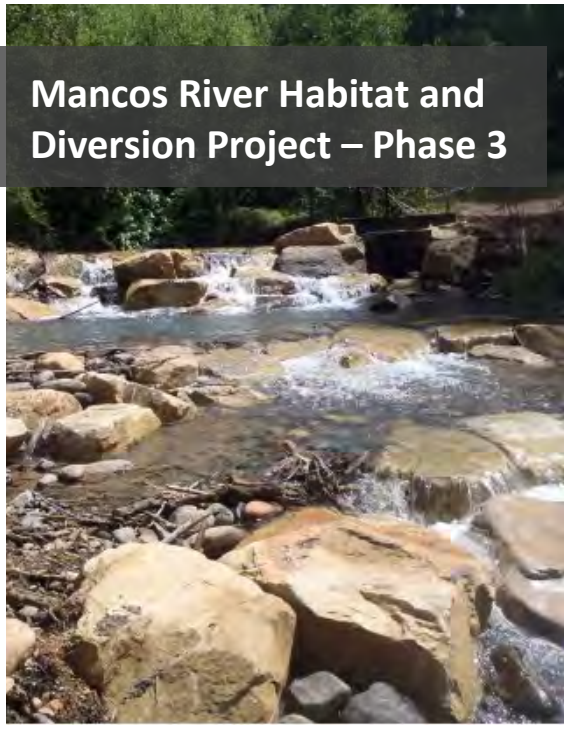


Photo taken from WSRF Report

PROJECT PROPONENTS: Mancos Conservation District

TIMELINE: Funded in March 2016, report completed in March 2018

COST: $59,000 (Southwest Basin)

Phase 3 of this project was to continue to build on previous phases by improving the ecological and agricultural function of an additional 1.5-mile reach of the lower East Mancos River. This multi-purpose project will complete two simultaneous efforts. One effort will physically improve the agricultural and ecological function of a 1.5-mile reach of the East Mancos River by installing improved diversion structures at three irrigation ditch headgates. The improved structures will save irrigators annual maintenance costs while allowing fish and sediment passage at higher flows and promoting channel stability. The other effort will convene a collaborative process to integrate existing data into an assessment of the resiliency of the Mancos River considering a changing climate. This stakeholder assessment will be useful to landowners and managers interested in where/how to invest resources to maintain/improve the value of the Mancos River for multiple uses into the future.

Vallecito Reservoir Donation Agreement

Photo from Erin Wilson

PROJECT PROPONENTS: Southern Ute Indian Tribe, Pine River Irrigation District, CWCB

TIMELINE: 2011–ongoing

COST: No WSRF funding was provided

The Southern Ute Indian Tribe, the Pine River Irrigation District, and the CWCB have entered into an agreement to pursue a donation agreement to provide Vallecito Reservoir water to meet Pine River instream flow needs downstream of the reservoir and to provide augmentation water for domestic well owners in the subbasin. The partnership filed jointly for a reservoir refill right with instream flow and augmentation as decreed uses, assuring that the donation agreement would not impact existing tribal and non-tribal supplemental irrigation supplies from Vallecito Reservoir. Each partner entity has provided in-kind technical and legal services to facilitate the donation agreement and associated water rights application.

Section 4. Updated Goals and Objectives

Each of the BRTs across Colorado developed goals and strategies or actions to achieve their goals during the development of their 2015 BIPs. The structure and naming convention of goals, objectives, strategies, and actions slightly vary across roundtables, but they all include a discrete set of high-level targets (described as goals and/or themes) with supporting objectives, actions, strategies, or processes that will help the BRTs and stakeholders achieve their targets.

The Southwest Basin goals and strategies are proposed to meet potential future gaps with a planning horizon of 2050. For this BIP update, the BIP Subcommittee reviewed the 2015 BIP goals and strategies and proposed updates which were incorporated by the Southwest BRT. The update reflects activities completed since the 2015 BIP, new challenges faced by water users in the Southwest Basin, and new areas of interest for the Southwest BRT.

The goals and strategies are described below. For each goal category, a broad primary outcome is stated as a goal with a narrative adding context to the broad goal's statement. Next, strategies describe the approach required to meet the goal.

The Southwest Basin's geographic, political, economic, and legal complexities lead to unique challenges and opportunities.

BASIN GOALS

- **Balance all needs and reduce conflict**
- **Support the needs of agriculture**
- **Meet municipal and industrial water needs**
- **Meet recreational water needs**
- **Meet environmental water needs**
- **Promote healthy watersheds**
- **Manage risk associated with Colorado River Compact**

Balance all needs and reduce conflict

The Southwest Basin is a region of diverse natural systems, agricultural heritage, outstanding beauty, and extensive recreational opportunities. Many communities within the area rely heavily on tourism and the recreational industry as primary economic drivers. Agriculture and the open spaces it maintains contribute to the culture, economy, and quality of life in the region. Municipal and industrial activities round out the economic and social values and help support the diverse and vibrant communities of the region. The geographical extent and diversity of the nine distinct subbasins, the multiple layers of legal agreements that govern water use, and numerous federal, state, tribal, and local jurisdictions all add complexity, opportunity, and challenge to the Southwest Basin. Balancing all of these stakeholder interests and issues can be difficult. Further, the results of the Technical Update suggest that all water users will be facing increasing challenges in the future (see Section 5 for details and description of planning scenarios). To meet these challenges, the Southwest BRT strives to ensure that water needs are balanced and water user conflict is reduced.

STRATEGIES TO MEET GOAL A:

A1: Support projects important to maintaining the quality of life in this region by pursuing community-directed projects that address single and/or multiple water needs, for example municipal, industrial, E&R, agricultural, risk management, and compact compliance water needs.

A2: Support dialogue and foster cooperation, collaboration, and conflict resolution among water interests in every subbasin, between basins, and at the Southwest BRT for the purpose of implementing strategies to mitigate risk and build resiliency for Southwest Colorado's and Colorado's water supply challenges.

A3: Support and implement education and outreach efforts to the diverse communities of Southwest Colorado to create a water-fluent public by providing relevant local and statewide water information.

Support the needs of agriculture

Agriculture is central to the culture and quality of life of the Southwest Basin. Agriculture is one of the dominant uses in the Southwest Basin, which includes 224,254 acres of irrigated land. Agricultural water supplies experience climate-stressed hydrology already, with much of Southwest Basin experiencing water shortages every year. The current climate and ongoing drought conditions continue to hinder the Southwest Basin's ability to meet its agricultural demands. With the planning scenario projections, it is anticipated that this will continue to be a challenge and may even worsen. The Southwest BRT supports preserving agriculture acreages in Southwest Colorado and acknowledges agricultural water users are already working with a limited water supply. While robust agriculture in Southwest Colorado provides economic benefits to communities, positive impacts of irrigated lands extend beyond monetary values and food security for the region. Agricultural lands provide open spaces, with many acres protected by conservation easements, which provide sanctuary for wildlife while preserving their habitat.

STRATEGIES TO MEET GOAL B:

B1: Minimize Southwest Colorado basinwide irrigated acres removed from production.

B2: Support implementation of efficiency measures to maximize beneficial use and production.

B3: Support implementation of projects that work toward meeting agricultural water supply shortages and address delivery concerns created by aging infrastructure.

B4: Support appropriate measures and efforts to increase carryover storage in Southwest Colorado reservoirs.

B5: Recognize and support the benefits of agriculture to the environment and recreational activities.

C Meet municipal and industrial water needs

The Southwest Basin is home to multiple communities that depend on treated water for municipal and industrial needs. These communities include the SUIT and the UMUT, which are the only two reservations in Colorado. Neighboring these tribal lands are multiple counties with townships and cities that require much of the municipal water in the region. The industrial water users in the region consist of mining, manufacturing, brewing and food processing, snowmaking for ski areas, thermoelectric power generation, and energy development. The projected increase in population and climate stress will further increase both the municipal and industrial water demand in the Southwest Basin. Currently, demands are not being met in certain areas due to lack of infrastructure. For example, some rural communities must truck water to meet their needs, because they do not have sufficient infrastructure. The municipal and industrial community provides great value to the Southwest Basin, and it is the BRT's goal to identify and meet their needs.

STRATEGIES TO MEET GOAL C:

C1: Pursue projects to meet the current municipal and future municipal demand.

C2: Provide safe and accessible drinking water to Southwest Colorado's citizens and visitors.

C3: Promote wise and efficient water use through implementation of municipal conservation and efficiency strategies to reduce overall future water needs.

C4: Support flexibility in projects to allow for development of industrial and power benefits of water use.

D Meet recreational water needs

Recreation is a cornerstone of the Southwest Basin's economy and the activities are vast. Water is needed to sustain streams, wildlife areas, national forests, recreational reservoirs, and city open spaces that support activities directly dependent on water, such as boating, paddle boarding and kayaking, fishing, hunting, camping, hiking, and wildlife viewing. Complete or partial protections for environmental or recreational flows that exist in the Southwest Basin include CWCB decreed ISF reaches, water rights, reaches found suitable for Wild and Scenic designation, recreational in-channel diversion (RICD), wilderness areas, and national parks. At a regional scale, the planning scenarios project that climate change will have a significant impact on recreational needs. The Southwest BRT recognizes that quantification of recreation water supply is lagging far behind quantification of consumptive uses. Because of this, the BRT has supported the evaluation of recreational needs in several stream management plans. With all of this in mind, it is the BRT's goal to continue to promote quantification of recreational water supply needs and to support cooperative projects that aim at meeting those needs.

STRATEGIES TO MEET GOAL D:

D1: Maintain, protect, and enhance recreational values that support local and regional economies derived from recreational water uses, such as fishing, boating, hunting, wildlife watching, camping, and hiking.

D2: Prioritize projects designed to better quantify our environmental and recreational water supply needs by supporting projects such as stream management plans, integrated water management plans, and nonconsumptive needs assessments to be completed on principal streams and rivers in Southwest Colorado.

Meet environmental water needs

The Southwest Basin supports many water-dependent species of wildlife, including warm- and cold-water fish species addressed by three multi-state conservation agreements, and four terrestrial species that are currently listed under the Endangered Species Act. The Southwest BRT supports measures that protect these species directly and/or by protecting the riparian and wetland habitats on which they depend. Complete or partial protections for environmental or recreational flows that exist in Southwest Basin include CWCB ISF, water rights, reaches found suitable for Wild and Scenic designation, RICD, wilderness areas, and national parks. In recent years, the BRT has supported local, subbasin approaches to assessing environmental (and recreational) water needs through stream management planning. These efforts and the planning scenarios emphasize that climate change has a significant impact on environmental water supply needs. The BRT's goal is to support meeting environmental water supply needs and it has developed strategies and objectives to better understand these needs.

STRATEGIES TO MEET GOAL E:

E1: Encourage and support restoration, recovery, and sustainability of endangered, threatened, and imperiled aquatic and riparian-dependent species and plant communities. (See Volume 2 for species of interest in a specific subbasin under the 'nonconsumptive needs assessment' mapping section).

E2: Support efforts to protect, maintain, monitor, and improve the condition and natural function of streams, lakes, wetlands, and riparian areas to promote self-sustaining fisheries, support native species and functional habitat (aquatic and terrestrial ecosystems) in the long term, and adapt to changing conditions.

E3: Encourage research and/or projects that support Colorado Parks & Wildlife (CPW), Upper Colorado River Endangered Fish Recovery Program, and San Juan River Basin Recovery Implementation Program actions and plans developed in conjunction with other affected stakeholders for Southwest Basin streams. These may include mitigating impacts to native and sport fisheries from physical habitat modifications, insufficient connectivity between fish populations, flow alterations, climate change, water quality impairments, or competition with non-native or invasive fish species.

Promote healthy watersheds

The BRT recognizes that forest health and watershed health are interconnected. Healthy forests moderate snowpack melt and runoff, enhance soil moisture storage and groundwater recharge, reduce the likelihood of flooding, prevent soil erosion, and filter contaminants. Wildfires in the region threaten critical water resource infrastructure, increase flooding, and sedimentation in streams. The planning scenarios demonstrate that the Southwest Basin continues to be susceptible to climate change. Current climate change projections predict an increase in forest fires under a warmer and drier climate scenario. Active measures are currently being taken across the Southwest Basin by local stakeholder groups to mitigate wildfire threats and to promote resilience in surrounding forests in the face of climate change. In working with the surrounding community, the BRT's goal is to promote healthy watersheds.

STRATEGIES TO MEET GOAL F:

F1: Support efforts to monitor, protect, and improve water quality for all classified uses.

F2: Support efforts to enhance and maintain watershed health by protecting and/or restoring watersheds to ensure sustainable water supply, water quality, critical infrastructure, and/or environmental and recreational areas.

F3: Encourage and support projects that build resilient watersheds and healthy forests impacted by drought, fire, and climate change.

F4: Support the management objectives, strategies, and actions identified in the Colorado Aquatic Nuisance Species Management Plan and the Noxious Weed Program to avoid or mitigate negative impacts to natural resources, outdoor recreation, and the water infrastructure of the Southwest Basin.

Manage risk associated with Colorado River Compact

All nine subbasins are tributary to the Colorado River and therefore fall under the Colorado River Compact and the Upper Colorado River Basin Compact. Seven subbasins are part of the San Juan River Basin. Two subbasins, the Dolores and the San Miguel, are part of the Colorado River Basin. The San Juan River subbasins provide the state of New Mexico with its Colorado River entitlements under the Upper Colorado River Compact. The BRT acknowledges the need for strategies to build resiliency and manage Compact risk.

STRATEGIES TO MEET GOAL G:

G1: Plan and help preserve water supply options for all existing and new uses and values.

G2: Support viable strategies to build resiliency and manage Compact risk.

G3: Ensure southwest Colorado is informed on regional and statewide opportunities, threats, and challenges from inception to completion.

G4: Ensure the interests of southwest Colorado water rights holders and water users are represented at a regional and statewide level.

G5: Ensure the Southwest BRT's concerns and priorities are reflected in Compact compliance and mitigation strategies.

Section 5. Demand, Supply, and Potential Water Needs

Water in the Basin

The Southwest Basin is made up of a series of nine subbasins. Water availability in the various subbasins can be drastically different, and the differences in subbasin water availability and gaps may not be evident at a basinwide scale due to the aggregated reporting of results. For this reason, technical gap and demand data for municipal and industrial (M&I) and agriculture are first presented basinwide and then by subbasin. Additionally, E&R data are presented basinwide and then by subbasin.

Planning Scenarios

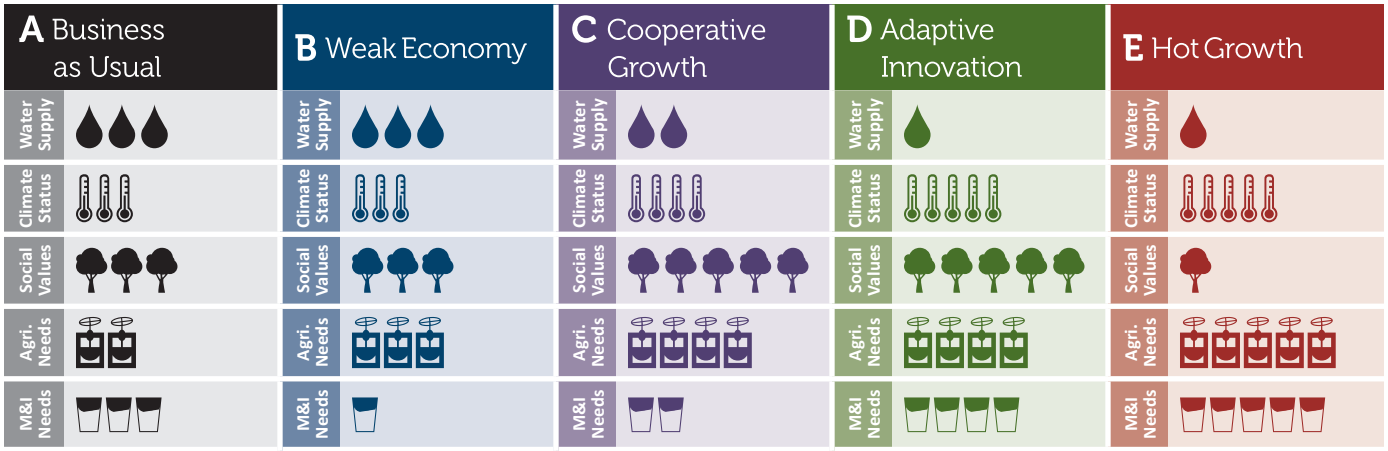
The Analysis and Technical Update to the Colorado Water Plan (Technical Update) published in 2019 quantified the current and potential future water demands, supplies, and additional water needs associated with the Southwest Basin under five alternative future scenarios. A key enhancement to Colorado's water planning processes has been the incorporation of scenario planning. The Colorado Water Plan identified five different but plausible future conditions for the year 2050. The scenarios each consider several water resources drivers and how the drivers may change. The drivers included population, urban land use, climate change, industrial water needs, agricultural conditions, and adoption of municipal and agricultural water conservation measures.

Water demands, supplies, and potential future water needs for the Southwest Basin were quantified in Section 4.9 of the Technical Update. This section summarizes demands, supplies, and potential water needs presented in the Technical Update.

Photo from Danielle Snyder

Potential future water needs, aka gaps, were estimated for each planning scenario. Gaps are a characterization of the potential risk that water supplies will not be adequate to meet future demand.

The graphic below provides a brief overview of the drivers and the scenarios. Refer to the Technical Update, Sections 2.1.3 and 2.1.4, for more details on the scenarios and drivers (**https://cwcb.colorado.gov/colorado-water-plan/technical-update-to-the-plan**).



A Business as Usual

- Population growth increases at trends predicted by the State Demography Office (SDO).
- Future hydrology, per capita water demands, and adoption of conservation measures are similar to what has recently occurred.

B Weak Economy

- The world's economy slows, and the state's population growth is less than predicted.
- Hydrology is similar to recent patterns.
- This scenario puts the least amount of stress on future water supplies and is a bookend for scenarios.

C Cooperative Growth

- Statewide population is similar to SDO predictions but is distributed differently across the state.
- Climate is moderately warmer, and irrigation demands increase.
- People seek to mitigate increased demands by more aggressively adopting water conservation.

D Adaptive Innovation

- Both scenarios assume that population growth is higher than projected, and both assume a much warmer and drier future climate.
- The scenarios' primary differences revolve around conservation. In the Adaptive Innovation scenario, the state aggressively adopts conservation measures in both municipal and agricultural sectors. In the Hot Growth scenario, conservation is not a focus.

E Hot Growth

THE FUTURE WATER CONDITIONS DESCRIBED FOR THE SOUTHWEST BASIN WILL BE IN THE CONTEXT OF THE FIVE PLANNING SCENARIOS

Refinements to Technical Update Modeling

During the BIP update process, some BRTs identified enhancements to the Technical Update data, modeling, and analyses. Enhancements included incorporating better municipal water use data, updating operating protocols for basin storage facilities, and revising potential future industrial water demands. Revisions in the Southwest Basin were limited to operations in Vallecito Reservoir, an on-channel reservoir located on the Pine River (Water District 31). Prior to 2014, the maximum reservoir content for Vallecito Reservoir was restricted to 77,000 AF through the winter to avoid ice damage to the radial gates used to release high flows. In 2014, bubblers were installed in the reservoir to ensure ice did not build up and potentially damage the gates. The Southwest Basin water allocation model was revised to allow reservoir storage up to 100,000 AF during the winter months, increasing winter storage carryover. This operational change has a positive impact for project irrigators during drought years, as water can be stored in the reservoir through the fall and winter. It also impacts water availability and downstream flows on the Pine River during wet years, as more water may need to be released for flood control.

This revision resulted in no change to the agricultural and M&I demand and less than a 1 percent change to the agricultural and M&I gap calculated in the Technical Update. There is a slight reduction to the maximum agricultural and M&I gaps during critically dry years in some of the planning scenarios, likely due to the impact of reservoir operations on water availability on the Pine River.

Additional information on the refinements to the Technical Update modeling is provided in Appendix A.

Municipal and Industrial Demands

POPULATION PROJECTIONS

Approximately 110,000 residents live in the Southwest Basin, which represents 2 percent of the statewide population. By 2050, population is projected to reach between 130,000 and 280,000 people in the low- and high-growth projections, respectively, which is an increase of 16 percent to 161 percent (Table 2). On a percentage basis, the Southwest Basin has the largest projected increase of all basins throughout the state.

Current and future diversion demands for municipal water users are driven by population and water usage rates. Population estimates were based on State Demography Office projections, with upward or downward adjustments based on the scenario description.

DEMANDS

The Southwest Basin M&I Baseline and projected demands are provided in Table 2, showing the combined effect of population growth and per capita usage. M&I demands are projected to grow from approximately 27,210 AFY in 2015 to between 30,260 AFY and 69,500 AFY in 2050 (see Table 2). La Plata County accounts for nearly half of the Baseline demand, followed by Montezuma County at just under one-third of the Southwest Basin demand.

Approximately 25% of the Southwest Basin consists of rural water users. This population obtains domestic indoor and outdoor water via wells, non-community water systems, water hauling, surface water diversions, or a combination of these. This may not be fully captured in Southwest Basin GPCD and should be addressed in the future.

The Baseline and projected demand distributions shown on Figure 2 also show how the population variation drives demands among the scenarios. All the planning scenarios except for Weak Economy result in a significant increase relative to Baseline. Demands generally follow population growth patterns; however, increased outdoor demands for the Hot and Dry climate condition have a greater impact on gallons per capita per day (GPCD), which results in higher demands for Hot Growth.

The Southwest Basin currently includes about 1 percent of the statewide industrial demand. Industrial demands are associated with the snowmaking and thermoelectric subsectors, with no demands projected for large industry or energy development subsectors.

The following are observations on M&I demands:

- The Southwest Basin is projected to experience significant population growth (the largest percentage increase in the state), which results in increased M&I demand for all future scenarios.
- Thermoelectric demands drive a modest increase in industrial demand.

GAPS

The following are observations on M&I diversion and gaps:

- Maximum water supply gaps for the planning scenarios range from 6 to 36 percent of demand. The largest gap is projected for Hot Growth, which is 36 percent of demand in the maximum gap year (see Figure 3).
- The persistent nature of the time series of gaps on Figure 4 points to the need for projects that will provide firm yield.
- Adaptive Innovation includes similar assumptions to Hot Growth in terms of future climate conditions and population projections; however, annual and maximum gaps are projected to be much less, which demonstrates the value of conservation.
- Figure 4 shows that gaps can increase significantly during dry periods, especially in Adaptive Management and Hot Growth (the scenarios most severely impacted by future climate assumptions). Projects and water management strategies will be needed to meet periodic maximum M&I gaps.

Calculation methodologies and assumptions for M&I water demands are available in the Technical Update documentation.

https://cwcb.colorado.gov/colorado-water-plan/technical-update-to-the-plan

Table 2. Summary of Baseline and 2050 Projected Municipal and Industrial Water Demands and Gaps

	Baseline[1]	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
Population	108,000	195,800	125,800	201,000	264,200	282,100
Systemwide Per Capita Demands (GCPD) [1]	198	181	186	173	166	199
Municipal Diversion Demand (AFY) [2]	26,700	44,000	29,800	42,800	53,500	68,100
Industrial Diversion Demand (AFY) [2]	510	790	460	460	460	1,400
Total M&I Diversion Demand (AFY) [2]	27,210	44,790	30,260	43,260	53,960	69,500
Average Annual Gap (AFY)[3]	0	3,300	390	4,100	7,800	13,500
Maximum Annual Gap (AF)[3]	0	7,500	1,800	7,500	13,800	24,800

[1] *Baseline year is 2015.*

[2] *M&I demands may vary slightly from the M&I Demand section of the Technical Update (Section 4.5.4) due to differences in geographic distribution of demand for counties that lie in multiple basins.*

[3] *Colorado Decision Support System (CDSS) water allocation model in the Southwest Basin calculates small baseline M&I gaps, but they are either due to calibration issues or they are reflective of infrequent, dry-year shortages that are typically managed with temporary demand reductions, such as watering restrictions.*

Southwest Basin water leaders have accomplished the planning and secured water rights when possible to meet the projected M&I gap. Infrastructure to deliver these future water supplies is yet to be constructed.

Figure 2. Baseline and 2050 Projected Population and Municipal Demand

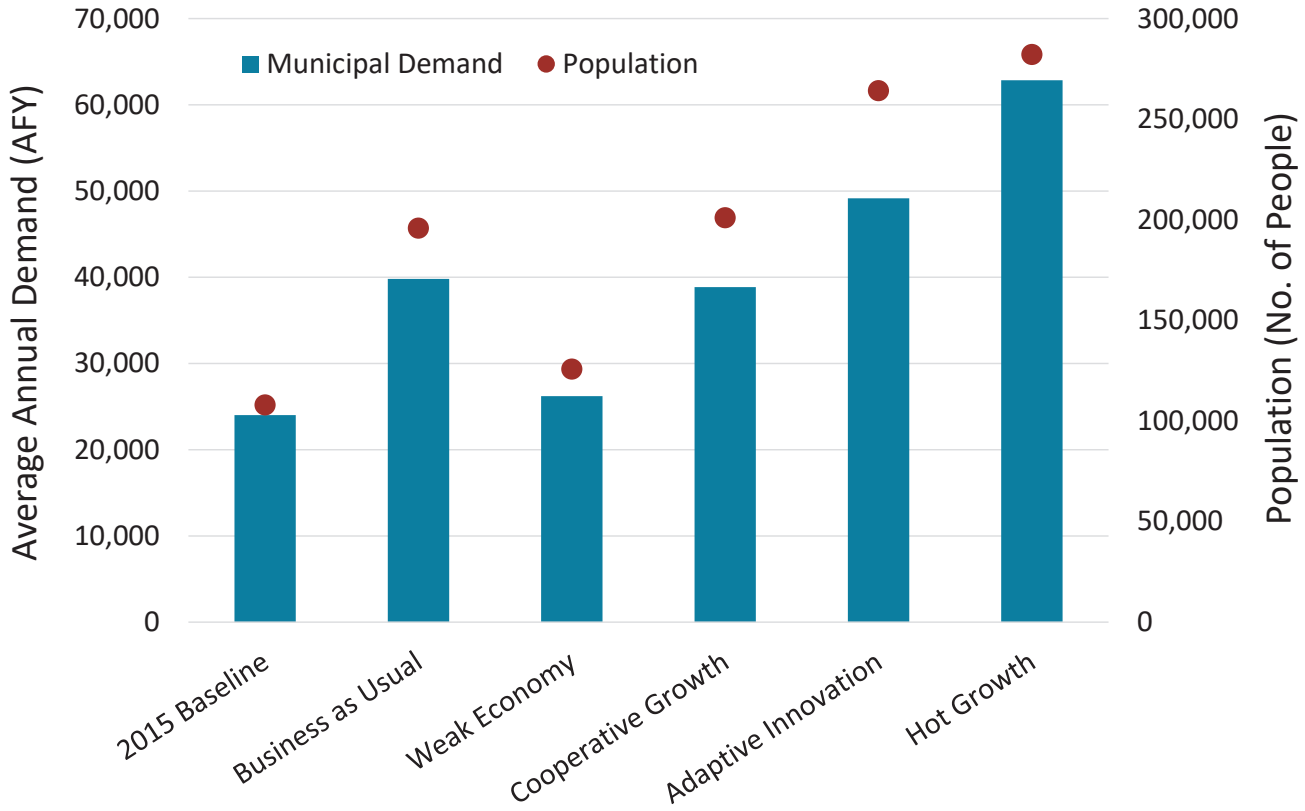


Figure 3. Baseline and 2050 Projected Maximum Annual M&I Demand Met and Gaps

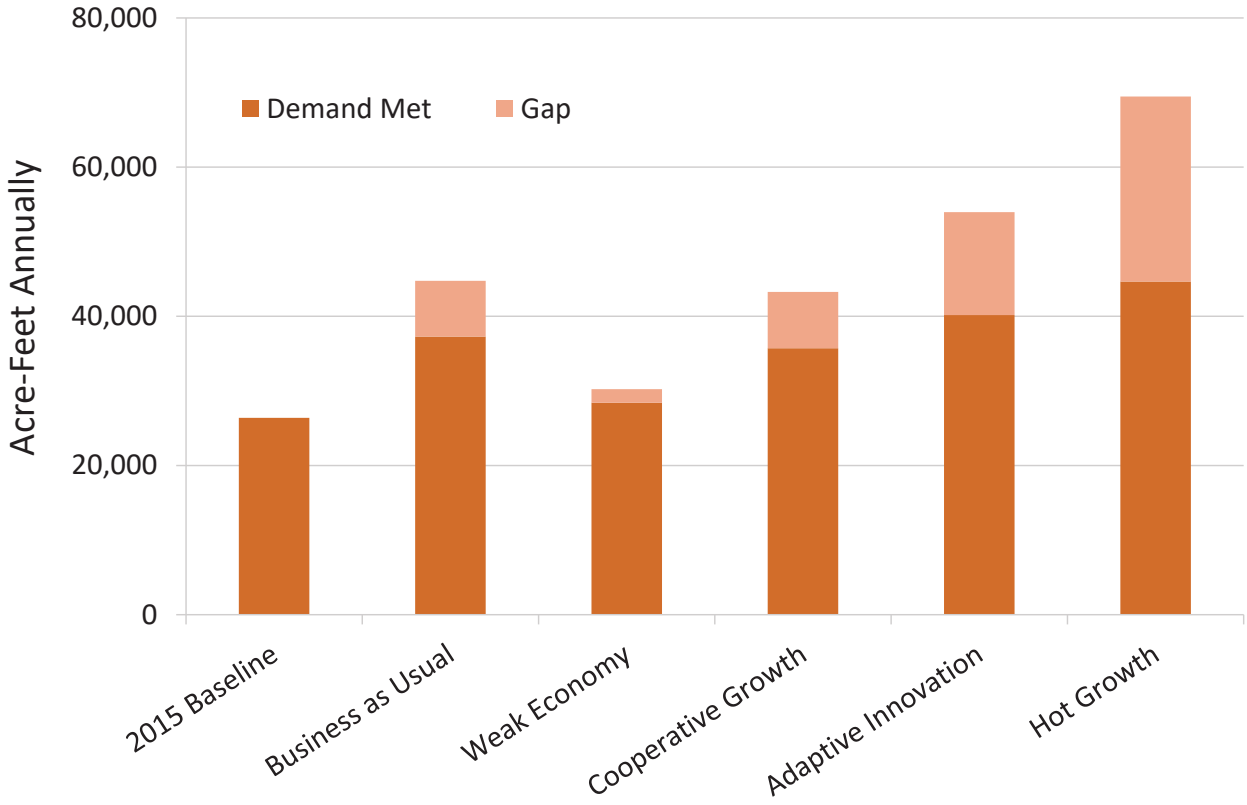
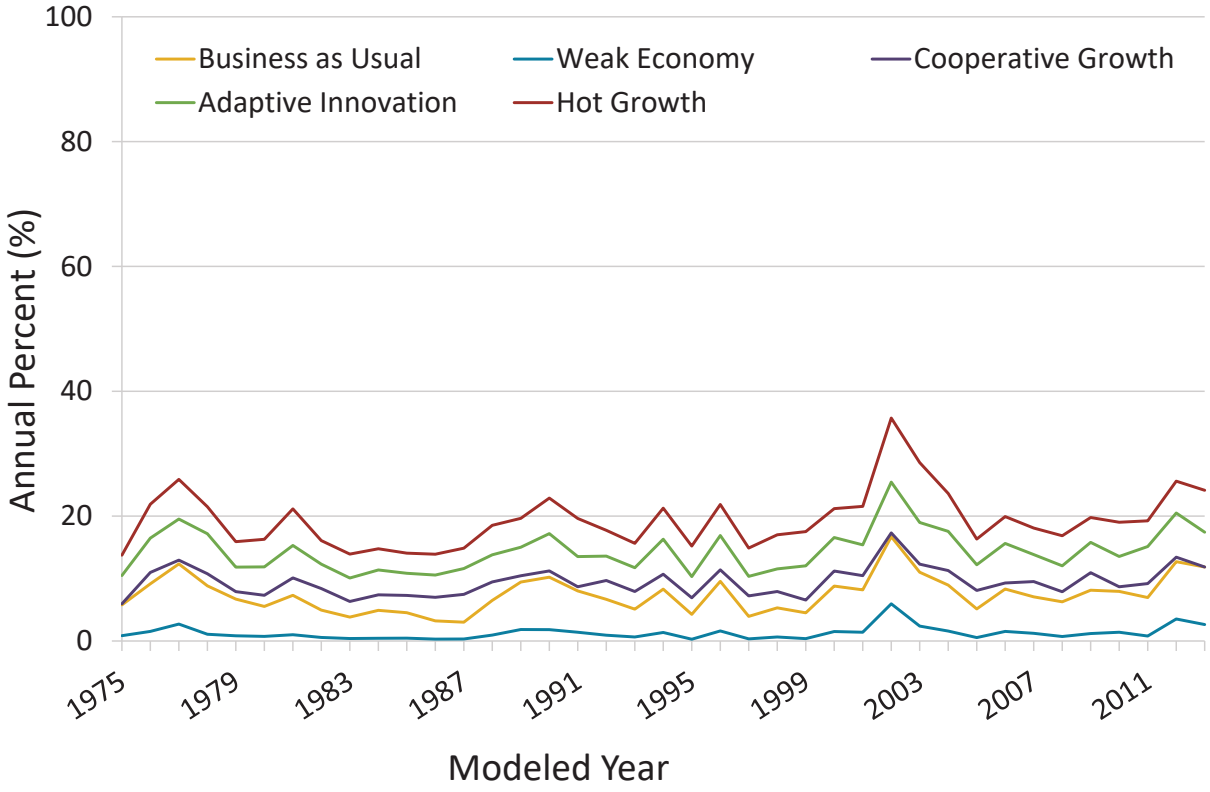


Figure 4. Modeled Annual M&I Gaps (expressed as a percent of demand unmet) for Planning Scenarios



"Modeled Years" are not a reference to historical conditions. Models used to simulate the planning scenarios consider 1975 to recent-year water supplies (in some scenarios, adjusted for climate change impacts), current administrative practices and infrastructure, and projected 2050 demands.

Agricultural Demands

DEMAND

The Southwest Basin is home to a diverse set of demands: several small towns founded primarily due to either mining or agricultural interests, UMUT and SUIT, one major transbasin diversion (San Juan–Chama Project), and four major BOR projects in the Pine, Dolores, Animas, and Mancos Subbasins that brought new irrigated acreage under production and provided supplemental supplies to existing lands.

Urbanization in the Southwest Basin will likely have a limited impact in the future. Only 4,080 acres of irrigated land basinwide were estimated to be urbanized by 2050. The larger towns of Durango, Cortez, and Pagosa Springs do not have significant areas of irrigated acreage located within or directly adjacent to the current municipal boundaries, and urbanization of acreage in these areas is projected to be low. Smaller towns in the Southwest Basin such as Norwood, Nucla, Bayfield, and Mancos are surrounded by irrigated agriculture, which may lead to some urbanization of irrigated lands by 2050.

Table 3 summarizes the acreage, irrigation water requirement (IWR), and the agricultural diversion demand for surface water supplies in the Southwest Basin for current conditions and the five planning scenarios. Increased demands were projected for Cooperative Growth and Hot Growth, which reflects the impacts of climate change without the benefit of increased efficiencies reflected in Adaptive Innovation.

Agriculture diversion demand represents the amount of water that would need to be diverted or pumped to meet the full crop irrigation water requirement. The diversion demand does not reflect historically applied irrigation amounts because irrigators often operate under water-short conditions and do not have enough supply to fully irrigate their crops.

GAPS

The following are observations on agricultural demands and gaps:

- Agricultural diversion demands are slightly reduced in three of the five scenarios due to urbanization and reduction of irrigated acres.
- IWR is predicted to increase in scenarios impacted by climate change.
- Although irrigated acreage does not increase across the planning scenarios, agricultural demand is projected to increase by 19 percent to 24 percent in Cooperative Growth and Hot Growth, respectively, due to climate impacts. The increased demand in these scenarios is exacerbated by reduced water supply and an increase in IWR, which results in an increased gap.
- A 10 percent reduction in demand is projected in Adapted Innovation due to expected improved delivery efficiency and less consumptive crop production; however, the reduction in water supply due to climate change could result in an increased gap over Baseline.
- As shown on Figure 5, incremental gaps are projected to increase above current conditions in scenarios that include climate change, i.e., Cooperative Growth, Adaptive Innovation, and Hot Growth.
- Figure 6 shows that scenarios with climate change predict higher overall agricultural gaps with increased gaps during drought.

Table 3. Summary of Baseline and 2050 Projected Agricultural Diversion Demands and Gaps

	Baseline[1]	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
Irrigated Acreage (acres)	224,300	220,500	220,500	220,500	220,500	220,500
Average IWR (AFY)	480,400	472,000	472,000	577,200	546,200	607,000
Average Annual Demand (AFY)	1,024,800	1,005,400	1,005,400	1,220,500	923,100	1,271,700
Average Annual Gap (AFY)	126,200	119,900	119,300	276,400	218,800	354,800
Incremental Avg. Annual Gap (AFY)	-	-	-	150,200	92,600	228,600
Maximum Annual Gap (AFY)	517,200	507,100	504,700	672,100	466,900	737,600

[1] *Baseline agricultural demands were estimated using a model that used "current" irrigated acreage and cropping patterns and incorporated historical weather patterns.*

The Incremental Average Annual Gap quantifies the degree to which the basinwide gap could increase beyond what agriculture has historically experienced under water-short conditions.

Calculation methodologies and assumptions for the water planning scenarios drive the results of these agriculture water demands and gaps. These are available in the technical update documentation in the link below.

https://cwcb.colorado.gov/colorado-water-plan/technical-update-to-the-plan

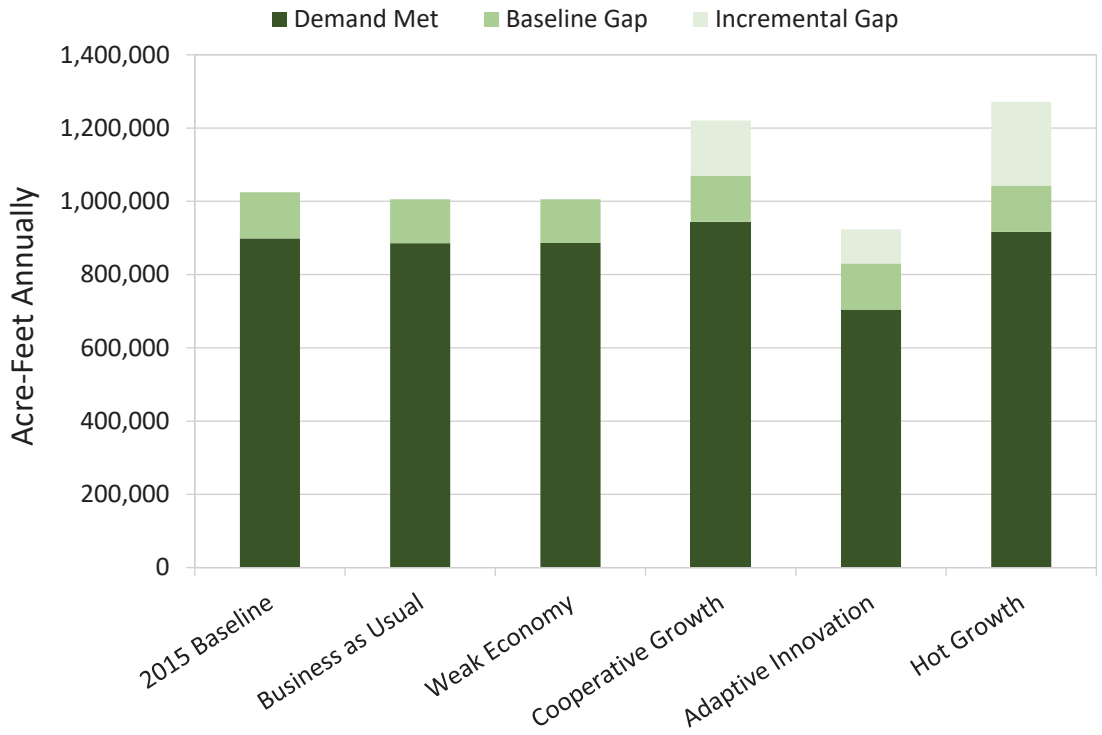


Figure 5. Baseline and 2050 Projected Average Annual Agricultural Diversion Demand, Demand Met, and Gaps

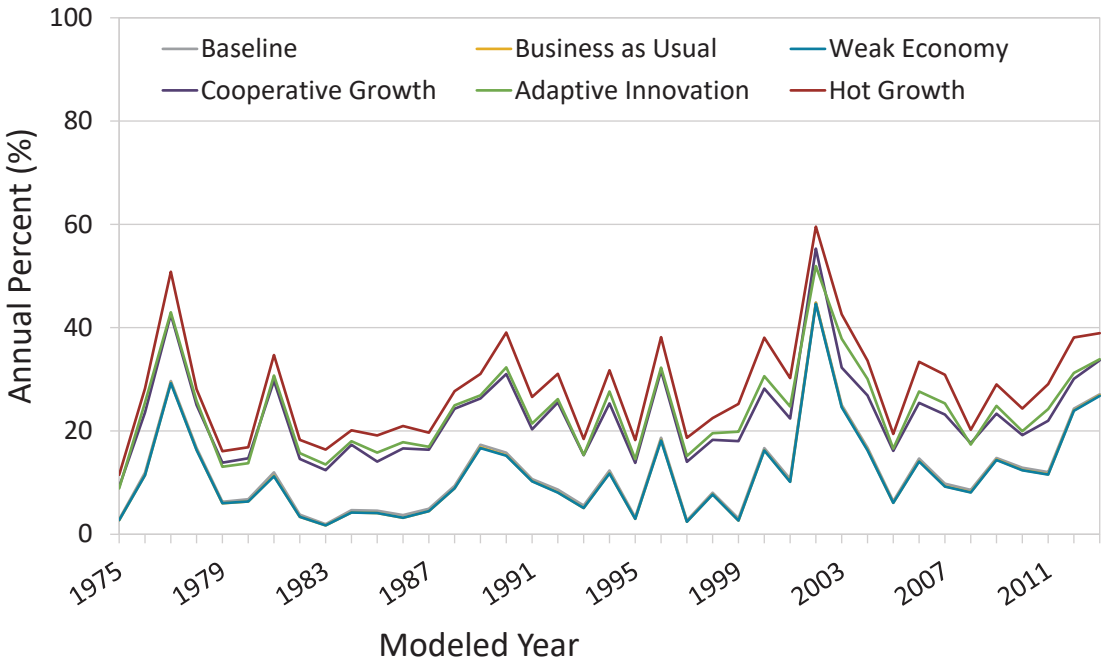


Figure 6. Modeled Annual Agricultural Gaps (expressed as a percentage of demand unmet) by Planning Scenario

The Southwest Basin has numerous reservoirs (e.g., Animas-La Plata, Electra Lake, Lemon, Vallecito, Jackson Lake, McPhee, and Gurley, and the reservoirs of Pagosa Area Water and Sanitation District and the Norwood Water Commission, among others) that provide or are planned to provide M&I water. While some extent of urbanization is inevitable, the Southwest BRT does not assume that current irrigation water supply will be transferred to meet the M&I gap. A minor exception is augmentation planning. Augmentation plans are developed on a case-by-case basis when a water rights holder is taking its own land out of production (drying up) in order to provide additional water supply for a different use (such as domestic water).

Summary of M&I and Agricultural Demands and Gaps by Subbasin

The Southwest BRT wanted to understand model results on a finer level, and thus opted to summarize a subbasin breakdown of the Technical Update results. The subbasins are shown on Figure 7. There are nine distinct river subbasins, eight of which flow out of Colorado. Together these nine subbasins make up the interdependent landscape of Southwest Colorado. In some subbasins, the needs of one subbasin have been met through a transbasin diversion. For example, the McElmo River subbasin receives municipal and irrigation water diverted out of the Dolores River through the Dolores Project. For this reason, the Dolores and McElmo Subbasin model results have been combined.

Agricultural demands and gaps are characterized in terms of averages while municipal demands and gaps are characterized in terms of maximums. The difference in terms is because water providers must plan for the maximum demand to meet service standards. A summary of the results and observations on each subbasin is provided in Table 4.

Further detail can be found in the Volume 2 Story Map, including subbasin-specific M&I data, agricultural data, and E&R data.

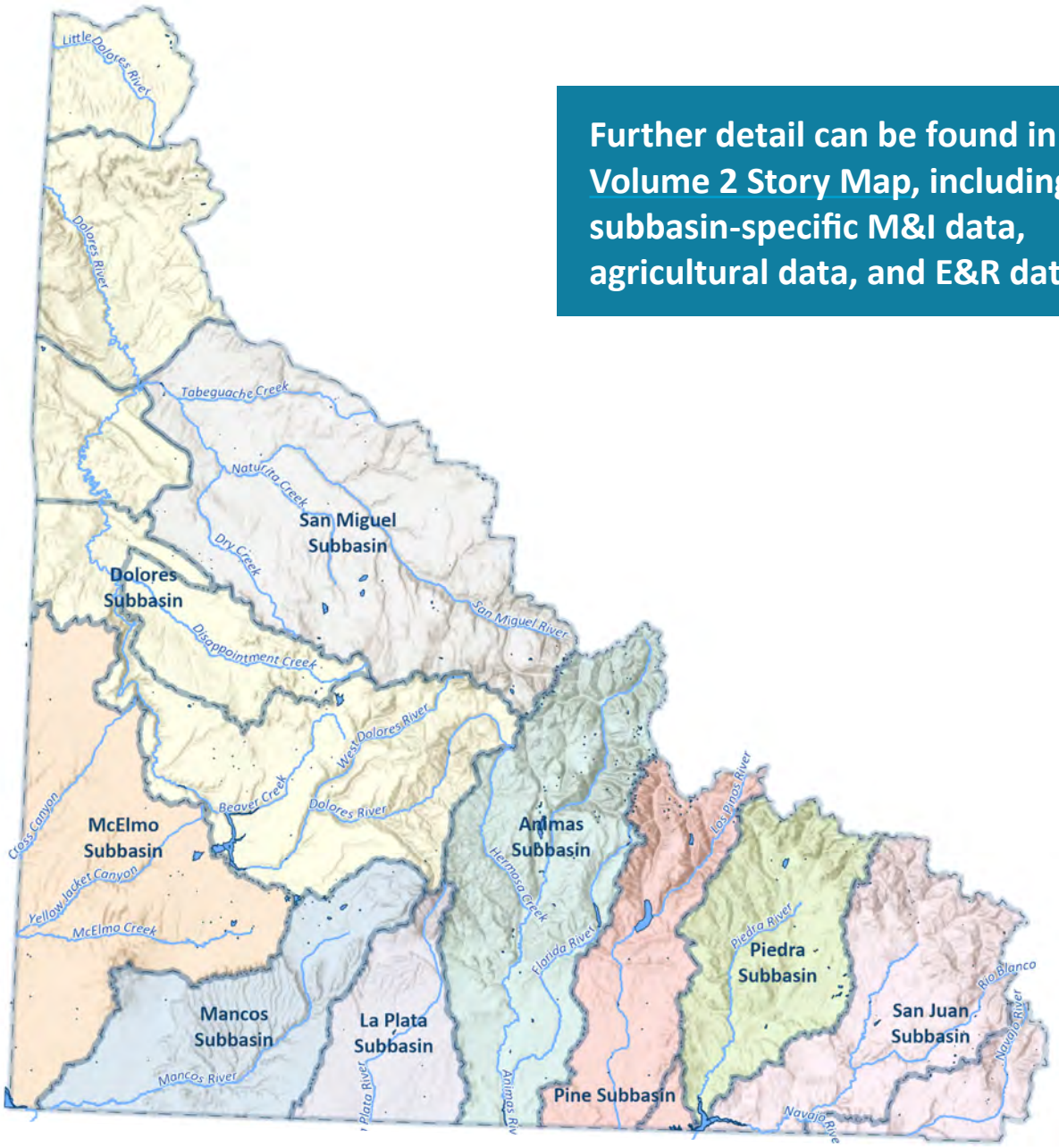


Figure 7. Southwest Subbasin Map

Table 4. Summary of Baseline and 2050 Projected M&I and Agricultural Demands and Gaps by Region

			Baseline	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
SAN JUAN	Municipal & Industrial	Demand in Maximum Gap Year (AF) [1]	2,000	3,800	2,500	3,400	4,600	5,900
		Maximum Annual Gap (AF) [1]	0	710	140	760	1,500	2,300
		• Pagosa Springs is the largest town in the San Juan Subbasin. • San Juan-Chama Project exports trans-mountain water to the Rio Grande River in New Mexico. The average annual diversion ranges from 85,000 AFY to 100,000 AFY. • San Juan Subbasin has a M&I gap across all five planning scenarios.						
	Agricultural	Average Annual Demand (AFY)	77,900	75,900	75,900	105,900	78,600	113,300
		Average Annual Gap (AFY)	5,900	5,700	5,700	16,400	12,500	20,300
		Average Demand Met (AFY)	72,000	70,200	70,200	89,500	66,100	93,000
		Incremental Gap (AFY)	-	-	-	10,500	6,600	14,400
		• San Juan Subbasin, like many in the Southwest Basin, historically experiences crop water shortages. • The majority of the agricultural community uses flood irrigation to cultivate land. • Although there is an agricultural gap across all planning scenarios, there is only an incremental gap in Cooperative Growth, Adaptive Innovation, and Hot Growth (scenarios that include climate change). • Water districts in this subbasin include: Southwestern Water Conservation District, San Juan Water Conservancy District, and San Juan Conservation District.						
PIEDRA	Municipal & Industrial	Demand in Maximum Gap Year (AF) [1]	1,000	1,900	1,300	1,800	2,400	3,000
		Maximum Annual Gap (AF) [1]	0	460	100	450	910	1,600
		• The municipal area consists mainly of well users, small metro districts, and small community water systems. • The Piedra Subbasin has the smallest M&I demands in the Southwest Basin due to its limited number of population centers.						
	Agricultural	Average Annual Demand (AFY)	31,300	31,300	31,300	45,200	35,400	49,000
		Average Annual Gap (AFY)	2,300	2,300	2,300	7,300	5,600	9,300
		Average Demand Met (AFY)	29,000	29,000	29,000	37,900	29,800	39,700
		Incremental Gap (AFY)	-	-	-	4,900	3,200	6,900
		• No incremental gap exists in Baseline conditions or two planning scenarios: Business as Usual and Weak Economy. • The agricultural demand exceeds supplies across all planning scenarios. • The water district in this subbasin is the Southwestern Water Conservation District.						

Table 4. Summary of M&I and Agricultural Water Demands and Gaps by Region *(continued)*

			Baseline[1]	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
PINE	Municipal & Industrial	Demand in Maximum Gap Year (AF)	2,200	3,500	2,300	3,600	4,300	5,500
		Maximum Annual Gap (AF) [1]	0	40	0	30	310	860
		• The Pine River provides water for Bayfield, La Plata Archuleta Water District, Ignacio, and various small metro water districts and community water systems. • Major distribution infrastructure is needed to meet the demands of hundreds of residences (typically well users). • The Pine Subbasin has the smallest M&I gap in maximum gap year metrics among the other subbasins.						
	Agricultural	Average Annual Demand (AFY)	205,200	201,500	201,500	243,400	185,300	251,400
		Average Annual Gap (AFY)	12,000	11,900	11,900	41,300	28,400	50,400
		Average Demand Met (AFY)	193,200	189,600	189,600	202,100	156,900	201,000
		Incremental Gap (AFY)	-	-	-	29,300	16,400	38,400
		• Pine River Irrigation District manages Vallecito Reservoir. Pine River Irrigation Project provides water for agricultural users on the Southern Ute Indian Reservation lands and for non-tribal lands. • The Pine Subbasin has the second highest agricultural demands in the Southwest Basin. • Water districts in this subbasin include: Southwestern Water Conservation District, Pine River Conservation District, and Pine River Irrigation District.						
ANIMAS	Municipal & Industrial	Demand in Maximum Gap Year (AF)	7,500	11,800	7,800	12,200	14,600	18,600
		Maximum Annual Gap (AF) [1]	0	1,800	350	2,100	3,700	5,600
		• Florida Water Conservancy District manages Lemon Reservoir and provides water for the City of Durango. • The Animas-La Plata water project uses water storage and conveyance structures to meet demands of Ute Mountain Ute and Southern Ute tribes and New Mexico. Water not allocated to the tribes may be used by other water providers to meet M&I demands in La Plata County. • Annual demands include snowmaking at Purgatory Ski Resort in Durango, CO. • There is a M&I gap across all planning scenarios, with the maximum gap in the Hot Growth scenario. • Major distribution infrastructure is needed to meet the demands of hundreds of residences (typically well users).						
	Agricultural	Average Annual Demand (AFY)	122,700	121,800	121,800	151,800	114,100	158,600
		Average Annual Gap (AFY)	13,400	13,200	12,900	40,900	32,200	51,400
		Average Demand Met (AFY)	109,300	108,600	108,900	110,900	81,900	107,200
		Incremental Gap (AFY)	-	-	-	27,600	18,900	38,100
		• The Florida River, a tributary to the Animas River, includes Lemon Reservoir, which serves a large agricultural community and is a major contributor to the Animas River. • Although there is an agricultural gap across all planning scenarios, there is only an incremental gap in Cooperative Growth, Adaptive Innovation, and Hot Growth. • Water districts in this subbasin include: Southwestern Water Conservation District, Animas-La Plata Water Conservancy District, and Florida Water Conservancy District.						

Table 4. Summary of M&I and Agricultural Water Demands and Gaps by Region *(continued)*

			Baseline[1]	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
LA PLATA	Municipal & Industrial	Demand in Maximum Gap Year (AF)	2,000	3,100	2,100	3,200	3,800	4,900
		Maximum Annual Gap (AF) [1]	0	1,100	450	1,300	1,800	2,600
		• Animas-La Plata Project serves Ute Mountain Ute Tribe, the Animas-La Plata Conservancy District, and the La Plata West Water Authority in the La Plata Subbasin. • The highest demand and gap are in Hot Growth. • Major distribution infrastructure is needed to meet the demands of hundreds of residences (typically well users).						
	Agricultural	Average Annual Demand (AFY)	46,700	46,700	46,700	56,700	44,500	59,100
		Average Annual Gap (AFY)	22,000	22,100	22,000	33,900	28,000	37,700
		Average Demand Met (AFY)	24,700	24,600	24,700	22,800	16,500	21,400
		Incremental Gap (AFY)	-	-	-	11,900	5,970	15,600
		• The La Plata Subbasin is home to an economically strong agricultural community. • La Plata Subbasin chronically suffers from a less-than-sufficient supply to meet agricultural demands, with years routinely only seeing 53 precent of supply. • The La Plata Subbasin is administrated according to the La Plata Compact. • Although there is an agricultural gap across all planning scenarios, there is only an incremental gap in the Cooperative Growth, Adaptive Innovation, and Hot Growth scenarios. • Water districts in this subbasin include: Southwestern Water Conservation District, Animas-La Plata Water Conservancy District, and La Plata Conservation District.						
MANCOS	Municipal & Industrial	Demand in Maximum Gap Year (AF)	1,900	3,100	2,000	2,800	3,800	4,800
		Maximum Annual Gap (AF) [1]	0	660	250	-	1,200	1,900
		• The Mancos Subbasin consists of two large water consumers—Town of Mancos and Mesa Verde National Park—surrounded by rural communities. • Mancos Rural Water Company and Montezuma Rural Water Company both provide water to users within the subbasin. • There is a gap in each scenario except Cooperative Growth.						
	Agricultural	Average Annual Demand (AFY)	49,200	47,700	47,700	61,300	48,600	64,500
		Average Annual Gap (AFY)	9,300	8,600	8,500	24,400	20,200	30,800
		Average Demand Met (AFY)	39,900	39,100	39,200	36,900	28,400	33,700
		Incremental Gap (AFY)	-	-	-	15,000	10,800	21,500
		• Although there is an agricultural gap across all planning scenarios, there is only an incremental gap in Cooperative Growth, Adaptive Innovation and Hot Growth. • Most of the lands under agricultural production exist in the northern region of the Mancos Subbasin. • The Mancos River has 5 stream segments: East, Middle, West, Chicken Creek, and Mud Creek. • Water districts in this subbasin include: Southwestern Water Conservation District, Mancos Water Conservancy District, and Mancos Conservation District.						

Table 4. Summary of M&I and Agricultural Water Demands and Gaps by Region *(continued)*

			Baseline[1]	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
DOLORES & MCELMO	Municipal & Industrial	Demand in Maximum Gap Year (AF)	8,100	13,300	9,200	12,100	15,600	20,500
		Maximum Annual Gap (AF) [1]	0	2,000	390	1,600	3,300	8,100
		• Dolores Project serves rural communities alongside Montezuma Water Company and the cities of Cortez, Towaoc, and Dove Creek. • Dolores Water Conservancy District provides Dolores Project water to Montezuma and Dolores Counties.						
	Agricultural	Average Annual Demand (AFY)	314,200	313,100	313,100	344,100	253,700	352,300
		Average Annual Gap (AFY)	19,200	19,200	19,200	35,500	27,600	59,900
		Average Demand Met (AFY)	295,000	293,900	293,900	308,600	226,100	292,400
		Incremental Gap (AFY)	-	50	-	16,300	8,400	40,700
		• There is a strong agricultural presence in this region, with McPhee Reservoir providing water to the Ute Mountain Ute Farm and Ranch, full-service irrigators along Dove Creek Canal, and a supplemental supply to Montezuma Valley Irrigation Company. • Both the Dolores and McElmo Subbasins are vulnerable to drought and climate change, with a large incremental gap in Hot Growth. • The Dolores and McElmo Subbasins have the highest agricultural demand in the Southwest Basin. • Water districts in this subbasin include: Southwestern Water Conservation District, San Miguel Water Conservancy District, and San Miguel Basin Conservation District.						
SAN MIGUEL	Municipal & Industrial	Demand in Maximum Gap Year (AF)	2,400	4,300	3,100	4,200	4,900	6,300
		Maximum Annual Gap (AF) [1]	0	1,300	310	1,300	2,000	3,300
		• Telluride, Mountain Village, Naturita, Norwood, and Nucla are the main municipal water consumers in the region; many rural communities are also served. • The Telluride ski area conducts snowmaking.						
	Agricultural	Average Annual Demand (AFY)	177,600	167,400	167,400	212,100	162,900	223,600
		Average Annual Gap (AFY)	42,100	36,800	36,800	76,700	64,300	95,100
		Average Demand Met (AFY)	135,500	130,600	130,600	135,400	98,600	128,500
		Incremental Gap (AFY)	-	-	-	34,600	22,300	53,000
		• The San Miguel Subbasin leans heavily on a robust agricultural community with many reservoirs used to serve the industry. • Gurley Reservoir supplies the most supplemental water to meet agricultural demands in the region. • Although there is an agricultural gap across all planning scenarios, there is only an incremental gap in Cooperative Growth, Adaptive Innovation, and Hot Growth (scenarios with climate change). • The San Miguel Subbasin lacks storage capacity compared to other subbasins. • Water districts in this subbasin include: Southwestern Water Conservation District, San Miguel Water Conservancy District, and San Miguel Basin Conservation District.						

[1] *CDSS water allocation model in this subbasin calculates small baseline M&I gaps, but they are either due to calibration issues or they are reflective of infrequent, dry-year shortages that are typically managed with temporary demand reductions, such as watering restrictions.*

Environment and Recreation

During the Technical Update, current and potential future risks to E&R attributes in the Southwest Basin were evaluated using the Colorado Environment and Recreation Flow Tool (Flow Tool). The Flow Tool was developed to help BRTs evaluate their portfolios of E&R projects by fostering an improved understanding of potential stream-flow-related risks (both existing and projected) to E&R attributes throughout their basins.

The Flow Tool uses streamflow data from the Colorado Decision Support System (CDSS), modeled streamflow data for various planning scenarios, and established flow-ecology relationships to assess risks to flows and E&R attribute categories at preselected gages across the state. The Flow Tool is a high-level tool that is intended to provide guidance during the planning process for stream management plans and the BIP Update. A total of 15 water allocation model nodes were selected in the Southwest Basin for the Flow Tool as shown on Figure 8. Figure 8 also shows the subwatershed (at the 12-digit HUC level) and the relative number of E&R attributes located in each subwatershed.

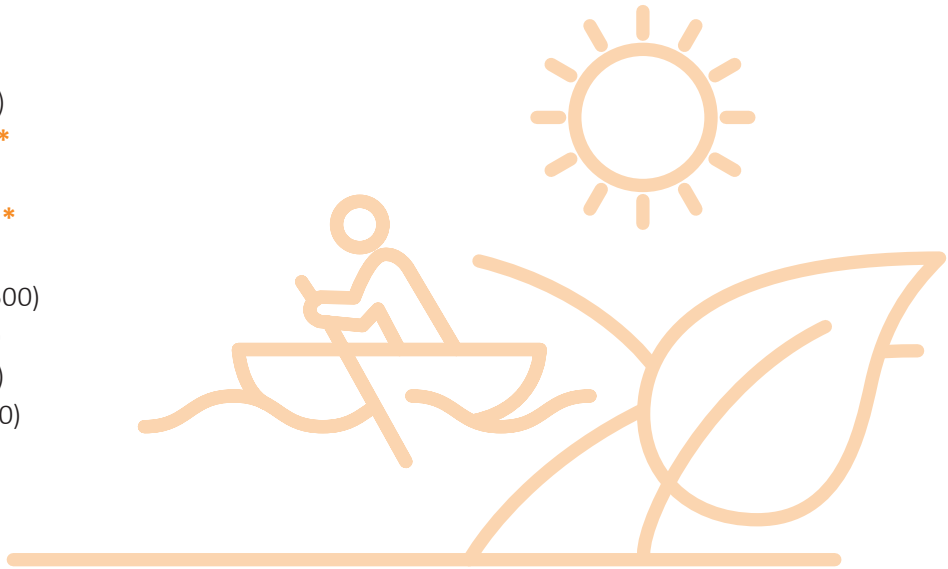
Additional nodes were added in the latest iteration of the Flow Tool to help the Southwest BRT evaluate impacts on stream reaches above and below communities and water diversions while assessing how impacts vary as the river flows downstream.

Tables 5 summarizes basinwide results of the Flow Tool and, in some instances, subbasin-specific observations are included. Table 5 identified a number of projected changes in streamflow regimes and potential risks to E&R attributes; stakeholders in the Southwest Basin have been engaged proactively in developing strategies and projects to mitigate these future and potential risks. Table 6 lists these activities in each subbasin (this list is not exhaustive).

The Flow Tool nodes in the Southwest Basin are:

- Navajo River at Edith, CO (9346000)
- San Juan River Near Carracas, CO (9346400)
- San Juan River at Pagosa Springs (9342500) *
- San Miguel River Near Placerville, CO (9172500)
- San Miguel River at Uravan (9177000) *
- San Miguel Near Telluride (9171200)
- Los Pinos River at La Boca, CO (9354500)
- Los Pinos River near Bayfield (9353500) *
- Dolores River at Dolores, CO (9166500)
- Dolores River Below Rico, CO (9165000) *
- Dolores River Near Bedrock (9171100) *
- Animas River at Howardsville, CO (9357500)
- Animas River near Cedar Hill (09363500)
- Piedra River Near Arboles, CO (9349800)
- Mancos River Near Towaoc, CO (9371000)
- West Mancos near Mancos (9368500) *

The identification of future risks to E&R attributes helps facilitate discussions about projects or strategies that can be implemented to reduce the risks. This type of discussion is similar to and integrates with BRT strategies that focus on reducing the risk of experiencing municipal or agricultural gaps.



***Newly added nodes**

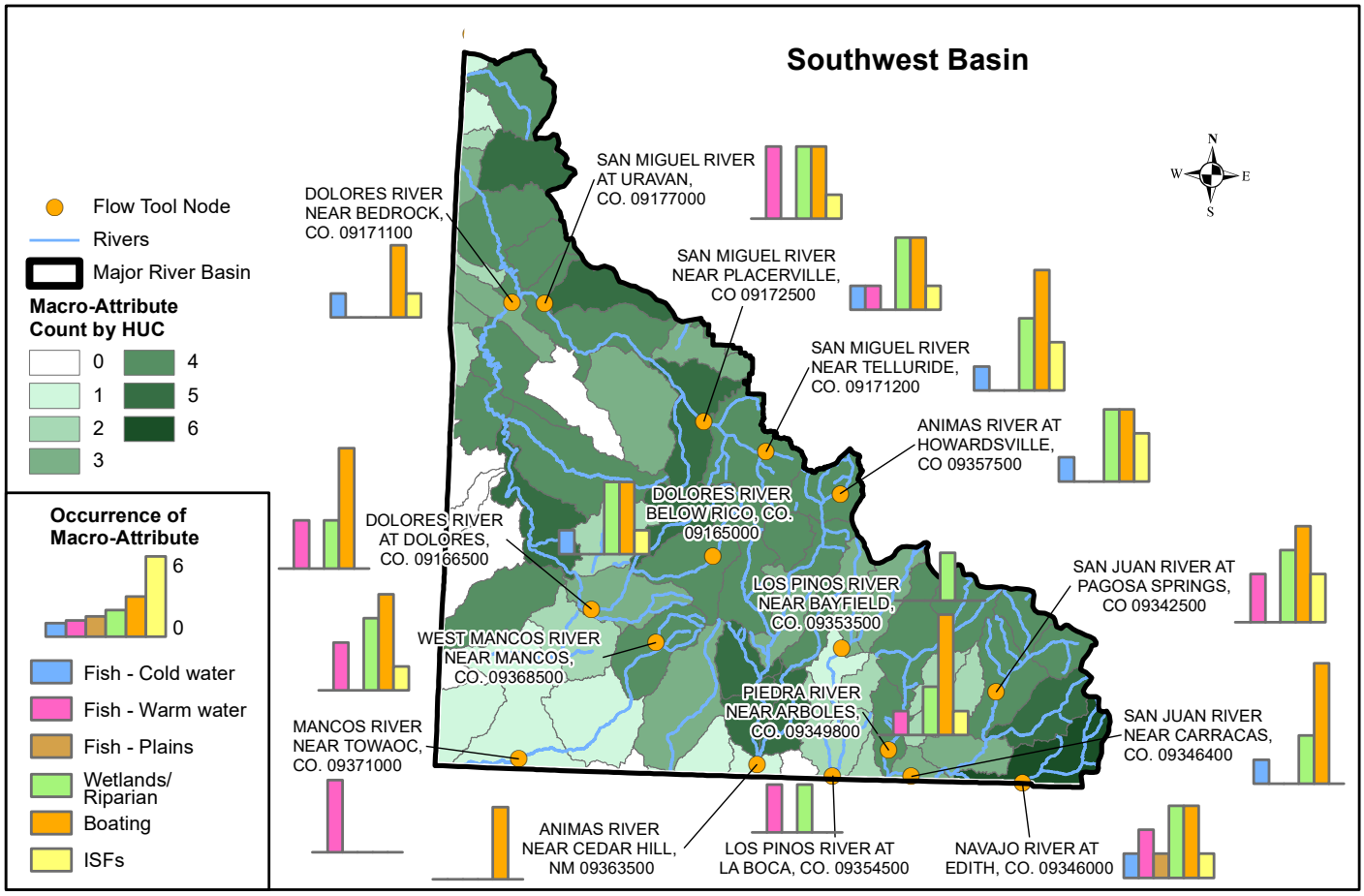


Figure 8. Flow Tool Nodes Selected

Table 5. Summary of Flow Tool Results

Category	Observation
Projected Flows	• Along tributaries to the San Juan and San Miguel Rivers, spring runoff peak flows are projected to occur earlier in April and May for the climate-impacted scenarios (Cooperative Growth, Adaptive Innovation, and Hot Growth) compared to the peak occurring in June for Baseline, Business as Usual, and Weak Economy. Subsequently, mean monthly flows are projected to be lower for climate-impacted scenarios for all other months (July through March). • Within the Dolores and San Miguel Subbasins monthly mean peak flows are projected to be lower for every month for the climate-impacted scenarios compared to the other scenarios. Spring runoff peak flows are projected to occur earlier in April and May for the climate-impacted scenarios. Low flow conditions are projected to be similar among all scenarios. • Annual flows in the headwaters at all flow nodes under climate-impacted scenarios are projected to be lower than flows projected for the Baseline, Business as Usual, and Weak Economy. In some wet years, climate-impacted scenarios are projected to have greater annual flow, but for most years, especially the drier years, less flow is projected compared to Baseline. Business as Usual and Weak Economy will have similar annual flows compared to Baseline. • The spring monthly peak runoff on the Navajo River is projected to be substantially greater for climate-impacted scenarios, which will also result in substantially lower summer monthly mean peak flows.
Ecological Risk	• Peak-flow-related risk to riparian/wetland plants and fish is already high and may increase under climate-impacted scenarios. • Due to the shift in mean monthly peak flows for the climate-impacted scenarios to an earlier spring peak runoff and lower mid- to late-summer flows, spawning opportunities for various species and summer low-flow conditions could adversely affect fish species. Lower flow conditions combined with warmer air temperatures due to climate change could result in warmer water temperatures that would negatively affect cold-water fish species.
ISFs and RICDs	• ISFs throughout the Southwest Basin and the RICD on the Animas River may not be met in many years under climate-impacted scenarios. For example, flows on the San Miguel River near Placerville are projected to fall short of the 93 cfs summer ISF regularly during both the mid-summer and late-summer. In August, this ISF is projected to be unmet 1 out of 3 years under Cooperative Growth and 2 out of 3 years under Adaptive Innovation and Hot Growth. • On the Animas River, the 25 cfs ISF would not be met in numerous years during late summer, i.e., August through October, and again in January and February (when the minimum flow is 13 cfs) under the three climate-impacted scenarios.
E&R Attributes	• Under Baseline, Business as Usual, and Weak Economy, flow issues related to E&R attributes are generally related to depletions that increase as water flows downstream. • In some locations, transbasin diversions reduce and change the timing of flow in the basin of origin while augmenting flows in the receiving basin. • Under climate-impacted scenarios, the shift in peak flow timing, reductions in total runoff, and increasing consumptive demands may contribute to reductions in mid- and late-summer flows.

Table 6. Summary of E&R Activities by Subbasin

DECREED ISFs	FOREST HEALTH GROUPS/PLANS	WATERSHED GROUPS	WATER QUALITY GROUPS/PLANS	STREAM MANAGEMENT PLANS
SAN JUAN				
• 17 stream segments • 13 natural lake segments	• San Juan Headwaters Forest Health Partnership	• San Juan Chama Watershed Partnership • Chama Peak Land Alliance	• Southern Ute Water Quality Program	• Upper San Juan Watershed Enhancement Partnership Project
PIEDRA				
• 12 stream segments	• San Juan Headwaters Forest Health Partnership		• Southern Ute Water Quality Program	
PINE				
• 4 stream segments • 26 natural lake segments	• Four Rivers Resilient Forest Collaborative	• Pine River Watershed Group	• Southern Ute Water Quality Program	
ANIMAS				
• 41 stream segments • 20 natural lake segments	• Four Rivers Resilient Forest Collaborative		• Animas Watershed Partnership • Animas River Community Forum • Southern Ute Water Quality Program • Bonita Peak Mining District Community Advisory Group	

Table 6. Summary of E&R Activities by Subbasin (continued)

DECREED ISFs	FOREST HEALTH GROUPS/PLANS	WATERSHED GROUPS	WATER QUALITY GROUPS/PLANS	STREAM MANAGEMENT PLANS
LA PLATA				
• 6 stream segments	• Four Rivers Resilient Forest Collaborative		• Southern Ute Water Quality Program	
MANCOS				
• 4 stream segments		• Mancos River Watershed Group • Mancos River Resilience Project	• Mancos Watershed Based Plan • Ute Mountain Ute Water Quality Assessment	• Manco Watershed Stream Management Plan
MCELMO				
• 2 stream segments				
DOLORES				
• 45 stream segments	• Dolores Watershed Resilient Forest Collaborative	• Dolores River Restoration Partnership	• Dolores River Native Fish Monitoring and Recommendation Team • Dolores Watershed Resilient Forest Collaborative • Dolores River Restoration Partnership • Upper Dolores Stream Protection Working Group	
SAN MIGUEL				
• 42 stream segments • 2 natural lakes levels		• Uncompahgre Plateau Collaborative Restoration Project • Valley Floor Preservation Partners	• San Miguel Watershed Coalition	• San Miguel Stream Management Plan

Focus Area Mapping

Since the 2005 passage of the Colorado Water for the 21st Century Act, the nine BRTs and the CWCB have worked to characterize Colorado's E&R water needs. The effort has included extensive inventory, analysis, and synthesized mapping of each basin's E&R attributes. Through this process, each BRT created Focus Area maps that identify streams or watersheds where E&R attributes are located and/or where these attributes may be at risk. The Focus Area maps were included in the 2010 version of the Statewide Water Supply Initiative. A total of 108 E&R attributes were identified during the mapping efforts and consolidated to 58 attributes grouped into macro categories for the Technical Update. These attributes range from select species, wilderness areas, river recreation activities, wetlands, fisheries, and wildlife watching.

Since the 2015 BIP, E&R water supply needs assessments (i.e. Stream Management and Integrated Water Management Plans) were conducted in San Miguel, Mancos, and upper San Juan Rivers' Subbasins, but the information was not incorporated into Focus Area maps. The E&R Subcommittee recommended that, in the future, the attribute mapping and the resulting focus areas be updated by incorporating the findings of the E&R water supply needs assessments that have been completed and adding data from the new assessments as they are developed. Figure 9 shows the current Focus Area map for the Southwest BRT.

The Focus Area maps were created to:

1. **Help guide water supply planning**
2. **Help identify where projects could reduce risks to E&R attributes**
3. **Identify potential collaborative projects**

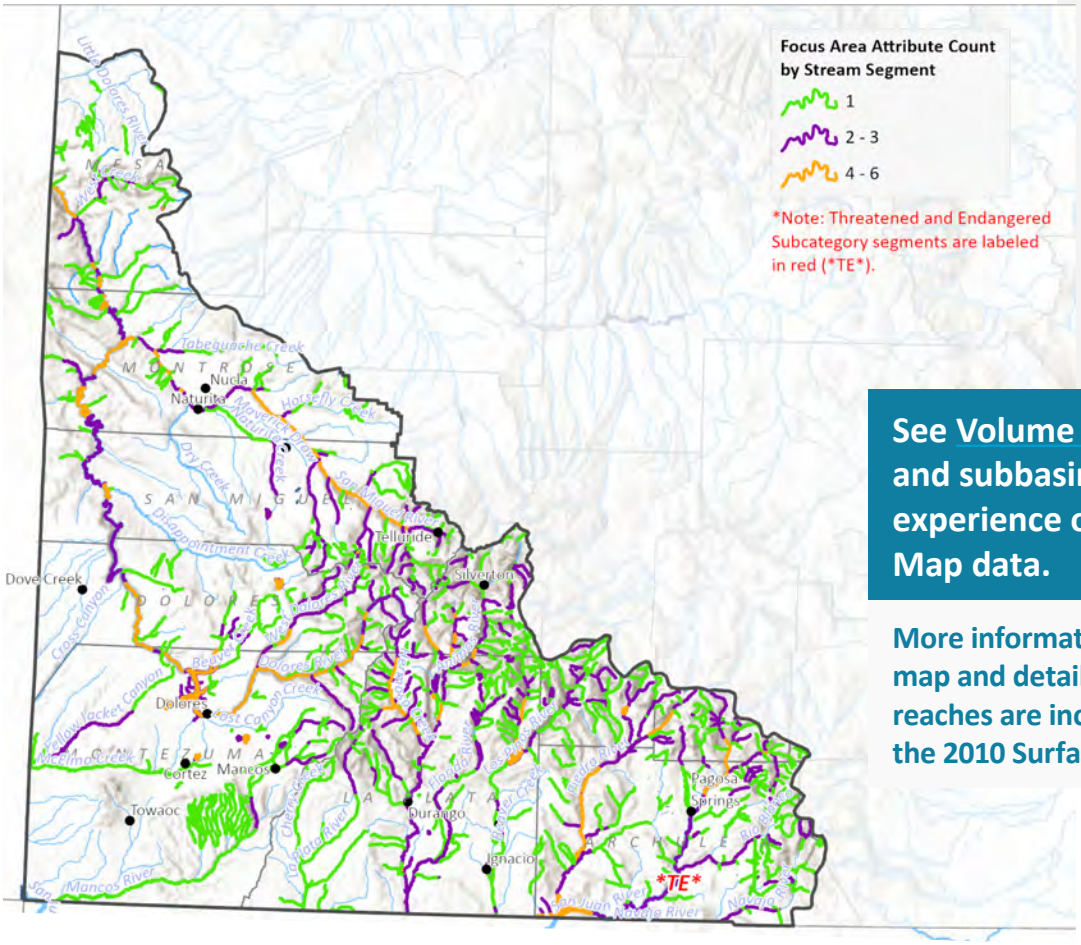


Figure 9. Focus Area Map

See Volume 2 for an interactive and subbasin-focused experience of the Focus Area Map data.

More information on the Focus Area map and details on specific focus area reaches are included in Appendix C of the 2010 Surface Water Supply Index.

Water Supplies

Water supplies in the Southwest Basin vary substantially based on location within the basin. The availability of surface water supplies depends on both the size of the upstream contributing drainage area and the nature of senior water rights. Figures 10 through 13 show simulated available flow for the Southwest Basin at two locations to illustrate the difference in hydrology and water availability across the multiple subbasins. The Animas River at Durango gage is located just upstream of the Durango Boating Park, which is a recreational instream flow with a peak demand of 1,400 cfs from June 1 through June 14 and has various lower demand for the remainder of the year.

The La Plata River produces very little runoff, and demands on the river chronically experience shortages due to physical flow limitations and curtailment due to the La Plata Compact. At both locations, available flows are projected to diminish, and peak flows could occur earlier in the runoff season under climate-impacted scenarios.

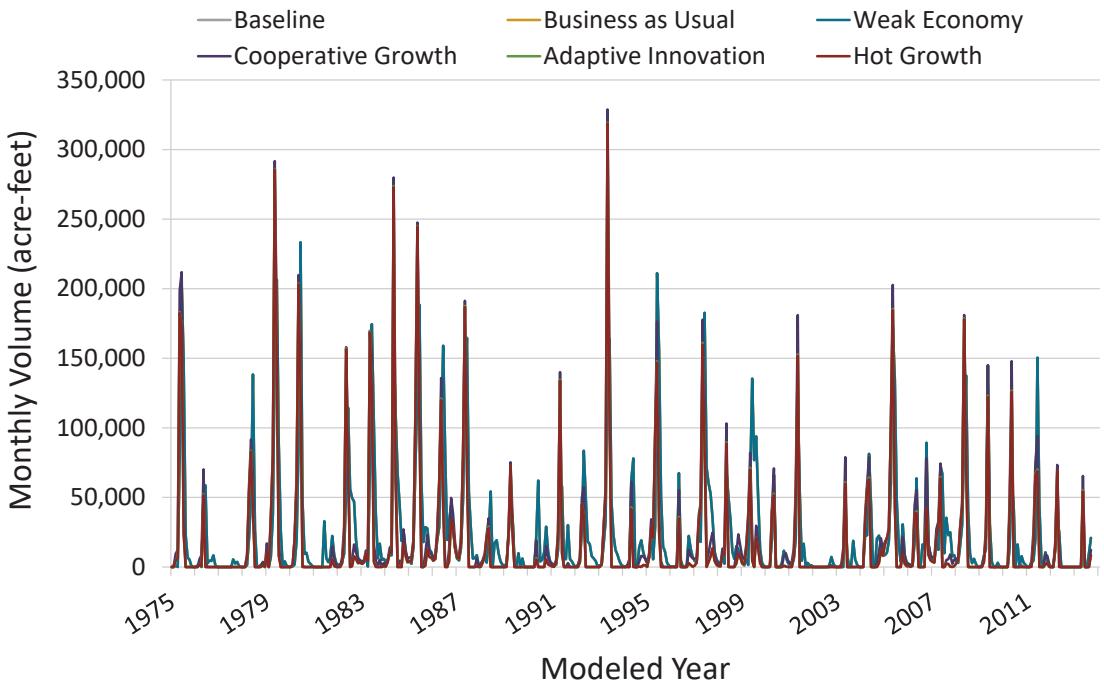


Figure 10. Simulated Hydrograph of Available Flow at Animas River at Durango, CO

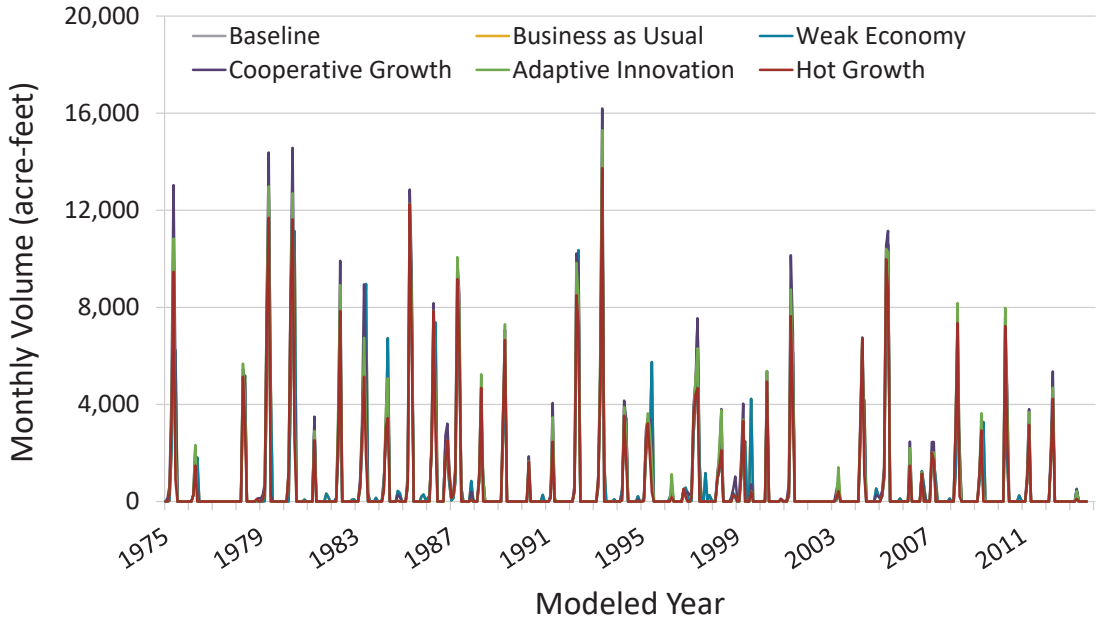


Figure 11. Simulated Hydrograph of Available Flow at La Plata River at Hesperus, CO

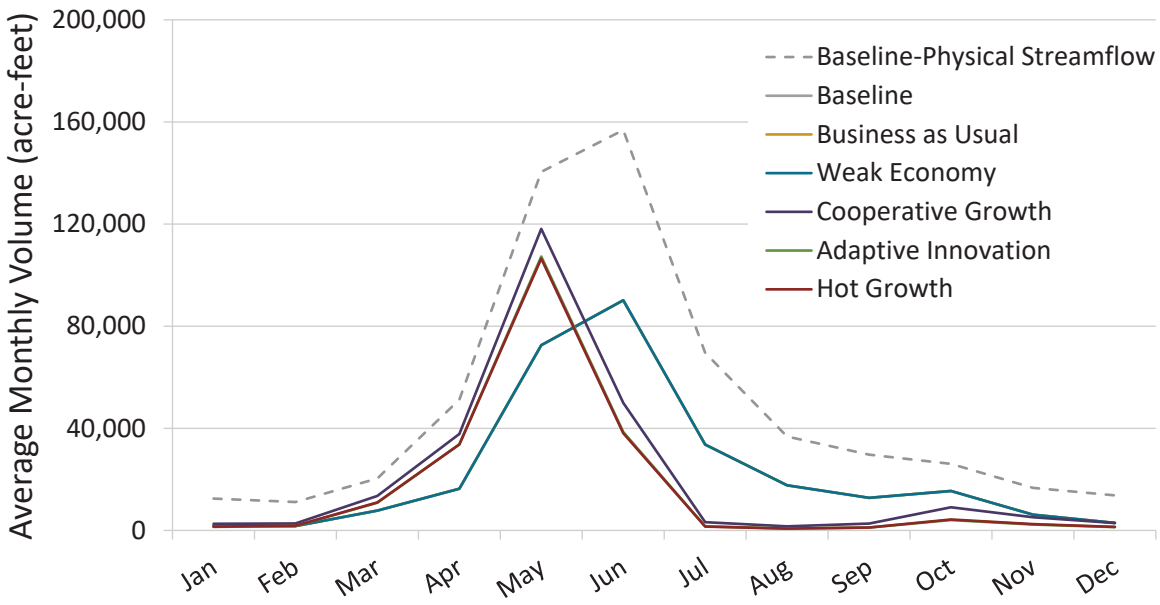


Figure 12. Average Monthly Simulated Hydrographs of Available Flow at Animas River at Durango, CO

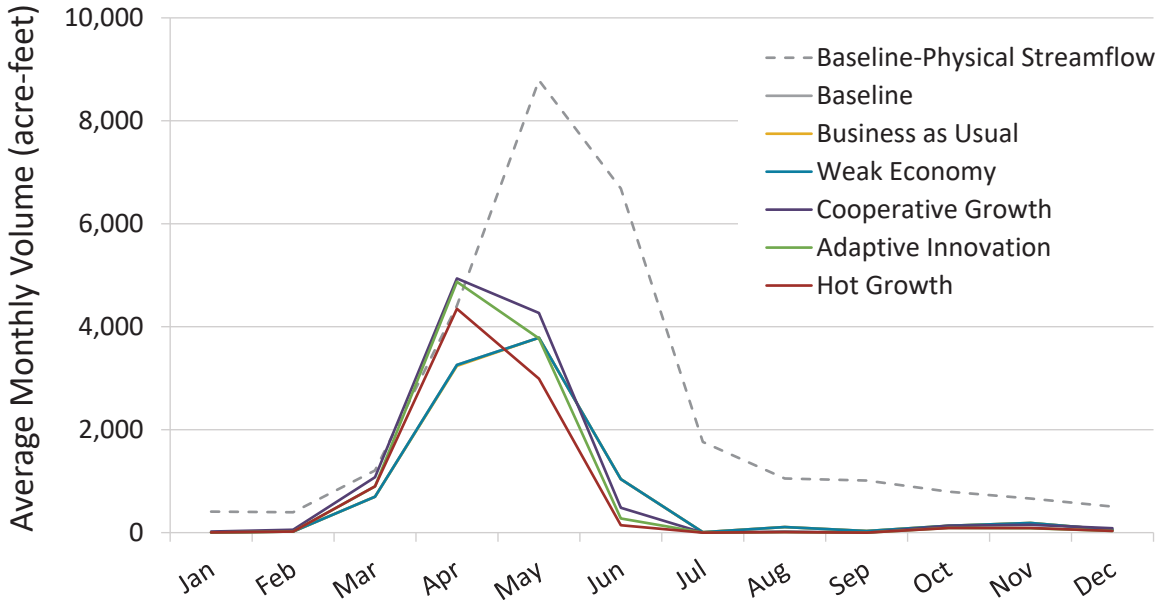


Figure 13. Average Monthly Simulated Hydrographs of Available Flow at La Plata at Hesperus, CO

Storage

Total simulated reservoir storage from the Southwest Basin water allocation model is shown on Figure 14. Baseline and Weak Economy conditions show the highest levels of water in storage (in general) and the lowest in Hot Growth. A significant spread between storage levels is shown for the various planning scenarios, with as much as 200,000 AF storage difference between Weak Economy and Hot Growth.

Basinwide storage supplies vary widely and are significantly impacted in Hot Growth.

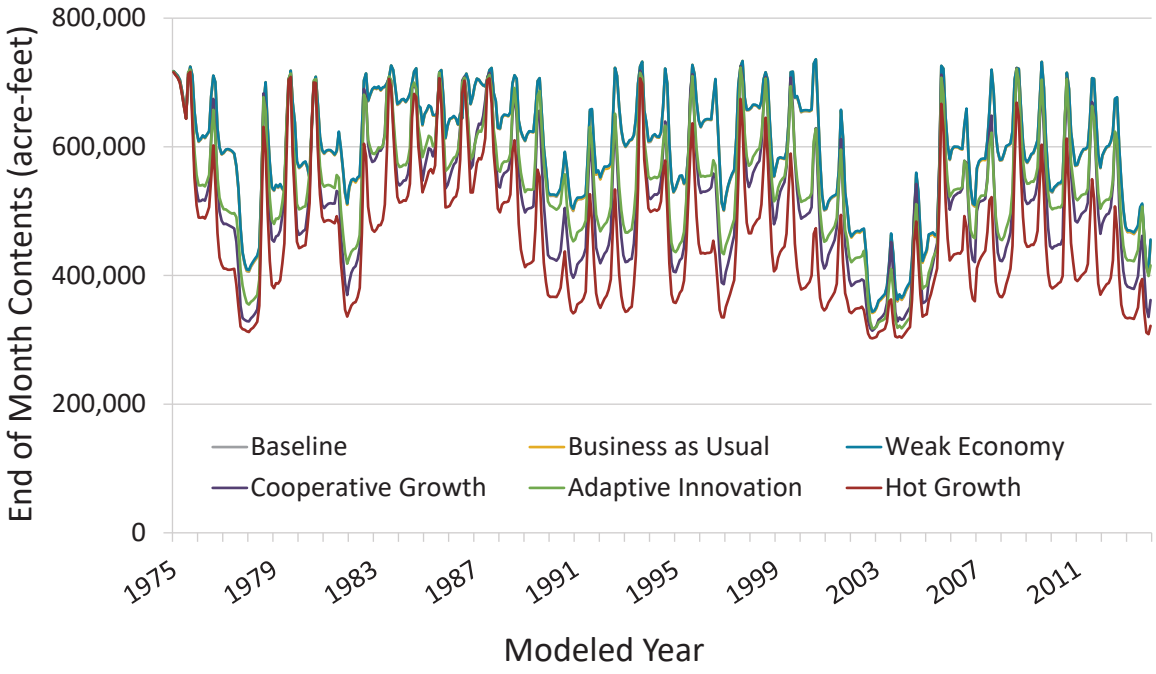


Figure 14. Southwest Basin Total Simulated Storage

Photo from Eddie Phillips

Section 6. Strategic Vision for the Future

The goals and strategies described in Section 4 provide the building blocks for a long-term vision for the Southwest Basin and describe steps that stakeholders can take to help protect existing water uses. Section 6 describes principles developed by the Southwest BRT that will guide its strategic vision for the future, support near-term progress toward meeting basin goals, and ensure projects supported and funded through the Southwest BRT align with BIP goals. Project implementation is another element of the strategic vision to meet basin goals, and it is described in the fifth item of this section.

Principles

The Southwest BRT acknowledges that geographic, political, economic, and legal complexities lead to unique challenges and opportunities for the Southwest Basin. In response, the BRT developed the following principles to guide its future actions. The Southwest BRT's guiding principles are grouped according to four overarching categories: cooperation and collaboration, role and regional position, legal acknowledgments, and challenges and threats.

1 Principles for Cooperation and Collaboration

- The Southwest BRT intends to develop, use, and maintain the BIP as a living document.
- The Southwest BRT agrees that all water uses are important to the future of this region and that cooperation among water interests is essential to accomplish the BIP goals.
- The Southwest BRT recognizes that members bring different interests and perspectives to the BRT and expects that exchange of ideas be done in a respectful manner.
- The Southwest BRT encourages multi-purpose projects when possible and when they can be accomplished in a manner that is protective of the values present.
- The Southwest BRT limits conflicts and promotes collaboration within the framework of state, tribal, and federal plans, policies, authorities, and rights.

2 Principles for Role and Regional Position

- The Southwest BRT identifies specific and unique projects that are important to maintaining the quality of life in this region, including domestic supplies, environmental needs, agriculture, recreation, and commercial/industrial needs.
- The Southwest BRT supports the preservation of the Southwest Basin's ability to use and develop Colorado River Compact entitlements and to meet our water supply gaps.
- The Southwest BRT recognizes the distinct roles of the state, the Southwestern Water Conservation District, and the BRT, while supporting dialogue and cooperation to better align local and statewide interests.
- The Southwest BRT recognizes and strives to address existing and future water supply-demand gaps.

3 Principles for Legal Acknowledgements

- The Southwest BRT recognizes and upholds the unique settlement of tribal reserved water rights claims through Colorado water rights settlements and consent decrees.
- The Southwest BRT recognizes the importance of negotiations, agreements, and legislation involving the Colorado River.
- The Southwest BRT recognizes and protects the compact entitlement as negotiated and enforced by the state of Colorado. Explicitly, the BRT recognizes and upholds the doctrine of prior appropriation and supports Colorado's system of water rights administration.
- The Southwest BRT recognizes the challenges faced by water users in Southwest Colorado due to continued water use, development, and pressures downstream and strives to protect interests in Southwest Colorado while complying with existing Compact obligations.

4 Principles for Challenges and Threats

- The Southwest BRT recognizes the challenges to all water users that future drought and/or climate variability may bring.
- The Southwest BRT recognizes that the flows necessary to support the full range of environmental and recreation values are not currently well understood but progress since 2015 in technical analysis and local stakeholder processes has improved our knowledge of these values.
- The Southwest BRT supports measures to discourage speculation and supports communicating with the state on this issue.

Project Implementation

5 Implement Projects

Implementation of water projects is the primary means by which future M&I, agricultural, and E&R water supply needs can be met. Implementation of projects ties to and will advance nearly all the goals and strategies identified in the Southwest BIP. Amplifying the importance of projects, the Southwest BRT has identified numerous and varied projects to meet future water needs in the Southwest Basin at a total future cost of nearly $790 million (an estimate that does not include all identified projects or projects that will be identified after the BIP is updated).

The Southwest BRT has long recognized the importance of supporting and implementing projects. In fact, the 2015 Southwest BIP recognized that implementing planned projects is critical to meeting the future water needs of the Southwest Basin. The 2015 BIP focused on implementing a wide variety of M&I, agricultural, and E&R projects and encouraged collaborative multi-purpose projects, projects that promote a balance among needs, and projects that reduce conflict. The same sentiment was expressed during the BIP update process, and a focus on project implementation is embedded in the goals and strategies.

The degree to which projects are successfully implemented relates directly to the risks associated with meeting the Southwest Basin's future M&I, agricultural, and E&R needs.

The updated Project Database includes a list of identified projects that have the potential to support the Southwest BRT goals as described in Section 4, as follows:

A Balance All Needs and Reduce Conflict

Since 2015, 13 projects have been completed that address more than one water need, including four processes. The current Project Database contains 72 projects that address multiple needs, including 21 focused on processes that promote dialogue, foster cooperation, and/or resolve conflict. These active projects range from concept ideas to currently implementing. Of these projects, 25 are categorized as Tier 1 with an estimated total cost of $88 million, while 10 are ranked as Tier 2 with an estimated total cost of $105 million.

B Support the Needs of Agriculture

Since 2015, seven projects have been completed that focus entirely on maintaining agricultural water needs. Many BRT-funded projects for agricultural improvements fall under the BRT's concept project specific to addressing agricultural efficiencies and improvements. The current Project Database contains 19 projects that have a 50 percent or more focus on agricultural water needs while also supporting another water need. For example, when improving agricultural diversion structure, fish or recreation passage can also be improved. These active projects range from concept ideas to currently implementing. Of these projects, seven are categorized as Tier 1 with an estimated total cost of $5.1 million, while two are categorized as Tier 2 with an estimated total cost of $340,000.

C Meet Municipal and Industrial Water Needs

Since 2015, 11 projects have been completed that focus entirely on addressing M&I water needs. Many BRT-funded projects for municipal needs fall under the BRT's multi-basin projects specific to addressing rural water supplies. The current Project Database now contains 34 projects focused only on addressing M&I needs. These active projects range from concept ideas to currently implementing. Of these projects, eight are categorized as Tier 1 with an estimated total cost of $298 million, while seven are categorized as Tier 2 with an estimated total cost of $24 million.

D Meet Recreational Water Needs

Since 2015, 17 projects have been completed that are entirely focused on environmental and/or recreational needs. The current Project Database contains 33 projects focused entirely on environmental and/or recreational needs. These active projects range from concept ideas to currently implementing. Of these projects, 16 are categorized as Tier 1 with an estimated total cost of $7.5 million, while nine are categorized as Tier 2 with an estimated total cost of $7 million.

E Meet Environmental Water Needs

Since 2015, 17 projects have been completed that are entirely focused on environmental and/or recreational needs. The Project Database now contains 33 projects focused entirely on environmental and/or recreational needs. These active projects range from concept ideas to currently implementing. Of these projects, 16 are categorized as Tier 1 with an estimated total cost of $7.5 million, while nine are categorized as Tier 2 with an estimated total cost of $7 million.

F Promote Healthy Watersheds

This goal was identified during the BIP update. The Projects Database includes at least 12 projects that include watershed health in their project descriptions. Many projects that meet Goal F and its strategies also meet Goals D and E. Reference the above summaries to learn more about projects meeting environmental and recreational water needs.

G Manage Risk Associated with Colorado River Compact

The Southwest BRT supported this goal through implementation of a West Slope Risk Study modeling Upper Colorado River water supplies and management activities. While no other projects specific to this goal were implemented; many projects that were implemented inherently address this goal by developing their water rights, building resiliency in the water management strategies, and protecting water uses and values in the Southwest Basin. The Southwest BRT formed a workgroup in 2018 that meets regularly to disseminate information and facilitate discussion to inform Southwest BRT participants on drought contingency planning, demand management, and other Colorado River basin issues.

Section 7. Future Basin Projects

The Southwest BRT, along with other stakeholders, identified projects that will further the BRT's progress toward achieving its basin's goals and meeting future water needs. The list of projects is managed in a database that was initially developed prior to the 2015 BIP and was updated in 2020 during the BIP update. The Project Database tracks projects considered by the roundtables through the BIP process, both in the past and into the future. Table 7 provides a snapshot summary of the Project Database at the conclusion of the current BIP update process.

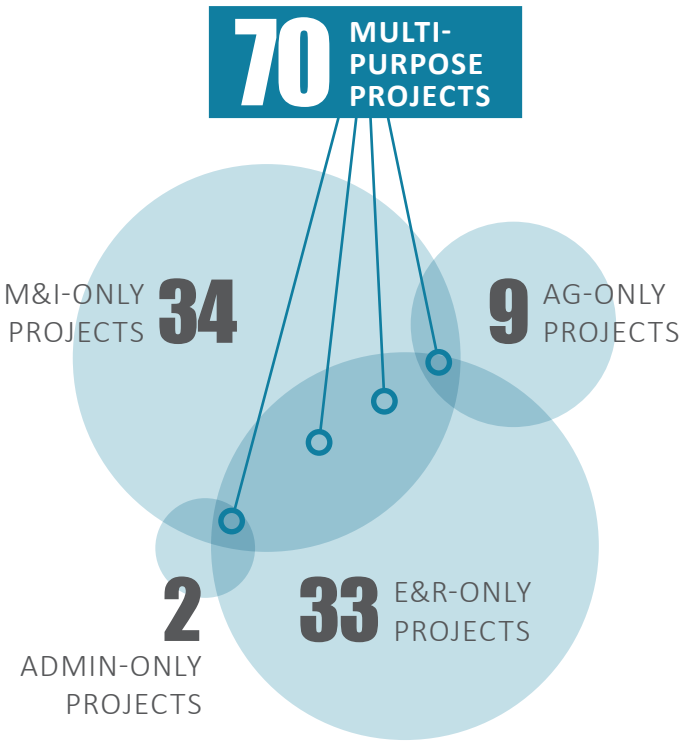
Total estimated costs for project implementation are more than $790 million

(for projects that have identified a project cost)

Table 7. Snapshot Summary of Southwest Basin Projects

Total Projects	148
New projects added in 2020	48
Projects completed	48
Projects being implemented	49
Projects identified as meeting M&I needs	89
Projects identified as meeting Ag needs	67
Projects identified as meeting E&R needs	83
Tier 1 projects	48
Tier 2 projects	34
Tier 3 projects	58
Tier 4 projects	8
TOTAL COST OF ALL PROJECTS	**$790,000,000**
PERCENTAGE OF PROJECTS WITH AN ESTIMATED COST	**91%**

Projects that are concepts, planned, or are being implemented were the basis for the above data summary (with the exception of data specifically describing projects completed or being implemented).



Project Tiering and Level of Readiness

A new feature of the Project Database for the BIP update is the assignment of "tiers" to projects (see description of tiers in the graphic). The project tiering exercise is a tool roundtables can use to do a preliminary characterization of their projects and associated project readiness. It facilitates a "first-pass" process and helps standardize data-gathering to allow for project updates and movement through the tiers as they advance toward funding. Project tiering was initially developed as a tool for basin-level WSRF grant approval discussions, where the data fields describing alignment with BIPs, local planning, and criticality are likely to be considered. Note that some of these categories were considered differently across basins. Tiering has no bearing on whether a project can be funded. Project proponents can apply for CWCB funding whether or not their project is in the database, and inclusion of a project in the database does not guarantee funding. For the CWCB in the long term, it will be useful for identifying immediate and long-term project costs and associated funding needs. Data fields describing level of readiness, alignment with the Colorado Water Plan, and the amount of available project data will also be considered.

TIER 1	**Supported and Ready** *Ready to launch and has full data set*
TIER 2	**Supported and Pursued** *Almost ready to move forward and has a significant amount of data*
TIER 3	**Supported and Developing** *Project is developing but still needs to be fleshed out*
TIER 4	**Considering** *Project not yet moving forward but should be kept on the list*

Section 8. Education and Outreach

The goal of the Public Education Participation and Outreach (PEPO) workgroup is to reach target audiences that include local community members, urban audiences, and recreational visitors to communicate the Southwest BRT's shared values. These values include the importance of agriculture, water management, collaboration among partner agencies, and natural resource stewardship. The PEPO workgroup hopes to help foster additional inclusivity and increased participation by a diverse audience by supporting outreach strategies proposed by the Southwest BRT. This section provides a summary of the Southwest BRT's Education Action Plan activities. The PEPO workgroup strives to continue expanding efforts to develop and distribute water resources information related to the Southwest Basin, including subbasin-specific water supplies and demands, related hydrology and watershed information, water quality influences, and challenges and opportunities facing citizens.

The PEPO workgroup's primary education effort will assist in meeting the vision and goals of the Colorado Water Plan and the supporting principles, goals, and strategies described in this BIP. ***The PEPO workgroup will make pertinent water data and other information readily available to Coloradans via the following methods:***

1. **Southwest BRT Website:** The PEPO liaison and PEPO workgroup, comprised of Southwest BRT members, have created a website to help disseminate BRT- and PEPO-related information. It will include educational and outreach content; highlight the progress and successes of the BRT; provide BRT meeting minutes, agendas and presentations; advertise upcoming events; and provide funding information. PEPO also offers outreach and educational support to interested parties, such as educators, which will be highlighted.

2. **Southwest BRT Handbook:** The handbook will outline the Southwest BRT role and purpose, by-laws, agreements, meeting norms and procedures, Code of Conduct, common acronyms, links to the BIP, Education Action Plan, and the WSRF grant process.

3. **Social Media:** The PEPO workgroup will manage multiple digital social marketing platforms (i.e., Twitter and Facebook).

4. **Water Information Program:** The Water Information Program (WIP) is a public information program in Southwest Colorado sponsored by a variety of organizations. The sponsors include agricultural, electric/energy, environmental, and water sectors. WIP is funded by sponsorship contributions matched dollar for dollar by Southwestern Water Conservation District. The PEPO liaison will work with the WIP to contribute to the WIP electronic interactive newsletter that showcases statewide and local water-related news, educational events, and weather and stream updates, among others. More can be learned by visiting their **website**.

5. **Water Education Programs:** A myriad of water education programs are underway in the Southwest Basin, spearheaded by numerous nonprofits and collaborative groups that are active in each subbasin. Basinwide education programs include 4 Corners Water Center, San Juan Mountains Association, and Mountain Studies Institute. When possible, the PEPO liaison will work with the educators to further the goals of the Southwest BRT.

6. **Statewide Education Engagement:** The PEPO liaison will participate in CWCB education-related meetings/webinars and attend statewide meetings and discussions regarding outreach and education efforts, particularly as they pertain to the Education Action Plan, BIP updates, and coordination with K-12 and higher education curriculum.

7. **Outreach at Events:** The PEPO workgroup will provide educational videos, water-related displays, and printed brochures at a variety of events and water and river festivals.

8. **Southwest BRT Driven Workshops:** The PEPO liaison and workgroup will work together on developing educational workshops for BRT members and individuals of the public. These workshops will focus on topics related to water and statewide water resource issues. Since 2015, workshops have been conducted on the following topics: stream management plans in Durango, land and water use planning in Durango, and a forest health webinar for the roundtable and other stakeholders. The Southwest BRT also partnered with Colorado Agriculture Water Alliance to host two agricultural-focused workshops on efficiencies and other water management topics.

Appendix A. Southwest Basin Current and 2050 Planning Scenario Water Supply and Gap Revised Results

Analysis for Basin Implementation Plans

Technical Memorandum

Prepared for:

Colorado Water Conservation Board

Project Title:

Southwest Basin
Current and 2050 Planning Scenario
Water Supply and Gap Revised Results

Date: June 14, 2021

Prepared by: Wilson Water Group
Reviewed by: Brown & Caldwell

Table of Contents

List of Figures

List of Tables

Section 1: Introduction

This technical memorandum summarizes changes to modeling inputs and results from the 2019 Technical Update that were conducted during the Basin Implementation Plan update process. The original model approach and results as well as other water supply related analyses were documented in Volume 2 of the Technical Update in a memo entitled "Current and 2050 Planning Scenario Water Supply and Gap Results".

The approach and results were presented to stakeholders throughout the State and to the Basin Roundtables, and feedback was obtained regarding areas where the approaches to developing the agricultural, municipal, and industrial demands or the modeling could be improved or refined. This technical document summarizes the revisions to inputs and/or results that affect the Southwest Basin.

The following are general notes regarding this effort:

- The revisions were based on stakeholder input and may not include every aspect of the Technical Update. For example, one basin may only have revised M&I demands whereas another basin may only have revisions to modeling operations.
- Revisions to West Slope basins may affect the transbasin import supply gap estimated for basins that receive imports. Revised import supply gaps are also included in the sections below if applicable.
- This document provides a summary of the revisions. Spreadsheets and modeling datasets will be available on the Colorado Water Plan website for further information on revisions.
- The revised information herein supersedes any previously developed information. Documentation and reports relying on the information from September 2019 will reflect a note to this effect, but the documentation will not be updated.
- The revised information will be used in the Basin Implementation Plan Volume 1 and 2 reports and the Update to the Colorado Water Plan.

1.1 DELIVERABLES

The revised model results are provided both within this document and in separate Excel spreadsheets for each basin. The General Contractor Team for the Technical Update has developed several spreadsheets of more localized results at the Water District level for basins that have requested this detail. These spreadsheets have also been updated and provided to the Local Experts in each of those basins. Additionally, revised streamflow results were loaded into the Flow Tool and made available to the Local Experts. Lastly, the model input and output files were delivered to the General Contractor and will be made available via the Colorado Water Plan website. The spreadsheets, modeling datasets, the revised Flow Tool, and this documentation serve as the deliverables for this effort.

1.2 DISCLAIMER

The technical data and information generated are intended to help inform decision making and planning regarding water resources at a statewide or basin-wide planning level. The information made available is not intended to replace projections or analyses prepared by local entities for specific project or planning purposes. The information or datasets provided are from a snapshot in time and cannot reflect actual or exact conditions in any given basin or the state at any given time. While the Technical Update and Basin Implementation Plan strives to reflect the Colorado Water Conservation Board's (CWCB) best estimates of future water supply and demands under various scenarios, the reliability of these estimates is affected

by the availability and reliability of data and the current capabilities of data evaluation. Moreover, the Technical Update and Basin Implementation Plan cannot incorporate the varied and complex legal and policy considerations that may be relevant and applicable to any particular basin or project; therefore, nothing in the Technical Update, Basin Implementation Plan, the associated Flow Tool or Costing Tool is intended for use in any administrative, judicial or other proceeding to evince or otherwise reflect the State of Colorado's or the CWCB's legal interpretations of state or federal law.

Furthermore, nothing in the Technical Update, Basin Implementation Plan, or any subsequent reports generated from these datasets is intended to, nor should be construed so as to, interpret, diminish, or modify the rights, authorities, or obligations of the State of Colorado or the CWCB under state law, federal law, administrative rule, regulation, guideline or other administrative provision.

Section 2: Southwest Basin Revised Results

The following sections reflect the revisions implemented in the Southwest basin and the resulting agricultural and M&I demands, water supply, and gaps modeled results. As discussed above, refer to the original 2019 Technical Update documentation for more information on the demands and gaps in each basin.

2.1 SOUTHWEST BASIN OPERATIONAL REVISIONS

Revisions in the Southwest Basin were limited to operations in Vallecito Reservoir, an on-channel reservoir located on the Los Pinos River (Water District 31). Prior to 2014, the maximum reservoir content for Vallecito Reservoir was restricted to 77,000 acre-feet through the winter to avoid ice damage to the radial gates used to release high flows. In 2014, bubblers were installed in the reservoir to assure ice did not build up and, potentially, damage the gates. The Southwest water allocation model was revised so that the reservoir can now store up to 100,000 acre-feet during the winter months. This operational change has a positive impact for project irrigators during drought years, as the reservoir is able to store through the fall and winter. It also impacts water availability and downstream flows on the Los Pinos during wet years, as more water may need to be released for flood control. Figure 1 and Figure 2 reflect the impact of the revision to simulated reservoir contents in Vallecito Reservoir and the streamflow downstream of the reservoir under Current conditions during the 2000s drought.

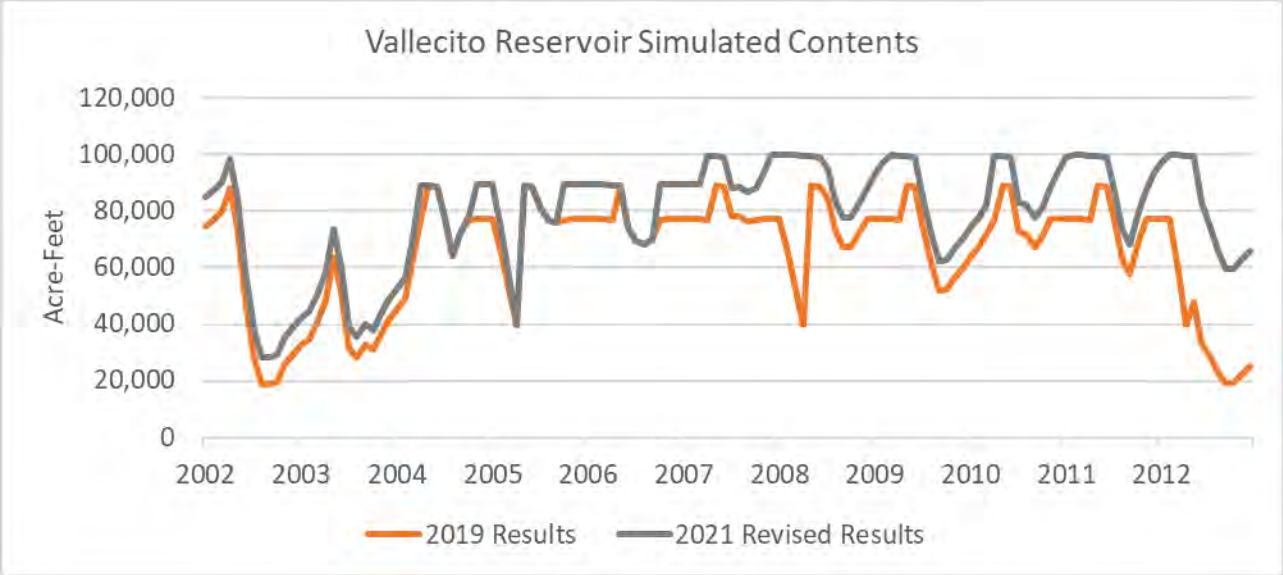


Figure 1: Vallecito Reservoir Simulated Contents – Current Conditions

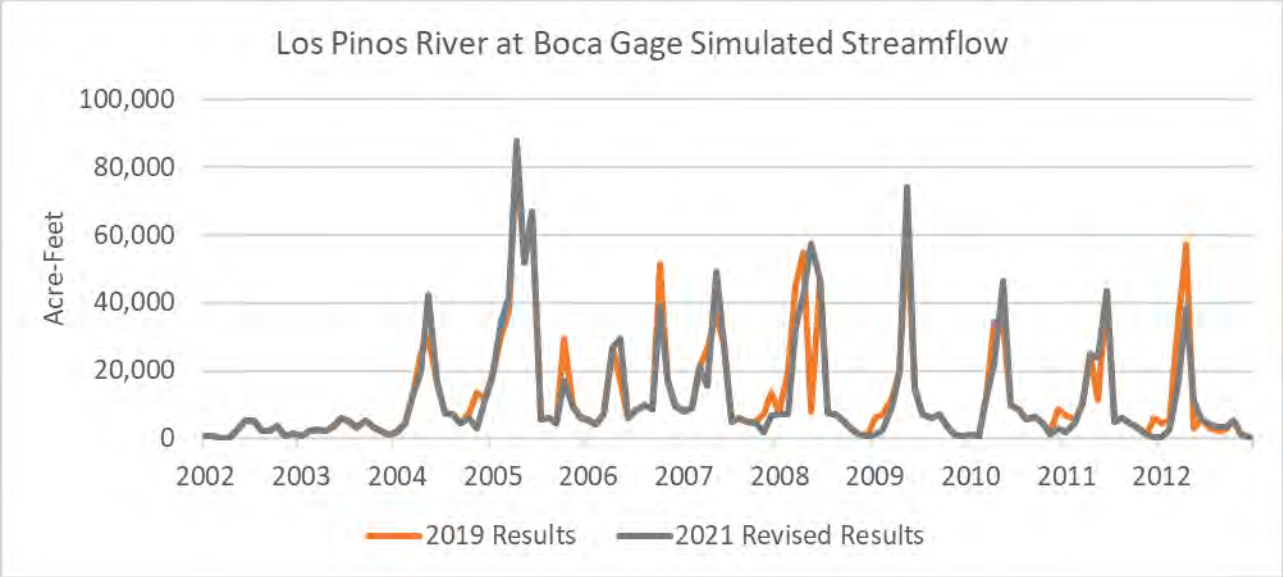


Figure 2: Los Pinos River at Boca Gage Simulated Streamflow - Current Conditions

2.2 SOUTHWEST BASIN REVISED WATER SUPPLY AND GAP RESULTS

The following tables reflect the revised demand, water supply, and gap results based on the revised reservoir operations in the basin. This revision resulted in no change to the agricultural and M&I demand and less than a one percent change to the agricultural and M&I gap. There is a slight reduction to the maximum agricultural and M&I gaps during critically dry years in some of the Planning Scenarios, likely due to the impact of the reservoir's operations on water availability on the Los Pinos River.

Table 1: Southwest Basin Agricultural Water Supply and Gap Summary

	Agricultural Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
Average	Average Annual Demand (ac-ft)	1,024,784	1,005,432	1,005,432	1,220,493	923,100	1,271,671
	Average Annual Demand Increase from Baseline (ac-ft)	-	-	-	195,708	-	246,887
	Average Annual Gap (ac-ft)	126,204	119,872	119,335	276,439	218,762	354,827
	Average Annual Gap Increase from Baseline (ac-ft)	-	-	-	150,235	92,558	228,622
	Average Annual Percent Gap	12%	12%	12%	23%	24%	28%
	Average Annual CU Gap (ac-ft)	72,012	68,485	68,156	158,287	147,086	206,269
Critically Dry Maximum	Demand In Maximum Gap Year (ac-ft)	1,152,958	1,131,100	1,131,100	1,215,185	899,260	1,238,203
	Increase from Baseline Demand (ac-ft)	-	-	-	62,227	-	85,245
	Gap In Maximum Gap Year (ac-ft)	517,210	507,127	504,712	672,097	466,922	737,579
	Increase from Baseline Gap (ac-ft)	-	-	-	154,887	-	220,369
	Percent Gap In Maximum Gap Year	45%	45%	45%	55%	52%	60%

Table 2: Southwest Basin M&I Water Supply and Gap Summary

	M&I Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
Average	Average Annual Demand (ac-ft)	27,182	44,760	30,238	43,267	53,968	69,464
	Average Annual Demand Increase from Baseline (ac-ft)	-	17,578	3,056	16,085	26,786	42,282
	Average Annual Gap (ac-ft)	39	3,326	385	4,097	7,774	13,455
	Average Annual Gap Increase from Baseline (ac-ft)	-	3,287	346	4,058	7,734	13,416
	Average Annual Percent Gap	0%	7%	1%	9%	14%	19%
Critically Dry Maximum	Demand In Maximum Gap Year (ac-ft)	27,182	44,760	30,238	43,267	53,968	69,464
	Increase from Baseline Demand (ac-ft)	-	17,578	3,056	16,085	26,786	42,282
	Gap In Maximum Gap Year (ac-ft)	799	7,477	1,820	7,547	13,795	24,803
	Increase from Baseline Gap (ac-ft)	-	6,679	1,022	6,748	12,996	24,004
	Percent Gap In Maximum Gap Year	3%	17%	6%	17%	26%	36%

Table 3: Southwest Basin Water Supply and Gap Summary

	Agricultural and M&I Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
Average	Average Annual Demand (ac-ft)	1,051,966	1,050,192	1,035,670	1,263,760	977,068	1,341,135
	Average Annual Gap (ac-ft)	126,244	123,198	119,720	280,536	226,536	368,282
	Average Annual Percent Gap	12%	12%	12%	22%	23%	27%
Critically Dry Max	Demand In Maximum Gap Year (ac-ft)	1,180,140	1,175,860	1,161,338	1,258,452	953,228	1,307,667
	Gap In Maximum Gap Year (ac-ft)	518,008	514,604	506,532	679,643	480,716	762,381
	Percent Gap In Maximum Gap Year	44%	44%	44%	54%	50%	58%