VOLUME 1 • JANUARY 2022 NORTH PLATTE Basin Implementation Plan



Basin Implementation Plan at a Glance



The North Platte Basin Roundtable prioritizes sustaining agricultural development while protecting endangered species, developing resources, and maintaining healthy forests and watersheds.

KEY ACHIEVEMENTS

Key projects helped advance goals while providing agricultural, environmental and recreational, and municipal benefits. Projects include:

- Agricultural Infrastructure Improvements
- Airborne Cloud Seeding Project
- North Park Lysimeter Study

CHALLENGES

Primary challenges in the North Platte Basin center around maintaining the agricultural way of life, developing resources for the future, and maintaining healthy forests and watersheds.

The North Platte Basin Roundtable will need to consider limits to consumptive uses and endangered species issues with sustaining the basin's agricultural economy and protecting forest and overall watershed health.

OUTREACH STRATEGIES

Ongoing outreach strategies educated the public on solutions-oriented water supply planning. Decision makers were informed on the status of all users' needs, project planning, river operation, and hydrologic cycle opportunities. This outreach helped identify potential project proponents for new projects and methods to meet future water needs.

GOALS + OBJECTIVES

The basin has 8 GOALS centered around:

- ✓ Maintaining and maximizing consumptive use of water permitted
- Increasing economic development and diversification through strategic water use and development
- ✓ Restoring, maintaining, and modernizing critical water infrastructure
- \checkmark Maintaining healthy rivers and wetlands
- Describing and quantifying the environmental and recreational benefits of agricultural use
- ✓ Promoting water rights protection
- ✓ Enhancing forest health and management
- ✓ Supporting development of municipal infrastructure and water supplies

DEMAND, SUPPLY, POTENTIAL WATER NEEDS

Municipal and Industrial:

Between the years 2015 and 2050, the population is projected to range from a 22 percent decrease in population to an increase of 8 percent. Also, relatively small municipal and industrial demands reflect the rural nature of this basin, and there is little anticipated municipal growth.

Environment and Recreation:

The Flow Tool results indicated that projected changes in climate will put environmental and recreational projected flows and attributes at risk. Climate change may lessen the risk for maintaining riparian/wetland plants and fish habitat due to greater peak flows earlier in the spring. Earlier peak flows lead to lower flows in the summer and fall and thus impact fishery health.

Agriculture:

Technology improvements will increase irrigation efficiency, and there will be an increase of irrigated land due to planned projects. Climate impacts will increase the agricultural gap by 8 to 16 percent, which is a potential risk to this economic driver. Loss of irrigated land due to urbanization is minor in Adaptive Innovation and Hot Growth.

Water Supply and Storage:

Water is projected to be available in most years but varies greatly depending on snowpack and runoff. Climate-adjusted conditions are projected to shift the peak flow earlier in the year, which may lead to increased agricultural gaps later in the irrigation season. Basinwide storage supplies are projected to vary but will generally remain viable and similar to current conditions.

STRATEGIC VISION

Securing project acceptance and demonstrating project feasibility are key to informing implementation strategies that help get projects built.

- Project acceptance strategies look to identify partnerships and cooperative opportunities, include public outreach and education, and identify ways to address regulatory constraints.
- Project feasibility strategies look to identify creative funding mechanisms, determine water availability, and address engineering design challenges.

FUTURE PROJECTS

More than **\$6.4 million** total estimated costs for project implementation*



9 Projects meet agricultural efficiency needs

7 Projects meet environmental and recreational needs

* Total cost based on projects that provided cost information. Future basin projects 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 North Platte Basin Roundtable for their efforts in updating their Basin Implementation Plan and contributions to the update of the Colorado Water Plan.

- Mike Allnutt Agricultural Representative & Co Rep IBCC
- Wade Allnutt Water Rights Holder
- Aleigh Aurin Colorado State University Extension
- Jim Baller Michigan River Water Conservancy District
- Soraya Baroumand Water Commissioner (liaison)
- Paula Belcher U.S. Bureau of Land Management (liaison)
- Coby Corkle Jackson County Rep.
- Jim Dustin Town of Walden Rep.
- Blaine Evans Water Rights Holder
- David Graf Colorado Parks and Wildlife (liaison)
- Mark Hackleman Approved Agent for Walden Reservoir Company
- **Deb Heeney** Natural Resources Conservation Service (liaison)
- Randy Miller Recreational Rep.

- Christopher Olds U.S. Forest Service
- Bryce Russell Legislative Rep.
- Blair Rynearson Colorado State Forest Acting (liaison)
- Sam Stein CWCB Liaison
- Curran Trick CWCB Liaison to North Platte BRT
- Carl Trick II Jackson County Water Conservancy District
- Pat Vanvalkenberg Water Rights Holder
- Barbara Vasquez *IBCC Rep.,* Environmental Representative and Recorder
- Ty Wattenberg Chair and Water Right Holder
- Tara Wertz U.S. Fish and Wildlife Service Arapaho National Wildlife Refuge
- Rick Wyatt Industrial Rep. and Vice Chair

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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, identifies the current and future needs for water in the North Platte 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 North Platte BIP was completed in 2015, and this is the first update of the plan.

VOLUMES:					
VOLUME 1:	A summary of the basin and its current and future water resources, focusing on updated goals and a strategic vision to meet future water needs.				
VOLUME 2:	A more comprehensive description of basin characteristics, challenges, goals, and strategic vision for meeting future water needs in the basin, including specifics on technical analyses, project data, and case studies. In the North Platte Basin, the 2015 BIP serves as Volume 2.				

THE NORTH PLATTE BASIN IMPLEMENTATION PLAN CONSISTS OF TWO

Section 1. Basin Overview

The North Platte Basin, also known as North Park, is a high-altitude valley covering about 2,000 square miles in north-central Colorado. It includes all of Jackson County and the small portion of Larimer County in the Laramie River watershed.

Both the North Platte and Laramie Rivers flow north into Wyoming and are subject to use limitations described in Supreme Court decrees. The basin is also included under the Platte River Recovery Implementation Program (PRRIP), which was developed to manage endangered species recovery efforts on the Platte River in Central Nebraska.

Water use in the basin is dominated by irrigated pastures associated with ranching operations. The basin also has a major wildlife refuge in addition to numerous public lands and recreational opportunities. The basin exports a portion of North Platte water—approximately 4,500 acre-feet per year (AFY)—to the Front Range.

AGRICULTURE	 Total irrigated area based on 2016 estimates is approximately 113,600 acres, consisting of 110,200 acres in North Park and 3,400 acres in the Laramie River watershed. Water use in the basin is dominated by irrigated pasture grass, with more than 400 irrigation ditches diverting from the mainstem and numerous tributary streams throughout the basin.
WATERSHED	 Environmental and recreational activities are abundant throughout the basin at locations that include the Arapaho National Wildlife Refuge, Routt National Forest, Arapahoe-Roosevelt National Forest, State Forest State Park, and U.S. Bureau of Land Management parcels. There are two Gold Medal water designations in the basin—Delany Butte Lakes, and North Platte River from the southern boundary of the Routt National Forest downstream to Wyoming.
MUNICIPAL AND INDUSTRIAL	 The largest town in the basin, Walden, is centrally located in Jackson County. It has a population of approximately 600, and it serves as the central hub of the basin. Jackson County has approximately 1,400 permanent residents; however, visitors to the region for hunting, fishing, and recreational opportunities expand the population, particularly during summer.
INTERSTATE DECREES, ADMINISTRATION, AND REGULATORY	 The basin is subject to the Nebraska v. Wyoming Equitable Apportionment Decree (2001), which limits the amount of available storage supplies and lands that can be irrigated on the North Platte Basin, as well as limits exports from the basin. The Wyoming v. Colorado (1957) decision established the rights of Colorado and Wyoming to water in the Laramie River and limits Colorado's total diversions and exports from the basin. Water use in the basin is also constrained by Colorado's Plan for Future Depletions of the PRRIP, which includes a basinwide depletion amount in the North Platte basin.



Figure 1. Map of the North Platte Basin

ADDITIONAL MAPPING

Volume 2 of the North Platte BIP includes additional mapping that describes federal lands, irrigated areas, and environmental features.



Section 2. Basin Challenges

The North Platte Basin faces several key issues and challenges pertaining to water management, endangered species, and resource development.

KEY CHALLENGE

The North Platte Basin will need to balance limits to consumptive uses and endangered species issues with sustaining the basin's agricultural economy and protecting forest and overall watershed health.

INTERSTATE DECREES. MUNICIPAL AND AGRICULTURE WATERSHED ADMINISTRATION, AND **INDUSTRIAL** REGULATORY • Gaining a better • Maintaining healthy rivers • Increasing economic • Maintaining compliance with understanding of the basin's through the strategic development and the equitable apportionment consumptive uses and highimplementation of projects diversification through decrees on the North Platte altitude crop coefficients that meet prioritized strategic water use and and Laramie Rivers that environmental and development quantify the amount of • Increasing agricultural available water and lands recreational needs • Developing water supplies, demands and unmet that can be irrigated needs by 8 to 14 percent • Monitoring and enhancing such as storage and Successfully resolving due to potential climate forest health and augmentation plans, change, though agronomic management efforts as it for future industrial endangered species issues practices and technological relates to forest beetle kill opportunities on the Platte River in Central improvements may offset and potential wildfires in Nebraska through the PRRIP these effects the basin in a manner that does not put pressure on water users • Developing water supplies • Peak runoff timing to reduce existing uses to serve additional potentially occurring irrigated area while earlier in the year with • Promoting water-rights maintaining compliance for climate change, which protection and management poses potential risks to through improved endangered species trout fisheries streamflow-gaging data • Maintaining and replacing aging agricultural infrastructure to preserve existing uses, increase efficiencies, and put additional acreage into production

Table 1. Key Future Water Management Issues and Challenges

Section 3. Achievements

The North Platte Basin Roundtable (BRT) has been engaged in a wide variety of projects and activities since the North Platte BIP was issued in 2015. From updating agricultural infrastructure originally installed in the early 1900s to cloud seeding, the projects and activities have achieved results that furthered the goals of the North Platte BRT and provided numerous benefits to agricultural, environmental and recreational (E&R), and municipal water users.

Agricultural Infrastructure

Agricultural Infrastructure Improvements

Owl Mountain Partnership, working with the Natural Resource Conservation Service (NRCS) and the North Platte BRT have updated 14 aging headgates and diversion dams since the 2015 BIP. The majority of the North Platte's agricultural infrastructure has not been updated since it was originally installed in the early 1900s. NRCS has worked with agricultural producers in the basin to identify critical water infrastructure in need of rehabilitation or improvements, and to provide funding and engineering support. North Platte Water Supply Reserve Fund (WSRF) grants approved by the BRT have been used as matching funds, with Owl Mountain Partnership acting as the applicant. This effort has helped the North Platte BRT achieve its goal to continue to restore, maintain, and modernize critical water infrastructure to preserve current uses and increase efficiencies. Improving critical water infrastructure in the basin will continue to be a priority, with nine new agricultural infrastructure improvement projects already identified by the NRCS and Owl Mountain Partnership for 2021.

PROJECT PROPONENTS:

Owl Mountain Partnership is a non-profit corporation formed in 1993. Its overall mission is to serve the economic, cultural, and social needs of the community while developing adaptive longterm management programs, policies, and practices that ensure ecosystem sustainability.

TIMELINE: Start 2015, Completion 2020 **COST:** \$716,000





Preliminary studies have shown evidence of an increase in snowpack in the North Platte Basin due to the airborne cloud seeding project. In 2018, Jackson County Water Conservancy District began working with the Wyoming Water Development Office to expand airborne cloud seeding operations into the Never Summer Mountains in Colorado. The cloud seeding effort began in 2018 and was recently extended through 2024. North Platte WSRF grants were used along with matching funds from Jackson County Water Conservancy District to fund this project. Preliminary studies from the Never Summer Cloud Seeding Program have indicated that aerial seeding has contributed as much as 3,000 to 4,000 acre-feet (AF) of new annual water supplies to areas in the basin that typically experience water shortages. The project relies on a creative partnership and funding arrangement to maximize the area and impact of an existing program and seeks to increase the amount of water supply available in the North Platte Basin.

PROJECT PROPONENTS:

Jackson County Water Conservancy District was formed in 1961 to represent water users in Jackson County. The district, managed by a board consisting of seven elected directors, strives to develop and protect water uses in Jackson County.

TIMELINE: Start 2018, Completion 2024

COST: \$587,000



The North Park Lysimeter Study involved installing and operating lysimeters to better quantify crop consumptive use in the North Platte Basin. Jackson County Water Conservancy District worked with the Colorado Climate Center to install two automated lysimeters adjacent to the Cowdry climate station. The lysimeters are fully automated and measure actual evapotranspiration of irrigated hay meadows. The lysimeter data is then compared to the computed crop evapotranspiration data from the nearby climate station. This comparison informs a more accurate calculation of crop coefficients of hay grown in high-altitude meadows to better quantify consumptive use in the basin. The Colorado Climate Center has been granted additional funding by the BRT to maintain the climate station, and currently allocated funds will be used to continue lysimeters' operation. The ability to better measure the actual amount of water consumed by irrigated hay meadows in the basin, particularly under variable climate conditions, is critical to protecting and maximizing the consumptive use of water permitted in the Equitable Apportionment Decree and the baseline depletion allowance in Colorado's Plan for Future Depletions in the PRRIP.

PROJECT PROPONENTS:

Colorado Climate Center (CCC) strives to collect and observe data with the purpose of monitoring the climate, placing individual events into historical perspective, disseminating climate information to the user community, and providing climate expertise as part of the decision-making process. CCC is located at Colorado State University in Fort Collins and is recognized as a State Climate Office.

TIMELINE: Start 2015, Ongoing

COST: \$232,000

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 stakeholders achieve their basin targets.

The North Platte BRT developed goals, measurable outcomes, and supporting processes that are consistent with the goals of the Colorado Water Plan and drive toward a productive economy, efficient and effective infrastructure, and a strong environment. The goals foster local implementation of Colorado Water Plan strategies that strive to achieve healthy watersheds, vibrant cities and towns, viable agriculture, and resilient communities.

The North Platte BRT identified eight primary basin goals in its 2015 BIP, and they were reviewed and made current during the BIP Update. Each goal includes a realistic and attainable process for achieving the goal. In addition, the North Platte BRT supports projects proposed by stakeholders that work toward achieving their goals. The principal objective underlying the goals is the maximum beneficial use of water allowable under the Equitable Apportionment Decree while maintaining compliance with the PRRIP.

BASIN GOALS Maintain and maximize the Maintain healthy rivers and consumptive use of water wetlands through the strategic permitted in the Equitable implementation of projects that Apportionment Decree meet prioritized environmental and the baseline depletion and recreational needs allowance in Colorado's Plan for Describe and quantify the **Future Depletions** environmental and recreational Increase economic development benefits of agricultural use and diversification through Promote water rights protection strategic water use and management through and development improved streamflow gaging data Continue to restore, maintain, **Enhance forest health and** and modernize critical water management efforts for wildfire infrastructure to preserve current protection and beetle kill impacts uses and increase efficiencies to watershed health Support the continued development of local municipal infrastructure and water supplies

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Maintain and maximize the consumptive use of water permitted in the Equitable Apportionment Decree and the baseline depletion allowance in Colorado's Plan for Future Depletions

The Equitable Proportion Decree stems from court cases involving Nebraska, Wyoming, and Colorado in 1945, 1953, and 2001 and 1953 (325 U.S. 589 (1945), modified, 345 U.S. 981 (1953), modified by the Final Stipulated Settlement, 534 U.S. 40 (2001) and limits the irrigated acreage and storage for irrigation purposes allowable in the North Platte Basin. The limit is 145,000 acres per amendments in the 1953 decree and 17,000 AF of reservoir storage for irrigation annually; however, depletions from irrigated acreage are further constrained by the PRRIP. The PRRIP is a recovery effort designed to assist three endangered species on the Platte River in Central Nebraska. Several agreements (Three States Agreement) allow for flexibility in the types of future water use by assigning a basinwide baseline entitlement depletion amount for the North Platte Basin. The baseline depletion, defined in Colorado's Plan for Future Depletions in the Final PRRIP program document, covers consumptive water use in the basin to a volume of depletions associated with the irrigation of up to 134,467 acres and an increase in county population to 2,022 people.

PROCESS

- Preserve Colorado's baseline entitlement depletion allowance associated with the irrigation of 134,467 acres under the Colorado Plan for Future Depletions set forth in the Final PRRIP Program (and all future increments) through an increase in irrigated acreage or allocation to other uses.
- Encourage the development of consumptive uses as prioritized by the North Platte BRT. Refine the BRT's potential future consumptive use list and volume requirements.
- Identify specific locations in the basin where consumptive shortages or opportunities exist, and the factors that may be causing the shortages. Quantify the shortages in time, frequency, and duration. Characterize locations where consumptive shortages exist.
- Recommend potential solutions in collaboration with local water users. Recommendations should include an initial analysis of hydrology (water variability), cost, financing, and permitting. Solutions will include storage and supplemental supplies (e.g., augmentation plans) to mitigate late-season shortages.
- Encourage projects and efforts that would lead to an increase of irrigated acreage in the basin, up to the 134,467-acre limit.
- Maximize the effectiveness of recommended solutions for meeting multiple objectives.



Increase economic development and diversification through strategic water use and development

As a predominantly agricultural economy with recreational and industrial components, water use in the North Platte Basin is closely tied to the health of its economy. To the extent possible, the North Platte BRT seeks to encourage balanced economic development through strategic water use.

- Promote projects with potential for beneficial economic impacts and economic diversification for Jackson County. Seek projects that increase sales tax revenue, increase visitors and tourism in the basin, and/or create new businesses.
- Continue to research the feasibility and structure of a potential basinwide augmentation plan and development of new storage projects to cover small amounts of consumptive use associated with various water development projects.





Continue to restore, maintain, and modernize critical water infrastructure to preserve current uses and increase efficiencies

To preserve the use of critical historical water rights, current infrastructure in the North Platte Basin must be restored, maintained, and modernized. It is particularly important to preserve infrastructure, including headgates, canals, and reservoirs, that enables the use of water rights and irrigated acreage that predate the original 1945 Nebraska v. Wyoming decision. In many cases, restoration or modernization efforts address multiple purposes, such as improved diversion reliability and accuracy, lower maintenance costs, the potential addition of hydropower generation, and improved fish passage.

- Identify specific locations where infrastructure requires improvement or replacement to preserve or maximize existing uses.
- Support the rehabilitation of existing reservoirs and development of new storage projects to help meet water use shortages.
- Recommend potential solutions in collaboration with local water users. Evaluating solutions to infrastructure needs will include an initial analysis of cost, financing, and permitting. Promote potential solutions that address multiple purposes.
- Work with funding agencies to write grants and secure funding to implement/construct projects.



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Maintain healthy rivers and wetlands through the strategic implementation of projects that meet prioritized environmental and recreational needs

Healthy rivers and wetlands have always been a critical component to the economy and way of life in the North Platte Basin. The North Platte BRT seeks to maintain healthy rivers and wetlands to support all uses in the basin.

PROCESS

- Identify locations where E&R needs are not being met.
- Improve the quality, quantity, and use of fisheries for beneficial economic impacts.
- Recommend potential site-specific solutions in collaboration with local water users. Recommendations should include an initial analysis of hydrology (water variability), cost, financing, and permitting. Solutions may include stream restoration projects, operational flow agreements, multi-purpose storage projects, and fish-friendly diversion structures, among others. Seek solutions that increase the number of recreational use days, such as fishing user days and waterfowl hunting and viewing days.
- Maximize the effectiveness of recommended solutions for meeting multiple objectives.
- Continue to ensure the successful implementation of the endangered species program to protect existing and future in-basin uses.



Describe and quantify the secondary benefits of agricultural use

Previous discussions at the North Platte BRT and Interbasin Compact Committee (IBCC) have noted the beneficial effects that the extensive agricultural water uses in the North Platte Basin have on E&R uses. In addition, the 2015 BIP describes how irrigation return flows provide benefits to streamflows and E&R water uses. Historical water uses, along with the potential for the ongoing development of mutually beneficial multipurpose projects, are important.

- Describe the nexus between agricultural uses and E&R uses.
- Identify instances where E&R needs are sustained and supported by agricultural water use. Quantify the positive impacts of agricultural water use in time, frequency, and duration.
- Support agricultural projects that serve multiple purposes and provide benefits to E&R uses.

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Promote water rights protection and management through improved streamflow gaging data

The North Platte River Basin has only one streamflow gage, the North Platte River near Northgate gage, with a significant historical record and is the only gage in the basin with a complete streamflow record over a long period (1950 – present). There are currently five streamflow gages in the basin with recent records (2012 or more current) operated and maintained by United States Geological Survey or Colorado Division of Water Resources. The collection of better and more consistent streamflow data could help effective planning efforts and water management in the basin.

PROCESS

- Use the North Platte Decision Support System and previous documentation to identify specific locations where new or restored gaging stations would provide important data for ongoing water management, modeling, and use.
- Develop partnerships to install and operate new gaging stations.

Active Streamflow Gages: shown in Figure 1

- Illinois River near Rand
- Michigan River near Meadow Creek Reservoir
- Michigan River near Cameron Pass
- Michigan River at Walden
- North Platte River near Northgate



Enhance forest health and management efforts for wildfire protection and beetle kill impacts to watershed health

The North Platte BRT recognizes that maintaining the health of its forests is important to long-term water management. The North Platte BRT has been monitoring the outbreak and impacts of forest beetle kill and related potential wildfire issues in the basin and intends to remain involved in monitoring and addressing forest health issues.

PROCESS

- Review, distribute, and implement the findings of the United States Forest Service's Pine-Beetle Study in the North Platte Basin, funded by Colorado Water Conservation Board's (CWCB) Water Supply Reserve Fund Program.
- Support and fund projects and initiatives that focus on improving forest health in the North Platte Basin.
- Maintain BRT communication with appropriate federal and state liaisons to stay informed on forest management activities in the North Platte Basin and throughout the state.



Support the continued development of local municipal infrastructure and water supplies

The North Platte BRT supports the continued development of local municipal infrastructure and water supplies. Low streamflow conditions impact the Town of Walden's ability to reliably meet the current municipal needs; an increase in future demands due to municipal growth may further affect reliability. Projects to help alleviate these current and future shortages are in the planning phases; the North Platte BRT will continue to work with the municipal provider to implement the projects.

- Support the use of state and local funding to rehabilitate and improve existing municipal infrastructure and develop new infrastructure and water supplies to provide a more reliable municipal supply.
- Promote the use of innovative solutions and best management practices to meet future municipal needs.

Section 5. Demand, Supply, and Potential Water Needs

Water in the Basin

The headwaters of the North Platte Basin originate in four primary mountain ranges that surround and divide the North Platte River and Laramie River watersheds: Park Range, Rabbit Ears Range, Medicine Bow Range, and Laramie Mountains. With average annual precipitation in the mountains of approximately 40 inches per year, the many tributaries in the basin are fed by spring snowmelt, which results in peak runoff occurring in May and June. Streamflow decreases rapidly throughout the summer and is considerably lower by September and through the winter months.

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 North Platte 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 plausible future scenarios 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.





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 Colorado Water Plan's scenarios and drivers. Refer to the Technical Update, Sections 2.1.3 and 2.1.4, for more details on the scenarios and drivers <u>(https://cwcb.colorado.gov/colorado-water-plan/technical-update-to-the-plan)</u>.

A Business as Usual	B Weak Economy	C Cooperative Growth	D Adaptive Innovation	E Hot Growth
Water	Vater	Water	Water	Vater
Supply	Supply	Supply	Supply	Supply
Status	Climate	Climate	Climate	Climate
	Status	Status	Status	Status
Social	Social	Social	Social	Social
Values	Values	Values	Values	Values
Agri.	Agri.	Agri.	Agri.	Agri.
Needs	Needs	Needs	Needs	Needs
M&I	M&I	M&I	M&I	M&I
Needs	Needs	Needs	Needs	Needs
 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. 	 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 ofuture water supplies and is a bookend for scenarios. 	 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 	 Both scenarios assum growth is higher than both assume a much future climate. The scenarios' prima around conservation Innovation scenario, adopts conservation municipal and agricu Hot Growth scenario a focus. 	ne that population n projected, and warmer and drier ry differences revolve . In the Adaptive the state aggressively measures in both Itural sectors. In the , conservation is not

THE FUTURE WATER CONDITIONS DESCRIBED FOR THE NORTH PLATTE BASIN WILL BE IN THE CONTEXT OF THE FIVE PLANNING SCENARIOS.

more aggressively adopting water conservation.

Refinements to Technical Update Modeling

At the request of the North Platte BRT, the municipal baseline and projected water demands were updated. The updated analysis incorporate the addition of outreach data for the Town of Walden. The original Technical Update did not include demand data for any municipal water providers in the North Platte Basin, and instead relied on demand data from nearby counties and the statewide demand distribution. The new data was used to update Baseline and projected demands for the Town of Walden and Jackson County.

In addition, revisions to North Platte Basin water rights, operations, and return flows (i.e., wastewater treatment plant effluent) associated with municipal demands for the Town of Walden were applied based on information provided by its public works director.

Additional information on the refinements to the Technical Update modeling is provided in Appendix A: North Platte Basin Current and 2050 Planning Scenario Water Supply and Gap Results.



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Municipal and Industrial Demands

POPULATION PROJECTIONS

The North Platte Basin includes less than 1 percent of the statewide population. Between the years 2015 and 2050, it is projected to change from approximately 1,400 to between 1,100 and 1,500 people in the low- and high-growth projections, respectively, as shown in Table 2. This ranges from a 22 percent decrease in population to an increase of 8 percent.

DEMANDS

Municipal data were available for the Town of Walden within Jackson County and were assumed to be representative of per capita demands basinwide. Systemwide per capita demands are projected to decrease relative to the baseline in all scenarios except for Hot Growth, as shown in Table 2.

GAPS

Current and projected municipal and industrial water demands were evaluated against available water supplies in the various planning scenarios using Colorado Decision Support System (CDSS) modeling tools. Gaps were calculated when

physically and legally available water supplies were unable to meet demands, as shown in Table 2. The following are observations on M&I diversion demands and gaps:

- Relatively small M&I demands reflect the rural nature of this basin. There is little anticipated municipal growth as illustrated in Figure 2.
- While significant M&I gaps are not projected in the North Platte Basin as shown in Figures 3 and 4, localized M&I gaps may occur that will require new water supplies and/or augmentation in the future.

auto 21 Summary of Baseline and 2000 Hojeeted Manieparand Industrial Water Demands and Gaps									
	Baseline ¹	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth			
Population	1,353	1,279	1,055	1,210	1,364	1,457			
Systemwide Per Capita Demands (gallons per capita per day)	270	250	260	248	238	276			
Municipal Diversion Demand ² (AFY)	410	360	300	340	360	460			
Industrial Diversion Demand ^{2,4} (AFY)	0	0	0	0	0	0			
Average Annual Gap (AFY) ³	0	0	0	0	0	1			
Maximum Annual Gap (AF) ³	0	14	12	12	12	16			

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

¹Baseline year is 2015

²M&I demands may vary slightly from the M&I Demand section of the Technical Update (Section 4.6.2) due to differences in geographic distribution of demand for counties that lie in multiple basins.

³CDSS water allocation model in this 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.

⁴The analysis does not include baseline and projected industrial demands in the North Platte Basin. Water demands for fracking occur in the basin, but no reliable sources of data were identified that could be used to quantify the water demands.

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



Figure 2. Baseline and 2050 Projected Population and Municipal Demand









"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

Current and potential agricultural diversion demands for the year 2050 were estimated using CDSS modeling tools and assumptions that were informed by the planning scenarios and information from the prior North Platte BIP. Several key adjustments to drivers for agricultural diversion demand were incorporated into the estimates of potential future demands. Those adjustments were:

- Due to a series of planned agricultural projects in the basin, there is an increase in irrigated land of 10,576 acres in all scenarios except Adaptive Innovation and Hot Growth, where the increase is 10,536 acres to account for increased urbanization
- Increase in irrigation water requirements (IWR) under scenarios that consider climate change
- Reduction in IWR and increase in irrigation system efficiency due to technological advancements in Adaptive Innovation

GAPS

Current and projected agricultural diversion demands were evaluated against available water supplies in the various planning scenarios using CDSS modeling tools. Gaps were calculated when physically and legally available water supplies were unable to meet demands as shown in Table 3. Observations on agricultural demands and gaps include:

• An additional 10,600 acres will increase agricultural diversion demand in the future.

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.

- Although some technology improvements may occur, climate impacts will serve to increase the agricultural gap by 8 to 16 percent, as illustrated on Figure 5.
- Annual agricultural gaps can vary significantly, and are more pronounced in dry years, as illustrated on Figure 6.

The agricultural demands and gaps in the North Platte Basin reflect full-season irrigation. Several ranchers in the basin, however, opt to reduce or stop irrigating even though they may have physically and legally available supplies. This is often because irrigators allow the land time to dry prior to haying or grazing and may be a reflection that there is not enough time in the growing season for an additional cutting. Note that even though these irrigation practices are not considered a gap by the water users, they are reported as such for this effort for consistency purposes across the state. The North Platte Basin water users in general believe that these reported gaps are an over-estimate of the actual shortages in the basin compared to on-the-ground practices, and strategies to meet agricultural gaps would need to account for these practices.

Table 3. Summary of Baseline and 2050 Projected Agricultur	al Diversion Demands and Gaps
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	Baseline ¹	Business as Usual	Weak Economy	Cooperative Growth	Adaptive Innovation	Hot Growth
Irrigated Acreage (acres)	113,600	124,200	124,200	124,200	124,200	124,200
Average IWR (AFY)	190,800	207,900	207,900	241,500	235,600	261,800
Average Annual Demand (AFY)	529,200	602,400	602,400	688,300	502,300	733,500
Average Annual Gap (AFY)	85,700	108,000	107,900	177,800	168,100	231,100
Incremental Avg. Ann. Gap (AFY)	-	22,200	22,200	92,100	82,400	145,400
Maximum Annual Gap (AFY)	296,900	336,700	336,700	394,800	320,800	441,000

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

Calculation methodologies and assumptions for agricultural water demands are available in the Technical Update documentation.

https://cwcb.colorado.gov/colorado-water-plan/ technical-update-to-the-plan The Incremental Average Annual Gap quantifies the degree to which the basinwide gap could increase beyond what agriculture has historically experienced under watershort conditions.



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





Environment and Recreation

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

The Flow Tool uses streamflow data from 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 intended to help guide stream management plan (SMP) and BIP development.

Three nodes were selected for the Flow Tool in the North Platte Basin (see list below and Figure 7). Figure 7 also shows subwatersheds (at the 12-digit HUC level) and the relative number of E&R attributes located in each subwatershed.

- Michigan River near Cameron Pass, Colorado (06614800)
- Illinois Creek near Rand, Colorado (06617500)
- North Platte River near Northgate, Colorado (06620000)

Results and observations from the Flow Tool analysis are described in Table 4.

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.



Figure 7. Flow Tool Nodes Selected in the North Platte Basin





Table 4. Summary of Flow Tool Results

Category	Observation
Projected Flows	 Annual flows lower in the basin are projected to be greater for climate-impacted scenarios (Cooperative Growth, Adaptive Innovation, and Hot Growth) for most years compared to Baseline, Business as Usual, and Weak Economy. Cooperative Growth is projected to have the greatest increase in annual flows compared to all other scenarios. Spring runoff peak flows are projected to occur sooner in April and May for the climate-impacted scenarios compared to the peak occurring in June for Baseline, Business as Usual, and Weak Economy. Subsequently, mean monthly flows are less for climate-impacted scenarios for all other months (July through March). Baseline flow conditions mostly recover through the winter months. The magnitude of difference in flows is projected to be greater farther downstream in the watershed.
Ecological Risk	 Baseline peak flow magnitudes create some risk for maintaining riparian/wetland plants and fish habitat, but this risk may lessen under climate-impacted scenarios due to greater peak flows earlier in the spring; however, these earlier peak flows lead to lower peak flows in the summer and fall months for the climate-impacted scenarios, potentially impacting fish movements, abundance, and growth. 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, both the spawning windows for various species and summer low-flow conditions could adversely affect fish species.
ISFs and RICDs	• Most of the headwater tributaries in the basin have instream flows. Streamflow in many of these tributaries is projected to decline due to hotter and drier conditions reflected in the climate-impacted scenarios. There are no recreational in-channel diversions in this basin.

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 basin 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 and were updated by some basins during the development of the 2015 BIPs.

As a part of the 2015 BIP effort, the North Platte BRT reviewed and updated its Focus Area map to consider the relative importance of different E&R attributes. Prior to the 2015 BIP, the CWCB conducted a preliminary analysis that identified "high project gaps" in most North Platte Basin stream segments. The preliminary analysis was not helpful to the BRT in prioritizing future projects due to the extent of segments with "high project gaps."

During the 2015 BIP process, the North Platte BRT created a revised Focus Area map (Figure 8, below) that considered the roundtable's prioritization of E&R attributes. The map considers the relative priority of E&R attributes based on roundtable consensus and the concentration of attributes. The roundtable's work resulted in a "heat map" that better indicates where important attributes are located (see Figure 8). The map will be used to help target projects that address identified E&R attributes in the basin, including both multi-purpose projects and specific E&R projects. During the current BIP update effort, the roundtable did not identify specific streams or additional attributes that should be added to the Focus Area map.



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 8. Focus Area Map of the Basin

Focus Area maps are intended to help guide future water supply planning in the basin. SMPs are one tool that stakeholders can use for collaborative planning. SMPs use biological, hydrological, geomorphological, and consumptive use data to assess the flows, water quality parameters, and other physical conditions to identify projects and management actions to maintain or improve stream conditions at a reach scale.

SMPs are not regulatory and have not resulted in regulatory action. Local participation is fundamental to the development of an SMP; however, while preferable and encouraged, participation by water users in the basin is not required, and the North Platte BRT is not required to support or be involved with any SMP proposed for the basin. A successful SMP in the North Platte Basin would:

- Be a collaborative effort in which goals and solutions are informed by the needs of all water users in the basin, including agricultural, municipal, industrial, and E&R
- Develop multi-benefit solutions that address and enhance agricultural, municipal, and industrial needs just as much as it would support E&R needs
- Be initiated and approved by the North Platte BRT
- Abide by prior appropriation and respect existing water rights and private property rights
- Consider North Platte BRT members and water users' time constraints and their limited capacity to participate in an SMP planning effort, particularly during the summer irrigation season
- Engage water rights holders within the SMP focus area to provide them with the opportunity to participate and/or be informed of the project

Water Supplies

Available water supplies in the North Platte Basin vary by location and are impacted by contributing drainage area, diversions, storage facilities, and the prior appropriation system. The CDSS model used to evaluate current and projected available supplies in the North Platte Basin includes supply evaluations at numerous locations throughout the basin.

Figures 9 and 10 illustrate simulated current and projected available flows using an example gage to illustrate current and projected available flows. Figures 9 and 10 show simulated available flow at a location on the Lower Michigan River upstream of the confluence with the North Platte River. The location represents water availability near the senior calling rights, which include the Hiho Ditch, Kiwa Ditch, and diversions to storage in Carlstrom Reservoir. Water availability is only moderately impacted by the calling rights, and flows are projected to be available in most years (but vary greatly on an annual basis). Peak flows are projected to increase at this location but could diminish in the late summer in climateimpacted scenarios.



Figure 9. Simulated Hydrograph of Available Flow at Michigan River at Cumberland Ditch

Figure 10. Average Monthly Simulated Hydrographs of Available Flow at Michigan River at Cumberland Ditch





Storage

Total simulated reservoir storage from the North Platte River water allocation model is shown on Figure 11. The North Platte Basin has approximately 30,000 AF of reservoir storage in its larger operational reservoirs, and approximately half of that storage is used for agricultural purposes. The remaining half of storage in the basin can be attributed to reservoir supplies owned by Colorado Parks and Wildlife (CPW), U.S. Fish and Wildlife, or other governmental entities. These supplies are generally kept in the reservoir in an effort to maintain minimum storage volumes; there are no active releases except to meet environmental demands (e.g., Arapaho National Wildlife Refuge) in some years. Baseline and Weak Economy show the highest levels of water in storage (in general), with Hot Growth showing the lowest levels; however, storage levels for all future scenarios track closely with Baseline throughout the study period.

Basinwide storage supplies are projected to vary depending on the future scenario but will generally remain viable and similar to current conditions.

Figure 11. North Platte Basin Total Simulated Storage



Section 6. Strategic Vision for the Future

The strategic vision for the future in the North Platte Basin is described in this section. Project implementation is the primary strategy of the North Platte BIP for addressing basin goals.

Summary of Strategies

1 IMPLEMENT PROJECTS

The North Platte BRT reviewed its existing Project Database during the BIP update and added numerous projects. The projects are important to basin stakeholders and will help meet future water needs across all sectors of water use. A high-level summary of the basin's Project Database is included in Section 7. The listed projects, further characterized below, include near- and long-term efforts.

Of the 148 total projects proposed for the basin, 90 are considered active projects as they are in the implementation, planned, or conceptual stage of development. Figure 12 reflects the percentage of active projects in each stage, with the majority at the conceptual stage.

Figure 13 illustrates the variety of active projects proposed in the basin. Most of the active projects fall into two primary categories: agricultural infrastructure improvement/rehabilitation projects, and watershed health, which includes forest health, water quality, and wetland restoration projects. A smaller percentage of the active projects falls into the reservoir rehabilitation/improvement and new storage (reservoir) category. The remainder of the basin projects involve improved/specialized measurement, improved or enhanced recreational attributes, municipal projects that develop new supplies or enhance reliability of existing supplies, or address regional issues across the basin.

Cost estimates were developed or provided for approximately twothirds of the active projects. Costs could not be developed for several conceptual projects in the watershed category as they are in the early planning stages. Based on available cost estimates, the total estimated cost to implement and/or construct the active projects in the basin is approximately \$6.4 million. Figure 14 reflects the estimated cost by project category.

The projects identified by the North Platte BRT and included in the basin's Project Database have been compiled and reviewed to assess the impact each will have on achieving basin goals and reducing potential future water shortages in the basin. The North Platte BRT has established strategies to support project implementation to ensure that impactful projects can come to fruition.

Numerous potential projects in the North Platte Basin will be impactful toward meeting the goals identified by the North Platte BRT. Table 5 illustrates how basin projects will potentially address basin goals. As shown in the table, all basin goals will be advanced in some way by project implementation.

Figure 12. Active Projects by Stage of Development











Table 5. Relationships Between Basin Goals and Highlighted Basin Projects BASIN GOAL									
Project ID	Project Name	1	2	3	4	5	6	7	8
NP-2015-0002	Evapotranspiration Project								
NP-2015-0004	Basinwide Augmentation Plan								
NP-2015-0006	Proposed Stream Gage Installation								
NP-2015-0037	Chandler Ranch (Arapaho National Wildlife Refuge)								
NP-2020-0091	Aqua Fria Reservoir Rehabilitation								
NP-2020-0095	North Platte Basin Airborne Cloud Seeding Project								
NP-2020-0097	North Park Irrigated Meadows Conservation Program - Phase II								
NP-2020-0102	VanValkenburg Staples Ditch Project								
NP-2020-0148	Middle Well Improvements Feasibility Study (Phase 1)								
NP-2020-0107	Hydrographic Survey of Meadow Creek Reservoir								
NP-2020-0110	Lewis Ditch Rehabilitation								
NP-2020-0111	Mexican Reservoir Rehabilitation								
NP-2020-0113	MacFarlane Extension Ditch								
NP-2020-0114	Managing High Elevation Forest at the Colorado St. Forest into the Future (Adaptive Silviculture for Climate Change Project)							•	
NP-2020-0133	Hebron Slough WMA Water Conservation Plan								
NP-2020-0135	Alkali Ditch Rehabilitation								
NP-2020-0141	Matheson Homestead Ditch Project								

– BASIN GOALS –

Maintain and maximize the consumptive use of water permitted in the Equitable Apportionment Decree	Describe and quantify the environmental and recreational benefits of agricultural use
Colorado's Plan for Future Depletions	6 Promote water rights protection and management through improved
© 2 Increase economic development and diversification through strategic water	streamflow gaging data
use and development	The second secon
Continue to restore, maintain, and modernize critical water infrastructure	protection and beetle kill impacts to watershed health
increase efficiencies	Support the continued development of local municipal infrastructure and
A Maintain healthy rivers and wetlands through the strategic implementation of projects that meet prioritized environmental and recreational needs	water supplies

Many of the projects identified in the North Platte Basin address aging infrastructure, and thus do not directly contribute to reducing future water shortages. The sheer number of agricultural infrastructure improvement and rehabilitation projects in the basin points to the increased need for this work in a basin dominated by ranching. In many instances, these projects allow irrigators to divert the full amount of water to which they are legally entitled and more easily convey the water to their fields. Support of these projects underscores the realization that reduced yields from existing water supply, storage, and delivery projects will only make matters worse and are, therefore, a good investment.

Example Projects

The following is a subset of basin projects that the North Platte BRT is currently pursuing that highlights the variety of projects and strategies towards meeting basin goals. The majority of projects in the basin are focused on replacing aging infrastructure to benefit both agricultural and environmental purposes.

Middle Well Feasibility Study and Construction (NP-2020-148 & NP-2020-150)

The Town of Walden will perform a feasibility study to determine if rehabilitating the Middle Well will result in more water being available for the town to use as a water supply, particularly when the town is typically water short in late summer and early fall. During the study, the town will work with a hydrogeologist to assess well logs and functionality of the existing well, and potentially drill test wells to assess aquifer properties and flow rates that could be obtained with additional wells or by rehabilitating the existing infiltration gallery. If feasible, the town will rehabilitate the infiltration gallery and/or construct a larger well system at the Middle Well site. Additionally, the project will enlarge the existing pipeline that conveys water to the treatment plant. Completion of the study's recommended project(s) will allow the town to take advantage of its water rights, improve the reliability of the town's supply during the late summer and early fall, and meet the town's existing and future demands during times of peak use.

Hanover, Sales, and Damfino Ditch Project (NP-2020-0137)

This project will replace aging agricultural infrastructure on three ditches. Irrigators on the Hanover Ditch, Sales Ditch, and Damfino Ditch partnered with NRCS and Owl Mountain Partnership to obtain funding, design, and install structures to divert, measure, and control the flow of water onto the irrigators' land. The project benefits agricultural and environmental water needs in a costeffective and collaborative way by providing irrigation supplies to more than 600 acres of hay and pastureland, and by creating irrigation-induced wetlands and riparian areas for wildlife species and recreational opportunities.

Wolfer Ditch Splitter Box on Roaring Fork (NP-2015-0073)

This project seeks to design, engineer, and construct a new 3-way splitter box to better route water to Wolfer Ditch irrigators and to South and East Delaney Lakes. Along with North Delaney Lake, the three lakes are the centerpiece of CPW Delaney Butte Lakes State Wildlife Area. Undertaken and funded by CPW, the project provides agricultural and E&R benefits to the Roaring Fork Basin. The project relies on a partnership strategy and new construction to jointly improve water availability and measurement to agricultural water users and to maximize water use in the basin.

N. Sand Hills - Erosion Control (NP-2020-0109)

This project is intended to develop a long-term solution to the erosion into North Sand Creek on the State Line Ranch, where sedimentation impedes the diversion of irrigation water. Mitigation of the sand/sediment would improve both agricultural diversions and fisheries in North Sand Creek. CPW, the Bureau of Land Management, and the State Land Board are working together to develop a long-term recreational plan for the area, with initial steps including utility task vehicle/all-terrain vehicle trail management, trail re-routing, hardening of ingress/egress at the creek crossing, and addressing unauthorized access to the sand dunes.



2 ADDRESS CONSTRAINTS TO PROJECT IMPLEMENTATION

Each project proposed for the North Platte Basin requires a unique and systematic implementation plan that includes discrete steps to maneuver the project from conception to completion. These implementation strategies typically involve two primary categories of action prior to project completion: securing project acceptance and demonstrating project feasibility. Each step in the project implementation process includes various challenges (constraints) or potential key issues or circumstances that may limit the ability of a project proponent to move forward. For each constraint, a corresponding strategy is identified to successfully complete the project. Table 6 summarizes strategies to overcome constraints related to securing project acceptance and demonstrating project feasibility to allow implementation of projects proposed for the North Platte Basin. Strategy details are provided after the table.

The following are details of the strategies to implement proposed North Platte Basin projects, organized according to the implementation categories and constraints listed above in Table 6. This section is provided to help inform decision makers on typical project challenges and guide future decision making for effective implementation of proposed projects.
 Table 6.
 Project Constraints and Implementation Strategies

Category	Constraint	Strategies
Ш	Conflict	 Partnerships Cooperative Strategies
PROJECT	Perception	 Public Education and Outreach Incentive-Based Programs
AC	Regulations	 Cooperative Strategies Regulatory Streamlining
≻	Cost	7. Creative Funding Mechanisms
PROJECT EASIBILIT	Water Availability	 Water Availability Analyses Water Administration Strategies
H	Constructability	10. Project Constructability Analyses

Strategies to Foster **PROJECT ACCEPTANCE**

1. Partnerships

The North Platte BRT can play an important role in building partnerships and fostering communication among different water users. To overcome conflict associated with differing priorities, the North Platte BRT can bring different users to the table to help identify appropriate land use policies and incentive-based measures, such as:

- Implementing cooperative agreements to sustain agriculture and provide benefit to streamflows, including new storage projects that provide late-season water for both E&R and agricultural uses
- Supporting multiple-purpose headgate reconstruction projects that can improve fish connectivity while reducing water users' operation and maintenance costs and improving diversion accuracy and reliability
- Promoting increases in irrigated acreage that will augment waterfowl habitat
- Managing wetlands and riparian corridors to improve water quality to benefit all users
- Recognizing that delayed irrigation return flows and irrigation water stored in the "soil reservoir" provide benefits to streamflows and E&R water uses

2. Cooperative Solutions

By compiling information on future basin projects, the North Platte BRT is in a unique position to help develop cooperative solutions in areas of potential conflict between competing interests. This strategy can include:

- Maximizing opportunities for recommended solutions to meet multiple objectives
- Combining water use purposes in collaboration with local water users
- Encouraging dialogue, collaboration, and negotiations among North Platte BRT and water entities
- Forming incentive-based measures to encourage competing interests to collaborate

3. Public Education and Outreach

Lack of knowledge and differing perspectives may generate an adverse perception of competing needs that may limit the ability of a project sponsor to implement a proposed project. The North Platte BRT can promote public education and outreach to change perceptions by:

- Working closely with organizations that specialize in public education and outreach facilitation, such as Water Education Colorado (WEco)
- Increasing public understanding of and participation in important basin water issues through the North Platte BRT
- Capitalizing on previous educational efforts of the North Platte BRT and its education liaison, such as The North Platte Basin Special Report magazine created by WEco

4. Incentive-based Programs

The North Platte BRT can facilitate the formation of beneficial relationships between agricultural and E&R water interests to capitalize on available funding opportunities and identify other incentive-based measures that provide mutual benefits.

5. Cooperative Regulatory Strategies

Regulations can be a constraint to securing project acceptance. Since a large amount of the land in the North Platte Basin is under federal ownership, permitting issues can impact project feasibility, cost, and schedule. Recent regulatory decisions (e.g., potential listing of the sage grouse, and the U.S. Environmental Protection Agency/Affordable Clean Energy Rule definitions of "waters of the United States") could pose additional challenges to project implementation. Cooperative strategies to help address regulatory constraints include:

- Using the North Platte BRT or a focus group to raise the issue through state water planning processes and by engaging regulatory decision makers
- Engaging elected representatives who understand regulatory challenges encountered on North Platte Basin projects
- Engaging federal and state agency representatives who understand the multiple steps required for project implementation
- Collaborating with local water users to proactively consider combining projects for multiple purposes
- Collaborating with CWCB to identify technical support mechanisms for federal permitting activities

6. Regulatory Streamlining

Identifying ways to improve communication and streamline the regulatory process can be beneficial to project timelines and budget. The North Platte BRT will:

- Identify methods to proactively address potential regulatory pitfalls that generate excessive time delays and added costs
- Identify methods to streamline regulatory processes among multiple agencies with proactive, timedependent deadlines
- Collaborate with CWCB to identify financial support mechanisms for federal permitting activities



Strategies to Advance **PROJECT FEASIBILITY**

7. Creative Funding Mechanisms

Cost can be a major constraint to project feasibility. Water users must balance their water needs with the costs of maintenance and potential improvement projects. The North Platte BRT can leverage its ability to secure funding in creative ways to support projects that are important to meeting basin goals, including:

- Applying for CWCB financing (loan and grant) programs and prioritizing multi-purpose water projects
- Applying for other federal, state, or local funding opportunities
- Investigating potential public-private partnerships to finance, build, and operate projects
- Considering the addition of small hydropower generation capability to dam and reservoir projects to increase revenue
- Prioritizing the most effective projects (cost/benefit analyses) to optimize cost savings
- Collaborating with local water users to investigate opportunities for multi-purpose projects

8. Water Availability Analyses

Investigating future water availability will be critical to managing basin water resources in the future. The North Platte BRT will:

- Use the North Platte Decision Support System to analyze timing, location, and conditions of limited water availability
- Use the results of water availability analyses to identify issues, inform stakeholders, and guide decisions about optimal relationships between water operations and water administration regimes
- Identify local projects with sufficient water available to recommend effective collaborative strategies
- Identify hydrologic runoff patterns that are in excess of demands and can be strategically stored and beneficially used
- Identify river dry-up points to ascertain strategic headgate improvements
- Identify irrigation scheduling issues to improve diversion and delivery reliability and accuracy

CWCB Funding Programs:

- Water Project Loan Program
- Water Efficiency Grants
- Water Supply Reserve Account Grants
- Colorado Healthy Rivers Fund Grants
- Severance Tax Trust Fund Operational Account Grants
- Colorado Watershed Restoration Grants
- Agricultural Emergency
 Drought Response Program
- Alternative Agricultural Water Transfer Methods Grants
- Fish and Wildlife Resources Fund Grants
- Weather Modification Grants
- Non-Reimbursable Project Investment Grants
- Invasive Phreatophyte Control Program
- Wild and Scenic Rivers Fund

9. Water Administration Strategies

The North Platte BRT can provide input to water administration and operations practices that can benefit the most users in the basin, such as:

- Protecting private property rights that contribute to the successful operation of Colorado's long-standing water rights system
- Facilitating effective water rights exchanges to optimize water availability
- Facilitating water rights leasing programs for E&R uses
- Identifying important historical water rights at risk for abandonment

10. Project Constructability Analyses

Numerous technical challenges affect the ease and efficiency of project construction or implementation and ultimately the feasibility of a project. Proposed North Platte Basin projects include a variety of new construction, enlargements, upgrades, rehabilitation, restoration, maintenance, or modernization of reservoirs, dams, outlet works, headgates, canals, and piping. Constructability for these types of projects requires a highly technical demonstration that appropriate measures are taken to safely and effectively plan, design, and construct the project. The North Platte BRT can support these types of analyses by requiring that project proponents:

- Hire a reputable engineering firm to analyze the feasibility of the project, demonstrating that:
 - The project can overcome previously identified constraints
 - Required land, space, labor, equipment, and materials are accessible, suitable, and proven
- Hire a reputable engineering firm to design the project with consideration for site conditions and feasibility results

Section 7. Future Basin Projects

The North Platte BRT identified projects that will further progress toward achieving its basin goals. The purpose of the Project Database is to help track all projects considered by the North Platte BRT through the BIP process, both in the past and into the future. Table 7 provides a snapshot summary of the Project Database during the BIP update.

Table 7. Snapshot Summary of North Platte Basin Projects

Total projects	90
New projects added in 2020	49
Projects already completed	33
Projects being implemented	14
Projects identified as meeting basin M&I needs	8
Projects identified as meeting basin Ag needs	59
Projects identified as meeting basin E&R needs	67
Projects identified as meeting basin Admin needs	10
Tier 1 projects	25
Tier 2 projects	7
Tier 3 projects	27
Tier 4 projects	1
TOTAL COST OF ALL PROJECTS	\$6,441,000
PERCENTAGE OF PROJECTS WITH AN ESTIMATED CO	ST 66%

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 are subjective and 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.

25 Active Projects were assigned an overall Tier 1, indicating the projects are ready to implement and have the support of the BRT.

Total estimated costs for project implementation top \$6.4 million

(for projects that have identified a project cost)



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

Active Projects were assigned an overall Tier 2, indicating that <u>more work is needed</u> to move the project toward implementation.

The remainder of the active projects fall into Tier 3 or 4, or were not assigned tiers during this effort, which indicates the conceptual nature of these proposed projects.

Section 8. Education and Outreach

Since 2010, the North Platte BRT has worked with the Public Education, Participation and Outreach (PEPO) Workgroup and WEco to strengthen its education and outreach activities. As a result, the North Platte BRT developed an education and outreach committee tasked with creating an Education Action Plan (EAP), the first version of which was approved in January of 2011. The EAP details the educational goals and tasks most effective for the BRT. It identifies BRT member education activities that promote a well-informed and high-functioning BRT. It also defines public participation objectives and appropriate implementation methods.

During the 2016-2019 time frame, the PEPO Workgroup of the IBCC and the BRT education liaisons have worked along with the North Platte BRT to implement EAPs that reach out to decision makers and stakeholders of their respective BIPs. **These efforts have accomplished the following:**

- ✓ Informed decision makers of the status of the basin's needs, planned projects, current river operation, and opportunities and constraints associated with different hydrologic cycles
- ✓ Helped the BRT connect with potential project proponents for new projects and methods needed to meet future water needs

The North Platte BIP indicates the components and activities of the EAP will continue to be used to facilitate public outreach and education related to the North Platte Basin. Implementing these outreach activities will adhere to the goal established by the North Platte Education and Outreach (E&O) Committee, which is to educate the basin public on solutions-oriented water supply planning. The implementation tasks developed by the E&O Committee are summarized in Table 8.

Task	Lead(s)	Timeline
Submit written North Platte BRT and BIP progress reports distributed to PEPO, CWCB, and Jackson County Star. Continue to post in the Jackson County Star all scheduled BRT meetings, inviting the public to attend. Provide North Platte BRT and BIP updates during community meetings, such as the North Park Stock Growers' annual and winter meetings.	Education liaison with E&O Committee assistance	Ongoing
Provide information on North Platte Basin water activities to Interim Legislative Water Committee.	E&O Committee and all BRT members	Upon request
Distribute Colorado Water Plan and BIP pamphlets, and basin fact sheets in the community.	Education Liaison with E&O Committee assistance	Ongoing within appropriate time frames
Deliver speaker's bureau using presentation materials and updating or customizing a presentation to meet interests of stakeholder groups within and potentially outside the North Platte Basin.	E&O Committee and all BRT members	Upon request
Host community water education workshop(s) to better engage stakeholders in water law and issues relevant to the North Platte Basin. Potential topics may include presentations on water law, history of decrees and compacts, ongoing efforts in Colorado to meet water gaps, and WSRF project updates, among others.	E&O Committee	At least one presentation per year 2016-2019
Develop and/or purchase educational materials, supplies, and services to use in North Platte Basin education efforts, such as development of tabletop displays, print materials, audio/video clips, and newspaper ads.	E&O Committee	Developed annually by E&O Committee as the North Platte BRT deems appropriate.
Request annual EAP funds as needed based on availability with a current budget submitted annually to support educational efforts as noted above. Annual funds will be submitted for reimbursement no later than June 15 of each year in which requests are made		

Table 8. Implementation Strategies of North Platte BRT E&O Committee



Appendix A. North Platte 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:

North Platte 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

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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 North Platte 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: North Platte Basin Revised Results

The following sections reflect the revisions implemented in the North Platte 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 NORTH PLATTE BASIN MUNICIPAL REVISIONS

At the request of the North Platte Basin Roundtable, in January 2021, ELEMENT Water Consulting (ELEMENT) updated the North Platte Basin municipal baseline and projected water demands that were initially prepared for the Colorado Water Plan Technical Update analyses completed in 2019 (Technical Update; 2019 Analysis). The updated analysis incorporates the addition of outreach data for the Town of Walden. The original Technical Update did not include any demand data for any municipal water providers in the North Platte Basin, instead relying on demand data from nearby counties and the statewide demand distribution. The new data was used to update baseline and projected demands for Jackson County and the North Platte Basin. The explicitly modeled demands for the Town of Walden were also updated.

The following sections provide additional detail regarding the analysis and the results, which should supersede the initial results provided with the Technical Update.

2.1.1 TOWN OF WALDEN DATA

In December of 2020, outreach demand data for the Town of Walden for the years 2010 through 2019 was provided to ELEMENT. At the time of the Technical Update, there was no provider-level information for the Town of Walden. All of Jackson County was represented by filled demand data from select counties. ELEMENT reviewed the Town of Walden annual water use data for the full period provided and compared it to the 1051 reporting period of 2013 through 2016 that was used for the Technical Update 2019 analysis. The annual average was similar between the two averaged periods, so the 1051 reporting period of 2013 through 2021 update to maintain consistency. Population was downloaded from the State Demographer Office by ELEMENT for the same period.

Table 1 below shows a comparison of the Jackson County demand data from the 2019 analysis and the updated analysis incorporating the Town of Walden outreach data. Water demand values are in acre-feet per year (AFY) and gallons per capita per day (gpcd).

Analysis	2015 Population Per SWSI Update	Total County Systemwide Demand (AFY)	Total County Demand incl. NRW (gpcd)	Indoor Residential Baseline Demand (AFY)	Outdoor Residential Baseline Demand (AFY)	Indoor Non- Residential Baseline Demand (AFY)	Outdoor Non- Residential Baseline Demand (AFY)	Non- Revenue Baseline Demand (AFY)
2019 Analysis	1,353	399	264	125	83	76	69	47
Jan 2021 Update	1,353	409	270	127	84	79	70	48
Difference	0	10	6	2	1	3	1	1

Table 1. Jackson County Baseline Demand Comparison

2.1.2 UPDATED BASELINE

The North Platte Basin does not have sufficient data to support a county-level demand distribution. Based on the Technical Update methodology, the statewide demand distribution was applied to all counties in the North Platte Basin. This remained unchanged after the January 2021 revisions. Table 2 below shows the impacts on the North Platte Basin baseline demands based on the January 2021 updates described above. Note that Jackson County is the only county within the North Platte Basin, so baseline demands are the same as above.

		Baseline (2015) AFY							
Analysis	Population	Residential Indoor	Non- Residential Indoor	Residential Outdoor	Non- Residential Outdoor	Non- Revenue	Systemwide		
2019 Analysis	1,353	263	125	83	76	69	400		
Jan 2021 Update	1,353	270	127	84	79	70	409		
Difference	0	7	2	1	3	1	9		

Table 2: North Platte Basin Baseline Demand Comparison

Because the North Platte baseline demand in the 2019 analysis was entirely filled using other county demand data, the documentation did not initially include a figure showing the baseline demand data sources for the North Platte Basin. With the addition of the Town of Walden data, 43% of the North Platte is now represented by outreach data.

2.2 NORTH PLATTE BASIN OPERATIONAL REVISIONS

The Town's water rights were also revised through this effort to include the water rights associated with their Michigan River surface water diversion and two wells. The North Platte water allocation model does not explicitly represent well operations; therefore, the simplifying modeling assumption was to assign the ground water rights to the surface water location. This assumption is appropriate for a planning level effort as there is not a significant lag to the well depletions, and the depletions generally accrue to the river near the same location as the surface water diversion. Note that infrastructure capacity was not revised, as it is not a limiting factor within the system under current and future conditions.

2.3 NORTH PLATTE BASIN REVISED WATER SUPPLY AND GAP RESULTS

The following tables reflect the revised demand, water supply, and gap results based on the revised M&I demand and operations. The revisions resulted in less than a one percent change in the agricultural demand and gap results. By attributing the appropriate amount of M&I demand to the Town of Walden, the average M&I gap was reduced to essentially zero and the gap during critically dry years was reduced to approximately 15 acre-feet annually.

	Agricultural Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
	Average Annual Demand (ac-ft)	529,204	602,431	602,431	688,308	502,345	733,493
0	Average Annual Demand Increase from Baseline (ac-ft)	-	73,227	73,227	159,105	-	204,289
rage	Average Annual Gap (ac-ft)	85,721	107,950	107,927	177,847	168,135	231,105
Aver	Average Annual Gap Increase from Baseline (ac-ft)	-	22,230	22,207	92,126	82,414	145,384
	Average Annual Percent Gap	16%	18%	18%	26%	33%	32%
	Average Annual CU Gap (ac-ft)	40,302	50,839	50,829	83,581	91,997	108,504
critically Dry Maximum	Demand In Maximum Gap Year (ac-ft)	521,572	582,442	582,442	659,426	494,854	693,975
	Increase from Baseline Demand (ac-ft)	-	60,870	60,870	137,854	-	172,403
	Gap In Maximum Gap Year (ac- ft)	296,924	336,721	336,659	394,810	320,785	441,034
	Increase from Baseline Gap (ac- ft)	-	39,797	39,735	97,887	23,861	144,111
	Percent Gap In Maximum Gap Year	57%	58%	58%	60%	65%	64%

Table 3: North Platte Basin Agricultural Water Supply and Gap Summary

	M&I Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
	Average Annual Demand (ac-ft)	410	361	302	337	362	463
	Average Annual Demand Increase from Baseline (ac-ft)	-	-	-	-	-	53
	Average Annual Gap (ac-ft)	-	-	-	-	-	1
age	Average Annual Gap Increase from Baseline (ac-ft)	-	-	-	1	-	-
Ave	Average Annual Percent Gap	0%	0%	0%	0%	0%	0%
	Demand In Maximum Gap Year (ac-ft)	410	361	302	337	362	463
y Dry Maximum	Increase from Baseline Demand (ac-ft)	-	-	-	-	-	53
	Gap In Maximum Gap Year (ac- ft)	17	14	12	12	12	16
	Increase from Baseline Gap (ac- ft)	-	-	-	-	-	-
Criticall	Percent Gap In Maximum Gap Year	4%	4%	4%	4%	3%	3%

Table 4: North Platte Basin M&I Water Supply and Gap Summary

Table 5: North Platte Basin Water Supply and Gap Summary

	Agricultural and M&I Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
	Average Annual Demand (ac-ft)	529,614	602,792	602,733	688,645	502,707	733,956
rage	Average Annual Gap (ac-ft)	85,721	107,951	107,928	177,847	168,135	231,106
Ave	Average Annual Percent Gap	16%	18%	18%	26%	33%	31%
y Dry Max	Demand In Maximum Gap Year (ac-ft)	521,982	582,803	582,744	659,763	495,216	694,438
	Gap In Maximum Gap Year (ac- ft)	296,941	336,735	336,671	394,822	320,797	441,050
Critical	Percent Gap In Maximum Gap Year	57%	58%	58%	60%	65%	64%