VOLUME 2 • JANUARY 2022

SOUTH PLATTE

Basin Implementation Plan

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ACRONYMS

ASR	aquifer storage and recovery
ATM	alternative transfer method
BIP	Basin Implementation Plan
BRT	Basin Roundtable
CCWCD	Central Colorado Water Conservancy District
CDPHE	Colorado Department of Public Health and Environment
CGWC	Colorado Ground Water Commission
CPW	Colorado Parks and Wildlife
CWCB	Colorado Water Conservation Board
DPR	direct potable reuse
DWR	Division of Water Resources
GC	General Contractor
gpcd	gallons per capita per day
GWMD	Ground Water Management District
IWR	irrigation water requirement
JSC	Joint Steering Committee
LE	Local Expert
RRWCD	Republican River Water Conservation District
SMWSA	South Metro Water Supply Authority
SPROWG	South Platte Regional Opportunities Water Group
SWSI	Statewide Water Supply Initiative
USGS	United States Geological Survey
WISE	Water Infrastructure and Supply Efficiency
WSRF	Water Supply Reserve Fund

ACKNOWLEDGEMENTS

This update to the South Platte Basin Implementation Plan (South Platte BIP) could not have been developed over the past eighteen months without the involvement and guidance of many individuals, committees and organizations with deep commitments to comprehensive water management in the South Platte and Republican River Basins. The Local Expert Team of HDR Engineering, LRE Water, and Stantec Engineering Consultants are very grateful for the generous support provided to us. First, thank you to the South Platte and Metro Roundtables for entrusting to us the important work of developing this update. Second, we especially appreciate the direction of the **Joint Steering Committee (JSC)** and three Subcommittees – **Municipal and Industrial**, **Environmental and Recreational**, and **Agricultural**—who were assigned by the roundtables to do the "heavy lifting" during the development, writing and editing of this update. The balanced and thoughtful advice of the JSC and Subcommittee members listed below provided important perspectives for this update.

The South Platte BIP Update builds on the 2015 South Platte BIP and the Technical Update to the Colorado Water Plan prepared by the Colorado Water Conservation Board. We are very appreciative of the support provided to us by CWCB Staff including Russ Sands, Kathryn Weismiller, Sam Stein, Alex Funk, and JoJo La.

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COLORADO
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Department of Natural Resources

Brown AND Caldwell

General Contractor

The Colorado Water Conservation Board selected Brown and Caldwell to serve as the general contractor (GC) to assist the CWCB and basin roundtables with the update of Basin Implementation Plans and the Colorado Water Plan.

The HDR team served as the Local Expert (LE) for the South Platte and Metro Roundtables and provided direct support to the roundtables during the Basin Implementation Plan update process. The LE was a subcontractor to the GC.

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 Basin Implementation Planning?

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

THE SOUTH PLATTE BASIN IMPLEMENTATION PLAN CONSISTS OF TWO VOLUMES:	
VOLUME 1:	A summary of the South Platte Basin's current and future water resources, focusing on goals, projects, and a strategic vision to meet future water needs.
VOLUME 2:	A more comprehensive description of Basin achievements, challenges, goals, and strategic vision for meeting future water needs as well as legacy and specific information on technical analyses, project data, and case studies. Note that Volume 2 is organized in a slightly different order than Volume 1.

THE SOUTH PLATTE BIP IS A JOINT EFFORT

The South Platte BIP was jointly developed by both the Metro Roundtable and the South Platte Basin Roundtable. It focuses on the water needs of northeast Colorado and encompasses both the South Platte and Republican River Basins.

The South Platte Basin Implementation Plan is organized to maintain a "line of sight" between all plan elements. The plan begins with a basin overview that characterizes the general water supply and demand situation and current environmental conditions. Considering these conditions, four overarching themes were developed to help guide the water supply planning effort. The remainder of the plan falls under these four overarching themes.

The plan describes the general current and future water supply challenges the Basin faces. Concurrently, it highlights key Basin achievements that have occurred since the 2015 Basin Implementation Plan that helped address these basin challenges. The plan also describes South Platte Basin supply, demand, and potential water needs.

Based on the identified challenges and water needs, the plan then describes goals, strategies, and measurable outcomes that were developed by the Metro and South Platte Basin Roundtables to address (maintain and overcome) challenges and measure progress over the next 5 years.

Finally, the plan describes specific projects that have been identified for managing the future water supply in the South Platte Basin.

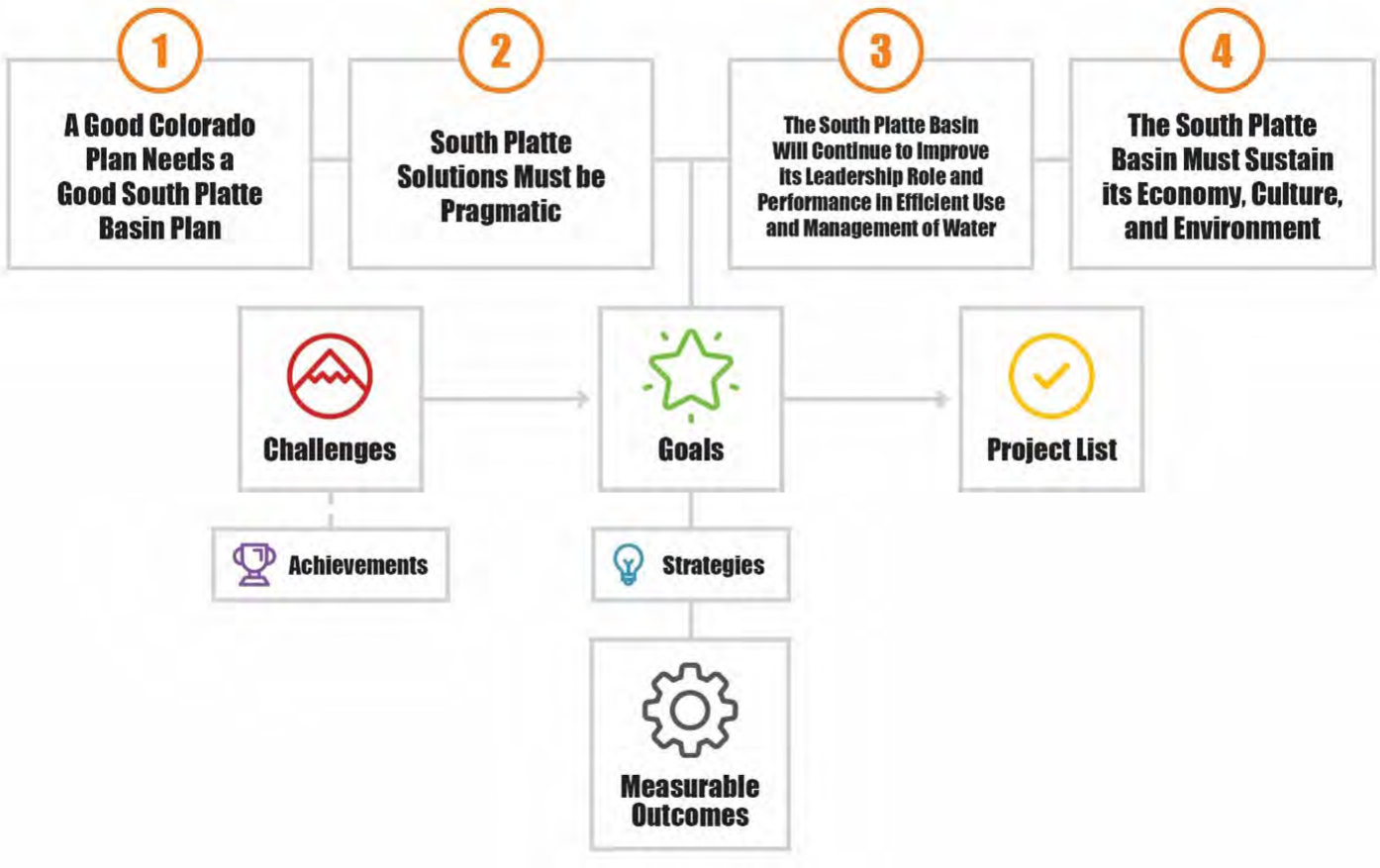


Figure 1-1. South Platte Basin Implementation Plan Organization

Section 2. Basin Overview

There are diverse factors affecting water management in the South Platte River and Republican River Basins, including the diversity of demographics and water uses for the urban portion of the South Platte River Basin in the Denver Metro area versus the needs of agricultural users and smaller communities in other portions of the Basins. These factors were deemed significant enough by the Colorado Water Conservation Board (CWCB) that the river basins were divided into two separate basin roundtables: the **Metro Roundtable** represents the Denver Metro region of the South Platte River Basin; the **South Platte Basin Roundtable** represents the remainder of the South Platte River Basin along with the Republican River Basin in Eastern Colorado. Given the integrated water needs of the two basin roundtables, the South Platte Basin Roundtable and Metro Roundtable decided to develop a single Basin Implementation Plan (BIP) for the South Platte and Republican River Basins. *This area is hereinafter referred to as the South Platte Basin.*

The South Platte Basin (Figure 2-1) comprises about 27,660 square miles in northeast Colorado. Because the South Platte River and Republican River Basins have distinct water supply challenges, separate descriptions are provided for each basin.

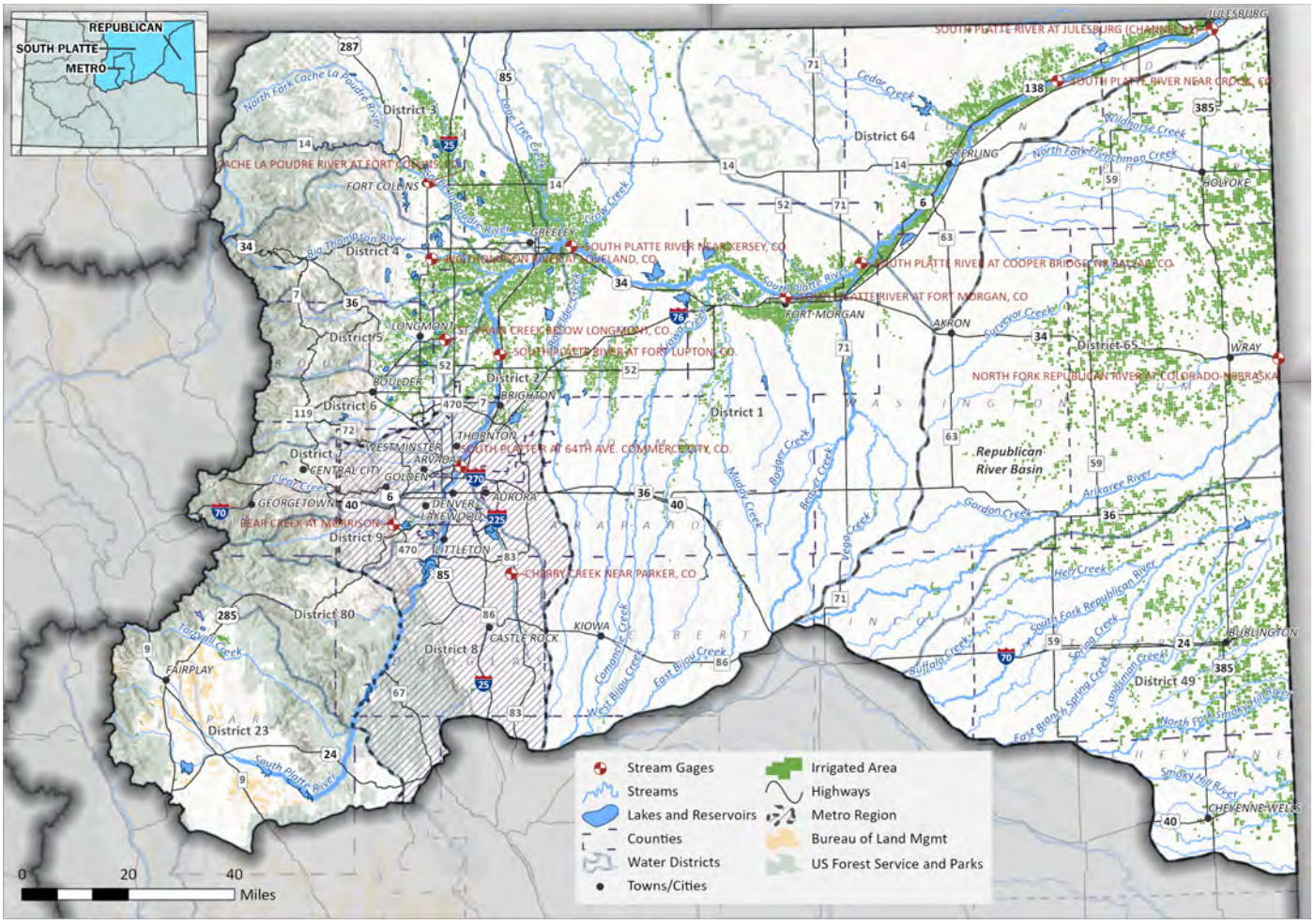


Figure 2-1. Map of the South Platte River, Metro, and Republican River Basins

South Platte River Basin

The South Platte River Basin waters originate in the mountain streams along the Continental Divide in the northern portion of the Front Range. The South Platte River emerges from the mountains southwest of Denver and moves north through the Denver metropolitan area where it is joined by numerous tributaries such as Cherry Creek, Clear Creek, Coal Creek, Bear Creek, Boulder Creek, St. Vrain Creek, Big Thompson River, and Cache La Poudre River. It then flows northeast across Colorado's High Plains, eventually crossing the Colorado-Nebraska state line near Julesburg.

The topographic characteristics of the South Platte River Basin are diverse. The western portions of the basin and its mountainous and subalpine areas are mostly forested, while the High Plains region is mainly grassland and planted or cultivated land with highly urbanized areas.

The hydrology of the South Platte River Basin is highly variable, with an approximate average annual native flow volume of 1.4 million acre-feet/year. Water supply in the South Platte River Basin is supplemented by approximately 400,000 acre-feet/year of trans-basin diversions from the Colorado River Basin and 100,000 acre-feet/year from the Arkansas, North Platte, and Laramie River Basins. In addition, over 30,000 acre-feet/year are pumped from nontributary groundwater aquifers to supplement supplies. The South Platte River Basin's surface water diversions average approximately 4.0 million acre-feet annually, with an additional annual average of 450,000 acre-feet of groundwater withdrawals. The amount of diversion in excess of native flow highlights the return flow-dependent nature of the basin's hydrology, and the efficient use and reuse of water supplies across the basin. On average, only 400,000 acre-feet leave the South Platte River Basin annually.

The South Platte River Basin is the most populous basin in the state. Seventy percent of Colorado's population resides here, and the Front Range area of the basin is Colorado's economic engine. Four of the top five and 17 of the top 20 largest cities in Colorado are in the South Platte River Basin. As a result, the South Platte River Basin has the highest municipal and industrial water use in the state.

The South Platte River Basin includes about 40 percent of the statewide self-supplied industrial demand with approximately two-thirds of that demand occurring in the Denver Metro region. These demands in the South Platte River Basin are associated with the Large Industry, Snowmaking, and Thermoelectric sub-sectors.

The South Platte River Basin also has the greatest concentration of irrigated agricultural lands in Colorado. Approximately 854,000 acres are irrigated in the South Platte River Basin. It is the highest producing basin in the state in terms of the value of agricultural products sold. Irrigated lands are located along and adjacent to the South Platte River and its tributaries and stretch to the state line.

The amount of irrigated land in the basin is anticipated to decrease in the future. Urbanization will impact irrigated lands in and around the basin's municipalities by 2050. Most of the urbanization of irrigated land (60 percent) is projected to occur in the St. Vrain River, Big Thompson River, and Cache La Poudre River basins. These basins have some of the highest concentrations of irrigated land adjacent to municipalities projected to increase in population.

Urban agriculture is an established and growing movement in the Denver Metro area that produces local food and other agricultural products, some of which occurs in historically underserved communities.

Environmental and recreational features in the basin are important to Colorado's quality of life and tourism economy.

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

Republican River Basin

The headwaters of the North Fork and South Fork of the Republican River and the Arikaree River originate in the northeastern high plains of Colorado. The Republican River Basin in Colorado encompasses approximately 7,760 square miles, which represents 31 percent of the total Republican River Basin located in Colorado, Nebraska, and Kansas.

The topographic characteristics of the Republican River Basin are similar to the high plains region of the South Platte River Basin, consisting mainly of grassland and planted/cultivated land. The Republican River Basin in Colorado is underlain by the High Plains Aquifer (also known as the Ogallala Aquifer), which is one of the largest waterbodies in the United States and extends from South Dakota to Texas.

The Republican River Compact of 1942 (Republican River Compact) apportions the waters of the Republican River Basin between Colorado, Nebraska, and Kansas. The Republican River Compact makes allocations for beneficial consumptive use in each state. Colorado is allocated the entire water supply of the Frenchman Creek and Red Willow Creek drainage basins in Colorado. It is also allocated 54,100 acre-feet, which is further allocated as follows:

- North Fork of the Republican River drainage basin – 10,000 acre-feet;
  Arikaree River drainage basin – 15,400 acre-feet.
- South Fork of the Republican River drainage basin – 25,400 acre-feet; Beaver Creek drainage basin – 3,300 acre-feet.

The allocations decrease with declining streamflow. In 2002 the U.S. Supreme Court determined that groundwater use impacts streamflow and those impacts must be accounted as part of a state's allocation. The 2002 Final Settlement Stipulation sets out the complicated accounting needed to determine those groundwater impacts and to determine each states' compliance.

In 2004 the Republican River Water Conservation District (RRWCD) was established for the purpose of cooperating with and assisting the State of Colorado with Republican River Compact compliance. Administration of surface water in the Republican River Basin is separate from groundwater administration. Much of the groundwater located within the basin has been authorized as being in a Designated Ground Water Basin. The Colorado Ground Water Commission (CGWC) has established eight Designated Ground Water Basins - Northern High Plains, Kiowa Bijou, Southern High Plains, Upper Black Squirrel Creek, Lost Creek, Camo Creek, North Kiowa Bijou, and Upper Crow Creek – and 13 Ground Water Management Districts (GWMD) within such basins. GWMDs are local districts that have additional administrative authority. Much of the Republican River Basin lies within the Northern High Plains Designated Ground Water Basin and eight GWMDs.

The Republican River Basin has nearly 580,000 irrigated acres, making it one of the highest producing basins of irrigated crops in the state. The basin has very limited surface water supplies. As a result, irrigators rely on groundwater supplies from the High Plains Aquifer. While all of the pumping in the basin is subject to the Republican River Compact, the Compact accounting recognizes that most of that pumping comes from storage in the High Plains Aquifer and not the stream system. Groundwater pumping is managed by the groundwater management districts in the basin.

Colorado, Kansas, and Nebraska reached an agreement in August 2016 in the long-standing conflict over water from the Republican River Basin, as the Republican River Compact Administration signed two resolutions. Representatives from the three states met monthly for over two years to change the approach and improve how they manage interstate water matters. This effort has created a new focus on transparency and certainty as all three states work to serve their water users. The intent of these resolutions is to provide long-term certainty to water users.

This agreement provides a path to resolve Kansas's concerns regarding streamflow on the South Fork Republican River, which flows through Cheyenne County in northwest Kansas. Colorado agreed to retire 25,000 groundwater-irrigated acres within the South Fork Republican River basin to address Kansas's concerns. Colorado and Kansas also agreed to work together to develop options to maximize the use of Bonny Reservoir, which was drained in 2012.

The current amount of irrigated land in the basin is expected to decline in the future and irrigated lands will need to be retired to maintain compliance with the Republican River Compact. In addition, declining saturated thickness in the High Plains Aquifer will also lead to the retirement of groundwater-irrigated lands.

The Republican River Basin contains less than 1 percent of the statewide population and does not account for any of the State's self-supplied industrial demands.

Relationship with Statewide Water Needs

The South Platte Basin is the most populous in the state, making up approximately 70 percent of Colorado's population and is expected to experience the largest municipal growth in the state by 2050. It also represents large portions of the agricultural, recreational, and tourism sectors of the State's economy. Given the interdependence of the State's regional economies, it is critical to Colorado's prosperity that future water demands in the South Platte Basin, as well as in all the basins, be satisfied.

In addition to economic interdependency between the State's river basins, there are many other important inter-relationships impacting the approach to addressing statewide water supply issues:

Political Inter-relationships. Solving Colorado's long-term water supply problems will take collaborative political processes in the General Assembly and in the State's water and natural resource planning, regulatory, and funding agencies. Many potential in-state approaches require that new legislation be applied uniformly and equitably across the State. Interaction with the nineteen states that receive water originating in Colorado must be led by State water managers. Interaction with federal water management and regulatory agencies must be handled consistently across river basins to maintain the authority of the State's water administration. The degree to which the State can speak with a unified voice on potential future federal legislation and/or executive orders may also greatly affect how water supply solutions are implemented.

Hydrographic, Environmental, and Recreational Interconnections. The existing and potential future diversions of water from the Colorado to the South Platte and Arkansas Basins receives intense attention and scrutiny; however, there are also many other water-related and environmental interconnections and co-dependencies that will benefit from continued collaborative statewide efforts. These include threatened and endangered species recovery programs, input on proposed changes to federal land and water management programs, including designation of additional special use areas (e.g., wilderness areas, wild and scenic rivers, national recreation areas, etc.), forest management and fire response planning, invasive species migration and control, and many other watershed and water quality programs that should be consistently applied across the state. The State and water users must consider that water diversions and uses are interconnected and interdependent with environmental and recreational flows and wetlands areas. Much of Colorado's economy and quality of life depends on these environmental and recreational attributes. The South Platte Basin is home to many important environmental and recreational attributes that require thoughtful consideration during water planning processes.

Cultural and Social Interconnections. Coloradoans take great pride in their state. Colorado is renowned worldwide for its natural beauty and hospitality. Its residents share a culturally rich heritage, founded in western individualism and pragmatism. As a result, Coloradoans seek practical and collaborative solutions that respect this culture, especially in federal legislative and executive agency interactions. These cultural traits tend to unite Coloradoans across river basins, allowing them to relate to each other's challenges and potential solutions. Moreover, as the state's demographic trends show, regional affiliations are progressively fluid with offspring of West Slope residents increasingly finding employment and raising families in new South Platte River Basin communities.

Section 3. Overarching Themes

The South Platte BIP has four overarching themes that guide the plan's future water supply planning. These overarching themes are described in Table 3-1.

Table 3-1. Overarching Themes

Overarching Themes		Descriptions
1	**A Good Colorado Plan Needs a Good South Platte Basin Plan**	A South Platte Basin Implementation Plan will need to be consistent with the values represented in the Colorado Water Plan. Comprehensive and reliable solutions to meeting the South Platte Basin's consumptive, environmental, and recreational water supply needs benefit all of Colorado. The continued and unmitigated loss of agricultural production through "buy-and-dry" is not in Colorado's overall interest.
2	**South Platte Solutions Must be Pragmatic**	An effective South Platte Basin Implementation Plan must address the needs of a variety of water interests. Potential solutions must be pragmatic and embrace the realities of Colorado's prior appropriation doctrine, state and federal regulatory/permitting nexus, increasing project costs, and environmental and socioeconomic impacts.
3	**The South Platte Basin Will Continue its Leadership Role and Performance in Efficient Use and Management of Water**	The state's future, and the future of each of its river basins, depends on efficient and sustainable use and management of all available water supplies. The South Platte Basin will continue to lead the state of Colorado in maintaining, promoting, and implementing efficient use of water through municipal and industrial planning, conservation, and reuse, and in adoption of innovative and efficient water use practices across all categories of water users.
4	**The South Platte Basin Must Sustain its Economy, Culture, and Environment**	Whether it's an urban center, a rural agricultural community, or a mountain resort, – Coloradans value their way of life, the financial engines that drive their communities, and the environment. The South Platte Basin will manage its water resources and develop projects to honor these unique values throughout the basin and the state.

Section 4. Basin Challenges and Achievements

The word that best encapsulates the water-related challenges faced by the South Platte Basin at the time of the BIP update is **scarcity**. The current challenges of meeting municipal and industrial and agricultural water needs while maintaining or enhancing environmental and recreational resources have inherent conflicts and led to water users having to make hard choices to meet their existing and future needs. Water scarcity, combined with anticipated growth in the basin, will increase the stress on already limited water resources in the future as the gap between sustainable supply and demand for all consumptive and non-consumptive uses grows. Scarcity concerns vary geographically within the basin, with the portion of the basin from the Denver Metro area downstream being at greater risk than the portion of the basin upstream of the Denver Metro area.

Examples of South Platte Basin challenges related to water scarcity include the following:

- Competition among water users to capture the limited remaining native water supplies.
- The basin is increasingly susceptible to influences of climate change on drought frequency and severity, wildfires, and forest health.
- Concerns about the sustainability of the Denver Basin Aquifer have driven many municipalities to pursue costly renewable surface water supplies.
- Agricultural water users face frequent water shortages, as well as pressure from urbanization and water acquisitions by municipal water providers.
- Protecting critical species habitat, water quality, and recreational opportunities will become more difficult as the gap between urban and agricultural water needs and available supplies increase.

Conversely, addressing challenges related to water scarcity has led to many creative and innovative solutions in the South Platte Basin such as:

- Collaborative projects like WISE (Water Infrastructure and Supply Efficiency), NISP (Northern Integrated Supply Project), Parker/Lower South Platte Project, and South Platte Regional Opportunities Water Group (SPROWG)
- Water reclamation and recycling by Denver Water, Aurora Water, and others
- Indirect potable reuse through projects like Prairie Waters
- Water efficiency improvements through municipal water conservation programs.

This chapter describes the key challenges facing the South Platte Basin as identified by the South Platte and Metro Basin Roundtables. All these challenges may be viewed as a direct or indirect result of **water scarcity** in the basin relative to existing and future needs.

Table 4-1 gives a brief summary of the challenges the South Platte basin faces and the goals that mitigate those challenges. Goals are further defined in Section 6. Following Table 4-1, the remainder of this section discusses each of the 16 challenges presented in the table in more detail with descriptions of illustrative projects and programs that have been done or are currently being done in response to the challenge. The description of the South Platte Regional Opportunities Work Group program is placed before the challenge sections because this comprehensive concept addresses many of the challenges.

Table 4-1. Basin Challenges and Goals

CHALLENGES	BIP GOALS
Competition for Scarce South Platte Basin Water Resources	**Goal 2**: Maximize Development of Native South Platte Supplies **Goal 5**: Maintain and Improve Irrigated Agriculture **Goal 9**: Support Collaborative Development and Management of Supply Options Outside of the South Platte Basin
Degree of Successive Water Use in the South Platte Basin	**Goal 4**: Maintain and Promote Reuse **Goal 5**: Maintain and Improve Irrigated Agriculture
Expanding Non-potable and Potable Water Reuse	**Goal 4**: Maintain and Promote Reuse
Municipal and Industrial **Water Use Efficiency**	**Goal 3**: Maintain and Promote Municipal and Industrial Conservation and Efficiency
Additional Use of Denver Basin Aquifer **System Water**	**Goal 1**: Encourage Implementation of Projects **Goal 2**: Maximize Development of Native South Platte Supplies
Aquifer Storage and **Recovery (ASR) in Denver Basin Aquifer System**	**Goal 1**: Encourage Implementation of Projects **Goal 2**: Maximize Development of Native South Platte Supplies
Use of the Alluvial Aquifer along the South Platte River	**Goal 1**: Encourage Implementation of Projects **Goal 2**: Maximize Development of Native South Platte Supplies
Water Quality Management	**Goal 2**: Maximize Development of Native South Platte Supplies

CHALLENGES	BIP GOALS
 Future of Agriculture	**Goal 5**: Maintain and Improve Irrigated Agriculture
 Republican River Basin Water Use Constraints	**Goal 5**: Maintain and Improve Irrigated Agriculture
 Need for Protection and Enhancement of Forest and Watershed Health	**Goal 6**: Protect and Enhance Watershed Function
 Diverse Environmental Water Needs and Concerns	**Goal 7**: Protect and Enhance Environmental Attributes
 Diverse Recreational Water Needs and Concerns	**Goal 8**: Protect and Enhance Recreational Attributes
 Time and Cost to **Obtain Regulatory** Decisions on New Water **Supply Projects**	**Goal 12**: Improve Efficiency and Effectiveness of Water Project Permitting
 The Roles of Elected **Officials, the Business Community and the** General Public in Water **Supply Planning**	**Goal 11**: Broaden South Platte Communications, Outreach, and Education Programs
 Climate Change	**Goal 10**: Utilize Scenario Planning to Better Manage Uncertainty of Future Water Needs

SOUTH PLATTE REGIONAL OPPORTUNITIES WATER GROUP CONCEPTUAL PROJECT

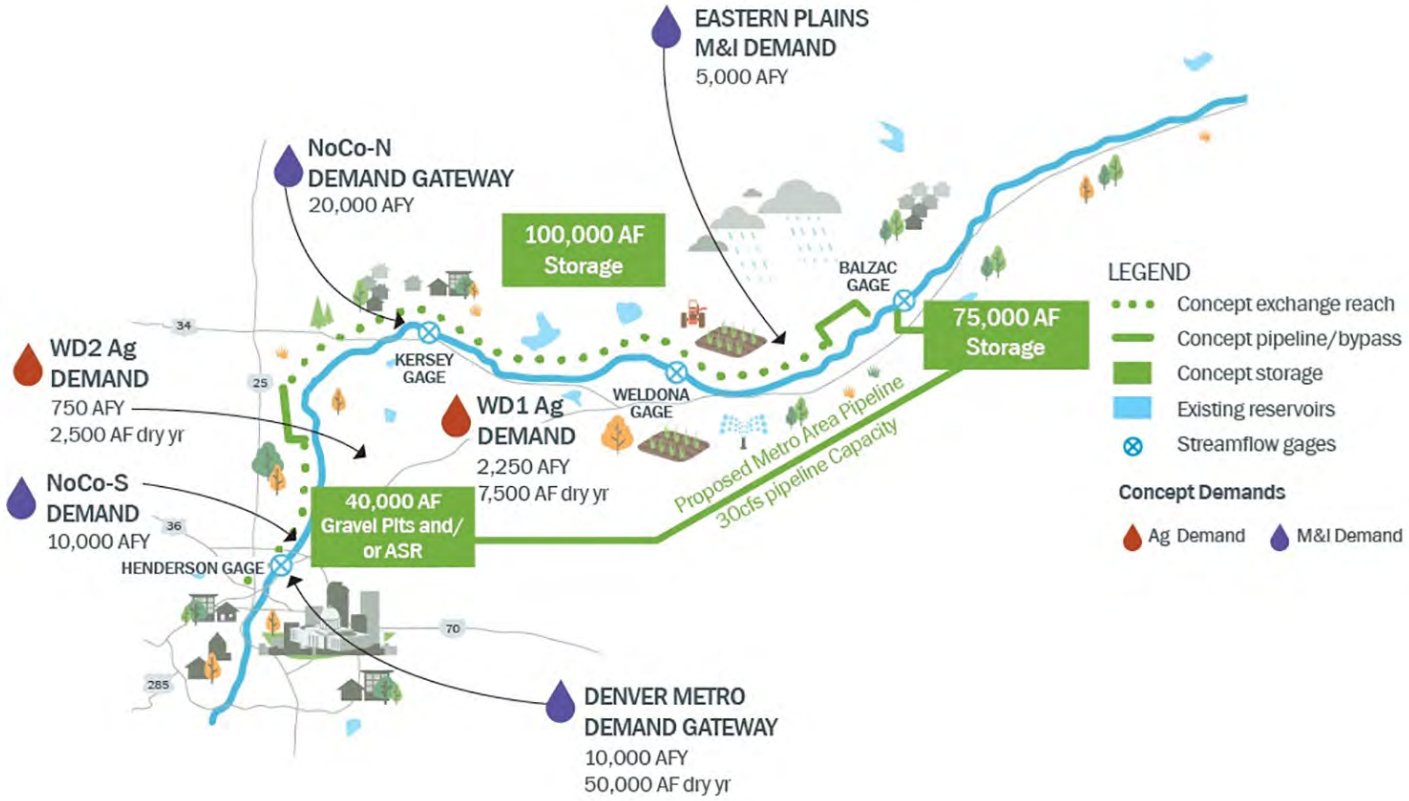


Figure 4-1. SPROWG Concept

The 2015 South Platte BIP included a discussion of opportunities to create a multipurpose, multiparticipant project in the lower South Platte River basin (see Section 4.6.2 in the 2015 BIP). To advance this idea, a consortium of municipal and agricultural water users formed the ad-hoc South Platte Regional Opportunities Working Group (later South Platte Regional Opportunities Water Group, or SPROWG) to explore concepts for capturing, storing, and conveying junior water rights, reusable return flows and agriculture to municipal (ATM) transfers between Denver and the state line. Following several informal technical studies, SPROWG used a Water Supply Reserve Fund (WSRF) grant to complete a Feasibility Study in March 2020 that refined project alternatives, produced enhanced modeling of options, refined alternative cost estimates, and outlined potential governance structures for owning and operating a multi-participant project.

Alternative concepts were developed to provide an average of 50,000 to 80,000 acre-feet per year of yield for municipal participants and 5,000 to 20,000 acre-feet per year of yield for agricultural participants. Alternatives included 215,000 to 409,000 acre-feet of reservoir or managed groundwater storage in several locations. Life-cycle costs for the alternative concepts vary from $25,800 to $33,300 per acre foot for raw water and $44,100 to $58,300 per acre foot for treated water.

Discussions are continuing among SPROWG members regarding next steps. At this stage no firm commitments for participation have been received or solicited; however, there is broad consensus that the concept warrants continued evaluation and that outreach to other potential municipal, agricultural, and environmental, and recreational participants should be conducted.

Competition for Scarce South Platte Basin Water Resources

Municipal and industrial and agricultural water providers in the South Platte Basin face daunting challenges to meeting their customers' needs considering the forecasted supply-demand gap in the basin. These include existing water shortages, anticipated future growth, climate change, threats to water quality, cost of new supplies, legal complexities, and environmental permitting hurdles. The fact that municipal and industrial and agricultural providers individually need to protect existing supplies and plan for future needs has created competition in the basin for the same limited resources, driving up the cost and complexity of developing remaining water resources. While new supplies are needed, the basin also needs to maintain, protect, or improve environmental and recreational water uses. The need to develop new supplies while protecting environmental and recreational uses sets up a tension that threatens the basin's ability to address future environmental and resource needs.

Competition among municipal water providers for scarce South Platte Basin supplies poses several threats to overall basin health, including:

- Increased pressure for municipal entities to acquire agricultural water through "buy-and-dry" strategies that could affect the health of agriculture and rural communities and the environment in the South Platte Basin.
- Inequities in the reliability of supplies available to South Platte Basin residents based on where they live, and the water supply portfolios owned by their water providers.
- Increased stress on a regional economy that depends on having reliable water supplies and healthy environmental and recreational resources for all its interconnected urban and rural communities.

This is not just a South Platte Basin issue. Similar factors related to competition for scarce water resources affect conditions at the state level and interstate level as well.

Future competition for scarce water resources will increase the difficulty and cost of developing additional in-basin supplies for all water user categories. However, this competition allows for the opportunity and need for multipurpose projects. An example is the Chatfield Reservoir Reallocation Project.

CHATFIELD RESERVOIR REALLOCATION PROJECT

The Chatfield Reservoir Reallocation Project reallocated 20,600 acre-feet of storage space in the U.S. Army Corps of Engineers managed facility. Chatfield Reservoir was created in 1975 for flood control and water storage and draws more than 1.6 million visitors annually while providing water supply to Denver and the Front Range. The reallocation project allows 20,600 acre-feet of storage space that was previously reserved for flood storage to be used for water supply storage under specified conditions.

To provide the additional water supply storage in the Chatfield Reservoir, the normal allowable water surface elevation was raised 12 feet, requiring modifications to state park amenities such as the floating marina, boat ramps, the swim beach, bike trails, parking lots, tree thinning, and forest floor clean up on walking trails. Onsite environmental mitigation included restoring sections of Plum Creek and ponds adjacent to the South Platte River to control erosion and improve habitat. Throughout the 2-year construction period, the park was kept open with limited disruptions to maintain the park's $2 million annual revenue.

This project enjoys broad support from municipal, agricultural, and environmental interests. The project brings environmental, agricultural, and outdoor recreational benefits along with new, critical multi-purpose water storage capacity for growing Front Range communities, including Highlands Ranch, Castle Rock, and Castle Pines.

Environmental Pool. The Chatfield Environmental Pool was created as part of the agreement between the water providers and Colorado Parks and Wildlife to allow for strategic releases out of Chatfield Reservoir to enhance stream flows and water quality in the South Platte River below the reservoir. The environmental pool has now been expanded to 2,100 acre-feet of the reallocated space because of the generosity of a partnership of 22 public and private, foundation and nonprofit entities and individuals. The environmental pool is a great example of the type of project called for in the 2015 Colorado Water Plan for maximizing water resources through projects that provide multiple benefits for multiple users.

Agricultural. Releases from storage in Chatfield Reservoir for use by Central Colorado Water Conservancy District (CCWCD) will typically be left in the river for augmentation purposes, saving energy costs by operating a gravity flow reservoir system. CCWCD is the only agricultural stakeholder in the Chatfield Storage Reallocation Project. CCWCD subdistricts supply augmentation water to more than 1,000 irrigation wells over a surface area of more than 360,000 acres in Adams, Morgan, and Weld Counties.

SOUTHERN WATER SUPPLY PIPELINE II

Photo Credit: Northern Water

With continued Front Range growth, Boulder, Left Hand Water District, Berthoud and Longs Peak Water District agreed to fund a second phase of the Southern Water Supply Project for secure, year-round water deliveries of their Colorado-Big Thompson and Windy Gap water. Northern Water constructed the first phase in the 1990s for Broomfield and other Front Range communities. Some of the second phase pipeline participant entities previously depended on seasonally operated open canals for water deliveries, which at times are subject to water quality concerns. In addition, the pipeline reduces losses in transporting water to the participating entities increasing the overall availability and reliability of supply in the basin.

The Southern Water Supply Pipeline II traverses from Carter Lake south to the Boulder Reservoir Water Treatment Plant, a total distance of over 20 miles and has a maximum flow rate of 50 cubic feet per second. The diameter of the steel pipeline is primarily 36-inches. The first 12 miles parallel the first Southern Water Supply Project pipeline (constructed in 1995) from Carter Lake to St. Vrain Road near Longmont's Vance Brand Municipal Airport. The pipeline's last 8 miles deliver water to Left Hand Water District and Boulder.

Northern Water's commitment to protecting sensitive species meant that scheduling had to be very nimble to deploy construction teams to ensure the protection of raptors and endangered species, while robust enough to get work completed on time. Through work with partner agencies in the corridor, Northern Water was able to accomplish the goal of completing the project promptly, on budget, while ensuring all environmental constraints were satisfied.

PROJECT PROPONENTS: Northern Water, Boulder, Left Hand Water District, Berthoud, and Longs Peak Water District

TIMELINE: Start 2018, Completion 2020

COST: $38 million for construction; $44 million in total including design, permitting, administration, management, and right-of-way.

Degree of Successive Water Use in the South Platte Basin

Water in the South Platte River Basin is used successively several times before it reaches the state line. Only a portion of most diversions is consumed, and the remaining portion, or "return flow", returns to surface water streams and is part of the supply for downstream water users. The degree of successive downstream water use is complicated and affected by many factors. While all the goals and strategies of the BIP are seeking desirable outcomes, the timing and extent that each of them occurs will influence the degree of successive use. Some examples include:

- The implementation of future projects will diminish the amount of unappropriated or free river water available in the stream.
- The maximization of native supplies along with the effects of climate variability can lead to decreases in streamflow and return flows.
- Increasing municipal and industrial conservation, efficiency and reuse can affect long-term return flows within the basin.

The efforts to improve watershed health and environmental attributes (including retiming of streamflow through recharge projects) are important and can have localized benefits, including the successive use by downstream users. Irrigated agriculture within the South Platte River Basin from both surface water and groundwater continues to see increases in irrigation efficiencies through the conversion from flood irrigation to sprinkler irrigation. This continued development will result in reduced return flows within the basin, thus impacting the degree of successive use.

Opportunities for developing additional water supplies from the lower reaches of the South Platte River exist, but there are major economic and water quality, treatment and permitting challenges.

Municipal and Industrial Water Use Efficiency

Water reuse as a non-potable supply or indirect or direct potable supply is an important component of the water supply portfolio of many municipal water users in the South Platte Basin. Typically, only nontributary groundwater, the consumptive use portion of agricultural transfer water, and most water imported from another river basin (the C-BT Project is an important exception) can be reused. Challenges to expanding water reuse as a strategy for reducing the water supply gap in the South Platte Basin are described below.

Regulatory Challenge

- The Colorado Department of Public Health and Environment (CDPHE) Regulation 84 was recently modified to expand the types of allowed uses. Further regulatory improvements, including expanding reclaimed water uses, could promote additional non-potable reuse.
- In 2015, CDPHE Regulation 86, which governs the use of graywater, was created. However, it requires separate adoption by each local agency that desires to implement graywater reuse. At the time of the BIP update, the only entities in the Metro Basin that have accomplished this adoption are the City and County of Denver and the City of Golden. A CDPHE Regulation 86 stakeholder process recently kicked off to solicit input on potential changes.
- Municipal plumbing codes may need to be changed to allow graywater reuse.
- Current regulations make implementing direct potable reuse (DPR) a challenge.

Return Flow Management Challenge

- Many larger water users in the South Platte River Basin currently capture and reuse a significant portion of their reusable return flows.
- Reuse is accomplished in several different ways; each water user must determine the most beneficial approach to reuse based on their own water rights and system configuration. This can include separate nonpotable water systems, potable reuse, graywater recycling, and meeting augmentation obligations.
- Reuse decisions for water users can be complex because beneficial short-term and long-term options may be different (e.g., they may allocate return flows for augmentation water now but plan on recovering them for DPR in the future).
- Additional reuse by municipal water providers in the Denver Metro and North Front Range areas could reduce streamflows historically relied on for agricultural supplies and environmental flows, and by upstream entities to accomplish exchanges.
- Downstream water quality changes such as increased salinity could result from more reuse by Front Range entities. Basin water users acknowledge there may be consequences of upstream water reuse and will consider the trade-offs of additional reuse against other supply alternatives.
- As South Platte Basin municipalities consider various reuse options, concerns about possible temporary reductions in Colorado River supplies available due to curtailment under the Colorado River Compact must be considered. Additionally, any voluntary involvement in a future Colorado demand management program could also temporarily decrease reusable Colorado River supplies

Pathways to Direct Potable Reuse

- The CDPHE recently initiated a stakeholder process for developing a new rule to govern DPR.
- DPR is becoming a more technically and financially feasible option for municipal and industrial water supply portfolios in the South Platte Basin.
- State regulations for DPR are under development and will provide the regulatory clarity desired by municipalities to consider DPR as a water supply strategy, as well as a proactive approach to addressing public acceptance.
- Technical issues related to distribution systems will need to be addressed, including dual distribution system issues and changing water types in pipes.

Research Challenge

- Additional research is needed to support implementation of reuse applications such as graywater use and DPR.
- Support will be needed to identify and implement the most pertinent research for the South Platte Basin. Research on reuse for agricultural crops and tapping into funds not typically used for water projects may be a useful strategy for research involving reuse and agriculture.

Public Education as a Priority

- Additional education is needed to provide accurate information and confidence-building on water reuse to the public and elected officials, especially related to DPR.
- A method of frequently gauging the status of public and elected official acceptance of reuse and DPR is needed.
- A consistent strategy is needed for entities to use when engaging with the public and elected officials such as WateReuse Colorado's "Communications and Outreach Plan for DPR in Colorado." Research must be translated into understandable terms for the general public.
- Additional emphasis is needed on the various quality-of-life benefits from reuse, including reliable water supply, economic benefits, and drought protection.

CDPHE Resource Challenge

- CDPHE has experienced challenges with funding and staffing levels to support the regulatory processes needed to facilitate new reuse strategies such as new uses under Regulation 84, DPR, and graywater use.
- Outside resources from other state agencies (CWCB and Water Resources and Power Development authority), basin roundtables, water users, and others were needed to accomplish recent regulatory changes and to develop DPR stakeholder materials. Similar and more reliable resources are expected to be needed in the future, including for administering a new DPR rule.

Technical, regulatory, and public acceptance challenges all present obstacles to expanding water reuse in the South Platte Basin, but similar obstacles have been overcome in the past and can be addressed in the future. The potential for future adoption of DPR by major South Platte Basin municipal water users could significantly change the water resources situation in the region.

DIRECT POTABLE REUSE DEMONSTRATION PROJECTS

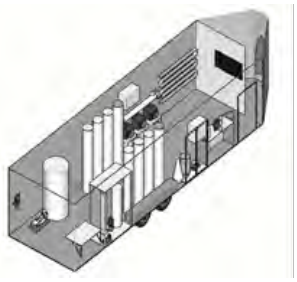


Photo 1. The PureWater Colorado Mobile Demonstration is housed in a 28-foot trailer, capable of operating in communities across the state.

Photo 2. 2018 PureWater Colorado Demonstration

Front Range utilities, several of which are in the South Platte River Basin, are evaluating the potential incorporation of DPR into their future water supply portfolios. Two demonstration projects provide a first-hand, tangible illustration of the viability of DPR as a safe and sustainable water supply option. Both projects were supported by CWCB grants as key steps toward meeting the water supply and reuse goals of Colorado's Water Plan and the South Platte BIP. The 2018 PureWater Colorado Demonstration Project and the new PureWater Colorado Mobile Demonstration facility support community engagement, regulatory development, operator training, and research and educational aspects of DPR implementation in Colorado.

In anticipation of DPR implementation in Colorado, the 2018 WateReuse Colorado DPR Project developed a DPR regulatory framework for Colorado and a communications and outreach plan to support engagement with regulators, utility leaders, community leaders, and the public. In tandem with the 2018 WateReuse Colorado DPR Project, the 2018 PureWater Colorado Demonstration Project was operated in spring 2018 as a regional initiative. Denver Water hosted the demonstration at its recycling plant site. The project used a carbon-based treatment train to purify secondary-treated reclaimed water from the Metro Water Recovery's Robert W. Hite Treatment Facility. The demonstration produced water compliant with all drinking water standards and removed unregulated trace organics to concentrations below detection or orders of magnitude below health-based levels determined in national-level research. The demonstration process did not produce a brine waste stream that would require disposal. Dozens of groups toured the facility and sampled the purified water it produced. Beer and wine were also produced with the purified water, further expanding the reach of community engagement efforts.

Building on the success of the 2018 PureWater Colorado demonstration, Colorado Springs Utilities spearheaded an effort to design and construct a demonstration with similar processes. Recognizing the ongoing multiple benefits of a demonstration facility (e.g., community engagement, regulatory development, operator training, and research and education), Colorado Springs Utilities commissioned a mobile demonstration capable of traveling across the state. The 5 gallon per minute process was constructed by Colorado School of Mines staff in a 28-foot trailer. It is the world's first mobile DPR demonstration that purifies reclaimed water without reverse osmosis technology. After operating at Colorado Springs Utilities' JD Phillips Water Resource Recovery Facility throughout much of 2021, the trailer will be housed at the Colorado School of Mines to support potable reuse research and education; it can then be used at other communities for advancement of DPR across the state.

Municipal and Industrial Water Use Efficiency

Municipal and industrial water providers in the South Platte Basin have long been champions of driving more efficient use of the scarce water resources in the region. Per capita water use rates continue to decline, particularly in the area of residential water use. There is, however, a limit to savings that can be achieved through water efficiency measures and future gains in efficiency will be more difficult to achieve than those in the past. This section highlights the key challenges to increased water efficiency in the South Platte Basin.

Limits on Conservation Effectiveness

- Most municipal water providers in the South Platte Basin have already implemented major water conservation programs, some of which are nationally recognized as "best-practices."
- Plumbing codes continue to drive passive conservation through replacement of older fixtures and appliances with new and more efficient products.
- Further gains in water use efficiency may be more difficult and expensive to achieve and may require more societal changes.
- Indoor per capita water use continues to trend downward, but how low is practical and sustainable in Colorado?
- Reducing per capita indoor water usage also reduces return flows available for irrigation and reuse downstream on a per capita basis. However, this may be more than compensated for by the increased return flows associated with increased population.
- Land use decisions are often not made by the same entity that is tasked with providing water for new development.

Demand Hardening

- Significant reductions in outdoor water use in the South Platte Basin have occurred as a result of landscape changes, new building ordinances, and improved irrigation system efficiencies.
- As everyday water use efficiency improves, the ability to use outdoor-focused demand management strategies such as lawn watering restrictions as a drought or emergency shortage strategy become more challenging and less effective, especially as new customers are added and use the water that was saved via prior efficiency improvements.

Climate Change

- A future hotter and drier climate will increase water demand for outdoor landscaping.
- Urban landscapes, parks, and irrigated open spaces that provide important recreational and aesthetic amenities will be more difficult to maintain and will need to adapt to changing conditions. These urban areas are important for communities (especially disadvantaged) without access to other opportunities for recreation and enjoyment of nature

Industrial Use

- Commercial and industrial water users in the South Platte Basin have done their part in improving the water efficiency of their operations.
- Several important local industries have high water use needs that cannot be significantly reduced using current best-practices (e.g., livestock operations, food processing, beverage production, energy production, and oil, gas, and mineral extraction).

Measurement Challenges

- Municipal entities across the South Platte Basin have different water use category make-ups (e.g., more industrial use, larger residential lot sizes), or have different demand drivers such as climate and weather.
- Entities report water use data in different ways. This makes it difficult to compare municipal and industrial water use between entities and track water efficiency trends using standard metrics like gallons per capita per day.
- Further standardization of the term "per capita water use" and improvement in the understanding of the factors impacting water consumption rates can help the Basin and State better understand the ways that conservation programs and reductions in per capita water consumption can help meet supply gaps.
- Differences in precipitation and temperature each year or over a series of years increase difficulty in measuring progress in reducing per capita usage.
- The time frame involved in collecting water use and conservation data, reporting data to the state in 1051 reports, and then having the state analyze the data creates difficulty in determining progress in a timely manner.

Improving municipal and industrial water use efficiency will remain a key element of water resources management in the South Platte Basin, but significant gains will be more difficult to achieve due to technical, societal, and climate factors.

GREELEY MUNICIPAL WATER CONSERVATION PROGRAMS

Photo 3. Greeley Municipal Water Conservation Program

The City of Greeley and its citizens continue to have one of the most robust water conservation programs in Colorado. This South Platte Basin municipal water provider demonstrates water innovation through water conservation and efficiency.

Highlights of Greeley's current water conservation program include:

- **Water Budget Rate Structure –** To promote and reward water efficiency, rates for Greeley's homes are personalized – determined by family size, landscape size, and current weather conditions. This helps Greeley residents use only the water needed and pay the lowest water rate. Higher rates are charged to residents whose use exceeds their water budgets.
- **2021 Drought Emergency Plan –** This plan created tools to reduce water use and build water savings during a drought, built-in equity among customers, and minimalized financial impacts and flexibility to adapt.
- **Water Audits –** Residential, commercial, industrial, and institutional water audits identify water waste and provide targeted recommendations for repairs and upgrades.
- **Rebates and Discounts –** Greeley incentivizes devices like irrigation system parts, toilets, and commercial devices. Even professional landscape contractors' certifications can be rebated. Garden in a Box discounts are offered to allow easy upgrades to residential landscapes.
- **Life after Lawn –** This "cash-for-grass" rebate incentivizes residents to remove turf for more xeriscape landscapes, beautifying Greeley and saving water at the same time.
- **Education and Outreach –** Greeley's landscape lecture series, local teachers' trainings, and tours provide education on water conservation at every level for the community.
- **Online Water Efficiency Tools –** Customers can log-in to their Water Budget and WaterSmart portals to see and compare their water use over time. Greeley's new advance metering infrastructure provides near real-time data eliminating surprise water bills.
- **Water and Land Use Planning –** Water conservation standards are built into City code and criteria. Adoption of landscaping/irrigation requirements serves long-range water savings and promotes water smart development.

RESOURCE CENTRAL – CONSERVATION MADE EASY

For 45 years, Resource Central has been putting conservation into action throughout Colorado. Resource Central is a nonprofit social enterprise based out of Boulder, Colorado. Resource Central's conservation programs have helped more than 600,000 people save water, conserve energy, and reduce waste since its founding in 1976. Of the 41 water providers that partnered with Resource Central in 2020 to support and implement programs, only three were located outside the South Platte Basin.

https://resourcecentral.org/

Since 2000, the water conservation programs supported by Resource Central have saved more than 1.5 billion gallons of water, greatly contributing to its partners' ability to meet their water conservation and efficiency goals.

The 25,000 community members served through the Garden in a Box program started in 2003 has resulted in more than 2.5 million square feet of lawn converted to xeriscape landscape. This program offers professionally designed, waterwise garden kits tailor-made for Colorado's climate, flora, and fauna.

The Waterwise Landscape Webinar Series started in 2013 has hosted over 139 seminars as of 2020, providing education about water conservation practices to more than 6,200 participants. Water provider partners sponsor these free webinars for the public and their residents.

The organization supports two different Slow the Flow programs. Slow the Flow-Outdoor, started in 2004, focuses on providing free, one-on-one, water-saving sprinkler inspections to individual homeowners. Resource Central estimates 9 million gallons have been saved annually as a result of the subsequent recommendations and changes to irrigation practice as the result of this program. Similarly, Slow the Flow-Indoor has resulted in 1.3 million gallons saved annually as a result of changes to indoor water use. The majority of water savings realized through the Slow the Flow-Indoor program is the result of the installation of over 5,316 low-water aerators and low-flow showerheads (suspended in 2020 and 2021 due to COVID-19).

Since its inception in 2016, the Grass to Garden program has removed 108,000 square feet of grass and replaced it with waterwise landscaping, resulting in 9 million gallons of water saved. Under this program, individuals submit an application (including a project plan) and phone consultation with a Resource Central staff member and, if approved, the individual receives two free Garden In A Box kits in exchange for the removal of at least 200 square feet of watered and maintained grass. In 2021, participating water utilities include the cities of Boulder, Fountain, Lafayette, Louisville, Westminster, and Little Thompson Water District.

The newest program, Lawn Removal Service, started in 2020 and has been a huge success with over 100 projects and 42,000 square feet of turf removed in the first year of the program. For a fee of just $2 per square foot, Resource Central Lawn Remove Service physically removes and composts a section of watered and maintained lawn (minimum of 200 square-feet). Participating water providers added a limited number of discounts, up to $500 off, for qualified customers in their service area on a first come, first served basis. Utilities offering discounts on Lawn Removal Service in 2021 include Arvada, Aurora, Fountain, Lafayette, Thornton, Westminster, Little Thompson Water District, and Willows Water District.

In 2019 alone, Resource Central's conservation programs resulted in a water savings of over 2.9 million gallons, which was a 15% increase from the prior year. And 2020 saw further reductions in water usage as the result of continued and increased program success and partner participation. As a result of putting conservation into action across Colorado's Front Range, Resource Central is committed to shifting conservation from a hope to a habit.

Additional Use of Denver Basin Aquifer System Water

The Denver Basin Aquifer system is a high quality, droughtproof water supply particularly important to Front Range areas with limited surface water supply options. The Denver Basin Aquifer system has the advantage of consistent water quality that typically requires less treatment than surface water. Many areas south of Denver such as those within the South Metro Water Supply Authority (SMWSA) service area, have been able to develop to their current density because of the Denver Basin Aquifer system. However, the supplies are nonrenewable and nontributary; therefore, there are a range of challenges associated with continued and expanded use of the Denver Basin Aquifer system.

Declining Water Levels Challenge

- Historical and ongoing pumping has caused significant declines in system water levels, particularly in the SMWSA area. Declining water levels decrease well yields, increase pumping costs, and threaten the future availability of system supplies.
- Continuation of current withdrawals or potential expanded use of this important regional asset (or both) are constrained by declining water levels in large areas of the Denver Basin Aquifer system. Predictions for depletions in the Denver Basin Aquifer system range from 1 to 13 feet per year.

Water Rights Administration Uncertainty Challenge

- There is disagreement over the application of the statute directing allocation of nontributary groundwater, including in the Denver Basin. The 1973 Senate Bill 213 and 1985 Senate Bill 5 legislation state that permits "shall allow withdrawals on the basis of an aquifer life of one hundred years" and that the amount of "groundwater available for withdrawal shall be that quantity … underlying the land owned by the applicant". For many wells and decrees, the end of that 100 years is now coming within the planning horizon; there is currently disagreement over water users pumping quantities in excess of the total volume underlying the land, which could only occur after 100 years, or longer, depending on the rate water was pumped. A lawsuit over this disagreement is pending in Division 1 water court case number 21CW3046.
- Many suppliers that were previously solely reliant on Denver Basin Aquifer system supplies have begun transitioning to renewable supplies. Some counties are also requiring new Denver Basin Aquifer system development to be based on a 200- or 300-year aquifer life.

To maximize development of native South Platte River Basin supplies, Denver Basin supplies may be coupled with 1) Denver Basin Aquifer system Aquifer Storage and Recovery, 2) limited agricultural water transfers, especially alternatives to traditional 'buy-and-dry," and 3) trans-basin water from either existing or new projects.

Further development of Denver Basin Aquifer system supplies is still an opportunity to consider; however, the challenges of declining water levels and water rights administration will need to be addressed. Denver Basin Aquifer system supplies can be particularly useful when used with conjunctive use strategies where renewable sources supply water in average and wet years and the Denver Basin Aquifer system is used to provide safe yield in dry years. In addition, studies conducted by the USGS, the SMWSA and the Douglas County Water Resource Authority suggest that certain areas of the Denver Basin Aquifer system may still be safely developed as new supplies.

Aquifer Storage and Recovery (ASR) in Denver Basin Aquifer System

In addition to the opportunities as a continued or expanded water supply, the Denver Basin aquifer and other aquifer systems have even more potential when utilized for aquifer storage and recovery. When compared to surface water storage, ASR has many advantages, including minimized land use, reduced evaporation, minimal environmental impacts, lower cost, and faster permitting. However, there are a range of current challenges associated with development and use of ASR.

ASR Regulatory Challenges

- Recharge implemented using wells, such as ASR implemented in the Denver Basin and other bedrock aquifers, has unique regulatory challenges related to EPA underground injection control permitting. Many of the water sources identified for bedrock aquifer ASR are reuse water or are impacted by upstream sources of pollutants that may make underground injection control permitting challenging.
- In addition to drinking water parameters, the EPA is currently requiring extremely low or no detections of micro-pollutants such as NDMA (N-nitrosodimethylamine). There is uncertainty in how the EPA will treat emerging contaminants such as PFAS in the future.
- In 2018, the Colorado Division of Water Resources (DWR) updated the Artificial Recharge Extraction Rules (2CCR 402-11), which govern ASR in nontributary aquifer systems, including the Denver Basin. The rule updates include different management requirements for confined and unconfined aquifer conditions. Unconfined aquifer conditions at the time of application (or in the future because of water level declines) require smaller distances between injection and recovery wells.
- 2020 DWR updates to the Designated Basins Rules (2CCR 410-1) included new requirements for ASR systems. Baseline characterization, groundwater modeling, and water flow/quality monitoring are now required for ASR plans. The Designated Basins ASR rule also includes restrictions on distances between recharge and recovery, potentially limiting the amount of water stored and/or the length of storage time.

ASR Water Quality Challenges

- When integrated with existing systems dominated by surface water supplies, ASR water quality needs to be carefully managed to avoid treatment and distribution disruptions. Recharge water mixing with native groundwater and aquifer matrix materials needs to be characterized and factored into treatment and delivery planning.

ASR Infrastructure Challenges

- Source water spatial and temporal availability may also present ASR challenges. If the location of source water is not matched with optimal hydrogeologic conditions in the Denver Basin Aquifer system, costly conveyance infrastructure may be required.
- The location of ASR wells may not be located near demand centers, requiring more conveyance infrastructure.
- Regional coordination projects, such as the WISE Authority, demonstrate that source water, ASR, and demand center geographic disparities can be successfully addressed.
- ASR wells are rate limited for water injection/recovery, and experience well-to-well interference if densely spaced. These limitations require ASR systems to be constructed over large, dispersed areas and/or operated with long periods of injection and recovery.

ASR is a particularly attractive opportunity when combined with other water supply and storage solutions. Relative to surface water storage, ASR is scalable, offering early storage (even during pilot system testing), and system expansion provides subsequent opportunity to optimize design and operation based on subsequent aquifer characterization. The associated challenges are manageable, and ASR offers water providers the operational flexibility to optimize groundwater supplies for drought resiliency.

CENTENNIAL WATER AND SANITATION DISTRICT CONJUNCTIVE USE PROGRAM

https://centennialwater.org/water-wastewater-services/water/#resources

Centennial Water and Sanitation District has a conjunctive use water supply and storage system that maximizes the resiliency of renewable surface water supplies by integrating Denver Basin groundwater supplies for use during drought and other periods of decreased surface water availability. Centennial has a network of water supply wells that access nontributary Denver Basin groundwater, some of which have been equipped for ASR injection of treated excess surface water supplies.

To date, Centennial has used ASR to store over 14,000 acre-feet of water in Denver Basin aquifers. Their conjunctive use system allows them to set a goal of an average 90 percent renewable surface water supply use. This goal limits their reliance on Denver Basin groundwater, reduces water level declines, and preserves groundwater use for drought periods. In addition to conserving groundwater within their own boundaries, Centennial participates in regional planning efforts such as the the regional South Metro Water Supply Authority and the WISE project.

CITY OF GREELEY – TERRY RANCH AQUIFER STORAGE AND RECOVERY

During the City of Greeley's alternatives analysis for National Environmental Policy Act permitting of the Milton Seaman Reservoir enlargement project, ASR emerged as a more economical and environmentally friendly alternative. In 2020, Greeley performed a due diligence investigation of Terry Ranch, a bison ranch that covers approximately 13 square miles (8,410 acres) of rolling green hills near the Wyoming border. The feasibility study confirmed the feasibility of the Terry Ranch ASR project and in 2021 Greeley finalized the purchase of the Terry Ranch groundwater rights, which will add 1.2 million acre-feet of supply and storage to Greeley's surface water sources.

Terry Ranch overlies decreed nontributary groundwater in the Laramie Formation. The nontributary groundwater has advantages over surface water because it has a consistent water quality and is not susceptible to water quality degradation such as those from wildfire impacts to surface watersheds. Access to this supplemental water source is being planned far in advance and Greeley's treatment plants will be upgraded to maintain safe, high-quality water deliveries.

Although Terry Ranch provides near-term supply expansion, Greeley views the site primarily as an underground storage project. Greeley will be able to pump excess treated surface water supplies to Terry Ranch for storage during wet periods. This recharged water will add to native groundwater for use during drought. When compared to surface storage, ASR has the benefits of eliminating evaporative losses, minimal land surface disturbance, and faster permitting with much lower costs. Additionally, the system can be phased and doesn't require a large, all-in capital investment such as reservoir expansion work to start storing water. More information is available at: **https://greeleygov.com/services/ws/trp/greeley's-water-future**.

Use of the Alluvial Aquifer along the South Platte River

The South Platte River Basin uses approximately 450,000 acre-feet per year of alluvial groundwater primarily for irrigation but also municipal, industrial, and environmental purposes. While alluvial groundwater is a very useful resource, pumping of alluvial groundwater creates lagged depletions to streamflows that, if unmitigated, reduce available supplies and can injure senior surface water rights. To prevent injury to senior water rights, augmentation plans have been developed to replace streamflow depletions caused by pumping of alluvial groundwater. Augmentation plans can be challenging to develop and implement. They are sometimes controversial and can be expensive to shepherd through the water court process. Acquisition of reliable, senior supplies to replace depletions can be cost prohibitive. Many augmentation plans rely on alluvial aquifer recharge projects that divert surface water when available under a junior priority, deliver the water to recharge basins for infiltration, and then use the resulting lagged streamflow accretions to offset pumping depletions.

Recharge projects have many benefits: they facilitate conjunctive use of surface and groundwater supplies, enhance waterfowl habitat, and they can be less expensive than purchasing senior water rights. However, recharge projects typically divert under junior water rights that are not in priority when streamflows are low and water demands are high. Additionally, recharge projects have contributed to high water table conditions in some areas along the South Platte River. The Groundwater Subcommittee of the South Platte Basin Roundtable held numerous meetings to examine high water table issues and explore mitigation strategies. In 2018, the subcommittee released a report with recommendations for mitigating high water table issues. Another challenge associated with recharge projects is the imprecise timing of when lagged recharge accretions and pumping depletions affect streamflows. It is impossible to perfectly match the timing and amount of recharge accretions with pumping depletions. Augmentation plans must ensure that recharge accretions are equal to or greater than pumping depletions; as a result, augmentation plans often have recharge accretions that are unused because they are greater than pumping depletions. The Northeast Colorado Water Cooperative was formed in part to establish a framework or market for leasing and more fully utilizing unused recharge accretions; however, legal issues and a lack of available infrastructure for managing and retiming the accretions have been a challenge.

While challenges with alluvial aquifer groundwater exist, the South Platte and Metro Roundtables remain committed to maximizing its legal use in the South Platte Basin.

Water Quality Management

All water users are facing the challenges of using lower quality and more distant water sources. They are meeting this challenge through technological innovation, shared risk through collaborative projects, programs and research and, in some cases, significant impact to their rate structures and customers. After current projects are implemented, greater use of the lower quality water sources may be significantly constrained depending on whether the industry's technological advancements satisfy regulatory requirements for disposal of highly concentrated waste streams from advanced water treatment processes. In some cases, water agencies with adequate volumes of higher quality water may be able to blend them with lower quality supplies for their next major increment of water supply and avoid the advanced treatment technologies that result in concentrated brine streams. After this next increment of supply, the challenges of inland brine disposal could be a major issue for South Platte water suppliers–both due to financial challenges and environmental impacts.

The challenge of developing high quality water supplies will increase in the future, and practical, cost-effective treatment technologies will be needed.

Future of Agriculture

The future of agricultural use within the South Platte Basin appears strong but will continue to face many challenges. However, economic strength is influenced by local, state, national and global issues – not the least of which is commodity prices and demand for agricultural products. The continued demand for water to meet the ever-growing population–particularly along the Front Range–continues to drive up the value of water rights, increasing the motivation of water right owners to sell. This is exacerbated by the ever-increasing costs of maintaining, improving, and replacing aging infrastructure within the agricultural sector, constraining the ability to sustain farming as an occupation.

The ability to meet the full irrigation demand by agriculture remains an issue; efforts to address it have generally been unsuccessful due to high costs to develop new or additional water supplies. Meeting this full demand in the future will be even more challenging in the face of climate uncertainty and a declining aquifer in the Republican River Basin. The amount of irrigated land within the South Platte River Basin continues to decline due to urban growth onto irrigated land and acquisition and conversion of water rights from ATM and industrial uses. Agricultural within urban areas is a growing movement but faces challenges, primarily access to affordable land.

A vibrant agricultural sector within Colorado can be impacted in positive and negative ways by existing and potential new laws and regulations at the local, state, and national levels.

It will require the collaborative efforts of all stakeholders to ensure that agriculture remains a prominent and important sector within all of Colorado as envisioned with the Colorado Water Plan.

LITTLE THOMPSON FARM ATM

Photo 4. Little Thompson Farm

In 2016, Larimer County was approached by a willing landowner who offered the County the ability to purchase and conserve 211 acres of prime farmland with scenic vistas, wildlife habitat, a community buffer, historic value, and almost $7 million in associated water rights. The County partnered with City and County of Broomfield (Broomfield) to develop the first perpetual ATM in Colorado, allowing Larimer County the opportunity to conserve its agricultural, historic, scenic, community separator, and educational values and Broomfield a dependable water supply for its growing population.

In August 2017, Larimer County and Broomfield entered into a water-sharing agreement whereby Larimer County could conserve and maintain as viable irrigated agriculture the 211-acre farm in perpetuity and Broomfield could acquire a dependable water supply and reliable drought, drought-recovery, and emergency water supply at a reduced cost. Development and implementation of this alternative transfer method was made possible, in part, by an Alternative Agriculture Water Transfer Methods Grant from CWCB. The CWCB grant was used to fund a team of experts to help Larimer County and its citizen advisory boards compile the water, agricultural, and legal knowledge needed to design an agreement that would work for both the farm and a municipality, while meeting the County's goal of preserving and protecting irrigated agriculture, which provides scenic and community buffers, wildlife habitat, local food supply, and a major source of income and opportunity to the local economy.

More information can be found at: **https://www.larimer.org/naturalresources/openlands/acquisitions/little-thompson-farm**.

CENTRAL COLORADO WATER CONSERVANCY DISTRICT WALKER PROJECT

The following information is from **https://ccwcd.org/walker-recharge/**

The Walker Project is moving along as expected; the first water is planning to be pumped during 2021. The Walker Project is in Weld and Morgan Counties between the towns of Orchard and Wiggins. Phase 1 of the project includes a surface diversion from the Weldon Valley that diverts water from the South Platte River, a recharge pond near the north bank of the river, a well field located on the south bank, and a pipeline to deliver water from the wellfield to the recharge ponds. Phase 2 will include development of additional surface diversions, wellfields, pipelines and recharge ponds. On completion it is anticipated that the project will be able to divert and recharge up to 30,000 acre-feet per year at rates up to 100 cubic feet per second from the South Platte River for delivery to recharge ponds located at distances of up to 3 miles from the river. Locations of individual recharge ponds will be staged at different distances to achieve different timing of accretion patterns and optimize project efficiency.

During 2020:

- There were 13 high-capacity wells drilled with an expected pumping rate over 50 cubic feet per second.
- Approximately 3 miles of 54-inch steel pipe associated with the project was installed.
- The manifold pipeline construction (to tie the wells into the steel pipeline) is underway.
- Three recharge ponds associated with the project have been constructed with a combined surface area of approximately 30 acres.

In June, CCWCD's Board of Directors awarded AB Underground, located in LaSalle, Colorado, the construction contract for Phase 3A of Central's Walker Recharge Project. Phase 3A of the Walker Recharge project encompasses the manifold pipeline that will tie together the 13 alluvial wells located on Central's riverfront property to the 54-inch steel pipeline, for delivery to recharge ponds on top of Bijou Hill. As part of Phase 3A, CCWCD will install approximately 6,500 feet of high density polyethylene pipe that ranges in size from 12-inch to 42-inch. The design capacity of the manifold pipeline from the 13 alluvial wells is approximately 65 cubic feet per second.

This project has a variety of benefits. Overall, it represents a project that efficiently uses South Platte River water. It does this by allowing for retiming of South Platte River flows and by putting water back into the river for appropriations. The project was also provided Water Plan Grant money.

NORTH STERLING POINT OF ROCKS I AND II ATM PROJECTS

Farmers under the North Sterling Irrigation District have successfully entered two alternative transfer methods whereby irrigation water stored in the North Sterling Reservoir is used to provide supplies for industrial use. Voluntary subsets of North Sterling Irrigation District landowners have entered into agreements with two separate energy companies: one for use as a drought supply; the second as a primary source for energy production.

In 2005, Point of Rocks Water Company, a Limited Liability Company comprised of North Sterling Irrigation District farmers representing 84 percent of the land within the District, entered into a 25 year agreement with Public Service Company of Colorado (Xcel Energy) that allows for water normally stored in North Sterling Reservoir to be exchanged approximately 10 miles upstream of the North Sterling Irrigation District diversion structure where it is made available for operation of the Pawnee Station power plant. This lease of water is available to Xcel Energy from November 1 through March 31 and reduces the amount of water stored in North Sterling Reservoir, which, in turn, reduces the amount of water available for irrigation the next season. Under the option contract, the Point of Rocks Water Company receives an annual fee, and an additional fee per acre foot of water delivered in years the agreement is exercised. The annual contract volume for Point of Rocks is up to 3,000 acre-feet per year.

Similarly, under Point of Rocks II, BNN Energy can use up to 6,800 acre-feet per year of North Sterling Irrigation District supply in connection with oil production. The 10-year agreement between Point of Rocks Water Company II LLC and BNN Energy began in late 2016. On signing of the agreement, BNN constructed a 37 mile pipeline with four pump stations to deliver water from North Sterling Reservoir to holding ponds in northern Weld County, where it is then distributed through an existing smaller system of pipelines to various oil production locations. Participation in Point of Rocks Water Company II LLC by farmers was, once again, completely voluntary, and 98.8 percent of the irrigated land in North Sterling Irrigation District is represented.

Under both agreements, irrigators under the North Sterling Irrigation District earn extra money to offset reductions in farming revenue as a result of decreased crop yield, and industrial water users receive water supply security.

Republican River Basin Water Use Constraints

The Republican River Compact between Colorado, Nebraska, and Kansas places severe constraints on Colorado's citizens living and working in this basin. In addition, the Republican River Basin is physically distinct from the South Platte River Basin and the Rocky Mountain snowmelt feeding the South Platte River does not benefit the Republican River Basin. The Ogallala Aquifer that spans eight Great Plains states supplies the basin's agricultural economy (Yuma, Kit Carson, Phillips, and Washington Counties are ranked in the top ten agricultural-producing counties in the state according to the 2012 USDA agricultural census). Irrigation with Ogallala Aquifer water contributes to superior crop yields; however, a declining groundwater table raises concerns about how much longer or to what degree the Republican River Basin will be able to benefit from this water source. Additionally, recent declines in aquifer levels have caused concern about water quality.

Aquifer recharge from rainfall is limited due to the Republican River Basin's soils. Opportunities for conservation and public education have been pursued by the Republican River Water Conservation District; however, it is the overwhelming desire of well owners in the basin that mandates not be placed on conservation and that strategies be pursued on an individual voluntary basis. Efforts continue to reduce the amount of irrigation from both surface and groundwater in the basin through surface water buyouts and land retirement programs. The draining of Bonny Reservoir in 2012 was necessary to meet compact compliance; however, this action resulted in the loss of a vital recreation area and fishery within the region. All these efforts are necessary to reduce the amount of water consumption within the basin to comply with the Republican River Compact and related agreements between the three states. Compliance with the Republican River Compact is mandatory and not discretionary. Any future violations could have severe consequences to the economic vitality of the basin.

The basin will continue to be challenged with maintaining compact compliance and economic prosperity as the primary natural resource continues to be mined. Additionally, there are diverse geographic interests within the basin that continue to challenge universal consensus on regulatory and administrative actions for conservation and compact compliance. The agricultural users in the basin work diligently on a variety of fronts to minimize the rate of decline of this precious resource.

The collective efforts of all stakeholders in the basin are needed to meet these challenges and to ensure a prolonged agricultural economy.

Need for Protection and Enhancement of Forest and Watershed Health

Residents throughout the South Platte Basin recognize that healthy forest and watersheds support the economy, environment, and quality of life, and that continued functioning of these systems is critical to municipal water users, agricultural water users, ecological processes, and recreational uses. Experience in the South Platte Basin, including the Buffalo Creek Fire of 1996 and a subsequent rain event that brought intake-clogging debris into Strontia Springs Reservoir (a primary intake for Denver Water and Aurora Water) highlights potential vulnerabilities of municipal water systems to service disruptions.

With concerns over increasing hydrologic variability, extreme weather events, periods of prolonged drought, and the hydrologic response of the watersheds due to forest health issues, the potential for irrecoverable impairment to ecological health is being recognized. Water supply agencies in the South Platte Basin continue to develop a broader understanding of the critical function the forests and watersheds provide and recognize the need to protect and enhance the health of the forests and watersheds on which they rely. Challenges to protecting and enhancing forest and watershed health as a strategy for preserving ecological health while meeting the increasing water supply needs in the South Platte Basin are described below.

Diversity in land ownership in forests and watersheds

- Forests and watersheds are owned by a variety of people and entities, making collaborative management difficult in protecting and enhancing all areas.
- Protection of watersheds require management of significant swaths of land, much of which is difficult to access.
- Large-scale projects and programs can be extremely costly and difficult to implement due to the large number of potential stakeholders with varying opinions and levels of interest.

Limited data and information about general river health and watershed health

- The assessment of river, forest, and watershed health requires analysis of a wide range of data. Some, but not all, of the necessary data is readily available; however, much of the data needs to be compiled or developed before it can be used for evaluation.
- The collection and analysis of data to assess river, forest, and watershed health takes significant time and money, both of which are not often readily available to the entities and organizations who lead these types of projects.
- There is limited baseline data related to river, forest, and watershed health, which is a challenge in developing and achieving measurable outcomes.
- There is a need for data-driven projects, specifically in the urban areas, to gain support for funding and participation in stream restoration projects. Additionally, some urban areas have a lack of stream assessment data to help inform project phasing.

Climate change, increased drought, and increased water demands may impact forest and watershed health

- A future hotter and drier climate may increase the likelihood of forest fires and impairment of watershed health.
- Warmer temperatures and drought conditions may increase the amount of forest insect and disease activity in the forests
- Increased drought and hotter temperatures will increase water temperature, which may negatively impact aquatic health.
- The future impacts of changing climate and increased demands to meet agricultural, industrial, and municipal needs on environmental flows and watershed health is unknown. Additional data and research are needed to evaluate potential impacts and support activities and actions that may mitigate negative impacts.
- Headwater ecosystems directly impact downstream water quality and water uses. Headwater restoration projects in critical or sensitive areas may be beneficial in reducing risk from wildfires and minimizing negative impacts to downstream users.

Deterioration of forest health results in an increase in wildfire risk

- There is a significant amount of deadwood in forests as a result of the spread of insects and disease. Without implementing science-based forest management, these areas present increased risk for wildfire.
- Increased wildfire risk and post wildfire remediation can result in closures of popular recreational areas. Management practices that are used with closures are challenging to implement and cost is significant.
- Additional research is needed to understand the connection between broad-scale declines in forest health and pre-/post-wildfire watershed health. Potential areas for additional research could include but are not limited to impacts due to high tree densities and bare understories, or the connection between canopy interception and evaporation and decreased groundwater storage.

There is a conflict with increasing municipal and industrial water demands and the impact that competition for water may have on forest and watershed health

- As municipal and industrial demand continues to increase, there will be more pressure on environmental and recreational attributes. A holistic watershed management approach would be beneficial in finding balance between the increasing demand for water by municipal and industrial users and supporting flows and ecosystems that are beneficial to the health of forests and watersheds. The protection and enhancement of environmental and recreational attributes typically rely on water, which is hard to come by because of the competing interest in the supply (competition by Municipal & Industrial and agricultural users)
- The price for water continues to be being driven up by both municipal and industrial and oil and gas users, making it difficult for environmental interests to compete and obtain the water needed or desired.

Limited funding for watershed and forest health-related projects and programs

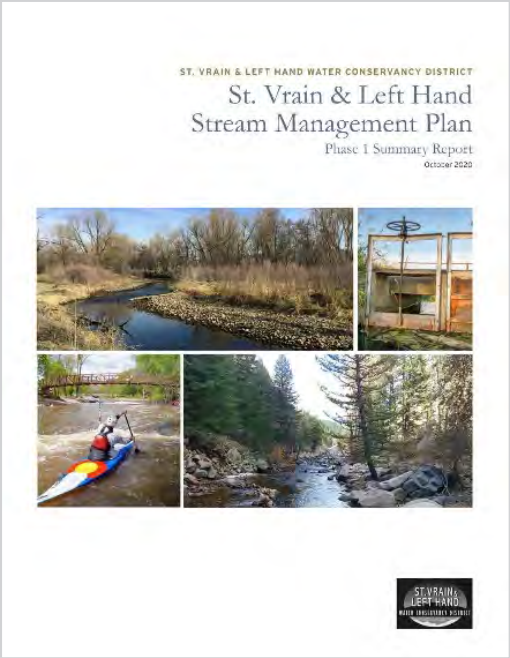
- When compared to municipal and industrial suppliers who send out a monthly bill that is tied to a measured amount of water usage, capturing fees from individuals associated with recreating or using land and resources within a watershed is challenging. Watershed and forest health-related projects and programs must rely on funding from alternative sources that can be limited in number or available funding amounts. Through the water court process there are changes of water rights and plans for augmentation or exchange of water that result in changes in streamflow. Oftentimes, the time and place to be actively engaged in the decisions and outcomes related to changes in streamflow as a result of a water court case is by being an objector in a water court case. The cost for participating in water court can be high, which in turn prevents forest and watershed health advocacy groups from participating in the water court process.
- Many forest and watershed heath projects are led by nongovernmental entities who have a small staff among other limited resources preventing an increase in both the amount and scale of projects.

Collaborative approaches will be needed to address numerous risks to watershed and forest health while meeting the basins water supply needs.

IMPLEMENTATION OF STREAM MANAGEMENT PLANS

There have been numerous stream management plans adopted within the South Platte River Basin:

- St. Vrain and Left Hand Creek (https://svlhwcd.org/stream-management-plan/)
- Poudre ISF Augmentation Plan (Colorado Water Trust)
- South Boulder Creek
- Middle South Platte
- Clear Creek
- Upper South Platte Watershed Assessment
- Lower South Platte – EAP 9 Element Plan
- Upper Cache la Poudre River
- Mile High Flood District Master Plans: Plum Creek, First Creek, Second Creek (https://mhfd.org/services/watershed-master-planning/)



WATERSHED MANAGEMENT MASTER PLANNING

Watershed planning is an important way to help protect people and property against flooding, erosion, and stormwater quality problems caused by watersheds. These plans contain a strategy and work plan that includes the following information and solutions for the watershed management issues:

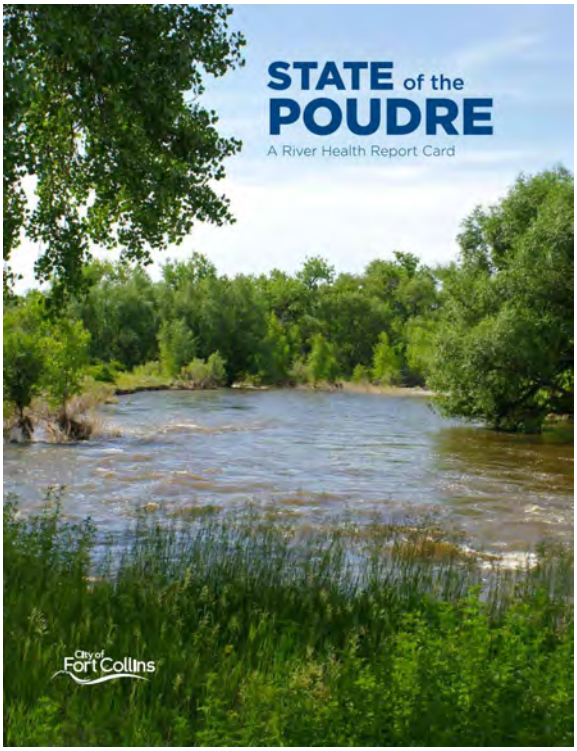
- Identifying remedial stormwater quality and flood risk management projects for construction.
- Guiding new land development projects on regional drainage and flood control needs.
- Supplying valuable input to watershed maps and the MHFD 5-Year Capital Improvement Program.
- Providing help with the identification and acquisition of rights-of-way for future capital improvements and areas for preservation.

VIEW COMPLETED WATERSHED MASTER PLANS

POUDRE RIVER ASSESSMENT AND REPORT CARD (CITY OF FORT COLLINS)

Source: https://www.fcgov.com/poudrereportcard/

This case study represents the first holistic ecological assessment of Poudre River health. This tool benchmarked progress on Fort Collins 2016 Strategic Plan for a healthy and resilient Cache La Poudre. The assessment has an online mapping tool allowing users to explore river health results by specific locations. It is designed to mitigate stress or to enhance benefits such as consistent and clean water supplies, flood mitigation, fish and wildlife habitat, and diverse recreational opportunities. It evaluates river health using the following indicator groups: flows, sediment, river channel, water quality, aquatic life and riparian corridor.



RIPARIAN RECONNECT

Riparian Reconnect is a restoration effort managed by Colorado Open Lands. The program aims to improve riverscape health and function. Their approach affirms riverscapes as integrated systems of interworking parts: channels, floodplains, terraces, riparian communities, and wetland all function together. When these components become disconnected, riverscape health suffers and ecosystem benefits diminish.

Colorado Open Lands is the administrative lead of Riparian Reconnect and the project manager. Riparian Reconnect takes a uniquely ecological approach to restoration, viewing it as a systemic healing process rather than design-build of engineered habitat. At each site, causes of impairment are diagnosed and treatments are prescribed that will alleviate the sources of ecological stress. Treatments are site-specific and vary, but all share the goal of promoting natural processes that do the hard work of restoration over time.

Their methodology improves hydrologic resilience in headwaters ecosystems by reconnecting incised streams with valley floor floodplains to restore riparian and wetland vigor using a variety of cutting-edge treatments. Once reconnected, these systems sustain habitat, store groundwater and recharge aquifers, and maintain water quality. As extreme drought and record wildfires besiege Colorado, these restored systems provide critical landscape resilience to floods, wildfires, droughts, and climate change.

EcoMetrics leads Riparian Reconnect's planning, design, and implementation. The low-tech, process-based methodology applied by EcoMetrics is data driven and focused on results.

Gillilan Associates, Inc. works closely with EcoMetrics. Typical projects include those focusing on hydrologic resiliency, aquatic and wetland restoration and innovative approaches to land conservation. focusing on hydrologic resiliency, aquatic and wetland restoration and innovative approaches to land conservation.

Johnson Environmental Consulting, led by Dr. Brad Johnson, brings expertise in wetland ecology, assessment, restoration, and plant taxonomy. Brad developed the federally required Functional Assessment of Colorado Wetlands, the Functional Assessment of Colorado Streams (both with EcoMetrics), and the Colorado Watershed Approach to Mitigation Planning.

In 2016, JEC and EcoMetrics completed a comprehensive baseline inventory of aquatic resources and a framework for tracking gains and losses to aquatic functions using the Functional Assessments for Colorado Streams. Most recently, JEC and EcoMetrics partnered with the Colorado Natural Heritage Program to pilot a watershed-scale analysis of the potential for beaver restoration across Park County using the Beaver Restoration Assessment Tool and field surveys of beaver activity.

The Colorado Natural Heritage Program (CNHP) offers a wide range of related services including biological monitoring, research, mapping, and conservation planning services.

Riparian Reconnect works closely with USFS staff at the South Park Ranger District led by District Ranger Josh Voorhis. Additional funders of Riparian Reconnect projects have included: LWTF, Colorado Parks and Wildlife (CPW), GOCO, CWCB & William F. Donner Foundation.

Riparian Reconnect is a group of scientists, practitioners, and conservationists dedicated to restoring and improving Colorado's headwater riverscapes.

Diverse Environmental Water Needs and Concerns

The process of quantifying the environmental "gap" is challenging

- Collection and analysis of data to assess river health and environmental factors takes significant time and money, both of which are not readily available to the entities and organizations who lead these types of projects.
- Limited baseline data presents a challenge in establishing measurable outcomes.
- There is a lack of public awareness around the meaning of an environmental gap and potential consequences.
- The metrics traditionally used are outdated and can be difficult to measure and use for monitoring. New types of metrics are needed to establish what determines minimum flow needs and to assess overall watershed health. It is also necessary to determine who can provide monitoring and recording rapidly and efficiently.

Determining how water supply decisions impact environmental attributes

- There is a lack of a qualitative and quantitative framework providing connection between water supplies decisions and impacts to environmental attributes.
- The National Environmental Policy Act process does not ensure early and meaningful engagement among stakeholders, agencies, and project proponents.

Obtaining water rights for environmental projects

- Local support for environmental uses is hard to come by. There is often a perception that an environmental water right is in competition or could injure other water users. The focus is typically on direct benefits owners can get from the land (money from development, crops from irrigation, etc.) and there is rarely a collective drive to improve the environment.
- The environmental community may not have the funding necessary to participate in water court/ change cases, or to acquire water. Project costs are also a burden.
- Limitations on the instream flow methodology generally used by CWCB. The ability of the CWCB to appropriate water for instream flow outside mountain regions has faced challenges, as there are many streams on which flows are simply too low to support an appropriation, or local entities have opposed instream flow appropriations as a matter of local interest.
- Inherently an environmental water right is going to be junior and due to enhanced demands alongside the effects of climate change this threatens environmental attributes.

Potential for changes in listing may impact State's ability to manage species

- Greenback cutthroat trout may go from threatened to endangered species.
- Small plains fishes have potential to be listed.

Federal regulations do not provide enough protection

- Federal roll backs to the Clean Water Act threaten protection of sensitive aquatic and nonaquatic habitat.
- Liability risks under the Clean Water Act and Comprehensive Environmental Response, Compensation, and Liability Act severely limit the work Good Samaritans can do to reduce pollution from abandoned hard rock mines.

Potential for negative impacts to environmental attributes as the result of climate change and increased drought

- Environmental and recreation attributes may be impacted before municipal and industrial water users are impacted by climate change.
- There is no good uniform and consistent toolbox for environmental management and mitigation in response to climate change. Impacts to environmental attributes can vary significantly from location to location and may change over time based on the amount of water, quality of water, and changes in the watershed both upstream and downstream.
- Obtaining input from the general public and stakeholders on potential for impairment to environmental and recreational attributes is difficult and can take a significant amount of time and resources.
- Increased drought and hotter temperatures will increase water temperature, which may negatively impact aquatic health.

WATSON LAKE FISH BYPASS

Source: https://www.nps.gov/articles/poudrefishladder.htm

A fish ladder at Watson Lake was constructed in 2019 to fulfill one of the promises made by Northern Integrated Supply Project participants to improve the Poudre River. The new fish ladder reconnects over 2 miles of river habitat by providing upstream movement opportunities for fish that had not existed at the Watson Lake Diversion Structure location since it was built in the 1960s.

Several species of fish, including longnose suckers and rainbow trout, will now be able to use the ladder to access spawning grounds. This greater freedom of movement for the fish will also help restore the natural ecosystem. The Watson Lake Fish Bypass is the first fish ladder constructed on the Poudre River as part of a long-term plan to mitigate human impact on the river's health. Partners hope that this project will pave the way for the construction of additional fish ladders and other initiatives to help support and protect the river's ecosystem. Colorado Parks and Wildlife tagged 71 fish in 2019 to monitor the effects of the fish ladder and have deemed the project a success with over half of the tagged fish detected ascending the entire structure.

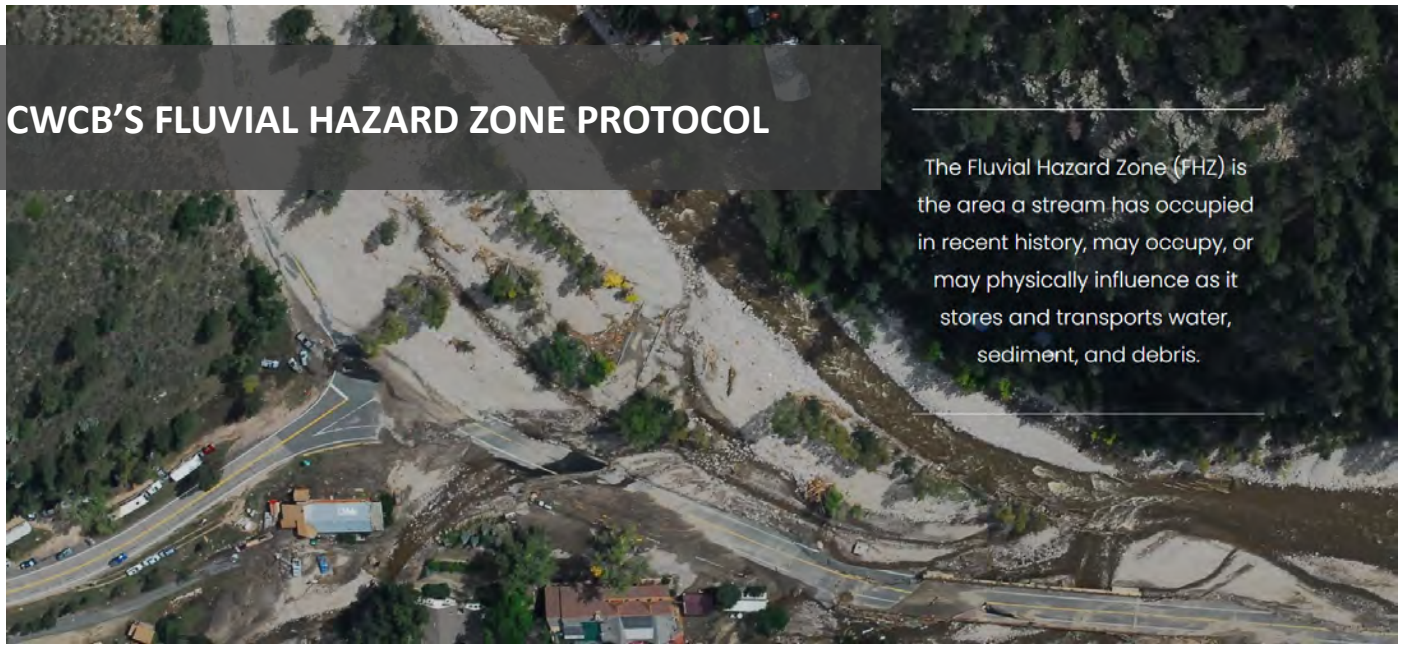
LOWER SOUTH PLATTE WETLAND CONSERVATION

The Lower South Platte River Basin contains some of the most important migratory bird habitat in the state and is a priority area for the Colorado Parks and Wildlife and many partner organizations. Private land makes up over 80 percent of the land within 8 miles of the South Platte River corridor, making it essential that private landowners be involved in the conservation of this precious resource. Natural Resource and Conservation Service provides technical and financial support to help landowners restore former wetlands, re-establish native wetland wildlife habitat and retire marginal land from agricultural production on their property through the voluntary Wetlands Reserve Program. The program has established over 50 easements along the lower South Platte River providing valuable wetland habitat.

FORESTS TO FAUCETS

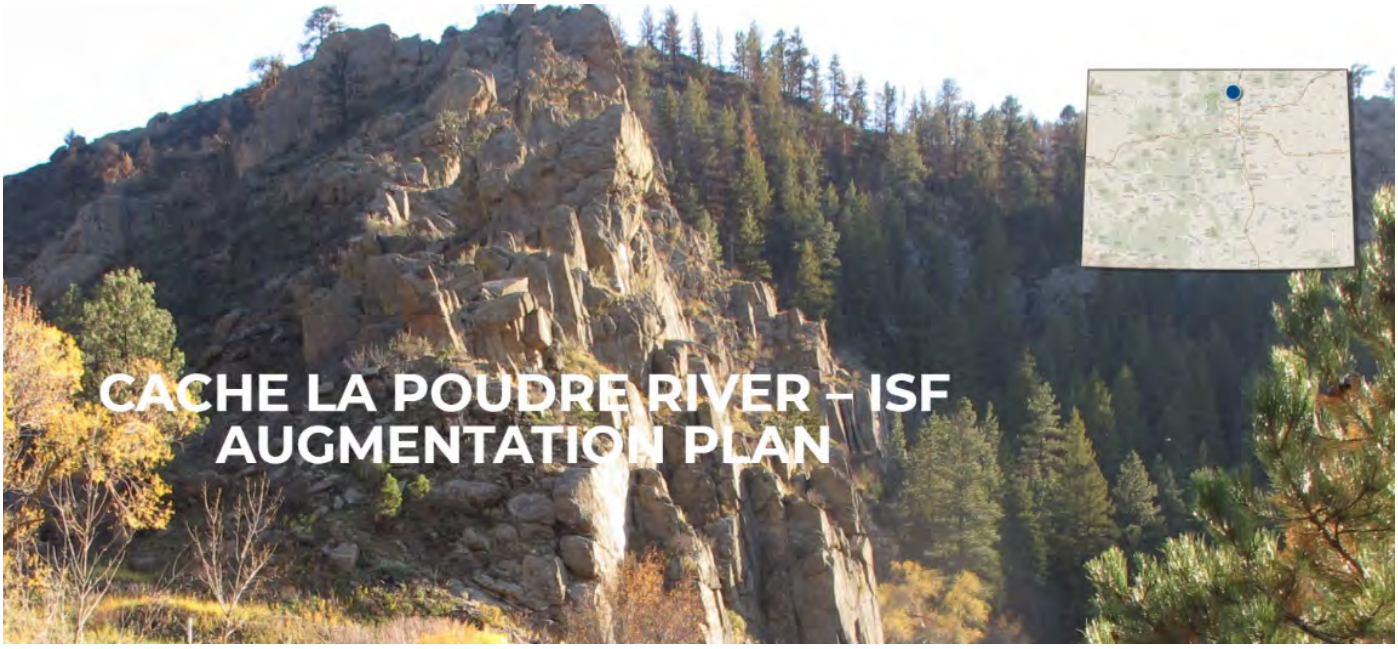
Denver Water's Forest to Faucets partnership began in 2010 with the Rocky Mountain Region of U.S. Forest Service to respond to the costly impacts of reactive forest management. Post-wildfire rainfall events brought sediment and debris deposits into Denver Water's collection system, causing service disruptions following the 1996 Buffalo Creek and 2002 Hayman wildfires. Capitalizing on the mutual benefits to lead proactive forest management, enhance forest resilience to fire, restore burned forestland, and protect water supply collection systems, the Forest to Faucets partnership expanded in 2017 to include the Colorado State Forest Service (CSFS) and the Natural Resources Conservation Service (NRCS). Collaboration among local, state, and federal agencies developed a methodology to analyze and rank wildlife hazards, flooding and debris risks, soil erodibility, and water use. This widely accepted methodology prioritizes "at-risk" watersheds for hazard reduction treatments and watershed protection measures. Denver Water has committed $33M towards the $66M partnership with the US Forest Service, CSFS, and NRCS for forest and watershed health projects in critical water supply watersheds, including the South Platte. Over 100,000 acres have been treated in critical watersheds through the Partnership.

CWCB'S FLUVIAL HAZARD ZONE PROTOCOL



Streams become hazardous when public infrastructure, houses, businesses, and other investments are placed in locations where fluvial processes naturally occur. To address the unrecognized hazards associated with erosion, sediment deposition, and other dynamic stream processes, the CWCB has developed a program that can be utilized within the South Platte Basin to identify and map the hazards posed by these natural stream processes and develop tools to help communities and landowners better understand the hazards associated with flood events. In addition fluvial hazard zone maps can be a valuable tool for communicating potential hazards associated with rainfall after wildfires.

CACHE LA POUDRE RIVER INSTREAM FLOW AUGMENTATION PLAN



Augmentation plans are usually purposed for taking water out of the river. A coalition of northern Colorado water users, including the cities of Fort Collins and Greeley, lobbied state lawmakers to create a new tool for keeping water in the Cache la Poudre River to help the environment. HB20-1037, voted into law in March of 2020, authorizes the CWCB to augment stream flows to preserve or improve the natural environment to a reasonable degree by use of an acquired water right that has been previously quantified and changed to include any augmentation use, without a further change of the water right being required. The Cache la Poudre River Augmentation Plan represents the first application proposed to be filed under section 37-92-102(4.5).

The proposal would allow municipalities, water conservancy districts, farmers, and others to sell or lease water they own for use in the Poudre Flows Project. The Poudre Flows Project will use that water to reconnect the river at the seven dry-up locations, and bring flows back up to healthy levels. Participating water users can receive reimbursement, providing options to diversify their income if desired. A board of stakeholders will strategically pool and distribute the water to restore needed flows, all the while protecting existing water uses.

Diverse Recreational Water Needs and Concerns

Impacts to water quality, water quantity, and wildlife movement corridors as a result of urbanization

- Increased habitat fragmentation as a result of urbanization leads to decreases in wildlife reproductive possibility, decreased opportunities for humans to view and enjoy wildlife in a natural and unobstructed environment, and increases in wildlife versus human interaction and confrontation.
- Hunting and recreational opportunities (from which the State and local communities derives a significant source of income) can be impacted or even lost due to urbanization.
- Urbanization, and resulting increases in storm runoff quantity, may lead to decreased water quality and corresponding negative impacts to the health and aesthetics of riparian habitats.
- Urbanization may result in an increase in invasive species, adversely impacting native population and riparian aesthetics.
- Urbanization, and the resulting increase in human presence near or within natural areas, will put increasing demands on habitats of sensitive species and have a negative impact on select species that are particularly sensitive to humans (i.e., Kingfisher).

Establishment of trails along riverways and riparian areas can result in negative impacts to wildlife and recreational opportunities

- As trails are established, they tend to be built along the stream. Placement of trails directly adjacent to riverways and riparian areas has a negative impact on wildlife (wildlife will often vacate the area, leaving the area void of wildlife and corresponding wildlife habitat). What once was an area abundant in wildlife and offering good wildlife viewing can become void of all wildlife.
- Instead of bisecting critical wildlife areas, trails should be designed and positioned to help protect wildlife and establish buffers between critical areas.
- Improperly locating trails along or within floodplains, or along irrigation ditches, can result in infrastructure damage, increased costs in operation and maintenance to support recreation, conflicts with agricultural operations, and safety hazards.
- Implementation of dry-up provisions in water court cases that require buy-and-dry or irrigated agriculture can result in negative impacts to recreational attributes.
- The removal or transition of fields from irrigated land to other uses, and implementation of dry-up agreements in change cases, will reduce food sources and shelter critical to migratory and wintering bird populations.
- Reduction in the productivity of land will alter the behavior and use by waterfowl, reducing availability for hunter harvest, which in turn will adversely affect local economy and farm income.

Increased pressures on existing recreational sites due to population increases and higher usage

- Use of recreational sites will continue to increase as population in the state increases. Meeting the demands for increased recreational opportunities while protecting the resources on which these opportunities depend will be a significant challenge.
- Maintenance, management, enforcement, and costs associated with the protection of recreational sites may be difficult to implement and enforce but are critical to supporting the long term success of recreational opportunities.
- There exists a lack of readily available and widespread public education around land stewardship.
- There are always new forms of recreation being introduced; while these new recreational activities provide opportunity, they may conflict with traditional recreation

The general challenges related to increased pressure on recreation sites can lead to water quality and watershed health issues

- Compared to municipal and industrial water suppliers, there is less opportunity to capture fees for recreational usage. Further, there is significant competition among recreation sites for capturing fees, with each entity trying to capture revenue for long-term O&M. Increased competition to capture fees results in recreation sites choosing to reduce fees below competition so they have a better chance of attracting paying users.
- Nonrecreational use of recreational sites results in additional costs for operation, maintenance, law enforcement, and conflict with recreational users. One nonrecreational use of concern (and resulting cost) is long-term occupancy by the homeless community.
- Impact on recreational opportunities as a result of CPW leases expiring
  - CPW relies on long-term leases for many recreation sites. As leases expire, CPW may be unable to renew these leases as the result of competition from other individuals or private entities willing to pay more. The resulting loss of CPW leases to private organizations or individual interests may limit public recreation opportunities.
  - A change in ownership and management of the current CPW lands may result in significant impacts to wildlife habitats as a result of the lack of protection or alteration of lake/stream frontage or land use.
  - New ownership of lands previously managed by CPW has the potential to change what is allowed on the property, limiting or eliminating recreational opportunities.

Tools and mechanisms available to protect and provide opportunities for recreation (such as recreation in-channel diversions, instream flow water rights, or water provider-supported management strategies to support recreation), can be costly to obtain and implement.

CHARLIE MEYERS STATE WILDLIFE AREA HABITAT ENHANCEMENT PROJECT

The Charlie Meyers State Wildlife Area (SWA) Habitat Enhancement Project is located in South Park in a 1.5-mile stretch of channel between Spinney Mountain Reservoir and Eleven Mile Canyon Reservoir. An initial habitat enhancement project occurred at the SWA over a 3-year period from 2013- 2015. This was Phase V of a larger restoration project on the Dream Stream to improve fish and aquatic invertebrate habitats. In June of 2015 and again in July 2016, the Upper South Platte River watershed experienced record-breaking flood flows during runoff that moved through the project reach and damaged portions of the project that were intended to provide bank stabilization and toe protection for riparian plantings to establish. A subsequent maintenance project repaired the damages.

The overall habitat improvement project aims to restore natural river processes, provide bank stabilization and create "living streambanks" by planting treated bank locations with deep-rooted vegetation and willows. Some areas were fenced to prevent people from trampling small willow plantings. The treatments are intended to stabilize bank erosion caused from recent major floods and from years of erosion due to the position of the project reach downstream of the reservoir, which has drastically reduced the natural upstream sediment supply.

The large woody material used in stabilizing outside bends, adjacent to lateral scour pools, is expected to provide cover from predators and reduce stream temperature for the recreational trout populations already established within the project reach.

Monitoring creel populations and increased fish biomass are planned and monitoring water temperature reduction is being discussed. Similar monitoring has been conducted on nearby streams. Colorado Parks and Wildlife will also monitor treatment longevity and evaluate stability over time.

This project will help the Dream Stream section of the South Platte River remain a world-class Gold Medal fishery while addressing bank instability and erosional issues.

PROJECT PROPONENTS: Colorado Parks and Wildlife, Park County Land and Water Trust Fund Board, Aurora Water, Colorado Department of Corrections, United State Forest Service, Denver Water, Trout Unlimited, Boy Scouts

TIMELINE: Start 2013, Completion 2022

CONSTRUCTION COST: $560,000

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https://cpw.state.co.us/aboutus/Pages/News-Release-Details.aspx?NewsID=7944

Time and Cost to Obtain Regulatory Decisions on New Water Supply Projects

A key challenge in the South Platte Basin is the ability of water supply agencies to plan for reliable sources of future supply due to the time and cost of complying with the National Environmental Policy Act, preparation of federal agency-led Environmental Impact Statements and finalizing the regulatory decisions and mitigation plans. Many recent and ongoing federal permitting processes for new water supply projects have taken more than 10 years to complete, at costs exceeding $10 million each. Several of these projects offer opportunities for lessons learned and new strategies for balancing diverse needs such as the development of multiparty agreements like the Chatfield Reservoir Mitigation Company, Eagle River Memorandum of Understanding, and Windy Gap Firming. A high success rate for the implementation of these types of water supply projects is key to the South Platte Basin meeting its future water supply needs.

Federal and state regulatory processes need to continue to be streamlined so appropriate projects can be implemented more quickly while preserving and protecting important environmental resources.

The Roles of Elected Officials, the Business Community and the General Public in Water Supply Planning

Solutions to South Platte and statewide water supply issues continue to be more technologically complex and expensive. More compromises and agreements are required to allocate water among competing municipal, industrial, agricultural, environmental, and recreational needs. There is an opportunity to engage the creative input of diverse parties to help develop solutions consistent with a combined vision for the South Platte Basin and the State. Support for identified solutions among elected officials, the public, and the business community will increase if those stakeholders feel they have been engaged in a collaborative process. Broader awareness of the South Platte BIP and the statewide roundtable process will help create a successful and unified plan.

There is an opportunity for the roundtables to create guidelines for stakeholder engagement to help create a less cumbersome stakeholder engagement process. In addition, the use of the South Platte Basin website to house a variety of tools, best practices, and lessons learned can help provide necessary information to allow for science-informed public policy.

SOUTH PLATTE BASIN WEBSITE

Colorado Watershed Assembly staff completed updates to the website, including coordination with the Open Water Foundation to develop a 'home' for the South Platte Data Platform. Three 'story maps' can be found at www.southplattebasin.com. Colorado Watershed Assembly staff monitors the site and the associated e-mail southplattebasin@coloradowater.org.

In 2020 www.southplattebasin.com was maintained and enhanced with a fresh, modern color palette. Large blocks of text were eliminated in favor of more photos and links. The main two audiences of the website were deemed to be roundtable members and engaged public citizens. Pages were reorganized for clarity and ease of use.

- The Home page was simplified, which brought forward photos of the South Platte River "working hard and being pretty", roundtable meetings, and stories. There is a link to the BIP on the Home page.
- The Learn More page was updated to have more in-depth information for interested citizens, including a page for Educational Resources. The Educational Resources page highlights curricula from the Colorado Foundation for Agriculture. Curricula are split into themes such as Understanding Water and Colorado Water and Agriculture.
- The Documents page houses impactful, pertinent content for basin roundtable members and other water professionals. Individual pages were created for the BIP, the SPROWG, and Roundtable Guiding Documents for both Metro and South Platte members. Also, statewide documents for Colorado's Water Plan and Statewide Water Education Action Plan are housed on their own pages.
- The Grants page was created to be a straightforward resource for visitors to apply for money from the WSRF. Applications to the Metro Roundtable WSRF grant cycle are housed within this page as an easy place for roundtable members to read and prioritize proposals.

The Education Committee of the roundtables expressed the importance of having technical documents available on www.southplattebasin.com. The website is flexible and can be utilized to advertise and administer Requests for Proposals for a variety of roundtable-related projects. Grant funds have been received to staff the maintenance and administration of the website and host a dedicated email address southplatte@coloradowater.org

Once a month, a snapshot of website analytics is taken to determine how many visits the website received, the duration of visits, and peak days of traffic.

Climate Change

Climate change is a challenge that is superimposed and exacerbates all other water resources challenges in the South Platte Basin, and in Colorado as a whole. Most climate change forecasts for the South Platte Basin show an increase in temperature and either an increase or decrease in precipitation. The planning scenarios and climate projections included in the Technical Update reflect these forecasted trends. With respect to water supply planning, climate change could have the following effects:

- Lower yields from historical water rights
- More rain and less snow
- Lower snow water equivalent in annual snowpack and less snowmelt runoff
- Earlier annual peak runoff
- Increased irrigation demand in agricultural and urban irrigated areas
- Increased frequency and severity of extreme weather events such as droughts and floods
- Increased frequency and severity of wildfires
- Increase in invasive species
- Changing watershed conditions and declining watershed health
- Degraded water quality

The exact nature and pace of these potential effects are uncertain, creating planning challenges for South Platte Basin water providers and water users in all sectors.

The Colorado Climate Plan identifies Colorado's statewide goals relative to climate change; to identify opportunities to mitigate greenhouse gas emissions, and to promote state policy recommendations and actions that increase Colorado's state agencies level of preparedness for unavoidable impacts. Climate change is anticipated to affect water quantity and quality, energy development, transportation, public health, tourism, and agriculture, all of which can impact the South Platte Basin.

Climate change is a primary concern that affects all water use sectors and dimensions and creates substantial uncertainty for South Platte Basin water planners.

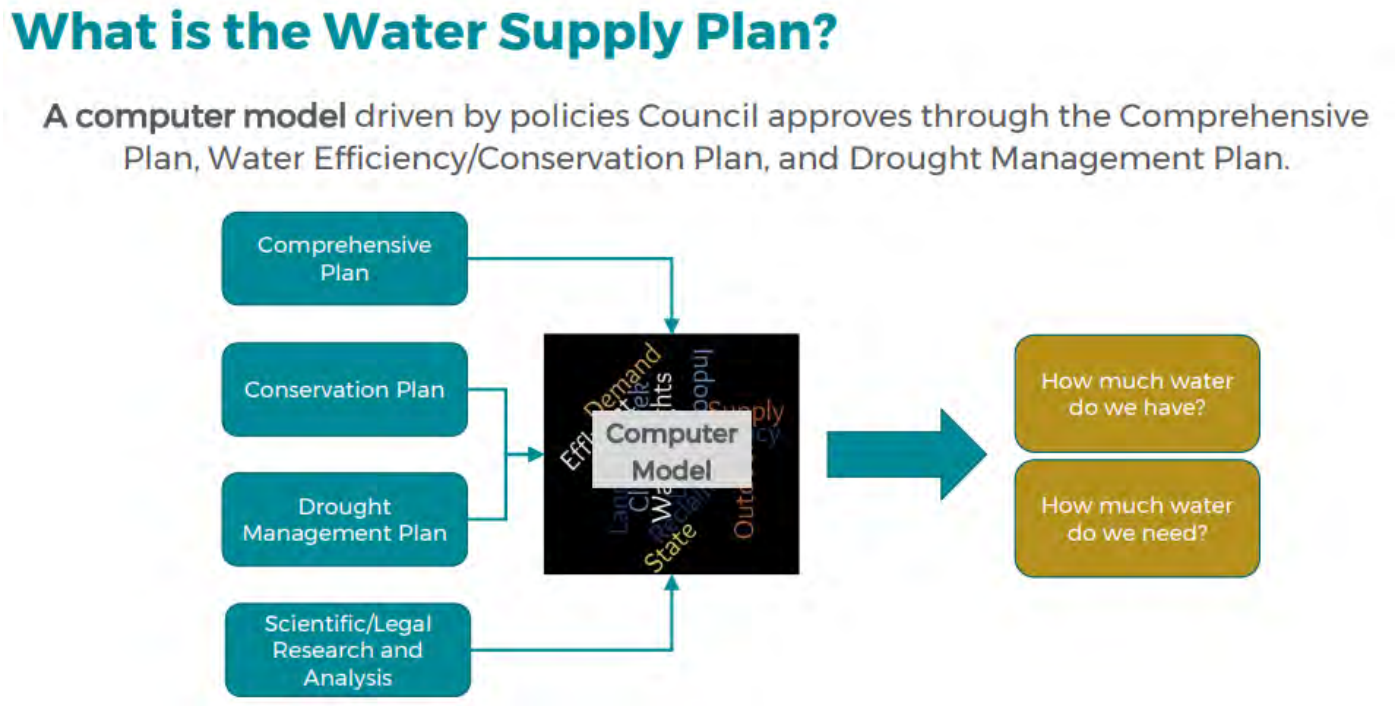
WESTMINSTER WATER SUPPLY PLAN

The Westminster Water Supply Plan resulted in five policy decisions that guide water supply planning and implementation. The key takeaways of the plan include:

1. Conservation is the single biggest lever in impacting water supply. The City has started to increase funding in conservation programs by four-fold over the last couple of years.
2. Infrastructure maintenance and construction of water supply facilities continues to be important to using every drop of water to its maximum efficiency. These activities continue.
3. Drought response is critical to protecting the City from severe droughts that are likely to become more significant as time goes on. Westminster is closely watching current drought restrictions – and drought response was a major part of modeling efforts to ensure they know the right time to implement these restrictions.
4. In general, the City can support the existing approved land use plan; however, they cannot support major deviations from this plan and still stay within the existing water supply of the City. This is why the Water Supply Plan and the Comprehensive Plan (which is the land use plan for the City) were so closely coordinated. The two plans were created together and are integrally linked.

Some additional findings from the study include:

- Drought is the greatest threat to the city's water supply. The city's water supply can vary by as much as 11,100 acre-feet depending on weather and drought.
- Conservation measures by customers are the best way for the city to secure its water supply. Adding or changing development types can impact how much water the City will need. Moving to a high-conservation, xeric-landscaping future could save the City between 3,690 acre-feet and 4,200 acre-feet depending on land use trends. Moving to a low-conservation future would cost the city between 8,660 acre-feet and 9,343 acre-feet depending on land use trends; increased demand of this magnitude would result in significant water supply shortfalls.
- In a future scenario with a weak economy and land use less dense than is anticipated in the current Comprehensive Plan, the City would save between 930 acre-feet and 1,435 acre-feet. If the city becomes significantly denser than is anticipated in the current Comprehensive Plan, the City would spend an additional 1,340 acre-feet to 2,020 acre-feet more water. This quantity of water impact is not insignificant; however, it is not as impactful as conservation trends.



Section 5. Supply, Demand, and Potential Water Needs

The South Platte Basin supports a wide range of water needs, including municipal, industrial, and agricultural, as well as important water-dependent environmental and recreational attributes. Coloradoans and tourists regularly enjoy the recreational opportunities provided by the many environmental features of the basin.

Native South Platte River Basin Supplies

Overview

The basin's water supply is highly dependent on both trans-basin diversions and return flows. Along with a native flow of about 1.4 million acre-feet per year from precipitation, mostly in the form of snow melt form the Rockies, the basin benefits from another half-million acre-feet of trans-basin diversions. The South Platte River Basin's surface water diversions average approximately 4.0 million acre-feet annually, with an additional annual average of 500,000 acre-feet of groundwater withdrawals.

The South Platte River Basin is fully appropriated. Any remaining water is available only during spring runoff in wetter than average years. The development of water rights within the South Platte River Basin generally started in the local tributaries and mainstem of the South Platte River upstream of Greeley. These early irrigation systems were inherently inefficient, resulting in large, lagged return flows. Consequently, more and more junior irrigation water rights were developed on the lower reaches of the South Platte River as a result of successive use of these return flows. Thus, the ultimate degree of successive use within the basin is largely influenced by the amount of water available to divert by any individual water right and the extent of return flow from that use. Many factors will influence the amount of water available, used, and successively used within the basin in the future as outlined below.

Limited water supplies also drive overall water use efficiency in the basin. As an upstream water user (municipal or agricultural, for example) diverts and uses water in accordance with their established water rights, a portion of that water returns to the South Platte River or its tributaries and is subsequently available for the next most senior downstream water right owner to use. It is generally understood that water is currently used up to seven times before it leaves Colorado at the Nebraska state line, and as population in the South Platte River Basin continues to grow, the degree of successive water use is likely to increase. This degree of successive downstream water use results in a degradation of certain water quality constituents, including salinity, as water flows downstream.

Groundwater

Groundwater in the South Platte River Basin occurs most commonly in alluvial aquifers composed of unconsolidated granular sediments and sedimentary aquifers composed of consolidated and semi-consolidated granular sedimentary bedrock formations. The USGS identifies three principal aquifers in the South Platte Basin: The South Platte Alluvial Aquifer, High Plains Aquifer, and Denver Basin Aquifer System.

The alluvial aquifer is made up of mainly silt, sand, and gravel deposits of alluvial and aeolian origin that cover an area of over 4,000 square miles of the South Platte River and its tributaries. In the mountainous areas, alluvial deposits tend to be discontinuous and serve as a water resource on a limited basis. The maximum saturated in the upstream region near Denver is 20 to 40 feet. In the eastern plains, the alluvial deposits thicken and become a continuous aquifer network with a maximum saturated thickness of more than 200 feet near Julesburg. The lower South Platte alluvial aquifer is a major source of water in the basin. It holds as much as 8.3 million acre-feet of water in storage. Infiltration into the alluvial aquifer is from precipitation, canal seepage, and pond seepage recharge. It is then typically discharged into the main channel, creating the base flow of the river. Currently, the South Platte River Basin is successfully using approximately 450,000 acre-feet of alluvial groundwater; however, greater use of this water supply is constrained due to the effects lagged depletions have on river flows in acquiring augmentation sources. There is limited availability of augmentation water to offset the effects of groundwater pumping.

The High Plains Aquifer is a regional aquifer that underlies approximately 174,000 square miles of the Great Plains states, including South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas. A portion of it underlies the eastern border of Colorado. The aquifer ranges from a thickness of

50 feet to approximately 500 feet in Colorado. The aquifer's primary source of recharge is from infiltration of precipitation, which is limited due to low precipitation and high evaporation rates common to the eastern plains. The aquifer lies in a closed basin that does not benefit from snowmelt.

Colorado has four statutory groundwater classes: tributary, nontributary, not-nontributary (specific to the Denver Basin), and designated groundwater. Groundwater that is hydrologically connected to a surface stream and can influence the amount or direction of flow of water in that stream is referred to as tributary. Nontributary groundwater is physically separated from surface water by impermeable layers in the aquifer. It is also considered nontributary when groundwater is at such a great distance from the surface water that it has little or no hydraulic connection with it.

Designated groundwater is a category of groundwater under Colorado law that has been created by the Colorado legislature and is governed by the Groundwater Management Act and managed and controlled by the Colorado Ground Water Commission (CGWC). It is defined as "groundwater which in its natural course would not be available to and required for the fulfillment of decreed surface rights, or groundwater in areas not adjacent to a continuously flowing natural stream wherein ground water withdrawals have constituted the principal water usage for at least fifteen years preceding the date of the first hearing on the proposed designation of the basin, and which in both cases is within the geographic boundaries of a designated ground water basin".

The Denver Basin Aquifer system is a unique geologic formation along the Front Range reaching from Greeley on the north to Colorado Springs on the south, and from the foothills on the west to Limon on the east. The Denver Basin Aquifer system is composed of bedrock aquifers, or water bearing formations, that lie one on top of the other in layers. Progressing from top to bottom, the aquifers in the Denver Basin are the Dawson, Denver, Arapahoe, and Laramie-Fox Hills Aquifers. Northern portions of the Dawson and Arapahoe Aquifers are differentiated into upper and lower aquifers. Between each aquifer there is a confining layer that isolates the individual aquifers from each other. There are two types of groundwater with the Denver Basin Aquifer system, both allocated according to overlaying land ownership, with the State Engineer overseeing permitting and administration: Non-tributary and Not Non-Tributary. Non-tributary groundwater does not significantly impact flows in a natural stream due to the lack of a hydraulic connection. Not Non-tributary groundwater does influence surface streams due to their locality; however, not as significantly as tributary groundwater.

Because of the nature of the confining layers and because of the limited connection between these aquifers and surface water, the groundwater in the aquifers is not renewable and threatened by continuation or expansion of current withdrawal rates. The result is declining water levels and well productivity in large areas of the aquifer. Conjunctive use of renewable supplies and the Denver Basin Aquifer system could provide promising opportunities for Metro municipalities to better manage water supplies through drought conditions and hydrologic variability.

Storage

Stream flows vary dramatically in the South Platte Basin seasonally and year-to-year. Storing water during wet year or free river conditions for use in times of shortage is a vital water management strategy. Multipurpose reservoir operations in the South Platte Basin are the norm. Many reservoirs are now operated in part to benefit the environment and recreational users. Most of the water storage in the South Platte Basin has been in existence for decades and reservoir operations have typically evolved over the years as the owners collaborate with others, legally change historic consumptive use to other beneficial uses such as municipal and industrial uses and respond to environmental regulations and public desires. Many reservoirs are now operated to bypass (not store) water under certain conditions and maintain downstream flows.

The larger municipalities in the basin, including Denver, Aurora, Fort Collins and Greeley, have complex water resources supply systems that include multiple reservoirs. These supply systems allow the water agencies the ability to manage the delivery of water to meet peak municipal and industrial demands, maintain stream flows and be prepared for extreme weather events.

Aquifer storage and recovery is another viable storage and water supply alternative. The process involves direct injection of surface water supplies to replenish groundwater stored in aquifers which can later be recovered for beneficial use. The amount of water injected into the aquifer is highly dependent on surface water yields from rivers and streams. Centennial Water

and Sanitation District's Denver Basin Aquifer system ASR program has a long history of storing excess treated water from South Platte surface water supplies within the Denver Basin Aquifer system for future use (see Section 4.7.1 for additional details). Other water providers, including the SMWSA are investigating and implementing ASR programs to provide additional storage to form existing water supplies.

ASR can provide a very cost-effective, flexible method of storing surface water when excess water treatment capacity is available and a water supplier has access to areas with favorable geologic conditions. Typically, peak demands for water during the summer are two to three times higher than the demand in off-peak periods, allowing for the excess treatment capacity in off-peak times to be used to treat and store available water. ASR also can provide cost-effective storage compared to surface water alternatives in many situations. The cost and time required to permit and construct a surface water storage unit today can cost tens to hundreds of millions of dollars and may require decades to complete. The permitting of ASR is simple and requires minimal surface area. In addition, 100 percent of the injected water is recoverable with no evaporative losses. Surface water storage evaporative losses can reach thousands of acre-feet per year.

Representation of Existing Transmountain Diversions in the Technical Update

Transmountain diversions, particularly from the West Slope to East Slope, are a critical component of the water supply necessary to meet Colorado's municipal and agricultural water demand now and into the future. Many factors influence the amount and timing of transmountain diversions (TMDs), including water availability and storage in both the source and destination basins, demands, availability of other water supplies owned by water providers, and operational considerations. All of these factors may change in the future, particularly under climate-impacted conditions.

The Technical Update analyzes Colorado's current and potential future water supplies and demands in the context of five future planning scenarios that were described in the Colorado Water Plan. The planning scenarios do not specifically describe how TMDs may change in the future, though they do describe changes to drivers that impact water availability for TMDs. For example, the planning scenarios that incorporate climate change project a general decrease in streamflow, which could result in a reduction in water available to TMDs. Additionally, the planning scenarios predict an increase in demands, which could result in an increase in TMDs, up to their physical and legal diversion limits, to meet the growing demand. Large storage facilities on both sides of the Continental Divide further affect how TMDs may operate in the future.

Understanding how these changing factors may impact the future amount and timing of TMDs is complicated from both technical and legal perspectives. The Technical Update, therefore, assumes that historical levels of TMDs and current operations will continue into the future. Previous planning efforts, including the 2010 Statewide Water Supply Initiative (the precursor to the Technical Update) and the 2015 basin implementation plans, also incorporated this assumption. In future Technical Updates, water providers with major transmountain diversions should be further consulted to understand how their operations could change on both the West and East Slopes under the conditions assumed in the planning scenarios.

Results in the Technical Update were recently revised due to changes in reservoir operations and demands in the West Slope basins. Results can be found in Appendix A.

Water Management and Water Administration

The Colorado Division of Water Resources, which includes the State Engineer, division engineers, and water commissioners, has the authority to administer the waters of the state and Colorado's water sharing agreements with other states. Water administration is the enforcement of the priority system of water rights, which includes curtailment of junior water rights that are not in priority and not operating in accordance with augmentation plans or administrative approvals. The Colorado Ground Water Law of 1957 established the permitting requirement of groundwater wells. Since 1969, surface and groundwater rights have been administered with a recognition of the connection between the two. Every new well in the state that diverts groundwater must have a well permit. If wells do not meet statutory exemptions and their priority dates are not senior enough to divert in priority, they may be able to operate pursuant to an Augmentation Plan decreed by the water court.

Interstate Compacts

The South Platte River Compact divides the waters of the South Platte River between Colorado and Nebraska. During the irrigation season, defined as April 1 through October 15, Colorado must curtail water rights in Water District 64 that are junior to June 14, 1897 if flows at the Colorado-Nebraska state line drop below 120 cubic feet per second. The State Engineer is authorized to administer the compact. In addition, compliance with federal programs for threatened and endangered species recovery also results in interstate water management commitments.

The Republican River Compact apportions the estimated virgin water supply of the Republican River Basin between Colorado, Nebraska, and Kansas based on beneficial consumptive use. Colorado was allocated 54,100 acre-feet, which accounts for approximately 10 percent of total pumping in the basin. The compact includes provisions for adjustments to the virgin water supply and allocations based on future records and changing conditions. In 2004, the RRWCD was established for the purpose of cooperating with and assisting the State of Colorado with Compact compliance. Administration of surface water in the Republican River Basin is separate from groundwater administration. Although the State Engineer has authority to administer both surface water and groundwater for Compact compliance purposes, the water courts have judicial authority regarding surface water rights, whereas the CGWC has regulatory and adjudicatory authority over the management and control of designated groundwater. The CGWC has established eight Designated Groundwater Basins and 13 Groundwater Management Districts within such basins. GWMDs are local districts that have additional administrative authority.

Endangered Species Recovery Programs

The most notable species protection program in the South Platte River Basin is the Platte River Recovery Implementation Program. This three-state program, established in 2007 through an agreement between Colorado, Nebraska, Wyoming, and the U.S. Department of the Interior, is designed to help listed species and provide Endangered Species Act coverage for water use in the Platte River Basin. The Platte River Recovery Implementation Program does this by providing programmatic benefits (through land protection, water management, and financial support) for three federally listed species and their associated habitats in the central and lower Platte River in Nebraska. (Additional information on the Platte River Recovery Implementation Program can be found at **Platteriverprogram.org**)

On December 19, 2019, Congress passed the Platte River Recovery Implementation Program Extension Act. This legislation extends the program by an additional 13 years. The legislation was developed by the three state representatives on the Governance Committee and enjoys broad bipartisan support from lawmakers, water users, conservation groups, and the administration.

Designated Groundwater Basins

All groundwater in Colorado is presumed to be tributary and regulated under the prior appropriation system unless shown to be nontributary to a surface stream. Unlike tributary groundwater, designated groundwater is regulated by the CGWC and is not subject to court adjudication. The CGWC uses a modified appropriation system to allocate designated groundwater outside of the Denver Basin Aquifer system on a permit-by-permit basis. As described previously, there are eight designated basins in eastern Colorado, five of which are in the South Platte Basin. Within the eight designated basins, there are 13 GWMDs that have additional administrative authority within their boundaries. Ground Water Management Districts (GWMDs) are authorized to adopt additional rules and regulations to help administer groundwater within their district.

Water resources located in Colorado's Denver Basin Aquifer system are subject to additional rules and regulations. Withdrawal of groundwater from the Denver Basin Aquifer system is tied to ownership or control of the overlying land. Well users are limited to withdrawing up to 1 percent of the water estimated beneath their land, thus preserving the aquifer's 100-year life for any given parcel. In 1985, Colorado's General Assembly provided further clarification for Denver Basin Aquifer system groundwater administration under Senate Bill 85-05 (SB 85-05). This bill required the State Engineer to promulgate rules and regulations governing the withdrawal of groundwater from the Denver Basin aquifers by December 31, 1985, which eventually became known as the Denver Basin Rules. Specifically, SB 85-05 resulted in the adoption of a rule to preserve the aquifer's 100-year reliability through the administration of pumping rights. This administration

attempts to deal with issues such as impacts for adjacent pumping, decreased well yields with decreased aquifer levels, and other factors.

Potential Impacts and Benefits to Environmental and Recreational Attributes

Preservation and enhancement of the environmental and recreational aspects of the South Platte River is important to Colorado's economy and quality of life. Water is needed to maintain aquatic, riparian, and wetlands habitats that are essential for ecological diversity. In addition, flows in streams are essential to many recreational economies, including fishing, waterfowl hunting, skiing, flatwater and whitewater boating, and for general aesthetics near waterways, including greenways, trails, and wildlife viewing. The important environmental and recreational values in the South Platte Basin must be considered when planning for Colorado's water future. Many of these attributes currently suffer due to current water diversions and infrastructure operations.

Maintaining or enhancing environmental and recreational attributes can be a constraint on potential future water development; however, many opportunities exist to maintain these attributes while concurrently developing water supply projects. Multipurpose projects or agreements for cooperative operation of existing projects to help benefit these important attributes should be considered when projects are planned to help meet water needs. Additional projects to address these needs should be considered, including environmentally friendly diversion structures, restoration of habitat and stream channels, environmental pools in reservoirs with release timing to benefit the environment, and additional instream flow water rights.

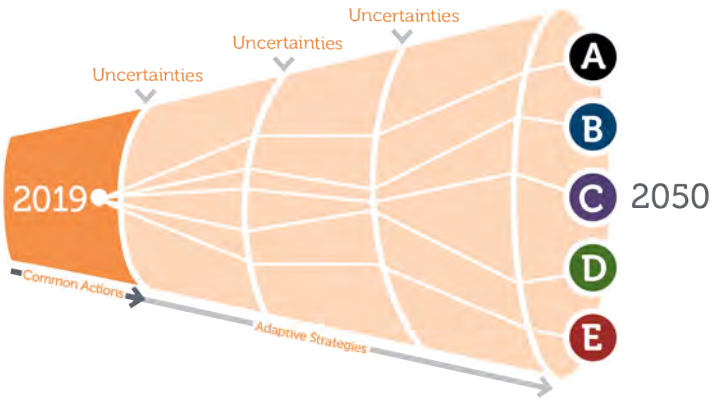


Figure 5-1. Illustration of Scenario Planning Concepts

Updates to Supply, Demand, and Potential Water Needs

Following the 2015 launch of the Water Plan and BIPs, the CWCB began a process of updating the underlying water supply and demand analyses. The work included collaboration with technical advisory groups who helped outline the methods to be used in the Analysis and Technical Update to the Colorado Water Plan, hereafter called Technical Update. Compared to previous Statewide Water Supply Initiative (SWSI) efforts, the Technical Update offers a more scientifically rigorous and robust analysis by including scenario planning, climate change considerations, water rights, and surface water modeling.

As part of the South Platte BIP, the LE/GC Team worked with a subcommittee to further refine the municipal and industrial supply, demand, and potential water needs.

Scenario Planning

Colorado's Water Plan uses scenario planning to consider a wide range of possible futures according to the best available science and stakeholder input. The approach embraces inherent uncertainties in future climate conditions, social conditions (such as values and economics), and supply-demand conditions (e.g., energy, agricultural, municipal and industrial, and environmental and recreational needs).

Scenario planning and adaptive management allow decision makers and water users the flexibility to track environmental and social changes over time that provide insights into which future conditions might become more likely as time passes (Figure 5-1). The scenario planning method varies from a more simplistic application of high, medium, and low stress conditions (used in SWSI 2010) by acknowledging that the future holds a degree of uncertainty, depending on a variety of environmental and social drivers.

Through a multi-year stakeholder process, the Interbasin Compact Committee developed five scenarios that represent how Colorado's water future might look in 2050 influenced by the following nine high impact drivers.

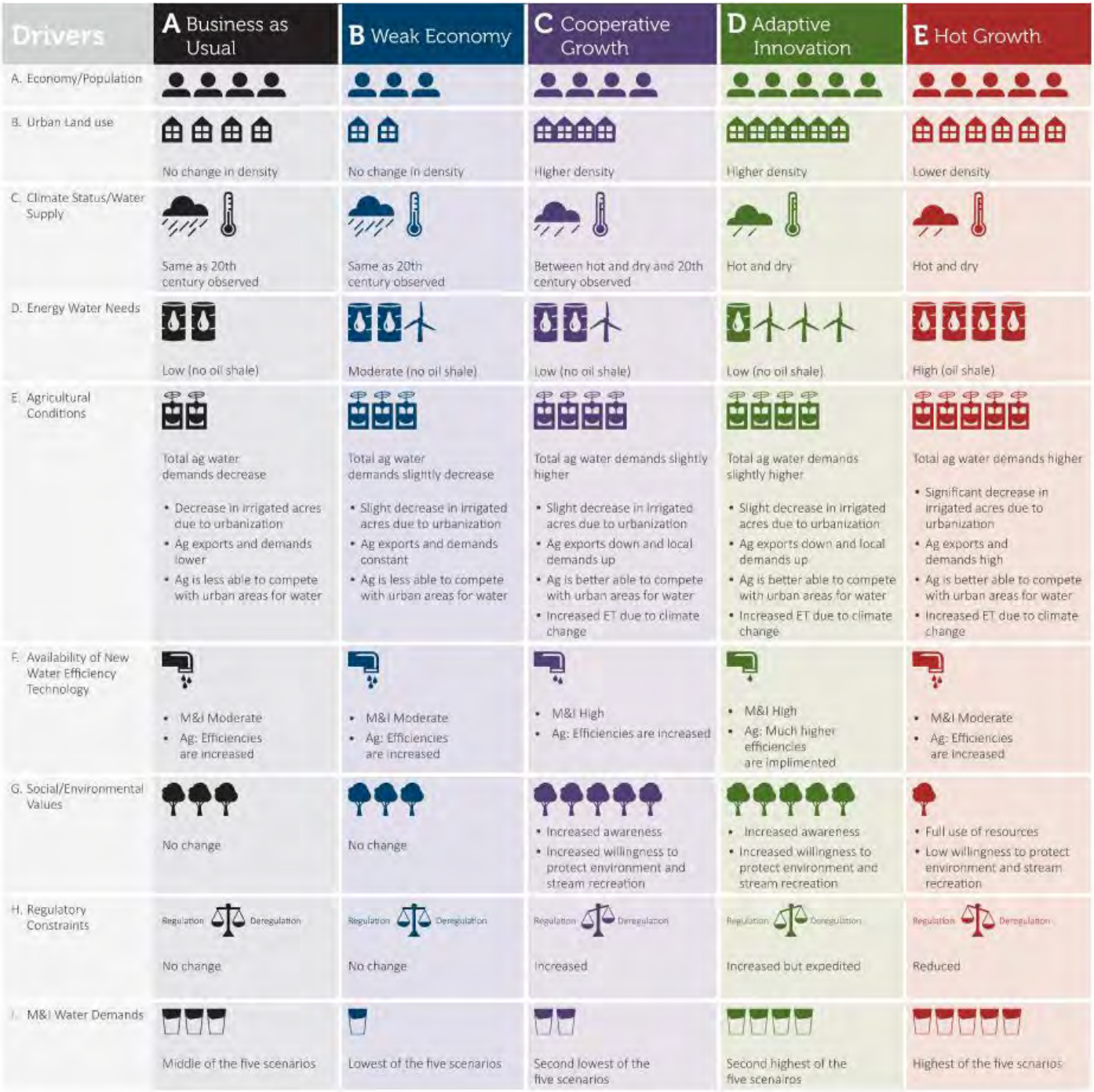


Figure 5-2.Illustration of High Impact Drivers Associated with Five Planning Scenarios

1. Population/Economic Growth
2. Urban Land Use /Urban Growth Patterns
3. Climate Change/Water Supply Availability
4. Energy Economics/Water Demand
5. Agricultural Economics/Water Demand
6. Availability of Water-Efficient Technologies
7. Social/Environmental Values
8. Level of Regulatory Oversight/Constraint
9. Municipal and Industrial Water Demands

The five planning scenarios are summarized in the 2015 Water Plan with names portraying each scenario's respective depiction of the future. A summary graphic (Figure 5-2) shows the relative increase and decrease for nine main drivers compared to current levels. Refer to the Technical Update for a more detailed explanation of how the various drivers were quantified and how the drivers relate to one another and across scenarios.

Climate

Of the five planning scenarios, three include some level of stressed future climate change. Climate stress was modeled from both a supply perspective by incorporating climate-adjusted hydrology from the Colorado River Water Availability Study and a demand perspective by adjusting the irrigation water requirement (IWR) with assumed average annual temperature and precipitation changes.

Population

Population projections are a primary driver in the municipal and industrial demand projections. As part of the Technical Update, population forecasts for each of the five planning scenarios were developed by applying the assumptions regarding future demographic growth to the estimated probabilistic range. The existing State Demography Office population forecasts were utilized as the middle projection. The high and low growth projections were estimated based on the historical and State Demography Office implied growth rate and the historical standard deviation in population growth rates by decade.

The South Platte Basin is currently the most populous basin and includes about 70 percent of the statewide population. The Metro Region holds the majority of the population at 51 percent of the statewide total. Between the years 2015 and 2050, the South Platte Basin is projected to grow from 3.8 million people to between 5.4 million and 6.5 million people in the low and high growth scenarios, respectively, which represents an increase in population of 42 to 70 percent.

Municipal and Industrial

This section describes the municipal and industrial water demand and water supply analysis for the South Platte BIP. It includes a brief review of the 2015 BIP gap analysis, results of the Technical Update analysis of water demand in the South Platte Basin, and an assessment of how the Metro and South Platte municipal and industrial water providers plan to meet their future water demands.

Gaps are a characterization of the potential risk that water supplies will not be adequate to meet future demand.

Summary of 2015 BIP Findings

The 2015 BIP estimated municipal and industrial water demands in the South Platte Basin in 2050 and assumed those demands would be met with a combination of existing supplies and new projects (termed IPPs in the 2015 BIP). A demand gap was forecast in 2050 based on a shortage of supply from IPPs to meet the full 2050 demand. The IPPs included planned projects, estimates of yield from agricultural transfers, and growth into existing supplies. Future available supplies were estimated at the regional level within the South Platte Basin.

The future yield from IPPs was estimated using a "Success Rate" to account for uncertainty of the specific projects being fully implemented and delivering the full planned yield by 2050. In the base portfolio, a success rate of 88 percent was used for Metro projects and a success rate of 66 percent was used for projects in the rest of the South Platte Basin. This resulted in a 2050 gap of approximately 196,000 AFY (see Figure 5-3; Figure-4-23 in the 2015 SIP BP).

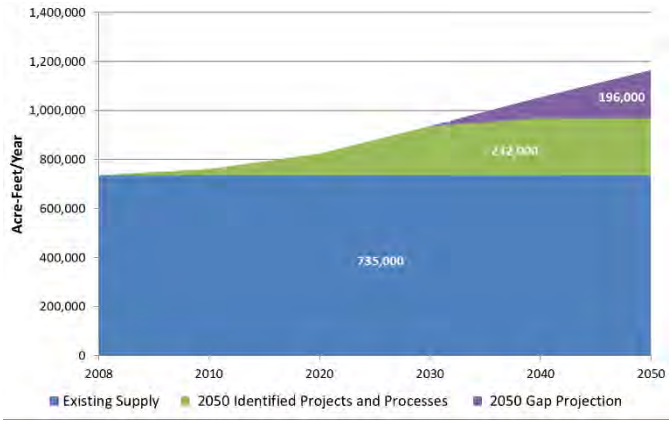


Figure 5-3. South Platte Basin and Metro Basin Municipal and Industrial and SSI Gap Summary (2015 BIP)

Three alternative South Platte Portfolios were proposed for meeting future demands, as shown in Figure 5-4 (Figure 5-2 in the 2015 BIP). Each provided approximately 375,000 AFY of new supply and 50,000 AFY of reduced demand through active conservation.

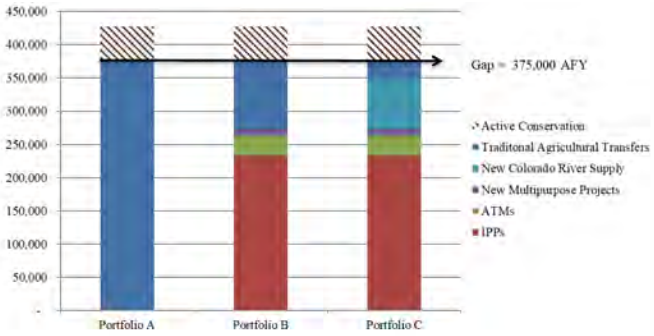


Figure 5-4. Portfolio Scenarios to Meet 2050 Municipal and Industrial and SSI Gap with 50 percent of Active Conservation applied to the Gap (2015 BIP)

Methodology for Potential Future Water Needs Analysis

The South Platte BIP Update includes an update to the analysis of potential future water needs based on the results of the Technical Update, the updated Project Database (see Section 7), and input from the BRTs. The updated analysis incorporated the following methodology and assumptions:

- The estimated increase to municipal and industrial demand beyond current conditions (2015) is based on the Technical Update analysis. These assumptions are further described in the next section.
- The analysis is applied to each of the five Technical Update Planning Scenarios to explore a range of future demand and supply conditions.
- The analysis is conducted at a basin-wide level. This approach was selected as information on projected demands and yields from new projects (particularly agricultural transfers) cannot reasonably be estimated on a regional basis.
- The analysis provides a discrete estimate of yield from planned projects, conceptual projects, and other future supplies. Examples include agricultural transfers and additional water efficiency practices.
- A "Realization of Yield" factor, similar to the Success Rate concept in the 2015 BIP, is applied to adjust the estimated yield from future supplies across the Planning Scenarios.

The analysis concludes with a qualitative discussion on potential options to address potential unmet demand in all Planning Scenarios.

Technical Update 2050 Municipal and Industrial Demands

This section summarizes the current and future municipal and industrial demands for each of the five Planning Scenarios based on revised information developed in the Technical Update. The following is a summary of assumptions applied in the Technical Update:

- The 2050 projected municipal demands were developed based on a range of future population projections multiplied by a per-capita usage rate adjusted to reflect potential future conditions under five planning scenarios. The planning scenario per-capita usage rate adjustments capture impacts from climate, varying levels of conservation, urban land use, technology, regulations, and social values.
- The 2050 projected industrial demands rely on current levels of industrial demands, adjusted to reflect conditions projected in the five future planning scenarios.
- Population change, one of the largest drivers in the 2050 municipal and industrial demand, was also taken into account. Between the years 2015 and 2050, the South Platte Basin is projected to grow from approximately 3.8 million people to between 5.4 million and 6.5 million people, depending on the planning scenario. Population projections were county based. Population regions referenced in the 2015 South Platte BIP are presented in Figure 5-5.

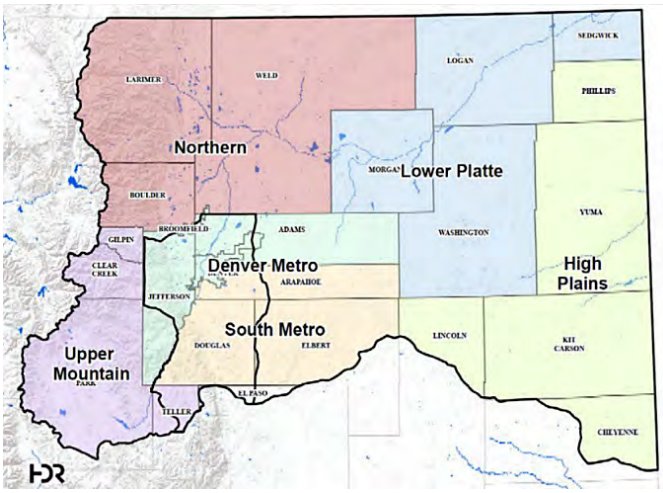


Figure 5-5 South Platte and Metro Sub-basins (Figure 4-19 in 2015 BIP)

- All existing supplies are assumed to be allocated to meet current levels of municipal and industrial demand into the future. Therefore, the 2050 municipal and industrial demands used in the South Platte BIP analysis

represent the increase in projected municipal and industrial demands beyond current (2015) conditions for the South Platte River Basin ("Increase in Municipal and Industrial Demand")

- Additionally, the 2050 projected municipal demand assumes that current storage reserves or contingency supplies need to be maintained into the future (i.e., no existing supplies would be allocated to meeting demands from future growth)

The projected total 2050 Increase in Municipal and Industrial Demand beyond current (2015) conditions for the South Platte basin ranges across the five planning scenarios from approximately 280,000 AF/year under the Weak Economy scenario to over 543,000 AF/year under the Hot Growth scenario (see Figure 5-6).

The increase in population by region from 2015 to 2050 is presented in Table 5-1. The largest Increase in Municipal and Industrial Demand in the South Platte Basin is projected to occur the Northern Region (Larimer, Weld, and Boulder counties), which also corresponds with the largest projected increase in population. (The Northern Region population is projected to increase from approximately 500,000 to 1,200,000 depending on the Planning Scenario).

Figure 5-6. Total 2050 Increase in Municipal and Industrial Demand Beyond Current (2015) Conditions

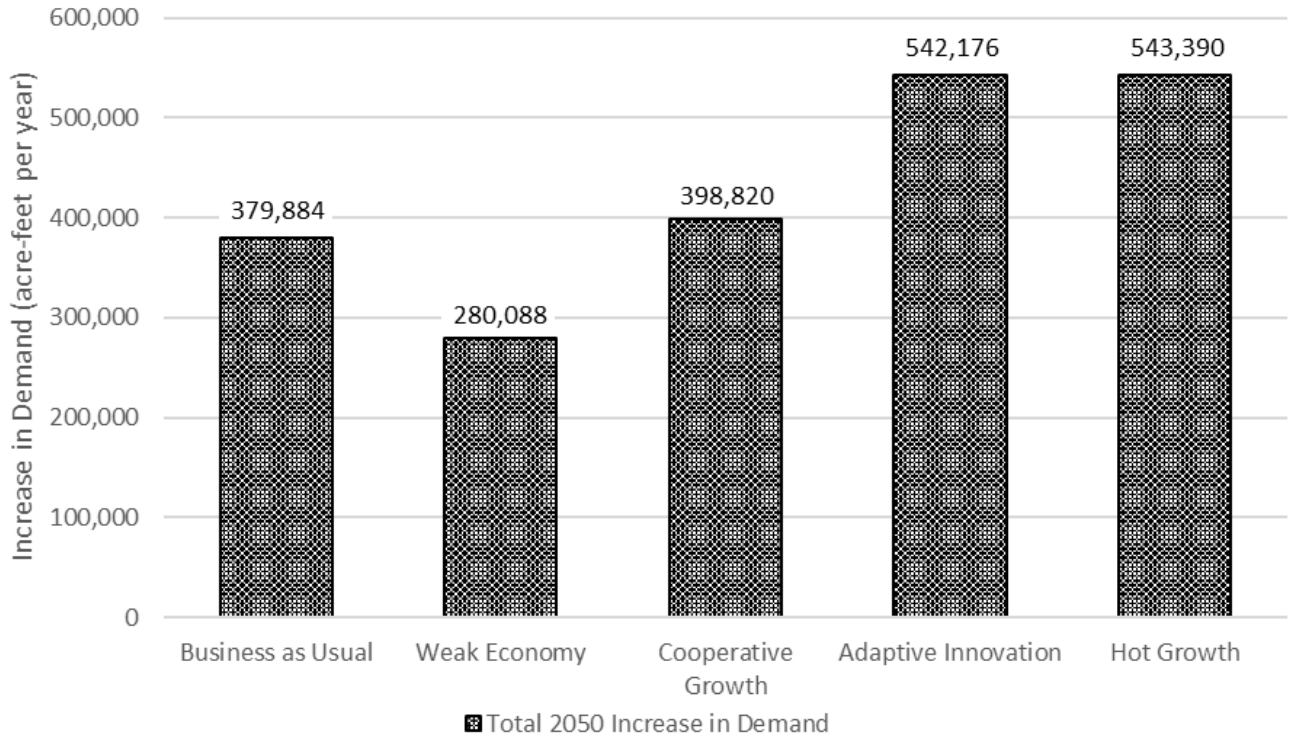


Table 5-1. Increase in South Platte Basin Population by Region: 2015 to 2050

	TECHNICAL UPDATE PLANNING SCENARIO				
Region	**Business as Usual**	**Weak Economy**	**Cooperative Growth**	**Adaptive Innovation**	**Hot Growth**
Northern Region	789,800	537,800	868,800	1,214,400	1,061,100
Upper Mountain Region	15,800	7,100	12,600	20,700	25,100
Denver Metro Region	833,800	675,000	770,600	940,100	999,600
South Metro Region	460,000	373,900	383,200	453,400	550,000
Lower Platte Region	21,800	10,200	17,500	28,400	34,300
High Plains Region	3,200	-900	1,700	5,600	7,600
Basin Total	2,124,400	1,603,100	2,054,400	2,662,600	2,677,700

Methodology to Analyze Strategies to Meet Increase in Demand By 2050

This section describes the range of potential strategies that may be utilized to meet the projected 2050 Increase in Municipal and Industrial Demand in the South Platte Basin and the estimated average annual yield that may be derived as a result of those strategies. These strategies include:

- Conservation Practices
- Recently Completed/Partially Utilized and Planned Projects
- Conceptual Projects
- Agricultural Transfers

An adjustment factor termed "Realization of Yield" was applied to each category of future projects (Planned and Conceptual) and each Technical Update scenario. This adjustment factor takes into account that future projects: may not be implemented, may not produce the anticipated yield, and/or may not operate at their full capacity by 2050.

Additionally, many of the strategies are not tied to a specific location. Therefore, supply was analyzed on a basin-wide level instead of at a regional level.

Portion of Increase in Demand Met by Conservation

The 2015 BIP recognized the success of long-standing conservation practices throughout the South Platte Basin. As summarized in Table 4-4 of the 2015 BIP, between 2000 and 2010, the overall municipal and industrial per capita water use in the portion of the basin represented by the Metro Roundtable declined from 191 gpcd to 155 gpcd. During the same 10-year period, municipal and industrial per capita water use throughout the South Platte basin dropped from 220 gpcd to 188 gpcd.

As part of the Technical Update, municipal water demands were further evaluated and presented for 2015 baseline conditions and for the five planning scenarios. For the Metro Roundtable, the Technical Update found the per capita municipal and industrial water demand under 2015 Baseline conditions to be 141 gpcd, an additional 9% total reduction in gpcd since 2010. For the Remaining South Platte Basin, the Technical Update found the per capita municipal and industrial water demand for 2015 Baseline conditions to be 181 gpcd, an additional 4% reduction in gpcd since 2010. It should be noted that, outside of the Metro Roundtable, reporting of water usage changed between 2010 and 2015, and as a result the actual decrease in per capita water use over this time period may differ from what is reported in the Technical Update.

The Technical Update assumes additional conservation savings will occur between 2015 and 2050 from further implementation of indoor and outdoor conservation measures at levels commensurate with each of the planning scenario narratives. This includes the effect of both active and passive conservation measures. These conservation benefits are embedded in the

demands reported for each planning scenario in the Technical Update. As summarized in Table 5-2, the reduction in additional demand in 2050 as the result of conservation varies among the five planning scenarios, ranging from approximately 3,000 AF/year to as much as 191,000 AF/ year.

Table 5-2. Reduction in Additional Demand Between 2015 and 2050 due to Conservation

Technical Update Planning Scenario	Reduction in Additional Demand Between 2015 and 2050 due to Conservation (AF\year)
Business and Usual	24,900
Weak Economy	30,500
Cooperative Growth	115,100
Adaptive Innovation	191,500
Hot Growth	2,900

Projected Supply from Recently Completed/Partially Utilized and Planned Projects

Recently Completed/Partially Utilized Projects

Several water supply projects were completed following the Technical Update and were therefore not included in the estimates of available supply to meet the 2050 projected Increase in Municipal and Industrial Demand over 2015 baseline conditions. These projects have been included in the estimates of available supply under the category of "Recently Completed/Partially Utilized Projects". These projects are further defined as:

- Projects classified as Completed in the Project Database (see Section 7 for more details on the Project Database that was updated/developed during the BIP update) and identified by stakeholders as being completed since 2015 and/or partially utilized as of the modeling completed in support of the Technical Update.

Recently Completed / Partially Utilized Projects

- Chatfield Storage Reallocation Project
- Plum Creek Diversion & WPF Upgrades
- Prairie Waters Expansion
- Rueter Hess Reservoir Enlargement
- WISE Project
- Westminster Agreement

- It was assumed that 50 percent of the Recently Completed/Partially Utilized Projects yield for municipal providers was available to meet the 2015 baseline demand estimate (i.e., considered as existing supply). The remaining 50 percent of the municipal yield would be available to meet the Increase in Municipal and Industrial Demand beyond 2015 conditions (i.e., considered as future supply).

Planned Projects

Planned Projects include municipal and industrial water supply and reuse projects are defined as:

- Projects classified as Implementing or Planned in the Project Database
- Projects with a yield greater than 1,000 AF
- Projects classified as Tier 1, Tier 2, or Tier 3 with a high likelihood of implementation by 2050 in the Project Database (Project tiers focused on project timing and availability of data. Tier 1 projects are ready for implementation and have good data. Lower tier projects are further from implementation and may not have as much descriptive data. See Section 7 for more information on project tiers).

Planned Projects

- Eagle River Joint Use Project
- NISP
- Northern Water Supply Project (ECCV)
- Windy Gap Firming
- Gross Reservoir Enlargement
- Halligan Reservoir Enlargement
- Denver Water Gravel Pits (D/S Exchanges)
- Parker/LSPWCD Phase 1
- Parker/LSPWCD Phase 2
- Thornton Water Project
- Arvada Highway 93 Lakes
- Terry Ranch ASR
- Firestone Reservoirs
- Castle Rock Reuse
- South Platte and Beebe Draw Well Project - Reuse
- Thornton Reuse
- Wild Horse Reservoir
- Westminster Reclaimed Water

Planned Project yield was based on the estimated portion of the project used for municipal and industrial purposes. Reuse projects assume the estimated annual yield estimate represents the portion of the reuse project yield available to satisfy municipal and industrial needs, and does not include any portion of project yield that may be utilized to satisfy return flow obligations associated with changed water rights.

Realization of Yield for Planned Projects reflects an adjustment for uncertainty associated with project construction and potential for full utilization of projects by 2050, or operational limitations. The following assumptions were used to estimate Realization of Yield factors for Planned Projects:

- **Business as Usual.** A 90 percent Realization of Yield was assumed by 2050 under Business as Usual, and was adjusted for other scenarios relative to Business as Usual. 90 percent is a reasonable reduction factor under the Business as Usual planning scenario because the projects considered in this category include those identified and currently being pursued by water providers. The importance of these projects to meeting the projected Increase in Municipal and Industrial Demand is supported by the size of the gap and the recognition that, even if these projects are implemented, there will continue to be a remaining gap between projected demand and supply.
- **Weak Economy.** 80 percent Realization of Yield under Weak Economy reflects a potential decrease in capital available to fully construct projects by 2050 and potential slower project development as the result of lower-than-expected population growth.
- **Cooperative Growth.** Cooperative Growth Realization of Yield was assumed to be similar to Business as Usual (90 percent). While there will likely be county-level differences between Business as Usual and Cooperative Growth, the statewide population growth trends under the two planning scenarios are similar.
- **Adaptive Innovation and Hot Growth.** Adaptive Innovation and Hot Growth were assumed to have 100 percent Realization of Yield. It is assumed the demand for water will be urgent for these planning scenarios due to higher than predicted population growth and hotter climate.

In addition, reduction factors reflect a high likelihood of project completion given the current level of commitment to these projects by water providers and the possibility that the full yield of planned projects may not come online by 2050.

Projected Supply from Conceptual Projects

Conceptual Projects include municipal and industrial projects defined as:

- Projects classified as Concept in the Project Database
- Projects with a yield greater than 1,000 AF
- Projects classified as Tier 3 or 4 in the Project Database

Conceptual Projects

- Northglenn New Storage Projects
- Coffintop
- Westminster Gravel Storage
- Bear Creek Reallocation
- Ovid Reservoir
- SPROWG
- Group of Projects <1,000 AF

Conceptual Project yield was based on the portion of the project dedicated to municipal and industrial uses. The Project Database included a number of conceptual projects having an estimated municipal and industrial yield of less than 1,000 AF. To reflect the benefits of many of these types of smaller projects being constructed, and in recognition of the fact that use of supply derived from agricultural transfers will require additional projects,

an additional aggregated conceptual project having a projected yield of 10,000 AF was included in the Conceptual Project strategy.

Realization of Yield for Conceptual Projects is an adjustment in yield across planning scenarios to reflect potential reduction in yield due to inability to fully construct and utilize project yield by 2050, operational limitations, reductions due to permitting and/or Water Court decisions, or reductions in yield due to impact of climate change. The following assumptions were used to develop the Realization of Yield factor for Conceptual Projects.

- **Business as Usual.** The Business as Usual scenario was assigned a Realization of Yield factor of 75 percent. This is lower than the value of 90 percent adopted for Recently Completed/Partially Utilized Projects and Planned Projects to reflect the greater uncertainly around Conceptual Projects.
- **Weak Economy.** Under a Weak Economy scenario, it is assumed that completion and full utilization of Planned Projects has slowed down in response to limited funding capacity and lower demand. Compared to the slow down assumed for Planned Projects, it is assumed that construction and completion of Conceptual Projects have an even greater reduction. Therefore, a 25 percent Realization of Yield was adopted for the Weak Economy planning scenario.
- **Adaptive Innovation and Cooperative Growth.** The Adaptive Innovation and Cooperative Growth scenarios were assigned a Realization of Yield of 75 percent because both assume creative solutions that enable high Realization of Yield while balancing other multi-use needs.
- **Hot Growth.** The Hot Growth Realization of Yield at 80 percent is reflective of population continuing to grow at a rate exceeding Business as Usual and a hotter climate increasing water demands.

Projected Supply from Agricultural Transfers

This category of future water supply includes water supplies from agricultural transfers due to urbanization on irrigated lands (Urbanization Yield) or anticipated agricultural transfers in Districts 1 and 64 (Municipal Transfer Yield). Many of the projects included in the Completed/Partially Utilized, Planned, and Conceptual project categories rely on agricultural water transfers for a portion of their supply. Therefore, the estimated yield in this strategy includes only additional water supply from agriculture for municipal and industrial exceeding what may already be captured in Completed/Partially Utilized, Planned, and Conceptual projects. It is recognized in the South Platte River Basin that there is a significant amount of irrigated agriculture land that has already been purchased for municipal use but has not yet been changed in water court or removed from irrigation for transfer to municipal and industrial use. For these reasons, the actual yield from agricultural transfers available to satisfy the 2050 projected Increase in Municipal and Industrial Demand may be higher or lower than presented.

Urbanization Yield

Urbanization Yield is the result of conversion of irrigated lands to developed land due to future urbanization. It represents the historical consumptive use of irrigated acreage located within or directly adjacent to current municipal boundaries.

The maximum estimated yield from this source was based on assumed conversion of 105,900 acres of irrigated land to urban development between 2015 and 2050, as identified in the Technical Update. As presented in the Technical Update, the estimated yield from urbanization is lower under Adaptive Innovation and Hot Growth, primarily due to potential reductions in water supply due to climate adjusted conditions in these scenarios. A lower basinwide total of converted irrigated land was estimated under the Adaptive Innovation and Hot Growth scenarios. This is primarily due to projected reductions to water supply due to climate adjusted conditions in these scenarios.

Urbanization yield was adjusted to reflect potential double accounting of yield with Planned/Conceptual projects, potential for reduction of yield in Water Court, lower potential yield as a result of junior priorities, acknowledgement that acreage may not be urbanized by 2050, or the potential for large portions of land adjacent to current municipalities to remain in agriculture due to open space and land conservation policies. For example, Boulder County and Larimer County have a vision/goal for preservation of agriculture and a planning approach that focuses on using irrigated agriculture buffers around municipal areas.

A 30 percent Realization of Yield was adopted for Business as Usual based on the assumption that not all water from irrigated land will get transferred to municipalities. Some will stay on land, some will not be feasible to transfer, and some will be used for non-municipal purposes. The same assumption was applied to Weak Economy and

Cooperative Growth. The Realization of Yield is higher for Adaptive Innovation and Hot Growth (50 percent) because entities may push harder under these scenarios to utilize this source water if population growth and demand are higher than predicted.

Municipal Transfer Yield

Municipal transfer yield is the estimated municipal and industrial supply from irrigated agriculture served by surface water in Water Districts 1 and 64 that originates from acquisitions, leases, or ATMs. The assumed yield represents the estimated historical consumptive use from 10 to 30 percent (varies across the Planning Scenarios) of irrigated acreage served by surface water in Water Districts 1 and 64.

A Realization of Yield of 50 percent was applied to all scenarios except Weak Economy to reflect the potential for double accounting with yield of Planned and Conceptual projects, and the potential for ATM programs to produce yield that is not fully available for municipal and industrial use by 2050. The lower Realization of Yield in the Weak Economy scenario suggests that water supplies may not be fully needed by 2050 due to lower than predicted population growth and potential lack of funding to support project implementation (including water court administration and infrastructure required to store, convey, and treat transferred agricultural water).

Increase in Supply and Demand By 2050

The combined yield from all identified projects with the estimated 2050 Increase in Municipal and Industrial Demand are presented in Figure 5-7. In this figure, Completed/Partially Utilized and Planned projects are combined, and both sources of Agricultural Water (urbanization and municipal transfers) are combined. The Reduction in Demand due to Conservation reflects the additional conservation savings above 2015 conservation levels. Municipal and industrial water providers will have to invest resources in current and future water conservation programs to achieve these water savings, and in this respect those programs are similar to proposed infrastructure projects in the other strategy categories.

Several observations can be made regarding the South Platte Basin's plans for meeting its future water needs.

- The largest category of sources of future yield is from projects that are currently Completed/Partially Utilized or Planned. Municipal entities have invested considerable resources in identifying and advancing the projects needed to meet a substantial portion of their anticipated 2050 water needs.
- A significant component of future supply will also come from transfers of agricultural water to the municipal sector via a variety of mechanisms

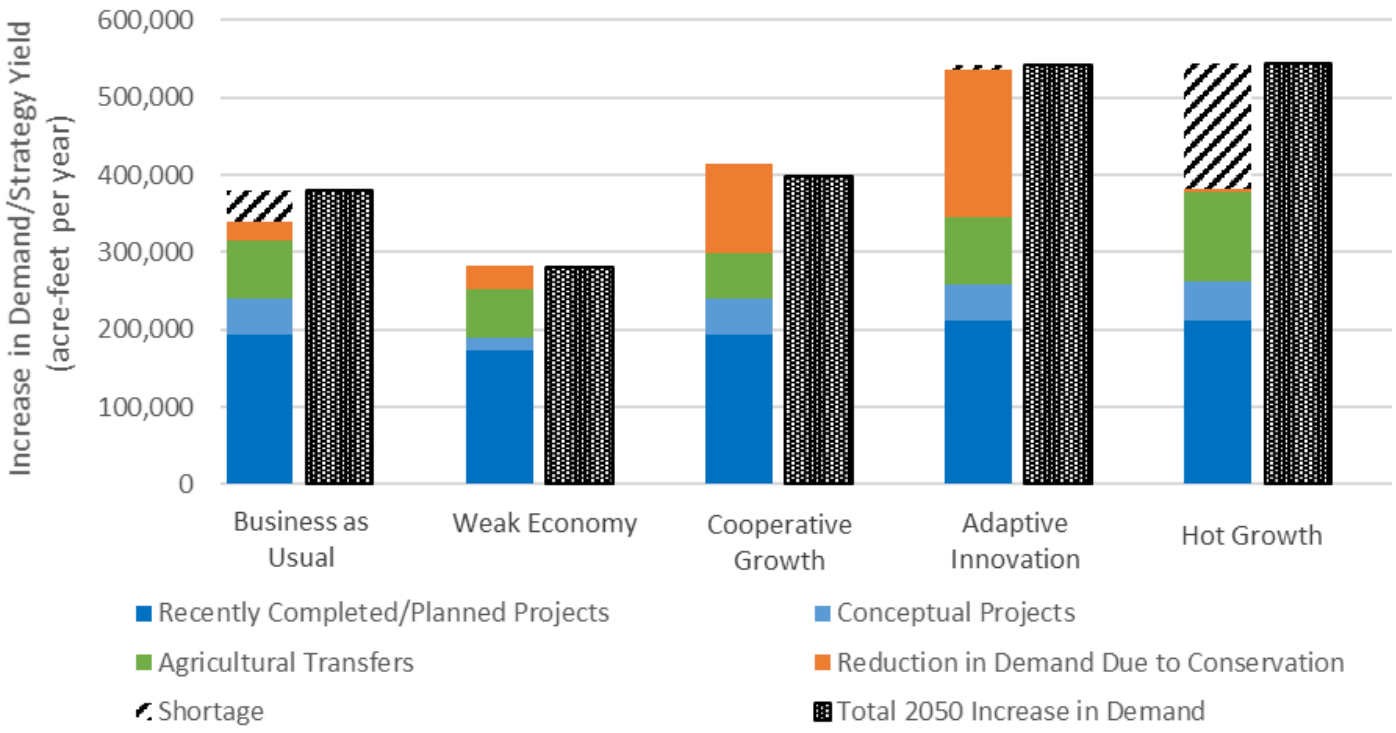


Figure 5-7. Comparison of Municipal and Industrial Strategies to Total 2050 Increase in Demand

including acquisitions, leases, ATMs, and growth over irrigated lands as a result of urbanization. The specific agricultural supply yield shown in the future significantly underrepresents the full amount of water that will be transferred from agriculture to municipal use because many of the Planned and Conceptual projects rely on agricultural supply for their yield. In addition, municipal and industrial water providers are expected to continue to look to agriculture as an important source of supplemental water to improve system resiliency and redundancy, beyond the amounts needed to meet their basic demands.

- Water reuse is an important part of the Basin's water supply strategy. Reuse projects are not highlighted specifically, but make up some of the Completed/ Partially Utilized, Planned, and Conceptual projects shown in the figure.

Based on this analysis, there continues to be remaining Unmet Demand after the yield from all currently identified projects and planned conservation is considered under the Business as Usual, Adaptive Innovation, and Hot Growth Planning Scenarios. The Unmet Demand varies from approximately 6,000 AF to 161,000 AF. This analysis suggests that sufficient supply has been identified and can be developed to meet the expected 2050 increase in demand under the Weak Economy and Cooperative Growth Planning Scenarios. However, a decrease in the Realization of Yield by as little as 5 percent for Planned Projects under Weak Economy, or 10 percent decrease in Realization of Yield under Cooperative Growth, could result in a supply shortage. The sensitivity of this water shortage analysis to the estimated Realization of Yield factor demonstrates the **importance of implementing the previously identified projects while continuing to identify and implement additional water supply projects and strategies. Also, while the basinwide shortage analysis suggests that, in some scenarios, water providers have identified water supply strategies that will meet their collective 2050 needs, individual water providers could struggle to find adequate water supplies and may need to rely on strategies like additional agricultural water transfers or more aggressive water conservation to meet their needs.**

Because this analysis only considered the projected 2050 increase in demand above current (2015) conditions, this analysis also demonstrates **the importance of continued operation and maintenance of existing water projects** so the full yield can continue to be realized. Deterioration of existing municipal and industrial water projects or further operational restrictions used by municipal and industrial water providers would increase the water shortage.

In addition to implementing the previously identified projects, South Platte Basin municipal and industrial water providers could engage in a variety of additional strategies to address the Unmet Demand. Some of these strategies may include:

- Implement more aggressive conservation measures above and beyond those already included in the planning scenario descriptions, including severe watering restrictions during droughts and more limiting landscape ordinances.
- Pursue additional agricultural water transfers either through acquisitions or ATMs.
- Implement additional water reclamation for indirect or direct potable reuse projects that further maximize the benefits of reusable return flows for the municipal and industrial sector.
- Develop additional storage opportunities, conjunctive use projects, and other strategies to capture excess supplies in wet years and make them available during drought years.
- Working collaboratively with the State of Colorado and entities in other basins to develop water supplies outside of the South Platte Basin for the benefit of the entire state.

The particular mix of these and other strategies to address the Unmet Demand will vary by water provider and may change over time in response to new technical innovations, regulatory changes, or other factors (e.g., the technical and social viability of direct potable reuse). It is noted that any of these supplemental strategies could have adverse consequences in the basin related to impacts on the agricultural community, environmental resources, or customer lifestyles, and would involve difficult choices to be made by the municipal water providers and basin stakeholders.

Agriculture

Over three-quarters of the total demand in the South Platte River Basin is associated with irrigated agriculture. Irrigated acreage in the South Platte River Basin steadily increased between the 1950s to the 1980s, driven by the development of supplemental trans-basin and groundwater supplies, reaching over 1 million acres. Irrigated acreage in the basin then began to decline, due in part to the transfer of agricultural water rights over to municipalities (i.e., "buy-and-dry"). The drought of the mid-2000s resulted in another decline in irrigated acreage as augmentation supplies were not sufficient to cover well depletions and acreage served solely by groundwater was taken out of production. Currently about 850,000 acres are irrigated using a mix of groundwater pumping and surface water diversions driven primarily by return flows from upstream irrigators.

Although large population increases are anticipated in and around the Denver Metropolitan area, the concentration of irrigated land that could be urbanized has decreased. Acquisition of senior water rights by "buy-and-dry" methods is also expected to reduce the amount of irrigated land in the basin.

The Republican River Basin has nearly 580,000 irrigated acres, making it one of the highest producing basins of irrigated crops in the state. The basin has very limited surface water supplies and irrigators rely on pumping supplies from the High Plains Aquifer. Nearly all of the fields are served by sprinklers, making efficient use of the pumped supplies. The current amount of irrigated land in the basin is expected to decline in the future. Pursuant to the 2016 agreement between Colorado, Kansas, and Nebraska, irrigated lands will need to be retired to maintain compliance with the Republican River Compact. In addition, declining saturated thickness in the High Plains Aquifer will also lead to the retirement of groundwater-irrigated lands.

The Technical Update agriculture diversion demand represents the amount of water that would need to be diverted or pumped to meet the full crop Irrigation Water Requirement (IWR) or full crop consumptive. This differs from the SWSI 2010 demand, which only reflected water consumptively used by the crops. The diversion demand does not reflect historical irrigation supplies because irrigators often operate under water short conditions and do not have enough supply to fully irrigate their crops.

The current agricultural diversion demand served as the foundational "baseline" for the Technical Update analysis. The five scenarios factor in the pressures of increased urbanization of irrigated lands, increased municipal conversions of agricultural water supplies, limited augmentation supplies, and higher irrigation demands due to a warmer climate by adjusting baseline irrigated acreage and IWR to varying degrees. For the South Platte River Basin, all five scenarios assume 105,900 acres of surface water and 4,800 acres of groundwater-irrigated acreage will be taken out of production due to municipal transfers from urbanization and a lack of augmentation supplies, respectively. An additional 10 to 30 percent reduction in irrigated acreage from potential future agricultural to municipal water transfers was applied to the Lower South Platte based on the planning scenario assumptions. For the Republican River Basin, a 25 percent reduction in irrigated acreage was applied to all scenarios to account for potential losses in acreage from declining High Plains Aquifer water levels. For the three scenarios that assumed a hotter and drier climate, IWR was increased 4 to 24 percent. Varying

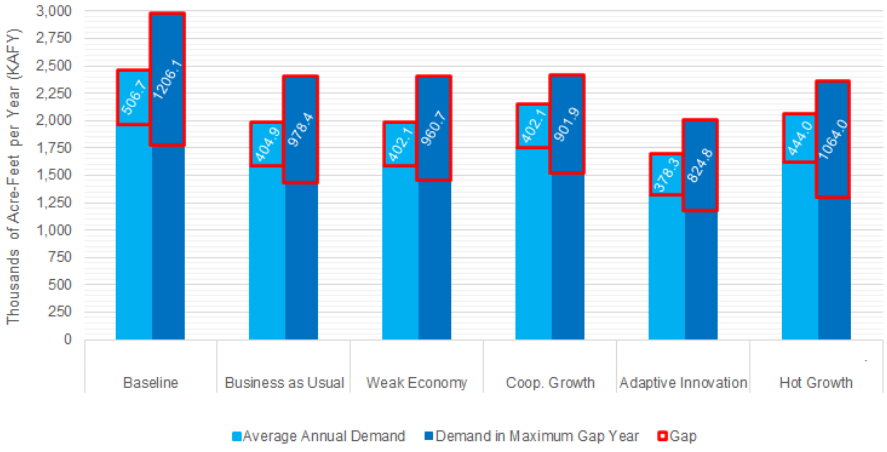


Figure 5-8.
South Platte River Basin-wide Agriculture Annual Demands and Gaps (developed from Tables 4.8.10 and 4.8.13 from Tech Update Volume 1)

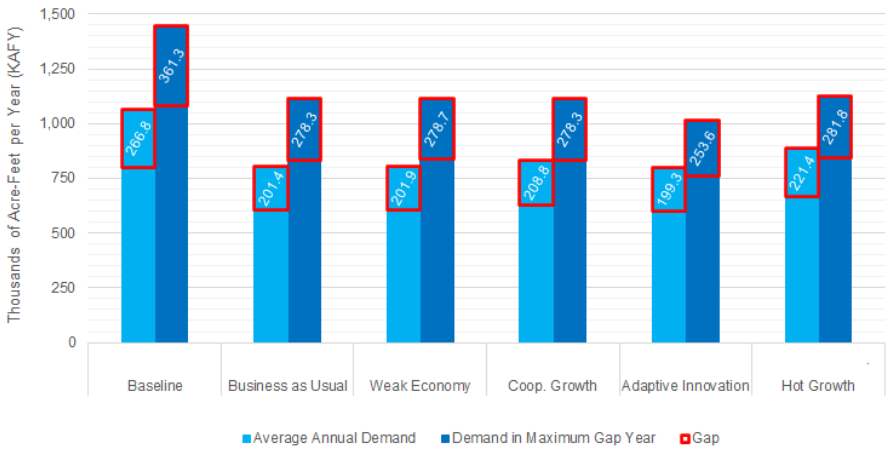


Figure 5-9.
Republican River Basin-wide Agriculture Annual Demands and Gaps (developed from Tables 4.8.10 and 4.8.13 from Tech Update Volume 1)

reductions in future IWR were applied based on input provided by the Agricultural Technical Advisory Group to represent increases in irrigation efficiency and advances in agronomic technologies.

The agricultural gap represents the amount of additional water that would need to be diverted or pumped to meet the remaining crop shortages, i.e., the difference between the amount of water the crops need to meet full IWR and the amount of applied water. The resulting average agricultural gap and gap during critically dry years relative to the demand is reflected in Figure 5-8 and Figure 5-9 for the South Platte and Republican River Basins, respectively.

Future agricultural diversion demands in both the South Platte and Republican River Basins are anticipated to be lower in the future due primarily to the loss of irrigated land. While assumptions of a warmer climate increase IWR in Cooperative Growth, Adaptive Innovation, and Hot Growth, the loss of irrigated land may offset the additional IWR demand, resulting in lower future demands. The agricultural gaps on average are substantial and are projected to more than double during critically dry years. Note, however, that despite the decline in agricultural demand, the percent gap for all scenarios is similar to baseline conditions, indicating the remaining irrigated acreage projected gap levels are consistent with currently experienced shortages.

The largest separation of results across the Planning Scenarios is experienced by the Adaptive Innovation and Hot Growth, which tend to project larger gaps during the average to above-average hydrological year. Agricultural diversion demands in the South Platte Basin are relatively consistent in wet, average, and dry years due to surface water irrigation system efficiencies that fluctuate in differing hydrologic conditions. In addition to hydrologic conditions, gap results are also impacted by the availability of supplemental storage, groundwater, and trans-basin supplies. Republican River Basin irrigation is provided from groundwater, and system efficiencies of wells do not fluctuate. As a result, agricultural diversion demands in the Republican River Basin change to a greater degree in response to weather conditions.

Environmental and Recreational

Reduction in stream flows due to further development of water supplies as well as the reduction of return flows from agricultural and municipal uses can impact aquatic, riparian, and wetland habitat. Hydrologic connectivity is important for many aquatic species, as it allows passage both up and downriver. Dry-up locations along the South Platte River and its tributaries break hydrologic connectivity and habitat is fragmented.

The Colorado Environment and Recreation Flow Tool (Flow Tool) was developed as part of the Technical Update to refine, categorize, and prioritize environmental and recreational projects and methods through an improved understanding of flow needs and potential flow impairments, both existing and projected. The Flow Tool uses hydrologic data from Colorado Decision Support System (CDSS), additional modeled hydrologic data for various planning scenarios, and established flow-ecology relationships to assess flow-related risks to environmental and recreational attribute categories at preselected gauges across the state.

The Flow Tool estimates the relative risk to environmental and recreational attributes in rivers under various hydrologic scenarios. Data-derived relationships were developed for riparian/wetland plants, coldwater fish, warmwater fish, and plains fish. Other metrics were

developed with basic, well-established relationships between hydrology and stream ecology. Eight water allocation model nodes were selected for the Flow Tool within the South Platte Basin to visualize changes in flow regime and risks to environmental and recreational attributes under existing and future conditions associated with the five planning scenarios. A map of the Flow Tool is presented in Figure 5-10.

In several locations in the mountains and foothills, Cooperative Growth, Adaptive Innovation, and Hot Growth project variable responses to peak flows, in some cases increasing peak flow (thus improving or maintaining risk to plants and fish habitat) and in other cases diminishing peak flows and increasing risk to riparian/wetlands and fish habitat to high or very high. In the mountains and foothills, Cooperative Growth, Adaptive Innovation, and Hot Growth project diminished mid- and late-summer flows, increasing risk to fish. This risk may remain moderate; however, the metric used to assess risk for fish does not include the month of July because historically July flows are sufficient.

Under Cooperative Growth, Adaptive Innovation, and Hot Growth, July flows may drop substantially, increasing risk for fish. On the plains, especially east of Interstate 25, flow conditions are projected to be poor for all aspects of ecosystem health. Peak flows for riparian/wetlands are high risk under baseline conditions and are projected to remain so under all scenarios. Mid- and late- summer flows are very high risk for plains fishes and risk is projected to increase under all future scenarios. The recreational in-channel diversions may be met less often in the future.

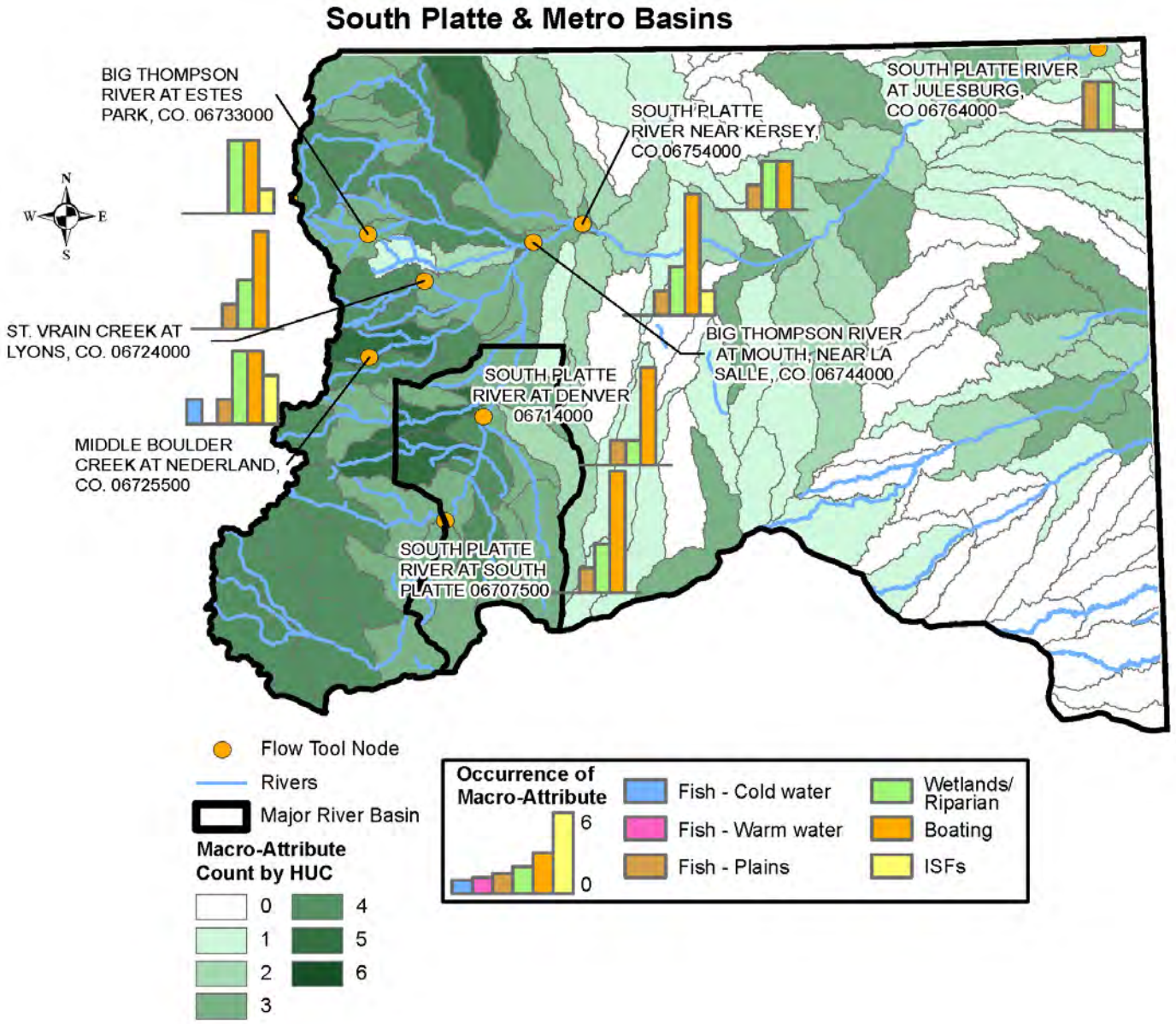


Figure 5-10. Flow Tool Map

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 environmental and recreational 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.

During the 2015 BIP effort, the South Platte and Metro BRTs reviewed and updated their Focus Area maps to incorporate additional focus areas, including:

- Several areas near canyon mouths of various Front Range tributaries to the South Platte River
- Reaches in Park County with significant riparian plant communities as well as recreational attributes not previously mapped

During the current BIP update effort, the E&R subcommittee of the roundtables determined that new focus areas should be added that reflect recreational reservoirs (e.g., Cherry Creek, Spinney, Jackson); wetland habitats and warm water sloughs along the Lower South Platte; and the Poudre headwaters (recovery area for threatened Greenback cutthroat trout). The subcommittee is compiling updated attribute mapping, and the resulting focus areas will be added in the future. Figure 9 shows the current Focus Area map for the South Platte and Metro BRTs. The E&R subcommittee also expressed a need to consider additional spatial data (e.g. burn scar mapping and areas vulnerable to future fires) during future updates to the Focus Area maps or during the development of analysis tools that could provide supplemental information useful for prioritizing SMPs and other proactive watershed health enhancement activities.

The South Platte and Metro BRTs see the Focus Area map as a tool for communicating where the roundtables would like to prioritize projects, helping to align goals and funding for projects, and collaborating with water project proponents on ways to create multi-benefit projects.

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**

More information on the Focus Area map and details on specific focus area reaches are included in Appendix B of the 2015 South Platte BIP.

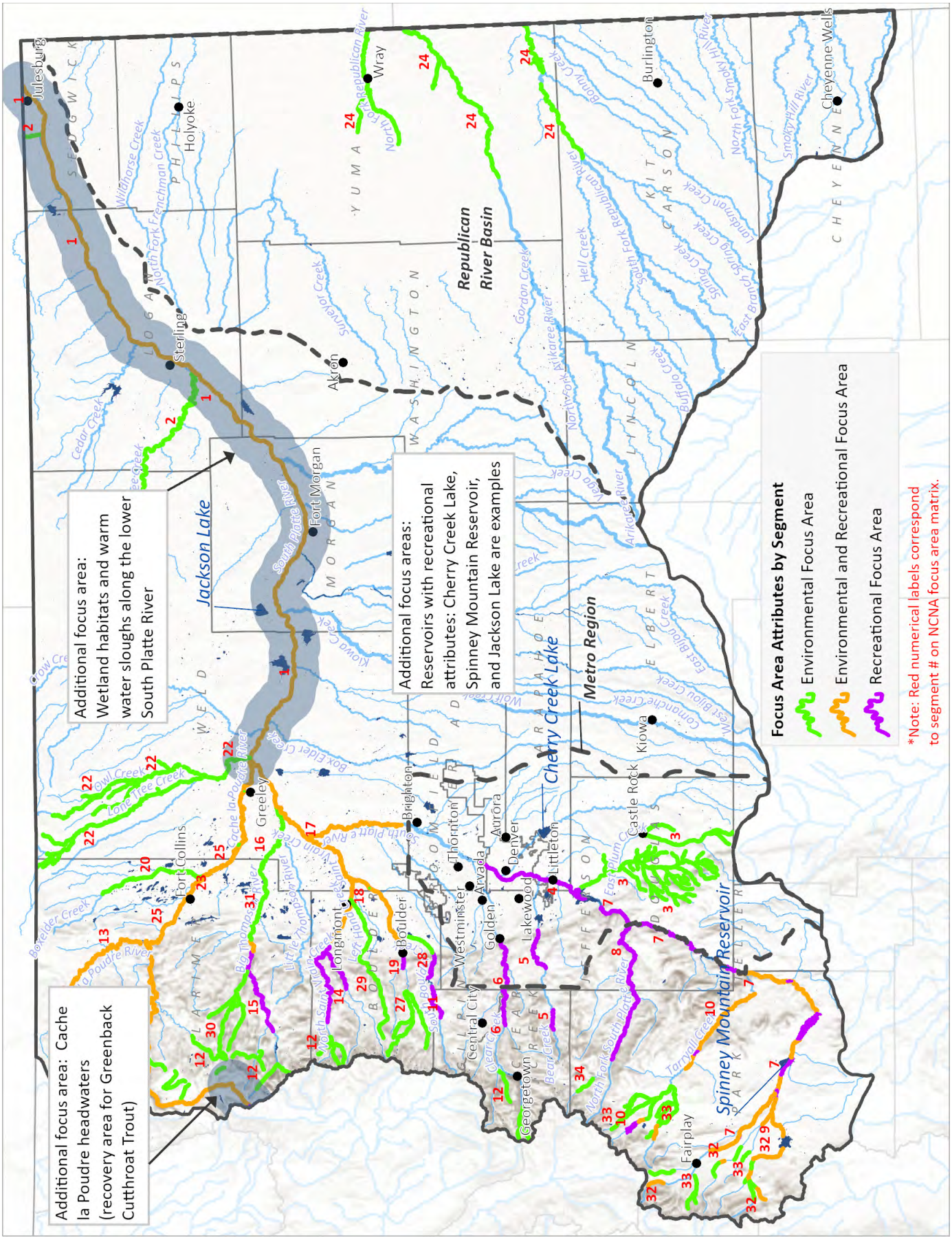


Figure 5-11. Focus Area Map

Section 6. Goals, Strategies, and Measurable Outcomes

The South Platte Basin has adopted 12 goals for managing the water resources of the basin. The South Platte BIP outlines strategies to meet each of these goals. Where applicable, strategies include measurable outcomes as a mechanism to track goal achievement. To monitor implementation activities that are conducted by either the roundtable or stakeholders, a joint South Platte and Metro BIP Implementation Committee will be formed to track and support implementation of strategies and measurable outcomes within the authority of the roundtables (example committee support activities: funding projects consistent with measurable outcomes, identifying common objectives among stakeholders and fostering joint project efforts, encouraging stakeholders to pursue projects and strategies that are consistent with measurable outcomes, and educating stakeholders).

This section describes each goal and lists the associated strategies and measurable outcomes. In addition, the subsection for each goal includes a discussion of unique opportunities for achieving that goal in the South Platte Basin.

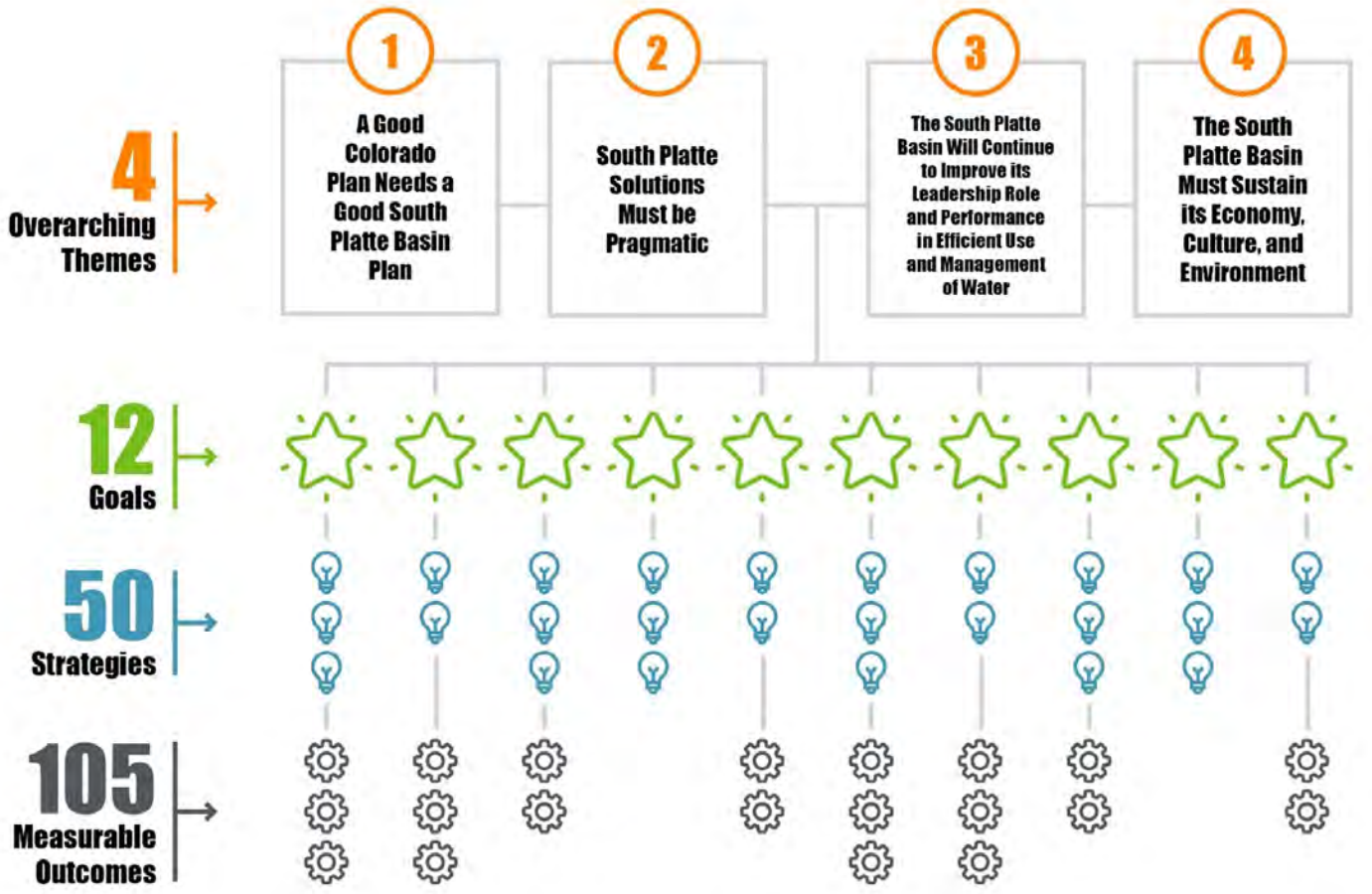


Figure 6 1. Updated BIP Organization

POINT OF VIEW FOR MEASURABLE OUTCOMES

The measurable outcomes for each goal and strategy were written as viewed from a future standpoint. In other words, the measurable outcome describes what was achieved through the successful implementation of the strategy.

Goal 1:
Encourage Implementation of Projects

The South Platte Basin will encourage the implementation of identified projects that meet existing and future municipal and industrial, agricultural, and environmental/recreational water needs.

STRATEGIES	MEASURABLE OUTCOMES
1.A: Promote implementation of identified projects for all water user categories, with emphasis on Tier 1, Tier 2, and Tier 3 projects.	• Developed a system consistent with state guidance to check in with project proponents, track the status of identified projects, incorporate additional project data into the projects database, and communicate the status of project implementation back to the South Platte and Metro Roundtables. • Developed a system consistent with state guidance to add new projects to the projects database. • Tracked ongoing challenges related to project implementation. • Tracked advancement of projects across tiers (i.e., projects moving from Tier 3 to Tier 2 or Tier 2 to Tier 1).
1.B: Work with project proponents to identify project funding opportunities.	• Documented successful funding mechanisms applied to projects within the basin. • Documented successful collaborations and partnerships that resulted in project implementation.

Opportunities for Regionalization and System Interconnections

In the South Platte Basin there may be options for regionalization and additional system interconnections, such as the WISE Project developed jointly by Denver Water, Aurora Water, and the South Metro Water Supply Authority, that will help share water supply risks. Unlike previously developed system interconnections and regional water projects, development and implementation of future projects is projected to be more challenging and take longer as a result of limited and dispersed water supplies, increased cost, permitting and regulatory challenges, and the increased amount of stakeholder engagement required throughout the project lifecycle. The underlying issues have existed for decades and considerable effort has been applied and will continue to be required to identify and implement creative solutions involving regional or interconnected systems.

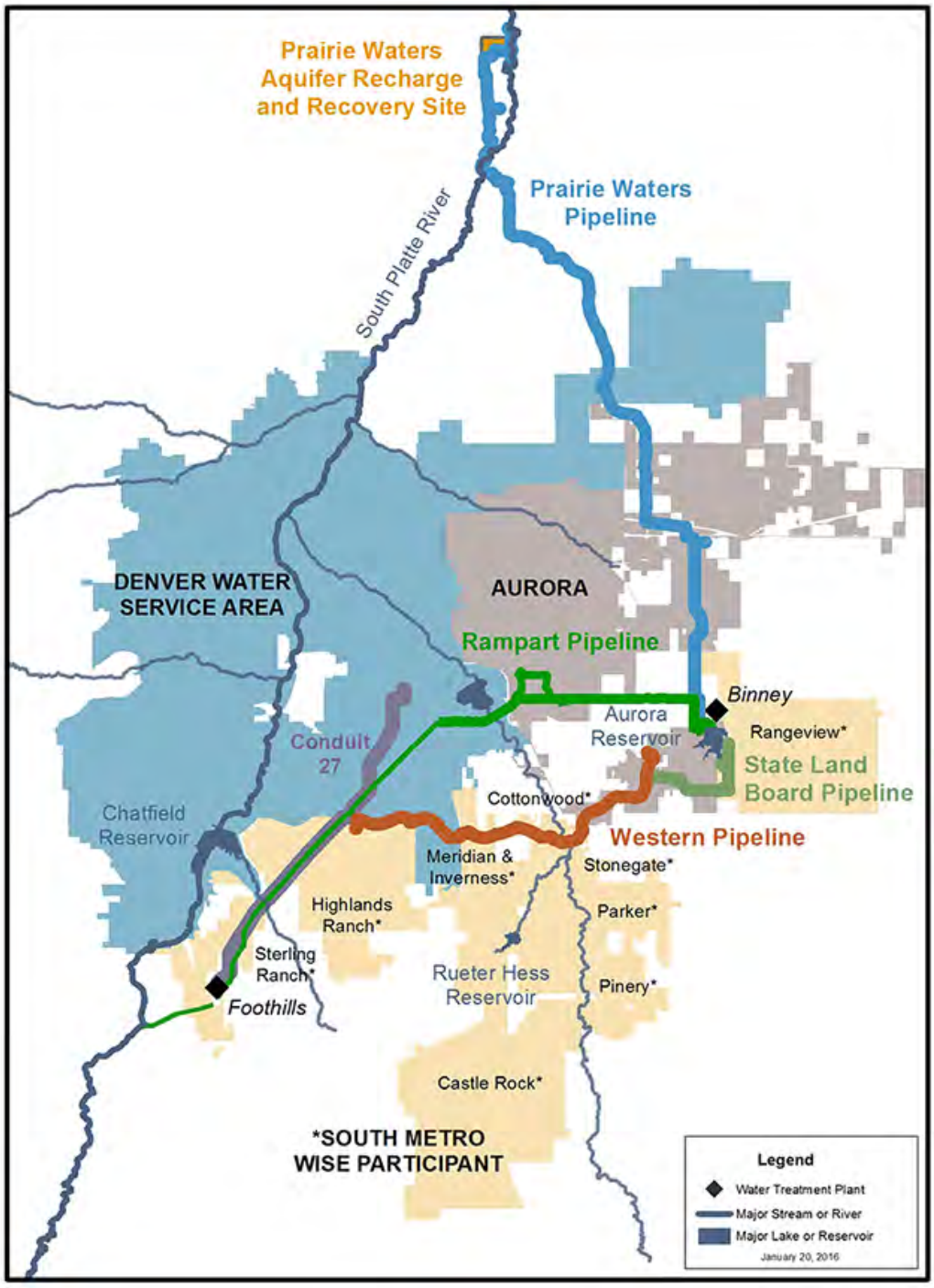


Figure 6-2. WISE System (https://www.denverwater.org/your-water/water-supply-and-planning/wise)

Goal 2:

Maximize Development of Native South Platte Supplies

The South Platte Basin will collaboratively develop new projects to maximize the use and effectiveness of existing native surface and groundwater supplies.

STRATEGIES	MEASURABLE OUTCOMES
2.A: Collaboratively develop multi-purpose (e.g., municipal, industrial, agricultural, environmental, and recreational) projects. These projects may include storage, conveyance, and system interconnections that promote basinwide water use efficiency and enhance supply reliability while maintaining compliance with the prior appropriation doctrine.	• Documented multi-purpose projects on the projects database, specifically the resulting yield for different water uses and the project partners. • Supported funding requests to advance multipurpose projects.
2.B: Develop methods and projects to more effectively use available groundwater supplies to supplement existing developed supplies and/or to provide additional yield and resilience using conjunctive surface/groundwater storage strategies (ASR and alluvial recharge).	• Documented projects on the project database that use available groundwater supplies to supplement existing developed supplies and/or create additional resilience via conjunctive surface/groundwater storage strategies.
2.C: Encourage sharing of data and information related to best practices, effective methods, and technological advancements that support the maximized use of existing native South Platte supplies.	• Asked Water Supply Reserve Fund (WSRF) grant recipients to describe best practices, effective methods, and/or technological advancements that supported the maximized use of existing native South Platte supplies in their deliverables. • Created a library of WSRF grants and other projects success stories, lessons learned, best practices, effective methods, and technological advancements and shared on the South Platte Basin website.

Opportunities for Multi-Purpose Projects

Cooperative, multipurpose projects provide benefits to more than one type of water user in the basin and can benefit diverse water needs including one or more of the following: municipal, industrial, agricultural, recreational and environmental.

Multipurpose projects can assist in protecting or enhancing environmental and recreational attributes. Project proponents of municipal and industrial projects and new Colorado River supply projects can work with environmental and recreational interests to potentially identify additional funding sources to construct projects that enhance attributes in the project area. Irrigation of agricultural lands and return flows from such irrigation often provide habitat or streamflows that can benefit environmental and recreational uses. Opportunities also exist for cooperative operation, optimization, and enhancement of infrastructure to assist in enhancing environmental and recreational attributes.

Goal 3:

Maintain and Promote Municipal and Industrial Conservation and Efficiency

Municipal and industrial water users in the Metro and South Platte Basins will maintain their leadership role in conservation in the state of Colorado, recognizing that limited water supplies and a robust population drive the application of conservation best practices within the basin and throughout the state. Future conservation and efficiency efforts can reduce adverse environmental and social impacts of new supply development, help mitigate the impacts of climate change, and also maintain or improve valuable environmental and social benefits of urban landscapes.

STRATEGIES	MEASURABLE OUTCOMES
3.A: Establish baselines against which future efficiency improvements can be assessed for effectiveness, recognizing the range of use characteristics across the basin, levels of efficiency improvements already achieved, and the challenges/tradeoffs of achieving additional efficiencies	• Developed appropriate water efficiency baseline data and methods; data will be available for use in the next BIP update.
3.B: Support the development and distribution of educational materials to promote "best management practices" for municipal and industrial water providers	• Posted links to CWCB-supported municipal water efficiency guidance documents on the South Platte Basin website.
3.C: Encourage innovation and efficiency improvements	• BRTs supported funding requests for innovative water efficiency studies and demonstration projects. • Performed analysis of efficiency goals (from both water-savings and economic standpoints) for different areas in the South Platte Basin using available data on existing use. • Developed specific efficiency recommendations in concert with water providers for different areas in the South Platte Basin using available data on existing use. • Supported funding requests for continuation and expansion of existing water efficiency programs, particularly in under-resourced communities. • Supported education related to on-site, non-potable supply alternatives, graywater use and rainwater capture. • Supported locally-driven funding requests for on-site water supply alternatives such as graywater and rainwater capture that are appropriate given the differing water portfolios and use constraints in basin communities.

STRATEGIES	MEASURABLE OUTCOMES
3.D: Identify and evaluate the range of benefits provided by urban landscapes and green spaces to make informed decisions on the most appropriate conservation and efficiency measures	• Conducted study of the benefits of urban landscapes and green open spaces (e.g., parks, playgrounds, trails, urban agriculture, among others) in the South Platte Basin, which recognizes the importance of urban landscapes to communities (especially disadvantaged) without access to other opportunities for recreation and enjoyment of nature; study will be available for use in the next BIP update.
3.E: Promote and encourage implementation of wise land use planning strategies that provide a desirable quality of life while minimizing the demand for water for existing and new development	• Provided links to CWCB guidance documents on integrating water resources and land use planning on the South Platte Basin website. • Tracked the increase in the number of municipal water providers that included land use strategies in water supply plans. • Tracked the increase in the number of municipal water providers or municipalities that incorporated water efficiency measures in land use planning. • Supported funding requests to further local integrated water and land use planning efforts (e.g., educational workshops, Comprehensive Plan updates, landscaping standards, etc.).
3.F: Support and promote water efficient landscaping	• Supported funding requests for development, evaluation, or implementation of updated landscaping standards that promote water efficient landscaping and include elements such as limits on non-essential turf in new development, funding for local turf replacement programs, and targeted education and outreach on water efficient landscaping opportunities. • Supported funding of research on vegetation appropriate to potentially warmer and/or drier future conditions in urban/suburban landscapes and best-practices for landscape replacement and maintenance. • Supported feasibility study of state-funded program to provide matching funds for local turf replacement rebate programs. • Supported developing a catalog of resources on South Platte Basin website on water-efficient landscaping, including, for example, guidance on replacement of non-essential turf, water efficient landscaping standards, financing and funding opportunities to promote turf replacement, and economic data on water-efficient landscapes. • Tracked the increase in the number of municipalities that developed or implemented non-essential turf replacement incentive programs. • Supported funding requests for landscape and irrigation professional certification courses that include climate-specific best practices. • Tracked the increase in municipalities that supported and/or offered landscape and irrigation professional certification courses.

Conservation Opportunities

Passive savings are those water savings that result from the impacts of plumbing codes, ordinances and standards that improve the efficiency of water use such as those that promote or require the use of high efficiency water fixtures and appliances.

Active conservation savings are the result of education and outreach, financial incentives, and other programs by municipal water users or other organizations designed intentionally to affect water user behavior and water use practices. Both types of conservation savings are achievable by municipal water providers in the South Platte Basin.

Water Efficiency Plans

Water efficiency plans for municipal water providers in the South Platte Basin typically incorporate a mix of the following strategies.

Water Rates and Tap Fees. Water efficiency pricing has been one of the most effective methods in influencing customer behavior and reducing water use.

System Loss Management and Control. Leaks in water distribution systems can reduce the system's effectiveness and impact overall profitability.

Data Tracking. Metering and data collection have been shown to have the effect of reducing customer water use by informing customers of their uses and the impact of water charges. It makes sense from a practical business perspective to initially invest in a means to track water usage and identify areas where water efficiency can be improved. These areas can then be targeted with other demand management activities.

Targeted Technical Assistance and Incentives. A collection of activities that rely on indoor water-efficient technologies and water-wise outdoor practices.

Ordinances and Regulations. A series of ordinances and regulations that promote or enforce water efficiency.

Educational Activities. A variety of techniques and venues to convey water efficiency information to the public.

There are currently 40 water providers within the South Platte Basin with formal water efficiency plans filed with the CWCB; each plan is tailored to conditions of the community and the system.

Conservation Successes

The Metro and South Platte Basin have long-standing conservation practices that are nationally known for their rigor and have documented success. The 2015 South Platte BIP demonstrated reductions in gallons per capita per day (gpcd) by 15 to 19 percent from 2000 to 2010. Results from the Technical Update demonstrate continued reduction of 4 to 9 percent between 2010 and 2015, and a total of 18 to 26 percent in 2015 compared to 2000.

Table 6-1. Total GPCD for Metro and South Platte Basins from 2000 to 2015

Year	Metro	South Platte
2000[1]	191	220
2010[1]	155	188
2015[2]	141	181

[1] *SWSI*

[2] *Technical Update*

It is noted that per capita water use values for municipal entities expressed as gallons per capita per day can vary widely between entities based on a number of factors, including the mix of residential and nonresidential customers, the presence of large commercial or industrial water users (e.g., factories, universities), and differences in how they compute and report the value. Thus, a simple comparison of gpcd as a metric of water use efficiency can be misleading without further background and justification.

Integrating Land and Water Resource Planning

Traditionally, responsibility for municipal water resource management and land use planning has been siloed in different departments or entities. However, the way new development occurs can have a major impact on municipal water demand as well as the health of the watershed in which it resides. This section highlights the importance of bringing water resource management and land use planning in line with one another in the South Platte Basin as indicated in Strategy 3E, and in doing so, shifting the focus from supply to demand side management.

Colorado's growing population puts pressure on the state's already limited water resources. This is especially true in the fast-growing and water-scarce South Platte Basin. Growing demands for water escalate the costs of operating local utilities, accelerate the need for enhanced and expanded infrastructure, and increase the competition and cost for acquiring new water sources. In the past, water resource managers and water providers have turned to supply side management to meet growing demand by investing in water acquisition, treatment, and storage and distribution projects. However, these options come with a significant price tag and can be time and resource intensive.

An alternative to these costly investments is more efficient use of existing supplies. Increasingly, communities are turning to demand side management—an approach that seeks to reduce the demand for water.

One of the more promising strategies in water demand management is integrating land use planning with water conservation and efficiency. Communities throughout the west have found that by pursuing aggressive conservation programs like increasing development density, installing climate-appropriate landscapes, and promoting technological advancements, they can continue to grow while reducing and delaying the need for acquiring new supplies. Water-smart development employing efficiency and conservation measures can reduce the negative financial impacts of increased water demand prior to, during, and after construction. This approach increases the cost-to-benefit ratio of capital investments in water-related infrastructure by using the same amount of water and infrastructure to serve more people. This approach benefits the environment, ensures a more sustainable future, and is good for the bottom line.

STRATEGIES AND RESOURCES

A number of resources have been used by South Platte Basin entities to promote the concept of integrated water and land use planning. Four are described briefly in the following sections.

Colorado WaterWise. Colorado WaterWise prepared a Guidebook of Best Practices for Municipal Water Conservation in Colorado (2010). The Guidebook highlights three best practices for regulations applicable to new development and redevelopment that link land development decisions to efficient water use.

Table 6-2. Colorado WaterWise Guidebook

Best Practice	Description
Rules and regulations for landscape design and installation and certification of landscape professionals	This best practice creates landscapes that are "water smart from the start." Creating rules for new landscape and irrigation system design and installation is a relatively inexpensive way for the utility to affect landscape water use. Minimum training requirements and certification for landscape irrigation professionals help ensure that landscapes and irrigation systems meet mandated standards
Water efficient design, installation, and maintenance practices for new and existing landscapes	Design, installation, and maintenance of landscapes and irrigation systems can greatly impact water use. This best practice maximizes water efficiency through the proper design, installation, and maintenance of new and existing landscapes and irrigation systems.
Rules for new construction – residential and nonresidential	Water conservation measures that are "built in" to new buildings can help slow the growth of new water demands. This best practice describes water efficiency specifications that water utilities can make voluntary or mandatory for new residential and non-residential development within their service areas.

Source: Colorado WaterWise, Guidebook of Best Practices for Municipal Water Conservation in Colorado, Table 3-2.

Colorado Water Conservation Board. CWCB followed up with an addendum in 2019 titled Best Practices for Implementing Water Conservation and Demand Management Through Land Use Planning Efforts. This document describes the foundational activities of:

- Coordinating between the water provider and the planning department
- Aligning data and information used for water and land use planning
- Establishing procedures for post-occupancy monitoring and enforcement
- Integrating water considerations into the development review process
- Integrating long-term water supply and land use planning

American Planning Association. American Planning Association has developed a Policy Guide on Water in 2016 that emphasizes the importance of integrated land and water supply planning. The Policy Guide recognizes:

> *"…the importance of water as a central and essential organizing element in healthy environments along with the importance of planning to ensure that land-use, environmental and infrastructure planning for water will increase resilience to extreme events and climate change. However, the report also acknowledges that new mechanisms for interdisciplinary efforts are critical to effective water management and the protection of the water environment."*

The Policy Guide includes the following objective for integrated planning of land and water development:

> *"Land development plans should seek to achieve development that results in sustainable land use patterns coupled with the efficient use of scarce and/or oversubscribed water supplies, by: protecting surface and groundwater supplies; promoting efficient water conveyance and use; protecting water quality; and facilitating water conservation, water reuse, nutrient, and energy recovery; and local storage."*

Growing Water Smart. Growing Water Smart is an outreach program of the Sonoran Institute to promote integrated land and water planning (Sonoran Institute 2021). Growing Water Smart workshops have been conducted annually in Colorado for several years. The workshops are focused on city and town officials, water providers, and planners. They offer tools, knowledge, and resources to increase sustainability and create water smart communities even as populations grow. The Growing Water Smart program introduces communities to the full range of communication, public engagement, planning, and policy implementation tools available to realize their watershed health and community resiliency goals.

SOUTH PLATTE BASIN HIGHLIGHTS

Growing Water Smart Workshops. Several communities in the northern Front Range portion of the South Platte Basin have participated in the Growing Water Smart workshops.

Table 6-3. Communities that have Participated in Growing Water Smart Workshops

Community *(year participated)*	Action Plan Goals and Outcomes
Weld County (2019)	Increased water provider coordination and a water section update for their comprehensive plan.
Town of Platteville (2020)	Draft landscape code and comprehensive plan update
City of Longmont (2020)	Align City plans, programs, and processes with water efficiency goals.
City of Greeley (2019)	Increased regional collaboration and information sharing
City of Evans (2019)	Completion of the City's Water Efficiency Plan
City of Fort Collins (2017)	Increased coordination among water providers; updated City Comprehensive Plan and the North Front Range Metropolitan Planning Organization Transportation Plan
Boulder County (2019)	A roadmap for developing a Comprehensive Water Supply Study
Town of Berthoud (2020)	Add demand management policies to their comprehensive plan

Goal 4:
Maintain and Promote Reuse

Municipal and industrial water users in the South Platte Basin will explore opportunities to expand their existing reuse practices and programs. Limited native water supplies drive the need for a broad application of water reuse practices of reusable supplies within the South Platte Basin

STRATEGIES	MEASURABLE OUTCOMES
4.A: Support and promote opportunities to increase current levels of municipal and industrial water reuse, including adoption of new DPR regulations, while considering other water users	• Supported state-adopted new DPR regulations by 2023. • Advanced South Platte Regional Opportunities Water Group (SPROWG) and other regional water sharing/reuse projects/ concepts. • New and updated integrated water resource plans and water efficiency plans were evaluated and integrated reuse where feasible, specifically with a focus on new reuse opportunities.
4.B: Support studies to help municipalities evaluate the trade-offs of new reuse projects, including the impacts of: • Additional municipal and industrial water conservation on water available for reuse • Additional municipal and industrial water reuse in relation to water available for exchanges • Additional reuse on agricultural and environmental and recreational water uses within the South Platte Basin. • The sudden reduction or loss of access to first use trans-basin reusable water supplies (e.g., Colorado River Compact administration), to assess the level of risk from overreliance on reuse, to explore acceptable levels of reuse in this context, as well as ways that such risk may be managed and mitigated	• BRTs supported funding requests that identify trade-offs of new reuse projects and consider ways to mitigate negative impacts.
4.C: Advocate for policy, funding, and regulations that promote safe and effective reuse throughout the South Platte Basin and Colorado. Consider supporting legislation that is supportive and helpful to advance reuse while preserving autonomy, flexibility, and options.	• BRTs supported funding requests for activities that inform non-potable reuse risk analysis to ascertain regulatory requirements necessary for Regulation 84 to expand the use of reclaimed water and protect public health and the environment • BRTs supported funding requests for activities that assist in DPR rulemaking
4.D: Support outreach efforts to improve policymaker and public understanding of water reclamation and reuse	• Considered environmental and social justice issues in key reuse stakeholder processes, reuse projects, and regulations • Achieved robust and diverse stakeholder participation in regulatory processes, new pilot projects, new research, and new use evaluations • Applied previously created outreach and communications tools that help shape outreach efforts and gauge public acceptance of reuse

STRATEGIES	MEASURABLE OUTCOMES
4.E: Promote research and implementation of new innovations, technologies, processes, and collaborations that could be adopted by municipal and industrial water providers to increase reuse opportunities	• BRTs supported funding requests for pilots that highlight proof of concept for new reclaimed water uses and technologies, with emphasis on those that will likely have the most meaningful impact
4.F: Support and promote efforts to secure additional and reliable funding of state, county, or municipal regulatory processes and ongoing administration that facilitate increasing reuse.	• State and local regulatory agencies were adequately funded to implement DPR regulations by 2024 • Local entities and reuse organizations continued to provide financial support to regulatory agencies for updates to regulations

Reuse Opportunities

Many municipal and industrial users in the South Platte Basin have existing consumable return flows that may be reused to the maximum extent practicable. Colorado water law defines what water supplies can be reused, and to the extent each source can be reused. Currently there are a limited number of sources that can legally be reused in Colorado. They include:

- Nonnative water
- Agricultural-municipal water transfers
- Nontributary groundwater
- Other diverted water with a decreed reuse right

Reusable water can be recovered after first use using a variety of mechanisms, including river exchanges, engineered conveyance systems, recycled water plants, and onsite grey water and black water systems.

Reusable return flows may be put to beneficial use in several different ways, including:

- Non-potable applications (outdoor landscape irrigation, industrial water)
- Indirect potable reuse
- Direct potable reuse
- Augmentation supply for replacing out-of-priority diversions

In the Denver Metro and North Front Range areas, reuse is being pursued by many water providers that own reusable supplies. The potential for future water rights exchanges of effluent will be considerably less in the Denver and South Metro areas as most of the exchange potential has already been allocated by existing exchange water rights applications. These exchanges, however, will continue to be made when and where feasible.

Direct reuse of effluent has been largely focused on nonpotable uses, such as irrigation of parks and golf courses, though other nonpotable uses are becoming more prevalent (e.g., power plant cooling water supply). Examples include Denver Water's Reclaimed Water Treatment Facility, Westminster's Reclaimed Water Facility, and Aurora's Sand Creek Recycling Plant.

Examples of indirect reuse for potable purposes include Aurora's Prairie Waters project and the WISE project, which both capture reusable return flows in the South Platte River below Denver and pump them back for use by Aurora and South Metro entities after blending with other supplies.

Limitations of Reuse

Several factors will limit the amount of potential reuse that can be used to meet future demands in the South Platte Basin.

- Losses within water supply systems (e.g., river transit losses, ditch and reservoir losses) and losses within the reclaimed water collection, treatment, and distribution systems all reduce the amount of available reusable return flows.
- There is a difference in timing between when during the year supply is available and when it is needed.
- High-quality blending water is often needed to offset the poor-quality reuse sources to achieve reuse or treatability objectives.
- Expensive advanced water treatment and brine disposal processes are needed to treat lower South Platte River water for potable use or ASR.
- Additional municipal conservation will reduce the percentage of return flows originating from reusable supplies.
- A warmer or drier climate could substantially reduce supplies and increase water use, which impacts the ability to operate river exchanges.

On a local level, reuse can increase supply for the water user reusing its return flows. However, on a larger basin scale, reuse does not have the same benefit of increased supply. In an over-appropriated system such as the South Platte Basin, downstream users, including agricultural, municipal, and environmental and recreational users, rely on return flows from upstream water users for a portion of their supply. Increased reuse by an upstream entity may occur at the expense of a downstream user that has historically relied on those return flows, who then must seek another supplemental supply. Reuse in this case may not increase the total supply available in the basin.

Changing Perspectives on Reuse

Since the 2015 South Platte BIP, DPR has received more attention as a viable reuse process for South Platte Basin municipal water providers. The 2015 South Platte BIP recommended several actions to advance the DPR concept:

- Begin to develop an appropriate regulatory framework addressing DPR
- Continue to promote/monitor research into new cost-effective technologies for brine disposal
- Promote and monitor research of non-reverse osmosis treatment of recycled water suitable for DPR
- Improve public understanding of advantages of potable reuse

These same ideas can be seen reflected in the Reuse strategies.

Despite the limitations and challenges, there are many encouraging opportunities to expand water reuse in the South Platte Basin to address a portion of the municipal and industrial water supply gap.

- Adoption of a statewide DPR regulation by CDPHE will create opportunities for that reuse solution that do not currently exist.
- Future regional water development projects in the lower South Platte River Basin such as SPROWG would make it possible to capture reusable return flows from many South Platte River Basin entities.
- ATM projects can enhance reuse opportunities through partnerships between agricultural and municipal and industrial water users.
- New water rights filings can include the intent to reuse any return flows.
- Continued education on water reuse will help remove social barriers to IPR and DPR. Existing programs by Water Reuse Colorado and Water Education Colorado can be used to change negative perceptions by adopting positive and supportive language around IPR and DPR.
- Continued water reuse research will create reuse opportunities through use of new technology and more cost-effective solutions such as zero liquid discharge advancements for brine disposal.

Goal 5:
Maintain and Improve Irrigated Agriculture

Due to the importance of agriculture to the future well-being of the South Platte River Basin, the Republican River Basin, and the State of Colorado, both basins support measures to maintain, and where legally, physically, and economically possible, improve and increase irrigated agriculture in the face of increasing municipal and industrial demand.

STRATEGIES	MEASURABLE OUTCOMES
5.A: Minimize traditional permanent buy-and-dry of irrigated by implementing other strategies, including implementation of multipurpose projects, maximizing use of native South Platte River Basin supplies, conservation, reuse, implementation of ATMs, and other innovative water-sharing measures	• Supported development of a baseline of irrigated acres that have been dried up (possibly via a review of aerial imagery). • Supported review and documentation of the purchase of agricultural water rights and/or land to evaluate the status of buy-and-dry. • Supported review and documentation of agricultural land annexed by municipalities.
5.B: Develop multipurpose projects to address agricultural water shortages	• Tracked multi-purpose projects that address agricultural water shortages and documented the resulting yield.
5.C: Continue support of measures to maintain the economy and agricultural production of the Republican River Basin.	• In coordination with federal, state, and local entities, continued revitalization of Bonny Reservoir State Wildlife Area, which includes improvements to riparian and fish habitat, hydrology, recreation, hunting, and camping. • Expanded collaboration with other Ogallala Aquifer users and project sponsors. • Considered and documented other alternative existing and developing economic opportunities (e.g., wind turbines, ethanol production, alternative high-value crops).

5.D: Continue support of measures for long-term compliance with the Republican River Compact.	• Retired an additional 25,000 acres within the South Fork of the Republican River Basin after August 2016 by 2029.
	  • 10,000 acres by 2024
	  • Additional 15,000 acres by 2029
	• Quantified additional surface water right buyouts conducted pursuant to compact compliance efforts.
	• Initialized a water conservation program to reduce the amount of water consumed.
	• Maximized and tracked funding of federal conservation programs, including Conservation Reserve Enhancement Program and Environmental Quality Incentive Program (EQIP) with Republican River Water Conservation District (RRWCD) cost share.
	• Continued to evaluate the need for Compact Compliance Pipeline expansion of appropriation.

STRATEGIES	MEASURABLE OUTCOMES
5.E: Engage in and support development of ATMs in the South Platte Basin as a flexible and creative approach to avoid permanent dry-up where possible	• Tracked ATM metrics on an annual basis (see Table 15 in Alternative Transfer Methods in Colorado, CWCB for metrics). • Supported ATM proposals that leverage ATM funding mechanisms and advance South Platte Basin goals. Examples include: Water Plan grants, WSRF, new state funding, U.S. Bureau of Reclamation WaterSMART Water Marketing Strategy grant program, environmental and conservation non-profit support, U.S. Department of Agriculture and Natural Resource Conservation Service programs such as EQIP and RCPP, and pairing ATMs with agricultural conservation easements for tax benefits).
5.F: Promote policies by municipalities and land use authorities that reduce urbanization on actively irrigated acreage while respecting private property rights	• Supported the identification of policies that have been implemented to preserve irrigated land and open space in areas that are pressured by urbanization • Monitored land use codes and zoning regulations that foster urban agriculture.
5.G: Document and promote the associated environment and recreational benefits provided by irrigated agriculture	• Supported implement of "Next Steps" identified in the Special Study: Environmental and Recreational Benefits of Irrigated Agriculture in the Lower South Platte Basin
5.H: Promote continued studies to characterize water quality (surface and groundwater) for irrigated agricultural use and identify practices that may improve water quality.	• Supported, tracked, leveraged the work of other organizations to document, and funded studies to characterize water quality (surface and groundwater) for irrigated agricultural use and identify practices that may improve water quality. Promoted studies on basin website.

Alternative Transfer Method Opportunities

Alternative Transfer Methods have the potential to reduce the amount of irrigated acres permanently dried up through the traditional "buy-and-dry" method. This can reduce the adverse recreational and environmental impacts associated with permanent dry-up. Additionally, mechanisms can be included with Alternative Transfer Methods to provide further environmental and recreational protections. For example, agricultural conservation easements can be used to provide further insurance that agricultural lands will remain in production. Off channel regulating reservoirs, needed for some Alternative Transfer Methods, may be designed and operated in a manner to provide fishery, habitat, wildlife and recreational benefits.

Augmentation and Recharge Opportunities

The augmentation of out-of-priority groundwater pumping has increased due to stricter groundwater administration in the South Platte Basin requiring court-approved augmentation plans. Recharge facilities are increasingly being used in the South Platte River Basin to recharge the underlying alluvial aquifer with augmentation replacement supplies. While additional diversions to recharge can negatively impact streamflows, recharge can, at times, be an effective means to maintain instream flows by replacing historical return flows, out-of-priority groundwater pumping depletions, etc. Typically recharge diversions remove water from the stream system during times when there are high flows, and re-time the recharge return flows to the river to times when there is less flow in the river. Therefore recharge projects typically provide streamflow benefits to environmental and recreational attributes.

Recharge facilities can also be specifically designed to provide environmental habitat benefits. For example, Ducks Unlimited has partnered with a variety of entities in designing recharge facilities that also provide wetland habitat while complying with water rights decrees and accounting requirements. Several other water supply agencies and environmental groups have also incorporated multi-benefit components in their projects and programs. Some potential impacts from recharge projects are the reduction in large flows that provide benefits including sandbar scouring and reconnection of slough habitat.

Protection of Agriculture in the Republican River Basin

The South Platte and Metro BRTs will continue to support the Republican River Basin's compliance program and its largely agricultural economy, which is undergoing dramatic changes in water management as it complies with the requirements of the interstate water compact.

The Republican River Water Conservation District (RRWCD) was created by the Colorado Legislature in 2004 to foster local involvement in Colorado's efforts to comply with the requirements of the Republican River Compact. The RRWCD has been active in utilizing federal and local funding to provide assistance for retiring irrigated acres as a tool for compact compliance. In addition, the RRWCD constructed the Compact Compliance Pipeline, which conveys water from groundwater wells north of Laird, Colorado to the North Fork of the Republican River just upstream of the Colorado-Nebraska state line. The water delivered by the pipeline offsets groundwater consumed by irrigation wells and allows continued pumping while maintaining compliance with the compact.

The Colorado Master Irrigator program is another strategy Republican River Basin irrigators are using to protect agriculture in the basin. The program, which is supported by CWCB funding, is an educational course that equips irrigators with training and tools for increasing water conservation and irrigation efficiency in the basin. The course is designed to be collaborative and useful in establishing connections that are long-term and beneficial for participants. The objective of the program is to help irrigators find ways to apply less irrigation water while maintaining a profitable farming operation and prolonging the life of the aquifer.

The Basin will continue to be challenged with maintaining compact compliance and economic prosperity as the primary natural resource continues to be mined. However, the recent approval of an agreement with Kansas and Nebraska along with adoption of compact compliance rules will ensure long term agricultural viability in the basin. The collective efforts of all stakeholders in the basin are needed to meet these challenges to ensure a prolonged agricultural economy.

SPECIAL STUDY:

Environmental and Recreational Benefits of Irrigated Agriculture in the Lower South Platte Basin

As part of the South Platte BIP update, the South Platte and Metro BRTs funded a special study that focused on the E&R benefits of irrigated agriculture in the Lower South Platte River Basin (study area). The purpose of this study was to research and document potential beneficial interactions among agricultural, environmental, and recreational water uses within the study area with a spatial data analysis and case study review. The study area was defined as the portion of the basin associated with the mainstem of the South Platte River from downstream of Denver to the Nebraska state line.

Goal 6:
Protect and Enhance Watershed Function

Healthy watersheds support economies, environment, and quality of life by enhancing the ability of rivers and streams to provide clean drinking and irrigation water, productive fisheries, quality habitat, and outdoor recreation. Healthy watersheds also help mitigate the impacts of climate change by reducing wildfire risk. To benefit the ecological health of all the watersheds within the Basin, as well as to meet water supply, economic, and water quality demands, the South Platte Basin will recognize the importance of and encourage strategies that enhance watershed functions and hydrologic processes.

STRATEGIES	MEASURABLE OUTCOMES
6.A: PROTECT AND IMPROVE WATER QUALITY THROUGHOUT THE WATERSHED	
6.A.1: Promote forest health through forest restoration and wildfire risk-reduction activities.	• Provided and supported outreach and education efforts to urban and rural communities about the connection between forest health, wildfire risk reduction, and sustainable drinking water supply. • Provided and supported outreach and education efforts to communities and water providers vulnerable to wildfire about federal, state, and local organizations and best practices that restore forest health and reduce wildfire risk. • Provided and supported outreach and education efforts to communities and water providers vulnerable to wildfire regarding potential funding opportunities for forest restoration. • Supported, tracked, and leveraged the applicable work of other organizations to document forest restoration and wildfire risk-reduction projects.
6.A.2: Control erosion and sedimentation.	• Compiled a library of best management practices, tools, and methodologies related to agriculture and wildfire mitigation and shared on the South Platte Basin website. • Provided and supported outreach and education efforts for agriculture and forestry practices that improve soil health using federal, state, and local organization knowledge and resources.

A common working definition of restoration as promulgated by the Society for Ecological Restoration is "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed".

—- International Principles and Standards for the Practice of Ecological Restoration, 2016

STRATEGIES	MEASURABLE OUTCOMES
6.A.3: Consider holistic impacts to water quality and watershed health during project development and implementation.	• Supported, tracked, and leveraged the applicable work of other organizations to document projects that include management of stormwater through natural-based solutions for urban, rural, and headwaters areas, and other means to minimize addition of pollutants to rivers and streams to the fullest extent possible. • Supported, tracked, and leveraged the applicable work of other organizations to document collaborative, integrated water resource management projects, including those that coordinate land use and water resource planning and management. • Supported, tracked, and leveraged the applicable work of other organizations to document agricultural projects that incorporate considerations for water quality and quantity. • Supported, tracked, and leveraged the applicable work of other organizations to document agricultural projects that directly support environmental attributes. • Supported, tracked, and leveraged the applicable work of other organizations to document environmental projects that directly support continued agriculture. Examples include augmentation ponds, ditch systems that provide water for environment and recreational benefits, and agricultural buffer zones between crop fields and waterbodies. • Supported, tracked, and leveraged the applicable work of other organizations to document environmental projects that directly support continued agriculture. Examples include augmentation ponds, ditch systems that provide water for environment and recreational benefits, and agricultural buffer zones between crop fields and waterbodies.
6.A.4: Identify, assess, and implement actions, programs, and measures that aim to minimize the adverse effects on wetlands, lakes, streams/rivers, and associated ecosystems from water pollution, nutrient overload, reduced streamflows, and filling or dredging.	• Compiled a library of actions, programs, and organizations that have resources (e.g., money, technical skill, institutional knowledge) to assist with minimizing negative effects on the identified waterbodies and shared on the South Platte Basin website. • Supported, tracked, and leveraged the applicable work of other organizations to document collaboration among land managers and recreational and related interest groups to develop strategies to divert recreationists from high-concern areas. • Supported the creation of a basinwide assessment to determine locations of headwater, floodplain, and wetland restoration projects. This study may be used to select locations for pilot projects that can be monitored for at least 5 years to determine ecological and hydrological benefits. • Supported WSRF grants for projects that minimize impacts of adverse effects on wetlands, lakes, streams/rivers, and associated ecosystems from water pollution, nutrient overload, reduced streamflows, and filling or dredging.
6.A.5: Apply adaptive management strategies for wildfire mitigation.	• Supported projects to identify ponds for firefighting in rural areas, and investigated strategies to bring those ponds into compliance, if necessary, with Colorado water law. • Supported, tracked, and leveraged the applicable work of other organizations to document forest and recreational management plans, especially those that focus on adaptive management. • Supported, tracked, and leveraged the applicable work of other organizations to document collaboration among land managers and recreational and related interest groups to develop strategies to divert recreationists from areas with high wildfire risk. • Tracked efficacy of fire-mitigation treatments.

STRATEGIES	MEASURABLE OUTCOMES
6.A.6: Conduct restoration projects and promote innovative strategies to improve water quality in impaired areas and downstream impacts.	• In conjunction with the similar Measurable Outcome in Strategy 6.A.4, supported the creation of a basinwide assessment to determine locations of headwater, floodplain, and wetland restoration projects. This study may be used to select locations for pilot projects that can be monitored for at least 5 years to determine ecological and hydrological benefits. • Supported the use of process-based restoration which seeks to restore the natural hydrologic, biologic, and geomorphic processes that contribute to a stream's ecological dynamics. One strategy of process-based restoration is reconnecting incised streams with their floodplains to restore functions such as sediment filtration, floodwater attenuation, and habitat. When there is not room to restore the footprint that a river could occupy or influence in a wide variety of flow conditions due to development and infrastructure, supported the use of form-based restoration which promotes modification of stream channels to improve in-channel habitat conditions and bank stability. • Supported the documentation of best management practices and challenges of planning and implementing science-based headwaters restoration work. This might include lack of equitable fund distribution and/or lack of awareness around benefits to water supply, recreation, and quality. • Supported projects to improve water quality in impaired waters, with outcomes tracked through the biennial 303(d) and Monitoring and Evaluation lists to identify when waters are removed and/or added to the lists. • Supported a diversity of projects to evaluate threats to water temperature or assess impairment to waters due to increased water temperatures, and identified opportunities to address impairments. • Identified and documented projects that improve water quality in coordination with public agencies (conservation districts and the NRCS, among others). • Supported public education related to land stewardship and the responsible use of land and water. Examples are the Greenway Foundation, Colorado Trout Unlimited, and Leave No Trace. • Compiled a library of best management practices, tools, and methodologies related to watershed health metrics. Examples include U.S. Forest Service Watershed Condition Framework. Shared this library on the South Platte Basin website. • Compiled a library of best management practices, tools, and methodologies related to stream health assessments, stream restoration methods, and science-based solutions for wetlands and headwaters areas as well as other South Platte Basin aquatic ecosystems. Examples may include Colorado Stream Health Assessment Framework, the Flow Tool, • Colorado Riparian Association Stream Restoration Network, and Colorado Natural Heritage Program's Colorado Conservation Data Explorer (CODEX). Shared this library on the South Platte Basin website. • Documented and tracked the long-term trends of stream health and associated restoration methods (e.g., Colorado Stream Health Assessment Framework) for the South Platte Basin. • Supported policy and regulatory changes that will help to scale up headwater stream and wetland restoration throughout Colorado as an important tool for water management, E&R, and increasing resiliency to floods and drought.

STRATEGIES	MEASURABLE OUTCOMES
6.A.7: Identify, assess, and implement actions, programs, and measures that address post-fire impacts.	• Supported and conducted research and pilot projects investigating the effects of mitigation, forestry, and other treatments on burnt landscapes. • Compiled information on best management practices and lessons learned to scale up and implement actions that restore forest and hydrologic function to burnt areas.

6.B: ASSESS, IDENTIFY, AND PRIORITIZE RELATIONSHIPS AND MULTILATERAL IMPACTS THAT AGRICULTURE AND FORESTRY HAVE ON THE WATERSHED RELATED TO:

6.B.1: Impacts on surface water and groundwater quality.	• Supported research investigating the effects of forestry treatments on hydrology. Specifically, more research is needed to discern how these effects differ among treatment types (e.g., forest restoration vs. fire-mitigation treatments).
6.B.2: Impact on streams, lakes, floodplains, riparian areas, wetlands, and wet meadows.	• Compiled a library of best management practices, tools, and methodologies related to agricultural practices that improve water quality. Examples include no-till, reduced pesticides, buffer strips, groundwater recharge, and wetland creation. Shared the library on the South Platte Basin website.
6.B.3: Impacts of water quality on irrigated agriculture infrastructure.	• Supported the identification of and listed the impacts salt, sediment, and increased chemicals may have on irrigated agricultural infrastructure.

6.C: THROUGH EDUCATION AND COMMUNITY COLLABORATION, IDENTIFY, PRIORITIZE, AND DEVELOP STREAM MANAGEMENT PLANS WITHIN THE SOUTH PLATTE BASIN

6.C.1: Plans should address and be based around biological, hydrological, geomorphological, and other data to assess the flows, water quality parameters, recreational opportunities and other physical conditions that are needed to support collaboratively identified environmental and/or recreational values.	• Supported the development of 80% of the locally prioritized lists of rivers with stream management plans, and 80% of critical watersheds with watershed protection plans, all by 2030. • Identified locations where stream management plans are most needed using tools and studies such as focus area mapping and a basinwide assessment of the best opportunities for headwater floodplain and wetland restoration projects.
6.C.2: Encourage implementation of projects and programs identified within these stream management plans.	• Highlight completed stream management plans on the South Platte Basin website. • Supported implementation of projects identified in stream management plans through WSRF grants.

Watershed Function Opportunities

Currently, multiple water providers, organizations, governmental groups, and public groups participate in watershed health programs in the South Platte Basin. However, the Basin is not only reliant on the watershed health in the South Platte basin, but also on other Colorado basins' watershed health due to transbasin diversions. Watershed health assessments should be considered at a statewide level that will involve collaboration between basins to achieve statewide watershed health.

Forest Management

Fire suppression in recent years has led to excessive vegetation density, abundant fuel, and species declines, providing extensive fuel for wildfires. Reducing vegetative competition and enhancing appropriate age and species diversity through forest management can reduce the risk of damaging wildfire in high priority watersheds. Management techniques vary by forest type and are largely accomplished by selective thinning to reduce tree stress and competition, but may include other options such as clear cutting, controlled burns, or other forest restoration activities, depending on forest type and desired outcome. Reducing fuel and implementing defensible space around homes and structures can significantly reduce the risk to people living on the wildlife-urban interface.

Colorado's forests are experiencing intense insect and disease activity. Parts of the South Platte River Basin have experienced significant loss of forested areas due to insect and disease, specifically Mountain Pine Beetle and Spruce Beetle. Once infestation has begun, management options to mitigate intensity and spread are limited. Infested forests can be thinned to prevent the spread of beetle kill. Trees can be sprayed with carbaryl to prevent the infestation, however, this process is time consuming and expensive. There is no effective means of mitigation large areas of infected forests.

The vast majority of beetle-killed forests are inaccessible to harvesting operations primarily because of steep topography, lack of road access, and weak timber market economics; the untreated forests that recover are likely to support a mixture of conifer species and an increased amount of subalpine fir compared to harvested areas. The limited amount of post-bark beetle treatment and salvage harvests should be targeted at stands that pose the greatest risk as fuels for wildfire.

Mountain ecosystems are expected to experience the most severe ecological impacts from climate change and/or other causes of more severe variability in temperature and the timing and magnitude of rain and snowfall.

Water Quality

Watershed resources management includes stormwater and flood control. Innovative projects are being developed in the South Platte Basin that provide water quality and flood control benefits. In addition, numerous studies have dealt with water quality characterization and/or management for large parts of the South Platte River Basin or for the entire Basin.

There are a wide range of water quality monitoring data and related information available for various subareas of the South Platte Basin. A number of the subareas surrounding the Denver metropolitan area, including plains and mountain tributaries, have watershed plans, monitoring reports, source water protection plans, and other investigation reports describing specific issues of concern in water quality or watershed health. The concept of sustainable watershed water resources management underlies many of the watershed or subarea-based studies cited in this review.

Sustainable management for environmental and recreational attributes is interrelated with water supply complexities and land use changes affecting water quality and land cover, the latter factor being especially critical in the forested, mountain tributary streams flowing into the South Platte River. In this respect, institutional consideration (e.g., Federal vs. private land ownership) plays a role. The role of land management Federal and State agencies, as well as the water resources and environmental protection agencies requiring compliance with the NEPA, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Clean Water Act (CWA) regulations is critical to the goal of sustainable water resources management. In addition, the Colorado Department of Health and Environment (CDPHE) monitors water quality throughout the State.

Goal 7:
Protect and Enhance Environmental Attributes

Throughout the South Platte Basin, the importance of ecological processes and environmental attributes will be fully recognized. The South Platte Basin will implement strategies that protect and enhance environmental attributes for ecologically, socially, and economically important habitats and focus areas.

STRATEGIES	MEASURABLE OUTCOMES
7.A: Continue to develop, promote, and apply best management practices, tools, and methodologies to adequately assess what is needed to maintain, increase, or enhance the following throughout the South Platte Basin: • General river health • Aquatic, riparian, floodplain, wetland, and wet meadow habitats • Instream flows • Water quality and impacts associated with temperature and other pollutants • Riverine connectivity, including biological, hydrological, geomorphological processes, and stormwater impacts	• Supported, documented, and tracked (leveraging the work of others where applicable) continued monitoring of South Platte waterbody health. • Created or updated current mapping of connectivity between streams and identified physical and hydrologic barriers. • Compiled a library of best management practices, tools, and methodologies for outcomes listed above. Examples include Proper Functioning Condition, Colorado Stream Health Assessment Framework, and Stream Visual Assessment Protocol (SVAP). Shared on the South Platte Basin website. • Based upon the assessment and/or existing knowledge of where the best opportunities for headwater floodplain and wetland restoration are located, identified and monitored (for at least 5 years) a few restoration pilot projects to better understand the ecological and hydrological results of restoration work.

7.B: Identify, assess, and implement actions, programs, and measures that aim to promote restoration, recovery, and sustained support of:
• Endangered species
• Threatened species
• State species of special concern
• Imperiled aquatic, riparian, terrestrial, and wetland-dependent species and plant communities
	• Supported the development of a database(s) to document current (baseline) conditions, and established metrics for measuring future changes, maintenance impacts, and decrease and/or increase of:
	  • Occupied habitat for federally and state-listed threatened and endangered species and plant communities.
	  • Habitat in the environmental and recreational focus areas that support or can support imperiled species and plant communities, and strive to secure the species in these reaches, if appropriate. Sources include Colorado Parks and Wildlife and Colorado Natural Heritage Program.
	  • Wetland, lake, or stream habitat used by migratory, wintering, and breeding birds and aquatic life.
	  • Wetland, lake, or stream habitat used by aquatic life.
	• Identified and documented programs and partners aimed at restoration, recovery, and sustained support (e.g., Colorado Parks and Wildlife, Wetlands for Wildlife, Corners for Conservation, Colorado Open Lands, and U.S. Fish and Wildlife Service's Partners for Fish and Wildlife).
	• Identified and documented on the South Platte Basin website threatened and endangered species, state-listed sensitive state species, and systems related to focus areas.

STRATEGIES	MEASURABLE OUTCOMES

7.C: Identify, assess, and implement actions, programs, and measures that aim to protect, maintain, and improve conditions and long-term sustainability of streams, lakes, floodplains, riparian areas, wetlands, and wet meadows for self-sustaining fisheries and functional waterfowl, beaver, and other aquatic habitats.	• Supported the development of tools to document current (baseline) conditions, encouraged use of recently developed tools, and established metrics for measuring future changes, maintenance impacts, and decrease and/or increase of:
	  • The number of stream miles or surface area of streams, lakes, floodplains, riparian areas, wetlands, and wet meadows that are in proper functioning condition.
	  • Fish habitat by:
	  • Providing habitat enhancements and improvements to water quality and temperature
	  • Reducing non-natural dry-up points
	  • Promoting riverine connectivity
	  • Adopting collaborative programs to sustain and/or improve instream flow
	  • Increasing the ecological and hydrologic function of stream and wetland areas

7.D: When and where buy-and-dry projects occur, project proponents are encouraged to restore or manage the formerly irrigated land in a manner that promotes ecological health, function, and diversity.	• Supported, documented, and tracked (leveraging the work of others where applicable) the restoration of habitats before water is removed from the land.

Environmental Opportunities

Instream Flows and Natural Lake Level Water Rights[2]

Instream flow water rights and natural lake level water rights can only be held by the CWCB. These water rights allow for the CWCB to hold a water right for a specific amount of instream flow within a specified reach or a specified lake level to assist in protecting the environment. An instream flow water right is a relatively junior water right that can call for water to benefit instream flows within a specified reach. However, instream flow water rights can also be donated to the CWCB and converted for instream flow use, allowing for more senior water rights to be used for instream flow purposes. The Colorado Water Trust is a non-profit organization that raises funds to buy water rights in identified reaches with needed flows that can be changed in water court and donated to the CWCB for instream flow purposes. The presence of an instream flow right in a reach does not guarantee streamflows, however, and does not necessarily translate into adequate protection in the reach.

Channel Restoration:
Channel restoration projects can benefit both in-stream aquatic habitat and species as well as riparian species such as wetlands and significant plant communities. Channel restoration projects can also help to improve water quality in certain areas.

Stewardship Projects:
Stewardship projects have protections that include areas near stream riparian areas and protect stream attributes for multiple uses. Examples of stewardship projects include areas protected by federal or state agencies, landowner agreements, and non- governmental organizations. These protections may cover multiple attributes in the areas where they are in place.

Species Reintroduction:
Species reintroduction projects allow for species to be reintroduced to habitat areas where their numbers may have declined. At times additional projects are needed to ensure protection along with species reintroduction projects. Examples of species reintroductions in the South Platte Basin include various projects that include reintroductions of the Boreal toad, cutthroat trout, and plains fish species.

[2] In 1973, the General Assembly authorized the CWCB to appropriate water rights for instream flows and natural lake levels to preserve the natural environment to a reasonable degree. Since 1973, CWCB has appropriated instream flow water rights on nearly 1,700 stream segments covering more than 9,700 miles of stream, and natural lake level water rights on 480 natural lakes.

Goal 8:
Protect and enhance recreational attributes

Throughout the South Platte Basin, the importance of water recreational attributes, and the associated economic and public health benefits, to communities will be fully recognized. The South Platte Basin will implement strategies to protect and enhance recreational landscapes and sensitive habitats for future generations.

STRATEGIES	MEASURABLE OUTCOMES
8.A: Continue to develop, promote, and apply best management practices, tools, and methodologies to adequately assess what is needed to maintain or improve recreational opportunities derived from water-related ecosystems throughout the South Platte Basin.	• Compiled a library of best management practices, tools, and methodologies related to recreational opportunities derived from water-related ecosystems and shared on the South Platte Basin website. • Working with public, private, and governmental partners throughout the state (i.e., other BRTs), identified opportunities to take a statewide approach to protect and enhance recreational attributes. • Considered the variety of landscapes and recreational opportunities across the state, encouraging consistent statewide application of assessment tools. • Identified strategies for responsible stewardship of the landscapes that provide recreational opportunities and access to open space in every community. • Supported efforts to improve management to protect public lands for generations to come.

8.B: Identify, assess, and implement actions, programs, and measures that aim to protect and strengthen local outdoor recreation economies derived from recreational water uses while protecting sensitive habitats.	• Supported the development of consistent and comprehensive metrics for measuring and reporting resource impacts.
	• Supported the development of a database(s) to document current (baseline) conditions, and established metrics to measure future changes, maintenance impacts, and decrease and/or increase of:
	  • Surface area, stream miles, and/or public access areas for sustainable recreational opportunities through cooperative efforts
	  • Sustainable recreational opportunities
	  • Miles of constructed and maintained trails and greenways to promote aesthetic values and quality of life
	  • Public access to recreational opportunities in lakes and streams/rivers, including fishing and boating
	  • Successful collaboration and relationships with landowners, nonprofits, for profit, and public entities to ensure projects are funded and completed
	  • Total area of wetlands, lakes, streams/rivers, and associated ecosystems for birding, waterfowl hunting, and wildlife viewing
	  • River miles or flatwater surface acres available to river and flatwater boaters
	  • Location of where and extent to which recreational pursuits conflict with sensitive habitats.

Recreational Opportunities

There are a variety of recreational opportunities within the South Platte Basins. Some include:

- Channel restoration can benefit recreational uses such as fishing, flatwater boating, rafting, and kayaking.
- Creation of alluvial recharge basins for agricultural augmentation plans that also provide waterfowl habitat and hunting opportunities.

Goal 9:

Support collaborative development and management of supply options outside of the South Platte Basin

The South Platte Basin will work collaboratively with the state of Colorado and entities in other basins, including the Colorado Basin, to develop and manage all water supplies for the benefit of the entire state.

STRATEGIES

9.A: Collaboratively support ongoing state of Colorado, Department of Natural Resources, and Interbasin Compact Committee leadership in managing the state's supplies within other basins, including the Colorado and Arkansas Basins.

MEASURABLE OUTCOMES

South Platte Basin's critical water needs considered by State agencies when making decisions regarding water management in the Colorado and Arkansas Basins

Goal 10:

Utilize scenario planning to better manage uncertainty of future water needs

The South Platte Basin will incorporate the five planning scenarios from the Technical Update to better manage uncertainty of future water needs. Scenario planning allows for evaluating inherent uncertainties in future climate conditions, social conditions (such as values and economics), and supply-demand conditions (e.g., energy, agricultural, and municipal needs).

STRATEGIES

10.A: Promote use of scenario-based planning and the scenarios from the Technical Update in local water supply planning.

MEASURABLE OUTCOMES

- Developed and maintained a database that summarizes the scenario planning approaches taken by water providers.

Goal 11:

Broaden South Platte communications, outreach, and education programs

The South Platte Basin will expand on existing communications and outreach programs to improve knowledge and understanding of water challenges and needs for all citizens of the South Platte Basin, and on how these needs are being addressed through the South Platte BIP.

STRATEGIES	MEASURABLE OUTCOMES
11.A: Support and expand communication and outreach activities of the Public Education, Participation, and Outreach (PEPO) Workgroup of the Interbasin Compact Committee and the Metro/South Platte BRT education liaisons.	• Attended and participated with the PEPO Workgroup of the Interbasin Compact Committee. • Developed and posted meeting schedules of the joint Metro/South Platte PEPO Committee. • Increased attendance and participation on the joint Metro/South Platte PEPO Committee.
11.B: Support the South Platte Basin's participation with the Colorado Statewide Water Education Action Planning (SWEAP) process to engage South Platte Basin residents in better understanding the South Platte BIP and in encouraging an active role in their communities to promote informed decisions about critical water issues.	• Attended and participated in the SWEAP process meetings. • Provided written updates on the SWEAP process to the Metro and South Platte Roundtables. • Made written updates available on the South Platte Basin website.
11.C: Support implementation of tools developed by the SWEAP process.	• Outcomes will be measured as consistent with actions outlined in the SWEAP for Colorado 2020-2025.
11.D: Provide annual updates to the South Platte Education Action Plan consistent with goals and strategies of the BIP.	• Provided annual updates to the South Platte Basin Education Action Plan. • Successfully implemented tasks identified in the South Platte Basin Education Action Plan.
11.E: Continue to develop the network of existing community organizations to increase local awareness of the goals and priorities of the South Platte BIP	• Provided speakers and other communications relating to the South Platte BIP and other helpful facts.
11.F: Expand communication of the goals, strategies, and measurable outcomes of the South Platte BIP.	• Developed and implemented a marketing plan to support BIP implementation.

Goal 12:

Improve efficiency and effectiveness of water project permitting

The South Platte Basin will support the State of Colorado's efforts to improve efficiency and effectiveness in water project permitting by local, state, and federal agencies while properly mitigating negative environmental impacts.

STRATEGIES	MEASURABLE OUTCOMES
12.A: Proactively engage in and support discussions and actions to improve efficiency and effectiveness of water project permitting.	• Reduction in average time and cost for water projects to be permitted. • Improved alignment between local, state, and federal permitting processes. • Increased resources to conduct permitting activities.
12.B: Encourage the sharing of best practices and lessons learned from water project permitting with other water users in the basin and throughout the state.	• Compiled and shared on the South Platte Basin website water project permitting best practices and lessons learned by CWCB.

Section 7. Future Basin Projects

Project Database

As part of the South Platte BIP Update, the Identified Projects and Processes Database (herein referred to as Project Database) from 2015 was updated. This included gathering information for consistency with the statewide standard database and confirming the status of projects. Project status is definted as: completed, implementing, planned, concept, or not pursuing (further disucssion on project status can be found in the following subsections). Additional information on the Project Database is available in Volume 2, Section 7 of the Technical Update.

Of the **120 projects from 2015 Plan** that are still relevant (i.e. implementing, planned, or concept), 17 were completed, and 9 are no longer being pursued. In addition, projects identified since 2015 were added to the list. This resulted in **187 new projects** being added to the list. The full project database can be found in Appendix C.

Project Tiering

What the tiering process is:

- An effort to collect project data, including but not limited to project cost information that was missing from the original Water Plan, as noted in Chapter 9.2. The Governor's Wildly Important Goal on water supports this basin-led effort.
- A tool roundtables can use to do a preliminary characterization of their basin projects and associated project readiness. It will be useful for basin-level WSRF grant approval discussions where the data fields describing alignment with BIPs, local planning, and criticality are likely to be considered.
- A tool the CWCB plans to use to better understand the costs of future water projects and how quickly those projects could be implemented, that is, their readiness.
- A means of facilitating a "first-pass" process to help standardize data-gathering for a dynamic project database. This will allow for project updates and movement through the tiers as they advance toward funding by the basin, the CWCB, or other sources.

What the tiering process is not:

- A ranking mechanism that would pit one project against another, one basin against another, or the roundtable against a project proponent. Rather, it groups projects by level of readiness and other factors where Tiers 1 through 3 reflect varying levels of readiness and have some level of basin support.
- An assumption on project funding or the potential for proponents to implement their projects. Any project, regardless of the assigned tier, could move forward if a project proponent advances the effort and can obtain funding (e.g. grant funding).

How will the tiering be used?

- For roundtables, it will be useful for WSRF grant approval discussions where the data fields describing alignment with BIPs, local planning, and criticality are likely to be considered.
- For the CWCB, 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 Water Plan, and the amount of available project data will also be considered.
- As a platform for future project tiering.

Tiering Approach

The CWCB developed a Project Tiering Matrix to tier projects identified in the South Platte BIP (Figure 7-1). Based on input from the Joint Steering Committee, the LE Team developed assumptions to systematically apply these criteria across the full Project Database (+300 projects). Due to the variability in project information provided by different project proponents and the variety of project types, these assumptions are designed to help the LE Team apply a consistent approach to the tiering process.

Project Tier Matrix (Roundtable Entry Form)

	Tier 1	Tier 2	Tier 3	Tier 4	Assigned Tier
PROJECT PHASE					
TIMELINE	Ready to launch projects that are immediately implementable (within one year) were funding to be made available or if funds have already been secured; does not apply for a "Concept" project.	Projects that could launch within two years were funding to be made available or if funding is in the process of being secured; does not apply for a "Concept" project.	Needs two to five years to launch were funding to be secured.	Not shown or longer than five years to implementation.	Tier 1
PLAN ALIGNMENT					
BASIN PLANS	Strongly aligns with Basin Implementation Plan.	Somewhat aligned with Basin Implementation Plan.	Not as well aligned with Basin Implementation Plan.	Not shown.	Tier 2
LOCAL PLANS	Extensive local planning, organizational support and water rights support the project.	Some local planning or organizational support for the project; water rights may or may not be explicitly identified.	Not clearly identified in any local plan, organizational effort; water rights concerns are noted; may be under consideration or going through a permitting process.	Not shown.	Tier 1
WATER PLAN	Benefits multiple sectors in the Colorado Water Plan including each of the following: agriculture, environment & recreation, and municipal & industrial. May also provide other benefits and cite specific goals or actions in the plan.	Benefits multiple sectors in the Colorado Water Plan including at least 2 of the following: agriculture, environment & recreation, and municipal & industrial. May also provide other benefits and cite specific goals or actions in the plan.	Benefits one sector in the Colorado Water Plan including one of the following: agriculture, environment & recreation, and municipal & industrial. May also provide other benefits and cite specific goals or actions in the plan.	Not shown.	Tier 3
MINIMUM CRITERIA					
MEETS CORE DATA NEEDS	Includes all 21 criteria.	Meets critical subset; (16) designated critical data fields.	Provides only a few details; critical subset is not complete.	Not shown.	Tier 3
NEED					
CRITICALITY	Critical to basin (would cause severe impact to the basin if the project didn't move forward; (Basin Priority and/or Emergency Need); Has clear metrics for tracking and completion date.	Significant basin effort (fully aligns with basin goals); implementation or plan would advance basin goals; has clear metrics for tracking and completion date.	Project could be of basin interest but may not as directly advance basin goals; may not have clear metrics and/or may not have a clear end date or objectives.	Not shown.	Tier 2
Priority categorization is calculated from the tier cumulative ranking above.			PRIORITY CATEGORIZATION		Tier 2

SUPPORT BY TIER	Tier 1	Tier 2	Tier 3	Tier 4
	Supported & Ready	**Supported & Pursued**	**Supported & Developing**	**Considering**

Figure 7-1. Project Tier Matrix

Project Phase: Timeline for Implementation

The timeline for implementation is based on when a project may be "ready to launch". The LE Team applied the following assumptions to two distinct project types:

- **An Infrastructure project** is "ready to launch" when the project is ready for construction. This generally includes: design is substantially complete, permitting is substantially complete, there are no outstanding legal or water rights administration issues, and there is overall political support.
- **A planning, study, or other nonstructural project** is "ready to launch" when the project proponent has the resources available to complete the project. This may include: a draft scope and budget, internal support, etc.

Tiering is dependent on project schedule (provided in the project description), status, and additional background knowledge of project. Many project proponents did not provide a project schedule. In these cases, the following assumptions based on provided project status were generally applied to projects:

If the project proponent indicated the project was in the implementing stage, it was defined as Tier 1 or 2. "Implementing" is defined as: *Project is underway (legislation is being drafted, study is underway, project is under construction, etc.). Note that a Tier 2 was applied to planning, study, or other nonstructural projects if no additional information was provided.*

If the project proponent indicated the project was in the Planning stage, it was defined as Tier 3. "Planned" is defined as: *Steps are being taken to move it forward (initiated permitting, seeking funding, forming a committee or group, designing project, etc.).*

If the project proponent indicated the project was in the Concept Stage = Tier 4. "Concept" is defined as: *Project is an idea, there are no specific plans to implement yet.* It should be noted that projects classified as "Concept" will automatically result in an overall Tier 3.

The LE Team understands the assumed Tier based on status may not align with actual project schedule. However, without further information on the anticipated project schedule, the assumptions were be used to apply consistency in tiering across the Project Database.

Plan Alignment

Basin Plan. Most projects were assumed to fall into a Tier 2 as many of the South Platte BIP Goals and Strategies align with benefiting multiple water sectors, which is evaluated in the "Water Plan" criterion.

Local Plans. Tier 1 included projects whose water rights are decreed or not required and permitting is substantially completed. Planning/Study projects are assumed to be Tier 1 as water rights and permitting are not required.

Tier 2 includes projects with little to no water rights considerations and smaller scale permitting requirements.

Tier 3 includes projects where water rights have not been identified or the water court process has not started and complex permitting has not started or is still occurring (i.e., NEPA, 404, 1041)

Water Plan. Tier 1 included projects that support all three water use categories (Municipal and Industrial, Agriculture, Environmental and Recreation). Tier 2 included projects which support two water use categories, and Tier 3 included projects which support one water use category. Secondary project benefits to other water use categories beyond those identified by the project proponent were considered when applying tiering assumptions. An example includes an environmental and recreational project with a water quality component or ancillary benefit. This type of project would be classified as Tier 2 due to its downstream water quality improvements for municipal and industrial or agriculture needs.

Minimum Criteria: Meets Core Data Needs

This score was based on the type of data provided by the project proponent with respect to the 21 core data needs identified by CWCB.

Criticality

Criticality is a measure of how critical the project is to providing for short term needs that may arise from natural disaster (for example, watershed restoration after a wildfire or food event) or achieving the goals of the BIP Update and Water Plan. Due to the subjectivity of this criterion, most projects were assumed to be a Tier 2. This criterion was applied from the basin-wide perspective – that is, criticality to meeting the overall basin goals and the needs of many water users and the ability of the project to address the current basin-wide supply-demand gap. It is recognized that some projects may have much higher criticality to the individual water users than to the overall basin.

Tiering Results

A total of 307 projects were tiered. Results of the overall tiering are presented in Figure 7-2. Of these projects, 44 percent are classified as Tier 3, and the lowest percentage of projects are in Tier 1 at 13 percent.

Implementing projects primarily fall into Tier 1 (40 percent) and Tier 2 (43 percent) categories. The majority of planned projects fall into Tier 3 (79 percent), while the majority of concept projects fall into Tier 4 (69 percent). A distribution of project status versus tier classification is presented in Figure 7-3.

Project proponents were also asked to provide a "key word" to help describe the project. The majority of projects are classified as Watershed Health, Environment & Recreation (45 percent) and Supply & Demand Gap (36 percent), as seen in Figure 7-4.

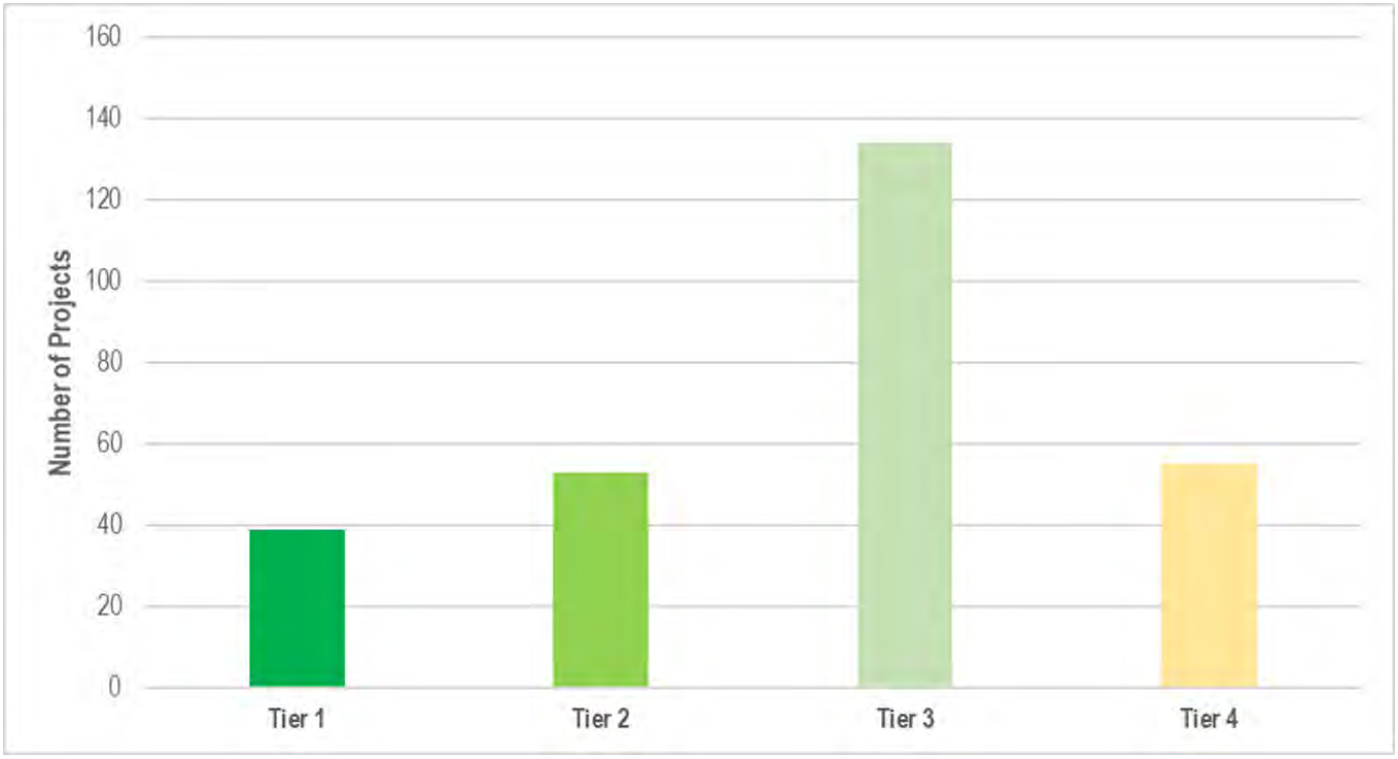


Figure 7-2. Distribution of Projects Among the Four Tiers

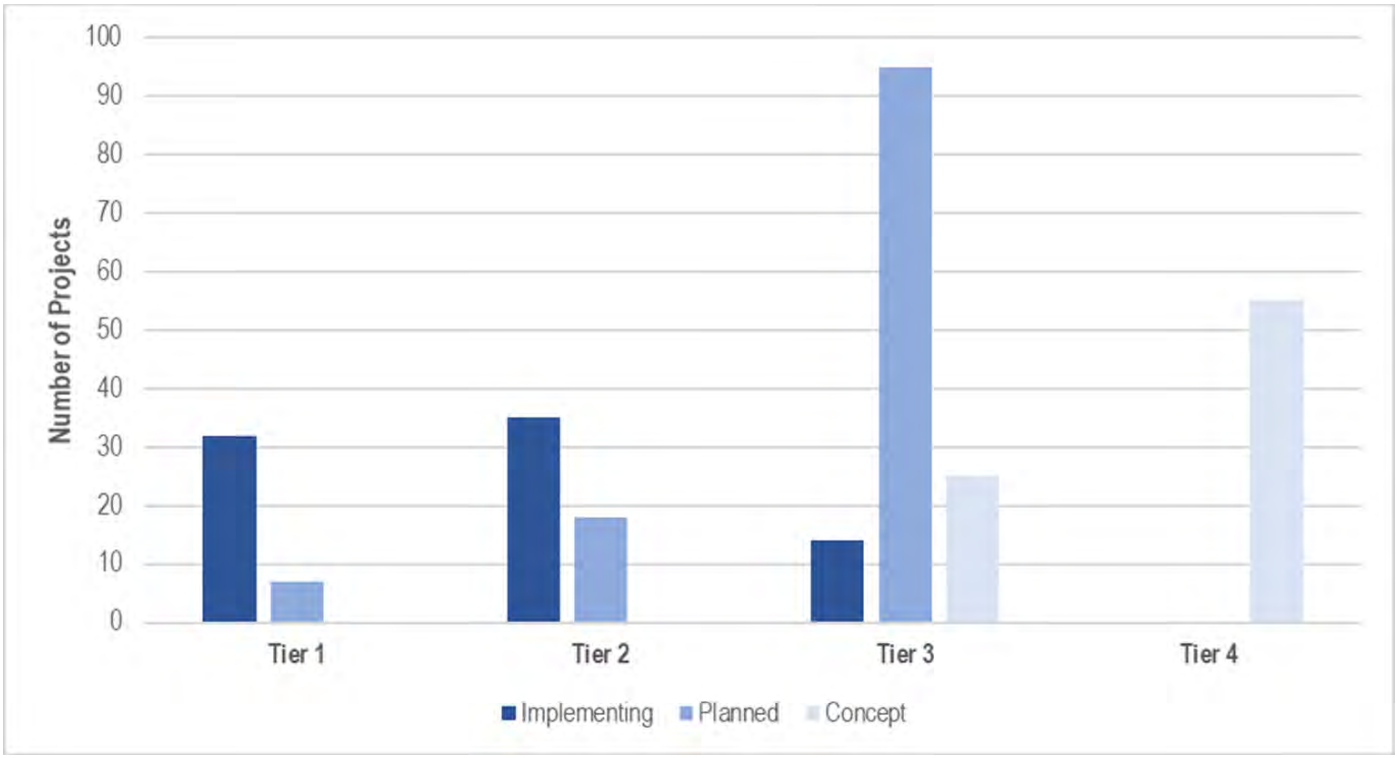


Figure 7-3. Project Status vs Project Tier

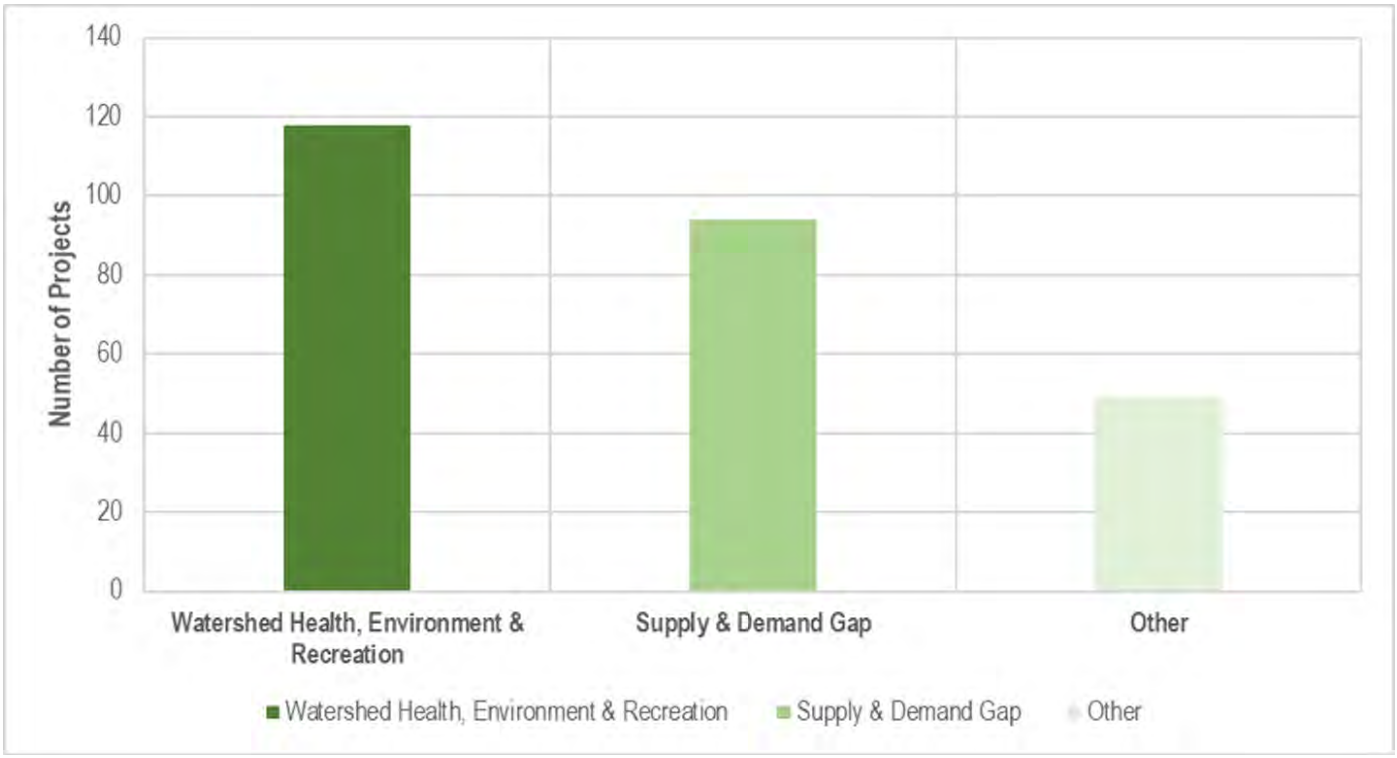


Figure 7-4. Primary Project Types in All Tiers Combined

Section 8. Education and Outreach

The South Platte and Metro Basin Roundtables combine their efforts to carry out Public Education, Participation, and Outreach (PEPO) activities in accordance with a joint Education Action Plan (EAP). The South Platte Basin EAP is updated annually by the PEPO Liaison and approved by the PEPO Committee. The PEPO Liaison has the duty to educate the roundtable and assist the flow of information among the roundtable, the Interbasin Compact Committee (IBCC) and the CWCB. Additionally, the PEPO Liaison coordinates with the basin roundtables to develop potential communications strategies, plans, and programs that support basin outreach and education.

Identifying a clear message is critical to successful implementation of the Education Action Plan

The roundtables provide guidelines for stakeholder engagement. Through the collaborative efforts of roundtable members, a strategy has been developed that reflects a shared vision for the South Platte Basin. Support for identified solutions among all stakeholders will increase if those stakeholders believe they have been engaged in a collaborative process. Broad awareness of the South Platte BIP and the statewide roundtable process will help create a successful and unified plan.

Meetings held over the last several years have led to agreement on a clear message, which focuses on four key elements of the South Platte BIP that support meeting current and future water supply needs in the South Platte Basin:

1. A high success rate of currently planned projects.
2. The ongoing leadership and advancement of conservation and reuse to efficiently use current and future water supplies.
3. The development of ATMs as an alternative to the permanent purchase and dry-up of irrigated agriculture.
4. Collaborative work with the State of Colorado and entities in other basins, including the Colorado and Arkansas Basins, to develop and manage all water supplies for the benefit of the entire state.

The South Platte Basin website houses a variety of tools, best practices, and lessons learned to provide necessary information to foster knowledgeable and productive civic engagement. Programs are being created to promote those four key elements and will be monitored to assess their progress. Key metrics to monitor success will include attendance and participation at events, meetings, and field trips. In addition, website and social media analytics will be enhanced to determine the volume, duration, and areas of interest of visitors to **www.southplattebasin.com**.

The communications strategy identified four categories of stakeholders as potential audiences:

- **Academic**: post-secondary educators and students
- **Agriculture**: trade organizations, conservancy districts, conservation districts, Colorado Foundation for Agriculture, Colorado Ag Water Alliance, and Future Farmers of America
- **Environment and Recreation**: County recreation and open space districts, Ducks Unlimited, Elk Foundation, Trout Unlimited, Pheasants Forever, Poudre Learning Center, and more
- **Roundtables**: members, web presence, CWCB and PEPO Liaison

The Metro and South Platte Basins are home to Northern Water Conservancy District, Denver Water, Aurora Water, and other large water suppliers who have their own outreach efforts that leverage the South Platte BIP and Colorado Water Plan messages.

In the future, the **Metro and South Platte Roundtables will expand on existing communications and outreach programs to improve knowledge and understanding of water challenges and needs for all citizens of the South Platte Basin and how these needs are being addressed by the South Platte BIP.**

The following outreach strategies will be applied:

1. The basin will support and expand communication and outreach activities of the PEPO Workgroup of the Interbasin Compact Committee and the Metro/South Platte Roundtable Education Liaisons.
2. The basin will support participation with the Colorado Statewide Water Education Action Planning process to engage South Platte Basin residents to better understand the South Platte BIP and to take an active role in their communities to make informed decisions about critical water issues.
3. The basin will support implementation of tools developed by Water Education Colorado in their Statewide Water Education Action Planning process, and provide annual updates to the South Platte Education Action Plan consistent with goals and strategies of the BIP.
4. Finally, the basin will continue to develop the network of existing community organizations to increase local awareness of the goals and priorities of the South Platte BIP.

The basin's website provides useful information such as education resources, stories about the basin's water, project reports, and guiding documents.

Visit the site at:

southplattebasin.com

The South Platte and Metro Rountables seek to educate all citizens of the South Platte River and Republican River Basins (including those historically underrepresented) and foster inclusive participation in roundtable activities and funding opportunities. The roundtables will align with recommendations for equity and inclusion that are developed in the Colorado Water Plan.

Section 9. Strategic Vision for the Future

The strategic vision for the future in the South Platte Basin is described in this section. The strategic vision is the amalgamation of the goals, future projects, and desired water future for the basin. The strategic vision for the South Platte and Metro roundtables focuses on four elements:

1. MEET THE MUNICIPAL SUPPLY GAP
2. PROTECT IRRIGATED AGRICULTURE
3. PROTECT AND ENHANCE WATERSHEDS
4. IMPLEMENT PROJECTS

Meet the Municipal Supply Gap

The largest category of future water supply is from projects that are planned and projects that are completed but not fully utilized. Municipal entities have invested considerable resources in identifying and advancing the projects needed to meet a substantial portion of their anticipated water needs in 2050 and beyond. **The South Platte BIP's goal to encourage the implementation of projects underscores the importance of this strategy for meeting future demands.**

- Water conservation practices are projected to be an important strategy for meeting future demands in scenarios that incorporate high levels of conservation (i.e., the Cooperative Growth and Adaptive Innovation planning scenarios). One of the more promising strategies for fostering water conservation and managing demand is integrating land use planning with water conservation and efficiency. Communities throughout the West have found that by pursuing aggressive conservation programs like increasing development density, installing climate-appropriate landscapes, and promoting technological advancements, they can continue to grow while reducing and delaying the need for acquiring new supplies.
- While the South Platte BIP has a goal to protect irrigated agriculture, a significant component of future municipal and industrial supply is projected to come from agricultural-to-municipal water transfers via various mechanisms, including acquisitions, leases, ATMs, and urban growth over irrigated lands. The specific agricultural supply yield shown in the future underrepresents the full amount of water that will be transferred from agriculture to municipal use because many of the planned and conceptual projects rely on agricultural supply for their yield. In addition, municipal and industrial water providers are expected to continue to look to agriculture as a source of supplemental water to improve system resiliency and redundancy, beyond the amounts needed to meet their basic demands. ATMs may be a useful way for M&I water providers to access supplemental supplies while preserving some level of irrigated agricultural production.
- Water reuse is an important part of the Basin's water supply strategy. Reuse projects are not explicitly highlighted but make up some of the completed/partially utilized, planned, and conceptual projects. In the Denver Metro and North Front Range areas, both direct and indirect reuse is being pursued by many water providers that own reusable supplies. Reusable water can be recovered after first use using a variety of mechanisms, including river exchanges, engineered conveyance systems, recycled water plants, and onsite grey water and black water systems. On a basinwide scale, reuse generally does not increase the total supply available in the basin, because additional reuse can in many, but not all cases, reduce supply to downstream water users that have historically diverted the unused, reusable supply. However, on a local level, reuse can increase supply for the water user reusing its return flows. Despite some limitations and challenges, there are many encouraging opportunities to expand water reuse in the Basin.

INTEGRATING LAND AND WATER RESOURCE PLANNING FOSTERS CONSERVATION

Many communities are turning to demand side management—an approach that seeks to reduce the demand for water. A promising strategy for this is integrating land use planning with water conservation and efficiency. Several resources are available to promote and guide the integration of water and land use planning.

REUSE WILL BE AN IMPORTANT TOOL

Many municipal and industrial users in the South Platte Basin are using and or are pursuing practicable additional use of consumable, reusable return flows. While reuse has limitations, it offers many encouraging opportunities to meet the municipal and industrial supply gap.

In most of the cases, there is a remaining unmet demand for each of the scenarios after the yield from currently identified projects and planned conservation is considered. Current supply strategies are projected to meet 2050 water demands in Weak Economy and Cooperative Growth, but additional supply sources of varying magnitudes are needed to meet 2050 demands in the other scenarios, ranging from 6,000 AFY in Adaptive Innovation to more than 160,000 AFY in Hot Growth. Business as Usual projects that more than 40,000 AFY of additional water supply will be needed by 2050 beyond what has currently been identified.

WATER IS NEEDED BEYOND 2050

While the shortage analysis focused on the year 2050, water demands will continue to grow in the future, and additional water supply strategies and projects will be needed. Storage, conservation, and reuse will be important components.

M&I water providers could engage in a variety of strategies to address the unmet demand. Some of these strategies include:

Conservation: Implementing more aggressive conservation measures above and beyond those already included in the planning scenario descriptions, including increasingly aggressive watering restrictions during droughts and more limiting landscape ordinances.

Storage: Developing additional storage opportunities (such as new storage, expanding or reallocating storage in existing reservoirs, restoring existing storage via sediment removal, and protecting storage through multipurpose floodplain and stream channel restoration that reduce sediment loads and enhance habitat), conjunctive use projects, and other strategies to capture excess supplies in wet years and making them available during drought years.

Agricultural Water Transfers: Pursuing additional agricultural water transfers either through ATMs or acquisitions.

Water Reclamation: Implementing additional water reclamation for indirect or direct potable reuse projects that further maximize the benefits of reusable return flows for the municipal and industrial sector.

The particular mix of these and other strategies to address the unmet demand will vary by water provider and may change over time in response to new technical innovations, regulatory changes, or other factors, such as the technical and social viability of direct potable reuse.

A BALANCED APPROACH IS NEEDED

Meeting future municipal and industrial water demands while minimizing adverse impacts will require a balanced approach. The South Platte BIP's goals provide guideposts for achieving this balance.

Supplemental water supply strategies could have adverse consequences to the agricultural community, environmental resources, or customer lifestyles and would involve difficult choices to be made by the municipal water providers and basin stakeholders. The South Platte BIP's goals and strategies help navigate these difficult choices and collectively provide a vision for a balanced approach to meeting future water demands. The goals encourage implementing projects, maximizing use of native supplies, and promoting conservation and reuse while protecting the environment and agriculture. **The South Platte and Metro BRTs will use their goals as guideposts to encourage balanced and collaborative solutions to meeting future municipal and industrial demands.**

STORAGE IS CRITICAL

New storage, whether above or below ground, will be critical for meeting the future water needs of the South Platte Basin.

THE FUTURE IS UNCERTAIN

The shortage analysis had widely ranging results driven by uncertainty related to demand drivers like population growth and climate change and also the realization of yield from water supply strategies. Basin stakeholders will need to be adaptive and collaborative to meet the challenges of an uncertain future.

Protect Irrigated Agriculture

Several strategies can be pursued to protect agriculture in the South Platte River Basin. Many of these were described in the 2015 South Platte BIP.

PROTECT IRRIGATED AGRICULTURE

It will be critical to protect the South Platte and Republican River Basins' remaining agricultural assets, because they will be pressured by loss of irrigated land and water scarcity.

Support Alternative Transfer Methods

Since the early 2000s, the state of Colorado has focused on ATMs as a strategy that provides water for municipal, industrial, and environmental water purposes by temporarily using agricultural supplies and compensating irrigators for the use of their water. Dry-year leasing has been the primary means of implementing ATMs, but they could potentially be implemented by rotational fallowing, deficit irrigation, or switching to less consumptive crops (though some of these strategies may be more complicated to legally implement). In addition, conservation easements have recently been implemented to preserve agricultural uses of water but also allow periodic leasing or other water sharing agreements to help meet water supply gaps. The South Platte and Metro BRTs support the implementation of ATMs and efforts by the State to promote and provide financial support through the ATM grant program.

Support Multipurpose Infrastructure Projects that Use Native Supplies and Foster ATMs

Agriculture in the South Platte can also be protected by maximizing the use of native, unappropriated supplies as an alternative to the purchase of senior water rights. Infrastructure such as storage and conveyance facilities are needed to divert and manage native supplies to create firm and reliable yield.

Another strategy for protecting irrigated agriculture is the development of new infrastructure and water supplies for augmenting out-of-priority depletions from irrigation wells. Recharge facilities are increasingly being used in the South Platte River Basin to recharge the underlying alluvial aquifer with augmentation replacement supplies. Typically recharge diversions remove water from the stream system during times when flows are high. In many cases, the aquifer recharge enhances flows in the river at times when flows are low and provide streamflow benefits to environmental and recreational attributes. In addition, recharge facilities can be designed to enhance water fowl habitat, thus providing multiple benefits.

Infrastructure is also needed to implement ATMs on a large scale. If a significant volume of supply were to be generated from ATMs, it would likely come from numerous farms spread over a wide geographic area. Storage and transmission infrastructure are needed to collect and aggregate the ATM supply to facilitate its exchange or conveyance to locations where the supply can be used by municipal water providers.

Multi-purpose infrastructure projects involving municipal, agricultural and environmental water users and stakeholders can help municipalities meet their water needs while helping to protect or enhance agriculture and environmental attributes. The SPROWG concept is a good example of how this could be accomplished: both the South Platte and Metro BRTs supported the investigation of the SPROWG concept, and they support the development and implementation of multi-purpose projects in general.

Use Water More Efficiently in All Sectors

The efficient use of water can help agriculture stretch available supplies and can help delay or prevent the need for cities to purchase senior agricultural water rights. Irrigation efficiency improvements that reduce the nonbeneficial consumption of water can help increase the irrigation supply provided to crops. On the municipal side, increased reuse and conservation as well as a focus on water-wise land use planning can also provide a degree of protection to irrigated agriculture, though it can also impact available supplies. If cities along

the Front Range conserve and reuse more water and reduce water demands for non-essential turf irrigation, they can prevent or at least delay the need to purchase and transfer senior agricultural water rights; however, increased conservation and reuse can also reduce a portion of return flows that supply downstream irrigators. In other words, increased efficiency in all water use sectors is beneficial, but trade-offs should be recognized and, if possible, mitigated.

The South Platte and Metro Roundtables encourage and promote efficient water use in all sectors as a critical strategy for meeting future water needs.

Protection of Agriculture in the Republican River Basin

The South Platte and Metro BRTs will continue to support the Republican River Basin's compliance program and its largely agricultural economy, which is undergoing dramatic changes in water management as it complies with the requirements of the interstate water compact. Stakeholders in the Basin have made great efforts to protect irrigated agriculture.

The Basin will continue to be challenged with maintaining compact compliance and economic prosperity as the primary natural resource continues to be mined; however, the recent approval of an agreement with Kansas and Nebraska, along with adoption of compact compliance rules, will ensure long-term agricultural viability. The collective efforts of all stakeholders in the basin are needed to meet these challenges to ensure a prolonged agricultural economy.

Secondary Benefits of Irrigation

Irrigation is not only important for agriculture and the rural communities it supports. The network of irrigation infrastructure, crop production, and return flow regime also support environmental and recreational attributes in the South Platte Basin. Protecting irrigated agriculture also helps to maintain the secondary benefits of irrigation to environmental and recreational attributes.

Protect and Enhance Watersheds

The South Platte Basin will need to protect and enhance its watersheds and associated environmental and recreational attributes while meeting its future municipal and industrial water needs and preserving agriculture. Doing so will require collaboration, strategic planning, and successful implementation of projects.

The updated goals, strategies, and measurable outcomes collectively embody the South Platte and Metro BRTs' vision with respect to protecting and enhancing watersheds. The goals reflect a spirit of collaboration, planning, and action:

- **Collaboration:** The goals point to collaboration by encouraging the holistic consideration of impacts to water quality and watershed health during water project development and implementation. Documentation and information sharing is encouraged regarding successful approaches on tools and strategies, such as on water quality best management practices, stream restoration methods, and stream health assessment methodologies. Collaboration is critical to identifying the best ways to incorporate environmental and/or recreational enhancements to water projects that can enhance the overall health of South Platte Basin watersheds.
- **Strategic Planning:** Successful planning requires a solid understanding of existing conditions and challenges. The goals identify data needs that are foundational to understanding the health of streams and watersheds. With an understanding of existing conditions, planning can be better informed and the results of projects or strategy implementation can be assessed. In addition, the goals support the development of stream management plans. These plans are geographically focused, collaborative plans that assess the health of streams and identify strategies and projects that will improve stream health.
- **Action:** The measurable outcomes associated with the South Platte and Metro BRTs' goals identify a wide variety of actions that are supportive of their goals. The South Platte and Metro BRTs also identified numerous watershed-focused projects in their projects database. The vision of the South Platte and Metro BRTs is to encourage and support the implementation of watershed, environmental, and recreational projects through funding assistance, fostering collaboration, and encouraging multipurpose projects.

Information on collaborative watershed groups is available via that Colorado Watershed Assembly website (www.coloradowater.org) and the Atlas of Collaborative Conservation in Colorado

Implement Projects

Implementation of water development and management projects is the primary means by which municipal water providers, environmental and recreational advocates, agricultural water users, and industry will meet their future water needs. Implementation of projects ties to and will advance nearly all of the goals and strategies identified in the South Platte BIP. Amplifying the importance of projects, the South Platte and Metro BRTs have identified numerous and varied projects to meet future water needs at a total future cost of nearly $10 billion (an estimate that does not include all identified projects).

The Basin's success in meeting future water needs relates directly to the extent to which water supply projects and strategies are implemented.

The roundtables have long recognized the importance of supporting and implementing projects. In fact, the 2015 South Platte BIP recognized that implementing planned projects is critical to meeting the future water needs of the Basin as well as the state of Colorado. While the 2015 BIP included a focus on implementing municipal and industrial projects, it also promoted the implementation of agricultural and environmental and recreational projects and encouraged collaborative multi-purpose projects. The same sentiment was expressed during the BIP update process, and a focus on project implementation is embedded in the goals, strategies, and measurable outcomes.

The degree to which projects are successfully implemented relates directly to the risks associated with meeting future municipal and industrial, agricultural, and environmental and recreational needs. Successful completion of water supply projects is critical to meeting future municipal and industrial demands, as demonstrated earlier in this section. Even if all of the identified projects are mostly implemented by 2050, South Platte and Metro water providers will still need to identify additional strategies to meet all of the projected demand. If water supply projects are not successfully implemented, water providers will be further challenged to find other alternatives to meet demands. Agricultural water users and environmental and recreational stakeholders are also seeking successful project implementation to help meet their current and future water needs. Without successful implementation of agricultural and environmental and recreational projects, risks to food supplies, rural economies, ecosystem health, and recreation will mount.

The 2015 South Platte BIP identified 10 primary challenges to successfully implement solutions to water supply shortages in the Basin. These challenges, summarized below, are still important to consider:

1. Future municipal and industrial needs are significant, and meeting them can affect other water use sectors as water is reallocated to meet municipal and industrial needs.
2. Agriculture in the South Platte and Republican River Basins is critical to Colorado's economy and culture, and loss of agricultural water supplies can be detrimental.
3. Environmental and recreational attributes should be proactively considered, but a lack of useful environmental data create difficulties in assessing environmental and recreational needs or project benefits.
4. Temperature increases and changes in precipitation from climate change could significantly increase demand.
5. Achieving extremely high levels of conservation and reuse requires societal buy-in and policy support beyond the purview of water providers.
6. Costs for developing additional municipal and industrial and agricultural water supplies is continually increasing due to dwindling local supplies and the need for larger, more complex projects.
7. Permitting for new water supply projects can be very lengthy and expensive.
8. Political and social support will be critical to the success of planned supply projects.
9. Front Range job growth benefits Colorado as a whole, and business and political leaders need to recognize that benefit with respect to buy-in on water supply projects.
10. The Interbasin Compact Committee must support implementation of water supply solutions.

The implementation of collaborative, balanced water supply solutions in the South Platte Basin will ultimately benefit all Coloradans.

Collaboration and communication among diverse stakeholders will help overcome these challenges and implement projects successfully. The South Platte BIP's overarching themes and goals support collaborative approaches, and many Basin water users are pursuing innovative projects that will rely on and benefit from collaboration.

The South Platte and Metro BRTs support collaborative approaches to identifying balanced solutions to current and future water supply challenges.

Appendix A. South Platte River 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:

South Platte River 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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List of Tables

Section 1: Introduction

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

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

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: South Platte River Basin Revised Results

The following sections reflect the model revisions and results applicable to the South Platte River Basin. As discussed above, refer to the original 2019 Technical Update documentation for more information on the demands and gaps in each basin.

2.1 SOUTH PLATTE RIVER BASIN

There were no identified revisions in the South Platte River basin, therefore the agricultural and M&I demand and gap remain unchanged from the 2019 Technical Update results. However, revisions in the West Slope basins do impact the simulated availability of water for import into the South Platte River basin, and the estimate of transbasin imports to the South Platte River was revised. As discussed in the 2019 Technical Update documentation, transbasin imports are reflected at their historical levels and a gap in the table below indicates that the historical import could not be diverted in the source basin due to a physical or legal limitation on the water supply at the diverting location. Although not incorporated into the basin-wide gap values, a reduction in transbasin supplies could increase the total South Platte River basin gap by more than the values shown in the table due to reuse of these supplies throughout the basin.

2.2 SOUTH PLATTE RIVER BASIN REVISED WATER SUPPLY AND GAP RESULTS

Revisions to reservoir operations and demands in the West Slope basins led to a decrease in the annual import supply gap. The reduction to the average annual import supply gap ranged from 140 to 5,300 acre-feet across the Planning Scenarios, and larger reductions of 2,150 to 21,600 acre-feet during critically dry years. This is largely a result of the revised operations for Green Mountain Reservoir in the Colorado River basin water allocation model resulting in increased water availability to the Blue River Diversion Project during critically dry years. A slight increase in diversions via Adams Tunnel in dry years also occurred as a result of revisions to the model, which in combination with the Blue River Diversion Project diversions, led to the reduction to the import supply gap in the South Platte River basin.

Table 1: Summary of Transbasin Imports to the South Platte River Basin

	Transbasin Import Supply Gap Results	Baseline	Business as Usual	Weak Economy	Coop. Growth	Adaptive Innovation	Hot Growth
Average	Average Annual Import Supply (ac-ft)	392,127	392,127	392,127	392,127	392,127	392,127
	Average Annual Import Supply Gap (ac-ft)	1,025	962	962	9,339	19,208	21,942
	Average Annual Import Supply Gap Increase from Baseline (ac-ft)	-	-	-	8,314	18,183	20,917
	Average Annual Import Supply Percent Gap	0%	0%	0%	2%	5%	6%
Critically Dry Maximum	Import Supply In Maximum Gap Year (ac-ft)	359,779	359,779	359,779	405,267	508,557	339,873
	Import Supply Gap In Maximum Gap Year (ac-ft)	3,430	3,388	3,388	21,617	75,979	87,808
	Increase from Baseline Import Supply Gap (ac-ft)	-	-	-	18,186	72,548	84,377
	Import Supply Percent Gap In Maximum Gap Year	1%	1%	1%	5%	15%	26%

Appendix B. SPECIAL STUDY: **Environmental and Recreational Benefits of** Irrigated Agriculture in the Lower South Platte Basin

Basin Implementation Plan

Special Study: Environmental and Recreational Benefits of Irrigated Agriculture in the Lower South Platte Basin

June 15, 2021

HDR LRE WATER Stantec COLORADO Colorado Water Conservation Board Department of Natural Resources Brown AND Caldwell

SOUTH PLATTE BASIN

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APPENDICES

ACRONYMS

BCR	Bird Conservancy of the Rockies
COL	Colorado Open Lands
CPW	Colorado Parks and Wildlife
CWCB/DWR	Colorado Water Conservation Board/Division of Water Resources
DU	Ducks Unlimited
NHD	National Hydrography Dataset
PRRIP	Platte River Recovery Implementation Program
sq mi	square miles
SWA	State Wildlife Area
USGS	United States Geological Survey
WBD	Watershed Boundary Dataset

SECTION 1. INTRODUCTION

1.1 PURPOSE

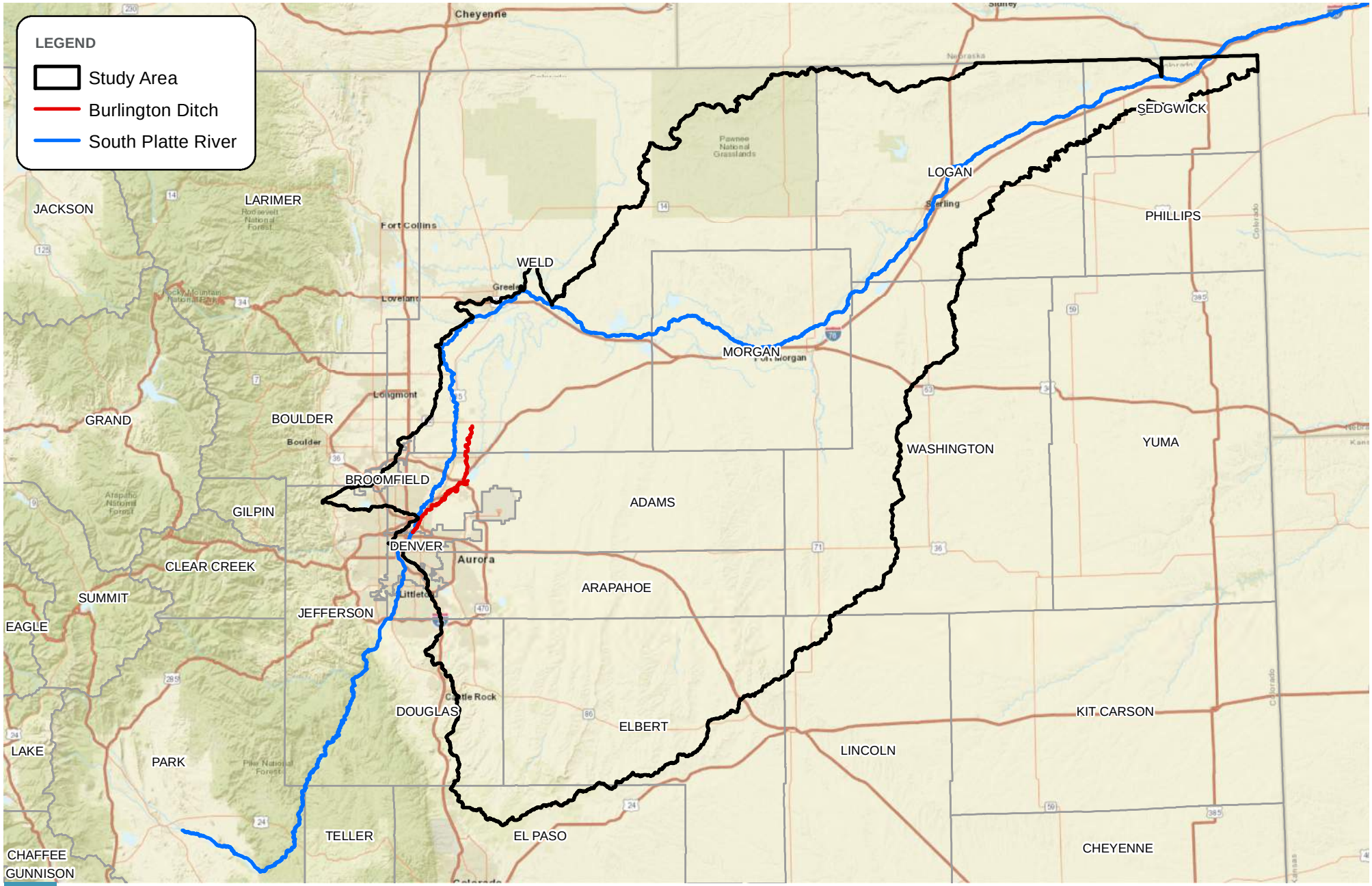
As part of the South Platte Basin Implementation Plan Update, the South Platte and Metro Basin Roundtables funded a special study that focused on the environmental and recreational benefits of irrigated agriculture in the Lower South Platte Basin (study area). The purpose of this study is to research and document potential beneficial interactions between agricultural, environmental, and recreational water uses within the study area with a spatial data analysis and case study review. These beneficial interactions may include: the creation of irrigated agricultural lands-supported wetlands; wildlife habitat along irrigation canals, ditches, and ponds; wildlife bird habitats; and recreational opportunities such as flatwater boating and fishing. This study did not include field verification or a direct study of the potential beneficial interactions.

The study consisted of two main components: a spatial data review and collection of case studies. The purpose of the spatial data review was to collect publicly available data related to agricultural, environmental, and recreational water use attributes and conduct simple spatial analyses to identify potential locations of beneficial interactions. The case studies provide actual examples of beneficial interactions from various stakeholders within the study area with mechanisms such as recharge and re-timing of South Platte River flows, leasing water, allocating portions of water rights, and conservation easements.

Documenting the potential beneficial interactions of the different water uses provides a greater understanding of the complexity and interdependency of water resources in the study area. Many of the wetlands originally present in the study area were lost and/or degraded either due to land conversion or as a result of various historical land and water management practices. Today, most landowner understand that wetland conservation is critically important for the long-term sustainability of the region's economy and environmental integrity.

1.2 LOCATION

The study area is located within the Lower South Platte Basin, which was defined as a portion of the watershed associated with the mainstem of the South Platte River from the diversion headgate of the Burlington Canal to the Colorado state line (Figure 1). Major tributaries of the South Platte River, including the Cache la Poudre River, Big Thompson River, and St. Vrain River, were not included in the study. The study area is located within Sedgwick, Logan, Weld, Morgan, Washington, Broomfield, Adams, Denver, Arapahoe, Elbert, Douglas, Lincoln, and El Paso Counties in Colorado and encompassed an area of approximately 9,800 square miles (sq mi) based on the United States Geological Survey's (USGS) 2015 Watershed Boundary Dataset (WBD). The topography within the study area generally drains from the southwest to the northeast, with flows draining into the South Platte River.



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LOCATION MAP

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 1

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SECTION 2. SPATIAL DATA REVIEW

2.1 PURPOSE

The purpose of the spatial data review was to collect, review, and document publicly available spatial data related to agricultural, environmental, and recreational water use attributes. Using this data, spatial analyses were completed using ArcGIS to identify locations where datasets of interest overlapped or intersected. For the purposes of this analysis, the areas of data overlap or intersection served to identify **potential** locations of beneficial interactions between agricultural, environmental, and recreational water uses. Field verification or a direct study is needed to confirm if locations represent beneficial interactions and the extent to which these intersections support one another.

2.2 DATA REVIEW

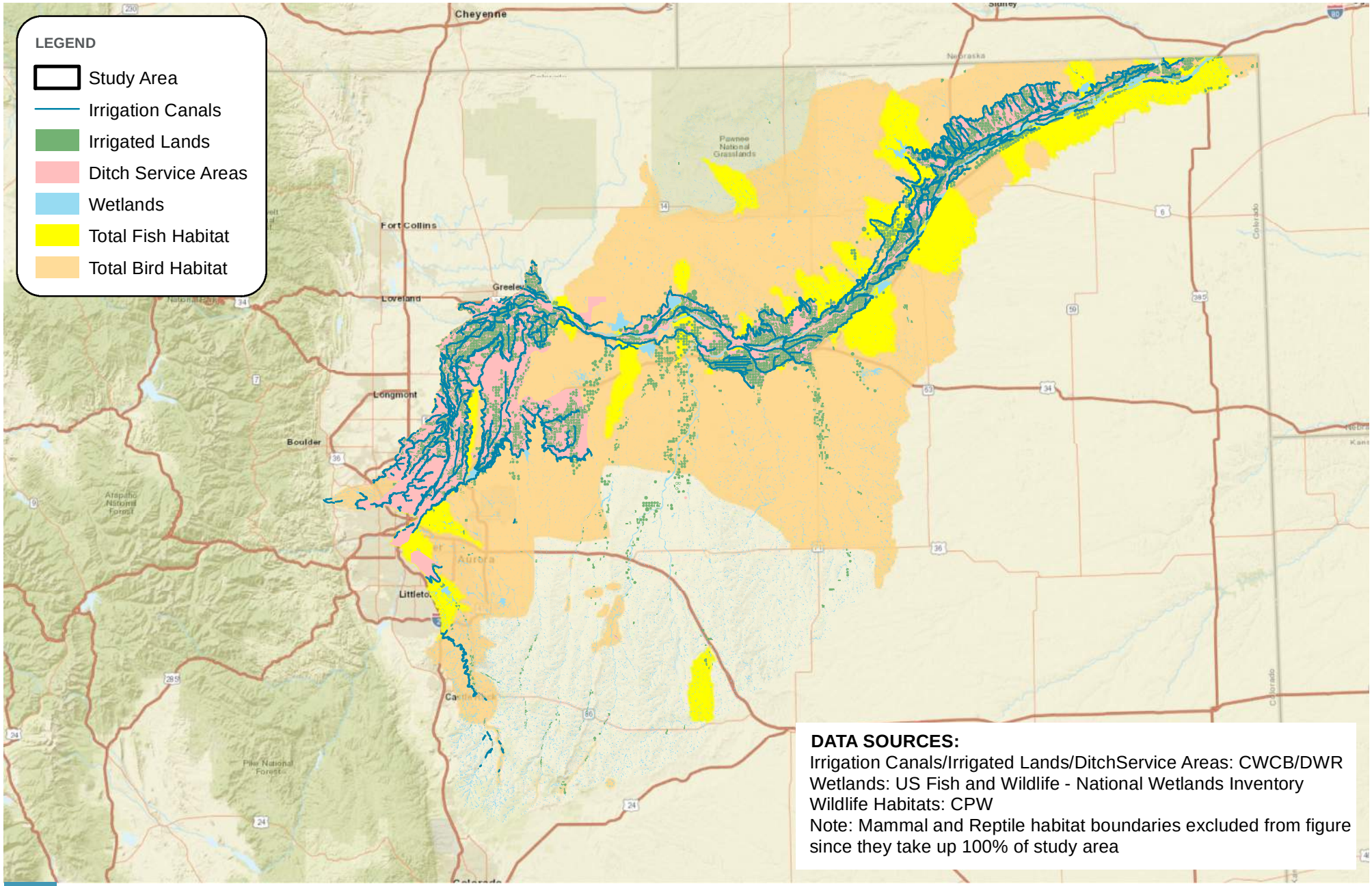
Publicly available spatial data with agricultural, environmental, and recreational attributes was downloaded and reviewed to evaluate potential interactions between the various water uses. The publicly available spatial data downloaded is presented in Table 1 and Figure 2 and includes: wetlands (including riverine and lake); irrigation canals, ditches, ditch service areas; and wildlife habitat boundaries. A detailed summary table for the downloaded spatial data is provided in Appendix A, Spatial Data Download. Additional data sources may be reviewed in future planning studies, including: State and County Parks and Open Space, Wildlife Refuges, 2019 Technical Update Environmental Database, etc.

Table 1. Spatial Data Review

Item	Source	Date Published	Data Type	Attribute	Area (acres)	Percentage of Overall Study Area
Study Area	NHD; USGS National Map	May 1, 2018	Polygon	N/A	6,273,900 (9,800 sq mi)	N/A
Wetlands	U.S. Fish and Wildlife – National Wetlands Inventory	October 1, 2020	Polygon	E&R	184,799	3
Ditch Service Areas	CWCB/DWR	November 19, 2020	Polygon	Agricultural	867,948	14
Canals	CWCB/DWR	November 19, 2020	Polyline	Agricultural	1,825 miles	0.35[1]
Irrigated Lands	CWCB/DWR	April 3, 2019	Polygon	Agricultural	469,333	8
Total Fish Habitat[2]	CPW	December 7, 2020	Polygon	E&R	917,991	15
Total Bird Habitat[3]	CPW[6]	December 7, 2020	Polygon	E&R	4,306,240	69
Total Reptile Habitat[4]	CPW[6]	December 7, 2020	Polygon	E&R	6,273,900	100
Total Mammal Habitat[5]	CPW[6]	December 7, 2020	Polygon	E&R	6,273,900	100

[1] Based on a 100-foot buffer applied to the canal polyline
[2] Five fish species available within the study area
[3] Thirteen bird species available within the study area
[4] Twenty-five reptile species available within the study area
[5] Fourteen mammal species available within the study area
[6] The bird, reptile, and mammal habitats obtained from the same CPW dataset; separated manually.

CPW = Colorado Parks and Wldlife; CWCB/DWR = Colorado Water Conservation Board/Division of Water Resources; E&R = Environmental and Recreational; N/A = not appliable; NHD = National Hydrography Dataset; USGS = United States Geological Survey



DATA SOURCES:
Irrigation Canals/Irrigated Lands/DitchService Areas: CWCB/DWR
Wetlands: US Fish and Wildlife - National Wetlands Inventory
Wildlife Habitats: CPW
Note: Mammal and Reptile habitat boundaries excluded from figure since they take up 100% of study area

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AVAILABLE DATA

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 2

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2.2.1 Wetlands

As noted in Table 2, publicly available wetlands data were available through the U.S. Fish and Wildlife – National Wetlands Inventory. This includes: freshwater emergent, riverine, lake, freshwater forested/shrub, and freshwater pond. There are 184,799 acres of total wetlands within the study area, with freshwater emergent wetland and riverine being the most prevalent. Table 2 provides a breakdown of wetland types found within the study area.

Table 2. Wetland Types

Wetland Type	Area (acres)	Percentage of Total Wetlands	Percentage of Study Area
Freshwater Emergent Wetland	63,505	34	1
Riverine	63,430	34	1
Lake	25,818	14	Less than 1
Freshwater Forested/Shrub Wetland	17,965	10	Less than 1
Freshwater Pond	11,762	6	Less than 1
Other	4,552	2	Less than 1

2.2.2 Wildlife

As noted in Table 1, publicly available wildlife habitat boundaries were available through Colorado Parks and Wildlife (CPW). Of the 57 available species, 5 are fish, 13 are birds, 25 are reptiles, and 14 are mammals.

FISH HABITATS

Fish species habitats comprise a total of 917,991 acres, approximately 15 percent of the study area. Of the five species, one is categorized as State Endangered, one is categorized as State Special Concern, and one is categorized as State Threatened, as shown in Table 3.

Table 3. Fish Species

Fish Species	Percentage of Total Fish Habitat[1]	CPW Status
Suckermouth Minnow	44	State Endangered
Iowa Darter	60	State Special Concern
Brassy Minnow	54	State Threatened
Plains Topminnow	21	N/A
Orange Spotted Sunfish	60	N/A

[1] Does not add up to 100 percent because species overlap each other.

BIRD HABITATS

Bird species habitat comprise a total of 5,711,790 acres, approximately 91 percent of the study area. Of the available bird species, three are categorized as State Special Concern and one is categorized as State Endangered, as shown in Table 4.

Table 4. Bird Species

Bird Species	Percentage of Total Bird Habitat[1]	CPW Status
Bald Eagle	9	State Special Concern
Lesser Sandhill Crane	29	State Special Concern
Peregrine Falcon	Less than 1	State Special Concern
Plains Sharp-Tailed Grouse	3	State Endangered
Bobwhite Quail	3	N/A
Canada Geese	38	N/A
Great Blue Heron	4	N/A
Greater Prairie Chicken	10	N/A
Osprey	Less than 1	N/A
Ring-Necked Pheasant	59	N/A
Snow Geese	12	N/A
White Pelican	3	N/A
Wild Turkey	9	N/A

[1] Does not add up to 100 percent because species overlap each other.

REPTILE HABITATS

Reptile species habitat encompass the entire study area. Of the available reptile species, only one is categorized as State Special Concern, as shown in Table 5. When the available data for reptile species is filtered for those categorized species (e.g., common gartersnake), only 2,484,720 acres, approximately 40 percent of the study area is reflected.

Table 5. Publicly Available Reptile Species

Reptile Species	Percentage of Total Reptile Habitat1	CPW Status
Common Gartersnake	40	State Special Concern
Bullsnake	100	N/A
Coachwhip	Less than 1	N/A
Common Lesser Earless Lizard	84	N/A
Glossy Snake	8	N/A
Great Plains Ratsnake	1	N/A
Great Plains Skink	2	N/A
Hernandez's Short-Horned Lizard	71	N/A
Lined Snake	18	N/A
Milksnake	100	N/A
North American Racer	94	N/A
Northern Watersnake	17	N/A
Ornate Box Turtle	83	N/A
Painted Turtle	81	N/A
Plains Black-Headed Snake	9	N/A
Plains Gartersnake	100	N/A
Plains Hog-Nosed Snake	90	N/A
Prairie Lizard and Plateau Fence Lizard	100	N/A
Prairie Rattlesnake and Western Rattlesnake	100	N/A
Six-Lined Racerunner	91	N/A

Reptile Species	Percentage of Total Reptile Habitat1	CPW Status
Smooth Greensnake	1	N/A
Snapping Turtle	32	N/A
Spiny Softshell Turtle	30	N/A
Terrestrial Gartersnake	45	N/A
Variable Sink and Many-Lined Skink	100	N/A

[1] Does not add up to 100 percent because species overlap each other.

MAMMAL HABITATS

Mammal species habitat encompass the entire study area. Of the available mammal species, one is categorized as State Endangered, one is categorized as Federally Endangered, two are categorized as State Special Concern, two are categorized as State Threatened, and one is categorized as Federally Threatened, as shown in Table 6. When only categorized mammal species are considered (black-footed ferret, black-tailed prairie dog, Preble's meadow jumping mouse, river otter, and swift fox), they also encompass the entire study area.

Table 6. Publicly Available Mammal Species

Mammal Species	Percentage of Total Mammal Habitat1	CPW Status
Black-Footed Ferret	Less than 1	Federally Endangered; State Endangered
Black-Tailed Prairie Dog	100	State Special Concern
Preble's Meadow Jumping Mouse	38	Federally Threatened; State Threatened
River Otter	1	State Threatened
Swift Fox	60	State Special Concern
Albert's Squirrel	3	N/A
Bighorn Sheep	Less than 1	N/A
Black Bear	7	N/A
Brazilian Free-Tailed Bat	12	N/A
Elk	8	N/A
Mountain Lion	15	N/A
Mule Deer	100	N/A
Proghorn	77	N/A
White-Tailed Deer	60	N/A

[1] Does not add up to 100 percent because species overlap each other.

2.3 IRRIGATED AGRICULTURAL LANDS

To capture the full effects of irrigated agriculture in the study area, "irrigated agricultural lands" was assumed to be a compilation of the following datasets:

1. CWCB/DWR Irrigation Canals
2. CWCB/DWR Ditch Service Areas
3. CWCB/DWR Irrigated Lands
4. Additional Agricultural Lands

The CWCB/DWR irrigation canals (irrigation canals) are available as a line feature. To include this data in the irrigated agricultural lands, the "buffer" tool in ArcGIS was used to create a buffer around a polyline to create a polygon, as shown on Figure 3. A 100-foot buffer was applied, representing 50 feet on each side of the centerline, to account for the spatial variability and width of the irrigation canals. Although a 100-foot buffer may not capture the full groundwater benefits of the irrigation ditch, it was assumed to be appropriate to capture the width of the irrigation canal due to limitations in consistently measuring canal width and based on review of aerial imagery.

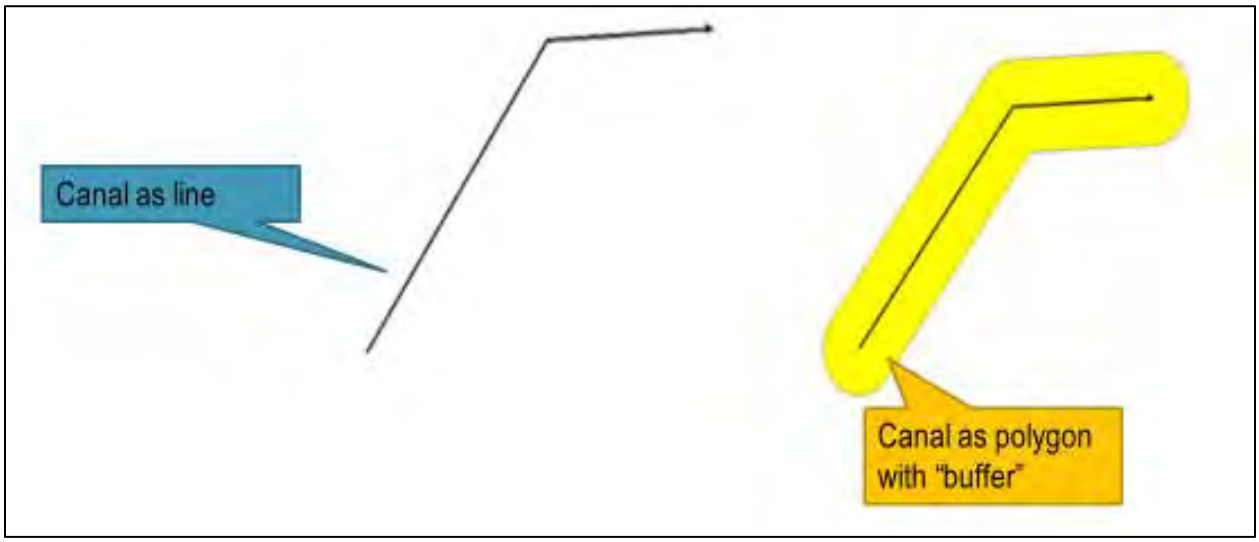
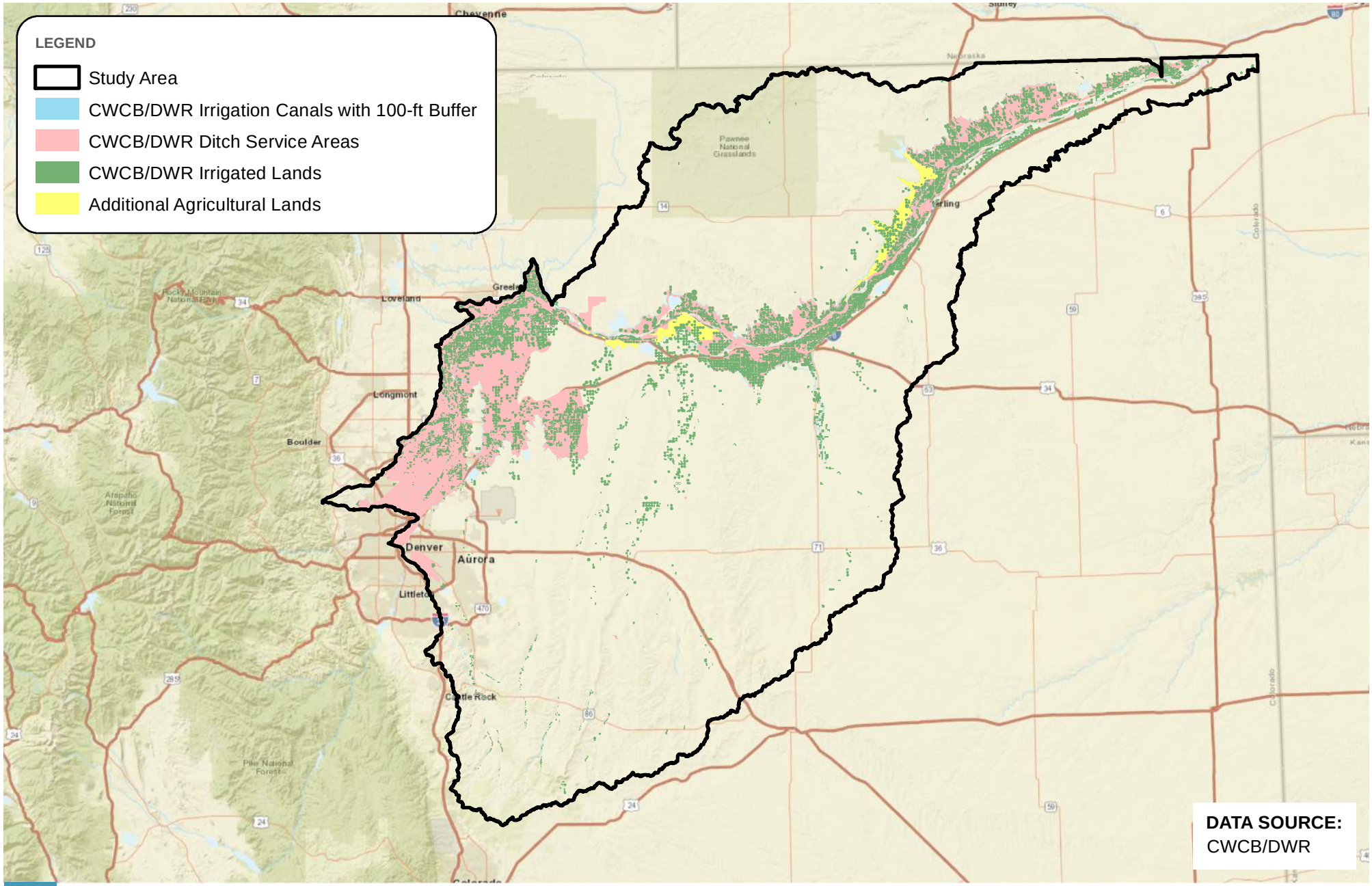


Figure 3. ArcGIS Buffer Tool Schematic

Additional agricultural lands represent locations between the irrigation canals and the South Platte River that were not captured within the irrigated agricultural lands dataset, which the Agricultural Subcommittee felt were influenced by agriculture.

The resulting irrigated agricultural lands are shown on Figure 4. The irrigated agricultural lands are 1,402,253 acres (ac), representing 22 percent of the overall study area.



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IRRIGATED AGRICULTURAL LANDS

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 4

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2.4 ENVIRONMENTAL AND RECREATIONAL ATTRIBUTES

The following data was assumed to represent environmental and recreational attributes:

- The wetlands boundaries downloaded from the U.S. Fish and Wildlife – National Wetlands Inventory. A wetland is defined as a portion of land consistently flooded by water creating the ideal habitat for vegetation, aquatic plants, and wildlife habitat.
- The wildlife habitats downloaded from CPW as these habitats provide opportunity for recreational hunting, fishing, and bird watching.

2.5 ANALYSIS

Three spatial data analyses were conducted to understand the relationship between the three different water uses. These analysis included:

1. Irrigated Agricultural Lands Potentially Supporting Wetlands
2. Irrigation Canal Potentially Supporting Wetlands
3. Irrigated Agricultural Lands Potentially Supporting Wildlife Habitats

To perform the spatial analyses, the "Intersect" tool in ArcGIS was used. This tool finds the area where polygon datasets overlap and outputs only those overlap areas, as shown on Figure 5. It was assumed that locations of Irrigated Agricultural Lands and Environmental and Recreational attributes overlap represent a positive and beneficial interaction.

No field work or additional analyses were completed to confirm that these intersections are beneficial.

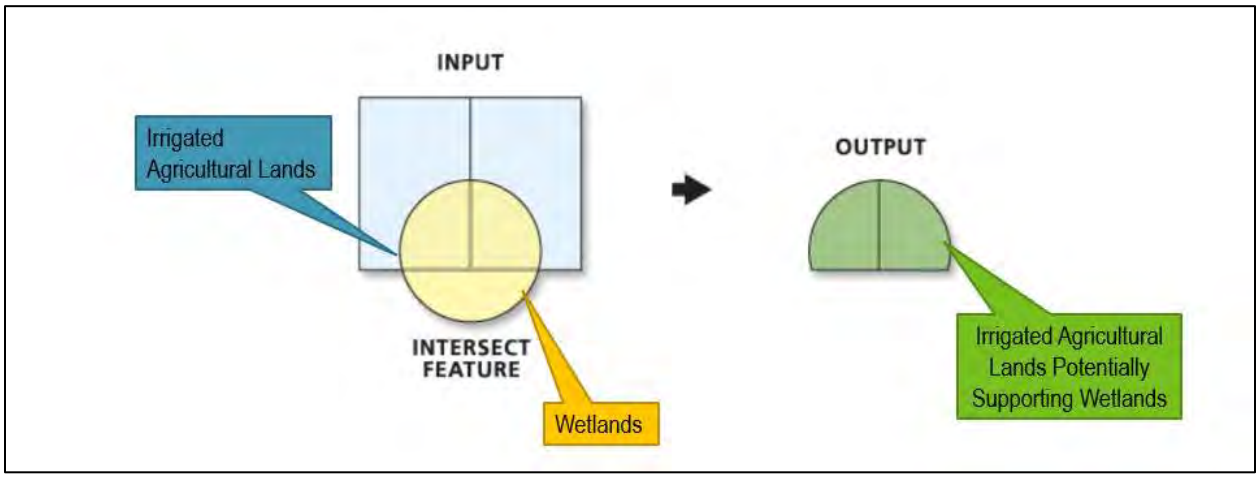


Figure 5. ArcGIS Intersect Tool Schematic

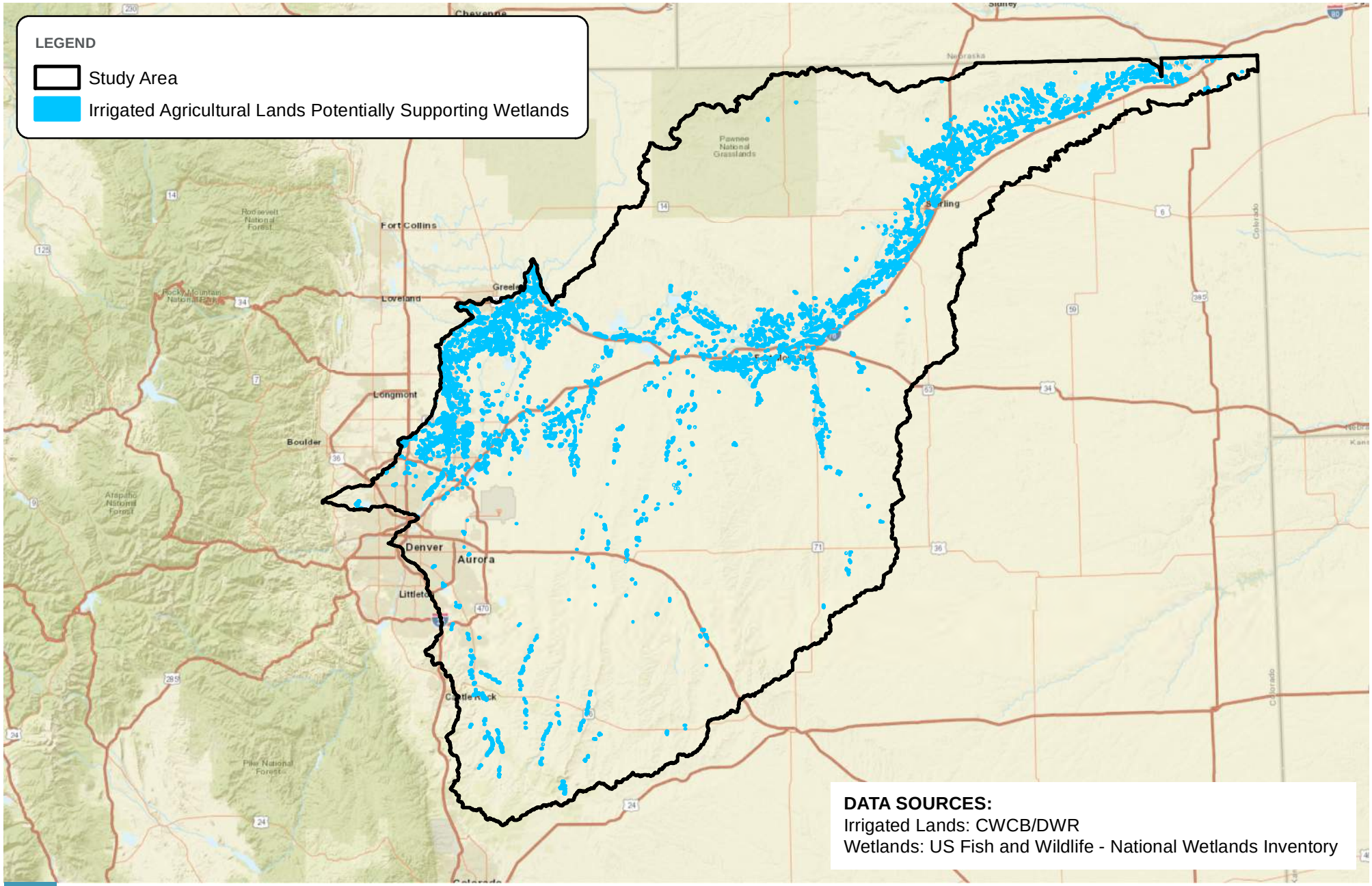
2.5.1 Irrigated Agricultural Lands Potentially Supporting Wetlands

Irrigated agricultural lands potentially supporting wetlands was assumed to be the intersection between the irrigated agricultural lands and the wetlands. The analysis concluded that there are 62,398 acres of land within the study area where irrigated agricultural lands and wetlands intersect, as shown on Figure 6.

This area represents 1 percent of the overall basin study area, 4 percent of the basin irrigated agricultural lands, and 34 percent of the basin wetlands. *It should be noted that riverine wetland types are also included in this analysis, which may include the South Platte River.* The most prevalent wetland type is fresh emergent wetlands, making up 51 percent of the total Irrigated agricultural lands supported wetlands. A breakdown of all wetland types supported by irrigated agricultural lands is shown in Table 7.

Table 7. Irrigated Agricultural Lands Potentially Supporting Wetlands

Wetland Type	Area (acres)	Percentage of Total Irrigated Agricultural Lands Potentially Supporting Wetlands
Freshwater Emergent Wetland	31,900	51
Riverine	12,440	20
Lake	6,727	11
Freshwater Forested/Shrub Wetland	6,220	10
Freshwater Pond	4,936	8
Other	175	Less than 1



IRRIGATED AGRICULTURAL LANDS POTENTIALLY SUPPORTING WETLANDS

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

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FIGURE 6

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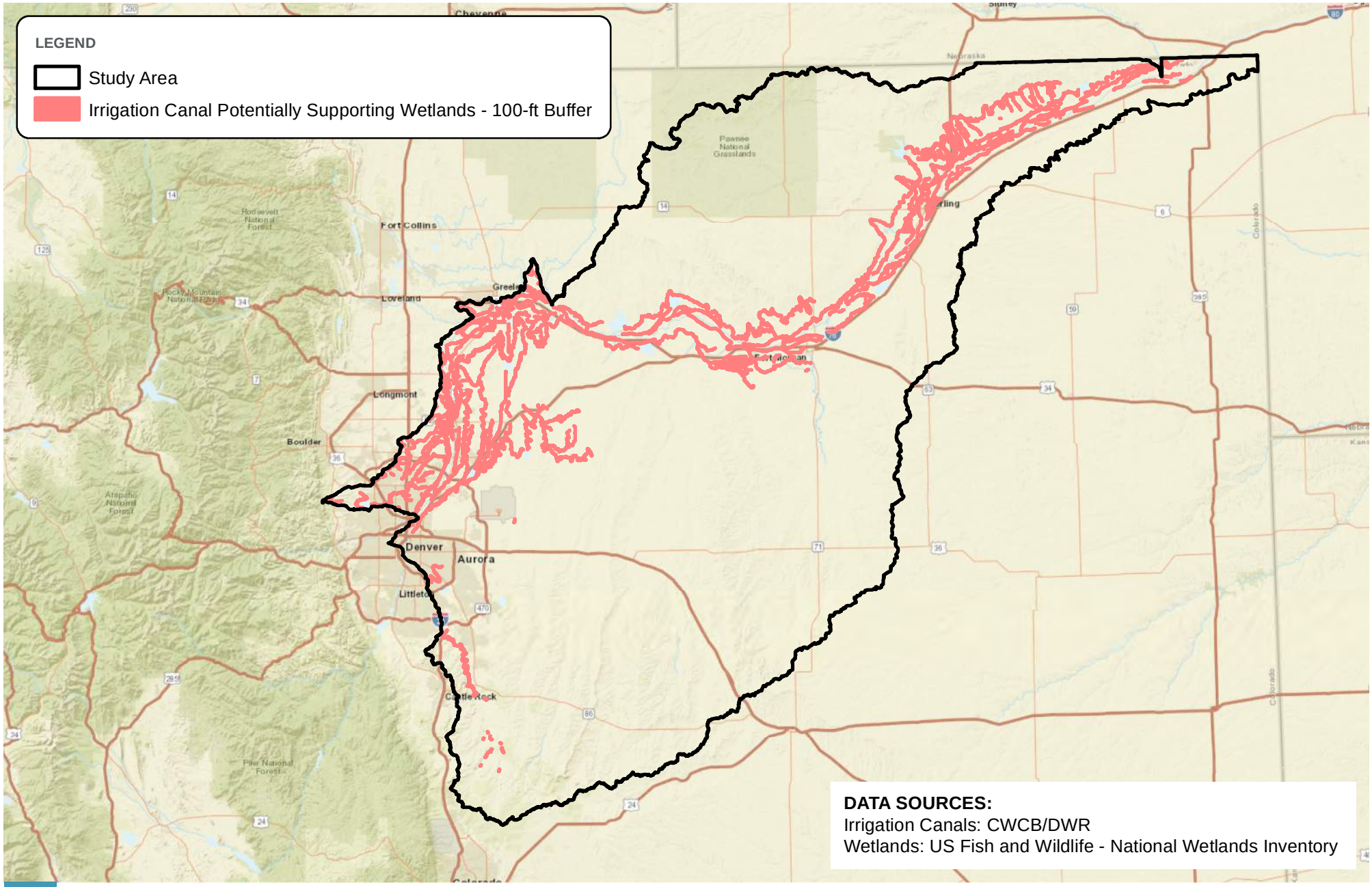
2.5.2 Irrigation Canal Potentially Supporting Wetlands

Irrigation canal potentially supporting wetlands was defined as the intersection between the irrigation canals (with the 100-foot buffer) and the wetlands. The analysis indicated a total of 5,664.8 acres of land within the study area where the irrigation canals and the wetlands intersect, as shown on Figure 7.

This area represents 0.1 percent of the overall study area, 26 percent of the basin irrigation canals, and 3 percent of the basin wetlands. The most prevalent wetland type is riverine, making up 79 percent of total wetlands supported by irrigation canals A breakdown of the types of wetlands supported by the irrigation canals is shown in Table 8.

Table 8. Irrigation Canal Potentially Supporting Wetlands – 100-foot Buffer

Wetland Type	Area (acres)	Percentage of Total Wetlands Potentially Supported by Irrigation Canals
Riverine	4,471	79
Freshwater Emergent Wetland	910	16
Freshwater Forested/Shrub Wetland	165	3
Freshwater Pond	90	2
Lake	30	Less than 1
Other	Negligible	Less than 1



IRRIGATION CANAL POTENTIALLY SUPPORTING WETLANDS

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

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FIGURE 7

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2.5.3 Irrigated Agricultural Lands Potentially Supporting Wildlife Habitats

For this analysis, the wildlife habitats were assumed to be the total animal classes (fish, birds, mammals, and reptiles). Each animal class was created using the "merging" tool in ArcGIS. This tool merged together all species of animals that fell into a specific animal class to create one animal class dataset (Figure 8).

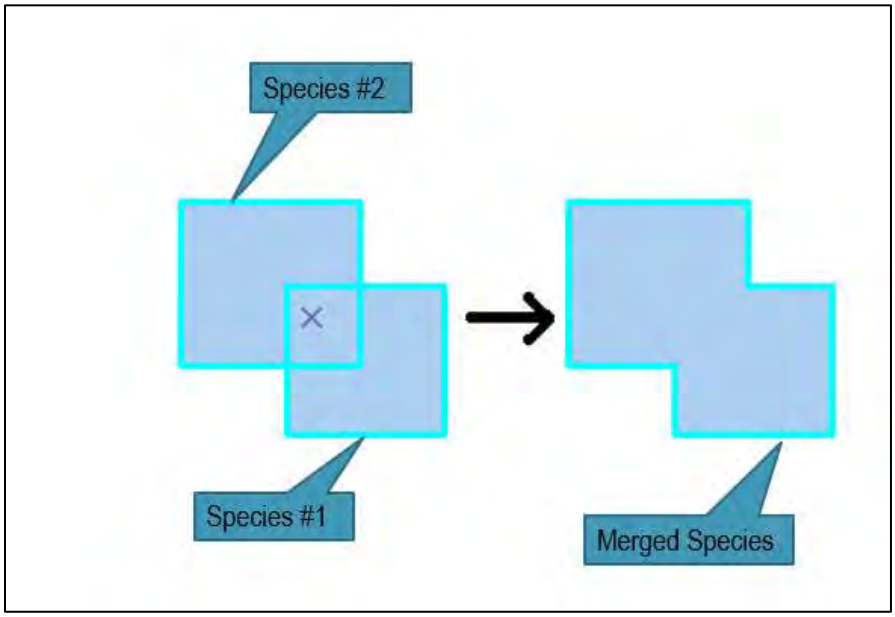
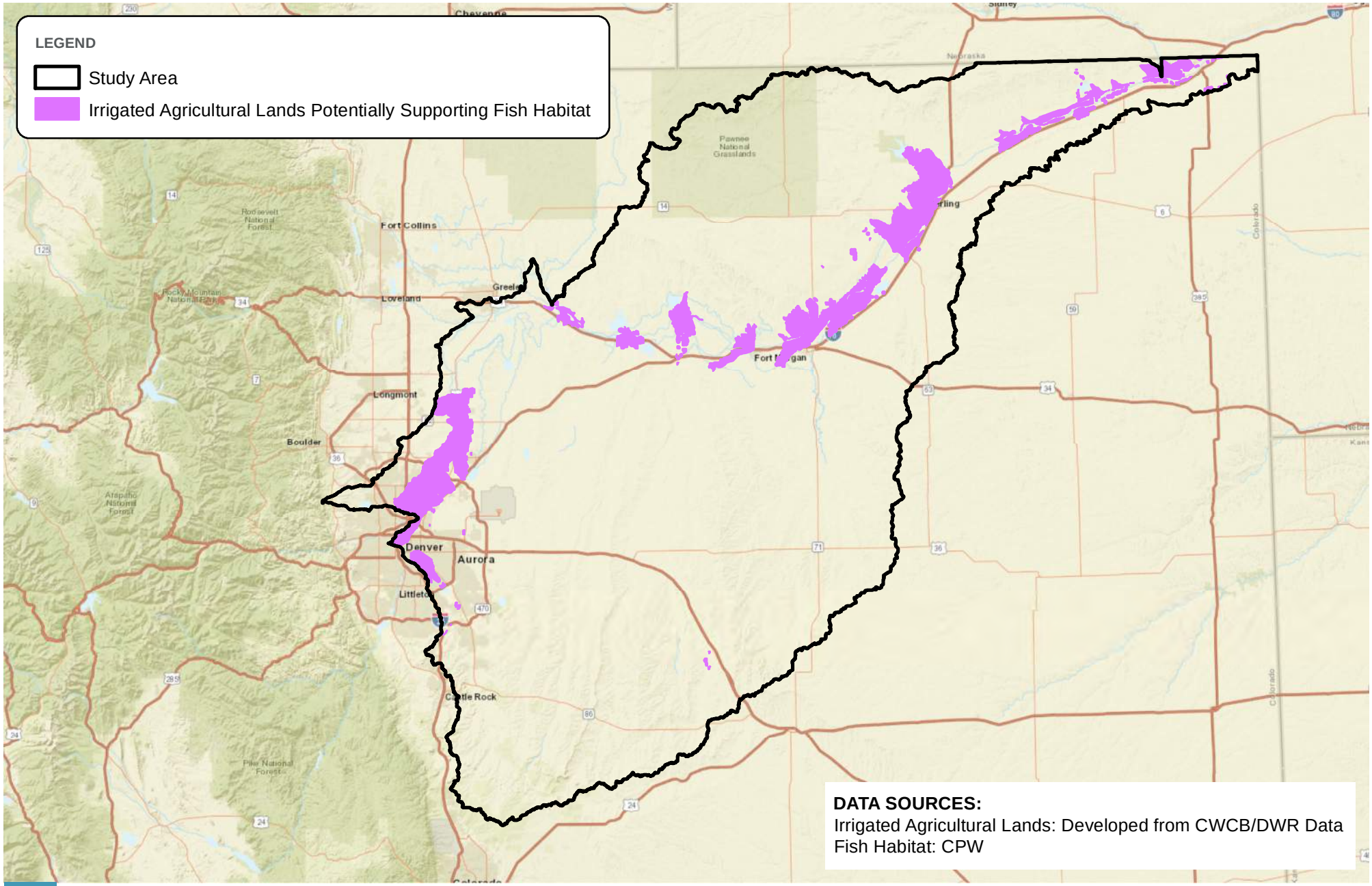


Figure 8. ArcGIS Merge Tool Schematic

2.5.4 Irrigated Agricultural Lands Potentially Supporting Fish Habitats

Irrigated agricultural lands potentially supporting fish habitat was defined as the intersection between the irrigated agricultural lands and the fish habitat within the study area. Note the CPW fish habitats were developed on the Hydraulic Unit Code 12 basin level, and may over-represent locations of fish habitat.

The analysis indicated a total of 299,372 acres of fish habitat within the study area where the irrigated agricultural lands intersect, as shown on Figure 9. This area represents 5 percent of the overall study area, 21 percent of the basin-irrigated agricultural lands, and 33 percent of the basin fish species.



IRRIGATED AGRICULTURAL LANDS POTENTIALLY SUPPORTING FISH HABITAT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 9

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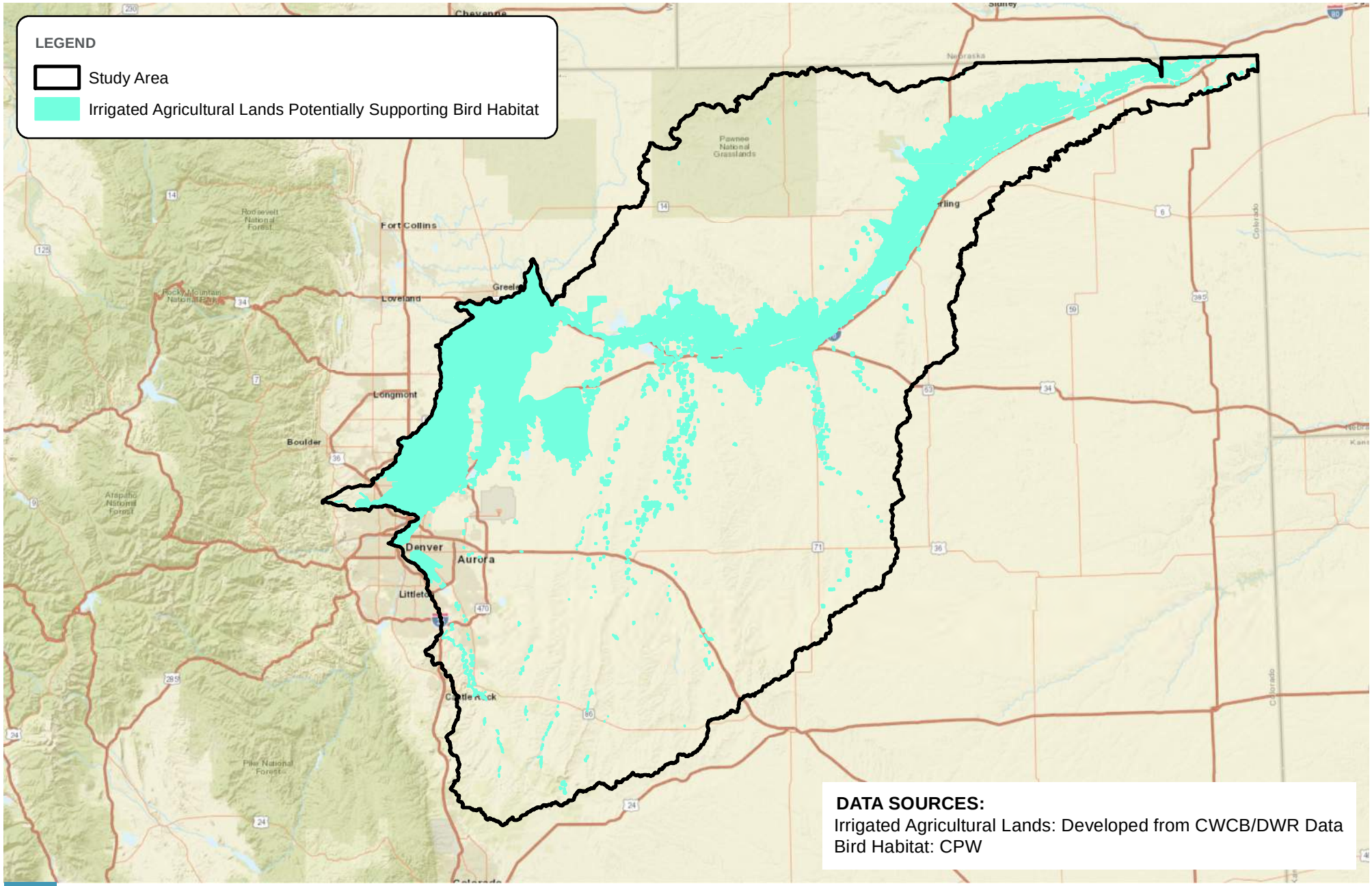
2.5.5 Irrigated Agricultural Lands Potentially Supporting Bird Habitats

The irrigated agricultural lands potentially supporting bird habitat was defined as the intersection between the irrigated agricultural lands and the bird habitats within the study area.

The analysis indicated a total of 1,008,690 acres of bird habitat within the study area where the irrigated agricultural lands intersect, as shown on Figure 10. This area represents 16 percent of the overall study area, 72 percent of the basin-irrigated agricultural lands, and 18 percent of the basin bird habitat.

Further spatial analysis of bird habitats by species is presented in Appendix B, Irrigation Canal-supported Birds.



IRRIGATED AGRICULTURAL LANDS POTENTIALLY SUPPORTING BIRD HABITAT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 10

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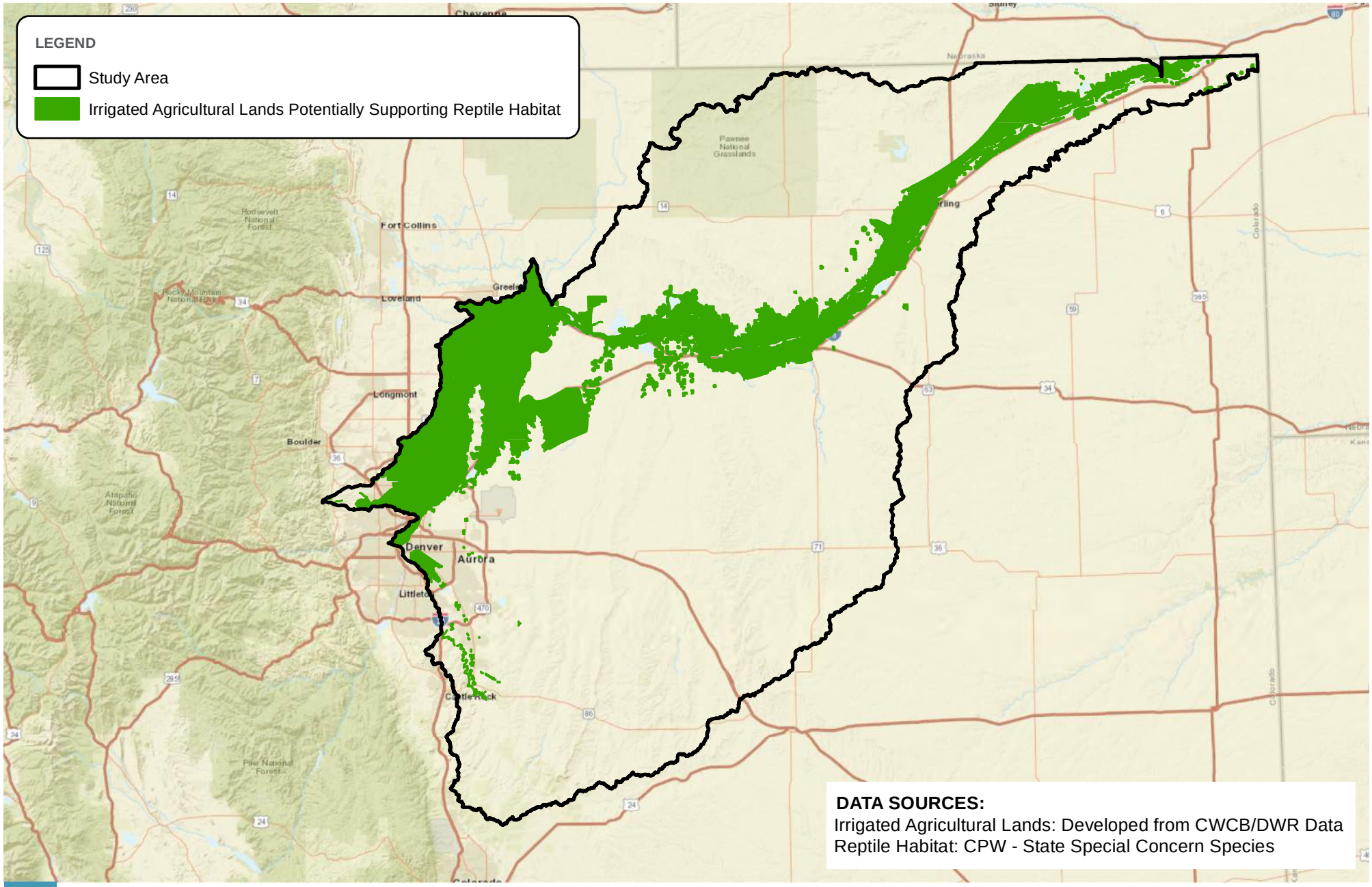
2.5.6 Irrigated Agricultural Lands Potentially Supporting Reptile Habitats

The irrigated agricultural lands potentially supporting reptile habitat was defined as the intersection between the irrigated agricultural lands and the reptile habitats within the study area.

When all the reptile species provided in Table 5 were merged together, the final reptile habitat boundary covered the entire study area. To perform the analysis, only CPW categorized reptile species were considered. In this case, only the common gartersnake (tagged as State Special Concern) was reviewed to represent the reptile habitat boundary.

The analysis indicated a total of 2,484,720 acres of reptile habitat within the study area where the irrigated agricultural lands intersect with the common gartersnake, as shown on Figure 11. This area represents 14 percent of the overall study area, 64 percent of the basin-irrigated agricultural lands, and 36 percent of the common gartersnake habitat.



IRRIGIATED AGRICULTURAL LANDS POTENTIALLY SUPPORTING REPTILES

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 11

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IRRIGATED AGRICULTURAL LANDS POTENTIALLY SUPPORTING MAMMAL HABITATS

The irrigated agricultural lands potentially supporting mammal habitats was defined as the intersection between the irrigated agricultural lands and the mammal habitats within the study area.

When all the mammal species provided in Table 6 were merged together, the final mammal habitat boundary covered the entire study area, similar to the reptiles (see Irrigated Agricultural Lands Potentially Supporting Wildlife Habitats). Similar to reptiles, the species tagged by CPW were then considered (black-footed ferret, black-tailed prairie dog, Preble's meadow jumping mouse, river otter, and swift fox [Table 6]). However, these species merged together also took up the entire study area, meaning that the habitats would intersect with the entire irrigated agricultural lands.

This demonstrates the positive relationship between mammal habitats and irrigated agricultural lands because 100 percent of irrigated agricultural lands support mammal habitat.

2.6 OBSERVATIONS

Based on the results from the spatial data review, there are substantial locations of beneficial interaction between agricultural and environmental water uses. From these results, it can be assumed that irrigated agricultural lands are an important source of water that supports environmental and recreational resources in the Lower South Platte Basin. It also demonstrates that agricultural lands and environmental resources should be managed collaboratively. Some statistics to highlight:

1. Percentage of basin wetlands potentially supported by the irrigated agricultural lands with the primary wetland type being freshwater emergent wetland: 34.
2. Percentage of basin wetlands potentially supported by irrigation canals when the 100-foot buffer is assumed with the primary wetland type being riverine: 26.
3. Percentage of irrigated agricultural lands that potentially support fish habitat: 21.
4. Percentage of basin-irrigated agricultural lands that potentially support bird habitat: 72.
5. Percentage of basin-irrigated agricultural lands that potentially support reptile habitat: 64.[1]
6. Percentage of basin-irrigated agricultural lands that potentially support mammal habitat: 100. [2]

Additionally, all the wildlife habitat supported by agricultural water uses provide recreational benefit, including hunting, fishing, and bird watching.

SECTION 3. CASE STUDIES

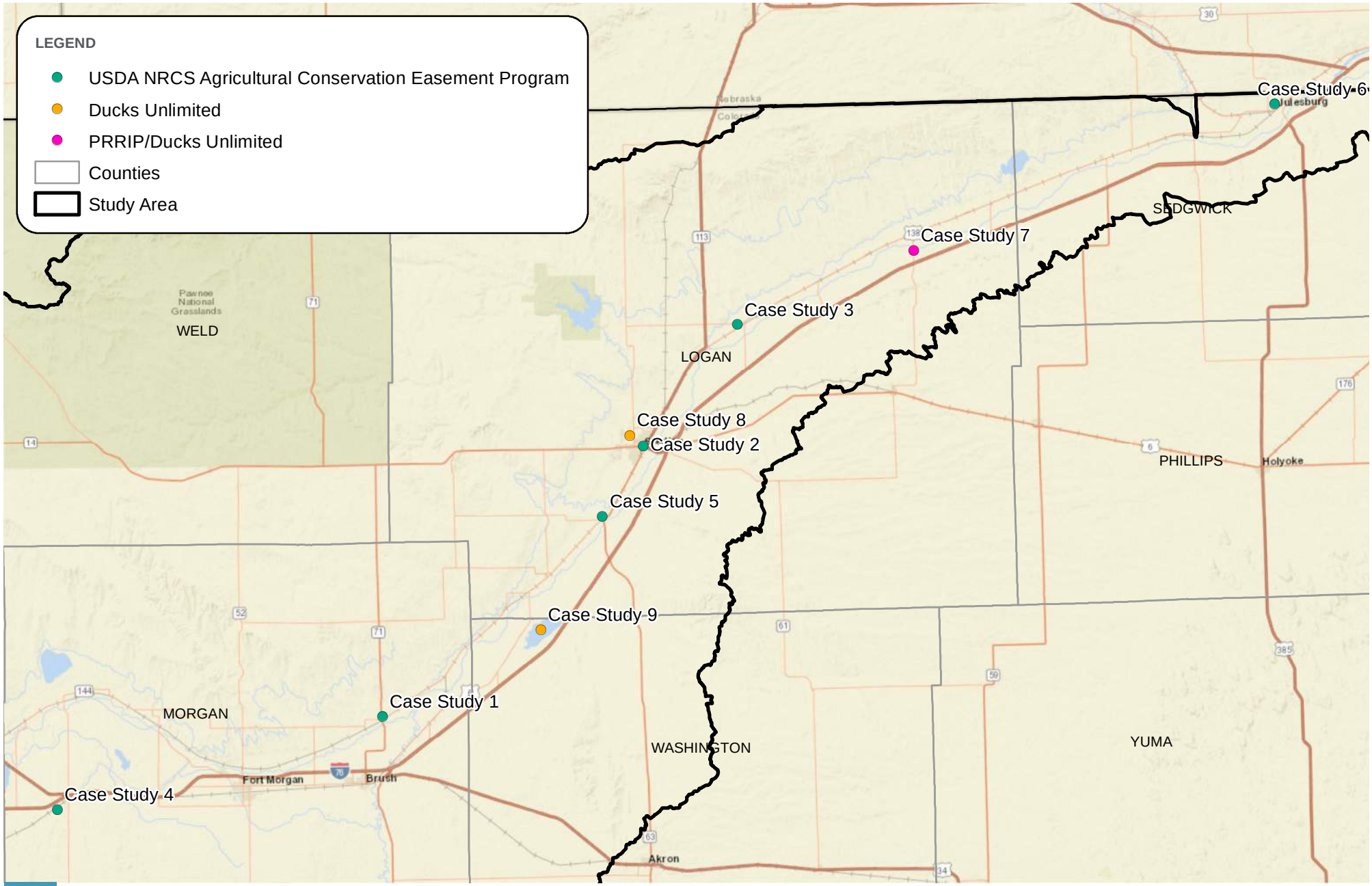
Case studies were collected from various stakeholders within the study area to further document beneficial interactions between agricultural, environmental, and recreational water uses. Locations and descriptions of these case studies are presented in Figure 12 and Table 9. Sources of these case studies included:

1. United States Department of Agriculture – Natural Resources Conservation Service (NRCS)
2. Platte River Recovery Implementation Program (PRRIP)
3. Ducks Unlimited (DU)

Five case studies presented in this section provide examples of beneficial interactions as well as the mechanisms in which agricultural, environmental, and recreational water uses interact with each other such as recharge and retiming of South Platte River flows, leasing water, allocating portions of water rights, and conservation easements. Additional case studies are presented in Appendix C, Case Studies.

[1] Note that this is only the categorized species: common gartersnake

[2] Note that this is only the categorized species species: black-footed ferret, black-tailed prairie dog, Preble's meadow jumping mouse, river otter, and swift fox



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CASE STUDIES

SOUTH PLATTE BASIN IMPLEMENTATION PLAN - SPECIAL STUDY

FIGURE 12

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Table 9. Existing Case Studies Summaries

Case Study	Source	Location	County	Project Summary
1	NRCS	Snyder, CO	Morgan	Property not historically considered a wetland, but considered part of the South Platte River floodplain. A ditch was installed through sandhills but seeps so much that the grounds cannot be used for agricultural purposes anymore. Therefore, land transitioned to be used as a wetlands through a conservation easement with the Wetlands Reserve Program to provide habitat. There are multiple augmentation ponds that serve as water recharge for the South Platte River and wetlands habitat. The property is now leased for recreational hunting.
2	NRCS	Sterling, CO	Logan	Property is historically farmland, which was then sold to city of Sterling to be turned into wildlife habitat. Property was reseeded and two augmentation ponds were installed to provide recharge to the South Platte River. These ponds are filled during the fall and spring, which benefit migratory bird species. Ground is now included in Wetland Reserve Program.
3	NRCS	Iliff, CO	Logan	Land historically used for grazing due to sub-irrigation providing year-round source of water for forage growth. Agricultural uses not possible on ground due to sandy soils and high possibility of flooding. A conservation easement was created to protect the wetland habitat and protect two recharge ponds that store water from the South Platte River. Landowners now use the land for hunting and quiet enjoyment.
4	NRCS	Wiggins, CO	Morgan	Property historically dry unless there is a large flood or snow melt. Property was used for grazing, but now has been overgrazed. Two conservation easements were implemented and multiple augmentation ponds were installed throughout the floodplain for the purpose of providing habitat and recharge for the South Platte River. The property is not used for recreational hunting.
5	NRCS	Atwood, CO	Logan	Property cannot be used for agriculture due to sandy soils and high possibility of flooding. Property historically used for grazing due to sub-irrigation, which provides a year-round source of water for forage growth. A conservation easement was created to protect the wetlands habitat. Property contains warm water slough, which is highly beneficial to waterfowl in the winter because waterbodies do not freeze over. It is noted that without irrigation, the warm water sloughs would likely not see as much water. Landowners can now use the land for recreational hunting and quiet enjoyment.
6	NRCS	Julesburg, CO	Sedwick	Property cannot be used for agriculture due to sandy soils and high possibility of flooding. Property historically used for grazing due to sub-irrigation, which provides a year-round source of water for forage growth. A conservation easement was created to protect the wetlands habitat. Property contains warm water slough, which is highly beneficial to waterfowl in the winter because waterbodies do not freeze over. It is noted that without irrigation, the warm water sloughs would likely not see as much water. Landowners can now use the land for recreational hunting and quiet enjoyment.
7	PRRIP/DU	Crook, CO	Logan	The Tamarack Ranch SWA serves as the most important groundwater recharge and retiming along the South Platte River. The project consists of seven shallow-water wetland impoundments along the South Platte River, along with a series of groundwater wells that provide seasonal water inflow into the impoundments. Water is diverted from the South Platte River to the impoundments during free-river periods using existing irrigation rights. The impoundment areas provide seasonal wetland habitat and high quality annual plants improving the conditions for endangered species and enhancing the wildlife habitat in the Tamarack Ranch SWA.

Case Study	Source	Location	County	Project Summary
8	DU	Sterling, CO	Logan	The Yahn Wetlands are 100 acres of shallow-water wetlands enhanced and restored on the Yahn property. Various agencies, as well as the landowner, contributed funds to complete the conservation of these wetlands. Earthen embankments were added to control irrigation water supply and improve the habitat conditions for waterfowl on the property. The intent of the project was to promote growth of wetlands vegetation, which then promotes the growth of waterfowl habitat.
9	DU	Prewitt Reservoir	Washington and Logan	This project enhanced and restored 340 acres of wetland habitat associated with the Prewitt Reservoir that are regularly flooded by normal reservoir operations. These areas were enhanced with the excavation of sand dunes providing quality habitat to birds and wetland wildlife that previously did not exist. Additionally, levees with water control structures were constructed within the reservoir basin to provide further shallow water flooding to create habitat for birds and wetland wildlife. This project was part of the Prewitt Wetlands Partnership that conserved and enhanced approximately 3,100 acres of important open water and wetland habitats in the Prewitt Reservoir complex. This partnership includes COL, DU, CPW, Colorado Water Conservation Board, Prewitt Reservoir Company, Prewitt Ranch private landowners, and the U.S. Fish and Wildlife Service.

BCR = Bird Conservancy of the Rockies; DU = Ducks Unlimited; PRRIP = Platte River Recovery Implementation Program

3.1 USDA NRCS AGRICULTURAL CONSERVATION EASEMENT PROGRAM

The Agricultural Conservation Easement Program (ACEP) helps landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements. Under the Agricultural Land Easements component, NRCS helps American Indian tribes, state and local governments and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance enrolled wetlands.

The Bird Conservancy of the Rockies (BDR) provided six sample case studies (Figure 12) where the integration of agricultural, environmental, and recreational water uses proved beneficial for both the landowners and the adjacent bird habitats. To provide an understanding of how the three water uses complement each other, two case studies provided by are highlighted in the report, while the remaining studies are included as summaries in Table 9 as well as in Appendix C, Case Studies.

3.1.1 NRCS: Irrigation Ditch to Wetland

The first case study is located in Snyder, Colorado in Morgan County (Case Study 1 in Table 9).

Photo 1. Emergent water from the North Sterling Canal in Morgan County, which provides habitat for wetland dependent wildlife.

This property was not historically considered a wetland but considered part of the South Platte River floodplain. An irrigation ditch was installed through the sandhills north of the property and seeps so that the ground can no longer be used for agricultural purposes.

New land use for environmental and/or recreational benefit: The portion of the property where the irrigation ditch was installed is now used as a wetland to provide wildlife habitat, a natural water filter, and recreational opportunities (Photo 1). Multiple augmentation ponds were added to the property as well, to serve as water recharge for the South Platte River and the wetlands habitat. Since this portion of the property has transitioned to a wetlands, it is used recreationally by the landowners for hunting.

How water rights were obtained to change the beneficial use: This was possible through the Wetlands Reserve Program, which is a USDA-Natural Resources Conservation Service easement program that restores and protects wetlands and wildlife.

Case study conclusion: This case study highlights the transition of land that can no longer function as agricultural to land that can benefit both environmental and recreational attributes.

3.1.2 NRCS: Private Property to City

The second case study is located in Sterling, Colorado in Logan County (Case Study 2 in Table 9).

Photo 2. Wildlife use of the augmentation pond in the early spring

This case study highlights where a piece of private property, historically considered farm ground, was turned into a wildlife habitat.

How water rights were obtained to change the beneficial use: This property had its water rights sold to the City of Sterling to turn the ground into a wildlife habitat. This was possible through the Wetlands Reserve Program, which is a USDA-Natural Resources Conservation Service easement program that restores and protects wetlands and wildlife.

New land use for environmental and/or recreational benefit: The ground was re-seeded and two augmentation ponds were installed to provide recharge to the South Platte River. The augmentation ponds are filled during the spring and fall, which benefits migratory bird species, as shown in Photo 2.

Case study conclusion: The ground is now part of the Wetlands Reserve Program and is protected for wetlands and wildlife.

3.2 PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

Colorado, Wyoming, Nebraska and the Department of the Interior formed a unique partnership in 1997 with the goal of protecting threatened and endangered species downstream, while allowing for water uses, by developing a shared approach to managing the Platte River. Water users from the three states, along with local and national conservation groups, joined the effort. Together, these stakeholders developed an innovative approach for improving the management of the Platte River, which considers the health of the ecosystem and the people who depend on it.

The Platte River Recovery Implementation Program is the result of that planning effort and is focused on implementing this shared vision for creating and maintaining targeted species habitats on the Platte River.

3.2.1 Platte River Recovery Implementation Program: Tamarack Ranch State Wildlife Area

The example project is located at the Tamarack Ranch State Wildlife Area (SWA) near Crook, Colorado (Case Study 7 in Table 9). Additional information provided by both Headwaters Corporation and Ducks Unlimited is available in Appendix C, Case Study 7.

Photo 3. Tamarack Project Recharge Pond

Photo 4. Tamarack Project – Photo provided by DU

The mission of the Platte River Recovery Implementation Program is to serve the threatened and endangered species of the Platte River Basin as well as the people living in the basin. The program focus their efforts on the following species:

- Piping Plover
- Interior Least Tern
- Whooping Crane
- Pallid Sturgeon

Their program components include increasing stream flow in the central Platte River during relevant periods; enhancing, restoring, and protecting habitat lands for the target bird species; and implementing management actions to learn and inform program decision-making.

New land use for environmental and/or recreational benefit: The State of Colorado and the South Platte Related Water Activities Program implement the Tamarack project, which benefits environmental and recreational water uses proved beneficial to the state, water users, and wildlife habitats. The State Wildlife Area includes managed groundwater recharge facilities and wildlife ponds that retime flows seasonally to the South Platte to benefit and improve conditions for threatened and endangered species, as shown in Photo 3 and Photo 4. These facilities also enhance wildlife habitat and provides habitat for Colorado's minnow Species of Concern. The Platte River Recovery Implementation Program and this project also reduces pressure toward dry up of lower South Platte agricultural lands to meet Endangered Species Act requirements.

How water rights were obtained to change the beneficial use: This project pumps/divert water into recharge ponds through existing irrigation rights when water demands are low, which retimes water back to the South Platte River to benefit threatened and endangered species.

Case study conclusion:. The impoundment areas provide seasonal wetland habitat and high-quality annual plants improving the conditions for endangered species and enhancing wildlife habitat.

Learn more: https://cpw.state.co.us/swa/Tamarack%20Ranch%20SWA

https://cwcb.maps.arcgis.com/apps/Cascade/index.html?appid=5eb94b23dbf042dd8c5d94aecebe57d1

3.3 DUCKS UNLIMITED

The mission of DU is to conserve, restore, and manage wetlands and associated habitats for North America's waterfowl. Their goal is to conserve wetlands sufficient to fill the skies with waterfowl today, tomorrow, and forever.

DU provided three case studies (Figure 12) where the interaction between agriculture, environmental, and recreational water uses proved beneficial for both the landowner and adjacent wildlife habitats. Note DU also provided information for the Tamarack Project (see Platte River Recovery Implementation Program (PRRIP)).

3.3.1 Ducks Unlimited: Yahn Wetlands

The first case study provided by DU is located in Sterling, Colorado in Logan County (Case Study 8 in Table 9). Additional information is available in Appendix C, Case Study 8.

Photo 5. Yahn Wetlands

This case study highlights the Yahn Wetlands, which are 100 acres of shallow-water wetlands enhanced and restored on the Yahn property. The property was historically considered a pastureland for many decades. Upstream development and diversions have reduced overbank flooding events in terms of frequency, duration, and volume effecting wetlands.

How water rights were obtained to change the beneficial use: Eight earthen embankments with water control structures were added to control irrigation water supply and improve the habitat conditions for waterfowl on the property.

New land use for environmental and/or recreational benefit: Various agencies, as well as the landowner, contributed funds to complete the conservation of these wetlands.

Case study conclusion: The intent of the project was to promote growth of wetlands vegetation, as shown in Photo 5, which then promotes the growth of waterfowl habitat, which are in decline along the South Platte River.

3.3.2 Ducks Unlimited: Prewitt Reservoir

The second case study provided by DU is located on the Prewitt Reservoir in Washington and Logan Counties (Case Study 9 in Table 9). Additional information is available in Appendix C, Case Study 9.

Photo 6. Prewitt Reservoir

This case study highlights 340 acres of enhanced and restored wetland habitat associated with the Prewitt Reservoir. The restored locations are regularly flooded by normal reservoir operations. In the upper reaches, seasonal inundation and drawdown resulted in emergent wetlands being flooded, effecting dependent migratory bird species. Additionally, shallow areas of the reservoir were cut off by sand dams created by ice flow and topography, limiting wildlife use.

How water rights were obtained to change the beneficial use: These areas were enhanced with the excavation of sand dunes providing quality habitat to birds and wetland wildlife that previously did not exist. Additionally, levees with water control structures were constructed within the reservoir basin to provide further shallow water flooding to create habitat for birds and wetland wildlife. This project increased the quality and quantity of habitat available to nonbreeding waterfowl along the South Platte River.

New land use for environmental and/or recreational benefit: This project was part of the Prewitt Wetlands Partnership that conserved and enhanced approximately 3,100 acres of important open water and wetland habitats in the Prewitt Reservoir complex. This partnership includes COL, DU, CPW, Colorado Water Conservation Board, Prewitt Reservoir Company, Prewitt Ranch private landowners, and the U.S. Fish and Wildlife Service.

Case study conclusion: The intent of this project was to enhance and restore wetlands to provide quality habitat to birds and other wetlands wildlife that previously did not exist.

SECTION 4. NEXT STEPS

Next steps for this analysis could include:

1. A field investigation to carry the analysis further beyond a spatial data review. A field investigation could help determine the true extents of the interaction between spatial datasets and determine if that interaction is truly beneficial. A field investigation could be used to properly define the irrigated agricultural lands to ensure that all agricultural lands are being properly captured.
2. A data review on the potential impacts for reduced irrigated agricultural lands. It is known that agricultural lands are decreasing within the Lower South Platte Basin, therefore a data review could be completed to understand potential comprehensive impacts to the environmental and recreational water uses.
3. Define the locations within the Lower South Platte Basin that are at highest risk for losing water. The data review could be used to determine which locations will have the highest impact on agricultural, environmental, and recreational water users if the water inflow is reduced.
4. Review the recreational water uses within the Lower South Platte Basin and quantify the hunting and fishing money brought into the state from these recreational lands supported by agricultural water uses.
5. Review what sort of cultural impacts these different water uses have in the rural community of the Lower South Platte Basin.
6. Provide a resource of mechanisms used to benefit all three water users to help inform and promote future projects within the Lower South Platte Basin.

Appendix A. Spatial Data Download

Table A-1. Spatial Data Download Summary

Data Layer	Data Type	Source	Date Published	Date Acquired	Description	Link
Watershed Boundaries	Geodatabase	NHD; USGS National Map	May 1, 2018	December 3, 2020	WBDHU8, WBDHU10, and WBDHU12	https://viewer.nationalmap.gov/basic/#/
Colorado County Boundaries	ArcGIS Shapefile	CDPHE Open Data	February 19, 2018	December 3, 2020	Colorado county boundaries	https://data-cdphe.opendata.arcgis.com/datasets/66c2642209684b90af84afcc559a5a02_5
Wetlands Boundary	ArcGIS Shapefile	U.S. Fish and Wildlife – National Wetlands Inventory	October 1, 2020	December 3, 2020	Wetlands boundaries	https://fws.gov/wetlands/Data/State-Downloads.html
Division 1 Canals	ArcGIS Shapefile	CWCB/DWR	November 19, 2020	December 3, 2020	Irrigation canals, ditches, and ditch service areas	https://www.colorado.gov/pacific/cdss/division-1-south-platte
Division 1 Irrigated Lands 2015	ArcGIS Shapefile	CWCB/DWR	April 3, 2019	December 3, 2020	Irrigated lands	https://www.colorado.gov/pacific/cdss/division-1-south-platte
Wildlife Boundaries	ArcGIS Shapefile	CPW	December ;8, 202012/8/2020	December 18, 2020	All species habitat borders. This includes mammals, reptiles, birds, and amphibians	https://gisftp.colorado.gov/#/State%20Data/DNR/CPW/CPW%20Species%20Data/GIS%20Files/
Fish Habitat Boundaries	ArcGIS Shapefile	CPW	December 7, 2020	January 15, 2021	Various fish species presence at the HUC12 level.	https://www.arcgis.com/home/item.html?id=c1aa2ab573e34dbb86a1a1b6190abeb1

CPW = Colorado Parks and Wldlife; CWCB/DWR = Colorado Water Conservation Board/Department of Water Resources; HUC12 = Hydrologic Unit Code 12; NHD = National Hydrography Dataset; USGS = United States Geological Survey

Appendix B. Irrigation Canal-supported Birds

Appendix B includes a further analysis of the different breakout categories of the species reviewed. The following tables and figures show the different species habitat boundaries following the irrigation canals. A summary of the species that intersect with the 100-foot buffer is shown in Table B-1.

Table B-1. Bird Species Supported by Irrigation Canals – 100-foot Buffer

Species	Area (acres)	Percentage – Sum of Species
Canada Geese	21,580.0	98.2
Pheasant	19,242.0	87.5
Sandhill Crane	11,088.4	50.4
Snow Geese	10,465.0	47.6
Bald Eagle	7,855.9	35.7
Great Blue Heron	5,327.7	24.2
Bobwhite Quail	2,730.6	12.4
White Pelican	2,234.4	10.2
Osprey	18.6	0.1

Note: The percentages do not add up to 100 percent because many of the habitats overlap each other.

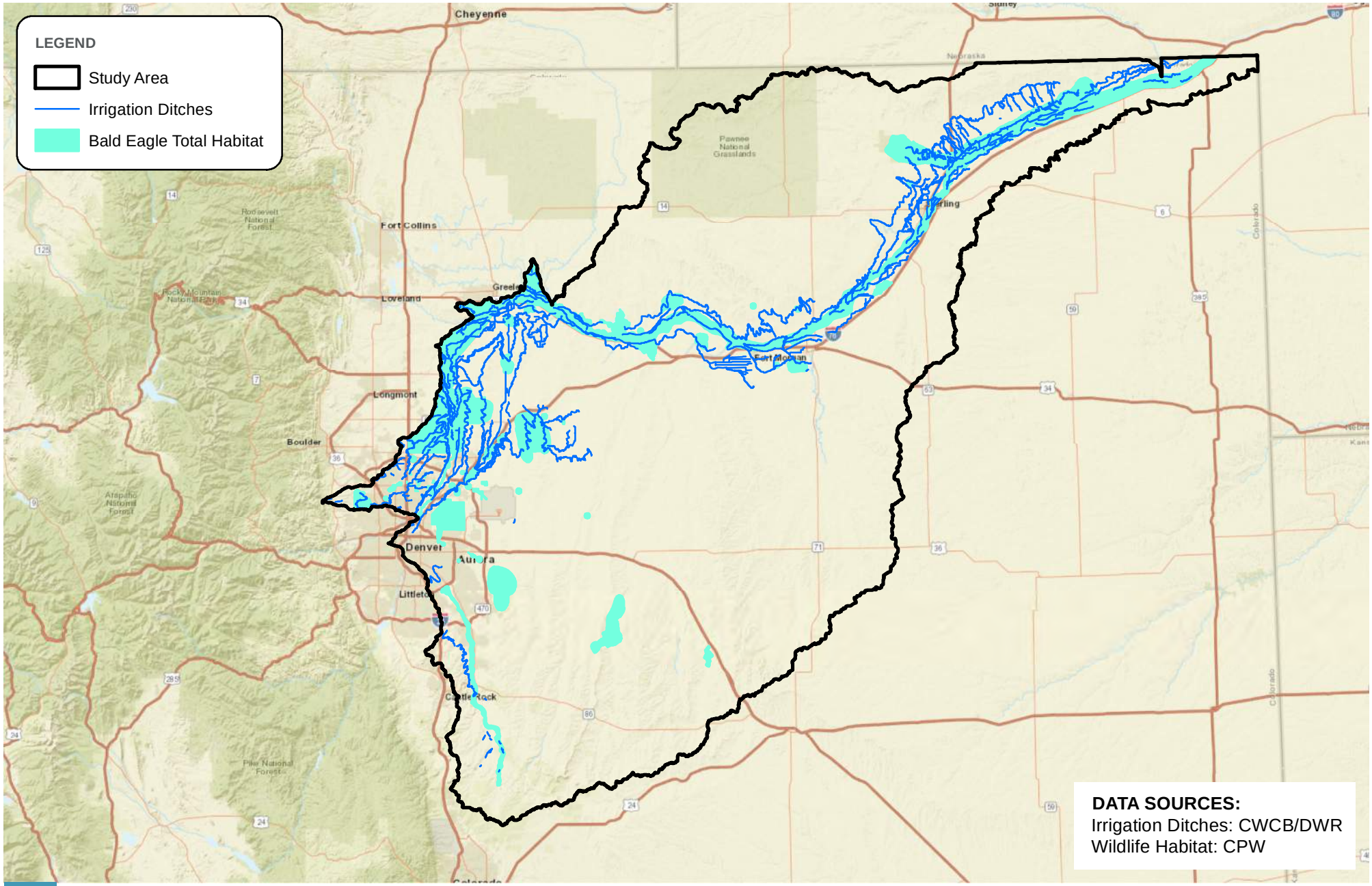
Bald Eagle

The following shows how the Bald Eagle species interacts with the irrigation canals within the study study area. Figure B-1 shows the outline of the Bald Eagle habitat boundary along with the irrigation canals. Figure B-2 and Table B-2 show the details of the species breakout.

Table B-2. Bald Eagle Species Breakout

Species Breakout	Area (acres)	Percentage
Bald Eagle Communal Roosts	884.5	0.2
Bald Eagle Nest Sites	44570.6	9.1
Bald Eagle Roost Sites	35922.2	7.4
Bald Eagle Summer Forage	199721.9	40.9
Bald Eagle Winter Concentration	175328.8	35.9
Bald Eagle Winter Forage	218194.3	44.6
Bald Eagle Winter Range	452218.5	92.5

Note: The percentages do not add up to 100 percent because many of the breakout habitats overlap each other.



0 Miles 25

BALD EAGLE

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-1

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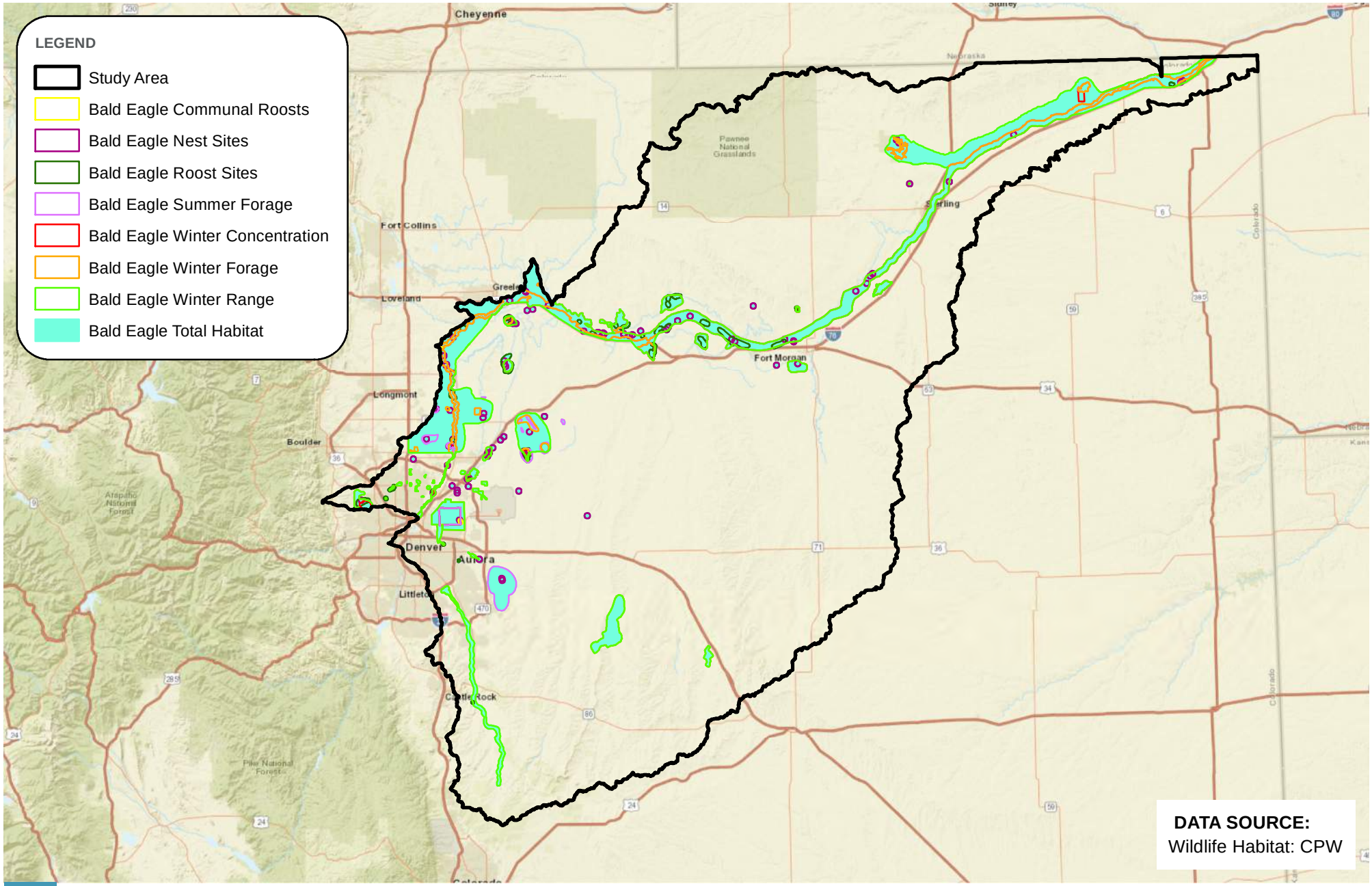

HDR | LRE WATER | Stantec | Colorado Water Conservation Board | Brown AND Caldwell

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BALD EAGLE - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-2

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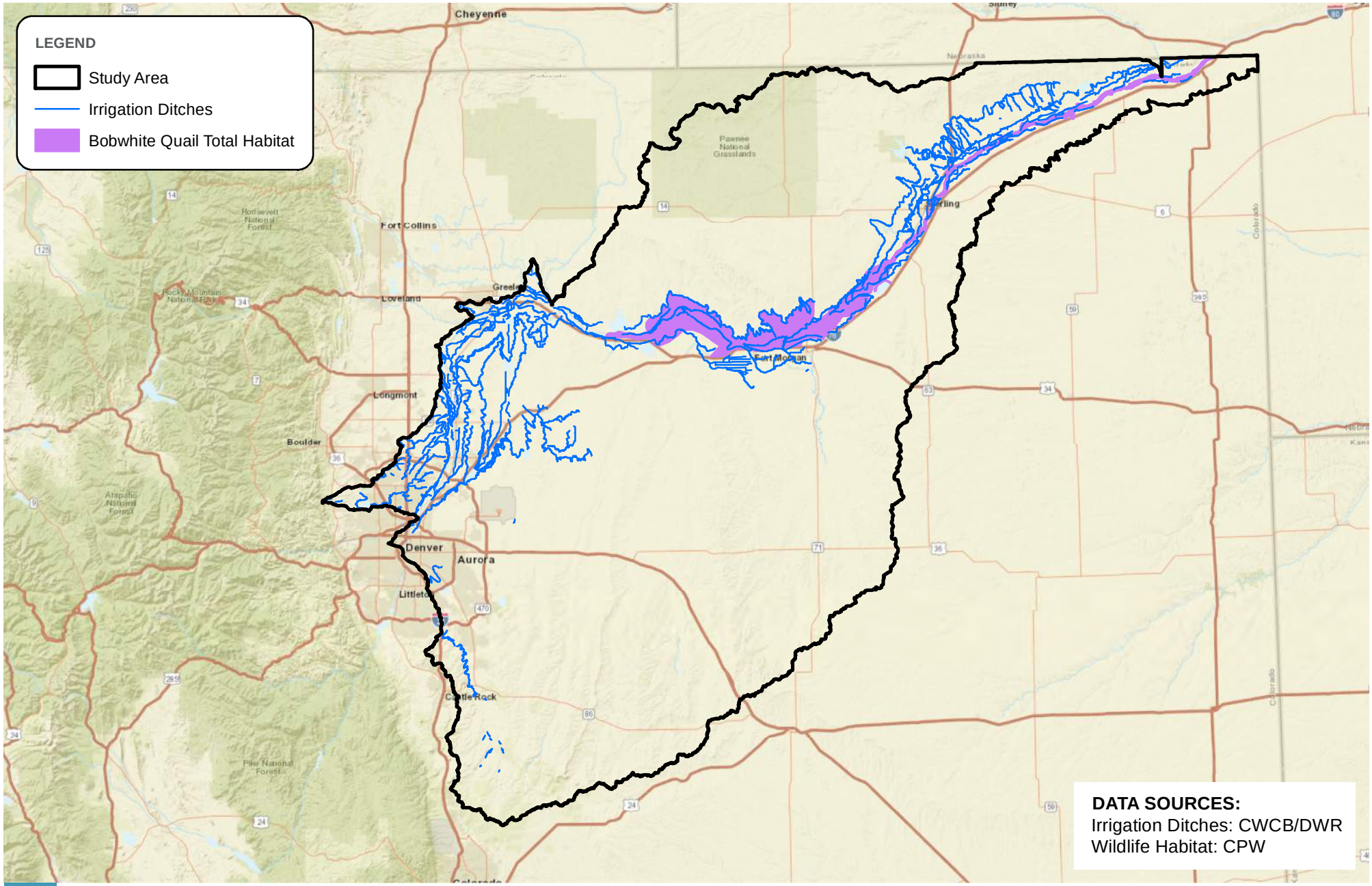
Bobwhite Quail

The following shows how the bobwhite quail species interacts with the irrigation canals within the study study area. Figure B-3 shows the outline of the bobwhite quail habitat boundary along with the irrigation canals. Figure B-4 and Table B-3 show the details of the species breakout.

Table B-3. Bobwhite Quail Species Breakout

Species Breakout	Area (acres)	Percentage
Bobwhite Quail Concentration Area	46053.5	27.0
Bobwhite Quail Overall Range	170565	100.0

Note: The percentages do not add up to 100 percent because many of the breakout habitats overlap each other.



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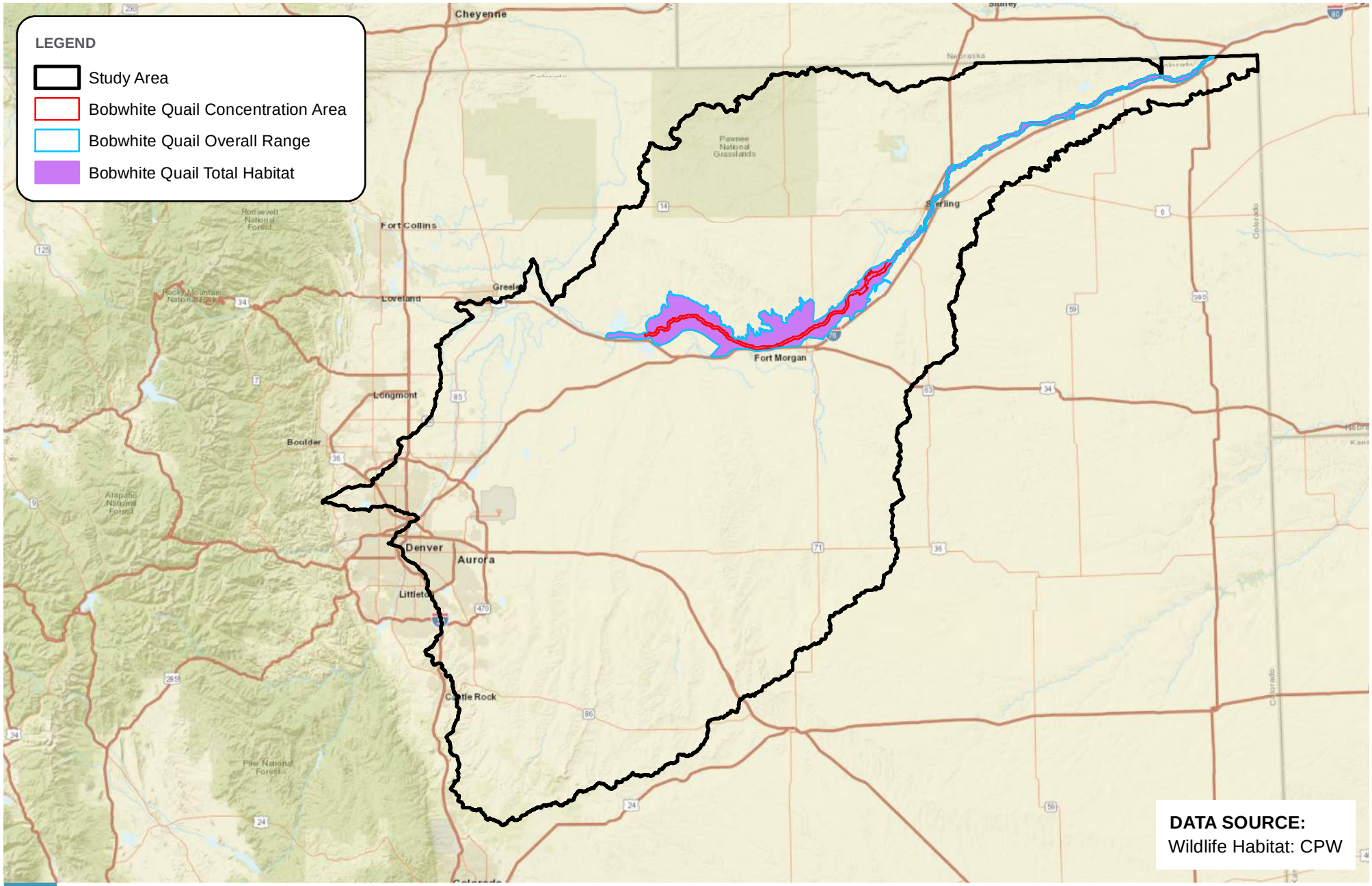
BOBWHITE QUAIL
SOUTH PLATTE BASIN IMPLEMENTATION PLAN
FIGURE B-3

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\BOBWHITEQUAIL.MXD - USER: MESSELLS - DATE: 4/8/2021



HDR | LRE WATER | Stantec | Colorado Water Conservation Board | Brown AND Caldwell

0 Miles 25

BOBWHITE QUAIL - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-4

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\BOBWHITEQUAIL_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

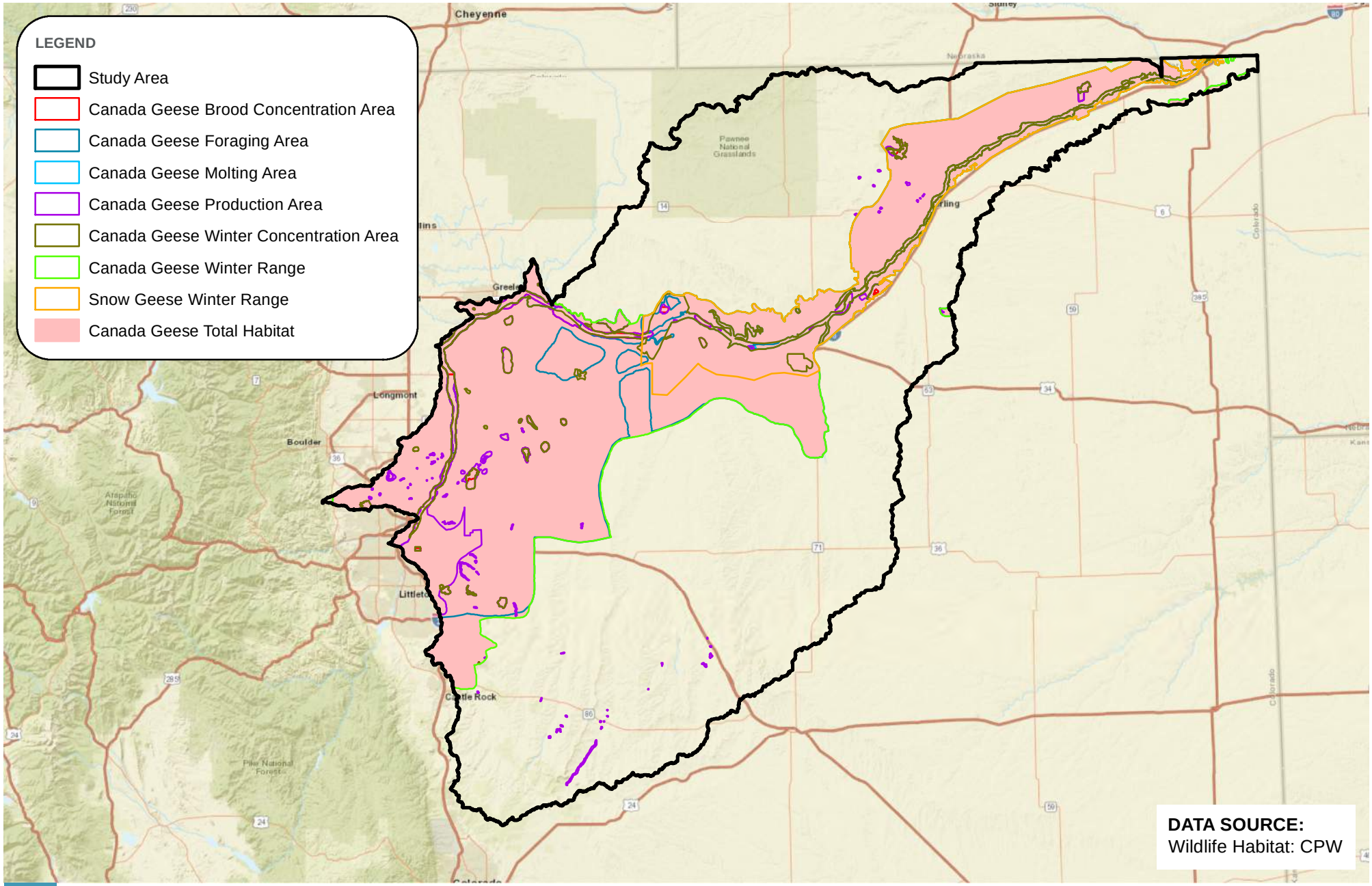
Canada Geese

The following shows how the Canada geese species interacts with the irrigation canals within the study area. Figure B-5 shows the outline of the Canada geese habitat boundary along with the irrigation canals. Figure B-6 and Table B-4 show the details of the species breakout.

Table B-4. Canada Geese Species Breakout

Species Breakout	Area (acres)	Percentage
Canada Geese Brood Concentration Area	53,032.7	2.4
Canada Geese Foraging Area	1,888,379.8	87.0
Canada Geese Molting Area	30,765.5	1.4
Canada Geese Production Area	173,236.7	8.0
Canada Geese Winter Concentration Area	177,200.3	8.2
Canada Geese Winter Range	2,166,744.3	99.8

Note: The percentages do not add up to 100 percent because many of the breakout habitats overlap each other.



HDR | LRE WATER | Stantec | Colorado Water Conservation Board | Brown AND Caldwell

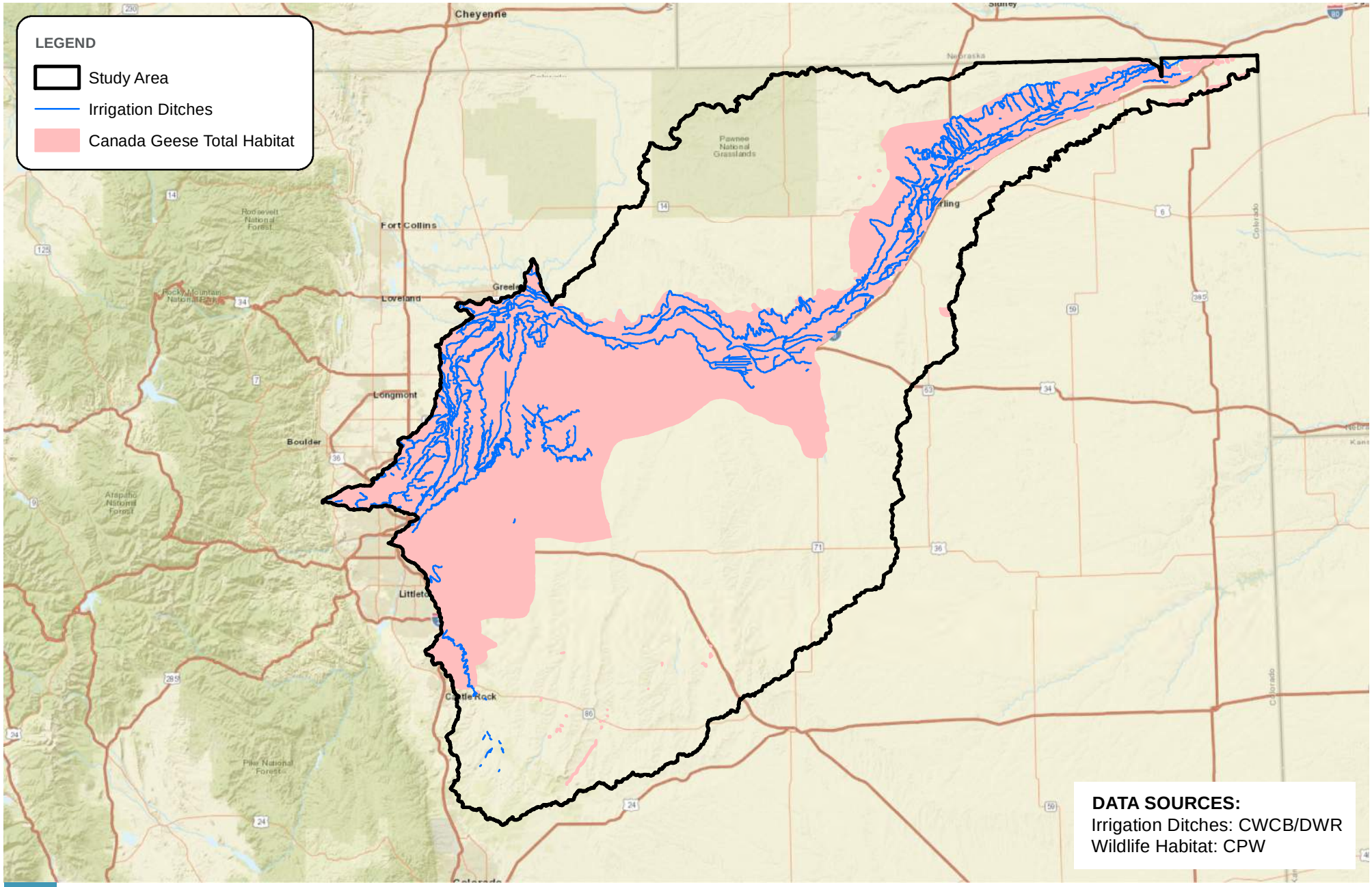
0 Miles 25

CANADA GEESE - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-6

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\CANADAGEESE_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021



HDR | LRE WATER | Stantec | Colorado Water Conservation Board | Brown AND Caldwell

0 Miles 25

CANADA GEESE

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-5

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\CANADAGEESE.MXD - USER: MESSELLS - DATE: 4/8/2021

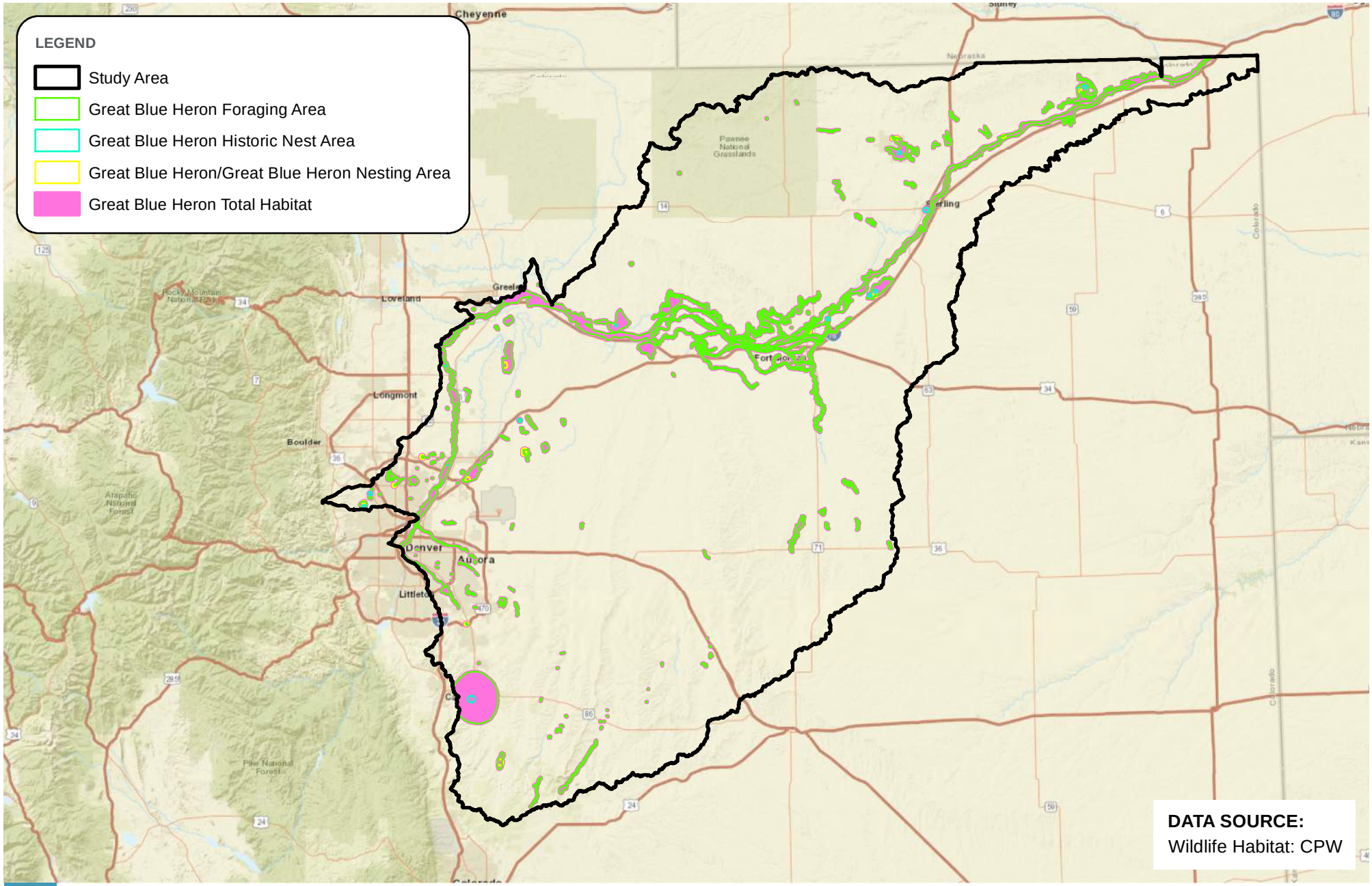
Great Blue Heron

The following shows how the great blue heron species interacts with the irrigation canals within the study area. Figure B-7 shows the outline of the great blue heron habitat boundary along with the irrigation canals. Figure B-8 and Table B-5 show the details of the species breakout.

Table B-5. Great Blue Heron Species Breakout

Species Breakout	Area (acres)	Percentage
Great Blue Heron Foraging Area	244,326.4	98.9
Great Blue Heron Historic Nest Area	2,830.9	1.1
Great Blue Heron Nesting Area	4,867.2	2.0

Note: The percentages do not add up to 100 percent because many of the breakout habitats overlap each other.



HDR | LRE WATER | Stantec | Colorado Water Conservation Board, Department of Natural Resources | Brown AND Caldwell

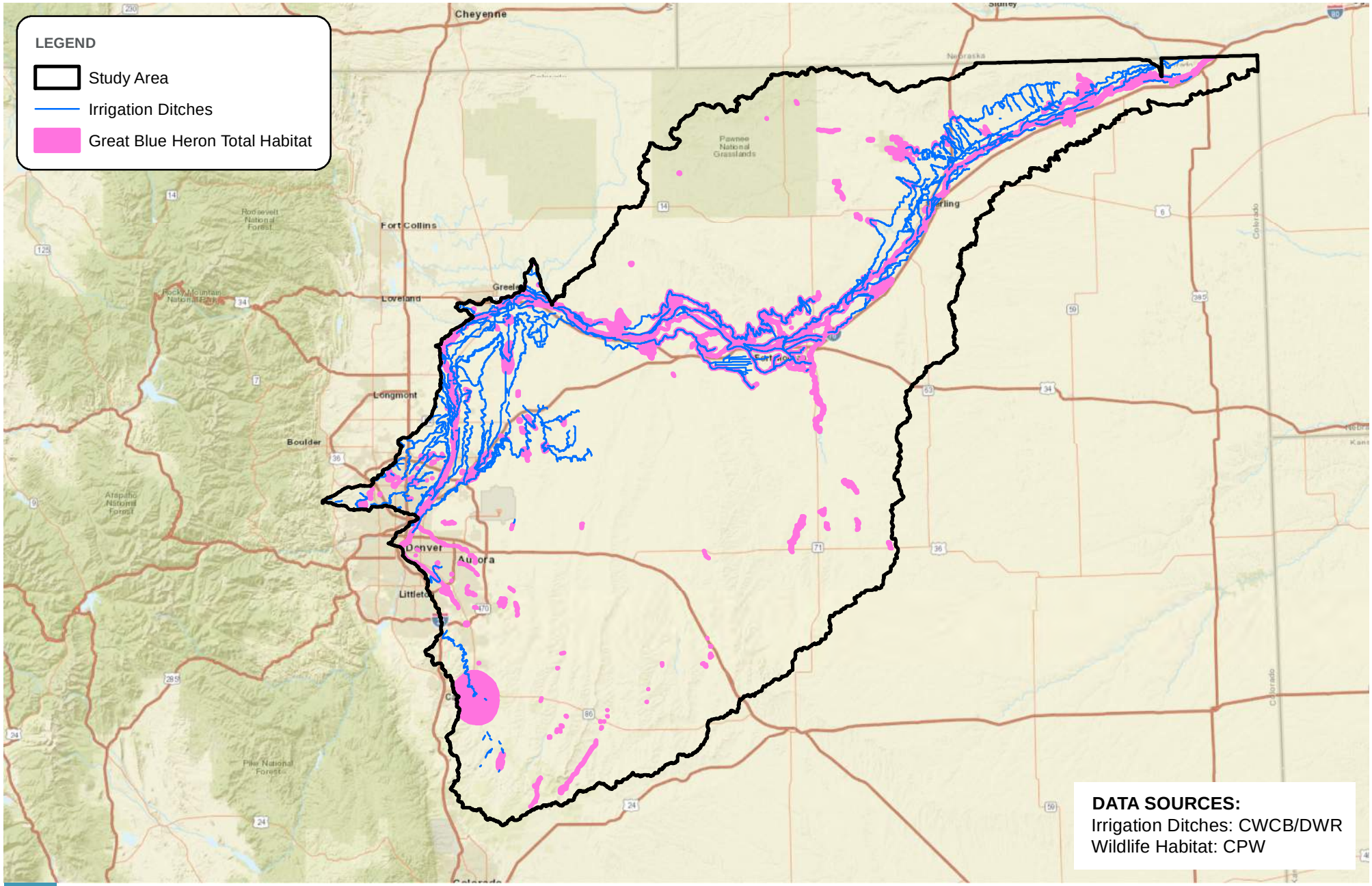
0 Miles 25

GREAT BLUE HERON - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-8

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\GREATBLUEHERON_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021



0 Miles 25

GREAT BLUE HERON
SOUTH PLATTE BASIN IMPLEMENTATION PLAN
FIGURE B-7

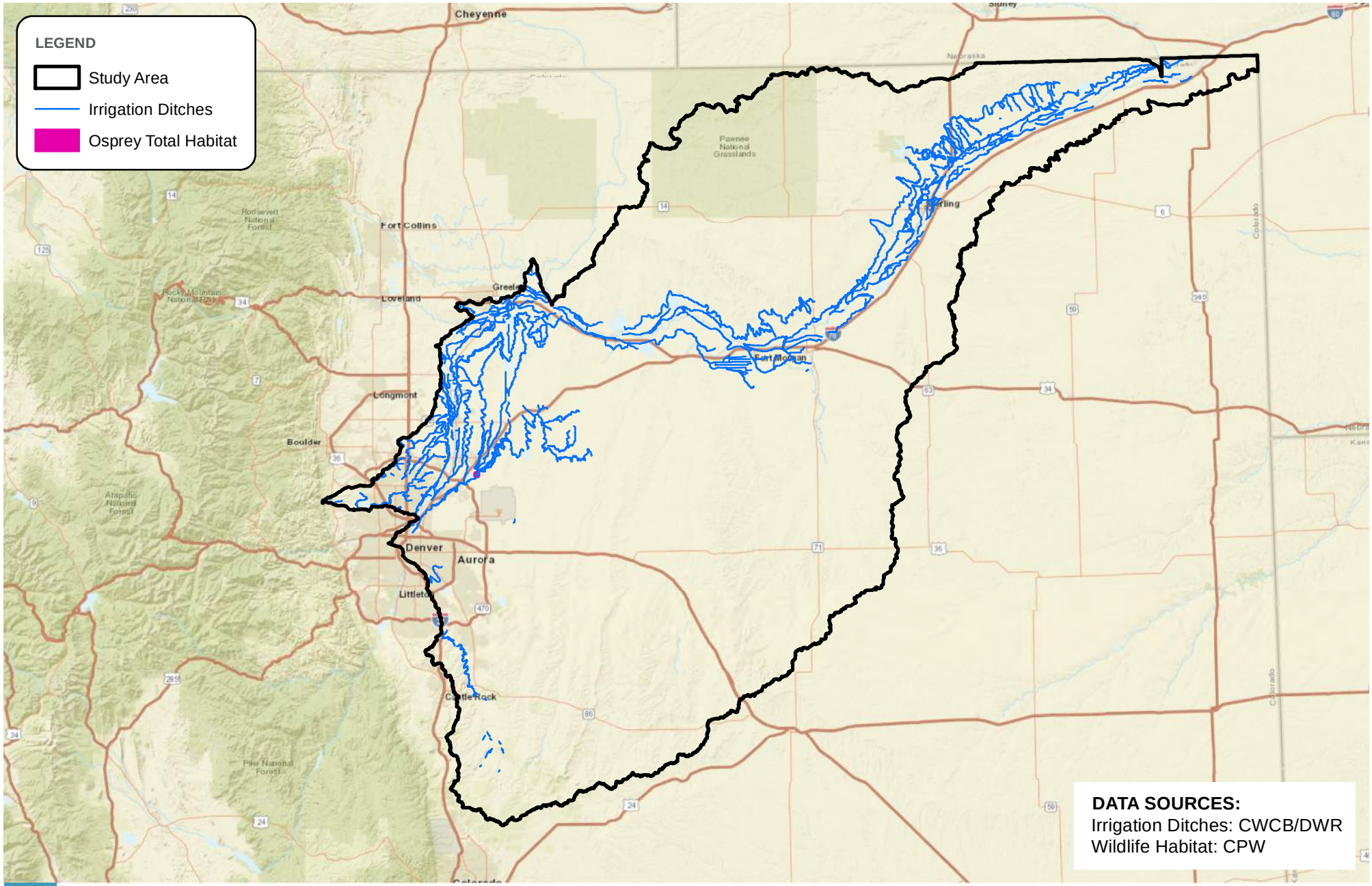
PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\GREATBLUEHERON.MXD - USER: MESSELLS - DATE: 4/8/2021

Osprey

The following shows how the osprey species interacts with the irrigation canals within the study area. Figure B-9 shows the outline of the osprey habitat boundary along with the irrigation canals. Figure B-10 and Table B-6 show the details of the species breakout.

Table B-6. Osprey Species Breakout

Species Breakout	Area (acres)	Percentage
Osprey Nest Sites	503	100



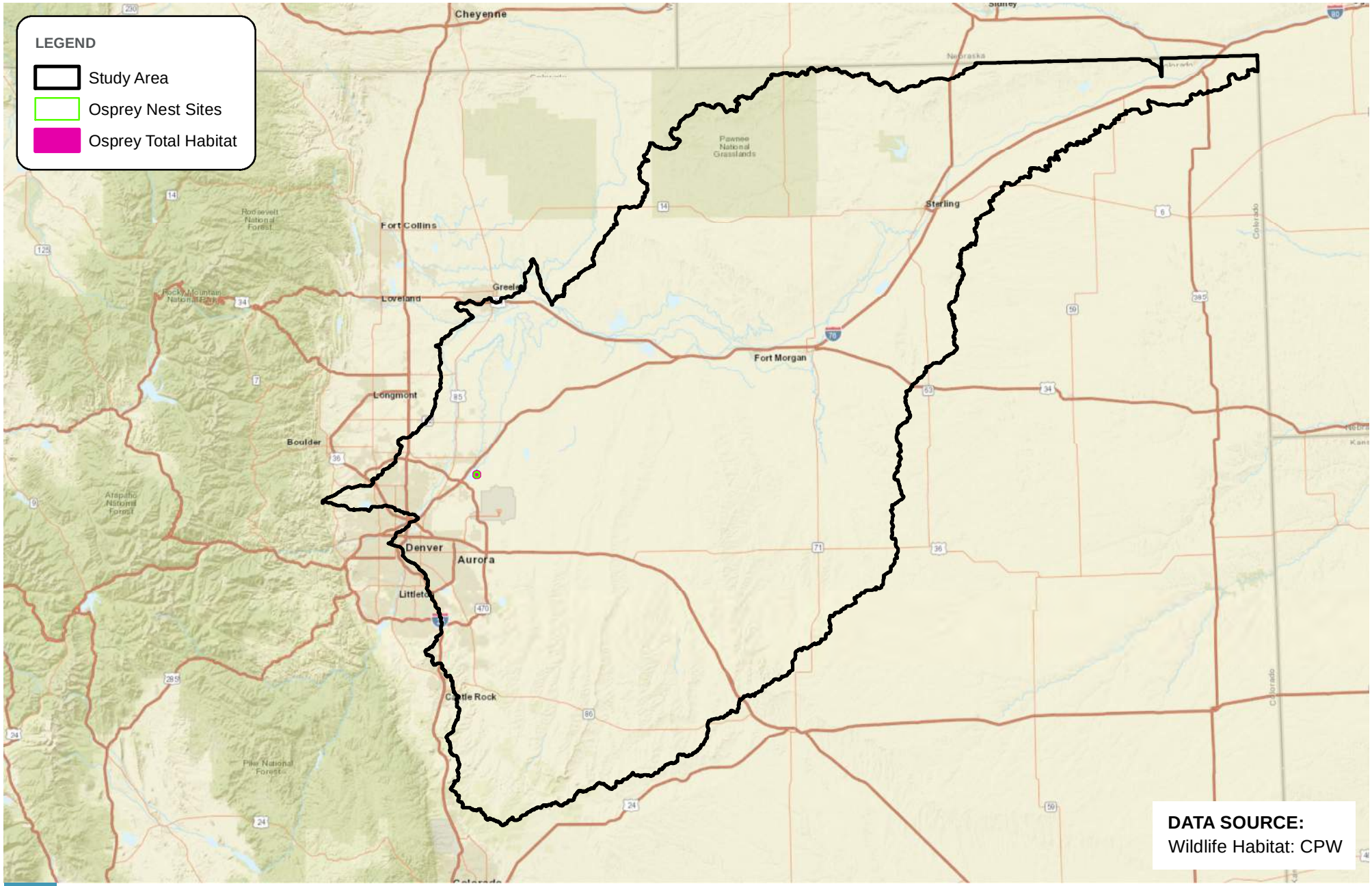
0 Miles 25

OSPREY

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-9

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\OSPREY.MXD - USER: MESSELLS - DATE: 4/8/2021



0 Miles 25

OSPREY - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-10

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\OSPREY_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

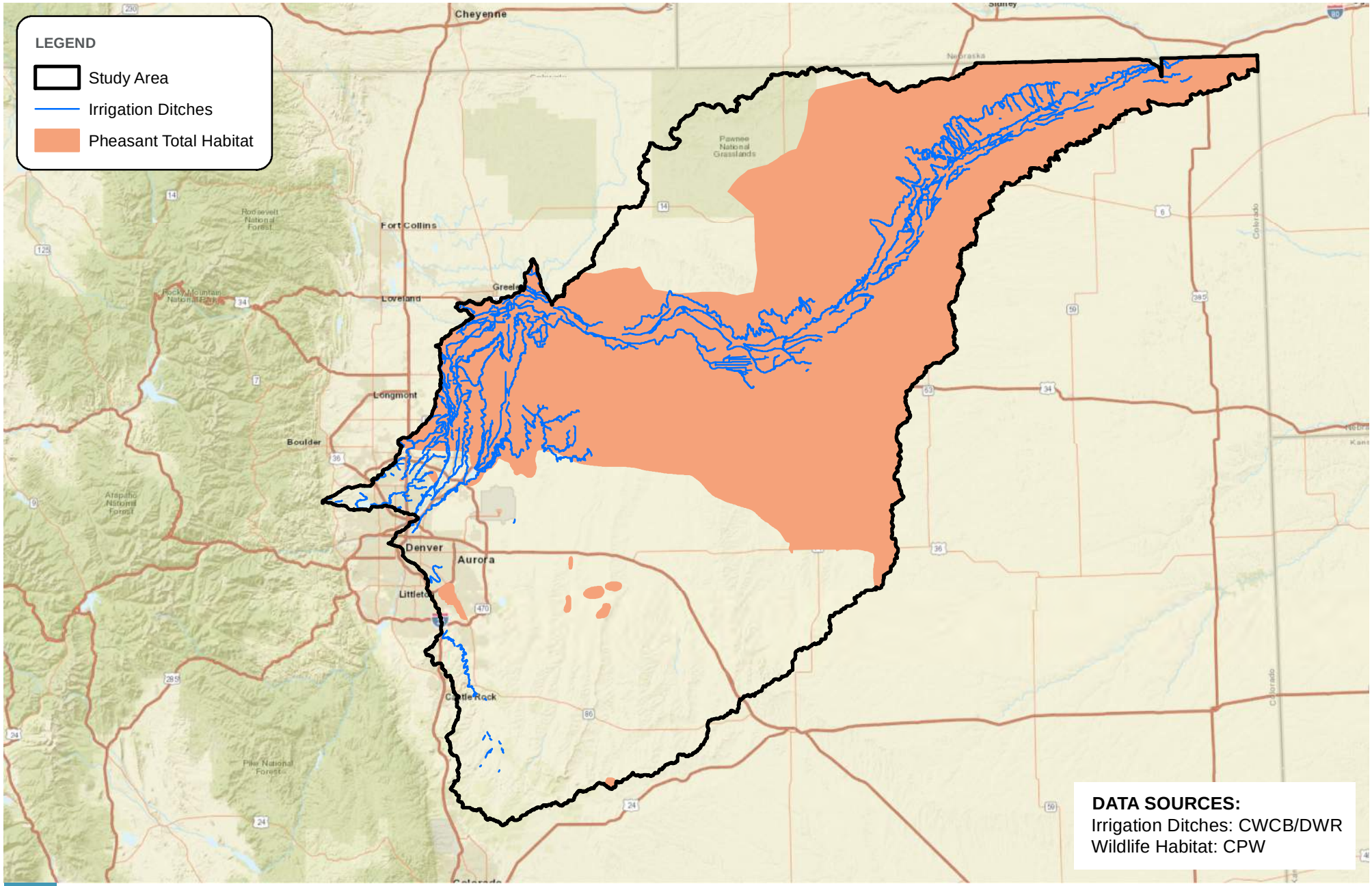
Pheasant

The following shows how the pheasant species interacts with the irrigation canals within the study area. Figure B-11 shows the outline of the pheasant habitat boundary along with the irrigation canals. Figure B12 and Table B-7 show the details of the species breakout.

Table B-7. Pheasant Species Breakout

Species Breakout	Area (ac)	Percentage
Ring-necked Pheasant Concentration Area	870,075.6	25.8%
Ring-necked Pheasant Overall Range	3,374,046.6	100.0%

Note: The percentages do not add up to 100 percent because many of the breakout habitats overlap each other.



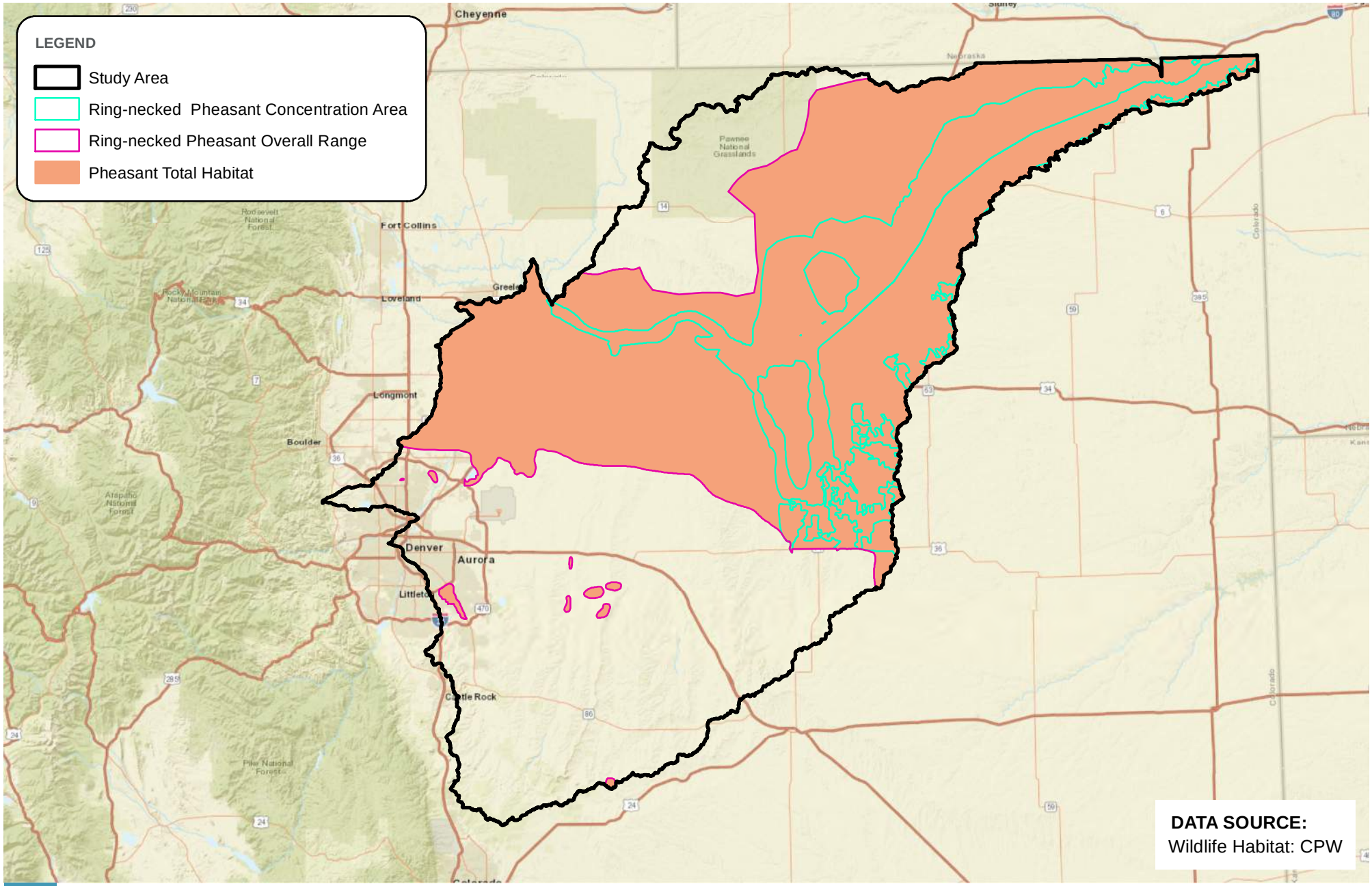
0 Miles 25

PHEASANT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-11

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\PHEASANT.MXD - USER: MESSELLS - DATE: 4/8/2021



HDR | LRE WATER | Stantec | Colorado Water Conservation Board | Brown AND Caldwell

0 Miles 25

PHEASANT - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-12

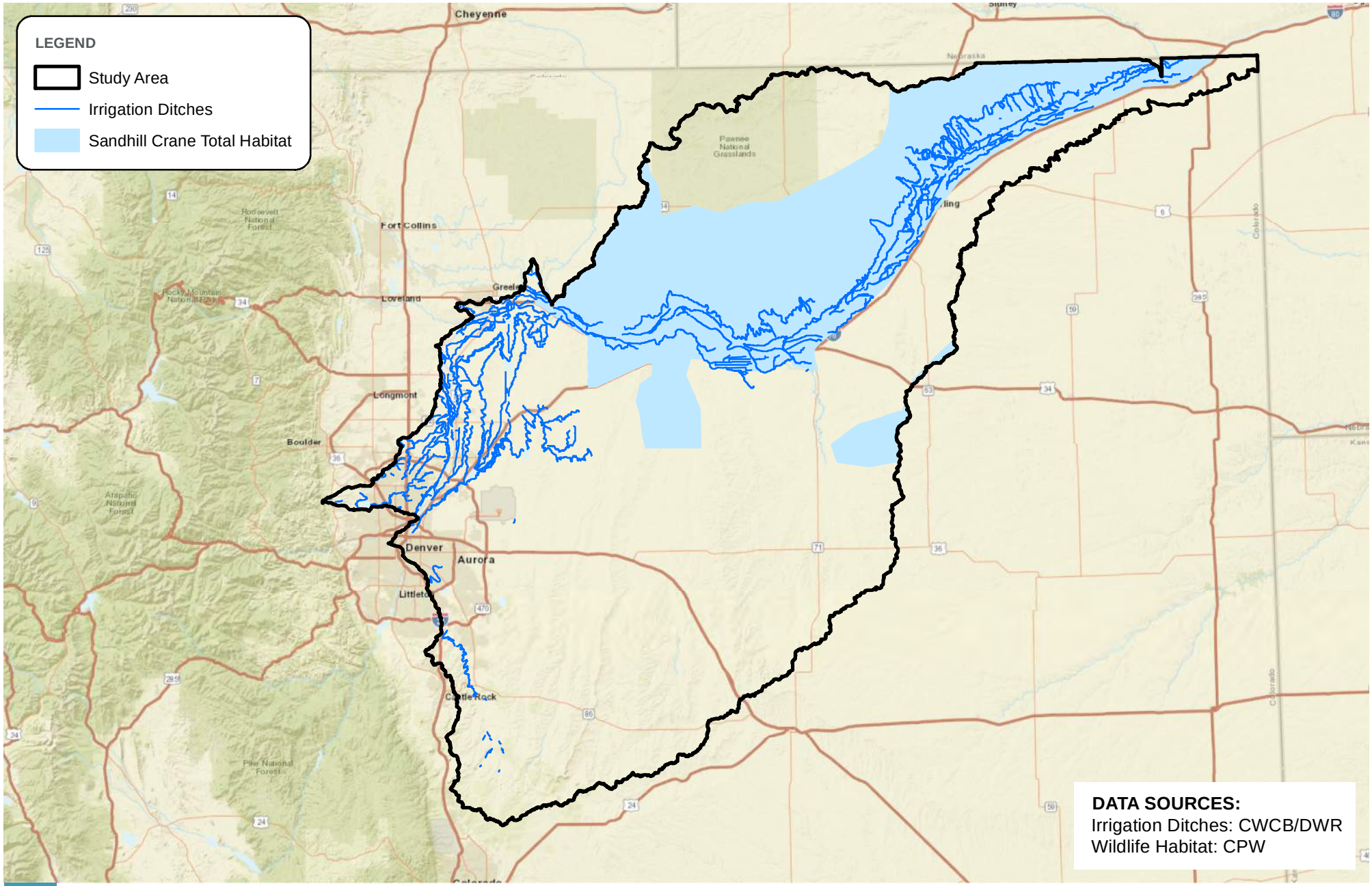
PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\PHEASANT_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

Sandhill Crane

The following shows how the sandhill crane species interacts with the irrigation canals within the study area. Figure B-13 shows the outline of the sandhill crane habitat boundary along with the irrigation canals. Figure B-14 and Table B-8 show the details of the species breakout.

Table B-8. Sandhill Crane Species Breakout

Species Breakout	Area (acres)	Percentage
Lesser Sandhill Crane Overall Range	1,666,150	100

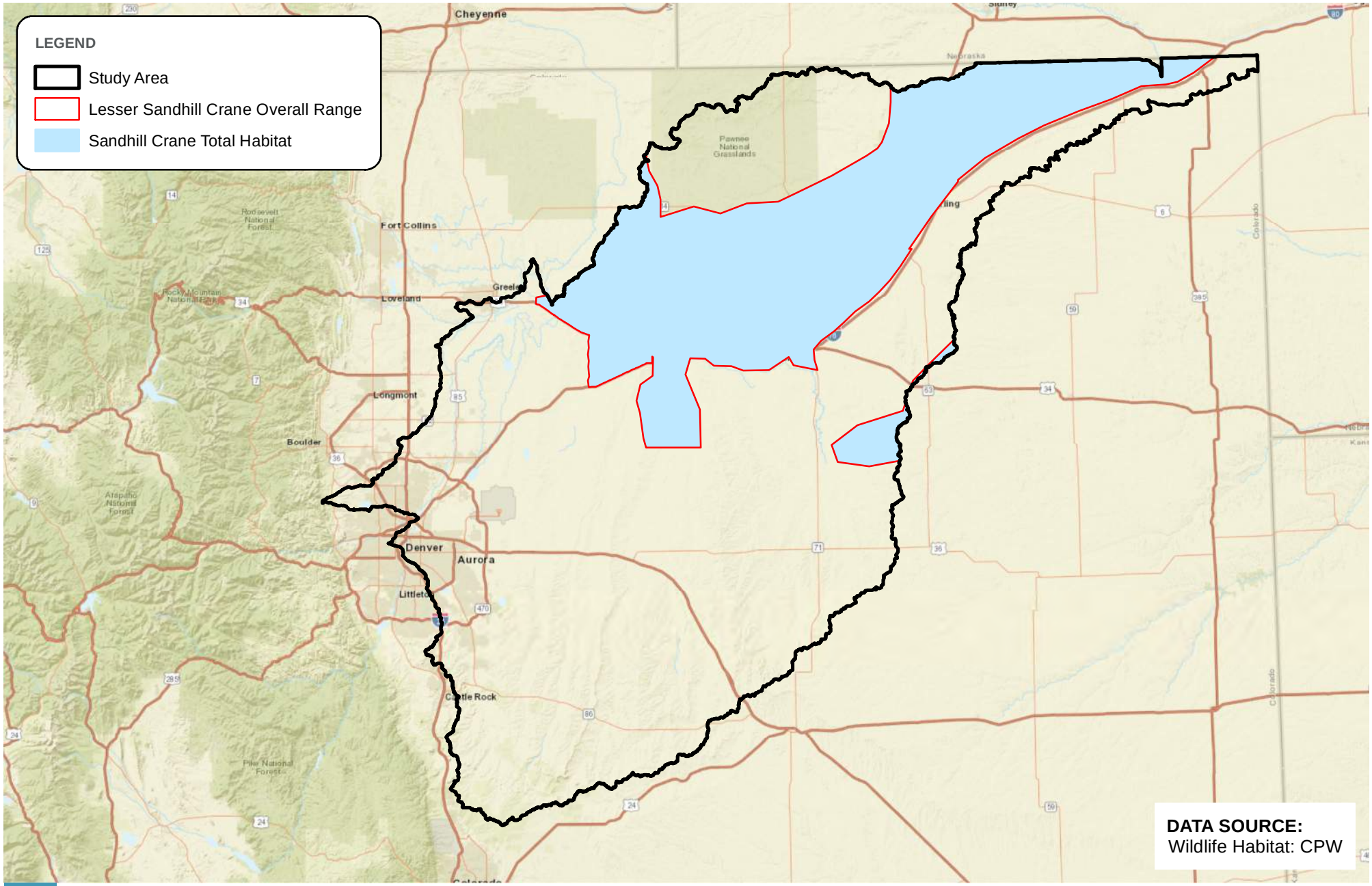


0 Miles 25

SANDHILL CRANE
SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-13

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\SANDHILLCRANE.MXD - USER: MESSELLS - DATE: 4/8/2021



HDR | LRE WATER | Stantec | Colorado Water Conservation Board, Department of Natural Resources | Brown AND Caldwell

0 Miles 25

SANDHILL CRANE - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-14

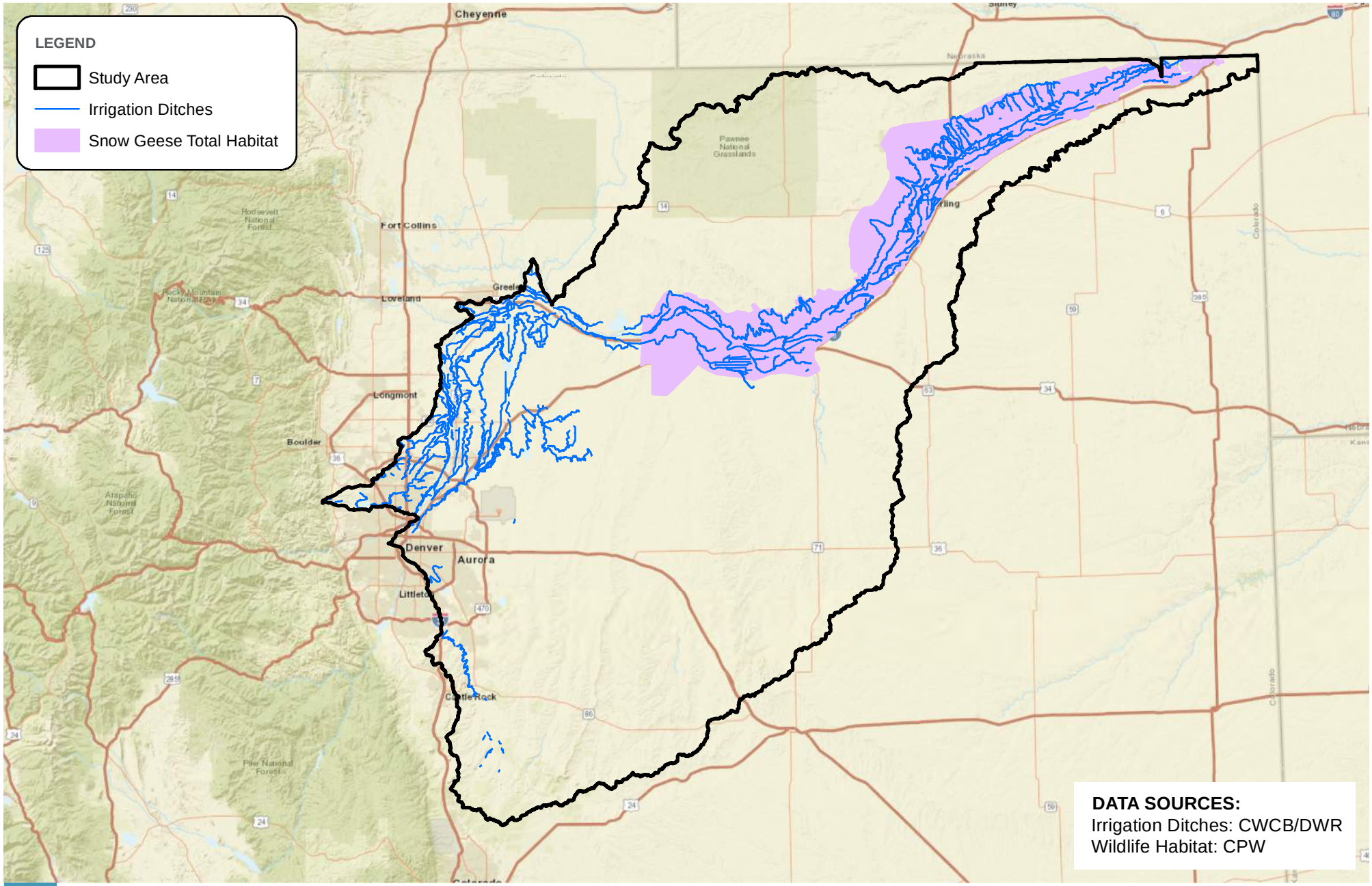
PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\SANDHILLCRANE_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

Snow Geese

The following shows how the snow geese species interacts with the irrigation canals within the study area. Figure B-15 shows the outline of the snow geese habitat boundary along with the irrigation canals. Figure B-17 and Table B-9 show the details of the species breakout.

Table B-9. Snow Geese Species Breakout

Species Breakout	Area (acres)	Percentage
Snow Geese Winter Range	713,437	100



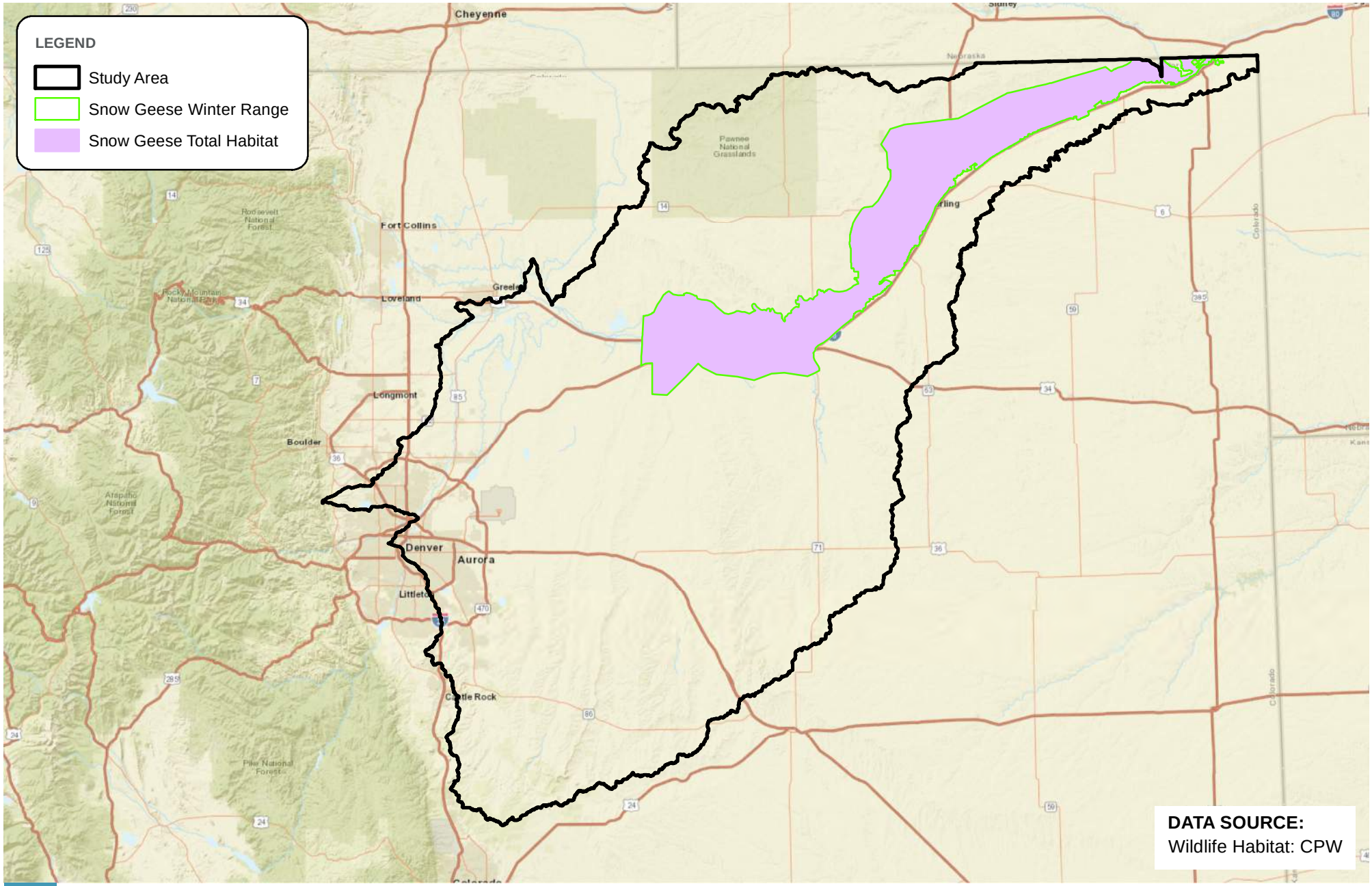
0 Miles 25

SNOW GEESE

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-15

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\SNOWGEESE.MXD - USER: MESSELLS - DATE: 4/8/2021



0 Miles 25

SNOW GEESE - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-16

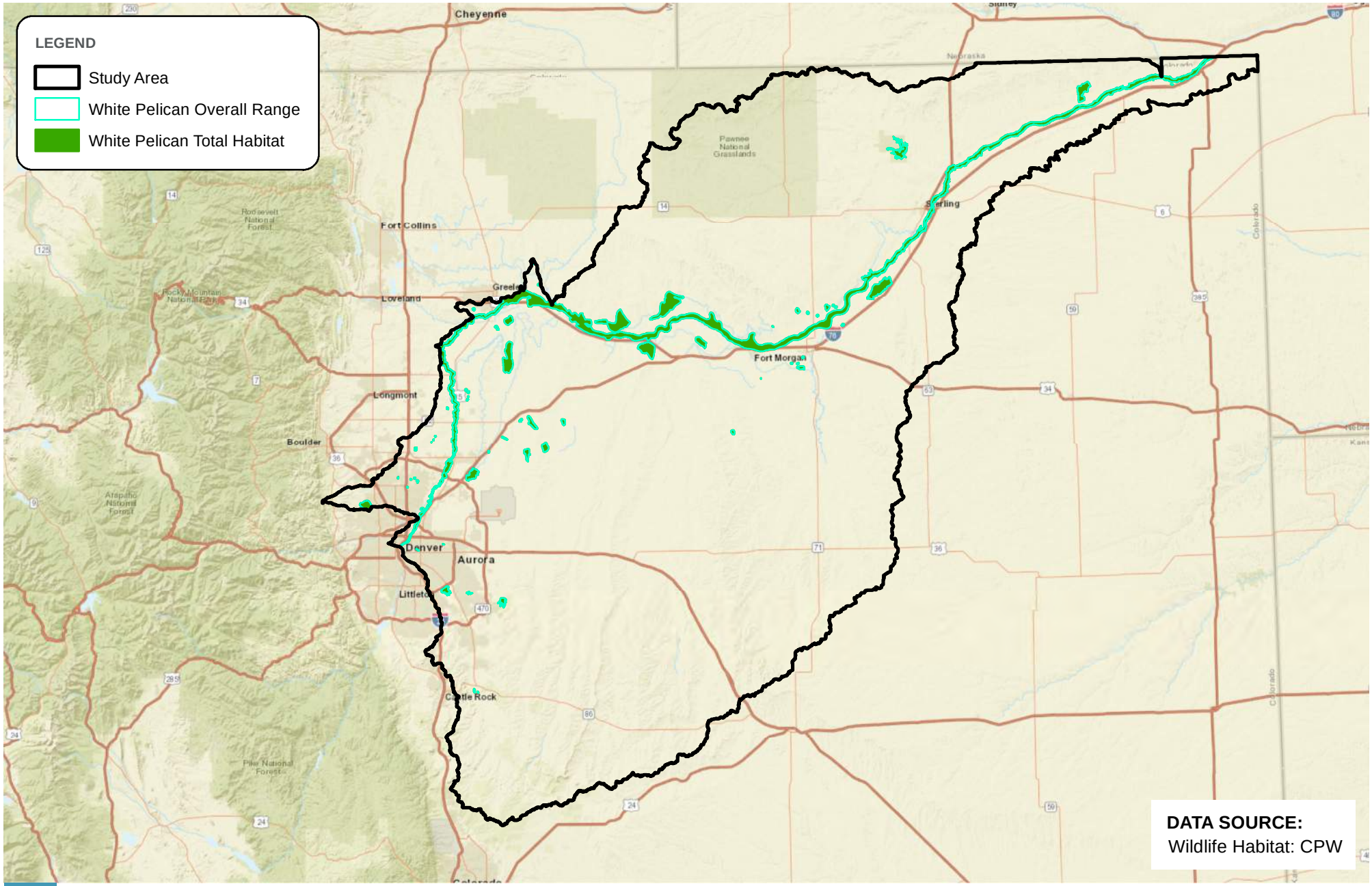
PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\SNOWGEESE_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

White Pelican

The following shows how the white pelican species interacts with the irrigation canals within the study area. Figure B-17 shows the outline of the white pelican habitat boundary along with the irrigation canals. Figure B-18 and Table B-10 show the details of the species breakout.

Table B-10. White Pelican Species Breakout

Species Breakout	Area (acres)	Percentage
White Pelican Overall Range	145,537	100



0 Miles 25

WHITE PELICAN - BREAKOUT

SOUTH PLATTE BASIN IMPLEMENTATION PLAN

FIGURE B-18

PATH: \\DEN-GISSRV1\GISDATA\PROJECTS\10234006_SP_BIP_UPDATE\MAP_DOCS\SPECIAL STUDY\WILDLIFE HABITATS\WHITEPELICAN_BREAKOUT.MXD - USER: MESSELLS - DATE: 4/8/2021

Appendix C. Case Studies

CASE STUDY 1

Source: USDA NRCS Agricultural Conservation Easement Program

Location: Snyder, Colorado. Morgan County.

Project Summary: The property is in the Wetlands Reserve Program which is a conservation easement program that restores and protects wetlands and wildlife. The ground was not historically a wetland but was part of the South Platte River floodplain. A ditch was installed trough the sandhills north of the property and seeps so much that the ground can't be used for agricultural purposes anymore. This has provided the opportunity to use the water for wetlands which provide habitat, a natural water filter, and recreational opportunities. There are also multiple augmentation ponds on the property which serve as water recharge for the South Platte and wetland habitat. The property is now leased out for hunting.

The primary water source for the property comes from seep from the North Sterling Canal during irrigation season. The Canal also supplies water to the augmentation ponds in the late spring and fall. The landowners hold 54.2 shares of the Union Mutual Ditch Company.

Figure C- 1. Emergent water from the North Sterling Canal in Morgan County that provides habitat for wetland dependent wildlife. The wetlands are protected under the Wetlands Reserve Program.

CASE STUDY 2

Source: USDA NRCS Agricultural Conservation Easement Program

Location: Sterling, Colorado. Logan County.

Project Summary: The project ground was historically farm ground. The previous landowners decided to sell the water rights to the city of Sterling and turn the ground into wildlife habitat. The ground was reseeded to grassland and two augmentation ponds were installed. The augmentation ponds provide recharge to the South Platte River and are filled during the fall and spring which benefits migratory bird species. The ground was entered into the Wetland Reserve Program and is now perpetually protected for wetlands and wildlife. The aug ponds are fed by the Sterling Irrigation County Ditch 1. The easement also has a well onsite that is used when there are calls on the ditch.

Figure C- 2. Wildlife use of the augmentation pond in early spring.

Figure C- 3. More wildlife use of the augmentation pond in Logan County

CASE STUDY 3

Source: USDA NRCS Agricultural Conservation Easement Program Location: Iliff, Colorado. Logan County.

Project Summary: The lower South Platte River's riparian area was historically used for grazing due to its subirrigation providing a year-round source of water for forage growth. Other agricultural uses were not possible due to the sandy soils and the high possibility of flooding. Although the land was used for grazing its greatest use was for wildlife. To improve and protect the conditions of the riparian area the Natural Resources Conservation Service (NRCS) partnered with the landowners to enter the ground into a conservation easement. The land remains in private ownership while the government pays for the rights to protect the wetland habitat for migratory bird species and other wildlife. The landowner now uses the property for hunting purposes and other quiet enjoyment. Part of the easement also contains two recharge ponds with water coming from the South Platte River. The well supplies water for augmentation, irrigation, recharge, wildlife, and other. They are allowed 13cfs. As long as there isn't a call on the river the Harris's can fill their ponds but they get more credits at certain times of the year. They hold their own augmentation plan and are part of the Logan Wells Users Group.

Figure C- 4. A multiuse augmentation pond that provides the South Platte with recharge and migrating birds with stopover habitat for forage and rest.

CASE STUDY 4

Source: USDA NRCS Agricultural Conservation Easement Program

Location: Wiggins, Colorado. Morgan County.

Project Summary: The project area consists of two conservation easements along the Bijou Creek held by the NRCS under the Wetland Reserve Program. The creek area is typically dry unless there is a large flood event from snow melt and rain. The landowners installed multiple large augmentation ponds throughout the floodplain with the intent of providing habitat for waterfowl and other game species while providing recharge to the South Platte basin. Prior to being in the wetland program the property was used for grazing but provided little forage after years of overgrazing. The property is now used as hunting grounds for the landowners.

The water rights are owned by the Bijou Irrigation District. The irrigation district controls when the water is released into the ponds and how much water flows into the ponds. The water is used for augmentation and recharge for the South Platte River.

The property also has a pivot that was rented for corn production each year. The landowners realized they were losing money by renting water and leasing the ground so they decided to plant half of the pivot back to grasses and forbs for wildlife. After the habitat is established they will cut back water use.

Figure C- 5. An augmentation pond on the Bijou Creek that supplies groundwater to the Bijou Creek and the South Platte downstream. The Bijou Irrigation District controls the water input depending on needs during the year. Timing usually benefits migratory birds.

Figure C- 6. Waterfowl and shorebirds loafing and foraging on an augmentation pond.

Figure C- 7. The owners of this pivot decided to return the ground back to grasses and forbs to benefit wildlife instead of losing money on watering crops.

CASE STUDY 5

Source: USDA NRCS Agricultural Conservation Easement Program

Location: Atwood, Colorado. Logan County.

Project Summary: The lower South Platte River's riparian area was historically used for grazing due to its subirrigation providing a year-round source of water for forage growth. Other agricultural uses were not possible due to the sandy soils and the high possibility of flooding. Although the land was used for grazing its greatest use was for wildlife. To improve and protect the conditions of the riparian area the Natural Resources Conservation Service (NRCS) partnered with the landowners to enter the ground into a conservation easement. The land remains in private ownership while the government pays for the rights to protect the wetland habitat for migratory bird species and other wildlife. The landowner now uses the property for hunting purposes and other quiet enjoyment. The water is surface flow from the South Platte.

A large benefit of this property is the warm water slough that runs through the riparian area. Warm water sloughs are highly beneficial to wintering waterfowl because they remain open when other bodies of water freeze over in the winter. The water typically comes from deep groundwater seep that fluctuates with irrigation uphill. Without irrigation these sloughs would likely not see as much water.

Figure C- 8. A warm water slough adjacent to the South Platte River. Warm water sloughs are bodies of water that remain open later than other bodies of water in the winter due to their tempurature when they seep out of the ground. They are highly beneficial to wintering waterfowl and provide great hunting opportunities.

CASE STUDY 6

Source: USDA NRCS Agricultural Conservation Easement Program

Location: Julesburg, Colorado. Sedgwick County.

Project Summary: The lower South Platte River's riparian area was historically used for grazing due to its subirrigation providing a year-round source of water for forage growth. Other agricultural uses were not possible due to the sandy soils and the high possibility of flooding. Although the land was used for grazing its greatest use was for wildlife. To improve and protect the conditions of the riparian area the Natural Resources Conservation Service (NRCS) partnered with the landowners to enter the ground into a conservation easement. The land remains in private ownership while the government pays for the rights to protect the wetland habitat for migratory bird species and other wildlife. The landowner now uses the property for hunting purposes and other quiet enjoyment. The water is surface flow from the South Platte.

A large benefit of this property is the warm water slough that runs through the riparian area. Warm water sloughs are highly beneficial to wintering waterfowl because they remain open when other bodies of water freeze over in the winter. The water typically comes from deep groundwater seep that fluctuates with irrigation uphill. Without irrigation these sloughs would likely not see as much water.

Figure C- 9. A warm water slough in Sedgwick County that acts as a natural water filter and wildlife habitat. Water comes from irrigation seep.

CASE STUDY 7

Tamarack Ranch State Wildlife Area

Ducks Unlimited Case Studies – South Platte BIP Special Study

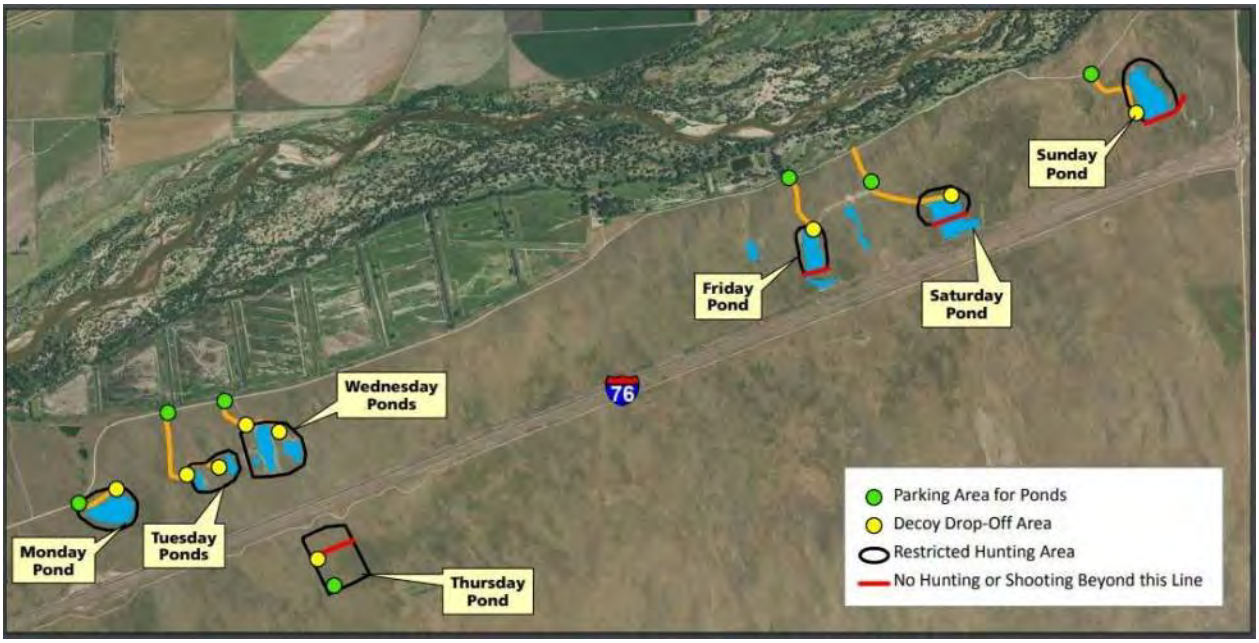
DATE: January 29, 2021

TOPIC: Project Information for various DU projects along South Platte River
Projects: Yahn Enhancements, Prewitt SWA, Tamarack SWA

TAMARACK SWA

- **Project Description**

Tamarack Ranch State Wildlife Area (Tamarack) is the most important groundwater recharge facility on the South Platte River. DU has a long history of work at Tamarack SWA. In the late 1990s and early 2000s, Ducks Unlimited (in cooperation with CPW and a number of other partners) constructed a series of seven shallow-water wetland impoundments along the South Platte River. From west to east, the ponds were named the Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday ponds. See overall map below:



A series of groundwater wells were constructed along the South Platte River to provide seasonal water inflows to the impoundments. Over the years, flooding and erosion along the South Platte River has begun to disrupt the well operations. Recently, bank stabilization work is being constructed to protect the wells and well infrastructure from further flooding and erosion issues.

- **Project Location**

Tamarack SWA is located in Logan County, Colorado approximately 2 miles south of Crook, CO. Tamaracks SWA is a publicly accessible State Wildlife Area managed by Colorado Parks and Wildlife (CPW).

Project Location Coordinates: LAT 40.8477823, LONG -102.7715575


PROJECT-
LOCATION
CROOK
PROJECT-
LOCATION
81
76
385
ENTRANCE TO
TAMARACK SWA
EXIT 149

Photos

- **Additional Information**
  - The project site was developed to provide seasonal moist-soil habitat for migrating waterbirds. Seasonal wetland habitat is one of the most important foraging habitats for migrating birds as they provide high quality annual plants from which waterfowl collect energy from seeds, and are highly productive invertebrate producers, important for protein. Shallow, seasonal wetlands persisted on the SPR floodplain due to regular overbank flooding, however, diversions of water from the river for anthropogenic needs have severely degraded the river's ability to sustain seasonal wetland types and they must now be restored and maintained through intense management practices. In addition, these wetland basins increase habitat diversity by complementing loafing, and roosting habitats in the area such as the river, warm-water sloughs, deep water habitat, and agriculture.
  - Pumping water to the basins from the river during free-river periods and using irrigation rights owned by the CDOW provides seasonal habitat for migrating birds in both spring and fall and allows summer to irrigate the wetlands and promote desirable annual plant species. Proper management of water helps control undesirable invasive species and reduce the need to apply chemicals within the basins and delivery ditches as a control measure.

Tamarack I Recharge Project

Source: Various *Score:* 10,000 AFY *Operations started:* 2007 *Mechanism:* Recharge & retiming

History

The Tamarack I groundwater recharge project was Colorado's initial state project for the Program. Development of the project began with the initiation of negotiations for the Platte River Cooperative Agreement in 1994. Colorado applied for water rights in 1996 and 1998; a final decree was issued in 2012. Tamarack I consists of both dedicated project facilities and excess credits leased from private recharge projects, most of which were constructed between 1997 and 2014.

Operations

Located along the last 35 miles of the South Platte River upstream of the Colorado-Nebraska state line, Tamarack I diverts from the river to recharge ponds when there are flows in excess of U.S. Fish and Wildlife Service (USFWS) targets at Grand Island, Nebraska and there is simultaneously no call on the South Platte River in Colorado. The sandy soils of northeastern Colorado allow the ponded water to seep into the underlying alluvial aquifer and migrate back to the South Platte River at rates that are much higher than other Program recharge projects in central Nebraska.

Tamarack I includes 16 dedicated riverside wells at the Tamarack State Wildlife Area near Crook, Colorado and the Heyborne project lift station between Ovid and Julesburg. Together, these dedicated projects deliver water to 10 recharge ponds. In addition, recharge credits are leased from 10 private wells and from the Peterson and Settlers ditches near Julesburg, which deliver water to about 60 recharge ponds. Diversions to Tamarack I facilities are highest in December and January, and most credits for shortage reductions occur between February and May. About 40% of Tamarack I recharge credits are attributable to dedicated projects and 60% to private recharge projects.

Tamarack Recharge Area #6

Tamarack Recharge Area #2

Yield and Score

Tamarack I is credited with a score of 10,000 AF. As shown in Table 1, total accretions from Tamarack I at the Colorado-Nebraska state line averaged 19,350 AFY over 2008-2018. The average operational credit for shortage reduction is 8,340 AFY. This yield is less than the negotiated score due to the lesser availability of divertible winter flows during the First Increment since 2007 compared to the 1947-1994 OPSTUDY hydrology used for the scoring. The possibility of actual project yield being lower than the credited score was recognized in the Program Document and is acceptable because the Tamarack I project was constructed and is operated as planned. At Grand Island, the Tamarack I shortage reduction credits average 7,380 AFY.

Financials

Reductions in shortages to USFWS target flows resulting from Tamarack I are credited to the Program at no cost. Through the South Platte Water Related Activities Program (SPWRAP), Colorado water users pay for the project O&M costs and recharge credit leases.

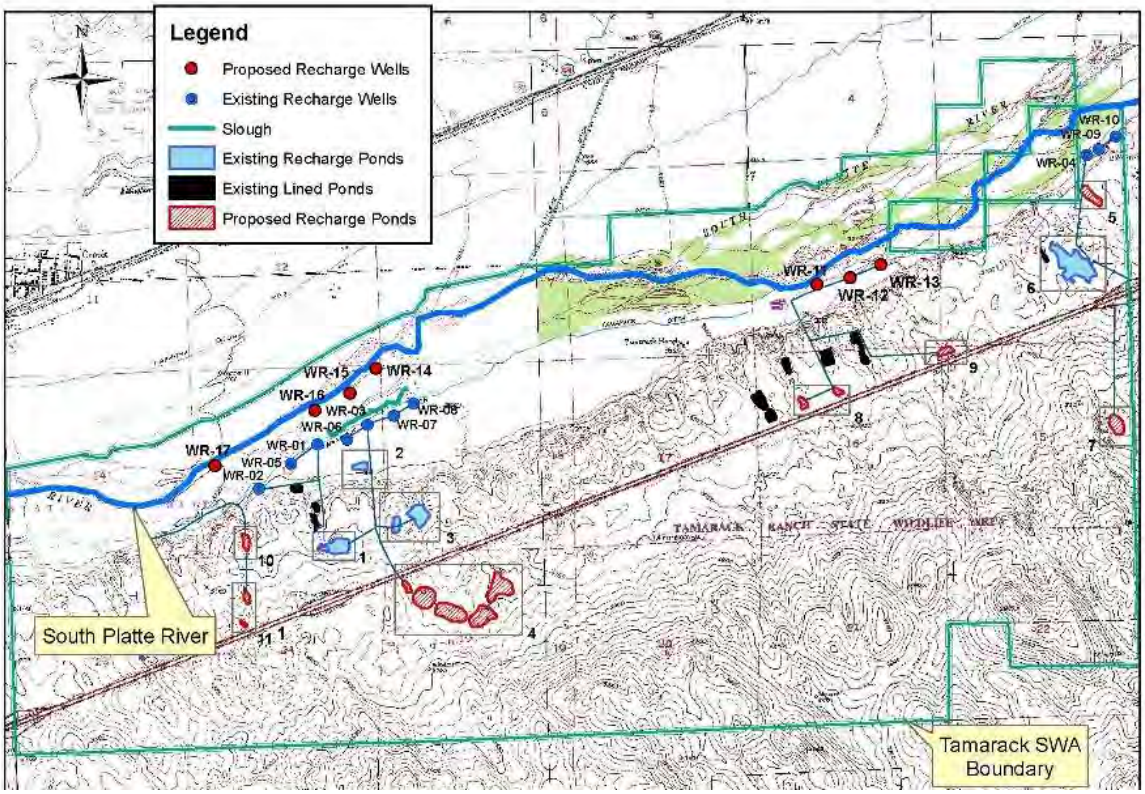
Table 1: Tamarack I Accounting (all values in AF, rounded to the nearest 10)

Irrigation Year[1]	Tamarack I Net Diversions in Reach (Gross-Evap)	Tamarack I Total Accretions in Reach	Tamarack I Total Accretions at State Line	Tamarack I Credits for Shortage Reduction at State Line	Tamarack I Credits Reaching Grand Island
2007	16,290	12,592	4,110	3,290	2,850
2008	25,990	21,801	10,890	6,760	6,020
2009	2,600	9,855	7,570	6,590	5,600
2010	27,370	20,359	16,200	7,290	6,670
2011	79,310	42,631	26,230	2,740	2,470
2012	26,200	39,536	24,000	9,210	8,030
2013	17,940	23,281	12,330	6,600	5,590
2014	16,780	21,481	17,130	12,930	10,770
2015	35,200	29,401	24,390	11,080	10,230
2016	49,870	38,579	25,970	8,400	7,690
2017	29,240	35,744	24,860	8,620	7,730
2018	27,610	31,425	23,250	11,510	10,350
Total, 2008-2018[2]	**338,110**	**314,093**	**212,820**	**91,730**	**81,150**
Average, 2008-2018[2]	**30,740**	**28,550**	**19,350**	**8,340**	**7,380**

[1] An irrigation year runs from November 1 of the previous year through October 31 of the current year. The irrigation year is used here for consistency with reporting by the State of Colorado.

[2] The Program began January 2007. Calculated total and average values exclude the incomplete Irrigation Year 2007, which began November 2006.

Note: This table is based on the best available accounting data to date. Minor modifications may be made in the future.



Tamarack I facilities at Tamarack State Wildlife Area (Photo, Map Credits: Vail 2012, Halstead 2012)

CASE STUDY 8

Yahn Wetlands

Ducks Unlimited Case Studies – South Platte BIP Special Study

DATE: January 29, 2021

TOPIC: Project Information for various DU projects along South Platte River
Projects: Yahn Enhancements, Prewitt SWA, Tamarack SWA

YAHN WETLANDS

- **Project Description**

The Yahn Wetlands project enhanced and restored approximately 100 acres of shallow-water wetlands on the Yahn property outside of Sterling, CO in Logan County, Colorado. Colorado Parks and Wildlife, the Colorado Department of Public Health and the Environment, Great Outdoors Colorado, the North American Wetlands Conservation Act, the United States Fish and Wildlife Service, Ducks Unlimited, Inc. and the landowners all contributed funds to complete conservation of these wetlands.

Eight earthen embankments with water control structures were constructed to control irrigation water supply and improve habitat condition on the property. These wetlands will provide foraging habitat to nonbreeding populations of waterfowl and other wildlife. Embankments were placed on appropriate contours to create irrigated wetlands no more than 18" deep on average. With water level manipulations these units will provide foraging birds with preferred plant communities.

The project area had been managed as pastureland for many decades. Historic Beall Creek is intercepted by the North Sterling Canal on the northern boundary of the tract. This ditch supplies seep water to the natural flow of the creek creating wet meadow and wetland conditions on the site. At some point in the past a ditch was cut along the western edge of the wetland areas to facilitate drainage.

Our intent on the site is to promote the growth of desirable wetland vegetation communities that provide the seeds and substrate for invertebrates that will attract and nourish foraging waterfowl species. Hydrologic manipulation of water levels in the irrigated wetlands will result in stands of native grass and forb plant communities preferred by nonbreeding populations of ducks and geese. The increased size and quality of marsh and wet meadow habitats on the site will assist non-breeding waterfowl in maintaining body condition by providing excellent foraging and roosting habitat in an area of the Platte River Basin deficient in these habitat types. Waterfowl in good body condition are more likely to survive the nonbreeding period and return to the breeding grounds with a higher likelihood of successful breeding effort, thus aiding managers in achieving waterfowl population goals.

The target species for this project include mallards and northern pintails, although all dabbling ducks will benefit. The intent of the project is to increase the availability and quality of shallow-water wetlands to spring and fall migrants, such that body condition is maintained and pre-breeding physiological demands are met.

Generally, high quality wetland foraging and thermal refuge are the limiting factors for nonbreeding waterfowl utilizing this stretch of the South Platte River. These habitats provide the critical nutrition and local environmental conditions that improve and promote waterfowl survival during the migration and

overwintering seasons. Ensuring these habitats remain intact and in functioning order will ensure that our populations will extend the duration of their stay, will maintain historic distribution up and down the river, and will arrive on the breeding grounds in better condition – which makes it more probable that they will be successful nesters, returning more birds to Colorado. These habitat types are in decline along Colorado's South Platte River.

Historically, floodplain terraces flooded and provided migrating birds with areas with easily-accessible invertebrate and plant food resources. Increased upstream development and diversions have shifted the hydrograph such that these overbank flooding events have become much less frequent, are of diminished volume, and of limited duration. All of which have led to decrease in spring habitat suitability. There is increasing evidence gathered on mallards, canvasbacks, and redheads suggesting that early nesting hens within a species contribute more young to the fall flight each year than later nesting hens. Survival of early broods is greater than later broods. Abundant, high quality spring migration habitat may allow hens to replenish nutrient reserves, move on to breeding areas, initiate nests earlier, and achieve greater reproductive success than would have otherwise been possible.

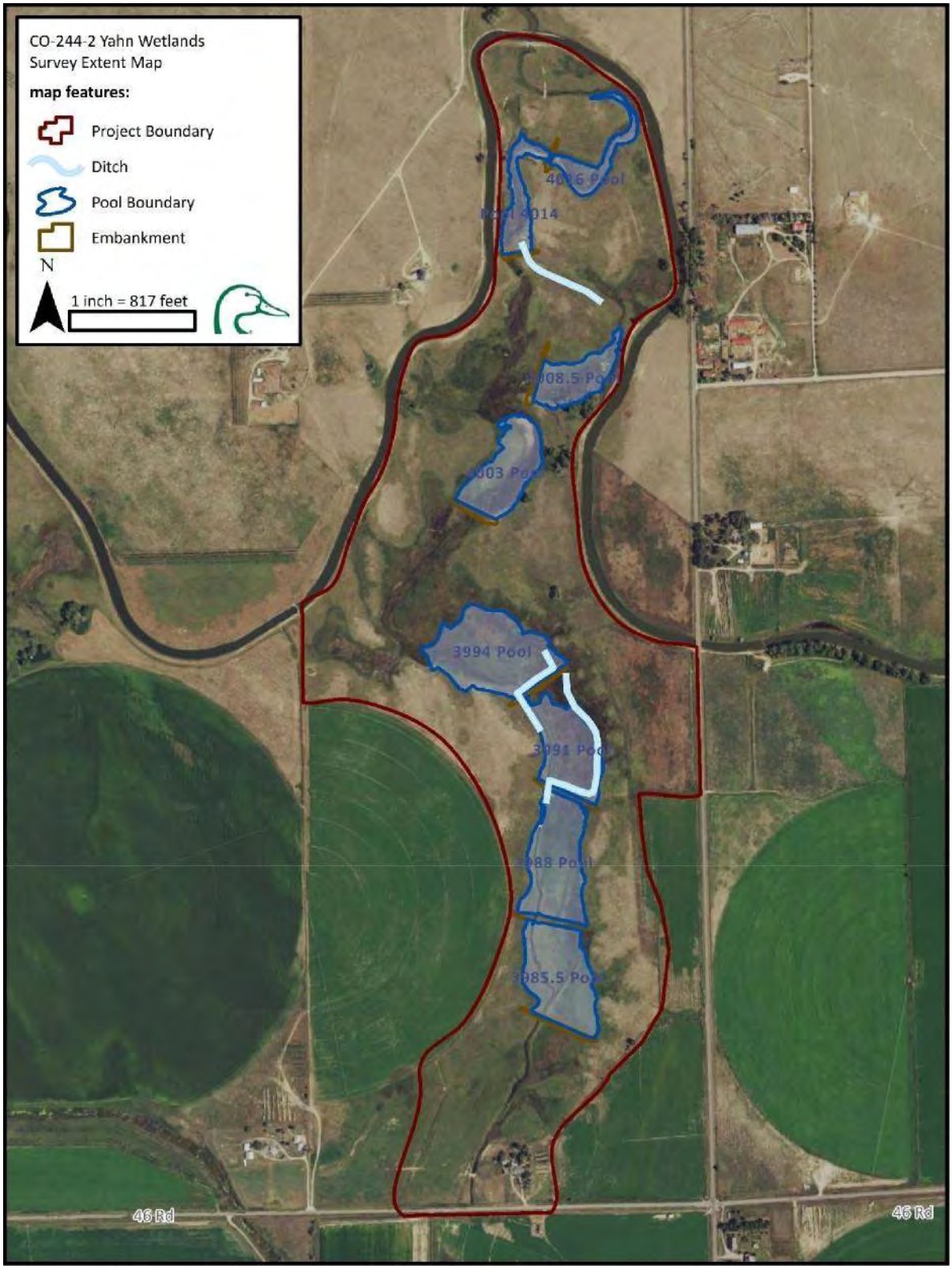
- **Project Location**

The tract is a privately-owned ranch near North Sterling Reservoir in Logan County, CO. Colorado Open Lands holds a conservation easement, funded by the North American Wetlands Conservation Act, on approximately 527 acres of the property.

Project Location Coordinates: [redacted]

Note: Please do not publish coordinates without further permission from Ducks Unlimited and Jim & Tracy Yahn.

- **Photos**


CO-244-2 Yahn Wetlands
Survey Extent Map
map features:
Project Boundary
Ditch
Pool Boundary
Embankment
N
1 inch = 817 feet
3994 Pool
46 Rd
46 Rd

CASE STUDY 9

Prewitt Reservoir Wetlands

Ducks Unlimited Case Studies – South Platte BIP Special Study

DATE: January 29, 2021

TOPIC: Project Information for various DU projects along South Platte River
Projects: Yahn Enhancements, Prewitt SWA, Tamarack SWA

PREWITT RESERVOIR WETLANDS

- **Project Description**

The Prewitt Reservoir Wetlands project enhanced and restored 340 acres of wetland habitat associated with Prewitt Reservoir in Logan and Washington counties, Colorado. The southern shore of Prewitt Reservoir maintains shallow-water wetlands used by thousands of waterfowl during the spring and fall migration. The project site was composed of areas of Prewitt Reservoir that are regularly flooded by normal reservoir operations. The seasonal inundation and drawdown of the upper reaches of the reservoir results in flooded emergent wetlands and shrub wetlands preferred by numerous migratory bird species and other wetland-dependent wildlife. However, existing shallow areas of the reservoir were cut-off by sand dams created by ice flows, others by the topography of the reservoir edge limiting their use by wildlife. Areas on the margins of the reservoir that provide suitable bird habitat were enhanced through the careful excavation of sand dunes. These cuts create natural back-flooding of shallow basins that provide quality habitat to birds and wetland wildlife, where none previously exists. Second, levees with water control structures were constructed within the reservoir basin to provide additional flooded shallow water habitat important to many of the wildlife species that use wetland habitats in the Platte River Basin. This project increased the quantity and quality of habitats available to nonbreeding waterfowl of the South Platte River.

- **Project Location**

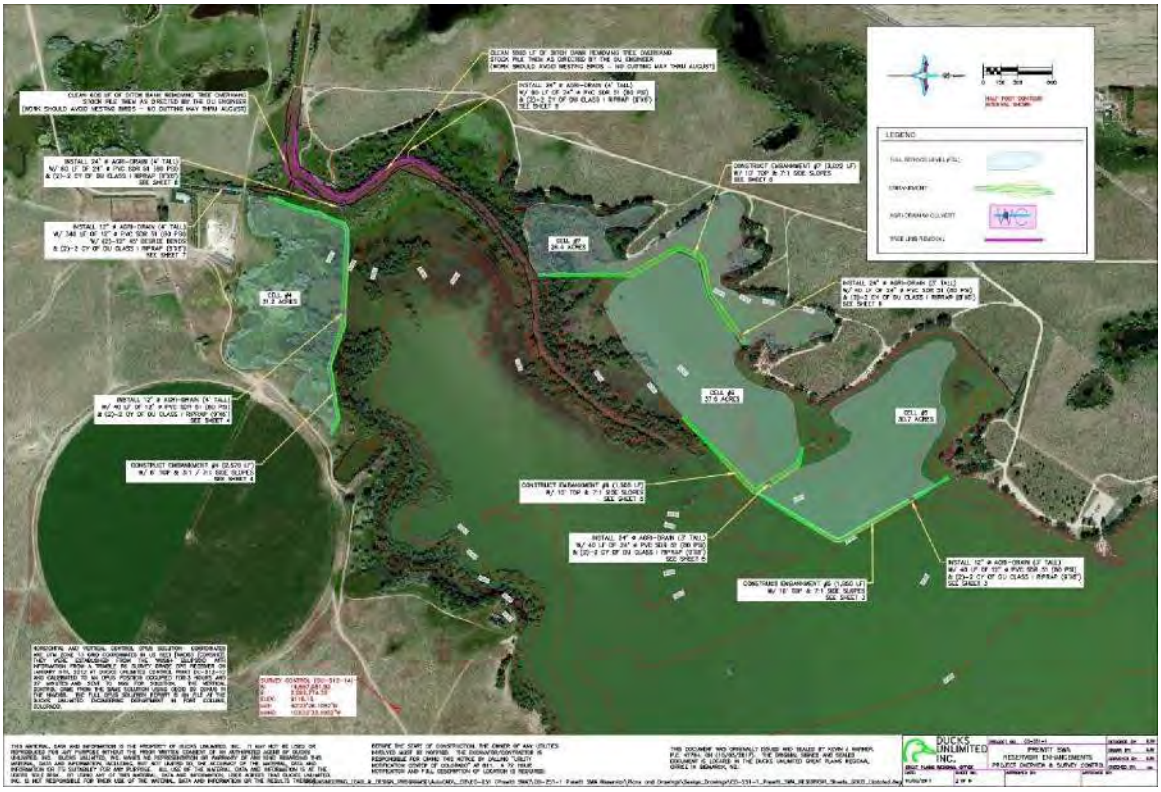
Prewitt Reservoir is located in Washington and Logan County, Colorado approximately six miles south of Merino. Prewitt Reservoir holds a publicly accessible State Wildlife Area managed by Colorado Parks and Wildlife (CPW).

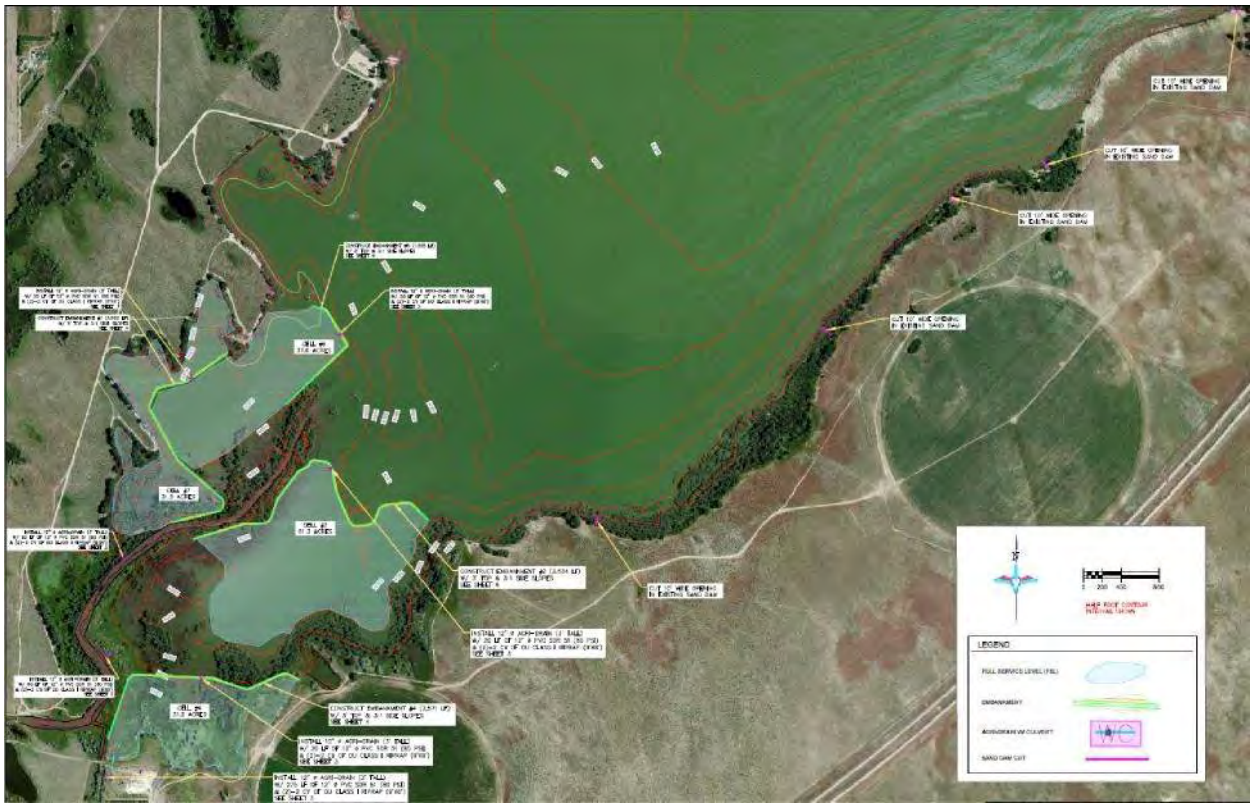
Project Location Coordinates: LAT 40.401493, LONG -103.383650


STERLING
STONEHAM
LOGAN
WILLARD
BEETLAND
MERINO
MESSEX
UNION
SNYDER
HILLROSE
DODD
FORT MORGAN
PROJECT LOCATION
EXIT 102

- **Photos**

Ü ' =
DUCKS





- **Additional Information**
    - This project was part of the Prewitt Wetlands Partnership that conserved and enhanced approximately 3,100 acres of important open water and wetland habitats in the Prewitt Reservoir complex. This unique partnership includes COL, DU, CPW, Colorado Water Conservation Board, Prewitt Reservoir Company, Prewitt Ranch private landowners, and the U.S. Fish and Wildlife Service.
    - Through the Partnership, this project enhanced approximately 340 acres of wetland habitat associated with the Prewitt Reservoir. Our work provides additional shallow flooded areas under passive water level management and active water control structure management as Prewitt Reservoir fills and drains. Some of these potential shallow areas were previously cut-off by sand dams created by ice flows, others by the natural topography of the reservoir edge. The objective was to carefully excavate material that impedes the natural back-flooding of shallow basins which, when functioning, provides the best habitats to birds, other wetland wildlife, as well as fish. Our work ensured that approximately 61 acres have improved function by removing sand dams and vegetative obstructions to passive flow.
    - Additionally, we installed low-level berms or levees within the Prewitt Reservoir boundary that protect and enhance approximately 279 acres of existing habitats and important infrastructure such that high water levels in the reservoir will not negatively impact existing habitats.
    - The 340 acres targeted by this project were those most likely to be impacted by changes in the management of water levels in Prewitt Reservoir. As water becomes scarcer in the South Platte watershed, water managers seek to store more water in existing storage systems. Over the century that the reservoir has been operating, forested and emergent wetlands have developed on the water body's margins, resulting in high quality habitats available to target waterfowl species. Reservoir management drives the quantity, quality and availability of these habitats to nonbreeding populations of ducks, geese and other important wildlife. However, as reservoir capacity is increased, all of these habitats will be impacted and some may be lost. Moreover, the increase in reservoir water level will inundate some areas of the operating ranch that are important for its agricultural operation. For example, as water levels rise within Prewitt Reservoir, the adjacent Prewitt Ranch calving grounds which are vital to their cattle operation could be inundated. The purpose of this project was to develop enhancements that will maintain overall habitat quality on the ranch and reservoir while also allowing water managers the flexibility to adjust water levels in the reservoir to meet their user's needs
    - Also, the work positively impacts tens of thousands of ducks and geese that utilize Prewitt Reservoir throughout the year as well as the following identified species of special conservation concern: Western Grebe, Bald Eagle, Northern Harrier, American Avocet, Forster's Tern, Red-headed Woodpecker, Marsh Wren, American White Pelican, Baird's Sandpiper, Wilson's Phalarope, Stilt Sandpiper, Least Sandpiper, Long-billed Dowitcher, Upland Sandpiper, Bullock's Oriole, Short-eared Owl, and Willow Flycatcher. The HABS database suggests a potential 514,595 duck-use days in both the spring and fall on the wetlands developed under this application. The model estimates that we will produce enough food to sustain about 10,000 mallard-sized ducks for 26 days each spring and fall or 5,000 mallard-sized ducks for 42 days each spring and fall or 20,000 mallard-sized ducks for 13 days each spring and fall.

Appendix C. Project Tiering Matrix

Project_ID	Project Name	Project Description	Key Word 1	Key Word 2	Key Word 3	Key Word 4	Status	Lead Proponent	Lead Contact	M&I Need	Ag Need	E&R Need	Admin Need	County	Water Dist	Estimated Yield	Yield Units	Estimated Capacity	Capacity Units	Estimated Cost	Timeline Tier	Basin Plan Align	Local Plan Align	Water Plan Align	Criticality	Core Data Num	Tier
MET-2015-0001	ECCV Northern Project Phase 1	The Northern Project is a collaboration between two South Metro Water members, East Cherry Creek Valley and Arapahoe County Water and Wastewater Authority, to deliver new renewable water supplies to the region and reduce dependency on nonrenewable groundwater. The project includes the 31-mile Northern Pipeline, pump stations, and the state-of the-art Northern Water Treatment Plant. Associated with the plant is a deep-injection well to dispose of concentrate, or brine, which will be generated by the treatment plant, and will allow East Cherry Creek Valley WSD to recover more usable water in an environmentally acceptable manner	Supply & Demand Gap				Completed	East Cherry Creek Valley Water & Sanitation Distict	Chris Douglass	100	0	0	0	Arapahoe	02	4500	AF			$ 110,000,000		Tier 2			Tier 2	19	Not applicable
MET-2015-0002	Broomfield County Grow Into Existing Supply	Broomfield County Grow Into Existing Supply	Supply & Demand Gap				Completed	Broomfield, City of	David Allen	100	0	0	0	Broomfield	06	4677	AF					Tier 2			Tier 2	18	Not applicable
MET-2015-0003	Water Infrastructure Supply Efficiency Partnership	Return flows from Aurora Water and Denver Water are delivered through Aurora's Prairie Waters Project under a permanent but variable water contract to WISE Authority members. Infrastructure required is a pipeline and associated infrastructure to move water from Aurora's Peter D. Binney Water Purification Facility. Yield will replace non-renewable groundwater pumping.	Supply & Demand Gap				Completed	Aurora, South Metro Water Supply Authority, Denver Water	Eric Hecox	100	0	0	0	Arapahoe	08							Tier 2			Tier 2	16	Not applicable
MET-2015-0004	Englewood Grow Into Existing Supply	Englewood Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Englewood, City of	Joe Pershin	100	0	0	0	Arapahoe	08	6173	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
MET-2015-0005	Box Creek Reservoir	Box Creek Reservoir is a planned reservoir in Lake County with up to 60,000 AF of storage on site. Current sources of water will include decreed (conditional and absolute) water rights in the Colorado and Arkansas River basins. No new water rights are associated with this project. Box Creek is an operational efficiency project utilizing existing exchanges and water rights. Beneficiaries and project participants include the City of Aurora and Lake County.	Storage	Supply & Demand Gap	Watershed Health, Environment & Recreation	Joint Use (benefits Lake County & Aurora)	Planned	Aurora	Alexandra Davis	100	0	0	0	Lake	11		AF	60,000	AF	$ 600,000,000	Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	20	Tier 3
MET-2015-0006	Eagle River Joint-Use Water Project (Eagle River MOU)	The ERMOU Joint Use Water Project (ERMOU Project) derives from the 1998 Eagle River MOU among East and West Slope water users for development of a joint use water project in the Eagle River basin that minimizes environmental impact, is cost effective, technically feasible, can be permitted by local, state and federal authorities, and provides 20,000 acre feet per year (AFY) average annual yield for East Slope use, 10,000 AFY firm dry year yield for West Slope use, and 3,000 AF of reservoir capacity for Climax Molybdenum Co. The ERMOU Project is proposed as a cooperative alternative to construction of the Homestake II Project in the Holy Cross Wilderness. The ERMOU Project will utilize conditional water rights held by the ERMOU Parties and a yet-to-be determined combination of gravity diversion, storage, pumping, and/or groundwater infrastructure to develop the contemplated project yield. ERMOU Parties include: Cities of Aurora and Colorado Springs; Eagle Park Reservoir Company (consisting of the Colorado River Water Conservation District, Eagle River Water & Sanitation District, Upper Eagle Regional Water Authority and Vail Associates, Inc.); and Climax Molybdenum Company	Storage	Supply & Demand Gap		5-year cost assumed	Implementing	MOU Partners (Cities of Aurora and Colorado Springs; Eagle Park Reservoir Company (consisting of the Colorado River Water Conservation District, Eagle River Water & Sanitation District, Upper Eagle Regional Water Authority and Vail Associates, Inc.); and Climax Molybdenum Company)	Jason Cowles Engineering Manager (ERWSD) jcowles@erwsd.org	85	0	15	0	Eagle	37	10,000	AF/year		AF	$ 1,500,000,000	Tier 2	Tier 1	Tier 3	Tier 2	Tier 1	20	Tier 2
MET-2015-0007	Aurora Grow Into Existing Supply	Aurora Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Aurora, City of	Joe Stibrich	100	0	0	0	Arapahoe	02	2000	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
MET-2015-0008	Prairie Waters Project Expansion and Storage	The core Prairie Waters Project was completed in 2010 and includes riverbank filtration wells, a 34-mile pipeline, and 3 pumping stations to pump return flows back to the City of Aurora, for subsequent treatment (by a new advanced treatment facility) and reuse after blending with high quality mountain supplies at one of the City's treatment plants. Expansions of the system are planned through 2050, including gravel pit storage.	Supply & Demand Gap	Storage			Completed	Aurora	Alexandra Davis	100	0	0	0	Arapahoe	02	10000	AF			$ 653,000,000		Tier 2			Tier 2	19	Not applicable
MET-2015-0009	Westminster Unspecified IPP Agricultural Transfers	Westminster Unspecified IPP Agricultural Transfers	Supply & Demand Gap				Planned	Westminster, City of	Josh Nims	100	0	0	0	Jefferson	02						Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
MET-2015-0010	Westminster Gravel Storage	Westminster Gravel Storage	Storage				Implementing	Westminster, City of	Josh Nims	100	0	0	0	Jefferson	02	3000	AF			$ 25,000,000	Tier 2	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
MET-2015-0011	Westminster Reclaimed Water	Westminster Reclaimed Water	Conservation				Implementing	Westminster, City of	Josh Nims	100	0	0	0	Jefferson	02	3500	AF				Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	18	Tier 2
MET-2015-0012	Arapahoe County Unspecified IPP Agricultural Transfers	Arapahoe County Unspecified IPP Agricultural Transfers				2020 status not provided; assumed concept	Concept	Arapahoe County	Julio Iturreria	100	0	0	0	Arapahoe	2	6862	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0013	Arvada Clear Creek Ag Transfer	Acquisition of irrigation water rights in various ditches in the Clear Creek and Ralston Creek basins to be changed in water court allowing for municipal water usage.	Supply & Demand Gap				Completed	Arvada, City of	Ken Peterson	100	0	0	0	Jefferson	07	0	AF			$ -		Tier 2			Tier 2	19	Not applicable

Project_ID	Project Name	Project Description	Key Word 1	Key Word 2	Key Word 3	Key Word 4	Status	Lead Proponent	Lead Contact	M&I Need	Ag Need	E&R Need	Admin Need	County	Water Dist	Estimated Yield	Yield Units	Estimated Capacity	Capacity Units	Estimated Cost	Timeline Tier	Basin Plan Align	Local Plan Align	Water Plan Align	Criticality	Core Data Num	Tier
MET-2015-0014	Arvada Grow Into Existing Supply (Gross Reservoir Expansion with Denver Water)	Arvada Grow Into Existing Supply	Supply & Demand Gap				Planned	Arvada, City of	Ken Peterson	100	0	0	0	Jefferson	07	2900	AF			$ 110,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	19	Tier 3
MET-2015-0015	Arvada Highway 93 Lakes	Highway 93 Lakes will be a single impoundment or series of lakes created by the excavation of gravel. Water sources include a combination of Arvada's Clear Creek and Ralston Creek water rights that would be pumped up to the site located above Arvada Reservoir.	Supply & Demand Gap				Planned	Arvada, City of	Ken Peterson	100	0	0	0	Jefferson	07	1400	AF	2000	AF	$ 30,000,000	Tier 3	Tier 2	Tier 3	Tier 1	Tier 2	21	Tier 3
MET-2015-0016	Teller County (Metro Basin portion) Unspecified IPP Agricultural Transfers	Teller County (Metro Basin portion) Unspecified IPP Agricultural Transfers				2020 status not provided; assumed concept	Concept	Teller County	Marc Dettenrieder	100	0	0	0	Teller	08	689	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0017	Denver Water Grow Into Existing Supply	Denver Water Grow Into Existing Supply	Supply & Demand Gap				Planned	Denver Water	Bob Peters	100	0	0	0	Denver	02						Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
MET-2015-0018	Gross Reservoir Expansion or Moffat Collection System Project	The Denver Water Board requested a Section 404 Permit (Clean Water Act) from the U.S. Army Corps of Engineers, Omaha District Regulatory Branch to enlarge the existing Gross Reservoir (near Boulder, Colo.) to supply 18,000 acre-feet per year new firm yield of water to its Moffat Collection System. The Corps is the lead federal agency and has been preparing an Environmental Impact Statement since 2003 to analyze environmental effects. Water supplied to the Moffat Collection System is proposed to be diverted from either West Slope tributaries of the Colorado River or from the South Platte River in the Colorado Front Range. Denver Water's preferred project is to enlarge Gross Reservoir in Boulder County to provide storage for the diverted water. Source: https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Colorado/EIS-Moffat/ https://grossreservoir.org/construction/progress-and-schedule/	Supply & Demand Gap	Storage			Planned	Denver Water & Arvada	Bob Peters	100	0	0	0	Boulder	06	18000	AF	72000	AF	$ 464,000,000	Tier 3	Tier 2	Tier 3	Tier 1	Tier 1	21	Tier 2
MET-2015-0019	Denver Water Reuse	Reuse of consumable return flows via the Denver Water Recycling Plant, Denver Water's Operations Complex water reclamation system, and other future reuse modes.	Supply & Demand Gap				Planned	Denver Water	Bob Peters	100	0	0	0	Denver	02						Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	16	Tier 3
MET-2015-0020	Thornton Conservation	Thornton Conservation	Conservation				Implementing	Thornton, City of	Emily Hunt	100	0	0	0	Adams	02	1100	AF			$ 1,600,000	Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	19	Tier 1
MET-2015-0021	Thornton Grow Into Existing Supply	Thornton Grow Into Existing Supply	Supply & Demand Gap				Planned	Thornton, City of	Emily Hunt	100	0	0	0	Adams	02	5000	AF			$ 5,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	19	Tier 3
MET-2015-0022	Thornton Reuse	Thornton Reuse	Conservation	Supply & Demand Gap			Implementing	Thornton, City of	Emily Hunt	100	0	0	0	Adams and Weld	02	2000	AF			$ 2,000,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	19	Tier 2
MET-2015-0023	Thornton Water Project	The City of Thornton purchased shares in the 1980s from the Water Supply and Storage Company for water rights in the Poudre River basin. Thornton plans to build a 70-mile pipeline through Larimer and Weld counties to convey the water to its service area.	Supply & Demand Gap				Implementing	Thornton, City of	Emily Hunt	100	0	0	0	Adams, Weld, Larimer	02	14000	AF			$ 450,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
MET-2015-0024	Consolidated Mutual Unspecified IPP Agricultural Transfers	Consolidated Mutual Unspecified IPP Agricultural Transfers	Supply & Demand Gap				Planned	Consolidated Mutual Water Company	Dianna Jordan	100	0	0	0	Jefferson	07						Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
MET-2015-0025	Consolidated Mutual Water District Reservoir Construction	Consolidated Mutual Water District Reservoir Construction	Storage				Implementing	Consolidated Mutual Water Company	Dianna Jordan	100	0	0	0	Jefferson	07						Tier 2	Tier 2	Tier 1	Tier 3	Tier 2	16	Tier 2
MET-2015-0026	Castle Rock Conservation	Conservation efforts include public outreach and education (participation in SMWSA's Water Ambassador program, Water Wiser classes with Castle Rock residents), rebate programs, water budgets and schedules for residents, particpation in the QWEL program (landscaper certification), efficiency and incentive regulations for developers including water efficiency plans, and more.	Conservation	Education, Outreach & Innovation			Implementing	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	2770	AF				Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	18	Tier 1

Project_ID	Project Name	Project Description	Key Word 1	Key Word 2	Key Word 3	Key Word 4	Status	Lead Proponent	Lead Contact	M&I Need	Ag Need	E&R Need	Admin Need	County	Water Dist	Estimated Yield	Yield Units	Estimated Capacity	Capacity Units	Estimated Cost	Timeline Tier	Basin Plan Align	Local Plan Align	Water Plan Align	Criticality	Core Data Num	Tier
MET-2015-0027	Centennial Aquifer Storage and Recovery	Centennial Aquifer Storage and Recovery	Storage	Education, Outreach & Innovation			Completed	Centennial Water and Sanitation District	Rick McCloud rmcloud@highlandsranch.org 303-791-0430	100	0	0	0	Douglas	08			33	wells equipped for ASR	$ 660,000		Tier 2			Tier 2	19	Not applicable
MET-2015-0028	East Cherry Creek Valley Pipeline Agreement	East Cherry Creek Valley Pipeline Agreement				2020 status not provided; assumed concept	Concept	Centennial Water and Sanitation District	Rick McCloud	100	0	0	0	Douglas	08	2500	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0029	Centennial Water and Sanitation District Conservation	Centennial Water and Sanitation District Conservation	Supply & Demand Gap	Conservation	Education, Outreach & Innovation	Demand Reduction	Implementing	Centennial Water and Sanitation District	Rick McCloud rmcloud@highlandsranch.org 303-791-0430	100	0	0	0	Douglas	08	2000	AF			$ 500,000	Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	19	Tier 1
MET-2015-0030	Renewable Water Project Phase I	Renewable Water Project Phase I					Not Pursuing	Castle Rock, Town of	Rick Schultz	100	0	0	0	Douglas	08	3360	AF			$ 25,000,000		Tier 2			Tier 2	18	Not applicable
MET-2015-0031	Renewable Water Project Phase II	Renewable Water Project Phase II					Not Pursuing	Castle Rock, Town of	Rick Schultz	100	0	0	0	Douglas	08	2340	AF			$ 10,000,000		Tier 2			Tier 2	18	Not applicable
MET-2015-0032	Rueter Hess Reservoir Enlargement	Castle Rock water participates in regional storage at Rueter-Hess reservoir and owns 8,000 AF of storage space. Supplies stored currently include return flows off of Cherry Creek and will likely one day include WISE supplies.	Storage	Watershed Health, Environment & Recreation			Completed	Parker Water and Sanitation District, Castle Rock, Castle Pines North, Stonegate	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	8000	AF	75000	AF			Tier 2			Tier 2	20	Not applicable
MET-2015-0033	South Platte and Beebe Draw Well Project - Agricultural Transfer	South Platte and Beebe Draw Well Project - Agricultural Transfer	Supply & Demand Gap				Implementing	Brighton, City of	Brad Dallam	100	0	0	0	Adams	02	3500	AF				Tier 2	Tier 2	Tier 3	Tier 3	Tier 2	18	Tier 3
MET-2015-0034	Brighton Augmentation Plan	Brighton Augmentation Plan	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Brighton, City of	Brad Dallam	100	0	0	0	Adams	02						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	16	Tier 4
MET-2015-0035	Brighton Grow Into Existing Supply	Brighton Grow Into Existing Supply	Supply & Demand Gap				Planned	Brighton, City of	Brad Dallam	100	0	0	0	Adams	02	1510	AF				Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 3
MET-2015-0036	South Platte and Beebe Draw Well Project - Reuse	South Platte and Beebe Draw Well Project - Reuse	Conservation				Implementing	Brighton, City of	Brad Dallam	100	0	0	0	Adams	02	3200	AF				Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	18	Tier 2
MET-2015-0037	Westminster Agreement	Westminster Agreement	Supply & Demand Gap				Completed	Brighton, City of	Brad Dallam	100	0	0	0	Adams	02	2000	AF			$ 9,150,000		Tier 2			Tier 2	19	Not applicable
MET-2015-0038	Northglenn Ag Transfer	Northglenn Ag Transfer	Supply & Demand Gap				Implementing	Northglenn, City of	Tami Moon	100	0	0	0	Adams	02	1000	AF				Tier 2	Tier 2	Tier 3	Tier 3	Tier 2	18	Tier 3
MET-2015-0039	Northglenn Conservation	Northglenn Conservation	Conservation				Implementing	Northglenn, City of	Tami Moon	100	0	0	0	Adams	02	600	AF				Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	18	Tier 1

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MET-2015-0040	Northglenn New Storage Projects	Northglenn New Storage Projects -- Standley Lake enlargement	Supply & Demand Gap				Concept	Northglenn, City of	Tami Moon	100	0	0	0	Adams	02	1500	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	18	Tier 3
MET-2015-0041	Northglenn Reuse Plan	Northglenn Reuse Plan	Conservation				Not Pursuing	Northglenn, City of	Tami Moon	100	0	0	0	Adams	02	700	AF					Tier 2			Tier 2	18	Not applicable
MET-2015-0042	Douglas County Unspecified IPP Agricultural Transfers	Douglas County Unspecified IPP Agricultural Transfers				2020 status not provided; assumed concept	Concept	Douglas County	Tim Murrell	100	0	0	0	Douglas	08	272	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0043	Adams County Unspecified IPP Agricultural Transfer	Adams County Unspecified IPP Agricultural Transfer				2020 status not provided; assumed concept	Concept	Adams County		100	0	0	0	Adams	02	13664	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	16	Tier 4
MET-2015-0044	ACWWA Flow Project	The ACWWA Flow Project's components include:renewable water rights from the South Platte River Basin; 1400 acre-feet of storage in Chambers Reservoir; water treatment capacity in the East Cherry Creek Valley Water Treatment Plant; water supply wells, storage and infrastructure to deliver water to the ECCV Water Treatment Plant; water carrying capacity in the ECCV Northern Pipeline; interconnection to deliver water supplies from the ECCV service area to the ACWWA service area.				2020 status not provided; assumed concept	Concept	ACWWA, SMWSA	Rick Marsicek	100	0	0	0	Arapahoe	08	4400	AF			$ 122,479,600	Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	18	Tier 4
MET-2015-0045	ACWWA Reuse Flow Project	The ACWWA Flow Project's components include:renewable water rights from the South Platte River Basin; 1400 acre-feet of storage in Chambers Reservoir; water treatment capacity in the East Cherry Creek Valley Water Treatment Plant; water supply wells, storage and infrastructure to deliver water to the ECCV Water Treatment Plant; water carrying capacity in the ECCV Northern Pipeline; interconnection to deliver water supplies from the ECCV service area to the ACWWA service area.				2020 status not provided; assumed concept	Concept	ACWWA, SMWSA	Rick Marsicek	100	0	0	0	Arapahoe	08	3520	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0046	ECCV Northern Project Phase 2	The Northern Project is a collaboration between East Cherry Creek Valley and Arapahoe County Water and Wastewater Authority, to deliver new renewable water supplies to the region and reduce dependency on nonrenewable groundwater. The Northern Project's second phase includes additional water rights, as well as expansion of the reverse osmosis treatment plant and pump stations from project MET-2015-0001 Associated with the plant is a second deep-injection well to dispose of concentrate, or brine, which will be generated by the treatment plant, and will allow East Cherry Creek Valley WSD to recover more usable water in an environmentally acceptable manner.	Supply & Demand Gap				Completed	East Cherry Creek Valley Water & Sanitation District	Chris Douglass	100	0	0	0	Arapahoe	08	6000	AF	10	MGD	$ 90,000,000		Tier 2			Tier 2	21	Not applicable
MET-2015-0047	South Platte Farms and SP Co-op AT	South Platte Farms and SP Co-op AT				2020 status not provided; assumed concept	Concept	Parker, City of	Rick Marsicek	100	0	0	0	Douglas	08	5000	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	17	Tier 4
MET-2015-0048	Northern Water Supply Project	Conveyance of renewable water supplies from the Town's Box Elder property to the Town of Castle Rock through ECCV's northern pipeline and WISE project infrastructure	Supply & Demand Gap	Additional			Implementing	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	2500	AF	3	MGD	$ 83,403,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
MET-2015-0049	Plum Creek Diversion & WPF Upgrades	A surface water diversion will give the Town of Castle Rock the ability to capture reusable supplies from Plum Creek. The Water Purification Facility (WPF) processes renewable and deep groundwater supplies. The WPF has been upgraded with ozonation, biologically activated filters, granular activated carbon and ultraviolet disinfection and can process 6 mgd of water.	Additional				Completed	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	2464	AF	6	MGD	$ 17,763,000		Tier 2			Tier 2	21	Not applicable
MET-2015-0050	ASR	The Aquifer Storage and Recovery wells allow the Town of Castle Rock to store excess renewable supplies through injection into the aquifer for future use.	Storage				Implementing	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	235	AF	0.69	MGD	$ 600,000	Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	21	Tier 1
MET-2015-0051	ASR Future Storage	The Aquifer Storage and Recovery wells will allow the Town of Castle Rock to store excess renewable supplies through injection into the aquifer for future use. Additional wells are being constructed and are planned to integrate power generation.	Storage	Additional			Implementing	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	400	AF			$ 1,230,300	Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	19	Tier 2
MET-2015-0052	Downstream Reservoir Exhanges	The Downstream Reservoir Water Storage Program allows Denver Water to store and release water through the use of depleted gravel mines for exchange and replacement purposes. There will be nine reservoirs divided into three complexes:South Reservoir Complex, North Reservoir Complex and Lupton Lakes Complex.	Supply & Demand Gap	Storage			Implementing	Denver Water	Bob Peters	100	0	0	0	Adams	02	12000	AF			$ 136,000,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	19	Tier 3

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MET-2015-0053	Chatfield Pump Station	Pump station/pipeline project to deliver water in Chatfield Reallocation Storage to Denver, Centennial, Castle Rock, Dominion (Need to talk with Bob Peters to determine if this is a duplicate of the prior Chatfield Pump Station project).	Supply & Demand Gap				Planned	Denver Water	Bob Peters	100	0	0	0	Jefferson	08	3000	AF			$ 7,000,000	Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	19	Tier 3
MET-2015-0054	Upper Colorado Cooperative Project	Upper Colorado Cooperative Project	Supply & Demand Gap				Implementing	Denver Water	Bob Peters	100	0	0	0	Denver	02	20000	AF				Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	18	Tier 1
MET-2015-0055	South Platte Protection Plan	The purpose of the South Platte Protection Plan is to protect those river-related values [outstandingly remarkable values ("ORVs")] identified by the USFS. These values are historic cultural resources, fisheries, geologic, recreational, scenic, and wildlife. The Proposal also recognizes that the Colorado Front Range communities rely heavily upon the South Platte for drinking water supply and other municipal and industrial uses that agriculture throughout northeastern Colorado depends heavily on South Platte flows, and river values must be protected in the context of preserving these functions as well. We believe that the interests of all these communities can be maintained through common dialogue toward an approach in which the many values on the river -- habitat, ecosystem, and human-based -- can all be addressed in coordination and balance with one another. It is this mutual respect for the many important uses that is central to the South Platte Protection Plan.	Watershed Health, Environment & Recreation				Implementing	Denver Water	Bob Peters	100	0	0	0	Denver	08	NA	NA	NA	NA		Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1
MET-2020-1	Aquifer Storage and Recovery Feasibility Study: Phase 2	The purpose of this study is to expand upon the findings of Northglenn's ASR Feasibility Study Phase I to complete all necessary analysis needed to confirm the feasibility and cost effectiveness of ASR and to provide staff with information to weigh ASR against other storage options under consideration. If ASR is feasible, all necessary permit applications for an ASR pilot well at Northglenn's Water Treatment Facility will be submitted, along with preparation for construction.	Storage	Supply & Demand Gap			Implementing	Northglenn, City of	Tamara Moon 303.450.4070 (desk) 303.887.8080 (cell) tmoon@northglenn.org	100	0	0	0	Adams	2	1000	AF				Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	18	Tier 2
MET-2020-10	Change of 47 Fulton Ditch Shares	Water court process to change 47 Fulton Ditch Shares from agricultural use to municipal use; apply for associated South Platte River exchange water right, appropriation of return flows, and plan for augmentation	Supply & Demand Gap				Implementing	Lochbuie, Town of	Steve Stamey sstamey@lochbuie.org 303-655-9308	100	0	0	0	Adams and Weld	1	54.8	AF/year	178.7	AF/year	$ 200,000	Tier 1	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 2
MET-2020-11	Chatfield Westside Alternatives	This project will develop infrastructure associated with the recently reallocated storage in Chatfield Reservoir, delivering supplies to water providers in the South Metro area. This includes a pump station and associated pipelines to deliver the water to water providers.	Storage				Planned	South Metro Water Supply Authority	Lisa Darling	100	0	0	0	Douglas	NA	5000	AF			$ 60,000,000	Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	19	Tier 3
MET-2020-12	Cherry Creek Upstream of Cherry Creek Reservoir Master Plan	Regional Collaboration to identify channel mitigation and stream restoration projects.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with SEMSWA, Parker, Douglas County and CCBWQA	Kurt Bauer, MHFD Partnering with SEMSWA, Parker, Douglas County and CCBWQA	0	0	100	0	Arapahoe	8	NA	NA	NA	NA	$ 200,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-13	Clear Creek	Increase bridge capacity at York and Broadway for a 100-year event. Improve boater safety on drop structures at I-25 and Washington Street and also upstream of York Street by incorporating a recreational feature	Watershed Health, Environment & Recreation				Completed	Mile High Flood District Partnering with Adams, Jefferson and Denver Counties	Brooke Seymour	0	0	100	0	Adams	7					$ 9,000,000		Tier 2			Tier 2	17	Not applicable
MET-2020-14	Clear Creek Reservoir above Golden	Construct new reservoir, permitting is issue.				2020 status not provided; assumed concept	Concept	Clear Creek County		100	0	0	0	Jefferson	7						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	14	Tier 4
MET-2020-15	CSU Water Campus - One Water Implementation	Pilot project for the One Water Vision. Integrating strategic and sustainable water practices in the land plan for the CSU National Western Campus.	Watershed Health, Environment & Recreation				Implementing	CSU System, Multiple Parnters	Jocelyn Hittle	0	0	100	0	Denver	8						Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	16	Tier 3
MET-2020-16	Denver Basin Aquifer Storage and Recovery	Investigation of ASR as future water storage option	Supply & Demand Gap	Storage			Concept	Denver Water	Bob Peters	100	0	0	0	Denver	8						Tier 2	Tier 2	Tier 1	Tier 3	Tier 2	16	Tier 3
MET-2020-17	Denver One Water Plan	The Denver One Water Plan provides a framework for implementing holistic and resilient water management and land use strategies through collaboration and strong policies that promost health watersheds in an equitable, economically and environmentally beneficial manner.	Watershed Health, Environment & Recreation	Land Use	Conservation	Outreach; Innovation; Prepare for Climate Change	Implementing	The Water Connection / The Greenway Foundation , Mile High Flood District, City and County of Denver, CWCB, Metro Wastewater, CSU	The Water Connection / The Greenway Foudation - Devon Buckels, Mile High Flood District - Barbara Chongtoua, City and County of Denver - Dave Jula, CWCB, Metro Wastewater, CSU	50	0	50	0	Denver	8	NA	NA	NA	NA	$ 500,000	Tier 1	Tier 1	Tier 1	Tier 1	Tier 2	21	Tier 1
MET-2020-18	Denver One Water Plan Implementation	Implementation projects pursuing recommendations in Denver One Water Plan. The Denver One Water Plan was funded in part through a CWCB grant to The Greenway Foundation. The Plan is scheduled to be completed in Spring of 2021. The primary organizations that initiated and are driving the DOWP will also be engaged in implementation of the Plan's recommendations and steps to move One Water in Denver forward. Specific projects have not yet been identified or costed at this time.	Land Use	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Conservation & Reuse & Climate Change	Concept	City and County of Denver, The Greenway Foundation and Mile High Flood District	Devon Buckels, Dave Jula, Barb Chongtua Devon@thewaterconnection.org 720-837-3289	50	0	50	0	Denver	7						Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3

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MET-2020-19	Denver Water Ralston Reservoir and Treatment Plant Upgrade	Upgrade to northern portion of supply from Ralston Creek, etc.				2020 status not provided; assumed concept	Concept	Denver Water		100	0	0	0	Jefferson	7						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	14	Tier 4
MET-2020-2	Arapahoe County South Platte River Working Group	Regional Collaboration to implement projects along the full length of the South Platte River in Arapahoe County.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District	Laura Kroeger	0	0	100	0	Arapahoe	1	NA	NA	NA	NA	$ 500,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-20	Districtwide Stream Management Corridor Delineation	Developing guidelines for stream management corridors across the District to assist with landuse and development planning.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District	Morgan Lynch	0	0	100	0	Denver	8	NA	NA	NA	NA	$ 100,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-21	Dominion Rainwater Harvesting Storage Project	Storage of stormwater/rainwater for subsequent non-potable municipal use	Supply & Demand Gap	Conservation			Planned	Dominion Water and Sanitation District	Mary Kay Provaznik	100	0	0	0	Douglas	8	400	AF	400	AF	$ 10,000,000	Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
MET-2020-22	East Plum Creek	Stabilize entire reach with grade control to mitigate lateral movement that has caused fast erosion, sloughing, and floodplain expansion. Protect existing infrastructure and property with aggressive bank stabilization measures.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Douglas County	Jon Villines	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 20,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-23	ECCV Northern Project Phase 3	The Northern Project's third phase includes additional water rights, as well as expansion of the reverse osmosis treatment plant and pump stations from project MET-2015-0001 & MET 2015-0046.	Supply & Demand Gap				Concept	East Cherry Creek Valley Water & Sanitation District	Chris Douglass	100	0	0	0	Arapahoe	08	3200	AF	5	Treatment MGD	$ 100,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 3
MET-2020-24	Foxton Road Forest Restoration	Forest treatments and watershed restoration in areas at high-risk of catastrophic wildfire. The projects will align with an initiative to strengthen fire lines, serving to both reduce the risk of wildfire and assist fire suppression efforts. Proactive high-intensity wildfire mitigation serves as sediment mitigation.	Watershed Health, Environment & Recreation				Concept	Upper South Platte Partnership	Christina Burri, Madelene McDonald	0	0	100	0	Jefferson	80	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
MET-2020-25	Johnson Habitat Park Improvements	Instream habitat improvement, along with lifetime fishing access improvements - Denver Chapter TU, Mile High Flood Control District	Watershed Health, Environment & Recreation				Concept	Denver Trout Unlimited	John Davenport - Denver TU Conservation Chair john.davenport.mac@mac.com	0	0	100	0	Denver	8	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
MET-2020-26	Lakewood Gulch Master Plan	Regional Collaboration to identify channel mitigation and stream restoration projects.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Cities of Denver and Lakewood	Bryan Kohlenberg	0	0	100	0	Jefferson, Denver	1	NA	NA	NA	NA	$ 300,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-27	Lifetime Angling Program - Denver South Platte	Improved angling access (& associated habitat improvement) including for more mobility-limited anglers including from younger to senior citizen anglers	Watershed Health, Environment & Recreation				Concept	Denver Trout Unlimited	John Davenport - Denver TU Conservation Chair john.davenport.mac@mac.com	0	0	100	0	Denver	7	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
MET-2020-28	Meadow Ditch/Lambert Reservoir #3	rebuild historic dam breached during 2015 flooding	Supply & Demand Gap	Storage			Implementing	Roxborough Water and Sanitation District	Barbara Biggs	100	0	0	0	Jefferson	8	106	AF	106	AF	$ 2,000,000	Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
MET-2020-29	Metro South Platte Restoration - Chatfield Reallocation Mitigation	Downstream habitat improvements as mitigation on South Platte below Chatfield Reservoir; for native and/or sport fish benefits	Watershed Health, Environment & Recreation	Funding	Storage	Stream Habitat Improvements	Planned	CPW	Jeff Spohn	10	0	90	0	Arapahoe	8	NA	NA	NA	NA	$ 1,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-3	Bear Creek Fish Passage	Potential reopening of fish passage on Bear Creek at diversion structure. More information can be found here: https://docs.google.com/presentation/d/1QME3Z3WSW5mXnLsLyi9Q2qy_EGaz1vEI-yv_AM0qbWo/edit#slide=id.g8177cc65a1_0_0	Watershed Health, Environment & Recreation				Concept	Denver Trout Unlimited	John Davenport - Denver TU Conservation Chair john.davenport.mac@mac.com	0	0	100	0	Jefferson	9	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
MET-2020-30	North Fork South Platte /South Platte Habitat Improvement Program	Denver Water, USFS, and CPW have discussed stream restoration work focused on the North Fork and the South Platte below Cheesman Reservoir; focused on areas open to public fishing. As part of mitigation for Denver Water's Moffat project, they will provide ~$1M toward channel/habitat improvements on the North Fork below Roberts Tunnel & mainstem below Cheesman Reservoir	Watershed Health, Environment & Recreation				Implementing	Denver Water	Travis Bray, Denver Water Travis.Bray@denverwater.org	0	0	100	0	Jefferson	80	NA	NA	NA	NA	$ 1,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-31	Oehlmann Park Forest Restoration	Forest treatments and watershed restoration in areas at high-risk of catastrophic wildfire. The projects will align with an initiative to strengthen fire lines, serving to both reduce the risk of wildfire and assist fire suppression efforts. Proactive high-intensity wildfire mitigation serves as sediment mitigation.	Watershed Health, Environment & Recreation				Concept	Upper South Platte Partnership	Christina Burri, Madelene McDonald	0	0	100	0	Jefferson	8	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
MET-2020-32	OHV impact restoration	Address impacts from unauthorized Off Highway Vehicle use on South Platte River and riparian corridor in Wildcat Canyon / secure closures, stabilize impacted areas	Watershed Health, Environment & Recreation				Concept	US Forest Service	Mikele Painter, U.S. Forest Service mikele.painter@usda.gov	0	0	100	0	Jefferson	101	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
MET-2020-33	Pine Valley Ranch River Habitat Improvement	Habitat improvements for fishery and riparian benefit on approximately 2 miles of North Fork South Platte River	Watershed Health, Environment & Recreation				Planned	Jefferson County Open Space	Scot Grossman, Jefferson County Open Space sgrossma@co.jefferson.co.us	0	0	100	0	Jefferson	80	NA	NA	NA	NA		Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
MET-2020-34	Platte Canyon Forest Restoration	Forest treatments and watershed restoration in areas at high-risk of catastrophic wildfire. The projects will align with an initiative to strengthen fire lines, serving to both reduce the risk of wildfire and assist fire suppression efforts. Proactive high-intensity wildfire mitigation serves as sediment mitigation.	Watershed Health, Environment & Recreation				Concept	Upper South Platte Partnership	Christina Burri, Madelene McDonald	0	0	100	0	Douglas	8	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3

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MET-2020-35	Plum Creek Mainstem: Airport Rd to Confluence	Location: Airport Road to Confluence. Add additional bridge span on Titan Rd to increase capacity. Construct guide banks to increase sediment movement underneath the structure, and construct limited bank protection measures such as rip rap and grade control to protect the floodplain and property.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District. Partnering with Douglas County	Jon Villines	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 15,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-36	Plum Creek Mainstem: Chatfield Reservoir toTitan Rd	Location: Downstream Limit (Chatfield Reservoir) to Titan Rd. Stabilize stream at key locations. Stabilize banks and protect against channel migration because the CMZ is encroaching onto private property. Property at risk of flooding and sloughing.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District. Partnering with Douglas County	Jon Villines	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 7,500,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-37	Plum Creek Mainstem: Titan Rd to Airport Rd	Location: Titan Rd to Airport Rd. Stabilize stream at key locations. Stabilize banks and protect against channel migration because the CMZ is encroaching onto private property. Property at risk of flooding and sloughing.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District. Partnering with Douglas County	Jon Villines	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 7,500,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-38	Purchase of shares in Cherry Creek Project Water Authority	The CCPWA is a group of water providers that has formed an Authority to construct and operate a water project in the Cherry Creek Basin to provide relatively firm water yield of from 500 to 2,000 acre feet per year. Castle Rock Water is in the process of purchasing Arapahoe County Water and Wastewater Authority's 41.25% stake in the project.	Supply & Demand Gap				Planned	Cherry Creek Project Water Authority	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	8	825	AF	NA	NA	$ 4,500,000	Tier 2	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
MET-2020-39	Reduce Sediment into Strontia Springs Reservoir	Understand, plan, and implement projects with partners within strategic areas to stabilize sediment supply and transport upstream of Strontia Springs Reservoir (North Fork, Horse Creek, and mainstem of the Upper South Platte downstream of Cheesman).	Storage	Watershed Health, Environment & Recreation		5-year cost assumed	Planned	Denver Water	Alison Witheridge	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 2,500,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-4	Bear Creek Forest Restoration	Forest treatments and watershed restoration in areas at high-risk of catastrophic wildfire. The projects will align with an initiative to strengthen fire lines, serving to both reduce the risk of wildfire and assist fire suppression efforts. Proactive high-intensity wildfire mitigation serves as sediment mitigation.	Watershed Health, Environment & Recreation				Concept	Upper South Platte Partnership	Christina Burri, Madelene McDonald	0	0	100	0	Jefferson	9	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
MET-2020-40	Rocky Flats NWR Riparian Restoration	At Rocky Flats NWR, riparian habitat restoration will first focus on the removal of noxious weeds degrading important riparian and wetland areas of the Refuge. Re-establishment of native riparian and wetland plant species will follow treatments such that wetland function is restored to the site. These restoration efforts will target critical habitats for the Preble's meadow jumping mouse on the Refuge. Riparian tree species and coyote willow are preferred habitats for this species listed as 'Threatened' by the USFWS. State listed noxious weeds found in riparian corridors at Rocky Flats NWR will be controlled using chemical or mechanical methods, depending on the plant species, growth stage, and proximity to open water. These include teasel, Canada thistle, houndstongue and poison hemlock. The Refuge will be responsible for follow up weed treatments within the project area. Willows will be planted along riparian corridors that provide moist soil and are lacking vertical structure.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Jefferson	7	NA	NA	NA	NA	$ 75,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
MET-2020-41	Salinity Management within the Water Infrastructure and Supply Efficiency Project	This project will construct a maximum of a 30 MGD desalination facility to reduce salinity in the WISE project. This includes construction of a plant, and associated concentrate disposal facilities.	Additional	Funding			Concept	South Metro Water Supply Authority	Lisa Darling	100	0	0	0	Arapahoe	8	10000	AF			$ 300,000,000	Tier 4	Tier 2	Tier 3	Tier 2	Tier 2	19	Tier 3
MET-2020-42	Sand Creek Downstream of Colfax Avenue Master Plan	Regional Collaboration to identify channel mitigation and stream restoration projects.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Cities of Aurora, Denver, Commerce City, Sand Creek Regional Greenway	Morgan Lynch	0	0	100	0	Denver	2	NA	NA	NA	NA	$ 300,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-43	Sand Creek/ Coal Creek Fluvial Harzard Zone Study and Mitigation Plan	Fluvial Hazard Zone Delineation and identify areas critical to channel function to help inform land use policies.	Watershed Health, Environment & Recreation				Completed	Mile High Flood District	Morgan Lynch	0	0	100	0	Denver, Adams, Arapahoe	2					$ 65,000		Tier 2			Tier 2	17	Not applicable
MET-2020-44	South Metro Water Supply Authority ASR Pilot	This pilot study will develop a regional storage system with existing aquifer storage and recovery wells.	Storage				Planned	South Metro Water Supply Authority	Erik Jorgensen	100	0	0	0	Arapahoe	8	3000	AF				Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 3
MET-2020-45	South Platte Angler Stairs/Access	Placement of angler access points with stairs accessing the South Platte, to direct angler usage and reduce sedimentation from social trails	Watershed Health, Environment & Recreation				Implementing	U.S. Forest Service	Mikele Painter, U.S. Forest Service mikele.painter@usda.gov	0	0	100	0	Jefferson	101	NA	NA	NA	NA		Tier 1	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 2
MET-2020-46	South Platte Basin Habitat Connectivity	Implementing and improving aquatic habitat connectivity throughout the South Platte Basin by modifying existing barriers to provide fish passage where appropriate	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Agriculture	Fish Passage	Concept	CPW	Pete Conovitz	0	10	90	0	Denver	8	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
MET-2020-47	South Platte River Corridor Assessment Plan	Vision plan along the full length of the South Platte River in the City and County of Denver	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Denver and The Greenway Foundation	Barbara Chongtoua	0	0	100	0	Denver	8	NA	NA	NA	NA	$ 800,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-48	South Platte River Corridor Vision	Vision plan along the full length of the South Platte River in Adams County.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District, Communities in Adams County and Adams County, and The Greenway Foundation	Barbara Chongtoua	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 600,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
MET-2020-49	South Platte Watershed Forest Restoration Monitoring and Adaptative Management	Funding for pre- and post-treatment monitoring to assess treatment effectiveness under various potential wildfire scenarios will help refine treatment prescriptions and improve the adaptative management process.	Watershed Health, Environment & Recreation				Concept	Upper South Platte Partnership	Christina Burri, Madelene McDonald	0	0	100	0	Denver	8	NA	NA	NA	NA		Tier 2	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 3

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MET-2020-5	Bear Creek Headwaters Greenback Cutthroat Trout Restoration	Evaluating potential sites, and then reintroducing threatened Greenback Cutthroat Trout in potential habitats in the upper Bear Creek watershed including Mt Evans Wilderness Area	Watershed Health, Environment & Recreation				Implementing	Evergreen Chapter Trout Unlimited	Mike McGinnis, Evergreen Chapter TU mossyshoal@aol.com	0	0	100	0	Jefferson	9	NA	NA	NA	NA		Tier 2	Tier 2	Tier 1	Tier 3	Tier 2	20	Tier 2
MET-2020-50	Squaretop Lakes Greenback Introduction Project	CPW lead project to introduce Greenback Cutthroat Trout to the Square Top Lakes and Duck Creek	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Implementing	CPW	Tyler Swarr; Area 1 Aquatic Biologist	0	0	100	0	Clear Creek	80	NA	NA	NA	NA	$ 200,000	Tier 1	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 1
MET-2020-51	Third Creek: 112th Ave to O'Brien Canal	Location: E112th Avenue to O'Brien Canal. Removal of 3 existing crossing structures. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 25,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-52	Third Creek: Burlington Ditch to E 132nd Ave	Location: Burlington Ditch to E 132nd Avenue. Removal of 1 existing crossing structrue. Installation of drop structure and 100-year culvert underpass at Fulton irrigation ditch crossing.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 25,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-53	Third Creek: DEN Pond Outlet to E 112th Ave	Location: DEN Pond Outlet to E. 112th Avenue. Removal of 2 existing crossing structures. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Denver	2	NA	NA	NA	NA	$ 10,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-54	Third Creek: E 132nd Ave to E 136th Ave	Location: E 132nd Avenue to E 136th Avenue. Removal of 4 existing crossing structures. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Installation of drop structure and 100-year culvert underpass at Burlington irrigation ditch crossing. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 10,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-55	Third Creek: E 136th Ave to E 144th Ave	Location: E136th Avenue to E 144th Avenue. Removal of 2 existing crossing structures. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Installation of drop structure and 100-year culvert underpass at O'Brien irrigation ditch crossing. A headgate diversion is proposed to maintain the 200 cfs water right. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 15,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-56	Third Creek: E 144th Ave to Third Creek Outfall	Location: E. 144th Avenue to the Third Creek Outfall. Removal of 1 existing crossing structure. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 15,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-57	Third Creek: O'Brien Canal to Burlington Ditch	Location: O'Brien Canal to Burlington Ditch. Removal of 1 existing crossing structrue. Installation of drop structure and 100-year culvert underpass at Fulton irrigation ditch crossing.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 15,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-58	Third Creek: Upstream of DIA	Location: Upstream of DIA. Removal of 1 existing crossing structure. Installation of bankfull and floodplain culverts or bridge at roadway crossings. Grading of the the channel and embankment (excavation and fill). Re-vegetation of the channel and embankment within the stream corridor. Riprap for riffles or cross vanes within the bankfull channel.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County, City of Aurora and Commerce City	Teresa Patterson	0	0	100	0	Denver	2	NA	NA	NA	NA	$ 10,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-59	USACE South Platte River and Tributaries Project	Collaboration with the U.S. Army Corps of Engineers to implement ecosystem restoration and flood risk reduction on South Platte River, Harvard and Weir Gulches. The South Platte River project will restore approximately 6.5 miles of the South Platte River from 6th to 58th Avenue, and result in 160 acres of improved riparian corridor and wetland habitat and 100 acres of improved wetland habitat, as well as reconnecting an additional 190 acres of existing habitat. The project also includes incidental flood risk reduction for approximately 100 structures along the South Platte River. The Weir and Harvard project components are focused on flood risk reduction.	Watershed Health, Environment & Recreation				Planned	City and County of Denver Partnering with Mile High Flood District and The Greenway Foundation	Jennifer Williams	0	0	100	0	Denver, Adams	8	NA	NA	NA	NA	$ 550,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-6	Bear Creek Lake Reallocation Project	The CWCB and the Army Corps of Engineers has entered into a Feasibility Cost Share Agreement for $3M. The Army Corps of Engineers is currently conducting a Semi-Quantitative Risk Assessment on the dam, which will determine whether or not the project will move into the Reallocation Feasibility Study phase. Anticipated completion of this risk assessment is October 2020. A scoping team for the study has been assembled, and will reconvene after the October 2020 decision. Partners have been identified for storage space and shares of a new storage right in the reservoir, and engineering work is currently underway for a water rights application.	Supply & Demand Gap	Storage	Watershed Health, Environment & Recreation		Planned	CWCB	Erik Skeie erik.skeie@state.co.us 03-866-3441 x3260	25	25	25	25	Jefferson	8	20000	AF	20000	AF	$ 166,000,000	Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 3
MET-2020-60	USACE Southern Platte Valley Section 1135 Ecosystem Restoration	Collaboration with the U.S. Army Corps of Engineers to restore approximately 2.4 miles of the South Platte River from W Yale downstream (north) to West Mississippi. The project results in an additional 11 acres of functioning riparian habitat, 22 acres of aquatic habitat, and 1.5 acres of palustrnig emergent scrub/shrub wetlands.	Watershed Health, Environment & Recreation				Planned	City and County of Denver Partnering with Mile High Flood District and The Greenway Foundation	Jennifer Williams	0	0	100	0	Denver	8	NA	NA	NA	NA	$ 12,400,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-61	Walker Reservoir	This project will construct the reservoir and appurtenant infrastructure	Storage				Implementing	Cherry Creek Project Water Authority	Richard Krulish	100	0	0	0	Douglas	NA	1000	AF			$ 15,500,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	19	Tier 3
MET-2020-62	West Plum Creek	Upgrade SH 67 Bridge to handle 100 year flows. Maintain status quo in many locations. Protect HWY 105 from eroding banks	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Douglas County	Jon Villines	0	0	100	0	Douglas	8	NA	NA	NA	NA	$ 15,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3

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MET-2020-63	Wild Horse Reservoir	Aurora's existing water rights from the Colorado and Arkansas rivers will be the source of water. No new rights or decrees are being pursued for this project. Wild Horse will allow Aurora to more efficiently, effectively and reliably manage its resources, particularly its Arkansas River water. Aurora is often forced to release or sell its Arkansas River water due to storage constraints. The site for Wild Horse Reservoir was selected due to its proximity to existing infrastructure. It will be near an existing pipeline from the Otero Pump station that already delivers transbasin water to Aurora's system, and is only six miles upstream of Aurora's existing Spinney Mountain Reservoir. Wild Horse would allow Aurora to more efficiently store and manage transbasin water we are currently diverting. We could then store that water at a higher elevation in the South Platte Basin, effectively reducing evaporation, minimizing spills, and reducing waste. From Wild Horse Reservoir, the water would then flow to Spinney Mountain Reservoir by pipeline and into the city's water system via the South Platte River. The location has very favorable topography and environmental conditions. Initial studies have determined there are no jurisdictional wetlands or endangered species at the site. Most of the property needed for construction is privately owned and undeveloped. Several small parcels are owned by the U.S. Bureau of Land Management (BLM).	Supply & Demand Gap	Storage		2018 Dollars	Planned	Aurora Water	Alexandra Davis	100	0	0	0	Park	23			96000	AF	$ 400,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
MET-2020-64	YWAM New Non-Tributary Well	New non-tributary well to replace existing non-tributary Denver Basin well. New well will provide augmentation supply. Implementing first phases on the project but needs additional funding to complete the project.	Supply & Demand Gap			Augmentation supply	Implementing	Youth With a Mission	Andrew MacIver	85	0	15	0	Jefferson	7	14.4	AF	150	gpm	$ 400,000	Tier 1	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 1
MET-2020-7	Brantner Gulch	Location: Branter Gulch. Channel will be stabilized to minimize erosion. Steep incised streambanks are to be flattened to 4:1 (max). In areas where the longitudinal slope is greater than 0.6%, the channel slope will be flattened and grouted boulder structure installed to achieve necessary slope.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County and City of Thornton	David Skuodas	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 20,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-8	Brantner Gulch: South Regional Park Tributary	Location: South Regional Park Tributary. Channel will be stabilized to minimize erosion. Steep incised streambanks are to be flattened to 4:1 (max). In areas where the longitudinal slope is greater than 0.6%, the channel slope will be flattened and grouted boulder structure installed to achieve necessary slope.	Watershed Health, Environment & Recreation				Planned	Mile High Flood District Partnering with Adams County and City of Thornton	David Skuodas	0	0	100	0	Adams	2	NA	NA	NA	NA	$ 750,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
MET-2020-9	Castle Rock - Boxelder Creek Municipal Project	Augmentation plan, surface and groundwater appropriations, including recharge in Box Elder Creek to be diverted by pipeline or exchange to Castle Rock				2020 status not provided; assumed concept	Concept	Castle Rock, Town of		100	0	0	0	Arapahoe	1						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	14	Tier 4
SP-2015-0001	Morgan County Unspecified IPP Firming In-Basin	Morgan County Unspecified IPP Firming In-Basin; ongoing water development that is not specific in nature	Additional				Planned	Morgan County	Allyn Wind	100	0	0	0	Morgan	01	2081	AF				Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 3
SP-2015-0002	Morgan County Unspecified IPP Grow Into Existing Supply	Morgan County Unspecified IPP Grow Into Existing Supply; ongoing water development that is not specific in nature	Additional				Planned	Morgan County	Allyn Wind	100	0	0	0	Morgan	01	2081	AF				Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 3
SP-2015-0003	Clear Creek County Unspecified IPP Firming In-Basin	Clear Creek County Unspecified IPP Firming In-Basin					Not Pursuing	Clear Creek County	Bert Weaver	100	0	0	0	Clear Creek	07	899	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0004	Clear Creek County Unspecified IPP Grow Into Existing Supply	Clear Creek County Unspecified IPP Grow Into Existing Supply					Not Pursuing	Clear Creek County	Bert Weaver	100	0	0	0	Clear Creek	07	899	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0005	Fort Morgan CBT & Augmentation Plan	Fort Morgan CBT & Augmentation Plan	Supply & Demand Gap				Implementing	Fort Morgan, City of	Brent Nation	100	0	0	0	Morgan	01						Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 2
SP-2015-0006	Windy Gap Firming Project	The WGFP is a collaborative proposal between 11 Northeastern Colorado water providers and the Platte River Power Authority. The WGFP would improve the Windy Gap Project's reliability by constructing a new storage reservoir for Windy Gap water at Chimney Hollow near Carter Lake.	Storage				Implementing	Municipal Subdistrict of Northern Colorado Water Conservancy District, Erie, Lafayette, Longmont, Louisville, Broomfield, Loveland, Greeley, Fort Lupton, Superior, Central Weld County Water District, Little Thompson Water District, Platte River Power Authority	Jeff Drager, Northern Water jdrager@northernwater.org	100	0	0	0	Grand, Larimer	51	30000	AF	90000	AF	$ 610,000,000	Tier 1	Tier 2	Tier 3	Tier 1	Tier 1	21	Tier 1
SP-2015-0007	Northern Integrated Supply Project	NISP is a regional water supply project coordinated by Northern Water on behalf of 15 Northern Front Range water providers. Its goal is to provide participating water providers with approximately 40,000 acre-feet of new, reliable water supply each year. NISP would include the building of two reservoirs, Glade Reservoir and Galeton Reservoir.	Supply & Demand Gap	Storage	Watershed Health, Environment & Recreation		Implementing	Erie, Lafayette, Left Hand Water District, Fort Morgan, Dacono, Eaton, Windsor, Fort Lupton, Fort Collins - Loveland Water District, Central Weld County Water District, Evans, Morgan County Quality Water, Severance, Firestone, Frederick	Carl Brouwer, Northern Water, cbrouwer@northernwater.org	100	0	0	0	Larimer/Weld	03	40000	AF	210000	AF	$ 1,300,000,000	Tier 3	Tier 1	Tier 2	Tier 1	Tier 2	21	Tier 2
SP-2015-0008	Ovid Reservoir	Ovid Reservoir	Storage			2011 Dollars	Planned	District 64 Reservoir Company	Joe Frank	50	50	0	0	Sedgwick	64	4600	AF	5700	AF	$ 20,000,000	Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	21	Tier 3

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SP-2015-0009	Left Hand Water District CBT & Ag Water Rights Acquisition	Left Hand Water District CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Lefthand Water District	Chris Smith	100	0	0	0	Boulder	05						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0010	Gilpin County Unspecified IPP Firming In-Basin	Gilpin County Unspecified IPP Firming In-Basin				2020 status not provided; assumed concept	Concept	Gilpin County	Connie McLain	100	0	0	0	Gilpin	07	203	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0011	Gilpin County Unspecified IPP Grow Into Existing Supply	Gilpin County Unspecified IPP Grow Into Existing Supply				2020 status not provided; assumed concept	Concept	Gilpin County	Connie McLain	100	0	0	0	Gilpin	07	204	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0012	Brush Augmentation Plan	Brush Augmentation Plan	Additional				Concept	Brush, City of	Don Marymee	100	0	0	0	Morgan	01						Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
SP-2015-0013	Fort Collins CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	Transfer of agricultural rights to municipal use. Sources include numerous shares of ditches that run through Fort Collins (collectively known as Southside Ditches: Arthur, New Mercer, Larimer County No. 2 and Warren Lake) and some shares in the Water Supply and Storage Company.	Supply & Demand Gap	Additional		Water rights	Completed	Fort Collins, City of	Donnie Dustin	100	0	0	0	Larimer	03	3300	AF			$ 23,400,000		Tier 2			Tier 2	19	Not applicable
SP-2015-0014	Lafayette CBT & Ag Water Rights Acquisition	Lafayette CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Lafayette, City of	Douglas Short	100	0	0	0	Boulder	06						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0015	Greeley Water Rights Acquisition	Greeley continues to purchase agricultural water rights, primarily in the Poudre River Basin, for future conversion to municipal use. The water will be exchanged to Greeley's Bellvue Water Treatment Plant. Fully consumptive use water from the use of such right will be reused for non-potable purposes either by exchange or directly through pipes.	Supply & Demand Gap				Implementing	Greeley, City of	Adam Jokerst adam.jokerst@greeleygov.com 970.381.5337	100	0	0	0	Weld	2	10000	AF			$ 64,000,000	Tier 1	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 2
SP-2015-0016	Greeley Conservation	City of Greeley Water Conservation Program. Activities include turf replacement, indoor and outdoor rebates, water use audits, system improvements, education and outreach, among other programs.	Conservation			5-year cost assumed	Implementing	Greeley, City of	Adam Jokerst adam.jokerst@greeleygov.com 970.381.5337	100	0	0	0	Weld	3	3000	AF			$ 4,250,000	Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	19	Tier 1
SP-2015-0017	Milton Seaman Reservoir Enlargement	The project would be an enlargement of the existing Milton Seaman Reservoir owned by Greeley. The source of water for storage would be changed irrigation water rights and water stored under the reservoir's priorities. Fully consumptive use water from the project will be reused for non-potable purposes either by exchange or directly through pipes.	Storage	Supply & Demand Gap			Planned	Greeley, City of	Adam Jokerst adam.jokerst@greeleygov.com 970.381.5337	100	0	0	0	Larimer	3	10000	AF	53000	AF	$ 400,000,000	Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 3
SP-2015-0018	Erie CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	Erie CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	Erie, Town of	Gary Behlen	100	0	0	0	Weld	06						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0019	Estes Park CBT Transfer	Combine raw water sources to one water treatment plant. Pipe inflow stream rights from Glacier Creek to the Marys Lake WTP; or pipe CBT, Windy Gap, USA (replacement) rights to the Glacier Creek WTP from the west portal of Adams Tunnel.				2020 status not provided; assumed concept	Concept	Estes Park, Town of	Jeff Boles	100	0	0	0	Larimer	04						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0020	Larimer County Unspecified IPP Agricultural Transfers	Larimer County Unspecified IPP Agricultural Transfers - Change crop use or inact other water conservation measures on lands with water rights to free up water for Instream Flow rights.	Conservation	Watershed Health, Environment & Recreation		Water Right Transfer	Concept	Larimer County Department of Natural Resources	Meegan Flenniken, Daylan Figgs	0	30	70	0	Larimer	03						Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	16	Tier 4
SP-2015-0021	Larimer County Augmentation Plan	Larimer County Augmentation Plan				2020 status not provided; assumed concept	Concept	Larimer County	Jeff Boring	100	0	0	0	Larimer	03						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0022	Larimer County Unspecified IPP Grow Into Existing Supply	Larimer County Unspecified IPP Grow Into Existing Supply - Collaborate with City of Fort Collins to exchange reusabile NPIC CBT shares with native flow rights for agricultural uses.	Conservation	Watershed Health, Environment & Recreation	Agriculture	Joint Project	Concept	Larimer County Department of Natural Resources	Meegan Flenniken, Daylan Figgs	0	100	0	0	Larimer	03						Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	16	Tier 4
SP-2015-0023	Sterling Augmentation Plan	Sterling Augmentation Plan	Supply & Demand Gap				Concept	Sterling, City of	Don Saling	100	0	0	0	Logan	64						Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
SP-2015-0024	Central Weld County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	Central Weld County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	Central Weld County Water District (Johnstown, Kersey, LaSalle, Gilcrest, Frederick, Firestone, Dacono, Milliken, Platteville)	John Zadel	100	0	0	0	Weld	02						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4

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SP-2015-0025	Erie Reclaimed Water	Erie Reclaimed Water				2020 status not provided; assumed concept	Concept	Erie, Town of	Jon Mays	100	0	0	0	Boulder	06	5390	AF			$ 43,430,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0026	Boulder County Unspecified IPP Agricultural Transfers	Boulder County Unspecified IPP Agricultural Transfers					Not Pursuing	Boulder County	Audrey Butler	100	0	0	0	Boulder	05	2055	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0027	Boulder County Augmentation Plan	Boulder County Augmentation Plan					Completed	Boulder County	Audrey Butler	0	0	100	0	Boulder	05					$ -		Tier 2			Tier 2	16	Not applicable
SP-2015-0028	Boulder County Unspecified IPP Grow Into Existing Supply	Boulder County Unspecified IPP Grow Into Existing Supply					Not Pursuing	Boulder County	Karen Martinez	0	85	15	0	Boulder	05	2055	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0029	Longmont Ag Transfer Water Rights Dedication Policy	Longmont Ag Transfer Water Rights Dedication Policy				2020 status not provided; assumed concept	Concept	Longmont, City of	Ken Huson	100	0	0	0	Boulder	05	1700	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0030	Longmont Conservation	Longmont Conservation				2020 status not provided; assumed concept	Concept	Longmont, City of	Ken Huson	100	0	0	0	Boulder	05	3500	AF			$ 11,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0031	Longmont Grow Into Existing Supply	Longmont Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Longmont, City of	Ken Huson	100	0	0	0	Boulder	05	9000	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0032	Union Pumpback Pipeline	Union Pumpback Pipeline				2020 status not provided; assumed concept	Concept	Longmont, City of	Ken Huson	100	0	0	0	Weld	05	4950	AF			$ 18,800,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0033	Union Reservoir Enlargement	The proposed enlargement will increase the reservoir from its current 12,000 acre feet capacity an additional 20,000 acre feet to a total of 32,000 acre feet. The increased capacity in the Reservoir would provide the City of Longmont with additional water storage capacity, better water exchange possibilities, and storage space for reuse water.				2020 status not provided; assumed concept	Concept	Longmont, City of	Ken Huson	100	0	0	0	Weld	05	1770	AF	12280	AF	$ 25,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	20	Tier 4
SP-2015-0034	Logan County Unspecified IPP Firming In-Basin	Logan County Unspecified IPP Firming In-Basin; ongoing water development that is not specific in nature	Additional				Concept	Logan County	Kent Swedlund	100	0	0	0	Logan	64	1314	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0035	Logan County Unspecified IPP Grow Into Existing Supply	Logan County Unspecified IPP Grow Into Existing Supply; ongoing water development that is not specific in nature	Additional				Concept	Logan County	Kent Swedlund	100	0	0	0	Logan	64	1315	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0036	Superior CBT & Ag Water Rights Acquisition	Superior CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Superior, Town of	Kurt Kowar	100	0	0	0	Boulder	06						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0037	Loveland CBT & Ag Water Rights Acquisition	Loveland CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Loveland, City of	Larry Howard	100	0	0	0	Larimer	04						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0038	Loveland Ag Transfer Water Rights Dedication Policy	Loveland Ag Transfer Water Rights Dedication Policy				2020 status not provided; assumed concept	Concept	Loveland, City of	Larry Howard	100	0	0	0	Larimer	04	3150	AF				Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	17	Tier 4

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SP-2015-0039	Loveland Grow Into Existing Supply	Loveland Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Loveland, City of	Larry Howard	100	0	0	0	Larimer	04	4850	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0040	Cheyenne County (South Platte Basin portion) Grow Into Existing Supply	Cheyenne County (South Platte Basin portion) Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Cheyenne County	Leon Allen	100	0	0	0	Cheyenne	49	63	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0041	Teller County (South Platte Basin portion) Unspecified IPP Firming In-Basin	Teller County (South Platte Basin portion) Unspecified IPP Firming In-Basin				2020 status not provided; assumed concept	Concept	Teller County	Marc Dettenrieder	100	0	0	0	Teller	23	689	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0042	Teller County (South Platte Basin portion) Unspecified IPP Grow Into Existing Supply	Teller County (South Platte Basin portion) Unspecified IPP Grow Into Existing Supply				2020 status not provided; assumed concept	Concept	Teller County	Marc Dettenrieder	100	0	0	0	Teller	23	689	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0043	Park County Unspecified IPP Firming In-Basin	Park County Unspecified IPP Firming In-Basin					Not Pursuing	Park County	Mike Brazell	100	0	0	0	Park	23	1236	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0044	Park County Unspecified IPP Grow Into Existing Supply	Park County Unspecified IPP Grow Into Existing Supply					Not Pursuing	Park County	Mike Brazell	100	0	0	0	Park	23	1236	AF					Tier 2			Tier 2	17	Not applicable
SP-2015-0045	Fort Collins-Loveland Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	Fort Collins-Loveland Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	Fort Collins-Loveland Water Distrcit	Mike DiTullio	100	0	0	0	Larimer	03						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0046	East Larimer County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	East Larimer County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	East Larmier County Water District	Mike Scheid	100	0	0	0	Larimer	03						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0047	Xcel Pawnee Power Facility Consumptive Use Water	Xcel Pawnee Power Facility Consumptive Use Water	Supply & Demand Gap				Concept	Xcel	Rich Belt	100	0	0	0	Morgan	01						Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	16	Tier 3
SP-2015-0048	Kit Carson County Grow Into Existing Supply	Kit Carson County Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Kit Carson County	Richard Mann	100	0	0	0	Kit Carson	49	940	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0049	Chatfield Storage Reallocation Project	The Chatfield Reservoir Reallocation Project came about as the result of a growing demand for water in Colorado's Front Range and on northeast Colorado farms. The U.S. Army Corps of Engineers (Corps) determined Chatfield Reservoir can accommodate an additional 20,600 acre feet of water storage for water supply without compromising its flood control function. This additional storage space will be used by municipal and agricultural water providers to help meet the diverse needs of the state. Project participants completed recreational modifications and environmental mitigations at Chatfield State Park to address the impacts of additional water storage.	Supply & Demand Gap	Storage	Watershed Health, Environment & Recreation		Completed	The Greenway Foundation, Aurora, Brighton, Central Colorado WCD, Colorado Division of Parks and Outdoor Recreation, Denver Botanic Gardens at Chatfield, Western Mutual Ditch Company, Castle Pines North Metro District, Centennial WSD, Center of Colorado WSD, Mount Carbon Metro District, Perry Park Country Club, Roxborough WSD, South Metro Water Supply Authority, Town of Castle Rock	Rick Mcloud	100	0	0	0	Douglas	08	8000	AF	20600	AF	$ 171,000,000		Tier 2			Tier 2	21	Not applicable
SP-2015-0050	North Weld County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	North Weld County Water District CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	North Weld County Water District	Rick Pickard	100	0	0	0	Weld	03						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0051	Castle Rock Reuse	Castle Rock Water anticipates reuse water will eventually comprise 39% of the Town's water supply, including senior and junior native surface water rights, lawn irrigation return flows (LIRF), and water reuse in both the Cherry Creek basin and Plum Creek basin. As part of Castle Rock's water supply plan, the Town of Castle Rock purchased a surface water diversion, pumping and raw water storage facilities located on Plum Creek near the Town of Sedalia. This location will include two reservoirs to divert reusable supplies for conveyance back to the Plum Creek Water Purification Facility, or to store and retime these supplies. Additionally, the Town recently completed a reuse pipeline that conveys non-potable reuse water to Red Hawk Golf Course for irrigation, saving the Town 600,000 gallons per day of non-renewable ground water on peak summer days.	Supply & Demand Gap	Storage	Additional		Implementing	Castle Rock, Town of	Matt Benak, Matt Benak, Water Resources Manager mbenak@crgov.com 720-733-6037	100	0	0	0	Douglas	08	5700	AF	1370	AF	$ 5,000,000	Tier 1	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 1

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SP-2015-0052	Hudson Augmentation Plan	Hudson Augmentation Plan				2020 status not provided; assumed concept	Concept	Hudson, Town of	RON ALLEN	100	0	0	0	Weld	01						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0053	Yuma County Grow Into Existing Supply	Yuma County Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Yuma County	Stan Holmes	100	0	0	0	Yuma	65	850	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0054	Berthoud CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy	Berthoud CBT, Ag Water Rights Aquisition, & Annexation Dedication Policy				2020 status not provided; assumed concept	Concept	Berthoud, Town of	Stephanie Brothers	100	0	0	0	Weld	04						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0055	Lochbuie Augmentation Plan	Lochbuie Augmentation Plan	Supply & Demand Gap				Completed	Lochbuie, Town of	Stevel Stamey	100	0	0	0	Weld	02					$ -		Tier 2			Tier 2	17	Not applicable
SP-2015-0056	Louisville CBT & Ag Water Rights Acquisition	Louisville CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Louisville, City of	Tom Phare	100	0	0	0	Boulder	06						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	15	Tier 4
SP-2015-0057	Sedgwick County Unspecified IPP Firming In-Basin	Sedgwick County Unspecified IPP Firming In-Basin; ongoing water development that is not specific in nature	Additional				Concept	Sedgwick County	Wayne Skold	100	0	0	0	Sedgwick	65	60	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0058	Sedgwick County Unspecified IPP Grow Into Existing Supply	Sedgwick County Unspecified IPP Grow Into Existing Supply; ongoing water development that is not specific in nature	Additional				Concept	Sedgwick County	Wayne Skold	100	0	0	0	Sedgwick	65	61	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	18	Tier 4
SP-2015-0059	Fort Lupton CBT & Ag Water Rights Acquisition	Fort Lupton CBT & Ag Water Rights Acquisition				2020 status not provided; assumed concept	Concept	Fort Lupton, City of		100	0	0	0	Weld	02						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	14	Tier 4
SP-2015-0060	Julesburg Augmentation Plan	Julesburg Augmentation Plan	Additional				Implementing	Lower South Platte Water Conservancy District	Allen Coyne	100	0	0	0	Sedgwick	64						Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	16	Tier 2
SP-2015-0061	Washington County Unspecified IPP Firming In-Basin	Washington County Unspecified IPP Firming In-Basin; ongoing water development that is not specific in nature	Additional				Concept	Washington County		100	0	0	0	Washington	65	36	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0062	Lincoln County (South Platte Basin portion) Grow Into Existing Supply	Lincoln County (South Platte Basin portion) Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Lincoln County		100	0	0	0	Lincoln	65	137	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0063	Phillips County Grow Into Existing Supply	Phillips County Grow Into Existing Supply	Supply & Demand Gap			2020 status not provided; assumed concept	Concept	Phillips County		100	0	0	0	Phillips	65	294	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0064	Washington County Unspecified IPP Grow Into Existing Supply	Washington County Unspecified IPP Grow Into Existing Supply; ongoing water development that is not specific in nature	Additional				Concept	Washington County		100	0	0	0	Washington	65	37	AF				Tier 4	Tier 3	Tier 3	Tier 3	Tier 3	17	Tier 4
SP-2015-0065	Halligan Water Supply Project	Halligan Reservoir is an existing reservoir on the North Fork of the Poudre River, 25 miles northwest of Fort Collins. If approved, the Halligan Water Supply Project will enlarge Halligan Reservoir by approximately 8,100 acre-feet to meet the demand of future Fort Collins Utilities' water customers and provide increased reliability for existing customers to help protect against service interruptions related to prolonged drought and emergencies. The project will help: provide a storage reserve for emergency water supply disruptions; increase drought security; improve water system reliability and flexibility; and meet future water demands of the Fort Collins Utilities' water service area.	Supply & Demand Gap	Storage			Planned	Fort Collins, City of	Donnie Dustin	100	0	0	0	Larimer	03	7900	AF	8100	AF	$ 120,000,000	Tier 3	Tier 2	Tier 3	Tier 1	Tier 1	21	Tier 2
SP-2020-1	Abell Ranch	Improve river habitat for aquatic species and bank stabilization on private land with 2.8 miles of river frontage.	Land Use	Watershed Health, Environment & Recreation	Conservation		Planned	CUSP and Abell Ranch	John Geerdes - Executive Director of CUSP	0	0	100	0	Park	23	NA	NA	NA	NA	$ 545,000	Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-10	Banner Lakes SWA Wetlands - Planning & Restoration	Banner Lakes State Wildlife Area is one of the most important public recreation areas in Weld County. and comprises over 900-acres of wetland and adjacent uplands. A comprehensive restoration and management plan will be developed to identify restoration opportunities as well as improve management of water resources on the property to benefit migratory birds and wetland habitats. Future work includes implementation of restoration projects that are identified and designed as part of this plan. Restoration projects will utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Weld	1	NA	NA	NA	NA	$ 60,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2

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SP-2020-100	South Flat Diversion Fish Passage	Modifications to the South Flat Ditch to open fish passage on reach of the St Vrain - in conjunction with Niwot and Beckwith Ditch fish passage efforts will open up more than 2 miles of habitat for native plains fish species of concern (as well as other native and sport fish passage)	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Planned	Boulder County and CPW	Tim Shafer, Boulder County tshafer@bouldercounty.org Boyd Wright; NE Region Native Aquatics	0	30	70	0	Boulder	5	NA	NA	NA	NA	$ 500,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-101	South Platte Public Lands Warmwater Slough Restoration Program	Warmwater sloughs and associated riparian habitats will be restored to improve waterfowl and other wildlife habitat characteristics. Flood-deposited sediments and invasive stands of vegetation will be removed. Water-control structures will be installed to maintain appropriate water levels and flows.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Morgan, Logan, Sedgwick	64	NA	NA	3	miles	$ 300,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-102	South Platte Reforestation	Reforestation of the burn scars in the Upper South Platte watershed.	Watershed Health, Environment & Recreation				Concept	Denver Water	Christina Burri, Madelene McDonald	0	0	100	0	Weld	1	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
SP-2020-103	South Platte Regional Opportunities Water Group Concept - Full/Unadjusted	Concept for new storage near Henderson, Kersey and Balzac and pipeline to Denver Metro Area. New water rights, capture of return flows, and ATMs. Proposed by group of Muni, Ag and E&R agencies (SPROWG). No adjustment for Parker/LSPWCD project in same region.	Supply & Demand Gap	Storage	Agriculture	Regional	Planned	SPROWG Working Group	Lisa Darling	85	15	0	0	Morgan	1	58000	AFY	223000	AF	$ 2,200,000	Tier 4	Tier 1	Tier 3	Tier 1	Tier 2	21	Tier 3
SP-2020-104	South St. Vrain Creek Restoration and floodplain connectivity project	Following the reclamation of the andesite quarry and adjacent reclamation efforts, complete restoration through the remaining creek sections, including the realignment of South St. Vrain creek at the quarry and post flood restoration upstream of Old South St. Vrain Bridge, as well as connecting the floodplain, improve habitat, and create recreation opportunities throughout.	Watershed Health, Environment & Recreation				Planned	Boulder County	David Hirt	0	0	100	0	Boulder	5	NA	NA	NA	NA	$ 1,500,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-105	St Vrain and Left Hand Creek Watershed Plan	St. Vrain and Left Hand Creeks Adaptive Management at Scale Watershed Planning and Monitoring, funded in progress, this program will identify new funding opportunities and has opportunity for expansion funding	Watershed Health, Environment & Recreation				Implementing	Left Hand Watershed Center	Jessica Olson, Left Hand Watershed Center jolson@lwog.org	0	0	100	0	Boulder	5	NA	NA	NA	NA		Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1
SP-2020-106	St Vrain Stream Management Plan	SMP examining watershed/stream conditions and opportunities for post-flood (2013) projects to further benefit environmental, recreational, agricultural and domestic uses. See website: https://svlhwcd.org/stream-management-plan	Watershed Health, Environment & Recreation				Implementing	St Vrain Left Hand Water Conservancy District	Sean Cronin / St Vrain Left Hand WCD - sean.cronin@svlhwcd.org	0	0	100	0	Boulder	5	NA	NA	NA	NA		Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1
SP-2020-107	St. Vain Basin Water Education	Developing publications, hosting annual conference and workshops, field tours for real estate profesionals and students, water literate leaders program.	Education, Outreach & Innovation	Watershed Health, Environment & Recreation	Conservation		Implementing	SVLHWCD	Jason Roudebush	0	0	0	100	Boulder	5	NA	NA	NA	NA	$ 300,000	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-108	St. Vrain Creek acquatic habitat development	Enhance backwater habitat for native fish and waterfowl and endangered species along St. Vrain Creek at Hygiene. This project currently has interest from CPW and USFWS but no formalized funding at the current time.	Watershed Health, Environment & Recreation				Planned	Boulder County	Mac Kobza	0	0	100		Boulder	5	NA	NA	NA	NA	$ 100,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 3
SP-2020-109	St. Vrain Creek Sediment Transport & Fish Passage - 10 Structures	In collabration with Boulder County, Left Hand Watershed Center, and several Irrigation Companies, SVLHWCD is proposing to retofit or replace 10 diversion structures on St. Vrain Creek. The projects require extensive feasibility studies and the development of agreements bewtween the Irrigation Companies and the Project sponsor. Ultimately the upgrades are necessary to improve sediment transport and allow for fish passage	Watershed Health, Environment & Recreation	Agriculture	Supply & Demand Gap		Planned	Partneship with Boulder County and Left Hand Watershed Center	Jason Roudebush	33	33	33	1	Boulder	5	NA	NA	NA	NA	$ 10,000,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 3
SP-2020-11	Beckwith ditch Diversion Fish Passage	Rebuild or retrofit diversion on St. Vrain Creek to facilitate fish passage; Modifications to the Beckwith Ditch to open fish passage on reach of the St Vrain - in conjunction with South Flat and Niwot Ditch fish passage efforts will open up more than 2 miles of habitat for native plains fish species of concern (as well as other native and sport fish passage)	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Planned	Boulder County and CPW	Tim Shafer, Boulder County tshafer@bouldercounty.org Boyd Wright; CPW NE Region Native Aquatics	0	30	70	0	Boulder	5	NA	NA	NA	NA	$ 750,000	Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
SP-2020-110	St. Vrain Creek Streamflow Gaging Stations	Procurement and installation of 4 streamflow gaging stations on St. Vrain Creek to improve administration and ongoing assessment of creek health.	Supply & Demand Gap	Agriculture	Watershed Health, Environment & Recreation	Administration	Planned	SVLHWCD	Jason Roudebush	25	25	25	25	Boulder	5	NA	NA	NA	NA	$ 24,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 3
SP-2020-111	Terry Ranch Aquifer Storage and Recovery Project	The Terry Ranch is an aquifer storage and recovery project that adds more than 1 million acre-feet of water to the city's vast, existing water portfolio	Storage	Supply & Demand Gap		ASR; Potential for Regional Project	Planned	Greeley, City of	Sean Chambers	100	0	15	0	Weld	1	60000	AF			$ 370,000,000	Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	19	Tier 3
SP-2020-112	Timnath Diversion Fish Passage	Reconstruct Timnath Diversion to facilitate fish passage	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Planned	CPW	Kyle Battige; Area 4 Aquatic Biologist	0	30	70	0	Larimer	3	NA	NA	NA	NA	$ 600,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 3
SP-2020-113	UNCC Pump Station No. 1	Construct a new infiltration gallery and pump station along Apex Road with a capacity of up to 7 cfs	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	7	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-114	UNCC Pump Station No. 2	Construct a new infiltration gallery and pump station along Apex Road with a capacity of up to 7 cfs	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	7	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-115	UNCC Pumping Station and Pipeline	Construct a new infiltration gallery and pump station with a capacity of up to 7 cfs	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	7	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-116	Upper Pickle Gulch Reservoir	New reservoir on Pickle Gulch, above the existing Pickle Jar Reservoir	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7			861	acre-feet		Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
SP-2020-117	Walker Ranch Forestry Project	Thinning planned on 350 acres on Boulder County POS land in Meyers Gulch, within the South Boulder Creek Watershed. Work would improve forest structure, promote aspen where possible, and complete GTR-373 forest restoration. This proect has an apporved prescription but will need a USFWS consult due to Preble's jumping mouse habitat. We hope to start that consult process in 2021/2022 This project could be spread out over a 2 to 3 year timeframe. $1.175 million, does not include local match.	Watershed Health, Environment & Recreation			Public Safety	Planned	Boulder County	Stefan Reinold	50		50		Boulder	6	NA	NA	NA	NA	$ 1,750,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	19	Tier 3
SP-2020-118	Watershed Science Education	Developing watershed science curriculum in collaboration with Lyons schools, and others. (Estimate $30K needed per year to keep program going.)	Education, Outreach & Innovation	Watershed Health, Environment & Recreation	Agriculture	Watershed Science	Implementing	Left Hand Watershed Center	Jessie Olson	25	25	50		Boulder	5, 6	NA	NA	NA	NA	$ 30,000	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1

Project_ID	Project Name	Project Description	Key Word 1	Key Word 2	Key Word 3	Key Word 4	Status	Lead Proponent	Lead Contact	M&I Need	Ag Need	E&R Need	Admin Need	County	Water Dist	Estimated Yield	Yield Units	Estimated Capacity	Capacity Units	Estimated Cost	Timeline Tier	Basin Plan Align	Local Plan Align	Water Plan Align	Criticality	Core Data Num	Tier
SP-2020-119	Wellington SWA Wetlands - Planning & Restoration	Wellington State Wildlife Area is one of the most important public recreation areas along the I-25 corridor. A comprehensive restoration and management plan will be developed for Wellington State Widllife Area and assoicated units to identify restoration opportunities as well as improve management of water resources on the property to benefit migratory birds and wetland habitats that they depend on. Future work includes implementation of restoration projects that are identified and designed as part of this plan. Restoration projects will utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Larimer	3	NA	NA	NA	NA	$ 60,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-12	Bijou Ranch Restoration II	Wetland restoration will be performed such that wetland habitats will grow wetland plants preferred by foraging populations of migratory ducks and geese. This restoration will be managed under a 30-year Site Conservation Agreement that will mandate a limited public access agreement, allowing some segment of the populations (i.e. youth hunters) access to the property for waterfowl hunting during allotted periods of the season	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 125,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-120	Wheeler Diversion Point	Construct a new infiltration gallery as an alternative point of diversion for Upper NCC Pump Station No. 2 and Upper NCC Pumping Station and Pipeline storage filling rights and for the direct diversion rights for Upper NCC Pump Station Nos. 1 and 2 along SH 119, west/upstream of the City, with a capacity of up to 21 cfs	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	21	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-121	Wiggins East Farm - Construction of Recharge Site	Development of a constructed recharge pond East of Fort Morgan for use in Wiggins Augmentation Plan. Project in the early phases (Catlin Approval Process)	Supply & Demand Gap	Agriculture			Planned	Wiggins, Town of	Tom Acre	75	25			Morgan	1	100	AF	100	AF		Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	18	Tier 3
SP-2020-122	Wiggins East Farm - Recharge Site (Project Planning)	Planning for development of a constructed recharge pond East of Fort Morgan for use in Wiggins Augmentation Plan. Project in the early phases (Catlin Approval Process)	Supply & Demand Gap	Agriculture			Implementing	Wiggins, Town of	Tom Acre	75	25			Morgan	1	NA	NA	NA	NA		Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 2
SP-2020-123	Wiggins Increase Capacity for Municipal Wells	Construction of new wells and improvements to existing wells to increase capacity of Town's municipal supply system	Supply & Demand Gap				Concept	Wiggins, Town of	Tom Acre	100	0	0	0	Morgan	1	600	AF	600	AF		Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-124	Wiggins North Farm - Wellfields and Recharge Ponds	Joint project with Wiggins and CCWCD including multiple wellfields and recharge ponds. Project currently being implemented. However, use of the site by Wiggins will require additional infrastrurcture (and therefore additional funding). Agriculture use on project reflects use of the site by CCWCD	Supply & Demand Gap	Agriculture			Implementing	Wiggins, Town of	Tom Acre	80	20			Morgan	1	950	AF	3000	AF		Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 2
SP-2020-13	Black Hawk Chase Gulch Reservoir	New reservoir on Chase Gulch, at or near existing Central City's Chase Gulch Reservoir	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7			600	acre-feet		Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
SP-2020-14	BOR - Narrows Tracts	The goal for the Narrows Wetlands Project is to maximize opportunities and partnerships to develop a series of conjunctive use wetlands that will benefit people and wildlife while enhancing recreational value of the Narrows properties. The restoration and creation of wetland basins on the properties will assist in easing water demands of the South Platte River system by providing additional water management opportunities in the form of streamflow augmentation via groundwater recharge.	Watershed Health, Environment & Recreation	Ag	Storage	Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	50	50	0	Morgan	1	NA	NA	50	ac	$ 1,200,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-15	Buckskin Gulch	Acquire 80 acres of land with Beaver Creek running west to east	Watershed Health, Environment & Recreation	Conservation			Implementing	The Alma Foundation	Jara Johnson	0	0	100	0	Park	23			1	River Miles	$ 375,000	Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	19	Tier 2
SP-2020-16	Button Rock Forestry Project	Thinning forested lands surrounding Button Rock Watershed on Boulder County, City of Longmont, and USFS lands. The goal would be to implemnt concepts of GTR 373, while increasing the meadow size, creating a groupy clumpy structure, promoting structural diversity on the landscape. This work can strategically protect the water supply for City of Longmont, Town of Lyons, and aricultural water on the plains. BCPOS has approxiamtely 160 treatable acres on the Billings property, 227 treatbale acres at Hall Ranch and another 40 or so at the Riverside property. All of these properties have data collected and a Forest Resource Action Plan (FRAP) written. 76 acres at HAll Ranch have a Scope of Work (SOW) to move forward as a demo project. Cost per acre estimate at $5000 per acre due to poor access (road work may increase costs of project. $380,000 for demo + more for City of Longmont. $1.13 million for all 227 acres.	Watershed Health, Environment & Recreation			Public Safety	Planned	Boulder County	Stefan Reinold	50	0	50	0	Boulder	6	NA	NA	NA	NA	$ 1,135,000	Tier 2	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 2
SP-2020-17	Chase Gulch Infiltration Gallery and Pump Station	Construct a new infiltration gallery and pump station with a capacity of up to 3.5 cfs on Chase Gulch above the confluence of Chase Gulch and NCC	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7			3.5	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	19	Tier 3
SP-2020-18	Clear Creek County Water Bank and Upper South Platte Basin-wide Augmentation Plan	Long-term Storage and Placement to Beneficial Use of Trans-Basin Waters. The CCC Water Bank delivers, stores and places to beneficial use, waters from the Upper Colorado River Basin into headwaters of the South Platte Basin. The CCC Water Bank is an integrated system of water rights and structures operated by the County for use of water within Clear Creek County, which system includes reservoirs, exchanges, an Upper Basin-wide Augmentation Plan, and numerous decreed water rights.	Storage	Supply & Demand Gap	Watershed Health, Environment & Recreation	Trans-basin water	Implementing	Clear Creek County	Lisa Leben lleben@clearcreekcounty.us 303-679-2434	90	0	10	0	Clear Creek	7	83	AF/year	1125	AF		Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1
SP-2020-19	Clear Creek Stream Managemen Plan	SMP to look at potential flow, water quality, habitat, passage issues on Clear Creek - final scope TBD but outreach is covering headwaters to confluence with the South Platte	Watershed Health, Environment & Recreation				Implementing	West Denver Trout Unlimited	Darren Beck / West Denver Chapter TU darren.s.beck@gmail.com	0	0	100	0	Clear Creek	7	NA	NA	NA	NA		Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	20	Tier 1

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SP-2020-2	Adaptive Management at Scale	We are collaborating with partners to develop and implement a shared adaptive management framework for assessing watershed health in the St. Vrain Basin (including Left Hand Creek and Boulder Creek). We will develop the shared framework collaboratively, with input from diverse entities that currently manage and monitor watershed health throughout the basin. Our goal is to create a framework that will help us make more informed management decisions as a basin and better track broad progress towards basin-wide watershed health goals. Additional funding needed to keep project going after current funding ends in 2023. Estimated cost is $200,000 per year to keep this project going.	Watershed Health, Environment & Recreation	Land Use	Education, Outreach & Innovation	Adaptive Management	Implementing	Left Hand Watershed Center	Jessie Olson	0	15	80	5	Boulder	5, 6	NA	NA	NA	NA	$ 200,000	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-20	Coffintop	Off-channel multi-purpose storage development with existing decree for conditional water right. Concepts being contemplated for maximizing decrees for multiple benefits throughout the basin. Additional funding will be required for project development including design and construction.	Supply & Demand Gap	Agriculture	Watershed Health, Environment & Recreation		Implementing	SVLHWCD	Jason Roudebush	33	33	33	1	Boulder	5	116000	AF		AF	$ 100,000,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
SP-2020-21	Community Science	We host annual Front Range Watershed Days and Catch the Hatch Projects we also host occassional community monitoring and volunteer stewardship projects. (Estimate $30K needed per year to keep program running)	Education, Outreach & Innovation	Watershed Health, Environment & Recreation	Agriculture	Watershed Science	Implementing	Left Hand Watershed Center	Jessie Olson	25	25	50		Boulder	5, 6	NA	NA	NA	NA	$ 30,000	Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	20	Tier 1
SP-2020-22	Continental-Hoosier System Project	Continental-Hoosier System Project (CHS)- an effort undertaken by Colorado Springs Utilities to improve resiliency of CHS system by addressing system risks associated to climatic and hydrologic variability, growing demands, operational and administrative challenges. By increasing high elevation storage through an enlargement of Montgomery Reservoir, the project will allow for economic and environmentally sensitive storage development, dry year carryover and diversion of additional water available under Colorado Springs' existing water rights. Historically this additional water has often been foregone ("spilled") due to system storage and capacity limitations, mostly during average and above average year types. Utilities may develop up to 8,100 acre feet (AF) of additional storage in Montgomery Reservoir (in the Upper South Platte Basin). However, an alternative to developing the additional South Platte storage described above, Utilities may develop up to 3,166 acre feet (AF) of its remaining conditional water storage rights in the Blue River Basin.	Storage	Supply & Demand Gap			Implementing	Colorado Springs Utilities	Kim Gortz Water Resources Planning Supervisor kgortz@csu.org	100	0	0	0	El Paso	36	4000	AF			$ 140,000,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	19	Tier 3
SP-2020-23	Coordination of St Vrain Forest Health Partnership	St. Vrain Forest Health Partnership was born out of a landscape scale and shared stewardship vision defined by a Boulder County and USFS MOU process (https://assets.bouldercounty.org/wp-content/uploads/2020/08/forest-health-mou-signed.pdf). The Partnership aims to bring together diverse stakeholders and community members (including, but not limited to SVLHWCD) to collaboratively plan and implement cross-jurisdictional landscape-scale forest restoration in the St. Vrain Basin that prepares the landscape and community to receive wildland fire as a natural part of the ecosystem. Currently have limited funding, but additional funding needed for coordination ($60,000/year) and implementation (estimated at $1million/year - implementation not included is project costs).	Watershed Health, Environment & Recreation	Land Use		Forest Health	Implementing	Left Hand Watershed Center	Jessie Olson	20	20	60		Boulder	5	NA	NA	NA	NA	$ 60,000	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	20	Tier 1
SP-2020-24	Copeland Reservoir	Lining of a leaky decreed reservoir. As a result, 75.5 AF of storage will be reclaimed. ALTA-survey complete. Design scope of work provided. Seeking funds for design and construction.	Supply & Demand Gap	Agriculture	Watershed Health, Environment & Recreation		Implementing	SVLHWCD	Jason Roudebush	33	33	33	1	Boulder	5	175.5	AF		AF	$ 1,500,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
SP-2020-25	Dam Risk and Resiliance Analysis	Comprehensive analysis of dam risk and resiliance of storage throughout Boulder County in response to update in Dam Safety Rules, and analysis of decreed vs. actual storage for the purpose of re-establishing storage volume lost as a result of sedimentation	Storage	Agriculture	Watershed Health, Environment & Recreation	Public safety	Planned	Boulder County	Aurdey Butler	0	70	30	0	Boulder	6	NA	NA	NA	NA	$ 300,000	Tier 2	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-26	Data Visualization Platform	Hosting and visualization of Stream Management Plan data/results. Platform will facilitate water management and land use decisions by SVLH and other water users in the basin and provide community water education	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Agriculture	Supply & Demand	Planned	SVLHWCD	Jason Roudebush	33	33	33	100	Boulder	5	NA	NA	NA	NA	$ 100,000	Tier 2	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-27	Double K Ranch Wetlands	Wetland restoration will be performed such that wetland habitats will grow wetland plants preferred by foraging populations of migratory ducks and geese. This restoration will be managed under a 30-year Site Conservation Agreement that will mandate a limited public access agreement, allowing some segment of the populations (i.e. youth hunters) access to the property for waterfowl hunting during allotted periods of the season	Watershed Health, Environment & Recreation	Ag	Supply and Demand Gap	Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	10	10	80	0	Morgan	1	NA	NA	NA	NA	$ 250,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-28	Dream Stream Revegetation	Annual CPW Project to plant willows along degraded portions of the "Dream Stream" section of the South Platte River	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Implementing	CPW	Tyler Swarr; Area 1 Aquatic Biologist and Matt Kondratieff; Aquatic Research Scientist	0	0	100	0	Park	23	NA	NA	NA	NA	$ -	Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 1
SP-2020-29	Duck Creek SWA - Planning & Restoration	A comprehensive restoration and management plan for Duck Creak State Wildlife Area will be developed to identify restoration opportunities as well as improve management of water resources on the property to benefit migratory birds and wetland habitats. Future work includes implementation of restoration projects that are identified and designed as part of this plan. Restoration projects will utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Concept	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Logan	64	NA	NA	NA	NA	$ 60,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-3	Adaptive Management in St. Vrain and Left Hand Watersheds	Completing stewardship, monitoring, and adaptive management in Left Hand and St. Vrain Watersheds. State of the Watershed Reports produced annually. Project underway, additional funding needed for continued implementation of monitoring and stewardship ($200k per year)	Watershed Health, Environment & Recreation	Land Use	Agriculture	Adaplive Management	Implementing	Left Hand Watershed Center	Jessie Olson	20	20	55	5	Boulder	5	NA	NA	NA	NA	$ 200,000	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1

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SP-2020-30	Economic Impact of River Recreation	Undertake an economic impact analysis to understand river recreation's economic impact to local economies and how it can provide integral economic diversification. American Whitewater is developing a framework to assess economic impact of river recreation to understand what recreational opportunities, as identified in the nonconsumptive toolbox, may generate in terms of dollars. This project will provide a thorough, data-based economic impact for the watershed that analyzes for the stakeholderdriven water management scenarios affect economic impact to the region. This study will provide communities with a comprehensive understanding of their recreation resource economy, how that economy is affected by streamflow, and how water management decisions affect that economic impact. It is optimal to implement this study in locations that have completed flow preference and boatable day studies. They will provide user-based recreational needs that are the basis of understanding when recreational opportunities are present. AW will coordinate with Lynker Technologies to examine varied management scenarios with StateMod in conjunction with economic impacts determined in the Future Avoided Cost Explorer project to identify how larger water supply changes may affect the river recreation economy. Additionally, utilizing an approach that has been developed through the University of Colorado and local economists, we will develop basin specific recreational spending profiles to identify the impact of a recreational opportunity. This project will help a basin in developing a comprehensive approach to\ protect watershed health, plan accordingly for Stream Management Plans and Basin Implementations Plans, and diversify economic growth.	Watershed Health, Environment & Recreation	Additional	Supply & Demand Gap		Planned	American Whitewater	Hattie Johnson hattie@americanwhitewater.org 970-456-8533	0	0	85	15	Weld	1	NA	NA	200	River Miles	$ 199,328	Tier 2	Tier 2	Tier 1	Tier 3	Tier 2	21	Tier 2
SP-2020-31	Eleven Mile Diversion Dam Removal	CUSP has completed 70% design for the removal of the 11 Mile low head dam at the mouth of 11 Mile Canyon and restoration of the river above and below the structure. We will take design to a public ZOOM meeting. Stakeholders have reviewed the design. After public meeting, USFS needs to complete NEPA and CUSP must fund raise for implementation of project.	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Planned	CUSP, USFS, COS Utilities, Denver Water	John Geerdes- Coalition for the Upper South Platte 719-748-0033 (office) johngeerdes@cusp.ws Tyler Swarr; CPW Area 1 Aquatic Biologist	0	0	100	0	Park	23					$ 2,000,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	17	Tier 2
SP-2020-32	Elevenmile Canyon Sediment Control	Improve parking and angler access points & stabilize banks, to address sedimentation coming from existing parking areas and social trails	Watershed Health, Environment & Recreation				Concept	Coalition for the Upper South Platte	John Geerdes - Coalition for the Upper South Platte 719-748-0033 (office)	0	0	100	0	Park	23	NA	NA	NA	NA		Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-33	Elliott SWA - Union Ditch Repair	Goal of the project is to improve conveyance of water resources to Elliot State Wildlife Area by replacing part of the main delivery ditch with pipeline in order to improve the quantity of water that supplies water to > 400 acres wetland habitat that migratory birds, and wildlife depend on. Elliott SWA is one of the most important public recreation areas for waterfowl hunting along the South Platte River.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 150,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-34	Elliott SWA Wetlands - Elliott West Tract	Elliott SWA is one of the premier public recreation areas for waterfowl hunting along the South Platte River.Wetland habitats have become degraded on this unit of Elliott SWA due to delipidated water control infrastructure and inefficiencies in conveyance of water resources. Project goals are to restore wetlands habitats that migratory birds, wildlife, and public depend on by utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-35	Elliott SWA Wetlands - North Hamlin Tract	Elliott SWA is one of the premier public recreation areas for waterfowl hunting along the South Platte River. Wetland habitats have become degraded on this unit of Elliott SWA due to delipidated water control infrastructure and inefficiencies in conveyance of water resources. Project goals are to restore wetlands habitats that migratory birds, wildlife, and public depend on by utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 250,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-36	Elliott SWA Wetlands - South Hamlin Tract	Elliott SWA is one of the premier public recreation areas for waterfowl hunting along the South Platte River.Wetland habitats have become degraded on this unit of Elliott SWA due to delipidated water control infrastructure and inefficiencies in conveyance of water resources. Project goals are to restore wetlands habitats that migratory birds, wildlife, and public depend on by utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-37	Elliott SWA Wetlands - Union Tract	Elliott SWA is one of the premier public recreation areas for waterfowl hunting along the South Platte River.Wetland habitats have become degraded on this unit of Elliott SWA due to delipidated water control infrastructure and inefficiencies in conveyance of water resources. Project goals are to restore wetlands habitats that migratory birds, wildlife, and public depend on by utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-38	Erie - Construction of Up to 5 Additional HDD Wells	Construction of up to 5 additional HDD wells in the Boulder Creek alluvium to divert junior water rights to be augmented with Windy Gap reuse effluent.	Supply & Demand Gap				Planned	Erie, Town of	Todd Fessenden	100	0	0	0	Boulder	06			5000	gpm		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	18	Tier 3
SP-2020-39	Evaluation of post flood fish passage	Evaluate three different type of fish passage structures at diversions along the front range (MS student at CSU)	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Implementing	CPW	Boyd Wright; NE Region Native Aquatics	0	30	70	0	Larimer	3	NA	NA	NA	NA	$ 250,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2
SP-2020-4	Alma River Walk	Build a sustainable ADA trail to reduce impacts to the wetlands and wildlife found there. Environmental interpretive signage aims to educate users to help inspire more responsible recreation in this unique place.	Watershed Health, Environment & Recreation	Education, Outreach & Innovation			Implementing	The Alma Foundation	Jara Johnson	0	0	100	0	Park	23	NA	NA	0.5	River Miles	$ 275,000	Tier 1	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 1

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SP-2020-40	Firestone - Alluvial Wellfield 1	Alluvial wellfield consisting of horizontal and vertical wells. To be used to provide raw water to the St. Vrain Water Authority WTP	Supply & Demand Gap				Implementing	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	500	AF	1000	AF	$ 4,000,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
SP-2020-41	Firestone - Alluvial Wellfield 2	Alluvial wellfield consisting of horizontal and vertical wells. To be used to provide raw water to the St. Vrain Water Authority WTP (online by 2032)	Supply & Demand Gap				Planned	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	500	AF	1000	AF	$ 5,100,000	Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
SP-2020-42	Firestone - Alluvial Wellfield 3	Alluvial wellfield consisting of horizontal and vertical wells. To be used to provide raw water to the St. Vrain Water Authority WTP (online by 2048)	Supply & Demand Gap				Planned	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	500	AF	1000	AF	$ 6,000,000	Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
SP-2020-43	Firestone - Mountain Shadows Park Irrigation Well	Alluvial Well to Non-Pot Park Irrigation	Supply & Demand Gap				Implementing	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	25	AF	25	AF	$ 253,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
SP-2020-44	Firestone - Phase 1 - Non-Potable Irrigaiton System	Use of direct flow water rights for non-potable uses within Firestone	Supply & Demand Gap				Implementing	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	125	AF	125	AF	$ 2,100,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
SP-2020-45	Firestone - Phase 2 - Non-Potable Irrigaiton System	Use of direct flow water rights for non-potable uses within Firestone	Supply & Demand Gap				Planned	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	150	AF	150	AF	$ 2,500,000	Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 3
SP-2020-46	Firestone Reservoir #1	Reservoir for Operation of Augmentation Plan to Support Non-Potable and Municipal Uses. Reservoir will also have Jr water rights that may produce some yield.	Supply & Demand Gap	Storage			Implementing	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	750	AF	1100	AF	$ 11,600,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
SP-2020-47	Firestone Reservoir #2	Reservoir for Operation of Augmentation Plan to Support Non-Potable and Municipal Uses (Online in 2023). Reservoir will also have Jr water rights that may produce some yield.	Supply & Demand Gap	Storage			Planned	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	550	AF	800	AF	$ 9,000,000	Tier 2	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 2
SP-2020-48	Firestone Reservoir #3	Reservoir for Operation of Augmentation Plan to Support Non-Potable and Municipal Uses (Online in 2035). Reservoir will also have Jr water rights that may produce some yield.	Supply & Demand Gap	Storage			Planned	Firestone, Town of	Dave Lindsay	100	0	0	0	Weld	6	3000	AF	5000	AF	$ 25,000,000	Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 3
SP-2020-49	George & Cornelius Creek Greenback Restoration Project	Post project remediation of riparian habitat at temporary barriers and road obliteration (probably not until 2025)	Watershed Health, Environment & Recreation	Land Use	Additional	Fish Passage	Planned	CPW	Boyd Wright; NE Region Native Aquatics	0	20	80	0	Larimer	4	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-5	Andrick - Teal Lodge - Structure Replacement	Andrick Ponds State Wildlife Area in Morgan County is a premier South Platte Basin waterfowl hunting property and is comprised of a complex of 22 wetlands, approximately 30 ditch diversions and water control structures, and a large network of ditches. Over time, the water control and conveyance infrastructure has fallen into disrepair and the long-term viability of the site as habitat and as a waterfowling destination is at-risk. DU will identify priority diversions and water-control structures in need of rehabilitation and improve those facilities such that manager's capacity to move water throughout the complex is vastly improved. This will allow them to better manage water levels, producing wetland vegetation communities preferred by waterfowl species during non-breeding life cycle events when they are utilizing the basin. Public hunting is allowed on Andrick during regular seasons under a reservation system. Project improvements will increase water conveyance to the site from the Riverside Canal, and in-turn, the quality of habitat available to birds during the fall hunting season. Our work will allow for CPW managers to develop a pond maintenance schedule to optimize opportunity and satisfaction of waterfowl hunters on the site. The engineering plan will detail the recontouring of ponds and ditches, elimination of colonies of permanent vegetation, and proper control of water surface elevations in the ponds.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Logan	1	NA	NA	NA	NA	$ 85,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-50	Greeley Interruptible Supply Agreements	This project will establish interruptible supply agreements with agricultural water users and owner in the Poudre Basin. For Greeley, the ISA will all periodic use of the agricultural water for municipal purposes.	Supply & Demand Gap				Planned	Greeley, City of	Adam Jokerst adam.jokerst@greeleygov.com 970.381.5337	100	0	0	0	Larimer and Weld	2						Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	16	Tier 3
SP-2020-51	Greeley Non-Potable Water System Expansion	Greeley is expanding its non-potable water system to provide additional untreated water sourced from the Big Thompson and lower Poudre Rivers throughout the city for outdoor irrigation. Work includes expanding non-potable water rights, gravel pit storage, distribution lines, and service area.	Supply & Demand Gap	Storage			Implementing	Greeley, City of	Adam Jokerst adam.jokerst@greeleygov.com 970.381.5337	100	0	0	0	Larimer and Weld	2	7500	AF	3500	AF	$ 60,000,000	Tier 2	Tier 2	Tier 3	Tier 3	Tier 2	21	Tier 2
SP-2020-52	Green Lake Inlet Pipeline	Increase capacity of the existing pipeline from 1.5 cfs to 10 cfs	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Clear Creek	7			10	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	19	Tier 3
SP-2020-53	Harris Riparian Restoration	The project is located on a permanent USDA easement which contains valuable wetland and riparian areas. A warm water slough is located on the property and was historically open water from the head to tail-end. Due to recent flooding of the South Platte River sediment has built up within the slough and hybrid cattail has choked out the open water, reducing the habitat value for waterfowl. The project will involve excavating the sediment and restructuring the slopes for easier ingress and egress for the birds. The value of the slough will be highest in the winter during cold snaps when all other bodies of water freeze over but will also be valuable during migration seasons.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Sedgwick	64	4	cfs	0.75	miles	$ 75,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2

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SP-2020-54	Heil Forestry Thinning	Thinning forested lands in the Left Hand/St. Vrain Watershed. This project is in the early planning stages collecting data on 480 acres. Data is being collected and a Forest Resource Action Plan (FRAP) will be written in 2021 with a goal of treatment in 2024-2026. This project would tie into existing treatments that go from north to south in Heil Valley Ranch, almost completing the lenght of the proeprty. The work would aim to follow GTR-373 and create a forest structure that could withstand low-intensity wildfire, while also decreasing possible fire severity. Since it is a large acreage project, this would be spread out over at least 3 years which might require $750,000 per year of funding not including local match.	Watershed Health, Environment & Recreation			Public Safety	Planned	Boulder County	Stefan Reinold	50		50		Boulder	6	NA	NA	NA	NA	$ 2,250,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	19	Tier 3
SP-2020-55	Hidden Valley Diversion Point No. 3 (New Infiltration Gallery)	Increase capacity of the existing gallery from 1.78 cfs to the 3 cfs decreed to this structure	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Clear Creek	7	NA	NA	3	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-56	Hidden Valley Ground Water Diversion Point (Original Infiltration Gallery)	Increase capacity of the existing original gallery from 0.89 cfs to the 1.5 cfs decreed	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Clear Creek	7	NA	NA	1.5	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-57	Implementation Fish Passage Feasibility Study and Education Initiative	In coordinatation with SVLHWCD, Boulder County, and the City of Longmont, the Watershed Center is exploring ways to balance the needs of water users and fish with the Fish Passage and Feasibility Study. This would be the potential cost to implement projects identified in the planning project. (Estimate between 5-8 million needed to implement).	Watershed Health, Environment & Recreation	Agriculture	Supply & Demand Gap	Fish Passage	Planned	Left Hand Watershed Center	Jessie Olson	25	25	25	25	Boulder	5	NA	NA	NA	NA	$ 7,000,000	Tier 2	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-58	Implementation of forest restoration projects defined by St Vrain Forest Health Partnership	Implementation of forest restoration projects defined by St. Vrain Forest Health Partnership described above (estimated at $1million/year)	Watershed Health, Environment & Recreation	Land Use	Education, Outreach & Innovation	Forest Health	Planned	Left Hand Watershed Center	Jessie Olson	20	20	60		Boulder	5	NA	NA	NA	NA	$ 1,000,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	20	Tier 3
SP-2020-59	Jackson Lake Outlet Tower	An in-reservoir outlet tower with fish screening system to prevent loss of fish as water is drawn down for agricultural use	Watershed Health, Environment & Recreation	Agriculture	Storage	Aquatic Habitat and Stream Health	Planned	CPW	Mandi Brandt - Aquatic Biologist Area 3	0	10	90	0	Morgan	1	NA	NA	NA	NA	$ 250,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-6	Andrick SWA Wetlands - Planning & Restoration	Andrick Ponds State Wildlife Area in Morgan County is a premier South Platte Basin waterfowl hunting property and is comprised of a complex of 22 wetlands, approximately 30 ditch diversions and water control structures, and a large network of ditches. Over time, the water control and conveyance infrastructure has fallen into disrepair and the long-term viability of the site as habitat and as a waterfowling destination is at-risk. comprehensive restoration and management plan will be developed to identify restoration opportunities as well as improve management of water resources on the property to benefit migratory birds, wetland habitats, and augmentation (i.e., recharge) potential. Andrick SWA is one of the most important augmentation sites along the South Platte River. Future work includes implementation of restoration projects that are identified and designed as part of this plan. Restoration projects will utilize standard techniques such as adding or removing water control and conveyance infrastructure in order to promote the growth of wetland plant communities that are beneficial to migratory birds and other wildlife. The project will also improve stream flow augmentation potential at the site.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Logan	1	NA	NA	NA	NA	$ 60,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-60	Jackson State Park Wetlands	Currently wetlands located in Jackson State Park and State Wildlife Area, areas open to public hunting of waterfowl, are not functioning at capacity largely due to degraded conveyance infrastructure and unfavorable topography within the basins. As such, they either do not receive adequate amounts of water in the shallower portions, and/or receive too much water for too long of a period in the deeper sections. This has restricted the availability of suitable habitat for migratory bird species and other wetland-dependent wildlife. The wetlands were originally intended to be moist-soil units managed to provide food resources for migratory birds. This is accomplished through shallow water wetland management, in which in-basin elevations and microtopography is critical. CPW and DU will retrofit existing ditches with pipe and recontour wetland basins such that water supplies are put to most effective use in growing plants providing food to ducks, geese, shorebirds and other wildlife using the ponds on the public areas. This project will increase habitat for an array of migratory birds, and improve the quality of recreational experiences. This work will allow area managers to manage the sites more efficiently and effectively for wildlife habitat and recreational experiences by improving utilization of water resources.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-61	Jackson SWA Wetlands	Currently wetlands located in Jackson State Park and State Wildlife Area, areas open to public hunting of waterfowl, are not functioning at capacity largely due to degraded conveyance infrastructure and unfavorable topography within the basins. As such, they either do not receive adequate amounts of water in the shallower portions, and/or receive too much water for too long of a period in the deeper sections. This has restricted the availability of suitable habitat for migratory bird species and other wetland-dependent wildlife. The wetlands were originally intended to be moist-soil units managed to provide food resources for migratory birds. This is accomplished through shallow water wetland management, in which in-basin elevations and microtopography is critical. CPW and DU will retrofit existing ditches with pipe and recontour wetland basins such that water supplies are put to most effective use in growing plants providing food to ducks, geese, shorebirds and other wildlife using the ponds on the public areas. This project will increase habitat for an array of migratory birds, and improve the quality of recreational experiences. This work will allow area managers to manage the sites more efficiently and effectively for wildlife habitat and recreational experiences by improving utilization of water resources.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Morgan	1	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3

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SP-2020-62	Jorgensen Wetlands	At least 71 acres of wet meadows, shallow-water wetlands, emergent marsh and riparian shrubland will be restored to benefit transient populations of waterfowl and other wildlife species that frequent the tract. Water diversion structures will be rehabilitated with modern measurement and conveyance facilities added to allow property managers to efficiently move water to habitats during critical life cycle events of targeted species. Water-control structures will be installed so that water levels in more permanent wetlands found on the property can be managed to encourage the growth of wetland plants that are preferred foods of ducks, geese and other birds using the property during spring and fall migration.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Logan	64	NA	NA	NA	NA	$ 175,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-63	Left Hand Creek Sediment Transport & Fish Passage - 8 Structures	In collabration with Boulder County, Left Hand Watershed Center, and several Irrigation Companies, SVLHWCD is proposing to retofit or replace 8 diviersion structures on Left Hand Creek. The projects require extensive feasibility studies and the development of agreements bewtween the Irrigation Companies and the Project sponsor. Ultimately the upgrades are necessary to improve sediment transport and allow for fish passage	Watershed Health, Environment & Recreation	Agriculture	Supply & Demand Gap		Planned	Partneship with Boulder County and Left Hand Watershed Center	Jason Roudebush	33	33	33	1	Boulder	5	NA	NA	NA	NA	$ 8,000,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 3
SP-2020-64	Left Hand Creek Streamflow Gaging Stations	Procurement and installation of 4 streamflow gaging stations on Left Hand Creek to improve administration and ongoing assessment of creek health.	Supply & Demand Gap	Agriculture	Watershed Health, Environment & Recreation	Administration	Planned	SVLHWCD	Jason Roudebush	25	25	25	25	Boulder	5	NA	NA	NA	NA	$ 24,000	Tier 3	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 3
SP-2020-65	Little Thompson Stream Restoration and Floodplain Connectivity	This project was identified following the flood of 2013 in the associated Little Thompson River Master Plan. It is a stream restoration project that will increase floodplain connectivity and riparian habitat, reduce flood risk, and improve sediment transport.	Watershed Health, Environment & Recreation				Planned	Boulder County	David Hirt	0	0	100	0	Boulder	5	NA	NA	NA	NA	$ 750,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-66	Lower Boulder Creek agriculture infrastructure improvement and stream restoration	Design of creek restoration lower Boulder Creek and permanent ditch diversion structure and conveyance at the Howell Ditch. This is a partnership between Boulder County, City of Boulder, and Mile High Flood District (MHFD). Design and construction for the stream restoration components are funded by MHFD and the rest of the project (diversion/conveyance design and construction) is currently needing funding. Construction planned for 2022. The permanent structure will be more resilient and eliminate the need for accessing the creek on an annual basis to create a push-up dam. Fish passage/in-stream flows will be considerations in the design process. Work on this segment of confined/channelized Boulder Creek will restore floodplain access for higher flow events.	Watershed Health, Environment & Recreation	Agriculture			Implementing	Boulder County	Justin Atherton-Wood	20	40	40	0	Boulder	6	NA	NA	NA	NA	$ 1,000,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-67	MERGS - Atwood Riparian Restoration	The project is located on a permanent USDA Wetland Reserve Program easement which contains valuable wetland and riparian areas. A warm water slough is located on the property and was historically open water from the head to tail-end. Due to recent flooding of the South Platte River sediment has built up within the slough and hybrid cattail has choked out the open water, reducing the habitat value for waterfowl. The project will involve excavating the sediment and restructuring the slopes for easier ingress and egress for the birds. The value of the slough will be highest in the winter during cold snaps when all other bodies of water freeze over but will also be valuable during migration seasons.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Sedgwick	64	4	cfs	1.5	miles	$ 100,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-68	Missouri Creek Reservoir	New reservoir on Missouri Creek, downstream of existing Missouri Lakes	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7			718	acre-feet		Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
SP-2020-69	MX2 Wetlands	DU will work with landowners to restore function to wetland impoundments found on the Wetlands Reserve Program easement. Wetland hydrologic function will be restored through the installation of modern water diversions, conveyance systems and water-control structures. Earth-moving will recontour basins on the property to best utilize water resources to grow wetland plant communities preferred by migrating waterfowl flocks. The landowners have agreed to allow limited public access (i.e. youth waterfowl hunting) on the property under a 30-year Site Conservation Agreement with DU.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Planned	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Logan	64	NA	NA	NA	NA	$ 250,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-7	Augmentation Program Expansion	Lined gravel pit development to expand the St. Vrain and Left Hand Water Conservancy District augmentation program on St. Vrain and Left Hand Creeks.	Supply & Demand Gap	Agriculture	Watershed Health, Environment & Recreation		Planned	SVLHWCD	Jason Roudebush	33	33	33	1	Boulder	5	1200	AF	400	AF	$ 4,500,000	Tier 3	Tier 2	Tier 3	Tier 1	Tier 2	21	Tier 3
SP-2020-70	NCC Diversion Point No. 1	Construct a direct flow diversion along SH 119, east/downstream of the City with a capacity of up to 10 cfs	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	10	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-71	NCC Diversion Point No. 2	Construct an alternative point to NCC Diversion Point No. 1 along SH 119, east/downstream of the City for direct flow diversion with a capacity of up to 10 cfs	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	10	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-72	NCC Infiltration Gallery	Rebuild existing gallery to increase capacity from 0.53 cfs to the 7 cfs decreed	Supply & Demand Gap				Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7	NA	NA	7	cfs		Tier 3	Tier 2	Tier 2	Tier 3	Tier 2	20	Tier 3
SP-2020-73	Niwot ditch Diversion Fish Passage	Rebuild diversion on St. Vrain Creek to facilitate fish passage	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Implementing	Boulder County and CPW	Sarah Heerhartz, Boulder County sheerhartz@bouldercounty.org Boyd Wright; NE CPW Region Native Aquatics	0	30	70	0	Boulder	5	NA	NA	NA	NA	$ 650,000	Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 1
SP-2020-74	Niwot ditch Diversion fish passage monitoring	Monitor and evaluate efficacy of new diversion for fish passage	Watershed Health, Environment & Recreation	Agriculture	Additional	Fish Passage	Planned	CPW	Boyd Wright; NE Region Native Aquatics	0	30	70	0	Boulder	5	NA	NA	NA	NA	$ 200,000	Tier 3	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 3
SP-2020-75	Non-point source pollution controls assessment	Identify areas within Boulder County where non-point source pollution controls can help reduce nutrients or E. coli loading in streams. Clarify: GIS based areas or stakeholder based. Does the assessment also include identifying mitigation options and the implementation of those mitigation projects identified.	Watershed Health, Environment & Recreation	Agriculture	Land Use		Planned	Boulder County	Scott Coulson, 303-441-1157, scoulson@bouldercounty.org	0	0	100	0	Boulder	5, 6	NA	NA	NA	NA	$ 100,000	Tier 2	Tier 2	Tier 1	Tier 2	Tier 2	21	Tier 2

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SP-2020-76	North Elk Creek Greenback Restoration Project	CPW lead project to introduce Greenback Cutthroat Trout to the North Elk Creek drainage	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Planned	CPW	Tyler Swarr; Area 1 Aquatic Biologist	0	0	100	0	Park	80	NA	NA	NA	NA	$ 850,000	Tier 3	Tier 2	Tier 1	Tier 3	Tier 2	21	Tier 3
SP-2020-77	North Fork SP Forest Service Habitat/Access Improvement	Pond and river fishing access for mobility-impaired anglers and habitat restoration on small public reach of North Fork South Platte River (~1/3 mile)	Watershed Health, Environment & Recreation				Planned	U.S. Forest Service	Mikele Painter, U.S. Forest Service mikele.painter@usda.gov	0	0	100	0	Park	80	NA	NA	NA	NA		Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	20	Tier 2
SP-2020-78	North Sterling Reservoir Outlet Tower	An in-reservoir outlet tower with fish screening system to prevent loss of fish as water is drawn down for agricultural use	Watershed Health, Environment & Recreation	Agriculture	Storage	Aquatic Habitat and Stream Health	Planned	CPW	Mandi Brandt - Aquatic Biologist Area 3	0	10	90	0	Logan	64	NA	NA	NA	NA	$ 250,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-79	Otsuka Wetlands	The goal of this project is to restore wetlands plant communities and habitats that benefit non-breeding migratory birds and other wildlife that utilize the South Platte River corridor. The restoration project will include the installation of water control infrastructure that will promote the germination of desired seasonal wetland plant communities The investment will be protected by perpetual conservation easement to ensure that the wetland resources preferred by wildlife ensuring that these benefits are safeguarded into the future.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Sedgwick	64	NA	NA	NA	NA	$ 30,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-8	Bailey Area, Water for Structure and Wildfire Suppression Study	Determine which ponds are viable for fire suppression, which have water rights and which do not. Goal purchase & adjudicate necessary water rights for ponds without	Watershed Health, Environment & Recreation	Conservation			Implementing	Fire Adapted Bailey	John Van Doren, Robin Davis	0	0	100	0	Park	80	NA	NA	NA	NA	$ 86,000	Tier 1	Tier 2	Tier 1	Tier 3	Tier 2	21	Tier 1
SP-2020-80	Park County Storage for Fire Protection Needs	Goal of project is to decree and utilize previously undecreed storage for the purpose of storage water for fire suppression. This project would occur after completion of the Bailey Area - Water for Structure and Wildfire Suppression Study.	Storage	Watershed Health, Environment & Recreation	Supply & Demand Gap	Fire Suppression	Concept	Park County	Dick Elsner	50	0	50	0	Park	80	50	AF	400	AF		Tier 4	Tier 2	Tier 3	Tier 2	Tier 2	20	Tier 3
SP-2020-81	Park County Unspecified IPP Grow Into Future Demand for Construction Supplies	Park County Unspecified IPP to Grow Into Future Demand for Water - Need for additional water supply to support construction, including road and bridge construction and maintenance.	Storage	Supply & Demand Gap			Concept	Park County	Dick Elsner	100	0	0	0	Park	23, 80						Tier 4	Tier 2	Tier 3	Tier 3	Tier 2	16	Tier 3
SP-2020-82	Park County Wetland and Stream Inventory	Indentify and map all stream and wetlands in Park county & determine health of each using FACWet and FACStream	Watershed Health, Environment & Recreation	Education, Outreach & Innovation			Completed	EcoMetrics and Johnson Environmental Consulting	Mark Beardsley	0	0	100	0	Park	23, 80, 12					$ 110,500		Tier 2			Tier 2	17	Not applicable
SP-2020-83	Parker/LSPWCD Project: Phase 1	Storage and conveyance project by Parker WSD and Lower South Platte WCD. Fremont Butte and Iliff Reservoirs; pipeline to Parker. Water right application filed. Uses water and facilities included in SPROWG Concept to meet both municipal and agricultural needs	Supply & Demand Gap	Storage	Agriculture	Multi-Use	Implementing	Parker Water and Sanitation District and Lower South Platte Water Conservancy District	Marina Kopytkovskiy and Joe Frank	50	50	0	0	Logan	64	24387	AFY	78500	AF	$ 400,000,000	Tier 3	Tier 2	Tier 3	Tier 2	Tier 2	21	Tier 3
SP-2020-84	Parker/LSPWCD Project: Phase 2	Storage and conveyance project by Parker WSD and Lower South Platte WCD. Fremont Butte and Iliff Reservoirs; pipeline to Parker. Water right application filed. Uses water and facilities included in SPROWG Concept to meet both municipal and agricultural needs	Supply & Demand Gap	Storage	Agriculture	Multi-Use	Implementing	Parker Water and Sanitation District and Lower South Platte Water Conservancy District	Marina Kopytkovskiy and Joe Frank	50	50	0	0	Washington	64	34927	AFY	78500	AF	$ 671,000,000	Tier 4	Tier 2	Tier 3	Tier 2	Tier 2	21	Tier 3
SP-2020-85	Pilot Project for the Erie HDD Well	Construction of one HDD well in the Boulder Creek alluvium to test the ability to divert junior water rights to be augmented with Windy Gap reuse effluent.	Supply & Demand Gap				Implementing	Erie, Town of	Todd Fessenden	100	0	0	0	Boulder	06			1000	gpm		Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	18	Tier 2
SP-2020-86	Planning and Coordination of Fish Passage Feasibility Study and Education Initiative	In coordinatation with SVLHWCD, Boulder County, and the City of Longmont, the Watershed Center is exploring ways to balance the needs of water users and fish with the Fish Passage and Feasibility Study. Watershed Center is currently implementing this project however they need additional funding for the ongoing planning and coordination. Estimated need for funding is $50,000/year	Watershed Health, Environment & Recreation	Agriculture	Supply & Demand Gap	Fish Passage	Implementing	Left Hand Watershed Center	Jessie Olson	25	25	25	25	Boulder	5	NA	NA	NA	NA	$ 50,000	Tier 1	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 1
SP-2020-87	Poudre Flows Project	Augmentation water being used to maintain minimum stream flows for the Poudre in the Ft Collins/Greeley areas - more info at: https://coloradowatertrust.org/project/isf-augmentation-plan-poudre	Watershed Health, Environment & Recreation				Implementing	Colorado Water Trust	Andy Schultheiss, Colorado Water Trust aschultheiss@coloradowatertrust.org	0	0	100	0	Weld	3	NA	NA	NA	NA		Tier 1	Tier 2	Tier 1	Tier 2	Tier 2	20	Tier 1
SP-2020-88	Poudre Headwaters Greenback Restoration Project	Ten-year-plus phased restoration project to establish a stronghold for threatened Greenback Cutthroat Trout and mitigate Long Draw Reservoir impacts on the Arapaho Roosevelt National Forest; ultimately will connect nearly 40 miles of restored native trout habitat. More info at: https://coloradotu.org/poudre-headwaters-restoration	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Planned	U.S. Forest Service and CPW	Matt Fairchild, U.S. Forest Service matthew.fairchild@usda.gov Harry Crockett; Nat. Aq. Spp. Coordinator	0	10	90	0	Larimer	3	NA	NA	NA	NA	$ 1,500,000	Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 1
SP-2020-89	Poudre River In-stream Flows	Utilizing new legislation to allow water rights previously decreed for augmetation to be utilized by CWCB to augment in-stream flows. Colorado Water Trust, City of Fort Collins, City of Greeley, CWCB.				2020 status not provided; assumed concept	Concept	Colorado Water Trust, City of Fort Collins, City of Greeley, CWCB		100	0	0	0	Larimer	3						Tier 4	Tier 2	Tier 3	Tier 3	Tier 3	14	Tier 4
SP-2020-9	Banner Lakes SWA	Recreational and habitat improvements on Metro area State Widlife Area. Water conservation and efficiency improvements.	Watershed Health, Environment & Recreation	Conservation	Additional		Planned	CPW	Pete Conovitz/Jason Duetsch; Area 2	0	20	80	0	Weld	1	NA	NA	NA	NA	$ 1,000,000	Tier 4	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 3
SP-2020-90	Prewitt Reservoir Outlet Tower	An in-reservoir outlet tower with fish screening system to prevent loss of fish as water is drawn down for agricultural use	Watershed Health, Environment & Recreation	Agriculture	Storage	Aquatic Habitat and Stream Health	Planned	CPW	Mandi Brandt - Aquatic Biologist Area 3	0	10	90	0	Washington	64	NA	NA	NA	NA	$ 250,000	Tier 3	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-91	Prewitt Wetlands - Phase II	In this second phase of a project, DU will deliver at least two intra-basin levees to impound water within the margin of Prewitt Reservoir, allowing managers to better time the flooding of wetland habitats beneficial to wetland birds and waterfowl hunters using the public State Wildlife Area.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Concept	Ducks Unlimited, Inc.	Matthew A. Reddy, Regional Biologist	0	0	100	0	Morgan	64	NA	NA	NA	NA	$ 80,000	Tier 4	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 3
SP-2020-92	Prince Lake No 2 Reconstruction	Boulder County is currently working through the design phase and will be ready for physical reconstruction at the end of 2021. This project captures the physical reconstruction work that will be required. It will re-establish decreed storage capacity and improve dam infrastructure to bring it into compliance with State mandates and regulations. At this phase of the project, no additional storage capacity being claimed. Final determination will be made during final design.	Storage	Agriculture	Watershed Health, Environment & Recreation	Public safety	Planned	Boulder County	Aurdey Butler	0	100	0	0	Boulder	06	50	AF	120	AF	$ 650,000	Tier 1	Tier 2	Tier 2	Tier 1	Tier 2	21	Tier 1

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SP-2020-93	Quartz Valley Reservoir	New reservoir downstream from the existing Central City Chase Gulch Reservoir	Supply & Demand Gap	Storage			Planned	Black Hawk, City of	Jim Ford, City of Black Hawk	100	0	0	0	Gilpin	7			1027	acre-feet		Tier 3	Tier 2	Tier 3	Tier 3	Tier 2	19	Tier 3
SP-2020-94	Riparian ReConnect	Prioritize and restore streams and wetlands in Park County Wetland and Stream Inventory based on increasing functionality by connecting streams and associated disconnected riparian areas.	Watershed Health, Environment & Recreation				Implementing	Colorado Open Lands, EcoMetrics, and Johnson Environmental Consulting	Cheryl Cufre (Colorado Open Lands)	0	0	100	0	Park	23, 80, 12	NA	NA	NA	NA	$ 1,900,000	Tier 1	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 1
SP-2020-95	River Watch Volunteer Group	School groups, watershed monitoring groups, community groups, and individuals all serve as watershed stewardship volunteers. Volunteers collect samples at their respetive site monthly for a continuous year. https://coloradoriverwatch.org/river-watch-volunteers/	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional	Water Quality	Implementing	CPW	Megan McConville - Water Unit	50	0	50	0	Weld	1	NA	NA	NA	NA	$ -	Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	21	Tier 1
SP-2020-96	Rock Creek Greenback Restoration Project	Restoration of threatened Greenback Cutthroat Trout into a set of connected streams within the headwaters of the Tarryall drainage; public-private partnership project with restoration on private ranch & Pike National Forest	Watershed Health, Environment & Recreation	Education, Outreach & Innovation	Additional		Implementing	U.S. Forest Service and CPW	Kristen Meyer, U.S. Forest Service Tyler Swarr; CPW Area 1 Aquatic Biologist	0	0	100	0	Boulder	6	NA	NA	NA	NA	$ 850,000	Tier 2	Tier 2	Tier 2	Tier 3	Tier 2	21	Tier 2
SP-2020-97	Sedgwick Wetlands	Current wetlands on the property are lost because of the inability to divert dedicated irrigation water supplies into the basins. This project will establish a new diversion point with measurement and modern conveyance such that property managers will be able to run water into the wetlands to grow desirable wetland plants and to make those vegetative resources available to bird populations using the area, especially during spring and fall migration events. Additionally, a playa basin located on the property will be watered through a new diversion point, heightening the availability of shallow-water wetland habitats on the tract. The landowners have agreed to allow limited public access on the tract under a 30-year Site Conservation Agreement with DU.	Watershed Health, Environment & Recreation	Additional Critical Goals and Actions		Wetlands Conservation	Implementing	Ducks Unlimited, Inc.	Martin Grenier, Conservation Manager	0	0	100	0	Sedgwick	64	NA	NA	NA	NA	$ 200,000	Tier 2	Tier 2	Tier 2	Tier 2	Tier 2	21	Tier 2
SP-2020-98	Sherwood Gulch Forestry Project	Thinning forested lands west of Nederland to improve forest structure, decrease fire hazards, and retain/promote diversity on landscape. Drainage of area feeds to Sherwood Creek which feeds into North Boulder Creek. This project is shelf ready and currently has funding to treat 100 acres, additional funding could lead to treating an additional 30 acres. Cost per acre estimated at $4500. Have $245,000 from existing grant, BCPOS match $205,000, additional 30 acres would cost $135,000.	Watershed Health, Environment & Recreation			Public Safety	Planned	Boulder County	Stefan Reinold	50		50		Boulder	6	NA	NA	NA	NA	$ 135,000	Tier 1	Tier 2	Tier 2	Tier 1	Tier 2	19	Tier 1
SP-2020-99	South Boulder Creek Stream Management Plan	SMP developing & monitoring stream health on South Boulder Creek and designing infrastructure improvements for diversion structures to address low-flow passage (needed to implement Gross Reservoir environmental pool), fish passage, and efficiency	Watershed Health, Environment & Recreation				Implementing	Stephen Brant / Boulder Flycasters Chapter Trout Unlimited	Stephen Brant / Boulder Flycasters Chapter TU, slbrant62@gmail.com	0	0	100	0	Boulder	6						Tier 1	Tier 2	Tier 1	Tier 1	Tier 2	16	Tier 1