

THE ANALYSIS & TECHNICAL UPDATE TO THE

COLORADO WATER PLAN

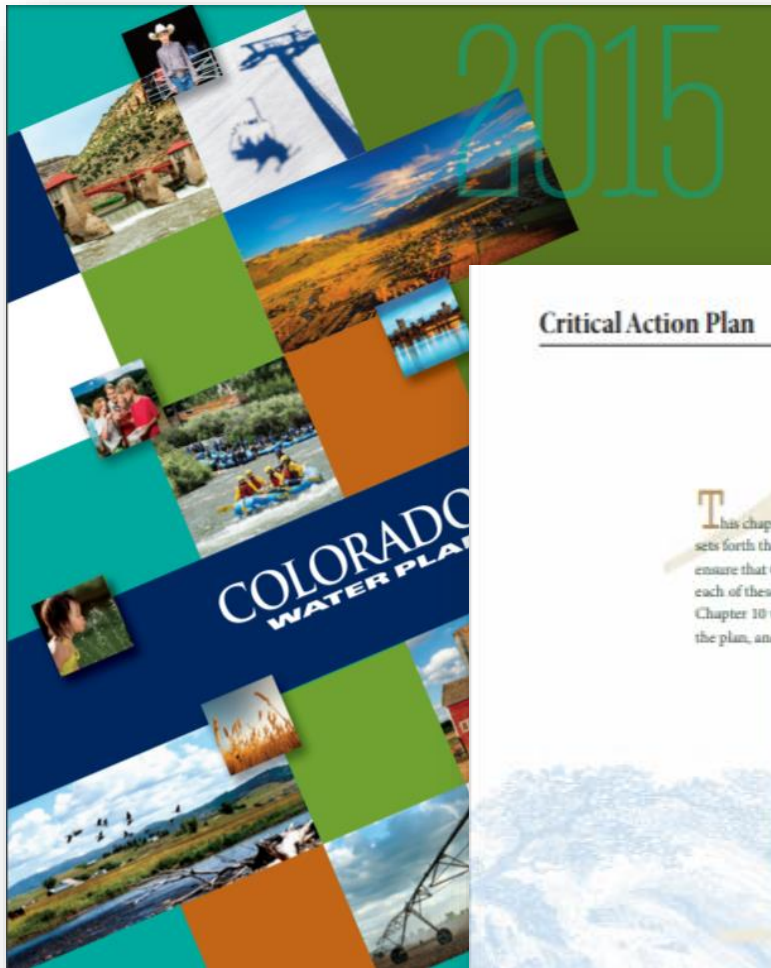
LAUREN RIS &
GREG JOHNSON



COLORADO
Colorado Water
Conservation Board
Department of Natural Resources

ADVANCING THE COLORADO WATER PLAN

LAUREN RIS
Deputy Director
Colorado Water Conservation Board



Critical Action Plan

This chapter further describes each of Colorado's water values, and sets forth the measurable objectives, goals, and critical actions needed to ensure that Colorado can maintain these values into the future. We define each of these terms on page 10-3. The high-impact actions included in Chapter 10 were culled from a broader set of actions found throughout the plan, and are also summarized in Appendix H.

10

C. Land Use

- ◆ **Integrate Land Use and Water Planning:** Initiate the use of local land use tools, where appropriate, to reduce water demands for municipalities, and the need to urbanize agricultural lands.

CRITICAL LAND USE ACTION	SECTION	PARTNERS	TYPE
1 Through voluntary trainings for local governments, encourage the incorporation of best management practices in land use for water demand management, water efficiency, and water conservation.	6.3.3	CWCB, DOLA, stakeholders	Programmatic

D. Agriculture

- ◆ **Maintain Agricultural Viability:** Maintain Colorado's agricultural productivity, support of rural economies, and food security (through meaningful incentives and grassroots efforts).
- ◆ **Facilitate Alternative Transfer Methods:** Respect property rights and contributions of the agricultural industry by establishing alternative options that compete with, if not out-perform, traditional "buy-and-dry" transactions in the water market.
- ◆ **Support Agricultural Conservation and Efficiency:** Support Colorado's agricultural industry to make it more efficient, resilient, and able to reduce water consumption without impacting agricultural productivity.

CRITICAL AGRICULTURE ACTIONS	SECTION	PARTNERS	TYPE
1 Establish an education and assistance program for farmers and ranchers to help realize more market-competitive transactions that promote implementation of ATMs, and enable Coloradans to enter the agriculture industry.	6.5, 6.4, 6.3.4	CWCB, CDA	Programmatic
2 Encourage ditch-wide and regional planning to explore system-wide conservation and efficiency opportunities and tradeoffs, the potential for water sharing, and long-term infrastructure maintenance needs.	6.5, 6.3.4	CWCB, agricultural partners, BRTs	Programmatic
3 Provide grants, loans, and technical support to update and improve Colorado's aging agricultural infrastructure, especially where improvements provide multiple benefits.	6.5, 6.3.4	CWCB, BRTs, agricultural partners, other stakeholders	Programmatic
4 Develop model voluntary flow agreement language, facilitation, and technical support to encourage the use of these agreements when paired with irrigation efficiency practices.	6.3.4	CWCB, DWR, agricultural partners, environmental groups, BRTs	Programmatic, state agency policies
6 Explore the development of administrative means to track and administer agricultural conserved water for the purposes of marketing these waters.	6.3.4, 6.4	DWR, CWCB	Process
6 Explore expanded grant funding that supports implementation of ATM projects, related infrastructure, or entities that would help facilitate alternative transfer methods.	6.4	CWCB, BRTs, DWR, stakeholders	Process

MAKING PROGRESS

Since 2015, significant **progress has been made on over 65%** of Water Plan critical actions even though many of the goals extend through 2050.



SUPPLY

Reduce the projected 2050 municipal and industrial gap from 560,000 acre-feet to zero by 2030.



AGRICULTURE

Support agricultural economic productivity and share 50,000 acre-feet using alternative transfer methods by 2030.



FUNDING

Sustainably fund the water plan by raising \$100 million in revenue annually starting in 2020 (\$3 billion by 2050).



CONSERVATION

Achieve 400,000 acre-feet of municipal and industrial conservation of water by 2050.



LAND USE

Ensure 75 percent of Coloradoans live in water-saving communities by 2025.



STORAGE

Attain 400,000 acre-feet of water storage to manage and share conserved water by 2050.



EDUCATION

Improve the level of public awareness by 2020 and engage Coloradoans on key water challenges by 2030.



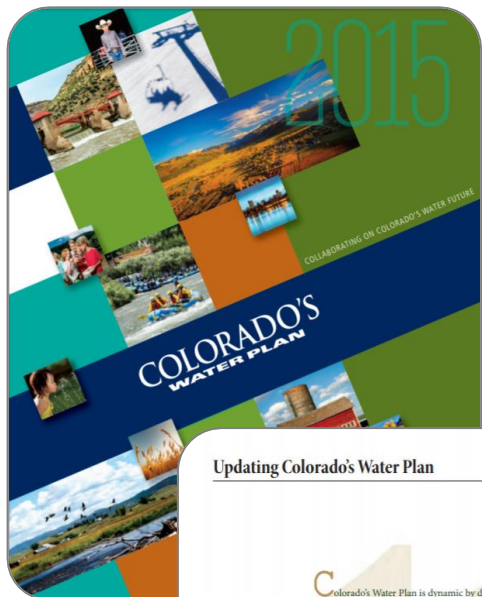
WATERSHED

Cover 80 percent of all prioritized watersheds and rivers with a Management plan by 2030.



ADDITIONAL

Respond to and prepare for natural disasters, climate change and energy needs while protecting interstate matters.



Updating Colorado's Water Plan

Colorado's Water Plan is dynamic by design. The plan addresses today's water challenges with the understanding that our water landscape may change quickly. Colorado's Water Plan will be agile in the face of future uncertainty regarding both water supply and demand, and will include advancements in water resource management to meet these changing conditions.



TABLE 11-1

CYCLICAL PLANNING PROCESS PROPOSED BY THE CWCB

Product	Year Initiated
Basin Implementation Plans	2013
Colorado's Water Plan	2013
Statewide Water Supply Initiative	2016
Basin Implementation Plans	2018
Colorado's Water Plan	2020
Statewide Water Supply Initiative	2022

CORE GOALS

- On Time.
- Improve Process.
- Advance the Water Plan.
- Engage Stakeholders and Incorporate Feedback.



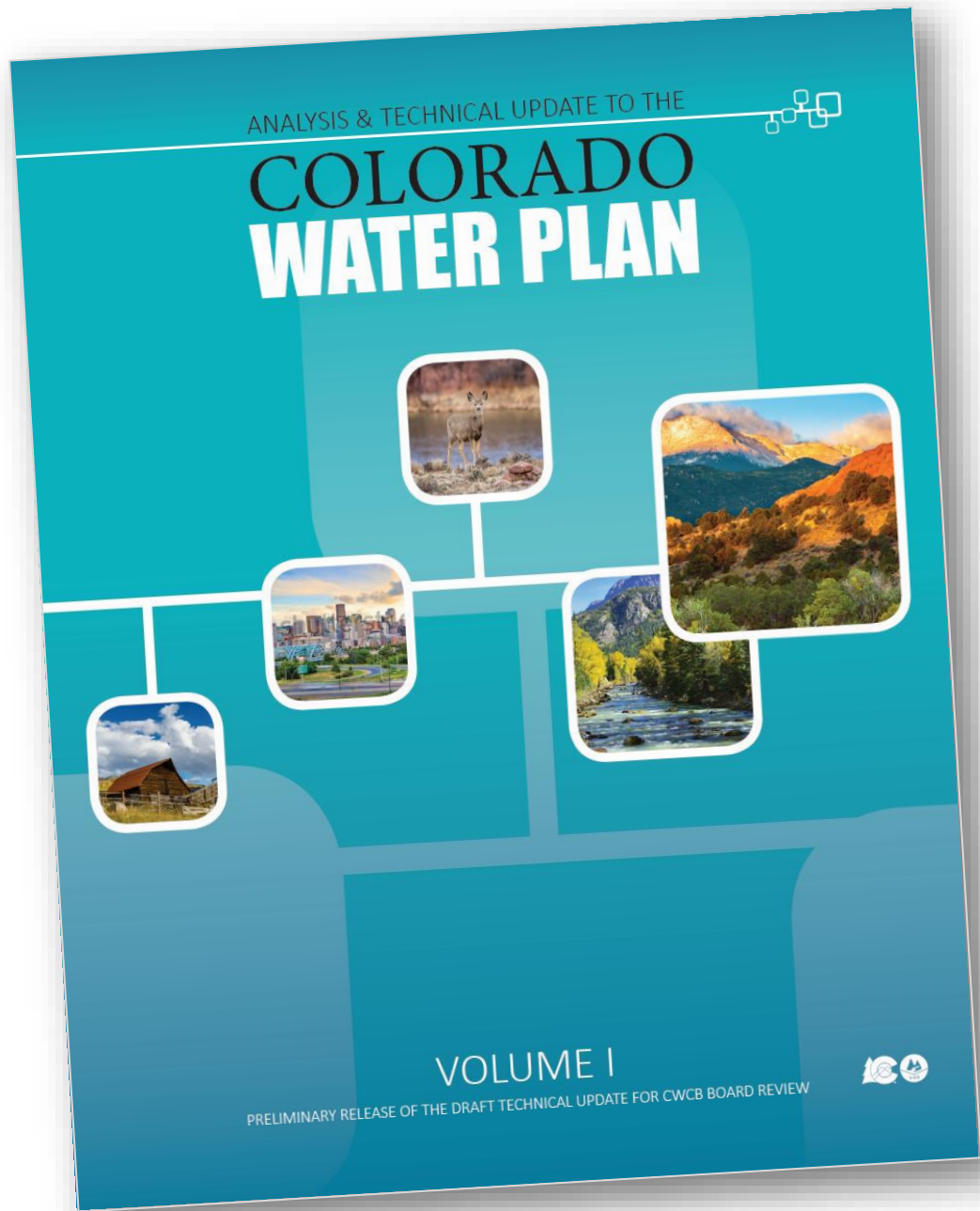
STAKEHOLDER ENGAGEMENT AND INCORPORATED FEEDBACK

GREG JOHNSON

Section Chief

(Water Supply Planning Section)

Colorado Water Conservation Board



ANALYSIS AND
TECHNICAL
UPDATE

BASIN
IMPLEMENTATION
PLAN UPDATES

COMPREHENSIVE
WATER PLAN UPDATE

A

B

C



9

**ROUNDTABLES
PRESENTATIONS**

5

**TECHNICAL
WEBINARS**

8

**TECHNICAL ADVISORY
GROUP MEETINGS**

4

**TARGETED OUTREACH
EFFORTS**

6

**IMPLEMENTATION
WORKING GROUP
MEETINGS**

2

**WORKSHOPS
ON TECHNICAL
TOOLS**

ANALYSIS & TECHNICAL UPDATE TO THE

COLORADO WATER PLAN



VOLUME I

PRELIMINARY RELEASE OF THE DRAFT TECHNICAL UPDATE FOR CWCB BOARD REVIEW



SECTION 5 INSIGHTS, TOOLS, AND RECOMMENDATIONS

In addition to the core analysis of this report, the Technical Update incorporates a set of topic-specific evaluations (insights), supporting tools, and recommendations. These efforts aim to provide insights, assistance and direction to basin roundtables as they update their BIPs and consider solutions for addressing future gaps. Technical memoranda on each of the insights and existing tools are included in Volume 2 (see Appendix A for a full list). An overview of each of these topics is provided in the following subsections and as summarized below:

Insights: Section 5.1 provides a summary of high-level and conceptual analyses on the following focused topics related to implications of supply/demand gaps and key points to consider when developing potential solutions to solving future gaps. Basin roundtables may choose to expand on these analyses if necessary or desirable when updating their BIPs. The analyses focused on the following water-related areas:

- Public values regarding water issues in Colorado
- Overview and case study descriptions of Alternative Transfer Methods (ATM)
- Overview of water reuse mechanism
- Storage opportunities in Colorado
- Economic impacts of failing to solve future projected supply/demand gaps

Tools: Section 5.2 highlights several tools for basin roundtables to use when updating their BIPs. During the Technical Update, the consistency of data across all the existing BIPs was reviewed. The results of this review pointed to a strong need to improve the completeness and uniformity of information on all water supply projects/strategies and related costs. The tools developed in the Technical Update build on prior efforts in the following areas:

- Costing Tool
- E&R Flow Tool
- E&R database
- Projects database

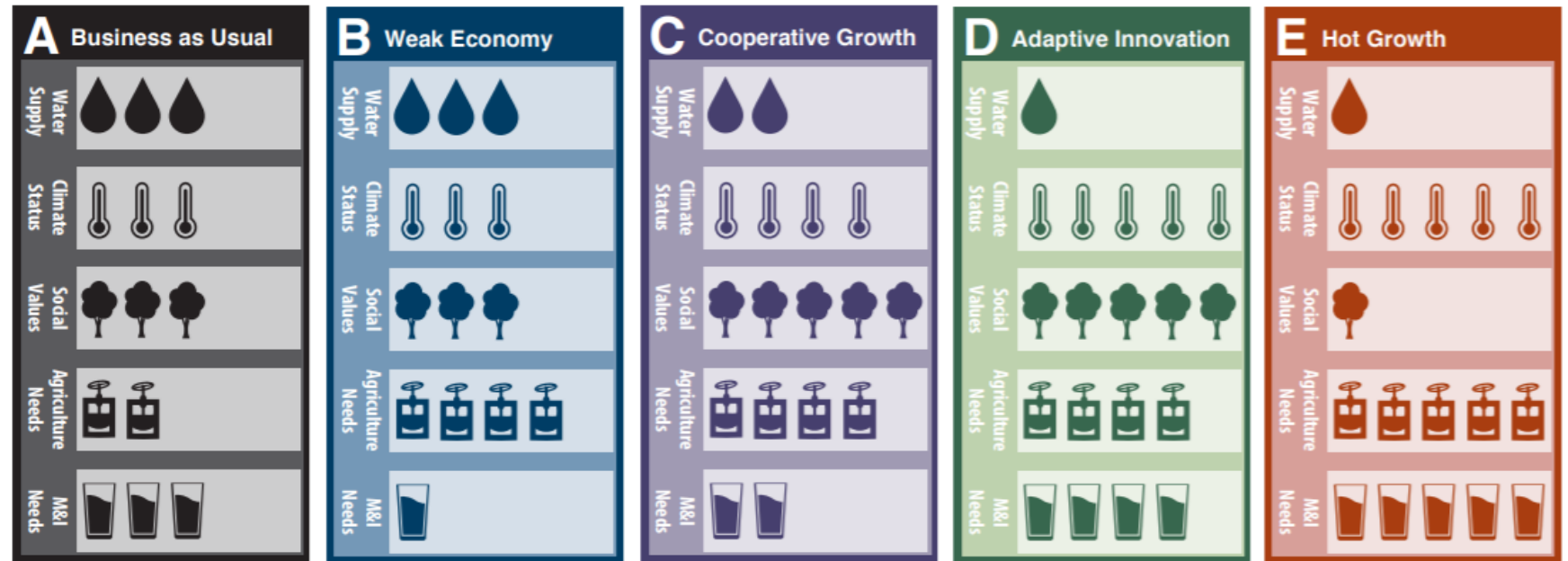
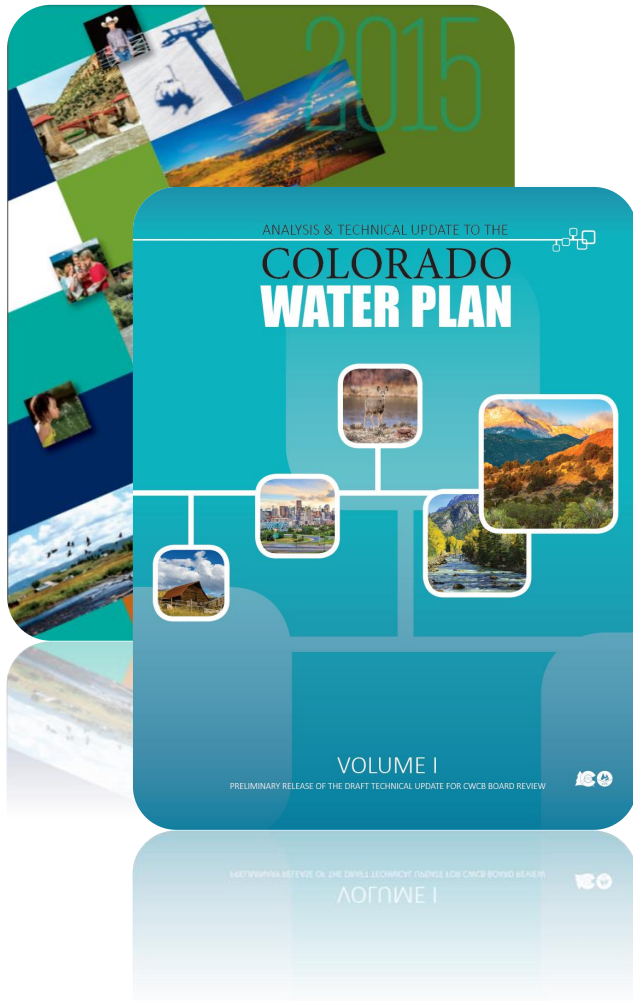
Recommendations: Section 5.3 outlines several recommendations that primarily focus on how to use, enhance, and integrate findings from the Technical Update into the BIP updates. Recommendations stem from multiple stakeholder interactions and divide into five major update areas:

- BIP
- Project
- Technical
- Outreach
- Strategic

WHAT'S NEW ?

NEW APPROACHES IN THE TECHNICAL UPDATE

PLANNING SCENARIOS



- Scenarios in the Water Plan were developed with the IBCC and BRTs
- These scenarios represent equally plausible futures
- Challenge to turn “narratives” into “numbers”

COLORADO DECISION SUPPORT SYSTEM

  **COLORADO'S**
Decision Support Systems
CWCB/DWR

Home | Online Tools ▾ | Software ▾ | Modeling Data ▾ | GIS Data ▾ | Resources ▾ | Map Viewers | About Us

CDSS is proud to be named a Bronze Winner of the
2018 Horizon Interactive Award
for Excellence in Interactive Media Production

 **2018**
BRONZE
WINNER

WATER ALLOCATION MODELS

INPUTS



MODELING



OUTPUTS

1. Water Demands

(Diversion Demands Ag and Municipal)

2. Water Supplies

Surface Water Allocation Models:

- Existing Infrastructure
- Water Rights
- River Operations

1. Met Demands

2. Available Supply

3. Gaps

4. Streamflows

5. Storage Levels

AG GAPS PARALLEL WITH MUNICIPAL GAPS



METHODS:

AGRICULTURAL DIVERSION DEMANDS

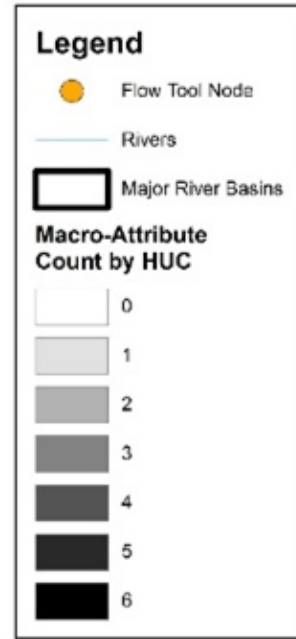
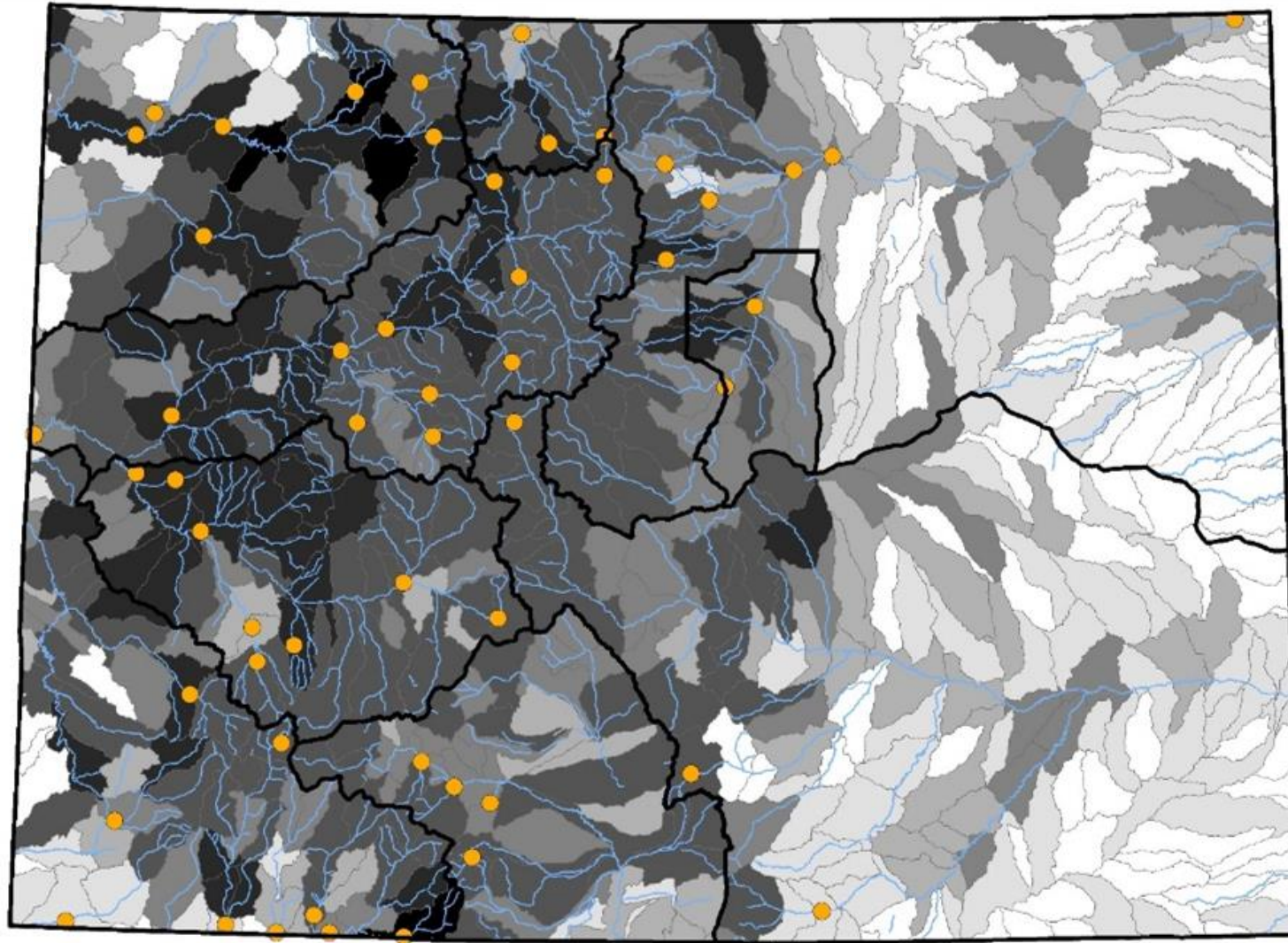


The amount of water supply that needs to be diverted or pumped to meet the full crop irrigation water requirement.

**EVALUATING RISKS TO
ENVIRONMENT & RECREATION
WITH NEW TOOLS**

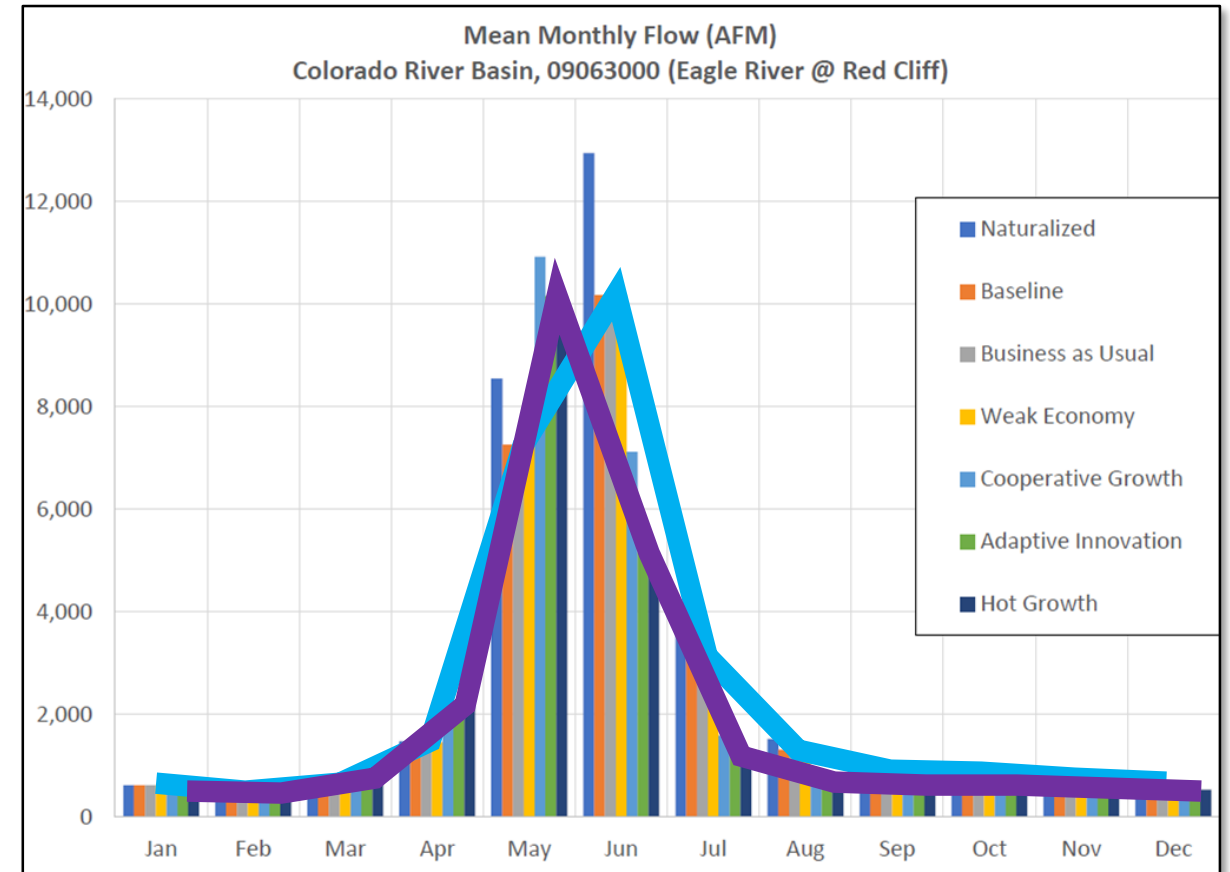


ENVIRONMENTAL FLOW TOOL

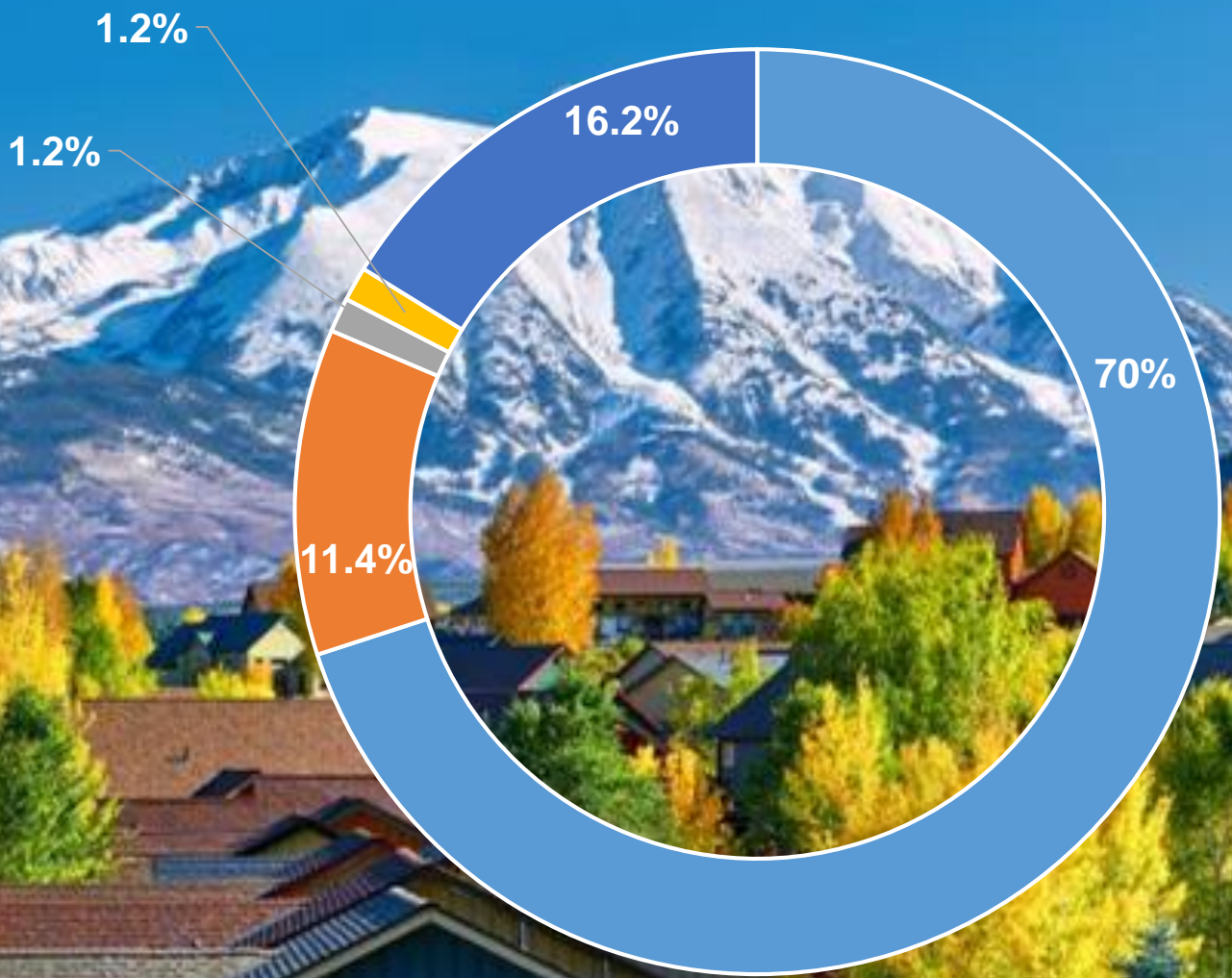


PEAK RUNOFF CHANGES IMPACT E&R ...AND EVERYTHING ELSE IN COLORADO

- Increases risk to streams, fish, recreation, etc.
- Increases need for late season water (e.g. outdoor)
- Exacerbates fire, flood and drought risks
- Impacts storage capabilities and operations



MUNICIPAL DEMANDS & CONSERVATION DATA

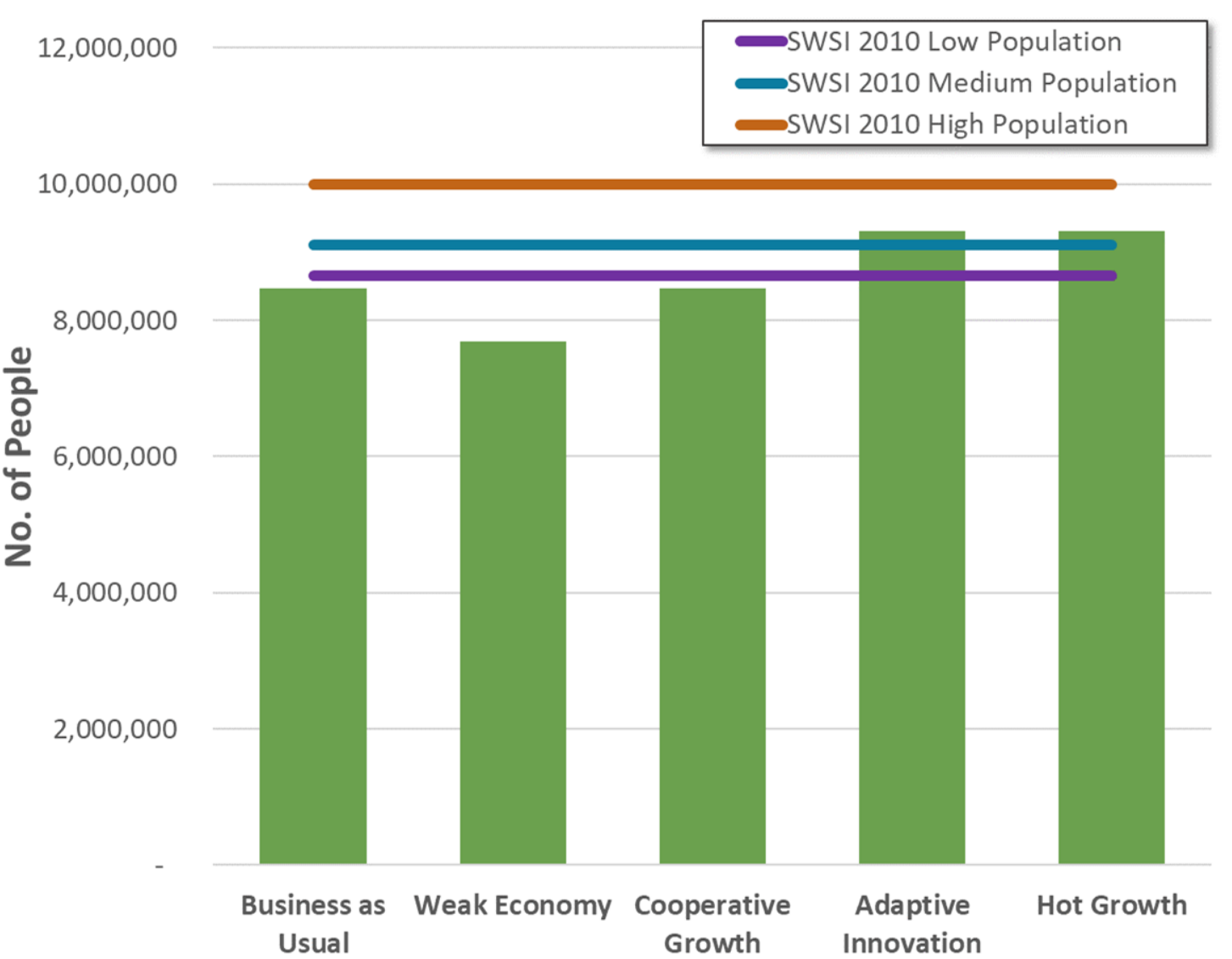


- 1051 Reporting
- Efficiency Plans
- Outreach
- BIPs
- Estimated

REVISED POPULATION ESTIMATES FROM SDO

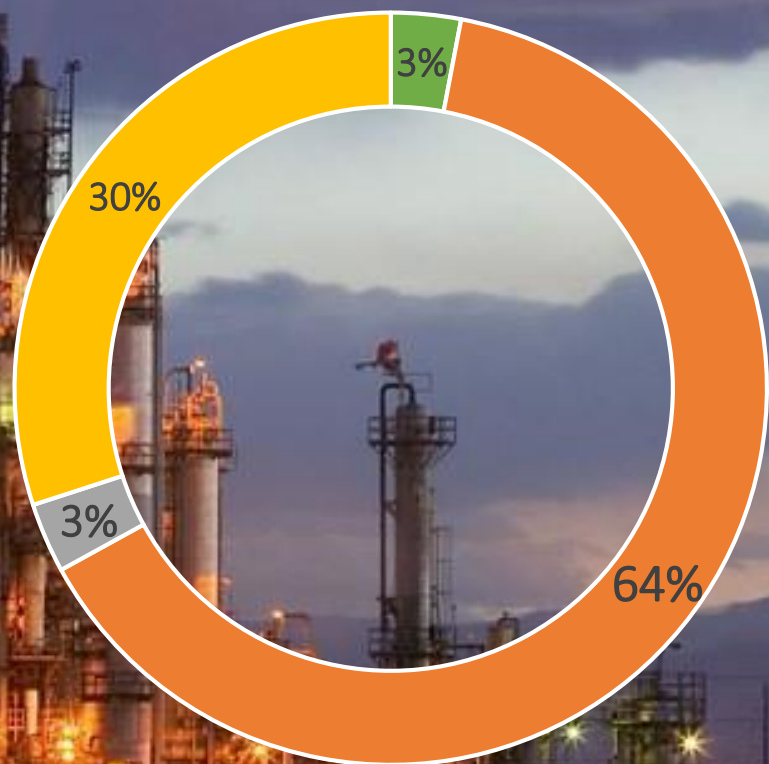
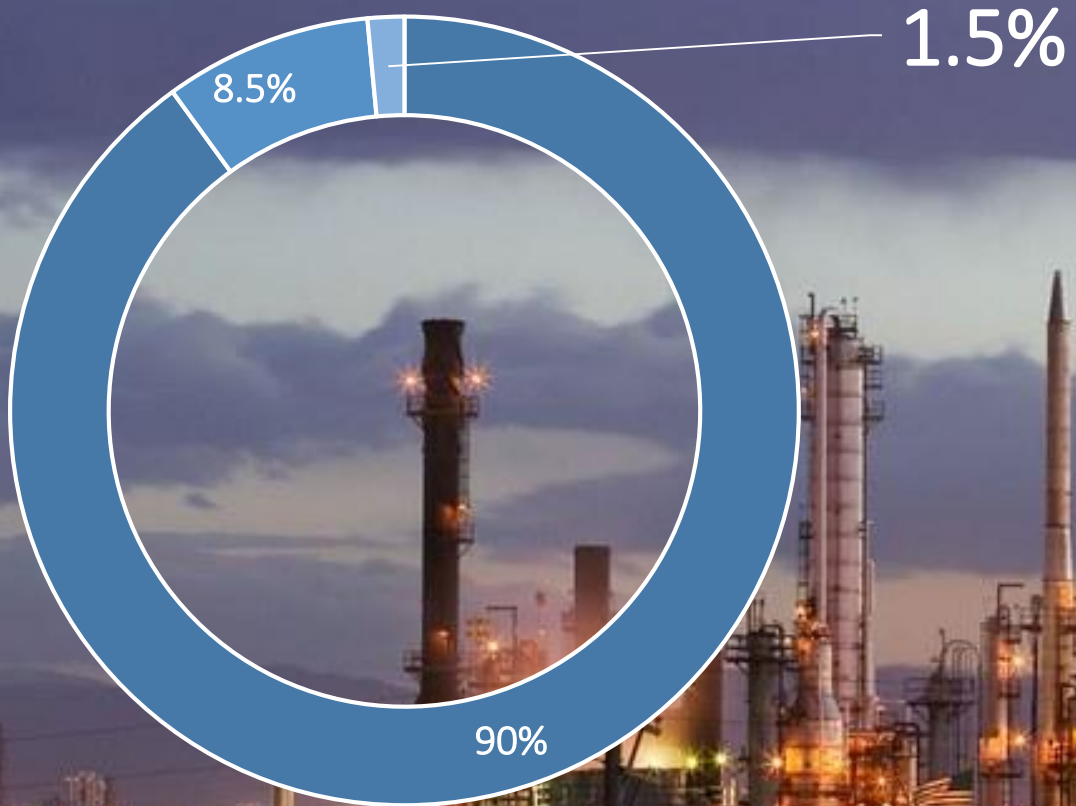


STATEWIDE POPULATION PROJECTIONS ACROSS THE 5 SCENARIOS



INDUSTRIAL WATER DEMANDS

Industrial Sector Breakdown *(for Self Supplied Industrial)*

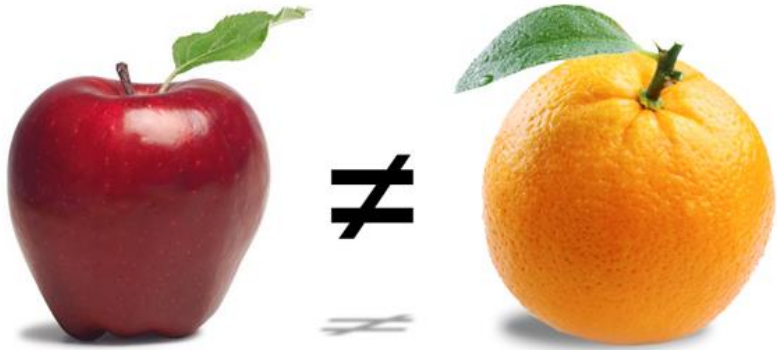


- Agriculture
- Municipal
- Self Supplied Industrial
- Energy Development
- Large Industry
- Snowmaking
- Thermoelectric

RESULTS

OF TECHNICAL UPDATE ANALYSES

COMPARING GAP NUMBERS



COMPARING THE 2015 WATER PLAN GAP NUMBERS TO GAPS IN THE TECHNICAL UPDATE

SIMILAR GAPS. ABSENT PROJECTS. LOWER POPULATION. LOWER DEMANDS.

1 Gaps Absent Projects

Gap projections in the Technical Update do not include estimates of basin identified project yields. This is primarily due to a lack of specific project data that would allow projects to be modeled. Forthcoming basin plan updates will reevaluate projects and consider strategies to address gaps.

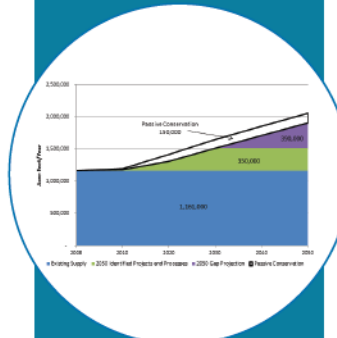
2 Gaps Across Scenarios

Unlike past projections which estimated high, medium and low gaps at 2050, the Technical Update identifies 2050 gaps for each of the five scenarios in the Water Plan.

3 Gap Influences

Some of the main drivers (population; climate) and assumptions (storage operations) heavily influence the gaps in the Technical Update. Population projections, while lower than in previous analyses, remain a major driver of demands. Climate change is included in three of the five scenarios, which drives irrigation, streamflow and storage timing. Modeled storage operations maximize the use of stored water to meet demands and lower gaps.

GAPS SHOWN IN THE 2015 WATER PLAN



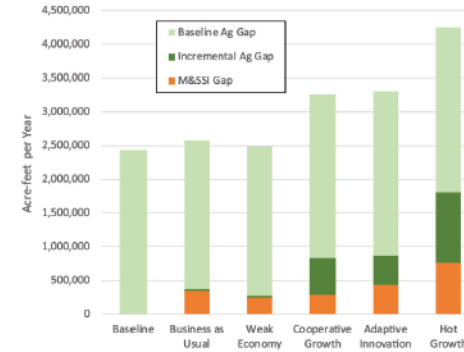
190K - 630K AFY
2050 M&I GAP

250K - 750K AFY
2050 M&I GAP

1,722,000 AFY
2050 AG SHORTAGE

23,000 - 1,053,000 AFY
2050 INCREMENTAL AG GAP

GAPS SHOWN IN THE 2019 TECHNICAL UPDATE



4 Gap Mitigation

When basins reevaluate plans it will be important to evaluate core projects that represent low-regret actions to meet future needs under any scenario. The Adaptive Innovation scenario, for example, illustrates how adaptive actions (e.g. efficiency) can help offset impacts from climate change and population growth.

5 Gaps: Max, Average & Incremental

Gaps are shown in a manner that reflects the difference in how M&I and agriculture plan in any given year. Feedback on earlier studies suggested that agriculture gaps may have been overstated because many agricultural producers live with annual shortages (especially in over-appropriated basins).

To address this, agricultural gaps are expressed in terms of average and incremental gaps — the degree to which gaps may increase in the future. Maximum agricultural gaps can also be found in the Technical Update results. At the same time, M&I gaps are primarily expressed in terms of maximums, which is consistent with firm yield planning.

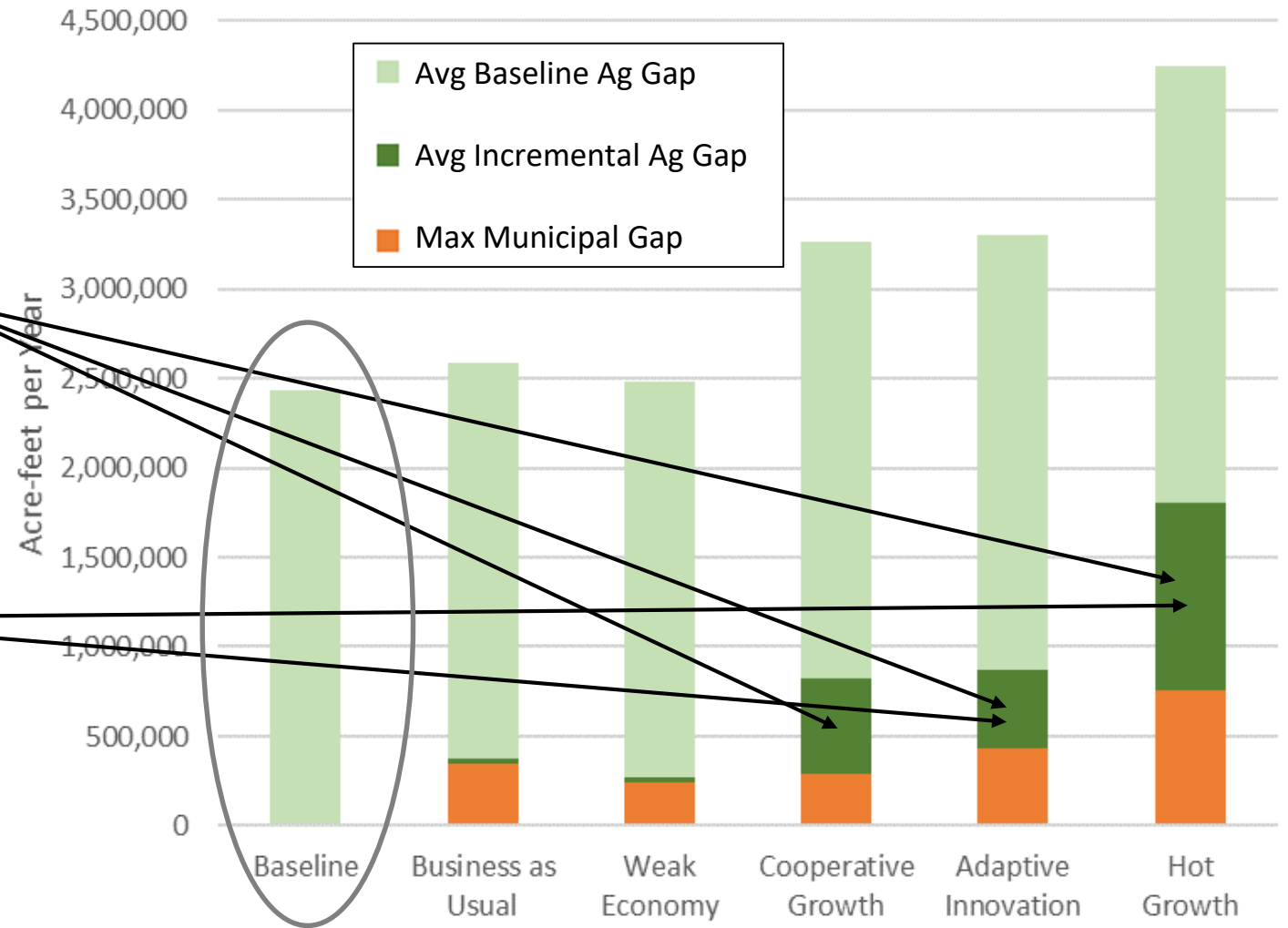
2020 AG SHORTAGE
1,722,000 AFY

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23,000 - 1,053,000 AFY

GAP ANALYSIS OBSERVATIONS

**Agricultural gaps may increase
18% to 43% beyond baseline**

**Ag gaps are less in the
Adaptive Innovation scenario
than in Hot Growth despite
similar climate**

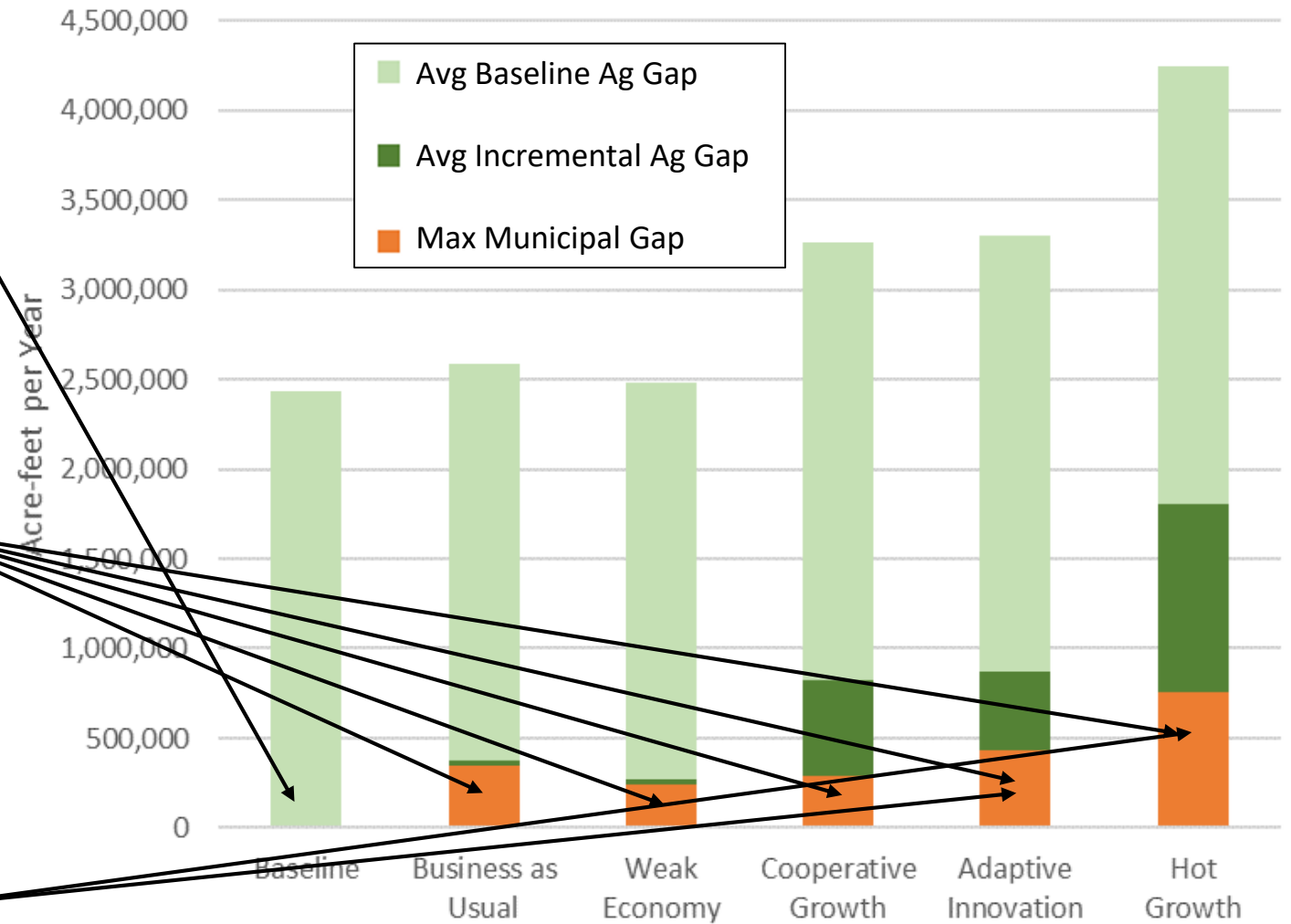


GAP ANALYSIS OBSERVATIONS

No current municipal gap

**Population and climate
will drive future gaps
despite conservation**

**Conservation efforts create
significant future benefits**



GAP ANALYSIS RESULTS

Municipal Gap

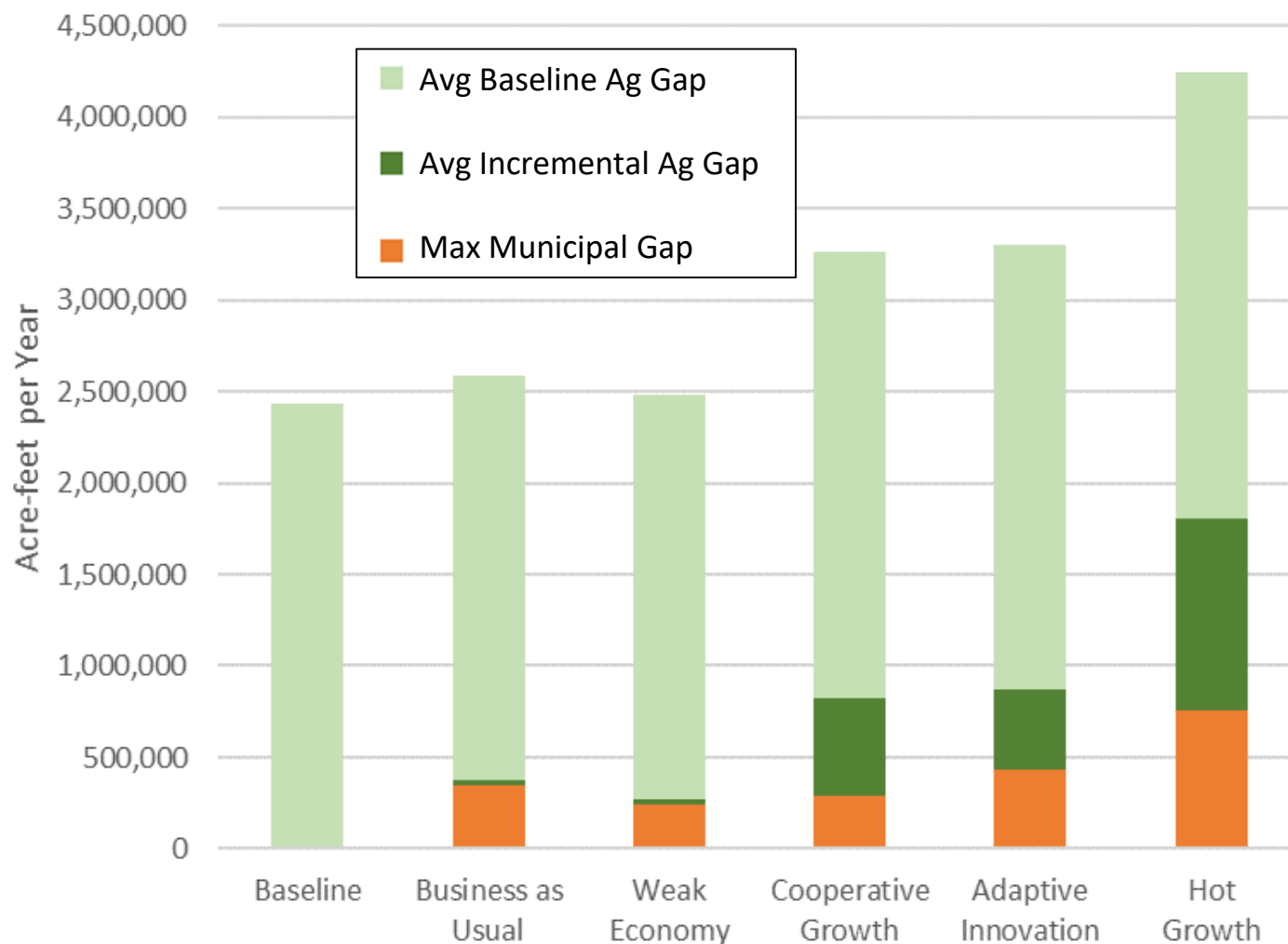
245,000 to 754,000 AF

Total Ag Gap

2,213,000 to 3,379,000 AF

Incremental Ag Gap

23,000 to 1,053,000 AF



The Arizona Basin originates in the central mountains of Colorado near Leadville, then flows southwest through the mountain part of Colorado toward the Sonoran Desert. The Arizona Basin is roughly the largest river basin in Colorado, covering slightly less than one-third of the state's total area. A large amount of land is devoted to agriculture, with one-third of agricultural land requiring irrigation. Irrigation is particularly important throughout portions of the Sonoran Basin, and in the most part, percent drought has heavily affected the basin.

The Arizona Basin comprises 284 aquifers. The waters of the Arizona Basin between Colorado and Arizona, with the exception for the mountain of the San Juan Basin. Since the early 20th century, Colorado and Arizona have negotiated water concerning Colorado River water, leading to the development of rules and regulations to administer the basin's water resources to comply with the compact.

ARIZONA



The North Platte Basin, also known as North Park, is a high-altitude valley covering about 3,000 square miles in north-central Colorado. It is a part of the San Juan Basin and the western portion of the Colorado Plateau. The basin is also affected by the North Platte Recovery Implementation Project (NPRIP), which was developed to manage and mitigate the impacts of the North Platte Basin's recovery. The basin is also affected by the North Platte Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the North Platte Basin's recovery. The basin is also affected by the North Platte Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the North Platte Basin's recovery.

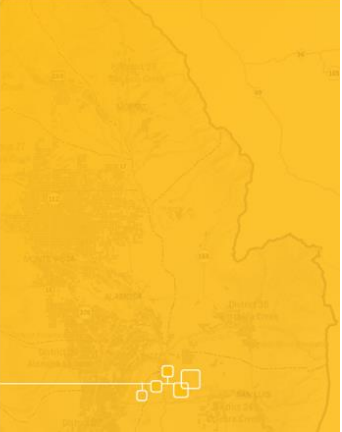
NORTH PLATTE

The Rio Grande drainage basin in Colorado is bounded by the San Juan Mountains to the west, the Sangre de Cristo Range to the north and east, the Colorado Range to the southeast, and the Colorado River to the south. Between the mountains to the San Juan Valley is a large area of agricultural land, which is irrigated by the Rio Grande. The basin is also affected by the Rio Grande Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the Rio Grande Basin's recovery. The basin is also affected by the Rio Grande Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the Rio Grande Basin's recovery.

RIO GRANDE

The San Juan Basin in Colorado is located in the northeastern High Plains. Land uses in the basin are primarily agricultural. The irrigated characteristics of the San Juan Basin, which are similar to the High Plains region of the South Platte Basin, consist mainly of grassland and cropland. The San Juan Basin in Colorado is a part of the High Plains region of the South Platte Basin, which is one of the largest aquifer systems in the United States, extending from South Dakota to Texas.

SOUTH PLATTE / METRO



The San Juan Basin, Colorado Basin, and San Miguel River Basins are located in the southwest corner of Colorado and cover an area of approximately 20,000 square miles. The region is a high-altitude valley, featuring the natural beauty of the region and the agricultural production of the basin. The basin is also affected by the San Juan Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the San Juan Basin's recovery. The basin is also affected by the San Juan Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the San Juan Basin's recovery.

SOUTHWEST

The Yampa, White, and Green Basins cover approximately 10,000 acres in northwestern Colorado and south-central Wyoming. The basin is located in the northern part of the state, and is a high-altitude valley, featuring the natural beauty of the region and the agricultural production of the basin. The basin is also affected by the Yampa, White, and Green Basins' recovery implementation project, which was developed to manage and mitigate the impacts of the Yampa, White, and Green Basins' recovery. The basin is also affected by the Yampa, White, and Green Basins' recovery implementation project, which was developed to manage and mitigate the impacts of the Yampa, White, and Green Basins' recovery.

YAMPA WHITE GREEN

The Gunnison Basin involves access to over 3,000 square miles of western Colorado, extending from the Continental Divide to the south edge of the Colorado and Colorado Basins and Grand Junction. The basin is a high-altitude valley, featuring the natural beauty of the region and the agricultural production of the basin. The basin is also affected by the Gunnison Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the Gunnison Basin's recovery. The basin is also affected by the Gunnison Basin's recovery implementation project, which was developed to manage and mitigate the impacts of the Gunnison Basin's recovery.

STATEWIDE



NEXT STEPS

THE PROCESS MOVING FORWARD

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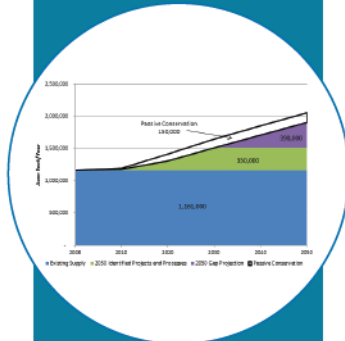
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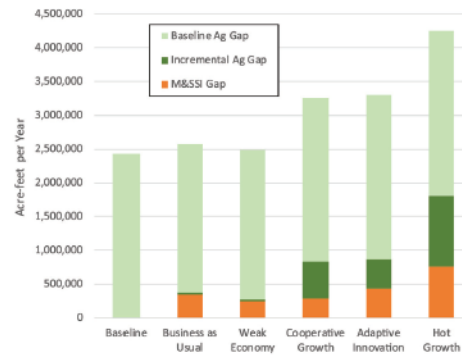
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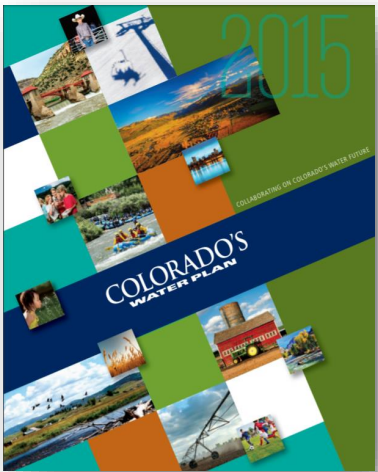
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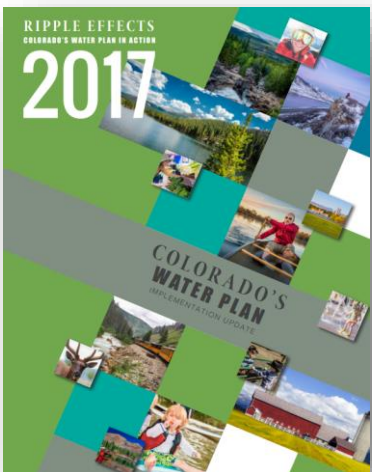
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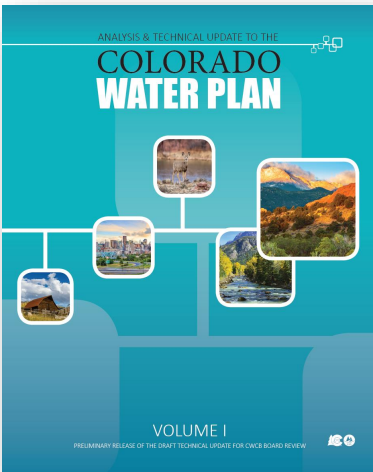
COLLABORATIVE. ITERATIVE. INTERCONNECTED.



2015



2017



2019



2018-2021

2019-2022

**We continue to act on
feedback we collect
from stakeholders.**



1 Better project data is
critical to the BIP updates



2

The first BIP was time-intensive for a volunteer board and the Technical Update is complex.



3 Let's be strategic with our updates and improve the process



STREAMLINING THE PROCESS

- New Tools from the Technical Update
- Looking to Create an IPP Database
- Strengthening Models & Assumptions
- Aiming for Shorter Strategy Documents



“THE DAY WE STOP
PLANNING IS THE DAY
THE WATER PLAN DIES”

- RUSS GEORGE
Director of Compact Negotiations

QUESTIONS?



COLORADO
Colorado Water
Conservation Board
Department of Natural Resources