

THE STATEWIDE WATER SUPPLY INITIATIVE

*The Technical Update to the*

**COLORADO**

**WATER PLAN**

1863





# AGENDA

- Background
- Data Analysis
- SWSI Rollout
- Future Planning



# CYCLICAL PLANNING IN THE COLORADO WATER PLAN

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 able to adapt to future uncertainty regarding both water supply and demand, and will include advancements in water resource management to meet the 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

**ACTIONS**

- The CWCB will work with other state agencies, the basin roundtables, and the people of Colorado to update Colorado's Water Plan, to be completed no later than 2020. The CWCB will develop guidelines for Basin Implementation Plans (BIPs) and use WWSRA grants to help facilitate the development of the BIPs.

2015

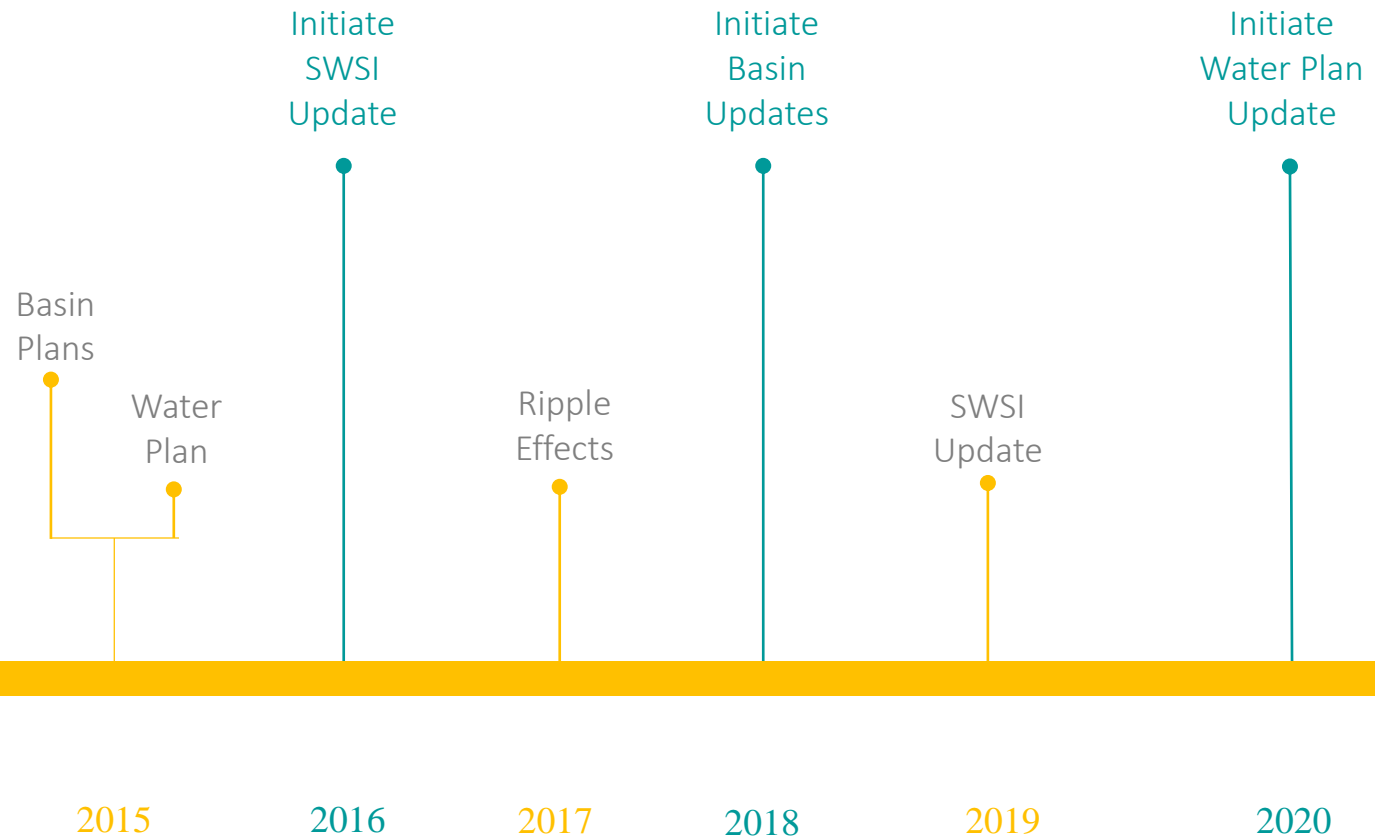
2016

2017

2018

2019

2020

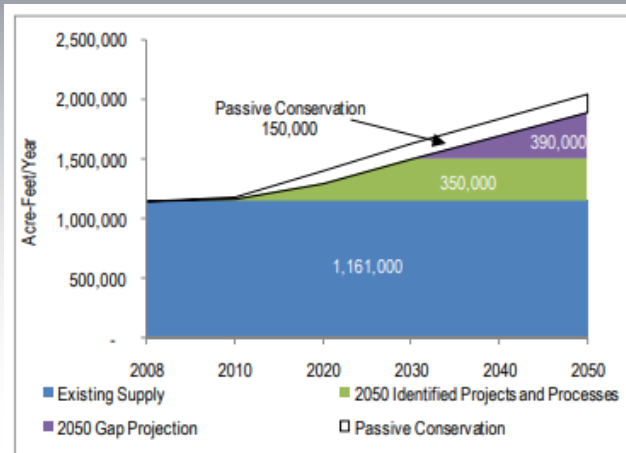


# New Stakeholder-Driven Methodologies

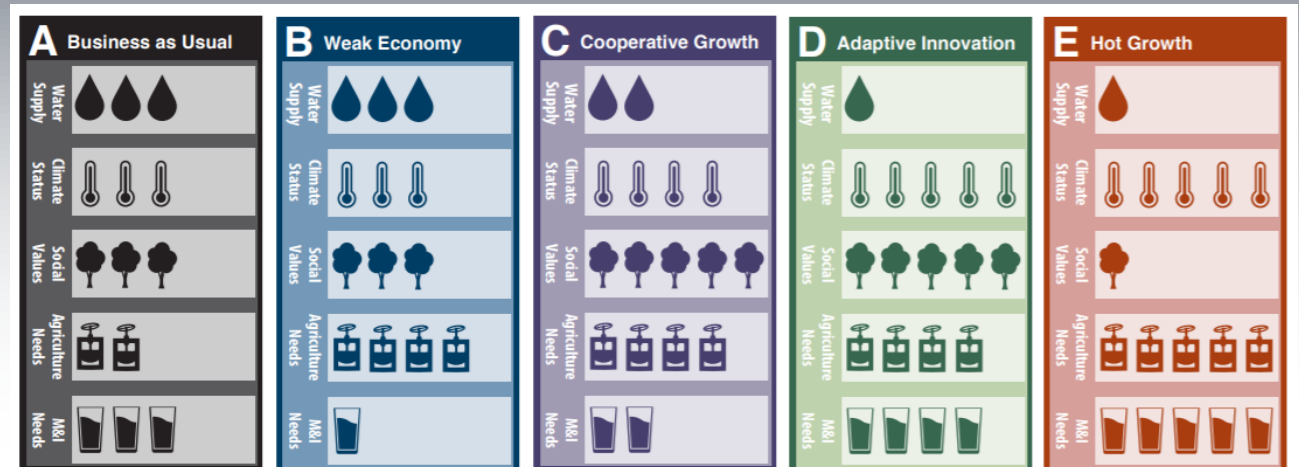
## 2050 Demand Projections

- IPPs

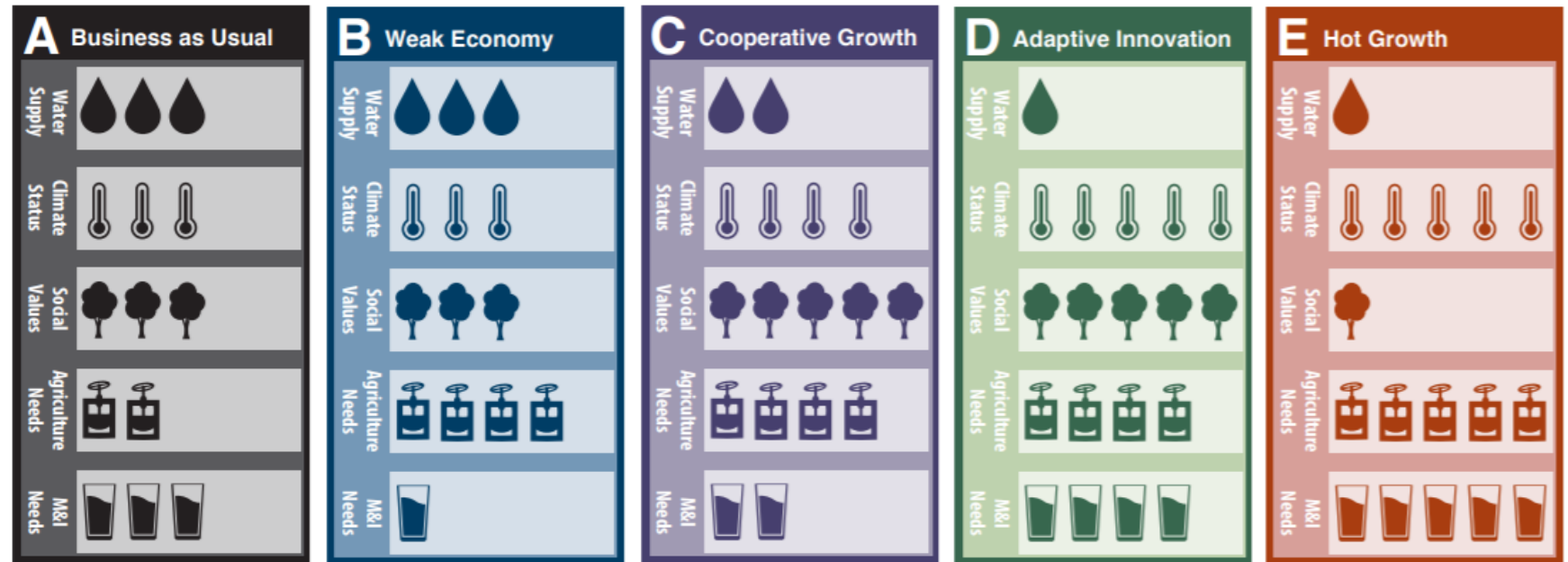
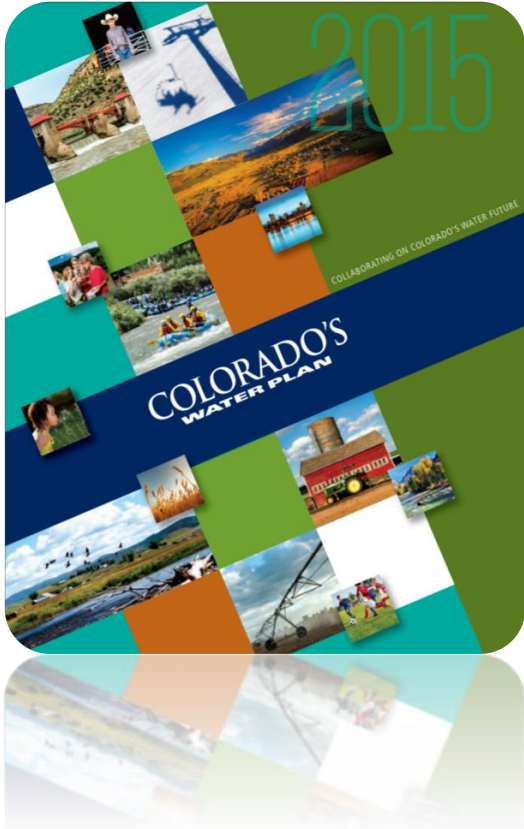
= 2050 M&I Gap



- Hydrologic Modeling
- Municipal Modeling
- Agricultural Modeling
- Environmental Modeling
- Scenario Planning Across Major Drivers



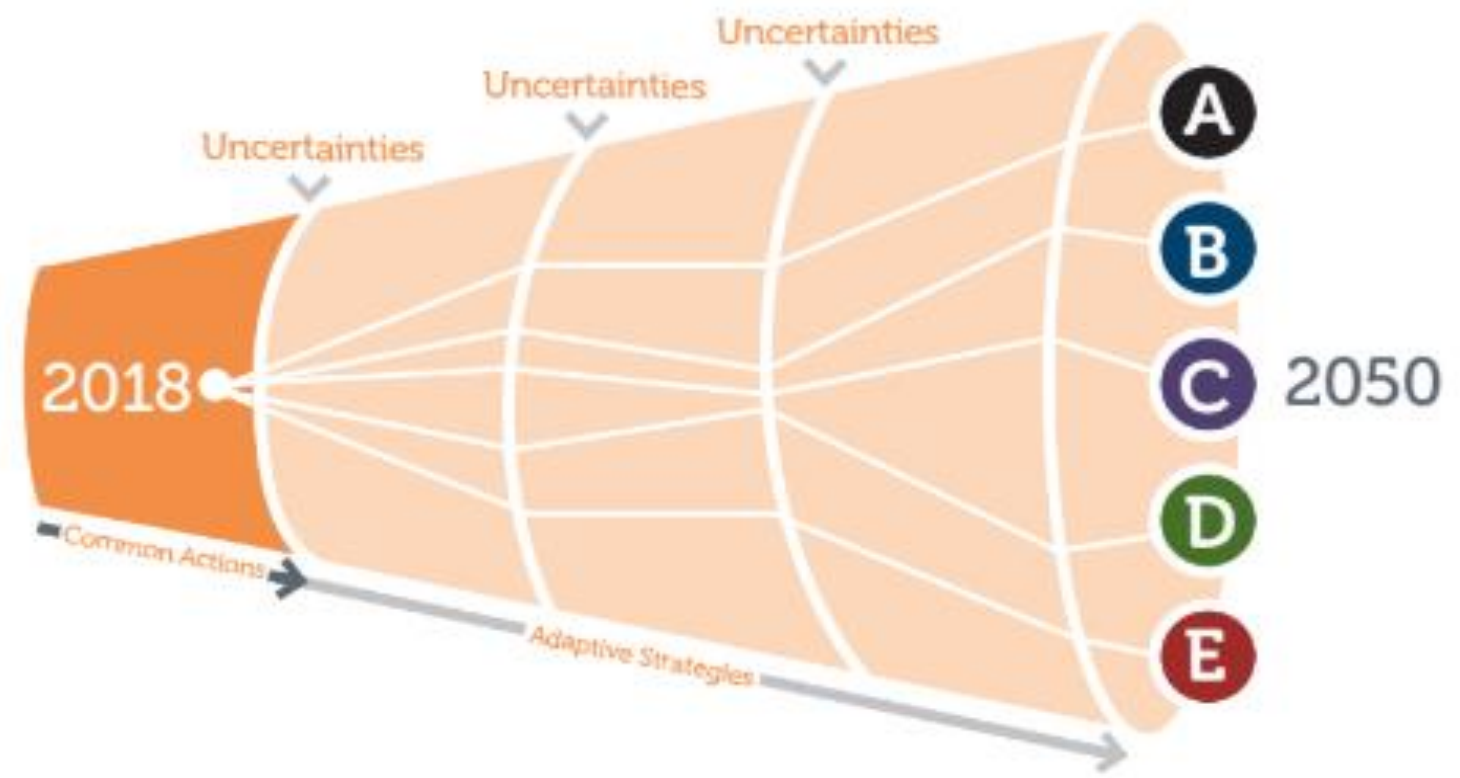
# WATER PLAN SCENARIOS



**NOTE:**

- Scenarios in the Water Plan were named and developed with the IBCC.
- These represent equally plausible futures.

- A** Business as Usual
- B** Weak Economy
- C** Cooperative Growth
- D** Adaptive Innovation
- E** Hot Growth



## FACT SHEET Agricultural Diversion Demand

This fact sheet summarizes the methodologies used to estimate agricultural diversion demands in the SWIS Update.

### Previous Methodology

Water demand and diversions for irrigated crops at the field level were estimated in SWIS 2010. Irrigation water requirements, water supply limited consumptive use, and crop water diversions were estimated and aggregated at a basin level.

### Updated Methodology:

In the SWIS Update, crop water demands will again be estimated. In addition, the river diversion or pumping necessary to meet crop water demands will also be estimated. Total agricultural water demands will account for consumptive needs at the field level plus the conveyance losses or pumping inefficiencies. As a result, agricultural demands (and gaps) will be higher than in SWIS 2010.

### Why did we make this change?

- Allows us to use planning methods to analyze planning scenarios from Colorado's Water Plan.
- Provides information and tools for basin roundtables to use in analyzing "what if" scenarios and for evaluating effectiveness of future projects.
- Provides consistency with estimates of municipal and industrial demands.

### Calculation Process for Current Agricultural Water Demands

JANUARY 2018 | AGRICULTURAL DIVERSION DEMAND METHODOLOGY FACT SHEET

## FACT SHEET Municipal and Self-Supplied Industrial Demand Methodology

This fact sheet summarizes methodologies used to estimate municipal and self-supplied industrial demands in the SWIS Update.

### Overview of Municipal Demand Methodology

Municipal demands for the SWIS Update will be calculated using methodologies similar to SWIS 2010 but will utilize Planning Scenarios and will be enhanced input data. Enhanced input data from 1051 roundtables will be used to estimate municipal demands. A data, Water Efficiency Plans, and Basin Implementation Plans.

### Municipal Demand Adjustments Under Planning Scenarios

Baseline estimates of 2010 population will be based on Colorado State Demography Office economic modeling. Additional adjustments accounting for statistical and geographic variability will be made per scenario-specific considerations.

### Projected Population Growth Through 2050

### Demand = Population \* gpcd

For the SWIS Update, five scenario-specific, county-level population estimates for 2050 will be developed along with scenario-specific per-capita water use rates.

Population Adjustment Driver	Baseline as used	Weak Economy	Cognitive Growth	Adaptive Innovation	Hot Growth
Rate Adjustment	500	Low	500, adjusted	High	High
Climate Conditions	Current	Current	In-between	Hot and dry	Hot and dry

Initial adjustments to future gpcd rates based on drivers such as water efficiency adoption rates, future residential indoor gpcd, outdoor use, non-residential indoor use, and non-revenue water.

### Summary of municipal demand calculation process for each Planning Scenario

JANUARY 2018 | MUNICIPAL AND SELF-SUPPLIED INDUSTRIAL DEMAND METHODOLOGY FACT SHEET

## FACT SHEET Scenario Planning & Gap Analysis

This fact sheet summarizes new approaches and planning concepts that are being adopted for the SWIS Update. Information describing proposed methodologies for specific areas of study (for example, quantification of municipal or agricultural water demands) can be found in other fact sheets in this series.

### Scenario Planning

Scenario planning relies on several planning forms to build multiple, plausible future (or "nonwater") scenarios. In contrast, the SWIS Update will use a single future scenario. The scenarios of future water supply and demand, the SWIS Update will use a single future scenario. The scenarios of future water supply and demand, the SWIS Update will use a single future scenario.

### Gap Analysis

In previous iterations of SWIS, the gap analysis considered net new municipal and self-supplied industrial (industrial) water needs and anticipated yield from identified projects and increases (pumps) in the year 2050. A range of 2050 urban gap was calculated by using high and low baseline water demands combined with higher and lower assumptions regarding the success rate of 1051 agricultural gaps. These also calculated and were defined at the field level as the difference between the irrigation water requirement and water supply applied to municipal gaps. However, these may be evaluated in more detail during future updates of SWIS.

### Potential Impacts of Climate Change

JANUARY 2018 | SCENARIO PLANNING & GAP ANALYSIS FACT SHEET

## FACT SHEET Environmental and Recreation Methodology

This fact sheet summarizes methodologies that will be implemented during the SWIS Update for the Environmental and Recreation component.

### The Environmental and Recreation Database Update

The Environmental and Recreation Database Update will focus on the development of two tools:

- Environmental and Recreation Database Update
- Environmental and Recreation Flow Tool

### Environmental and Recreation Database Update

During the 2010 SWIS process, Basin Roundtables identified projects and methods required to meet the nonconsumptive needs identified as part of their Needs Assessment and focus area development process. In 2010, CWRB developed a survey to collect information on existing or planned nonconsumptive projects, methods and studies. In addition, CWRB facilitated numerous meetings to gather additional data from stakeholders.

### Environmental and Recreation Flow Tool

A database was developed in 2010, known as the "Nonconsumptive Needs Database" to help manage the nonconsumptive data received by Basin Roundtables and other stakeholders. The database included information related to nonconsumptive attributes (Basin, project, and protection).

A significant focus of the SWIS Update will be enhancing the Nonconsumptive Needs Database (note that it is being renamed the "Environmental and Recreation Database" in the SWIS Update). The update of the Environmental and Recreation Database (ERDB) will include the following improvements:

Overall Goal	Action and Results
Enhanced Technical Foundation	Data linking processes will be consistent and streamlined to add efficiency and improve data quality. The Source Water Route Framework will be implemented as a common spatial unit to provide metadata consistency. Existing-based templates for data entry will be developed, which will improve uniformity of data and add efficiency. Standard reports will be developed to enhance consistency of data retrieval. An on-line mapping tool will be developed to increase ease of use and enable visualization of database content. User feedback will be collected to identify improvements.
Engaging and Meaningful User Experience	Integrate into Colorado Water Planning Processes. Includes project identification, project descriptions, etc. making it more useful and meaningful for planning purposes.

The updated database will use the Source Water Route Framework as a common spatial unit for statewide consistency.

JANUARY 2018 | ENVIRONMENTAL AND RECREATION METHODOLOGY FACT SHEET

## FACT SHEET Finance Methodology

This fact sheet summarizes project cost estimating tool that will be developed as a part of the SWIS Update.

As Colorado's Water Plan is implemented, it is critical that the overall cost of proposed projects and methods is understood and presented in a way that enables easy comparison (i.e., "apples to apples"). However, only 1% percent of the projects and methods listed in Basin Implementation Plans included cost estimates. Previous iterations of SWIS have incorporated costing mechanisms developed for strategy and cost analysis and portfolio comparison. The goal of the finance component of the SWIS Update is to build on previous SWIS cost estimation methodologies and develop an accessible and user-friendly tool for Basin Roundtables to use in developing high-level cost estimates of projects and methods.

### The Environmental and Recreation component of the SWIS Update will focus on the development of a cost estimating tool with two modules:

- Projects Module
- Costing Module

### The Projects Module

The Projects Module represents either an entire water project or a component of a large-scale, complex project. It includes an overview of the tool and allows the user to modify global inputs such as project yield, peaking factors, cost indices, and life cycle and annual costs.

The types of projects proposed in Basin Implementation Plans will be pre-loaded into the Projects Module, and the user will be able to customize the parameters associated with their project to reflect specific design and physical characteristics. The output from the Projects Module becomes input to the Costing Module.

JANUARY 2018 | FINANCE METHODOLOGY FACT SHEET

## FACT SHEET Water Supply Methodology

This fact sheet summarizes methodologies that will be implemented during the SWIS Update to estimate current and future water supplies under the various Planning Scenarios. In addition, modeling methodologies that will be used to quantify gaps under the Planning Scenarios will be described.

### Current and Future Water Supplies

Estimates of current water supply information are necessary to understand the amount of water that is physically and legally available to meet current demands, and any additional water supplies that may be available to meet future demands. Current water supply information consists primarily of estimates of "natural flow" at key locations as well as supplies available in reservoirs or conveyed across basins. "Natural flow" is the amount of surface water in the river at particular location above the effect of man, and serves as the foundation of the Colorado Decision Support System (CDSS) surface water allocation model used in the SWIS Update effort.

### Impacts to Water Supplies from Climate Change

CWRB has undertaken several studies and investigations on the impact of climate projections on the future of water use in Colorado. Most notably were the development of the Colorado Climate Plan (CCP), which focuses on observed climate trends, climate modeling, and climate and hydrology projections to assist with the planning and management of water resources in Colorado. The CCP documents the most recent global climate projections (GCMs) and recommends the integration of these results with the previous global climate projections (GCMs) to provide a representative range of potential future climate and hydrological conditions.

Colorado's Water Plan incorporates the impact of climate change and identifies two future potential climate projections for the planning scenarios. The projections reflect "Hot and Dry" conditions and conditions that are in between Current conditions and the Hot and Dry conditions ("In-between"). The climate projections are assigned to the planning scenarios as follows:

Assumes as Usual	Current	In-Between	Hot and Dry
Weak Economy	Current	In-Between	Hot and Dry
Cognitive Growth	Current	In-Between	Hot and Dry
Adaptive Innovation	Current	In-Between	Hot and Dry
Hot Growth	Current	In-Between	Hot and Dry

The effort associated with processing the projected climate data and downsampling the information for use at the Water District level was completed through the Colorado River Water Availability Study Phase II (CROWAS-II) project. This effort resulted in a new series of climate-adjusted "natural flow" hydrology at over 300 streamflow gauging locations statewide for each climate projection. Natural flow hydrology for the In-Between and Hot and Dry conditions differed from Current conditions in various degree depending on location. In general, peak runoff tended to occur earlier than Current in some locations, average annual natural flow tended to be lower than Current in most locations, and frequency/duration of droughts tended to increase.

JANUARY 2018 | WATER SUPPLY METHODOLOGY FACT SHEET

## FACT SHEET Population Projection Methodology

This fact sheet summarizes methodologies that will be implemented during the SWIS Update to project population growth to the year 2050 for each Planning Scenario.

### Population projections, by basin and for the state as a whole, are the primary driver in the municipal and industrial demand projections being developed for the SWIS Update. In the Update, population projections will be developed for each of the Planning Scenarios described in Colorado's Water Plan. The projections will then be used to estimate municipal and industrial demands for each Planning Scenario and will also influence agricultural water demands as the urban footprint is anticipated to expand onto lands currently used for agricultural purposes. Projections of future population have been a key component of past SWIS iterations. Prior population projections conducted by the State Demography Office (SDO) covered the period 2005 to 2035. In past SWIS iterations, a complex process was used to extend the population projections to the year 2050. The process included developing economic forecasts for the state and each county, estimating future labor demands, comparing future labor demands to labor supply, and estimating net in-migration to balance labor markets throughout the state. In addition, high and low growth scenarios were developed.

### The SWIS update will include two primary enhancements to the population projection methodology:

- Adoption of new SDO population projections, which are now available through 2050.
- Taking a simpler approach for developing high and low population projections for various Planning Scenarios.

### Statewide Population Projection

High and low rates of population growth will be projected using statistical methods that consider the SDO growth rate through 2050 and historical growth rates from 1945 to 2010. Thousands of simulations of future growth based on these parameters will be conducted. The estimate of high population growth will be based on the level at which only 10 percent of the simulations predict higher growth. Similarly, low population growth will be based on the level at which only 10 percent of the simulations predict lower growth.

JANUARY 2018 | POPULATION PROJECTION METHODOLOGY FACT SHEET

## FACT SHEET SWIS Update Overview

This fact sheet provides an overview of the context, process, and features of the current update to the Statewide Water Supply Initiative (SWSI).

### Context

The current SWIS Update is the first iteration of SWIS to be conducted in the context of Colorado's Water Plan (CWP) and the Basin Implementation Plans (BIPs) that were developed in Colorado's eight major river basins. Prior iterations of SWIS included components (such as portfolios of projects and methods to meet future gaps) that are now exclusive to the BIP & CWP process. As a result, the SWIS Update will be a technically-focused effort to develop analysis tools and data sets that will be useful to the basin roundtables, water managers, and the public for planning and education purposes. The SWIS Update results will provide more detailed scientific information to help guide basin roundtables as they update their BIPs, which in turn will serve as the backbone for the next update to CWP.

### Features of the SWIS Update

The SWIS Update addresses a wide variety of new questions, processes, and tools.

#### New Questions

The SWIS Update will estimate future available water supplies and gaps under the five different planning scenarios described in CWP. Previous iterations of SWIS were conducted prior to CWP and therefore did not consider the constraints. The planning scenarios incorporate water supply and demand drivers associated with the potential effects of climate change, population growth, and many other factors.

#### New Processes

In three BIPs, the basin roundtables cataloged various projects and methods to irrigate future water supply gaps. The SWIS Update focuses on developing tools and more detailed datasets to help the basin roundtables update their portfolios and of projects and methods for meeting future water needs in a targeted manner with forthcoming updates to their BIPs.

#### New Tools

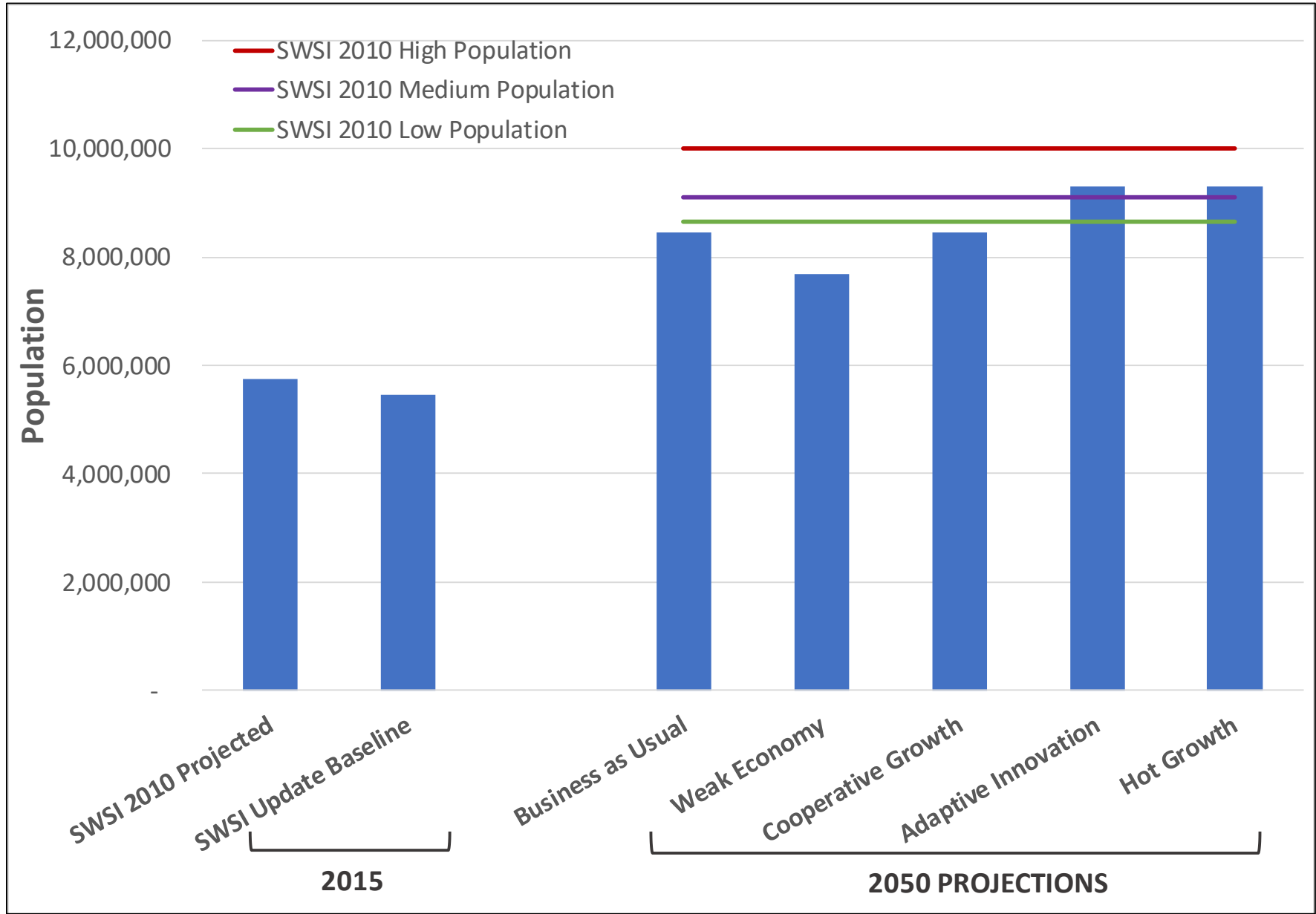
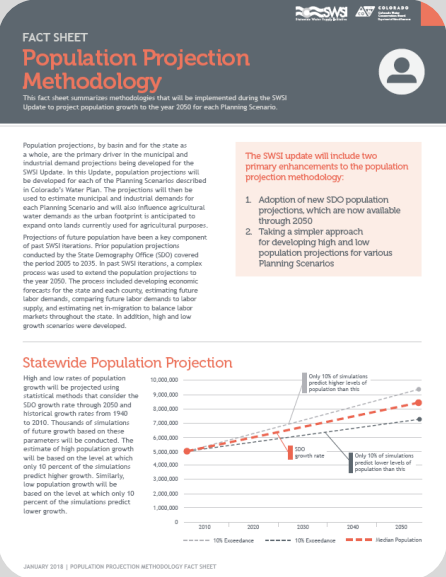
New analysis tools and data sets have been developed since the last iteration of SWIS. Consumptive water and surface water allocation models are now available in most river basins. Municipal water demand and conservation data is available via 1051 reporting. The availability of these new tools and data sets allow for a more robust approach to assessing future water availability and gaps.

JANUARY 2018 | SWIS UPDATE OVERVIEW METHODOLOGY FACT SHEET

Methodologies were guided by Technical Advisory Groups (TAGs) from across the basins.



# DRAFT Statewide Population Projections





FACT SHEET

Finance Methodology

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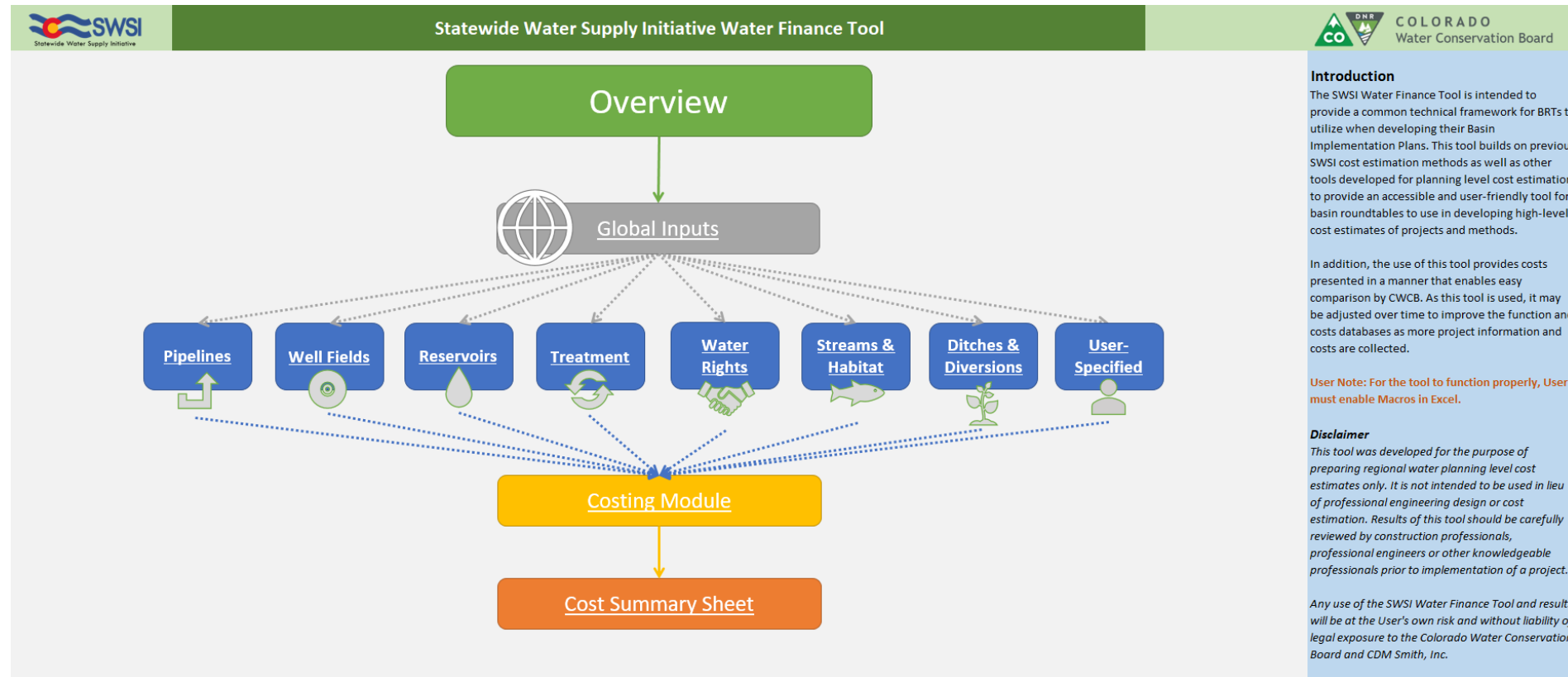
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JANUARY 2018 | FINANCE METHODOLOGY FACT SHEET

# COSTING TOOL



## TOP THREE THINGS WE HEARD



### **PROVIDE A TOOLBOX**

for SWSI users that includes messaging, infographics and presentations



### **TELL THE SWSI STORY**

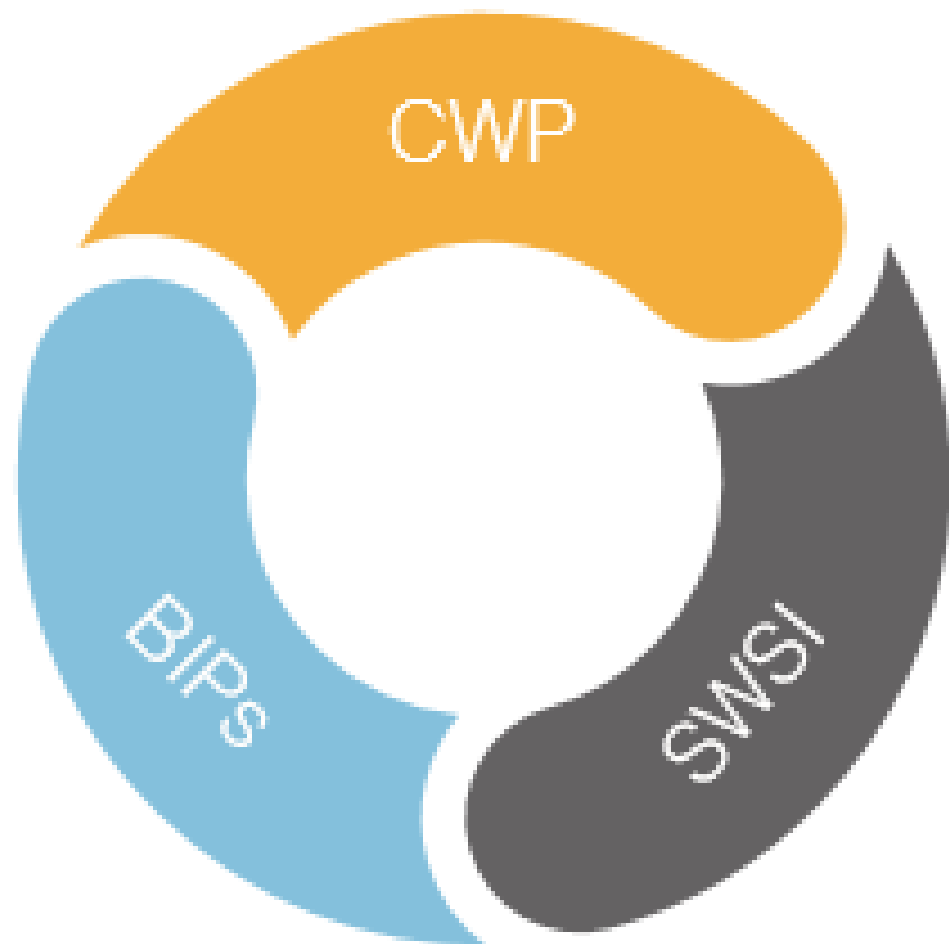
about its evolution up to today to help users understand the limits of its data



### **UNIFY THE BRANDING**

by rolling the SWSI Update into the larger story of Colorado's Water Plan it will show they are interrelated

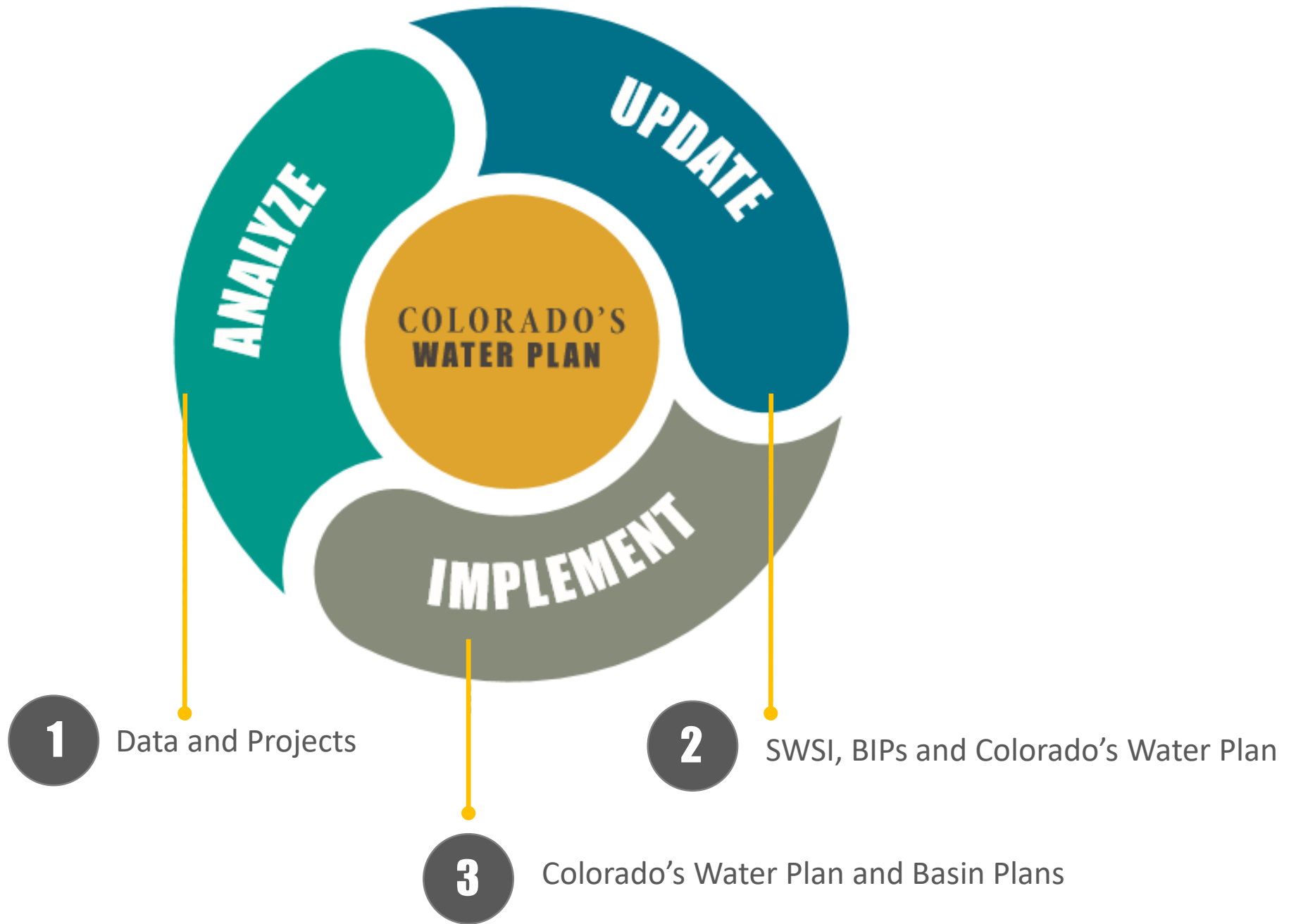




# DEATH BY **ACRONYM**







## **PHASE 1**

### **NOW - DEC**

- Modeling
- Roundtable Tour
- Data Visualization
- Initial Data Release

## **PHASE 2**

### **JAN - JULY**

- Working Group
- Tech Webinars
- Report Release

## **PHASE 3**

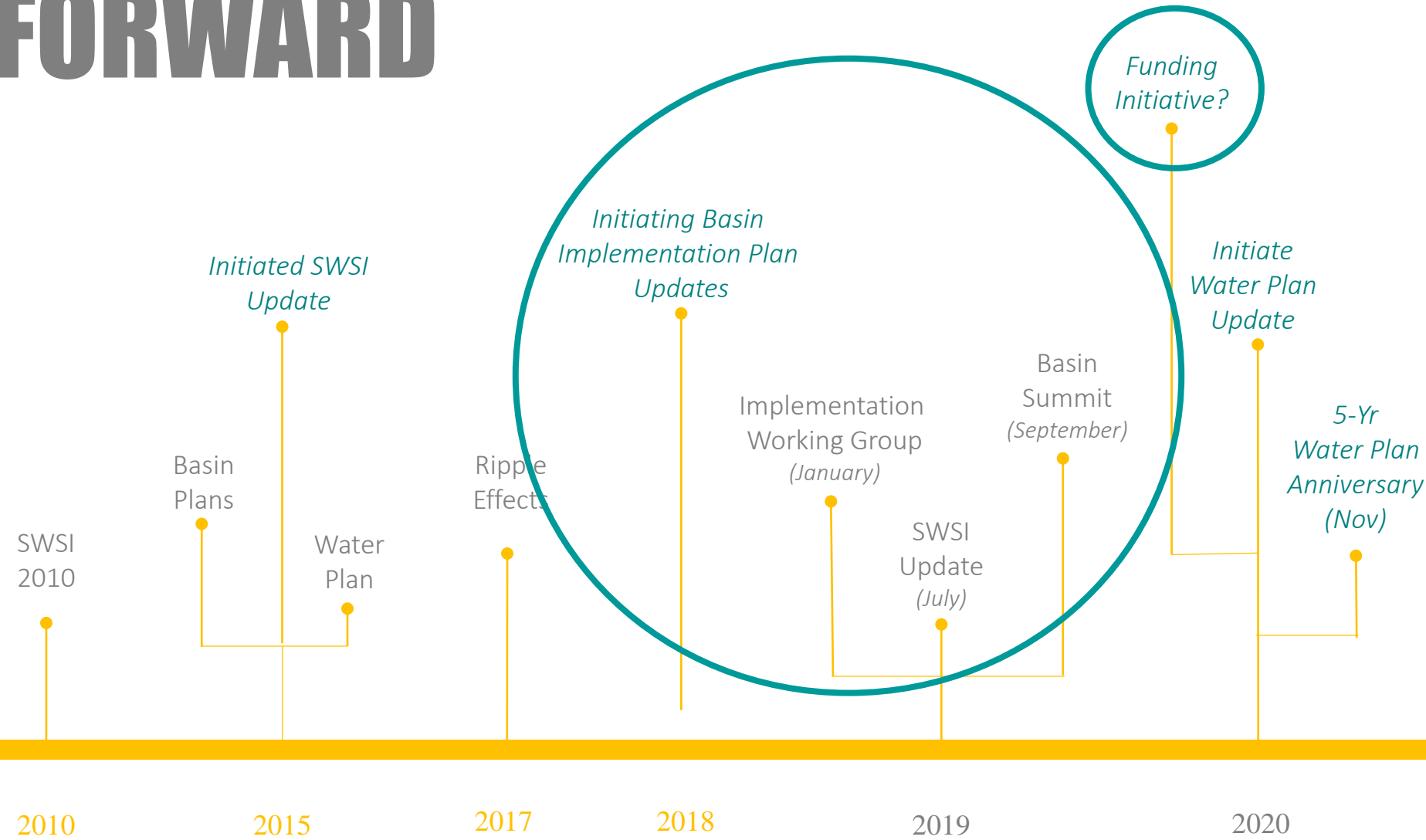
### **AUGUST - BEYOND**

- Roundtable Summit
- BIP Updates

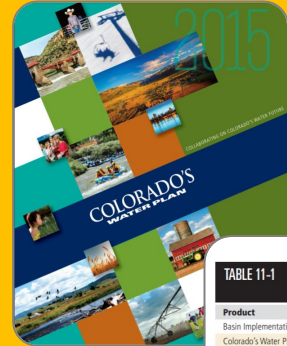
**PHASED OUTREACH**



RECENT HISTORY & THE PATH  
FORWARD



COLORADO WATER PLAN  
**CHAP. 11**



**TABLE 11-1 CYCLICAL PLANNING PROCESS PROPOSED BY THE CWCB**

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**ACTIONS**

CWCB will work with other state agencies, roundtables, and the people of Colorado to update Colorado's Water Plan, no later than 2020.

CWCB will develop guidelines for Basin Implementation Plans to help facilitate the implementation of the BIPs.



Sets goals to initiate the updates to SWSI (2016), BIPs (2018) and CWP (2020)

# 8 THINGS WE HEARD:

- 1) Focus on Projects (Funding is Down)
- 2) Basin Updates Take Time
- 3) Better Project Metrics (61%)
- 4) Working Group (65%)
- 5) CWCB Support (88%)
- 6) Retain Basin Control
- 7) Roundtable Summit
- 8) Utilize SWSI Findings





### **SWSI Integration**

- Standardization + Support
- IPP Database
- HB-1051 Updates

### **Basin Updates**

- \$ to Roundtables (% avg BIP cost)?
- Central BIP + IPP Document
- Contractor/BIP Coordination + Standardization

### **Water Plan Update**

- CWP Scoping, Update and Printing
- Statewide Survey
- Engagement and Innovation

# IMPLEMENTATION WORKING GROUP

1. **Concept Exploration – What will we tackle?**  
*- Expectations, SWSI Guidance and BIP Updates*
2. **Sign Posts – Where should they be set?**
3. **SWSI Toolkit – What is it?**  
*-Data, Communications, etc?*
4. **Standardizing BIP Updates – What are the critical elements?**
5. **IPP Database**  
*- Online Database of Identified Projects & Processes*
6. **SWSI Guidance Chapter Review**
7. **Next Steps – Where to from here?**  
*-Informing the Statewide Basin Summit*

THOUGHTS, COMMENTS OR  
**QUESTIONS?**

