

Building Strong Collaborative Relationships for a Sustainable Water Resources Future:

STATE OF COLORADO

SUMMARY OF STATE WATER PLANNING

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The findings contained in this report are based on the information collected from the literature search and interviews for this initiative and should not be construed as an official Department of the Army position, policy or decision unless so designated by other official documentation.

STATE OF COLORADO

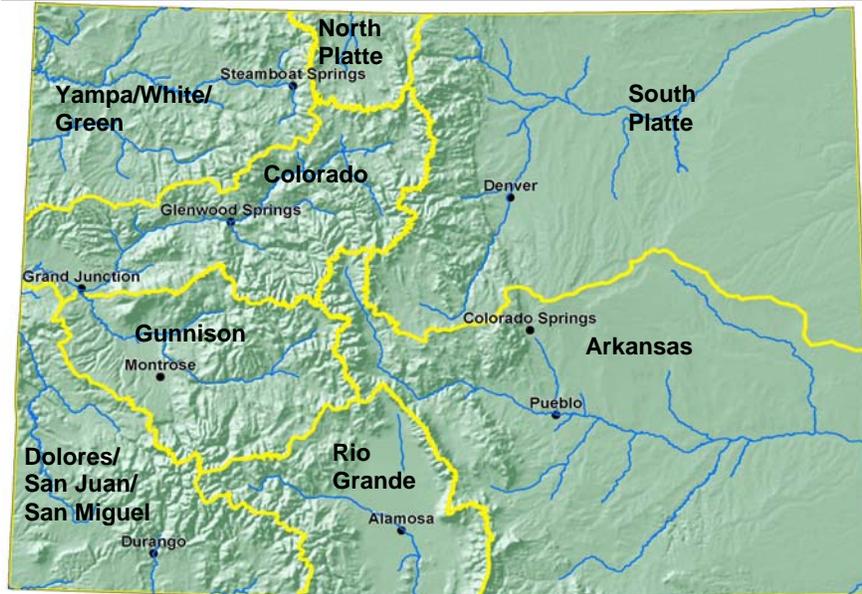


Figure 1. Colorado's Eight Major River Basins

1. RESPONSIBLE STATE AGENCIES/REGIONAL ENTITIES

The Colorado Water Conservation Board (CWCB), located within the Department of Natural Resources, is the water policy agency for the State of Colorado. The CWCB's website <http://www.cwcb.state.co.us/> contains extensive program information regarding water supply planning and management.

Key Agency Contacts at CWCB are:

Jennifer Gimbel, Director – email address jennifer.gimbel@state.co.us

Dan McAuliffe, Deputy Director – email address dan.mcauliffe@state.co.us

The Intrastate Water Management and Development Section is the section within CWCB that coordinates the state water planning efforts at the Direction of the Director and CWCB Board (15 member Board composed of 9 Governor appointed citizens who represent geographic regions of the state and members of the executive branch of state government).

Mailing Address/Phone:

Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80204
Phone (303) 866-3441

The State of Colorado is party to and bound by international treaty, numerous interstate compacts, equitable apportionment decrees, and that govern the use and management of water.

Administration of water rights and compliance with interstate agreements is a key responsibility of the State Engineers Office (SEO), Department of Natural Resources.

Key Agency Contact at SEO:

Dick Wolfe, State Engineer – e-mail address dick.wolfe@state.co.us

Mailing Address/Phone:

State Engineer Office
 1313 Sherman Street, Room 818
 Denver, Colorado 80204
 Phone (303) 866-3581

The SEO is responsible for Dam Safety issues and works with CWCB and the Colorado Division of Emergency Management to address security and the states comprehensive emergency management planning.

The Colorado Department of Health and Environment and Division of Wildlife address water quality and wildlife management, respectively. However, the CWCB has exclusive authority to acquire water for the natural environment.

2. STATE/REGIONAL WATER PLANNING STATUS

The State of Colorado acting through the CWCB has undertaken a statewide “planning” effort. The Statewide Water Supply Initiative (SWSI) was undertaken in 2003 with the goal to “help provide an adequate water supply for Colorado’s citizens and the environment”. SWSI is not identified as a “state water plan” but contains the vital elements of a state water planning process. Based on the success, and the findings and recommendations, of SWSI the CWCB has increased its commitment to and dedicated more resources for planning and addressing Colorado’s water supply future. This effort will be done by the Intrastate Water Management and Development section working with each of the CWCBs sections, and it will focus in part on the following general strategies to meet future water needs:

- Conservation
- Reuse
- Agricultural transfers with a focus on alternatives to the traditional purchase and transfer
- Addressing environmental and recreational needs
- New water supply development and enlarged water storage
- Addressing hydrologic variability due to climate uncertainty

Beyond its broad legislative authority (see the following section for more detail) the CWCB did pass specific legislation to implement SWSI. This legislation in part was needed to provide the funding (appropriation of money) to undertake the effort.

The legislation was Senate Bill 03-110 and the specific excerpt from that legislation is provided below:

SECTION 14. Statewide water supply initiative - appropriation.

(1) The Colorado water conservation board is hereby authorized to contract with a responsible contractor for the purpose of preparing a reconnaissance-level study of a statewide water supply initiative. The initiative will investigate all aspects of water supply and water demand in Colorado over the next thirty years by evaluating water supply and water management project alternatives in each river basin of the state, formulating water development strategies for the implementation of the most promising alternatives in each basin, and building a consensus among the state's water users as to which alternatives and strategies should be pursued for implementation. The initiative is to be conducted in fiscal year 2003-04, with the final report completed by November 15, 2004. Any water development project in the final report shall include consideration of the social, economic, and environmental impacts caused by the project. The board shall provide the report to the senate agriculture, natural resources, and energy committee and the house agriculture, livestock, and natural resources committee of the general assembly on or before December 1, 2004.

(2) In addition to any other appropriation, there is hereby appropriated, out of any moneys in the Colorado water conservation board construction fund not otherwise appropriated, to the Colorado water conservation board, the sum of three million dollars (\$3,000,000), or so much thereof as may be necessary, to conduct the statewide water supply initiative.

(3) The moneys appropriated in subsection (2) of this section shall become available upon passage and approval of this act and shall remain available for the designated purposes until the project is completed.

Highlights of additional legislative authority that guides the CWCB's Intrastate Water Management and Development section is summarized below:

CRS Title 37, Article 60 requires the Board to formulate methods, means and plans; to gather data and information; to foster conservation; to recommend water infrastructure projects; make mitigation recommendations to balance between the development of the state's water resources; and to protect the state's fish and wildlife resources as means to promoting the utilization of the waters of the state. This Program implements the above statutory authority through the projects associated with the findings and recommendations of the Statewide Water Supply Initiative (SWSI).

CRS Title 37 Article 75 defines water resource tasks to be undertaken pursuant to the Water for the 21st century Act and requires the non-duplication of work by the Director of Interbasin Compact Negotiations with the activities undertaken by this CWCB Program. It also requires the development of a common technical platform.

CRS 39-29-108 creates the Water Supply Reserve Account to aid in water resource management and development and requires the Board to develop Criteria and Guidelines in consultation with the Interbasin Compact Commission. These funds will be distributed by the CWCB based on recommendations from Interbasin Basin Roundtables.

Colorado Water for the 21st Century Act

In 2005 the General Assembly passed House Bill 1177 which develops a process for negotiation of interbasin compacts and the equitable division of the state's waters. The legislation draws heavily on the Statewide Water Supply Initiative process and institutionalizes a process to evaluate and negotiate interbasin water issues. The legislation creates an interbasin compact committee and interbasin compact roundtables. The legislation establishes an appropriation and staffing for the Board for implementation of the Act. The Board is required to support the ongoing implementation of this Act.

Collectively the above legislation and other CWCB's authorities provide the framework for long-term planning in the areas of drought, flood, and comprehensive water resource planning and development. The state is currently implementing the above processes.

3. WATER MANAGEMENT VISION AND GOALS

As stated in the authorizing legislation, Colorado's SWSI evaluated at 30 year planning horizon. SWSI was conducted at the major river basin level and summarized: statewide demographic, economic and social setting; physical environment; legal framework for water use; projected water use; water needs; availability of water supply; options for meeting future water needs; framework for evaluating water management and development solutions; basin specific options; and ongoing implementation. Detailed information on each of these topics is found in the SWSI Final Report, November 2004.

Beyond SWSI the CWCB also has a strategic plan that guides the agencies actions the plan can be found at <http://cwc.state.co.us/NR/rdonlyres/8A9400AC-593D-4F10-9D43-5AC651414D6D/0/CWCBStrategicPlan.pdf>.

As stated in the strategic plan, the mission of the CWCB is to: **Conserve, Develop, Protect and Manage Colorado's Water for Present and Future Generations.**

The CWCB has identified the following fundamental goals to help fulfill their mission:

- **Conserve** the waters of the State for wise and efficient beneficial uses
- **Develop** waters of the State to:
 - Preserve the natural environment to a reasonable degree
 - Fully utilize State compact entitlements
 - Help ensure that Colorado has an adequate water supply for our citizens and the environment by implementation of CWCB adopted mission statements and the findings and recommendations identified in the 2004 Statewide Water Supply Initiative
- **Protect** the waters of the State for maximum beneficial use without waste
- **Manage** the waters of the State in situations of extreme weather conditions – both for floods and droughts

The CWCB indicates that it must also maintain and sustain its autonomy and identity with respect to other State and Federal entities, while collaborating and cooperating with local, State

and Federal entities and others, in service to the citizens of Colorado. These Fundamental Goals apply to all of the major programs and projects undertaken by CWCB, and to the staff working within this organization.

Structure, Authority, and Role of the Board

The CWCB was created in 1937. It is responsible for water supply protection, flood protection, water supply planning and finance, stream and lake protection, water conservation and drought planning, intrastate water development and management, as well as the management of related water information and educational materials. CWCB's Major Programs include:

- Water supply protection
- Flood protection
- Water supply planning and finance
- Instream flow and natural lake level protection
- Conservation and drought planning
- Water information and education
- Intrastate water management and development

The CWCB Board consists of 15 members. The Governor appoints one representative Board member from each of the state's eight major river basins and one representative member from the City and County of Denver. All appointees are subject to Senate confirmation and serve three-year terms. The Executive Director of the Department of Natural Resources is an ex-officio, voting member. The Director of the CWCB, the State Engineer, the Attorney General, the Director of the Division of Wildlife, and the Commissioner of the Department of Agriculture are also ex-officio, non-voting members.

To the greatest extent possible, Board appointees are persons experienced in water resource management, water project financing, engineering, planning, and development of water projects, water law, irrigated farming and/or ranching. No more than five appointees can be members of the same political party. By statute, six voting members constitute a quorum for the conduct of business, with six affirmative votes needed for the Board to take a position on any matter.

Statutory authorities and responsibilities of the Board and Board Staff are defined in Section 37-60 and 37-92 Colorado Revised Statutes (CRS). The role of the Board, as defined in the Statute, includes:

- Establishing policy to address state water issues
- Exercising the exclusive authority of the Board to hold instream and natural lake level water rights to protect and improve the environment
- Mediating and facilitating resolutions of disputes between basins and water interests
- Maintaining and upholding fiduciary responsibilities related to the management of state resources including, but not limited to, the Construction Fund and the Severance Tax Trust Fund
- Representing citizens within individual basins

- Identifying, prioritizing and implementing water development projects to be funded using its Funds and when necessary, recommending such projects for approval by the General Assembly
- Making Findings and Recommendations concerning applications for water rights for Recreational In-channel Diversions and defending its decisions in water courts
- Making decisions regarding Watershed Protection Fund grants, upholding fiduciary responsibilities related to the Fund and implementing its own river restoration projects designed to help the CWCB accomplish its mission
- Supporting the on-going implementation of the Water for the 21st Century Act
- Distributing Water Supply Reserve Account Grants and Loans

Identification of CWCB's Customers

All Colorado citizens are the CWCB's customers. Among these citizens, the CWCB works closely with: water users, local governments, federal and state government entities, municipal and domestic water suppliers, ditch and reservoir companies, irrigation districts, water conservancy and conservation districts, environmental, recreation, conservation, and other special interest groups, private (for profit) entities, and special districts.

4. SCOPE OF WATER RESOURCES PLANNING AND MANAGEMENT

The SWSI Executive summary provides an overview of the factors that frame many of the water supply issues and trends facing Colorado. A short excerpt is provided below:

From SWSI Executive Summary, November 2004:

Looking forward, it is hard to predict what Colorado will look like in the coming decades. We do know, however, that 2.8 million more people are expected to call Colorado home by the year 2030. Most of these new residents, almost 2.4 million, will live along the Front Range, but the greatest percentage increases will be seen in the Western Slope and mountain communities. We know these new residents will need water, more water than can be delivered today. Conservation will play an important role, but conservation alone cannot meet all these requirements. New storage projects will be needed and must be pursued, but these can take years or even decades to permit and construct and their success is uncertain. In this setting, cities will increasingly look to agricultural water to meet their needs, creating impacts on rural Colorado that need to be recognized and addressed.

Against this backdrop of change and drought, the Colorado Water Conservation Board (CWCB) determined that it was important to understand and prepare for our long-term water needs.

Beginning in 2001, the CWCB, through its strategic planning process, became very proactive in determining how Colorado uses water, how it will use water in the future, and evaluating how well we are prepared for drought. In 2001 to 2002, CWCB held a series of meetings in each river basin to outline basic issues on water use in Colorado. This effort culminated in

the development of Basin Specific Fact Sheets. Later in 2002, a second set of fact sheets were developed outlining water use, growth, and water demand.

These initial efforts were designed to help Coloradans better understand how we are using our water supplies and to begin to understand major issues regarding water resource management and development. In 2001, CWCB also began to think about conducting an assessment of our drought preparedness. This effort culminated in the completion of the Drought and Water Supply Assessment in February 2004.

These previous efforts produced valuable information and set the stage for a more comprehensive and complete analysis of water supply and demands throughout Colorado. The data and information from these studies helped guide the development of what would become known as the Statewide Water Supply Initiative (SWSI).

With the approval of the 2003 General Assembly, CWCB commissioned SWSI, an 18-month study to explore, basin by basin, existing water supplies and existing and projected demands through the year 2030, as well as a range of potential options to meet that demand. This information will help local communities and water providers as they work to plan, manage, and efficiently use Colorado's surface and groundwater resources.

Water has long been a divisive issue in the West, and thus it was important for this study to establish certain ground rules at the very outset.

Local authority and control: *Providing water for municipal and agricultural users is the purview of local water providers. Consequently, it was important that SWSI not take the place of local water planning.*

Bottom-up, not top-down: *Providers, stakeholders, and communities across Colorado were asked to identify their unique concerns, needs, and issues. SWSI does not take a top-down approach or presuppose what those concerns are or will be.*

All solutions explored: *All solutions, including conservation, rehabilitation of existing water supply facilities, enlargement, and/or more efficient use of existing water supply facilities, as well as new water supply projects, have been and must continue to be considered.*

Adherence to Colorado's Doctrine of Prior Appropriation: *The baseline requirement for any water supply or water management solution is that it must be accomplished within the statutory framework of Colorado's existing water rights and water administration system, incorporating Colorado's Doctrine of Prior Appropriation.*

Two additional ground rules were set after commencement of the study. First, it was determined that the initial 18-month study would not evaluate transbasin diversion issues. This issue is highly charged, and would have threatened the ability of SWSI to produce meaningful results in the initial 18-month study period. Instead, the CWCB determined it would be most productive to focus on in-basin solutions first and undertake a subsequent effort in 2005 to focus on issues that reach across river basin boundaries. Second, following

a tradition of local control over water planning, SWSI would not judge or evaluate the merits or likelihood of success of any of the projects or processes being pursued at the local level. As a result, what is presented in this report is a catalogue of the solutions advanced by local providers.

Trends and Key Drivers for Water Resources Planning in Colorado

An overview of additional social, economic, environmental, technological, political, or security trends is provided below (from SWSI, Executive Summary, November 2004).

Social

Population growth is the most significant factor driving water supply need. Most of Colorado's citizens are on the east side of the continental divide along the urban Interstate 25 corridor. However, the west slope is expected to see an faster overall growth rate. Growth on the west slope is made even more challenging because much of this growth is expected in the headwaters areas where supplies are more scarce, have already been developed and/or where environmental and recreational needs and uses are especially important.

Over the next 30 years Colorado is expected to see a significant reduction in irrigated agriculture (more than 500,000 acres). This is due to the following factors:

- Lack of available supply
- Urbanization of agricultural land
- Purchase and transfer to new uses especially municipal and industrial

This trend has raised significant concerns over the impact that may result. Those impacts include:

- Sustaining locally available food and fiber
- Impacts to rural communities especially where agriculture is the major source of income
- Impacts to open space, wildlife habitat, and wetlands associated with agricultural production

As previously mentioned historically, Colorado used our water primarily for mining, agriculture, and industry, and later for municipal purposes. Today, recreational activities such as skiing, fishing, and other water-based recreation are an important part of the economy in many communities – communities that experienced significant hardship during the historic low flows of 2002. Environmental needs, such as fish and wildlife habitat, were viewed differently when much of our water infrastructure was built (and our legal framework was developing). Interstate compacts place significant additional requirements on water supplies originating in Colorado, requiring deliveries to downstream states, but also help meet environmental needs within the state.

There is increase focus on how Colorado can sustainably grow and how much new water development can occur without putting existing uses at risk. Climate uncertainty has put this issue at the forefront of discussion regarding water development in the Colorado River system.

At the same time, a significant number of communities in the south urban Denver area and northern Colorado Springs area are currently utilizing groundwater that has a finite supply and are in need of a more renewable water supply source.

There is a lack of financial and planning resources for smaller providers, areas of rural development, agricultural uses and for environmental and recreation needs.

Technological

Colorado has developed several modeling tools to evaluate water supply issues. A core need for these models is gauged water data. Maintaining and expanding USGS gauging is a key need. In addition, spectral satellite imagery is of significant important for land cover and determining agricultural water use.

Estimating ground water quantity, use and recharge is very complex in many areas of the state especially in the Denver basin aquifer. Continued improvement in evaluating and estimating sustainability is needed.

As Colorado seeks to develop and use water in areas where water quality affects beneficial use there will be greater challenges. This include advance treatment issues for high total dissolved solids raw water and the associated brine disposal issues, and minimizing impacts from agricultural run-off and/or ground water impacts from high salt soils. Moreover, temperature and selenium are water quality issues the state is actively trying to address.

As Colorado strives to evaluate climate uncertainty and adaptation it is clear that more information is needed to downscale climate model and understand the linkage between the models and expected hydrology.

Economic

Water plays an important role in Colorado by sustaining many economic activities. Colorado relies on snowmelt for much of its yearly water supply; in times of drought or water shortages, economic consequences may occur, as was evident during the drought of 2002. The options developed for meeting future water needs must be sensitive to the implications each can have on the state's various economic sectors. These supply options will be critical to many economic segments in the state that will continue to rely on consistent and dependable water supplies.

SWSI highlighted several elements of Colorado's economy, with special emphasis on the segments most reliant upon water supplies. These segments are identified as:

- Urban economy
- Agriculture
- Mineral
- Recreation and tourism

The agricultural sector is the largest consumptive user of Colorado water as shown in the following figure.

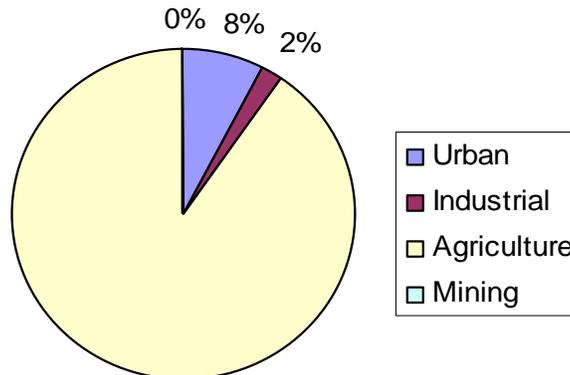


Figure 2. Percent Urban, Industrial, Agricultural, and Mining Water Use in Colorado

The tourism and recreation sector is a fast growing portion of the economy and is reliant upon several water-based activities. The mining sector has nearly always had periods of growth and decline, and has essential water needs in what are often water scarce areas. Colorado has experience explosive oil and gas development and has one of the nation’s largest oil shale deposits. If oil shale development becomes feasible at a commercial level, and if oil shale is extensively developed, then this could have profound effect on water development and use in Colorado.

Political

In Colorado several political forces effect water resource management and development. Extensive negotiations over the use of the Colorado River, interstate litigation, endangered species issues, federal reserved water rights, and the desire to maintain local focus and control over water planning are a few of the broad issues that drive local and state political issues. Within the state the distribution of water has lead to disagreements and conflicts over water development and management. In rough numbers about 80 percent of the demand for water is on the east side of the continental divide and about 80 percent of the supply is on the west side of the continental divide.

Each year there are numerous water related pieces of legislation that are considered during the legislative session. Typically only a few are successful as obtaining consensus from the diverse range of interests is difficult.

Most recently the importance of environmental and recreational uses of water have lead to changes in Colorado law and new program initiatives. While these efforts were at times very contentious there has been general statewide support for protecting these values.

The CWCB works to help resolve conflicts and to identify opportunities to work together to solve Colorado water challenges but this effort at times has also resulted in conflict over local versus more statewide priorities and differing legal responsibilities. Diverse stakeholders and

political leaders are often committed to identifying, protecting and resolving their priorities. At the same time local water providers will move forward to address the needs of their customers, boards, and councils. The challenge going forward is to identify where common interest and collaboration can be found.

Security

CWCB did not address national security issues or potential threats to infrastructure. SWSI did identify restricted reservoirs which typically have restrictions due to safety related concerns.

Key Driving Factors for SWSI

There are three key factors that lead the CWCB to implement SWSI:

- Rapid population growth
- A severe and sustained drought that began in the late 1990's and continues to a lesser extent in some basins
- Shifts in how Coloradoans use water: 1) Colorado is seeing a major impact on agriculture as urban areas grow into and/or acquire agricultural water and transfer it to municipal or industrial use; 2) There has been an increased emphasis on providing/protecting more water for the environment and recreation.

Overview of Colorado's SWSI

A summary of the report's table of contents offers a quick synopsis of the content of the study.

Executive Summary – contains a summary of the role of the CWCB, Stakeholder Process, Major Findings of SWSI, Key Recommendations, Overview of Report, and Roundtable Members and Participants

Section 1 - Introduction – summarizes SWSI Communication and Community Involvement Process, Background on Colorado Water Resources, Water Institutions (State, Federal, Non-Governmental Interest Groups)

Section 2 -Statewide Demographic, Economic, and Social Setting – presents Colorado's Historical and Projected Demographics, Economic Status and Trends and the Role of Water, Statewide Social Setting, Statewide Environmental Setting, Institutional and Regulatory Setting, Water Quality

Section 3 - Physical Environment of the Major River Basins – provides a summaries by each of the 8 major river basins including: Geography, Climate, Topography, Land Use, Surface Geology, Surface Water, Groundwater, Water Quality, Areas of Environmental Concern, Special Attention Areas, and Threatened and Endangered Species, Basin Energy and Mineral Resources

Section 4 - Legal Framework for Water Use – includes an Overview of State Water Laws, Interstate Compacts, Equitable Apportionment Decrees, and Memoranda of Understanding, Specific Tools for Addressing Water Needs (Water Storage Rights, Conditional Water Rights, Changes of Water Rights, Leases of Water, Augmentation Plans, Instream Flows, New Appropriations, Groundwater Rights, Reuse, Conservation Activities)

Section 5 - Projected Water Use – summarizes Method for Estimating Municipal and Industrial Use, Method for Estimating Agricultural Use, Estimated 2000 and Projected 2030 M&I and SSI, Projected 2030 Agricultural Demand

Section 6 - Water Needs Assessment – presents Potential Water Management Solutions, an Assessment of Future M&I and Agricultural Water Needs, Potential Approaches to Defining Environmental and Recreational Flow Enhancements, Implications of Uncertainty in Identified Projects/Processes and Existing Supplies, Identified Projects and Planning Processes by River Basin

Section 7 - Availability of Existing Water Supplies – summarizes, Methods and Tools Employed to Evaluate Surface Water Supply Availability, Overview of Groundwater Supplies and Availability including Designated Groundwater Basins and Non-tributary Aquifers, Available Surface Water and Alluvial Groundwater Supply in Each Basin, Availability for Water Supply Development under Interstate Compacts and Decrees, Colorado River Compact Analysis and Potential for Development of Additional Supplies, South Platte River Compact Analysis and Potential for Development of Additional Supplies

Section 8 - Options for Meeting Future Water Needs – identifies the process for Developing Options for Future Water Needs including:

- Conservation
- Agricultural Transfer
- Development of Additional Storage
- Conjunctive Use of Surface Water and Groundwater
- Municipal and Industrial Reuse
- Control of Non-Native Phreatophytes

Section 9 - Evaluation Framework – discusses and stakeholder decision framework and process to evaluate water supply solutions including: Overview of Evaluation Framework, Defining Objectives and Performance Measures, Individual Preferences, Basin Roundtable Members' Individual Preferences, Summary of Objective Weighing, Evaluation of Options (Develop Options, Evaluate Options and Combine Option Evaluation with Stakeholder Preferences, Identify Likely Preferred Options to be Used to Construct Alternatives)

Section 10 - Basin-Specific Options – presents an Overview of Basin-Specific, Environmental and Recreational Options, Potential Options for Addressing Remaining Water Needs and Enhancements

Section 11 - Implementation – discusses the Major Findings and Key Recommendations, Implementation Issues, The Path Forward, and the Implementation Process

A summary of key findings and recommendations and an overview of some of the key issues in each basin has been extracted from Section 11 of the SWSI November 2004 Report and are summarized below.

Major Statewide Findings from SWSI

SWSI explored all aspects of Colorado's water use and development on both a statewide and an individual basin basis. SWSI focused on in-basin issues first. Analysis of supply and demand at the statewide level will be conducted in greater detail in 2005. Major findings identified during this first phase of work are based on technical analyses and feedback gathered through Basin Roundtable input.

Even though some of these findings are readily apparent to some, it was important that they be affirmed as part of building a foundation and common understanding. Other findings were determined and/or clarified through the SWSI process. These findings are summarized below and are discussed in the Executive Summary.

1. Significant increases in Colorado's population – together with agricultural water needs and an increased focus on recreational and environmental uses – will intensify competition for water. Colorado's population in 2000 was 4.3 million and is expected to increase by 2.8 million (65 percent) to 7.1 million people by 2030.
2. Projects and water management planning processes that local M&I providers are implementing or planning to implement have the ability to meet about 80 percent of Colorado's M&I water needs through 2030, under the most optimistic scenario. Colorado estimates that it will need an additional 630,000 acre feet of water to meet municipal and industrial needs.
3. To the extent that these identified M&I projects and processes are not successfully implemented, Colorado will see a significantly greater reduction in irrigated agricultural lands as M&I water providers seek additional permanent transfers of agricultural water rights to provide for the demands that would otherwise have been met by specific projects and processes.
4. Supplies are not necessarily where demands are; localized shortages exist, especially in headwater areas, and compact entitlements in some basins are not fully utilized.
5. Increased reliance on nonrenewable, non-tributary groundwater for permanent water supply brings serious reliability and sustainability concerns in some areas, particularly along the Front Range.
6. In-basin solutions can help resolve the remaining 20 percent gap between M&I supply and demand, but there will be tradeoffs and impacts on other uses – especially agriculture and the environment.
7. Water conservation (beyond Level 1) will be relied upon as a major tool for meeting future M&I demands, but conservation alone cannot meet all of Colorado's future M&I needs. Significant water conservation has already occurred in many areas.
8. Environmental and recreational uses of water are expected to increase with population growth. These uses help support Colorado's tourism industry, provide recreational and

environmental benefits for our citizens, and are an important industry in many parts of the state. Without a mechanism to fund environmental and recreational enhancement beyond the project mitigation measures required by law, conflicts among M&I, agricultural, recreational, and environmental users could intensify.

9. The ability of smaller, rural water providers and agricultural water users to adequately address their existing and future water needs is significantly affected by their financial capabilities.
10. While SWSI evaluated water needs and solutions through 2030, very few M&I water providers have identified supplies beyond 2030. Beyond 2030, growing demands may require more aggressive solutions.

Key Recommendations of SWSI

Following from SWSI's major findings, and based primarily on feedback obtained from the CWCB Board, Basin Roundtables, and public input, the recommendations outlined below provide guidance on how Colorado should proceed in addressing its future water needs. The reader is encouraged to look at the Key Recommendations section of the Executive Summary, which expands on these key recommendations.

1. Ongoing Dialogue Among all Water Interests is Needed.
2. Track and Support the Identified Projects and Processes.
3. Develop a Program to Evaluate, Quantify, and Prioritize Environmental and Recreational Water Enhancement Goals.
4. Work Toward Consensus Recommendations on Funding Mechanisms for Environmental and Recreational Enhancements.
5. Create a Common Understanding of Future Water Supplies.
6. Develop Implementation Plans Toward Meeting Future Needs.
7. Assess Potential New State Roles in Implementing Solutions.
8. Develop Requirements for Standardized Annual M&I Water Use Data Reporting.

These Findings and the Recommendations found in Section 11.3 of the SWSI report were drawn from all aspects of the SWSI process. However, they should not be viewed as consensus products of the Basin Roundtables.

River Basin Issues at a Glance

Section 10 of the SWSI report presents a comprehensive view of Colorado and its water uses and needs. A brief overview of some of the individual basin issues is provided here from Section 11 of the report.

Arkansas Basin

- Arkansas River Compact requirements and existing uses and water rights result in little to no water availability for new uses.
- Growth in the headwaters region will present challenges in obtaining augmentation water for new demands.
- Concerns over agricultural transfers and its impact on rural economies are significant in the lower portion of the basin downstream of Pueblo Reservoir.

- Concern over water quality and suitable drinking water are key concerns in the lower basin.
- The success of two major projects is key to meeting future water needs.
- The urban landscape is very important to the economy and an important component to quality of life.

Colorado Basin

- Rapid growth in the headwaters areas and lack of available supplies or storage are significant challenges to meeting future water needs.
- Recreation and the environment are key drivers in the basin and are important for economic health and quality of life.
- Agriculture is important in the basin, especially in the lower basin (Grand Valley).
- The success of the Endangered Species program is critical to help protect current and future water use.
- There is concern over a potential compact shortage during severe and sustained drought and potential impacts to in-basin supplies.
- The development of water rights associated with transbasin projects are a concern and their effect on in-basin supplies must be considered.

Dolores/San Juan/San Miguel Basin

- This multiple basin area of the state is extremely diverse with changing demographics.
- The Pagosa Springs-Bayfield-Durango corridor is rapidly growing, has areas of localized water shortages, and is transitioning from mining/agricultural to tourism, recreation, and a retirement/second home area.
- The Cortez area remains strongly agricultural but is also seeing rapid growth with retirees moving to the area.
- The San Miguel area is a mix of recreation and tourism along with a strong desire to maintain agriculture.
- Overall water supply is available but getting sufficient infrastructure and water distribution will be a key challenge.
- The Colorado River Compact places pressure on uses of the San Juan River because New Mexico's primary source of the upper Colorado River Basin supplies is the San Juan River.

Gunnison Basin

- Growth in the headwaters will require additional water management strategies.
- Addressing agricultural water shortages in the upper portion of the basin is an important goal of the community; lack of financial resources is an impediment.
- There is concern over possible future transbasin diversions and the effect this might have on the basin's future.
- Resolving federal issues is a priority. Federal issues include: resolving the National Park Service claims for flows in the Black Canyon, completion of the Blue Mesa/Aspinall reoperations EIS, and addressing Endangered Species issues in the Gunnison River near the confluence with the Colorado River main stem.
- The area between Ouray and Montrose is rapidly growing. Tourism is important in the headwater but agriculture is dominant in the Uncompahgre Valley. A rapid influx of retirees and growth in the Uncompahgre Valley may dramatically change the agricultural uses and land use in the area.

North Platte Basin

- One of Colorado's only basins with concern over lack of growth and economic development.
- There is a desire to ensure protection of existing water supplies, and a concern over the impact of the lack of forest management. It is important that Endangered Species issues on the Platte River in Central Nebraska are successfully resolved and in a manner that does not put pressure on North Platte water users to reduce existing uses.
- The equitable apportionment decree quantifies the amount of available water and lands that can be irrigated.

Rio Grande Basin

- The Rio Grande Compact and the effects of sustained drought make new water development very difficult.
- In the Rio Grande Valley, agricultural water use is at unsustainable levels and economic impacts of reducing irrigation use of groundwater supplies will be difficult to address.
- Groundwater is a key component of water use in the basin.

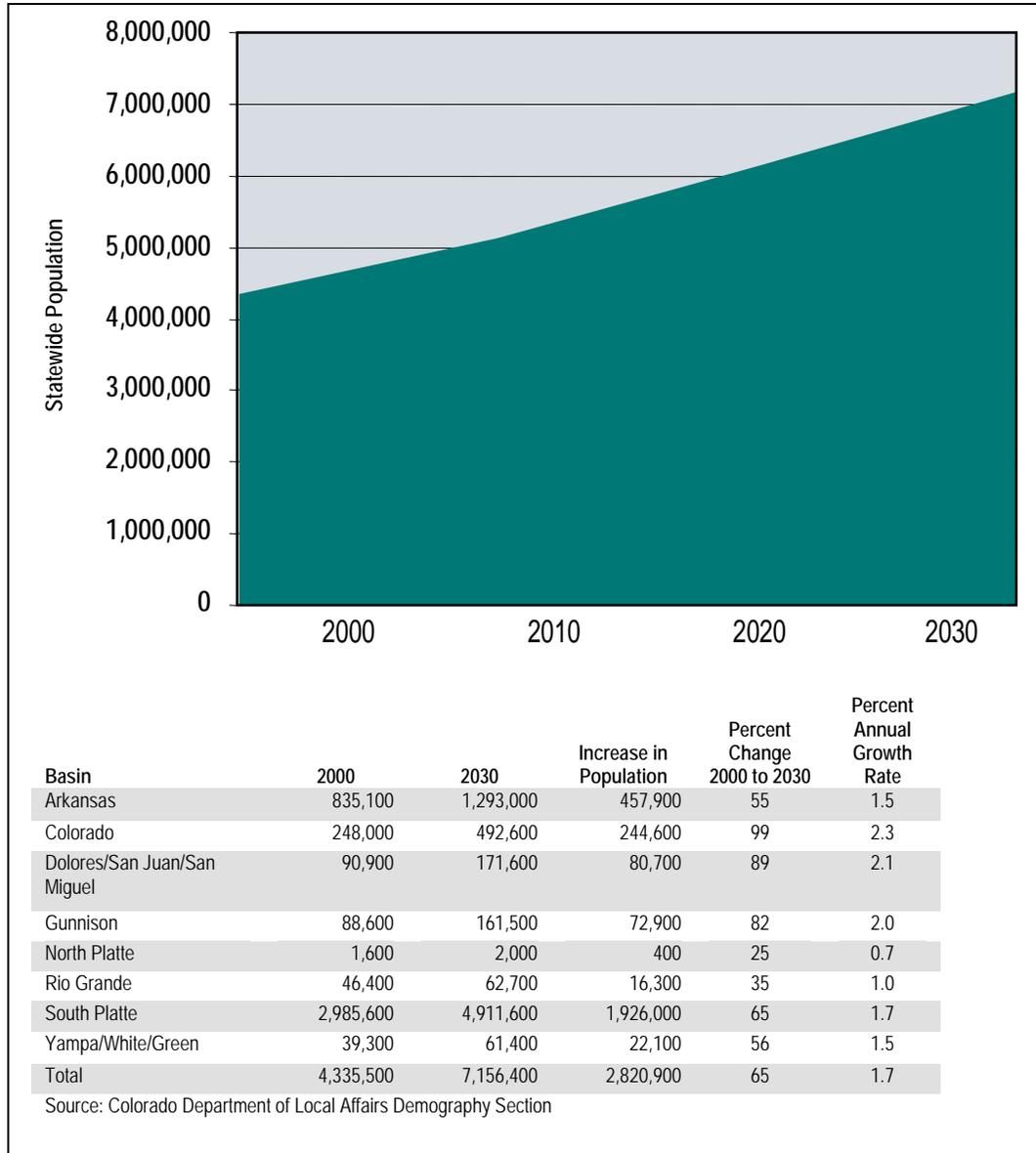
South Platte Basin

- Colorado's most diverse and industrialized basin. Agriculture is still a dominant water use but rapid changes are occurring and the impacts to rural communities are a key concern.
- Competition for water is fierce and it is unclear how much competition there is for the same water supplies.
- The lack of any new major water storage in the last 20 years has led to reliance on non-renewable groundwater in Douglas, Arapahoe, and northern El Paso (El Paso County is in the Arkansas Basin) Counties. Explosive growth in these counties coupled with the lack of surface water supplies led to the creation of multiple small water districts and makes coordinated water development a challenge and less efficient especially in light of limited renewable surface water supplies.
- Water reuse and conservation are major components to meeting future water needs but this will put added pressure on agriculture as return flows diminish.
- The urban landscape is very important to the economy and an important component to quality of life.
- Transfers of agricultural water rights to M&I use will continue to be a significant option for meeting future needs.

Yampa/White/Green Basin

- Agriculture, tourism, and recreation are vital components to this basin's economy.
- Industrial uses, especially power production, are a major water use. Future energy development is less certain.
- While rapidly growing in some areas (Yampa River/Steamboat area) the basin is not developing as rapidly as other portions of the state. This has led to concern that the basin will not get a "fair share" of water use afforded to Colorado under the Colorado River Compact.
- Implementation of a successful Endangered Species Program is vital to ensuring protection of existing and future water uses.

The following figures provide a summary of key trends, and water supply gaps across the State of Colorado



**Figure 3. From Executive Summary
Population Projections by Basin**

**Table 1 From Executive Summary
Municipal & Industrial Gross Water Demand in
2000 and 2030**

Basin	Estimated Water Demand in 2000 (AF)	Projected Water Demand with Level 1 Conservation in 2030 (AF)	Increase in Water Demand (AF)	Increase in Water Demand (%)
Arkansas	256,900	354,900	98,000	38%
Colorado	74,100	136,000	61,900	84%
Dolores/ San Juan/ San Miguel	23,600	42,400	18,800	80%
Gunnison	20,600	35,500	14,900	72%
North Platte	500	600	100	20%
Rio Grande	17,400	21,700	4,300	25%
South Platte	772,400	1,182,100	409,700	53%
Yampa/White / Green	29,400	51,700	22,300	76%
TOTAL	1,194,900	1,824,900	630,000	53%

**Table 2 From Executive Summary
Irrigated Acres by Basin**

Basin	Estimated Irrigated Acres	Average Total Diversions (AF)
Arkansas	538,100	1,769,900
Colorado	237,700	1,986,900
Dolores/San Juan	255,000	902,200
Gunnison	263,500	1,736,100
North Platte	115,700	396,900
Rio Grande	632,700	1,619,000
South Platte	1,003,500	2,545,500
Yampa/White/Green	118,400	652,000
TOTAL	3,164,600	11,605,000

Source: Colorado's Decision Support Systems and Basin Roundtable/Basin Advisor input. See SWSI Section 5 for details on current estimates and periods of record.

Overview of Colorado’s Approach to Completing SWSI

Municipal Demands

Estimating future demands was completed based on gallons per capita water use. Colorado had undertaken several surveys of municipal water use and then utilized a weighted average approach as municipal data was aggregated to the county level. County level data was then adjusted to meet river basin boundaries. Levels of water conservation were also estimates based on municipal survey data.

Water Supply and Agricultural Demands

Colorado has invested millions of dollars to establish a Decision Support System (DSS). The Colorado’s DSS is data centered with historical gauge data typically going back about 100 years, and state of the art GIS and spectral imagery used to determine crop distribution and type. There are several modeling platform to determine legal and physical water availability, consumptive use, and to undertake what if scenario’s. The DSS is complete in 5 of Colorado’s major river basins and is underdevelopment in the remaining 3 basins.

5. PARTNERSHIPS, STAKEHOLDER, AND PUBLIC INVOLVEMENT

The backbone of Colorado’s SWSI was a focus on stakeholder involvement at the local basin level. The process is described below and was taken from the SWSI, Executive Summary, November 2004. The public information and Basin Roundtable participant activities were designed to provide a mechanism, and forum for the CWCB Board to solicit and exchange information. This process was vital to the success of the project. The Basin Roundtables, with

the support of and input from the CWCB Board, defined the overall water management objectives, established performance measures to meet these objectives, and identified solutions for meeting future water needs. Information exchange occurred at different levels as described below.

Basin Roundtables

The Basin Roundtables are where local interests met to exchange ideas, review and present water supply and demand data, summarize planning initiatives, and help guide the development of water supply and demand objectives and strategies for achieving the objectives. This was a consensus-building process to address specific issues within each river basin. A portion of each meeting was also devoted to obtaining information and comment from the public. Roundtable participants in each basin included representatives of:

- Agricultural and ranching community
- Business, development, and civic organizations
- Environmental interests
- Federal agencies (e.g., U.S. Forest Service [USFS], U.S. Bureau of Reclamation [BOR])
- Local Governments not directly providing water (municipal, county, and regional)
- Municipal water providers
- Recreational interests
- Water Conservancy/Conservation Districts
- CWCB Board Member(s) for the basin
- Technical support was provided by: the State Engineer's Office (SEO), Division of Wildlife (DOW), State Parks, and select federal agencies

General Public Outreach

This activity intended to provide a forum specifically for presenting information to and obtaining feedback from the general public. The public was kept informed of the progress of the study, and invited to provide public input and feedback, through a variety of activities, including:

The 2-hour public meeting portion of each of the 30 Basin Roundtable Technical Meetings
 A series of press releases that were issued at key milestones throughout the project
 Presentations to numerous community and stakeholder organizations, including agricultural, environmental, and business groups

A public comment period specifically reserved for SWSI at each CWCB meeting
 A series of e-mails to a database of over 1,400 Colorado individuals and organizations with an interest in water

A series of two rounds of Public Information meetings conducted through the course of SWSI.
 A project website was updated throughout the study process. One of the key goals of the Basin Roundtable and public involvement process was to learn: *What is important to people in Colorado when they consider how water should be used and managed?* Through the SWSI process, a set of nine major "water management objectives" were developed, refined, and then

used to evaluate options for addressing Colorado's future water needs. These objectives represent the overarching interests in water management – they define major goals of water users in clear, understandable terms.

Recognizing that each individual will value these objectives in different ways – that is, each individual will assign a unique importance to each objective relative to the others – individual preferences for the objectives were identified and tracked for each Basin Roundtable member in each basin. Similarly, the relative importance of the objectives from one basin to another was different, indicative of the diversity of the basins and the ways water is used in each. Several overall observations can be made from the basin-by-basin assessment of Basin Roundtable members' preferences for the SWSI water management objectives, summarized as follows:

Sustainably Meet Municipal and Industrial (M&I) Demands: A wide range of preferences was evident in each basin. Municipal water interests, as expected, generally preferred this more strongly than did other interest groups.

Sustainably Meet Agricultural Demands: Also saw a wide range of preferences in each basin. As expected, agricultural interests typically preferred this more strongly than did other interest groups.

Optimize Existing and Future Water Supplies: Relatively strong support for this objective was expressed in each basin, with significant variability between interest groups' perspectives from one basin to another.

Enhance Recreational Opportunities: While recognized as important, other water management objectives generally received greater support, even among recreational and environmental interests in most basins.

Provide for Environmental Enhancement: A very diverse range of support for this objective was expressed, both within each basin and from basin to basin. Environmental and recreational interests typically ranked this as one of the top objectives relative to the others.

Promote Cost-Effectiveness: This objective generally saw a moderate to low level of support relative to the other objectives, suggesting that many Basin Roundtable members value other objectives more highly than costs.

Protect Cultural Values: This objective saw a moderate to low level of support in most basins, though with wide variability, suggesting an interest in maintaining cultural values but not necessarily at the expense of some of the other objectives.

SWSI Water Management Objectives

- Sustainably Meet Municipal & Industrial Demands
- Sustainably Meet Agricultural Demands
- Optimize Existing and Future Water Supplies
- Enhance Recreational Opportunities
- Provide for Environmental Enhancement
- Promote Cost Effectiveness
- Protect Cultural Values
- Provide for Operational Flexibility
- Comply with All Applicable Laws, Regulations, and Water Rights

Provide for Operational Flexibility: This objective was moderately valued in most basins, except in the North Platte Basin, which, on average, valued it less than all of the other objectives.

Comply with all Applicable Laws, Regulations, and Water Rights: The Basin Roundtables acknowledged that all alternatives must squarely meet this objective, and rather than serving as a basis of comparison of alternatives, it instead represents a minimum condition or "gate" that all alternatives must successfully pass through to be considered for implementation. Together, these objectives and preferences guided the identification and development of potential solutions to Colorado's future water needs throughout the course of SWSI.

6. PLAN IMPLEMENTATION STRATEGY

Colorado has successfully identified water supply needs for municipal, industrial and agricultural needs and water supply at the watershed, basin and statewide level. Colorado has an active instream flow program and local municipalities can and have filed for recreation water rights. Colorado is currently actively examining how and where to do additional quantification of environmental and recreational flow priorities and needs.

As previously discussed local water providers have plans and projects that can meet 80 percent of Colorado's 2030 water needs. However, this optimistically assumes that every project will be successful and every project will make it through the permitting and regulatory process. The State of Colorado through CWCB has adopted the goals of tracking and supporting the "80 percent solution" and is developing plans to meet the 20 percent "gap" and help address uncertainty should some of the plans and projects fail.

There are several state organizations that provide funding for water development projects. The most prominent are: the Colorado Water and Power Resources Authority and the CWCB. Both entities provide loans and grants for water resource projects. CWCB has been examining water resource partnership projects where the state would have an ownership interest and/or role in helping implement water supply and management solutions. To date there has been interest in the concept but there has also been questions that need to be resolved before statewide support can be garnered. CWCB does appropriate water from instream flow/environmental purposes and has recently expanded its ability to acquire water rights for the protection of the natural environment. CWCB also provides funding to address water resource impacts via their Fish and Wildlife Mitigation Fund. The Department of Natural Resources acting through CWCB and other agencies also has a Species Conservation Trust Fund to help address federal threatened and endangered species issues and other species of concern.

SWSI has been a major step forward for Colorado in understanding water resource issues and challenges. Significant partnerships have been formed but many difficult issues remain. The establishment of permanent basin roundtables has provided a forum for collaborative decision making. To date in general the roundtables have focused more on local issues. While regional issues have been identified there has been less work and success addressing these challenges. With the passage of the Water for the 21st Century Act, which established the Interbasin Compact Committee (IBCC), Colorado is working on an organizational approach that more clearly integrates IBCC, CWCB, basin roundtables and local planning entities. While there is

certainly more dialogue and focus on collaborative planning it is clear that more time will be needed to determine if the processes and planning can yield a common vision, or absent that, can agreement be reached in part on where and how to proceed with filling that water supply and planning needs of the state.

CWCB has implemented a second phase of SWSI in response to the following goals identified in the 2004 report.

Next Phases of SWSI

Building on the foundation laid by this first phase of SWSI, SWSI continued to address technical issues and potential future solutions between November 2004 and July 2006. The subject of Basin Roundtable Technical Meetings included:

- Continue to refine technical data and demands on a statewide level.
- Assess supply availability on a statewide basis.
- Determine risk associated with uncertainty in the implementation of the Identified Projects and Processes.
- Identify key Identified Projects and Processes and develop a monitoring mechanism to track the progress of Identified Projects and Processes.
- Develop basin-specific alternatives using options for 20 percent M&I gap, agricultural, recreational, and environmental needs, and uncertainty associated with the Identified Projects and Processes.
- Assess the ability of existing funding programs to meet Colorado's water needs, begin to develop a framework for new programs if a need is identified, and develop basin-specific implementation and funding plans.
- Develop water supply and water use reporting mechanisms and work with water users to develop consensus; identify levels of conservation and work with the Colorado Municipal League to facilitate this process.
- Facilitate the creation of partnerships between water suppliers and state and federal agencies.

A SWSI Phase 2 Report was completed in November 2007. The Phase 2 Report addressed several of the above issues and focused on:

- Conservation and reuse
- Alternative agricultural transfer methods
- Environmental and recreation needs and quantification
- Strategies to address the water supply gap between supply and demand including new and expanded water storage

CWCB is also undertaking an extensive evaluation of water supply in the Colorado River basin to refine estimates of developable water and to try and reach consensus on how much water can be sustainably developed.

7. OUTCOMES AND ASSESSMENT PROCESS

Colorado is currently developing a comprehensive data base of the identified projects and planning processes that have been identified for meeting the future water supply and use needs of the state. The data base will allow CWCB to track: the progress being made to address the future water supply needs; monitor and quantify the gap between supply and need; focus resources to help move projects or planning processes forward that may be stalled due to funding, regulatory, political or other implementation issues. The CWCB will also utilize its other programmatic resources and tools to address critical needs identified by water providers and users, various stakeholders groups including the basin roundtables, and the general assembly.

8. NEEDS, CHALLENGES AND CRITICAL PRIORITIES - INTERVIEW INSIGHTS

The major needs, challenges and priorities of Colorado are summarized in the “Scope of Water Resources Planning and Management” section of this document.

The major finding and recommendations regarding Colorado water needs and priorities include:

Key Findings

1. Significant increases in Colorado's population – together with agricultural water needs and an increased focus on recreational and environmental uses – will intensify competition for water. Colorado's population in 2000 was 4.3 million and is expected to increase by 2.8 million (65%) to 7.1 million people by 2030.
2. Projects and water management planning processes that local M&I providers are implementing or planning to implement have the ability to meet about 80 percent of Colorado's M&I water needs through 2030, under the most optimistic scenario. Colorado estimates that it will need an additional 630,000 acre feet of water to meet municipal and industrial needs.
3. To the extent that these identified M&I projects and processes are not successfully implemented, Colorado will see a significantly greater reduction in irrigated agricultural lands as M&I water providers seek additional permanent transfers of agricultural water rights to provide for the demands that would otherwise have been met by specific projects and processes.
4. Supplies are not necessarily where demands are; localized shortages exist, especially in headwater areas, and compact entitlements in some basins are not fully utilized.
5. Increased reliance on nonrenewable, non-tributary groundwater for permanent water supply brings serious reliability and sustainability concerns in some areas, particularly along the Front Range.
6. In-basin solutions can help resolve the remaining 20 percent gap between M&I supply and demand, but there will be tradeoffs and impacts on other uses – especially agriculture and the environment.
7. Water conservation (beyond Level 1) will be relied upon as a major tool for meeting future M&I demands, but conservation alone cannot meet all of Colorado's future M&I needs. Significant water conservation has already occurred in many areas.

8. Environmental and recreational uses of water are expected to increase with population growth. These uses help support Colorado's tourism industry, provide recreational and environmental benefits for our citizens, and are an important industry in many parts of the state. Without a mechanism to fund environmental and recreational enhancement beyond the project mitigation measures required by law, conflicts among M&I, agricultural, recreational, and environmental users could intensify.
9. The ability of smaller, rural water providers and agricultural water users to adequately address their existing and future water needs is significantly affected by their financial capabilities.
10. While SWSI evaluated water needs and solutions through 2030, very few M&I water providers have identified supplies beyond 2030. Beyond 2030, growing demands may require more aggressive solutions.

Key Recommendations

1. Ongoing Dialogue Among all Water Interests is Needed
2. Track and Support the Identified Projects and Processes
3. Develop a Program to Evaluate, Quantify, and Prioritize Environmental and Recreational Water Enhancement Goals
4. Work Toward Consensus Recommendations on Funding Mechanisms for Environmental and Recreational Enhancements
5. Create a Common Understanding of Future Water Supplies
6. Develop Implementation Plans Toward Meeting Future Needs
7. Assess Potential New State Roles in Implementing Solutions
8. Develop Requirements for Standardized Annual M&I Water Use Data Reporting

In addition, the following observations, needs, and priorities have been identified by CWCB:

- Growth in the front-range of Colorado and rapid growth in the headwaters areas of the state are key challenges; supplies are not where and when water is needed.
- Several key water supply projects undergoing National Environmental Policy Act review and the timely permitting of these projects is required to meet future needs.
- Energy development including coal bed methane, and potential oil shale creates planning challenges and if successful will require water supply/water quality management.
- Environmental and recreation flows are an emerging focus across the state.
- Zebra mussels and other invasive vegetative species such as tamarisk are creating water supply and water management issues.
- Interstate Compact coordination and issues: Colorado, Republican, and Arkansas take time and resources to address some conflicts have been more contentious than others.
- Water quality needs to be addressed to maintain and support beneficial uses both consumptive and nonconsumptive.
- Drought and declining groundwater are significant challenges.
- Colorado's budget shortfall in some program and economic sectors has increased legislative review and interest in transferring dollars from Colorado's water supply and planning funds. A secure and steady funding source for water planning and development projects is needed. This funding provides the ability to plan and loan for water projects that are required to meet

future needs. CWCB provides loans to project proponents to help them implement water supply/management solutions.

- In the 1940-60's states wanted to partner with federal agencies (i.e., BOR, USACE) and looked to these agencies to help implement projects especially larger civil works. It seems that in the 1980's that began to change and the federal agencies became more of an entanglement and something to avoid. Federal agencies have become more needy; and rather than helping states meet state needs they look to states to provide support or justification to congress or other entities to help them implement their own federal agendas. Some have increasingly looked to states for funding and to get involved in state lead initiatives.
- Federal agencies may be better served to focus on providing financial and technical support to states. In doing so they could be a great resource for data and technology transfer. Examples of management issues and solutions that should be made a priority and made more available include: invasive species such as zebra mussels and tamarisk, water measurement, treatment technologies, water supply augmentation, snow pack monitoring (increasing the understanding and accuracy of runoff forecasts).
- Colorado seeks to meet in state and intrastate needs with water that is needed to meet compact obligations.
- The water market is a good means to have water move on a willing buyer willing seller basis when it may be needed; concerns over the viability of rural areas where transfers occur is a concern and challenge.
- Colorado's instream flow program has been a good tool to help address needs of federal agencies.
- Increasing water supplies when and where they are needed can help reduce conflict. System wide augmentation from wetter areas to dryer areas may be useful especially if more climatic extremes are encountered.
- Colorado does not want to see the United State Corps of Engineers weigh in on regional issues; things are not necessarily broken. Rather the Corps should examine how they can better integrate and manage their programs especially permitting, planning and operations sections. The Corps organization in Colorado is especially cumbersome. The Federal Emergency Management Administration is a good model for how to assist states (they effectively get funding to states, are much more transparent, and more effective and efficient in contracting). The Federal Energy Regulatory Commission is a good example of how to more effectively communicate with, involve and coordinate with states on their program and requirements.

9. REFERENCES

Much of the language and information in this summary comes directly from reports published by the Colorado Water Conservation Board.

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