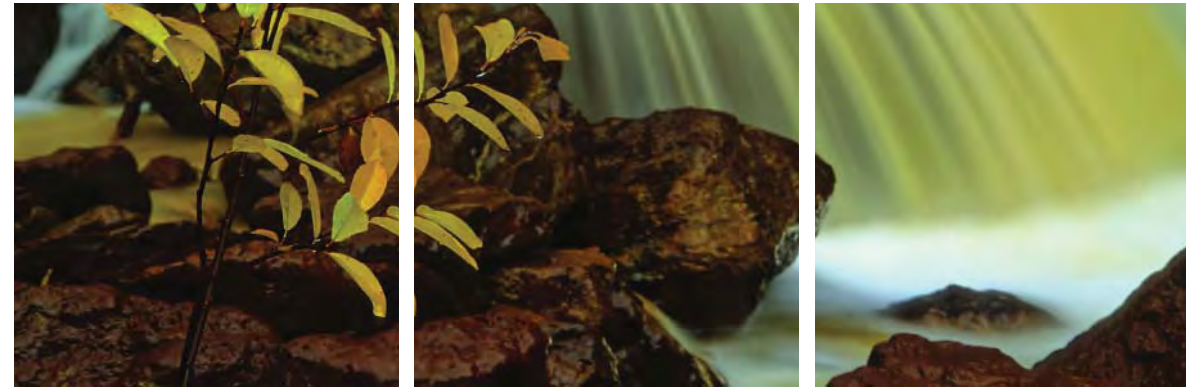


COLORADO'S WATER FUTURE

EXECUTIVE SUMMARY FOR THE DU WATER FUTURES PANEL



INTRODUCTION

This Executive Summary provides a concise synopsis of nine key priorities that are recommended for Colorado to ensure the state's water future. These synopses have been reviewed by all panelists and all agree that these nine areas must be part of any discussion of Colorado's water future. The panelists believe that an opportunity exists to consider the feasibility and value of these proposals and to begin implementation, concurrent with other ongoing statewide programs, including the Statewide Water Supply Initiative (SWSI), House Bill 1177 basin roundtables, and conservation planning workshops. One fact is clear to nearly all panel members; without systematic and cooperative planning, water development will occur with many unintended and problematic consequences.



Appendix A is a technical report on topics discussed during the initial panel meeting, followed by supplemental information and individual panel member comments. In some cases, Appendix A includes diverse viewpoints on each topic considered by the panel and may not always be completely consistent with the Executive Summary. The panel believes that presenting the healthy exchange of opinions will be helpful as the state considers its approaches to addressing its water challenges.



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June 27, 2007
Dear Citizens of Colorado:

We believe that Colorado can realize a sustainable water future. We see a future that protects our water resources, promotes our economy, preserves our natural environment, and ensures that Colorado's rural heritage remains a legacy for generations to come. To protect water needs for our environment, businesses, cities and agriculture, we must begin now to address problems forecasted 20 years and longer into the future.

Colorado continues to be an attractive place for families to live and the demand for water will continue to grow. This expanding demand statewide combined with existing patterns of use, population concentrations along the Front Range, the variable spatial and temporal distribution patterns of supply, the continuing public interest in water for the environment, and the uncertainty created by projections of future climate effects present unique challenges for defining a framework for meeting all of Colorado's water needs.

Cities in Colorado are making great progress in water conservation. Even with this success, in the not too distant future, several studies predict the Front Range municipalities will require an additional demand of two to three times the amount of water currently delivered by Denver Water, the largest municipal water agency in the state. In addition, other regions within the state anticipate a growth in future water demands for a variety of purposes. To meet this need, some changes to existing use of water must be considered, including extensive conservation, reuse, and carefully structured reductions or optimization of agricultural uses.

These are broad and complex issues. The University of Denver assembled a diverse group of community leaders to collaboratively develop strategies to assist with the statewide responsibility to be good "water stewards." The attached report summarizes our observations and provides strategies for overcoming challenges we face in developing a sustainable plan for our state's water future. To achieve this plan, we must take action now. Doing nothing is not a viable option.

While there are major challenges, the panel believes Colorado can have a sustainable water future where no economic, agricultural, geographic, or environmental sector has to lose at the expense of another's interests. The panel found that by increasing conservation throughout the state, making some relatively modest changes to optimize how we use our water today, and utilizing Colorado's compact allotments, we can meet future demands without sacrificing one sector of the state for the benefit of another. To do so will require that we work together as a state, and not allow one region or one set of interests to be pitted against another.

Our report includes nine key proposals:

1. Embrace fairness, trust, respect, and openness as core values in water planning.
2. Encourage an ethic of water conservation including region strategies.
3. Encourage partnerships between urban and agricultural water users by creating new conceptual models for municipal and agricultural water users to make water available for municipal use while supporting the cultural and economic importance of agriculture.
4. Manage non-native, water-loving trees in our riparian habitats. Non-native species like tamarisk and Russian olive use surprisingly large quantities of water.
5. Streamline processes of the Water Court to facilitate decision-making.
6. Encourage an integrated statewide perspective on water storage and infrastructure projects.
7. Facilitate cooperation between river basins to maximize yield and ensure flexibility and integration of facilities.
8. Establish statewide contingency plans for potential climate change or long-term drought scenarios.
9. Maintain healthy rivers and instream flows.

Each of these nine action steps is described in greater detail in the attached report. In addition to this executive summary, Appendix A, which is also available on-line at www.du.edu/waterfutures, provides technical information related to the panel deliberations, including discussion of points where the panel was not in full agreement. Finally, Appendix B includes a copy of the background information provided to the DU Water Futures Panelists prior to their first meeting on November 3-4, 2006. Appendix B is available at www.du.edu/waterfutures.

This report is being released statewide to help begin the process of developing a common understanding and appreciation of the water issue and its importance to the future of Colorado. Thank you for taking the time to consider this important issue. Working together, we will be able to meet our future water needs without compromising our ability to maintain our strong and diverse economy or sacrificing the water environment in Colorado.

Respectfully submitted by the DU Forum Panelists,

Daniel Ritchie,
Co-Chairman, Chancellor Emeritus,
University of Denver

Ralph Peterson,
Co-Chairman, Chairman and CEO,
CH2M HILL

Chuck Berry, President, Colorado Association of Commerce and Industry

Honorable Ernie Blake, Mayor of Breckenridge

Joe Blake, President and CEO, Denver Metro Chamber of Commerce and President and CEO, Denver Economic Corporation

Reeves Brown, Executive Director, CLUB 20

Hubert Farbes, Shareholder/Attorney, Brownstein, Hyatt and Farber

Patrick Grant, President and CEO, The Western Stock Show Association

Honorable John Hickenlooper, Mayor of Denver

Thomas Honig, Regional President and CEO, Wells Fargo Bank

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Chetter Latcham, President, Colorado Division of Shea Homes

Bill Long, Entrepreneur, Bent County Commissioner, and President of the Southeastern Colorado Water Conservancy District

Bennett Raley, Attorney, Trout, Raley, Montano, Witwer & Freeman, P.C.

Honorable Lionel Rivera, Mayor of Colorado Springs

Robert Sakata, Owner, Sakata Farms

Marguerite Salazar, President/CEO, Valley Wide Health Systems

Rocky Scott, Principal/President, Centerra Community, McWhinney Enterprises

Harris Sherman, Director, Department of Natural Resources

Honorable Ed Tauer, Mayor of Aurora

Bill Trampe, Manager, Trampe Family Ranch, and Founding Director, The Gunnison Ranchland Conservation Legacy

Albert C. Yates, President Emeritus, Colorado State University

1 EMBRACING FAIRNESS, TRUST, RESPECT, AND OPENNESS IN WATER SUPPLY PLANNING

Observations

One of the panel's earliest and most broadly supported conclusions is that effective water resources planning in Colorado must be built around a foundation of trust, mutual respect, openness, and inclusiveness.

Water agency and stakeholder interactions in the Western United States have not often been characterized by these traits. Contentiousness has frequently sidetracked progress. If we as a state are to optimize the use of our water resources, which is essential to meeting future water demands, we need to learn to work together with the common purpose of addressing our water needs in a sustainable fashion – taking steps today that enhance rather than limit the choices of future generations. Challenges to developing trust are most acute in projects involving more than one river basin or involving agricultural and urban entities. Developing trust is a process, not an event. Long-term, sustained effort and conscientiousness among many entities are

required, guided by respect for the differing interests that such entities may legitimately embrace.

Part of this necessity of trust is driven by legal, political, and future water supply shortage realities. Also, as societal values have changed and environmental awareness and greater appreciation of in-stream uses have developed, the legal framework has adapted to empower these changing values. The result is that a determined and well-financed group can almost indefinitely delay or stop a given project that does not have widespread support.

The State of Colorado has recognized the need for open planning processes, with all major stakeholder groups having a “seat at the table,” in its SWSI and HB-1177 planning processes. Similar processes are being used successfully in other states in the Colorado River Basin and indeed across the country. The requirement for new types of relationships and interactions among entities is clear.

Challenges and Limitations

The challenge to elected and appointed leaders in Colorado is to continue to fund (it is expensive to include extensive dialog in the planning process) and have the patience to be inclusive in its planning processes. For an atmosphere of trust and respect as discussed herein to be created, a consistent, long-term process of interactions must occur.

SUGGESTED STEPS TO FOLLOW:

Continue to fund SWSI and use the involvement processes of HB-1177 and HB 1385 with the goal of promoting a statewide effort for meeting Colorado's present and future water demands.

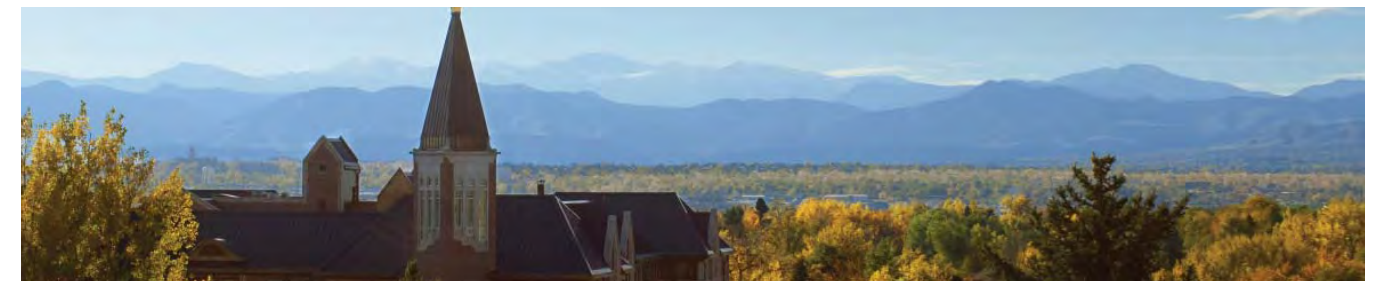
The state should continue to be proactive to ensure maximum efficiency among user groups like the Front Range cities or agricultural users in selected river basins. Maximization of efficient use of water builds trust and goodwill among all competing water user groups.

ENCOURAGING WATER CONSERVATION 2

Observations

As a semi-arid state with a history of serious droughts, Colorado needs to expand its efforts to embrace a permanent water conservation ethic for all water users, to develop a culture of conservation. Urban water conservation and water efficiency efforts have made significant progress and have nearly unanimous support among Colorado residents as one way to address water supply challenges proactively. Even with significant progress, there are opportunities to encourage more conservation, including identification of water lost through leaking distribution systems, improving water use efficiency and use patterns, and reuse of water where permissible. Conservation efforts

and efficiency improvements of irrigation water are less widely practiced, often more expensive, and contain unique challenges. Without real economic incentives for agriculture, the potential for significant changes in agricultural efficiency is low. Meeting Colorado's urban water demands will require some transfer of irrigation water to urban use. Conservation and irrigation efficiency improvements are elements of an integrated and holistic approach to meeting Colorado's needs and may facilitate movement of irrigation water to municipal use while minimizing impacts in the agricultural and ranching communities.



Challenges and Limitations

To some extent, Coloradans have demonstrated more willingness to conserve during times of drought than in average water years. Water providers are facing a challenge of instilling an “ethic of conservation” during both drought and average years. Many water providers are aggressively addressing water conservation with deliberate programs and plans; however, developing a better understanding of conservation practices (and their relative effectiveness) would improve the potential for conservation to have a significant impact on the state's water needs. Components will vary among water providers, however uniformity and consistency where applicable send a clearer message and align political will.

As it currently stands, Colorado water law provides little incentive for agricultural users to improve the efficiency of their systems. Water delivered to agriculture that is not lost to evaporation or incorporated into the crops remains within a river system as a return flow. Return flows are considered to be part of the public's water resource, and are not a part of an individual user's water right. Therefore, the only part of an agricultural delivery that can be sold or transferred to another water user is the consumptive use. The United States Geological Survey has estimated that an average of 37 percent of the water delivered statewide to agriculture is actually consumed. In addition, conservation of agricultural water in water-short systems, which are common in the Arkansas and Platte River basins, will not necessarily reduce total consumptive uses or increase the water supply available for municipal use. Conservation measures in these systems may instead allow agricultural users to meet a greater proportion of their total demands because the same quantity of water can be used at a higher rate of consumption.

Both cities and agricultural water users are working to overcome social and political barriers that have presented historical challenges to working together, such as the fear of permanent loss of water for irrigation if it is shared with cities. However, studies by SWSI and others show that significant reductions in agricultural deliveries are possible through the following:

- **Encourage and enable rotational fallowing, where a group of growers pools their resources and agrees to follow blocks of acreage on a season-by-season basis.**
- **Install more efficient irrigation practices such as drip irrigation on new crops that have reduced consumptive use demand.**
- **Make certain modifications to the delivery system that reduce evaporative losses (may require a statutory change)**

OPPORTUNITIES

As discussed above, it is essential that Colorado begin to develop a culture of conservation in both urban and agricultural areas within the state. Because agricultural deliveries in Colorado are about eight times that of urban use, savings of some portion of the consumptive use of agricultural irrigation will partially meet projected demands of the Front Range cities. Urban areas need to maximize conservation practices to reduce the quantity of new water required to support the expected growth. To advance these strategies, the state could do the following:

- Encourage projects or studies that provide accurate assessments of the quantity of water that could be saved by maximizing efficiency of urban water use statewide.
- The state should consider imposing a mandate that all municipal water providers have approved water conservation plans, akin to the current requirement of the Colorado Water

Conservation Board for loan applicants. Also, incentives should be provided for municipal water providers to conduct integrated resource planning that examines all opportunities for maximizing existing supplies, including more conservation and reuse.

- Initiate a detailed statewide evaluation of irrigation uses and potential savings, the required infrastructure to transport water to urban areas, and potentially new financing mechanisms.
- Consider legal and institutional changes so that farmers and ranchers can benefit from changes in irrigation practices that improve efficiency, while maintaining historical return flow patterns. This would provide long-term protection of the state's rural economies by sustaining current agricultural production with less water consumption.

Observations

Water demands in urban areas throughout Colorado are increasing due to growth pressures. With this prospect in mind, it is merely a matter of when and how the agricultural and urban water users participate in water transfers. The challenge is to construct an integrated exchange system that provides mutual benefits. An over-riding concern of the panel was preservation of the farming and agricultural heritage of the state, while enabling continued economic development in urban areas.

This approach is not without precedent in Colorado. Several recent agreements between the City of Aurora and

entities in the Arkansas basin are examples that provide insight upon creative partnership formation.

An agreement between the Upper Arkansas Water Conservancy District and Aurora provides management of water resources for the Arkansas River basin. Within this agreement, Aurora operates its system to remove the 1874 call of the Rocky Ford Ditch for the benefit of junior diverters within the basin.

The City of Aurora has worked to find mutually beneficial ways to transfer water between the City and the Arkansas Valley communities. Some examples follow.

- **In the late 1980s Aurora purchased 8,000 acre-feet of water for the City's use.**

- Before Aurora could use a drop of the water, the City agreed to revegetate 4,100 acres of land that had been irrigated with this water.
- Aurora agreed to make payments in lieu of taxes (PILT) to Otero County to mitigate impacts to the tax base.

- **In the late 1990s, Aurora worked with Rocky Ford area farmers to purchase 5,000 acre-feet of water for the City's use. In addition to previous mitigation activities, Aurora instituted a continued farming program with selling farmers.**

- In 2004, Aurora paid Rocky Ford area farmers \$1,400 per acre to install drip irrigation systems, thus allowing farmers to continue to farm with efficient irrigation technology.
- Aurora provides a portion of the purchased water back to the farmers, using the remainder for the City.
- In addition to PILT payments to the County, Aurora has mitigated tax base losses with a payment of \$1.5 million to the local school district.

- **In 2003, Aurora implemented a 2-year temporary leasing (water leasing) of agricultural water (consumptive use) to the City using a Temporary Substitute Supply Plan. This pilot leasing-fallowing program included 160 farmers who negotiated to lease water to Aurora.**

- This provided drought protection for Aurora.
- There was no permanent dry-up of farmland.
- This agreement provided much needed finances to the farmer.

- **In 2006, Aurora supported successful legislation to provide for the leasing/fallowing of agricultural lands.**

A couple of studies have recently been initiated that will further evaluate the possibility of sharing of water between cities and farms. These are 1) a study to be conducted by Colorado State University sponsored by Parker Water and Sanitation District to examine potential impacts of agricultural conservation programs and rural-to-urban water transfers in the Lower South Platte River Valley, and 2) a study related to the establishment of a water entity that will serve as a clearinghouse for farmers who practice rotational crop management practices, or fallowing, and then lease a portion of their water to municipal and urban water providers. The concept and potential new authority has been labeled the "Super Ditch."

Challenges and Limitations

Creating and implementing a new model to facilitate the new uses and partnering for water use would face legal, social, and political challenges. However, a framework that would allow long-term leasing and successful transfers between agricultural and municipal users requires a fresh approach.

For example, a water bank concept could facilitate the efficient sharing and/or exchanges between agricultural and municipal users. The following financial incentives could be considered as part of the water-banking approach:

- **Compensation to those growers participating in rotational fallowing programs.**
- **Compensation to install more efficient irrigation equipment.**
- **Payments for irrigation scheduling to reduce applied water.**

The overall challenge is creating the institutional structure to support pilot testing of the water bank or similar concept, and whether this represents an opportunity for public-private partnerships.

OPPORTUNITIES

Use of a model where growers are compensated at competitively negotiated market prices for saved water (and assured of no loss of long-term water rights) results in a major infusion of capital into rural counties of Colorado, while at the same time, provides cities with a competitive and reliable source of future water supply. Next steps to evaluate the feasibility of this approach could include the following:

- Evaluate whether and to what extent Colorado water rights laws need to be clarified to assure participants that their historical water rights will be protected even if their actual water use diminishes.
- Conduct scientific analysis to determine how much of the consumptive use portion of water, if any, could be saved from

modified farming practices. Evaluate the required infrastructure to collect and transport water to the new point of use.

- Identify current barriers (legal, social, and political) to enabling a market-based approach to the transfer of water between users.
- Develop and implement a well-thought-out model on a pilot scale in one basin within the state.
- Encourage a group of panel participants to work with Department of Natural Resources in this initiative. Several panel members are interested in working as a small group in developing a model and criteria to enable these partnerships to become effective.

Observations

Phreatophytes are terrestrial plant species that thrive under shallow water table conditions by extending their roots to the phreatic (water-saturated) zone. Many of these species are considered invasive and non-native, and use significant quantities of water through evapotranspiration. Tamarisk (also known as salt cedar) is an exotic drought- and flood-tolerant, small, shrubby tree that was introduced into the Southwestern United States near the beginning of the 20th Century. This plant consumes large quantities of water and deposits salt into the soil. The plant thrives in mostly salty soils and reproduces quickly via the hundreds of millions of wind-blown seeds produced by each plant annually. Another non-native species that also uses a significant quantity of water is the Russian olive tree.

In 1970, it was estimated that tamarisk occupied more than 1 million acres of riparian habitat in the West. Current estimates are that the plant may occupy as much as 2 million acres in the Western United States. Estimates of water consumption by these species vary widely. Studies indicate that the consumption throughout the Southwestern United States is in the range of 2 to 4.5 million acre-feet per year. In Colorado, it has been estimated that 55,000 acres have been infected with an estimated consumption of 170,000 acre-feet. Left uncontained, the species will continue to spread, and water consumption by non-native species will continue to increase.

Several removal methods have been utilized. These removal methods include physical/mechanical removal, cutting, mulching and stump spraying, aerial spraying, and using the tamarisk beetle to defoliate the plant. The National Park Service and The Nature Conservancy have both had positive and low-cost experience eradicating tamarisk. Further, the U.S. Department of the Interior has identified addressing the negative

effects of invasive plant species on the ecosystem as an agency priority through Executive Order 13112. Over 40 linear miles and over 10,000 acres of the Canyon de Chelly National Monument have been invaded by tamarisk and Russian olive, threatening the stability of the canyon road system and creating fire hazards. The National Park Service has treated approximately 1,000 acres of tamarisk infestation in the Canyon de Chelly National Monument by cutting stumps or removing roots, applying herbicide, and slash burning. Removal of tamarisk from the infested areas has allowed native species to re-establish themselves naturally. However, other studies indicate that active revegetation with native species is required to prevent re-infestation.

The U.S. Department of Agriculture has evaluated biological control methods for tamarisk, including a mealybug (*Trabutina mannipara*) and a leaf-feeding beetle (*Diorhabda elongata*), with promising results. However, due to concerns over protection of the endangered southwestern willow flycatcher bird, the Environmental Assessment for the release of the two insects was delayed. The endangered bird has adapted to nest in tamarisk trees because the trees have displaced willow trees. Concerns have been raised that no trees would grow in place of the tamarisk trees if they were removed, and thus the endangered southwestern willow flycatcher bird would be negatively impacted by efforts to control tamarisk infestations.

Water savings resulting from eradication efforts with the tamarisk becomes system water, meaning that the water saved cannot be claimed by an individual entity but rather becomes available to all users under the appropriation doctrine. However, this additional water can be obtained through moderately priced efforts, and increases in water flows within the river basin are certainly beneficial to all water users.

4 ERADICATION OF NON-NATIVE PHREATOPHYTES (CONTINUED)

Challenges and Limitations

Creating a significant reduction in non-native phreatophytes' water consumption would require eradication of thousands of acres of tamarisks and other non-native phreatophytes. While this would likely receive broad-based support from the conservation and environmental community, this expansive project would require sponsorship and funding at the state and/or federal level. In addition, because any saved water becomes system water, there is no apparent economic incentive for an individual water purveyor to provide financial support for this initiative.



OPPORTUNITIES

- Pursue the continuation and expansion of federal funding for eradication of non-native phreatophytes. (While the cost per acre-foot of water produced is small, the area where eradication is needed is very large.) Some funding is likely to be needed and can be justified in part because the major rivers leaving Colorado are all shared by multiple states.
- Plan for a statewide program after the benefits and techniques are well understood.
- Consider changes to water law and/or river management practices to create real economic incentives for non-native phreatophyte removal that could increase the water supply for Colorado water suppliers.
- Select a pilot basin for implementation to fine tune eradication and revegetation methods.

5 STREAMLINING WATER COURT

Observations

Water courts are currently overburdened and understaffed, resulting in trial dates often being set several years into the future. The current caseload seems to be larger than what existing personnel can handle.

During the January meeting of the panel, two proposals received support from the panelists related to potential changes intended to streamline the Water Court Process. The first proposal was to appoint special Masters to assist in conducting certain water court proceedings. The Master could conduct hearings and make recommended findings of fact on some of the issues. The individual could be an engineer in some instances, as technical knowledge in some water related cases would be helpful. The benefit of such a proposal would be to develop a procedure that could save the current Water Judges time and could reduce to some extent the logjam of cases currently in front of the Water Court. This proposal and the procedure

indicated below were presented to several knowledgeable individuals for comments, including current Colorado Water Judges and Referees, Justice Gregory Hobbs on behalf of the Colorado Supreme Court, State Engineer Hal D. Simpson, and the Water Law Section of the Colorado Bar Association. A detailed discussion of their comments is included in Appendix A.

The second proposal of the panel was potential establishment of an emergency process whereby the user could obtain an immediate hearing before the referee or Water Judge. This recommendation was made based on circumstances known to some panel members in which water users had need of rapid action by the Water Court due to emergency circumstances. An example of this type of dispute is review of a temporary augmentation plan or change of use to get the user through the plant-growing season. Again, responses to this proposal are included in the location discussed above. Several other specific suggestions were made by the commentators.

Challenges and Limitations

The fact that the Water Courts are overburdened and understaffed, often leading to extended periods of time for a proceeding to take place, is almost universally agreed upon. However, the challenge exists in identifying proposed solutions that will be acceptable for the key participants in the Water Court proceeding process. The participants include Water Court Judges, attorneys representing the water users involved in the dispute, and water entities seeking resolutions. Each of these participants has unique interests which they wish to protect. The overriding concern is that the decision from the Water Court proceedings be just. Timeliness of the decision may be less important to some of the participants than others. It is also extremely difficult to create changes to legal processes and procedures that have been in place and have become institutionalized over many years.



OPPORTUNITIES

The panel understands that water cases in Colorado can be complex, contentious, and time-consuming. However, two proposals are made to streamline the process while still ensuring just decisions.

1. Consider amending Rule 53 of the Colorado Rules of Civil Procedure to permit the appointment of special Masters in Water Court proceedings, upon request of one or more parties to the case. The special Master could be an engineer, retired judge, water lawyer, or others who have necessary expertise to thoroughly and efficiently conduct certain parts of the proceeding.

2. Consider establishing a study group, consisting of a Water Judge, a Water Referee, a representative from the State Engineer's Office, representatives of the General Assembly,

and members of the Water Bar to design amendments to the present system that would allow for:

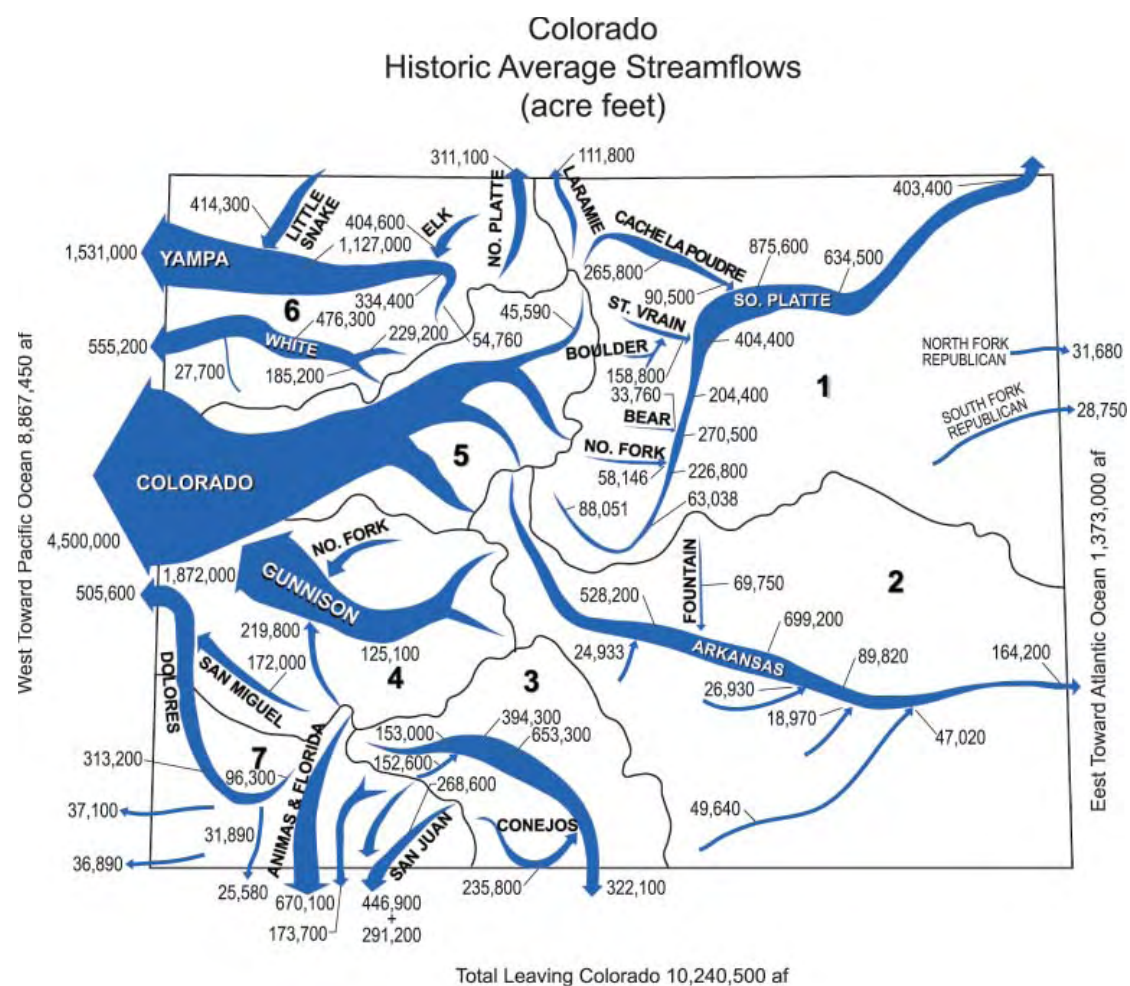
- a. emergency proceedings
- b. simplified proceedings for non-complex disputed matters
- c. changing the re-referral provisions to vest authority in the Water Court and the referee to determine the necessity of re-referral, rather than leaving the discretion with the parties involved
- d. merging of some authority into the State Engineer's office to add flexibility to the Water Court system

6 ENCOURAGING STATEWIDE PERSPECTIVE ON WATER STORAGE AND INFRASTRUCTURE PROJECTS

Observations

Storage has historically been an essential component of water supplies in the Western United States. In Colorado alone, 1,879 reservoirs with a capacity of at least 100 acre-feet or a surface area of 20 acres currently exist. These reservoirs hold an average of 6.8 million acre-feet of water. The need for additional water storage was included in the consensus list of critical topics, but not without debate and disagreement regarding the potential effective yield of remaining storage sites. Some on the panel stressed that the enlargement of existing reservoirs, underground storage in groundwater basins, off-stream or prairie reservoirs, and gravel pits should be pursued whenever possible.

Future water projects being evaluated by Front Range water utilities all involve some storage component, either the enlargement or re-operation of an existing reservoir, a new reservoir, storage in groundwater basins, or development of gravel pits. The recent SWSI study concludes that storage is an essential component of meeting the future water supply gap and lists 11 benefits of reservoir storage. Among the benefits is the need for new storage reservoirs to protect and ultimately develop the full Colorado allotment within existing compacts. There is debate regarding the amount of Colorado's remaining allotment from the Colorado River Basin, which could be as much as 400,000 acre-feet. The figure above shows Historic Average Streamflows leaving Colorado.



7 FACILITATING COOPERATION BETWEEN RIVER BASINS

Observations

The areas of highest potential population growth and therefore water demands are on the eastern side of the Continental Divide, in the South Platte and Arkansas River Basins (see figure). Recognizing not all panelists accept some of the findings of the SWSI Report, it does provide estimates of water supply needs for the various river basins in the state. The report estimates statewide demand for municipal and industrial usage will increase by 730,000 acre-feet at current usage, and 630,000 acre-feet with enhanced conservation by 2030. The report estimates future municipal and industrial demands of 410,000 acre-feet and 98,000 acre-feet

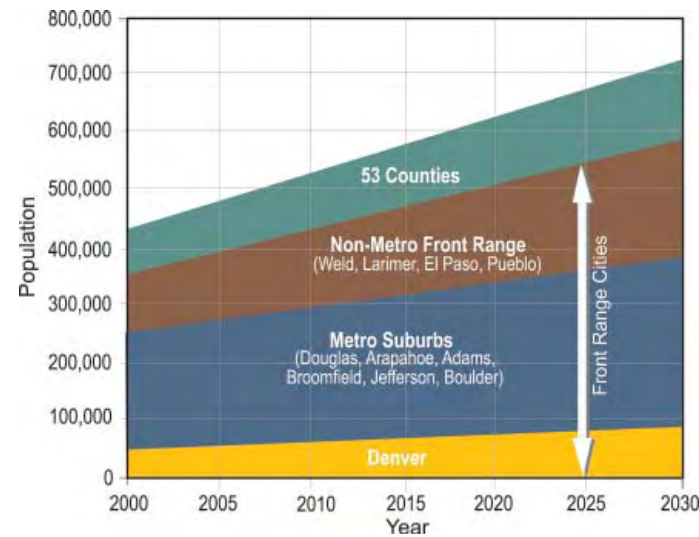
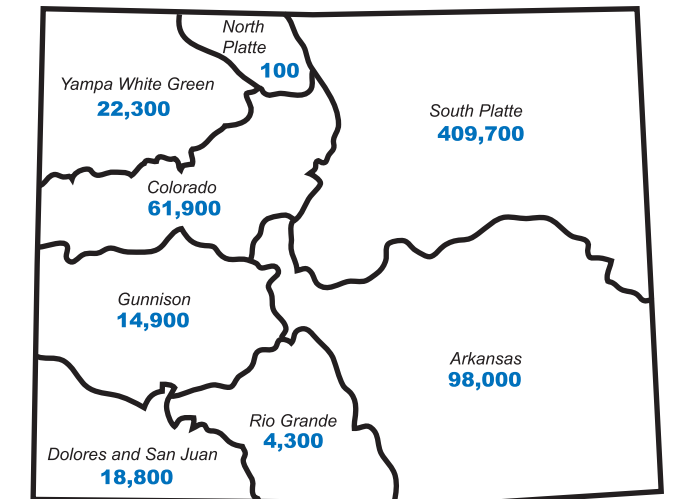
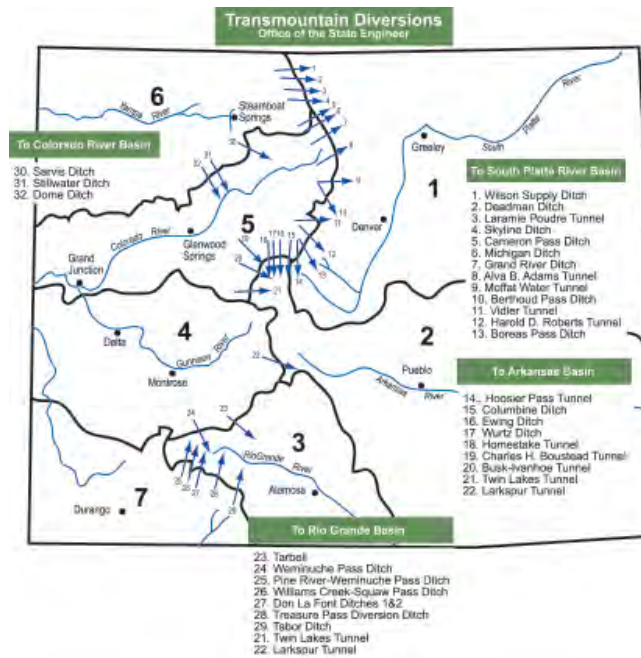
within the South Platte and Arkansas River Basins, respectively, by 2030 with enhanced conservation.

Interbasin and transmountain diversions and transfers have been used in Colorado for decades, and the State Engineer's Office lists 32 transmountain diversions, as shown below. The first major water law decision in Colorado supported this action in 1872. The situation of water demands being large in areas where adequate supplies do not exist is a common occurrence in the Western United States.

Challenges/Limitations

Some protections for the basin of origin of river basin diversions exist in state law. However, the level and extent of protection that these statutes and regulations provide is a controversial topic throughout the state. Nonetheless, meeting the long-term water supply needs in Colorado may include some additional diversions, and implementation of these types of projects will require new trust and cooperation between affected basins. The January 19, 2007, technical report (Appendix A) provides a complete discussion of existing statutes and regulations within the State of Colorado related to transbasin diversions.

Colorado's eight major river basins and the expected increase in gross M&I water use in acre-feet per year by the year 2030 with enhanced conservation



OPPORTUNITIES

During the course of our discussions, there was considerable debate among the panelists regarding the necessity and future for transbasin diversions. The panelists recognize that transbasin diversions are an important aspect of the water supply infrastructure that currently exists in Colorado, but the panel could not develop a consensus opinion regarding the need, timing, and guidance framework for future transbasin diversions. Some panelists believe that transbasin diversions should be considered only after exhausting other supply options, but the panel was not able to conclude what factors would be considered to determine when transbasin diversions may be appropriate. Other panelists felt that additional transbasin diversions are inevitable. Without a clear framework for cooperation between the various river basins in the state, decisions regarding the validity of transbasin diversions will likely be made with a parochial view-point, potentially blocking sharing of water resources for the collective good of Colorado.

Appendix A includes a discussion on transbasin diversions and panelist opinions. The Colorado Water for the 21st Century Act (HB-1177) set up a framework that provided a forum for broad-based water discussions. It created two new structures: 1) nine independent Basin Roundtables and 2) The Interbasin Compact Committee (IBCC), a statewide committee that addresses issues between basins. The IBCC will be using the SWSI Report, which has identified that "future demands in basins will outstrip all available water rights within the various basins."

The panel believes that the state should encourage institutional cooperation in sharing of existing and new facilities when such cooperation will enhance the value of projects for multiple entities or jurisdictions along the Front Range. Maximizing the overall project benefit and water yield should be the overarching priority.

8 PLANNING FOR POTENTIAL CLIMATE CHANGE AND DROUGHT

Observations

Climate change is a relatively new consideration that would create new challenges for water utilities. Some believe that if climate change is a reality, the effect on mountain regions will be particularly significant. The U.S. Global Change Research Program (2000) reported with “very high confidence that climate change would greatly reduce snowpack in the Rocky Mountains. Not only is the climate expected to be warmer overall, but temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations – all leading to less snow.” Researchers at the National Center for Atmospheric Research recently developed a climate model demonstrating how climate change could impact runoff, snowpack, and other variables in the Colorado River Basin. Their results predict a 14 to 17 percent reduction in runoff in the Colorado River.

We need only to look at the Australian continent today to see the impact of extreme drought. Some areas are in the “eleventh year of a 10-year drought,” and in some instances, storage is available for only about 11 percent of annual demand. Strategies are being considered by city leaders for:

- **Stage 5 water restrictions in Brisbane. These will commence on April 10, 2007, with an aim of limiting water consumption to 140 liters/person/day (37 gallons/person/day).**
- **A water grid is the government’s response to connect South East Queensland with a number of source waters (surface, groundwater, desalinated ocean water, and recycled) such that water can be moved between cities and districts. The current storage in South East Queensland is at 21 percent. This gives about 18 months of storage at Level 5 restricted water use. Level 5 restrictions mainly impact outdoor water use for homes by reducing the number of days people can water gardens with buckets from 3 to 2. Level 5 restrictions also prohibit washing vehicles, caravans, and boats.**

It has been reported that Brisbane may get as low as 5 percent of dam capacity prior to the time new desalination plants and recycled water projects will be completed.

On January 29, Australia’s Prime Minister John Howard announced a national initiative to take over management of a drought-stricken basin, which is home to 2 million people and 80 percent of the country’s irrigated farmland.

This proposal is likely to be very controversial and result in debate of several of its components including:

- **Investment to improve efficiency of agricultural irrigation.**
- **Address over-allocation of water to some long term users.**
- **Cap surface and groundwater use in the basin.**

Challenges and Limitations

Various predictions have been proffered regarding the potential for global or regional climate change, which could increase the intensity and duration of drought cycles. The old planning paradigm (the historical record) may not serve us well in the future, and that increasing uncertainty must be matched with increased system and institutional flexibility as well as a broader menu of the means of adapting to this uncertainty. This creates a difficult challenge for the state’s water planners and will likely force many Colorado water suppliers to question their previous assumptions regarding “firm yield,” or the amount of water an entity has to withstand a severe drought period. This could significantly change the way that water supply systems are designed and operated, and forces water suppliers to consider this risk factor as part of their long-term resource planning.

There is no well-accepted methodology for planners to assess this risk, but over-estimating the risk creates a need for new supply projects and related infrastructure, and under-estimating the risk creates a potential water supply crisis. Development of a uniform approach to addressing this risk is probably not realistic or even appropriate. In addition, distinct groups of water users, such as municipalities, business and industry, the ski industry, ranchers and farmers, and environmental groups will disagree on priorities in planning for impacts of climate change and drought.

OPPORTUNITIES

In many respects, the nation is becoming more attuned to the potential impact of climate change. Likewise, many water users are concerned about potential for severe droughts and are looking for ways to minimize their impacts. This could help contribute to consensus that Colorado and other Southwestern states should be taking practical steps to plan ahead. Colorado could play a pivotal role in preparing a plan that includes the best science and brings together water users

from various regions and water communities. As part of an integrated resource planning approach, all medium to large water suppliers that depend on storage or reusable supplies should consider “sensitivity” analyses to determine how their systems would respond to protracted drought and confirm with their communities how much investment should be made in drought protection measures.

9 MAINTAINING HEALTHY RIVERS AND INSTREAM FLOWS

Observations

Vibrant and flowing rivers and streams are essential to defining Colorado's uniqueness. Rivers make the state an attractive, enjoyable place to live, work and visit. Colorado is the headwaters for the Colorado, Arkansas, Rio Grande and Platte River, and in total, there are more than 95,000 miles of rivers and streams in the state. Maintaining a minimum flow in rivers (known as instream flows) provides an essential component to maintaining healthy aquatic habitat. The flows in these rivers and streams also support the riparian habitat that wildlife depends on. The recently passed House Bill 1177 allows basins to evaluate need and priorities of

instream flows or "non-consumptive needs assessments" (NCNA). The Colorado Department of Natural Resources' Interbasin Compact Committee is helping the basins with this evaluation and has set a goal to produce a prioritized set of needs by the end of 2008. In addition, our economy benefits from maintaining instream flows in rivers, which is critical for fishing, rafting and other recreational and tourism industries. Cities such as Golden have enhanced the quality of their communities by maintaining instream flows through their parks and recreational areas.

Challenges and Limitations

Awareness of and support for instream water needs has increased - but so have other water demands creating more competition for this limited resource. For example, industrial, municipal, and agricultural water users are also competing for water.

In 1973, the Colorado Legislature granted authority to hold instream flow water rights. This was necessary because most water rights are only valid when the water is put to "beneficial use," in other words, water rights holders must "use it or lose it." While the legislature made this change, the law stipulated that instream flows can only be helped by the Colorado Water Conservation Board and can only protect "minimum flows." In addition, these rights, like other water rights in the state are subject to the prior appropriation system. Senior water rights must be met before junior water rights are effective.

OPPORTUNITIES

Most Coloradans, as well as the tourists who visit our state, value the fact that instream flows help maintain the unique natural qualities of Colorado. Further, they protect the fish, the environment, wildlife, and the recreational economy. Details of ideas and solutions to further the impact of instreams are discussed in reports such as Facing Our Future: A Balanced Water Solution for Colorado, and Trout Unlimited's A Dry Legacy. These opportunities include:

- Support for water conservation measures to reduce the impact of increasing demand
- Prioritize river segments in need of instream flows (Gold

Medal and wild trout fisheries, Great Outdoors Colorado priorities).

- Encourage the CWCB to acquire senior water rights.
- Encourage water rights holders to share water through following, leases and interruptible supply agreements.
- Operate storage facilities to help maintain instream flows at critical times of the year.
- Use the NCNA priorities to help plan projects around instream values and strategically expand the existing instream flow program.



