



## Living in the Rocky Mountain West

*A Series from the* Colorado Institute of Public Policy



# Water in 2025

## Beliefs and Values as a Means for Cooperation

January 2006



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The views expressed in this paper are those of the Colorado Institute of Public Policy and do not necessarily reflect the positions of the reviewers and stakeholders.



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# Executive Summary

Issues of water policy in the West are about people and the diverse beliefs and values that they hold. The relationship among these beliefs and values and society's ability to find policy solutions is strong, but not always evident.

In an environment of resource scarcity, many in the water community have already placed themselves in positions that advocate for particular solutions. There are ongoing debates about the challenges, strategies, and their associated issues, but rarely are the underlying values examined. Instead of embracing common interests, we have tended to harden against the various positions that others hold.

Recognizing the full range of beliefs and values is not just a useful starting point for tackling today's challenges; it is a pragmatic starting point. Searching for commonalities, understanding personal assumptions, and knowing how others understand situations can foster innovative strategies. But prior to effectively determining what strategies to endorse, it is necessary to understand how the varying values and beliefs in the water community mold interpretations of the most pressing water problems.

To illustrate how beliefs and values are connected to water challenges, this paper highlights the results of two surveys given to 84 water stakeholders in Colorado. The stakeholders included people representing environmental, agriculture, recreation, and urban interests as well as water providers, elected officials, and researchers.

## Key Findings

The first survey gathered information about the varied interests—beliefs and values—held by stakeholders in the water community. The results of the survey indicate:

Three areas of *overwhelming agreement*:

1. *Water is fundamental to the economy.*
2. *An appropriated right does not mean water will be available for use.*
3. *Agricultural water is the prime target for water transfers to urban and recreational uses.*

Five beliefs held by a *majority* of participants:

1. *Money has become the means for allocating water.*
2. *The market is not always the appropriate method for allocating water.*
3. *Protecting existing individual water rights is important*, and this is the case whether one believes the system is broken or not.
4. *Water court decisions have been favorable to agricultural interests*, a belief held by those inside and outside the agricultural community.
5. *Current water law is quite functional*—it is neither outdated nor unable to handle new demands.

And five areas of *disagreement*, including:

1. The “*use it or lose it*” doctrine is seen by some to encourage wasteful use of water, while others believe it has no detrimental impact.
2. There is a strong division of opinion on whether there is a *connection between land use and water planning*.
3. Some respondents believe the *recent drought proved the inadequacies of the current water system*, while some felt just the opposite.
4. Some respondents think there is *plenty of water if used wisely*, while others see a shortage and think *new water needs to be developed*.
5. There is significant disagreement as to whether or not *environmental claims have limited legal recognition*.

The second survey addressed perceptions of the water challenges Colorado and the Rocky Mountain West face today and will face in the future. Survey respondents articulated three distinct views of current and future challenges:

1. *Balancing consumptive use needs*, which included the following priorities:
  - Accommodate municipal growth without harming the long-term viability of agriculture.
  - Solve problems through effective partnerships—local, regional, basin, federal, private, and public.
  - Increase cooperation among basins and states where water is a shared resource.
  - Prepare for future severe droughts.
  - Balance private property rights and public interest.
  - Protect water quality.
2. *Water sustainability*, which included the following priorities:
  - Maintain water quantity and quality while the population continues to grow.
  - Incorporate conservation and efficiency in existing water user operations.
  - Integrate water supply for consumptive use, environmental use, and recreational use.
3. *Institutional streamlining*, which included the following priorities:
  - Develop institutional responses to political and legal barriers for better management of water.
  - Address federal regulations that are impediments to solving state problems.
  - Streamline the water development process.
  - Solve problems through effective partnerships—local, regional, basin, federal, private, and public.
  - Prepare for future droughts.
  - Incorporate conservation and efficiency in existing water user operations.

Taken together, the surveys reveal overlapping and diverging beliefs and values within the water community, which are linked in complex ways to the challenges we face. If conversations within the water community begin with and periodically come back to values and beliefs, common values can emerge, allowing for a wider range of positions and, ideally, more enduring solutions.



# Living in the Rocky Mountain West

The West's long-term economic health depends on the availability of adequate water supplies. It is therefore essential to approach water issues in ways that are forward thinking and relevant. This paper encompasses the perspectives of a variety of participants from the academic and water community and is addressed to stakeholders grappling with the diversity of water interests within water basins, between basins, and across the state. The information presented is intended to illustrate a productive way to think about water in the West.

This paper is the first in a series, *Living in the Rocky Mountain West, 2025*, produced by the Colorado Institute of Public Policy at Colorado State University. A series overview is available at [www.cipp.colostate.edu](http://www.cipp.colostate.edu).

## Introduction

The Rocky Mountain West<sup>1</sup> continually faces complicated and rapidly changing water policy challenges. We can take a back seat to these issues and let future generations deal with them; or, we can take the driver's seat and cooperatively<sup>2</sup> address our challenges.

Issues of water supply, water needs, and water quality continually bring stakeholders together in cooperation or in conflict. The West has proven resilient in finding an array of strategies, but has not yet figured out how best to move the process forward cooperatively. Today, water issues are fundamentally about the people of the West and the diverse beliefs that they hold.

To illustrate how beliefs and values are connected to water challenges, this paper highlights the results of two surveys given to 84 stakeholders in Colorado. The first survey gathered information about the varied interests—beliefs and values—held by stakeholders in the water community. The second survey addressed their perceptions of the water challenges faced by Colorado and the Rocky Mountain West today and in the future.

Taken together, the surveys reveal overlapping and diverging beliefs and values within the water community, which are linked in complex ways to how problems are defined. Because subjective perceptions are as important as objective data in defining policy problems (Giandomenico, 1989; Wood & Doan, 2003), a focus on perceptions is critical for creating constructive dialogue, inclusive solutions and, ultimately, more enduring water strategies.

This paper begins by imagining a system with today's issues in mind, but without the views and solutions structured by decades of water law. Following this is a framework to think about water issues in terms of beliefs and values, both as commonalities and differences in the water community. A discussion of how beliefs and values relate to framing policy problems sets the stage for reporting the results of the surveys. In conclusion, this paper touches on concerns related to implementing values and beliefs in the decision-making process.

*Water issues are fundamentally about the people of the West and the diverse beliefs that they hold.*

<sup>1</sup> The Rocky Mountain Region includes Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.

<sup>2</sup> Cooperation, as defined in this paper, is the willingness and ability to work with the heterogeneous groups of water stakeholders in a decision-making process (Rosen & Sexton, 1993).

## Water Today: An Exercise

In the early 20<sup>th</sup> century, the Rocky Mountain West was sparsely populated. Most people lived in rural areas and engaged in farming and ranching activities. Issues of water management, conservation, and efficiency were in their infancy compared to today, but interstate disputes over water were not. Delph Carpenter, Colorado's Commissioner of Interstate Streams, led the creation of the 1922 Colorado River Compact, which equitably apportioned the waters of the river among seven states in the West. This process was important not only for the Colorado River, but for the thirteen water allocation compacts that followed (Tyler, 2003).

These accomplishments, profound at the time, have had a significant influence on water in the West today. But yesterday's landscape is not today's. Today's landscape is not the future's. If there were no precedents—no system of water allocation, no priority dates, no history of water law—just a blank slate, how would today's water needs influence discussions and negotiations about water in the future?

Our predecessors, who creatively and successfully built the system we have today, used their discussions and negotiations to forge new ground in an era with few precedents. Imagine the conversations that would have occurred if the following conditions existed in the early 1900s:

1. There are many interests to accommodate: Agriculture, urban, industrial, recreation, and the environment, among others.
2. Economic benefits come from both consumptive and non-consumptive uses.
3. Most of the population lives in urban areas. Population growth in the Rocky Mountain West is projected to be among the highest in the country over the next 20 years.
4. Some basins are experiencing rapid groundwater depletion.
5. Groundwater use alters the availability of surface water in some areas.
6. Water quality is an important consideration within basins and between states that share water sources.
7. Federal regulations governing water quality change over time. Some pollutants are generated by human activity; others result from natural environmental conditions.
8. Federal regulations, including the Endangered Species Act, must be addressed in water management.
9. Many rivers are over-appropriated. Meeting the needs of all basin users within basins, across basins, across state lines, and across national boundaries is increasingly difficult.
10. Bi-national water usage and practices of the same river can be in conflict and create significant management and legal challenges.
11. Tribal water demands and uses need to be accommodated.
12. Increasing climate variability adds additional uncertainty to water supplies and new challenges to management techniques.

Every so often—perhaps once a generation—it is worth resetting the baseline to *imagine* a system that would stem from new conditions and future projections. Consider the following questions:

1. What would be an equitable system? Is it even possible? If not, how are “losers” compensated?
2. How would efficiency and “best use” be determined?

*Yesterday's landscape is not today's. Today's landscape is not the future's.*

*It is possible to find the same creativity and motivation for accommodating multiple interests our forebearers possessed.*

3. How is flexibility built into the system to adapt to uncertainties—be they legal, environmental, or unforeseen consequences?
4. How does this “new” system differ from the current system?
5. What aspects of the current system are deemed useful in the “new” system?
6. How can the current system accommodate the realities faced today?

Exercises such as this provide an opportunity to think beyond the constraints of the current system; a system that has evolved over time and is the accumulation of punctuated changes. If stakeholders could come to the negotiation table looking squarely at the conditions we now face, it might be possible to find the same creativity and motivation for accommodating multiple interests our forebearers possessed.

## An Opportunity

*It ain't what you know that hurts you, it's what you do know that ain't so.*

– Will Rogers

## The Significance of Water

Much of the attraction to the West is rooted in the arid environment—growth is spurred by a mild climate, sunny skies, and spectacular scenery, all of which lie at the interface between aridity and water.<sup>3</sup> Moreover, water is not like oil, wood, or some other natural resource that may be essential for *modern* life. Water is essential for *all* life.

Water is also different from many other competitive resources because it is both a public good and private right. The doctrine of prior appropriation maintains that those users who first put water to beneficial use have senior rights to those with later, more junior claims. In addition to these private interests, water also serves public interests and values. Yet, rarely is there full agreement on what public values are or on which ones are the most important (Stone, 2002).

## The Meaning of Common Interests

When rivers run low and reservoirs tilt toward empty, there is every reason to maximize available supply and conserve existing water supplies. But in an era when many water sources in the western United States are over-appropriated, the problem is not simply scarcity. Disputes increasingly encompass the allocation and reallocation of water among competing needs. Yet, there is a common desire to make the best use of the water supply to meet current and future water needs.

Although stakeholders have some interests in common, disagreement exists about the definition or relative importance of these interests. So while stakeholders may be united in the desire to pursue these common interests, they are often divided when it comes to understanding them (Stone, 2002).

Most people in the West fundamentally understand that we live in an arid environment and, consequently, that it is important to live within the limits of our water supply, particularly during drought periods. But instead of agreeing on how best to solve the problem from the perspective of diverse interests, we tend to focus on the various strategies that fit within our individual understanding of the issue. For example, some suggest that urban water conservation is the best strategy to secure

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*Although stakeholders have some interests in common, disagreement exists about the definition or relative importance of these interests.*

<sup>3</sup> Drylands are conventionally defined in terms of water stress where the mean annual ratio of precipitation (P) to potential evapotranspiration (PET = potential evaporation from soil plus transpiration by plants) is significantly less than one, indicating that potential evapotranspiration exceeds annual precipitation (Convention on Biological Diversity, n.d.; National Oceanic and Atmospheric Administration, 1982; Sauchyn, Barrow, Hopkinson & Leavitt, 2002).

*Citizens often want things for their community that are in direct conflict with what they want for themselves.*

*Instead of embracing common interests, we tend to harden against the various positions that others hold.*

future supplies. If urban residents conserve, there will be water to meet future needs. Others suggest that urban conservation alone will not meet the water demands required for economic growth. Plus, by limiting water use on urban landscape, the quality of life for urban dwellers is diminished. They may then suggest creating additional urban water supplies to meet demand.

These interpretations of a common interest in living within limits are remarkably different. Ideas about how to use “extra” water also differ. The conservation advocate above may want water for other uses besides population growth. The supply-side advocate may want to preserve the economic viability of the region, and prioritize water for expanding populations and industries.

Citizens in the West recognize that water must be allocated among a multitude of uses, including agriculture, municipal and industrial, environmental, and recreational sectors. But there are also broader public interests, such as adequate supplies for future generations, proper water resources planning and management, water quality, and the environment. These serve to further complicate the meaning of “best allocation.”

In order to provide for public interests, we often have to rethink the ways in which we have individually defined the “best allocation” of water. Social benefits require private sacrifices (Stone, 2002). Private sacrifices may take many forms: those required to implement adequate conservation and water management strategies (e.g., watering or lawn size restrictions), those required to implement a well-designed water supply project (e.g., adverse impacts to the environment or areas-of-origin), and those required for instream flow protection (e.g., constraints on the development of additional water supplies). As is found in many policy issues, citizens often want things for their community that are in direct conflict with what they want for themselves (Stone, 2002). So, although we can generally agree on the need to provide water for these public uses, we do not typically agree on the degree to which we should make personal sacrifices to achieve them.

## **The Challenge is in the Differences**

If we really do share some common water interests, why do we so often end up in conflict over solutions? This is because we also have divergent interests. We tend to approach problem-solving without adequately understanding either our commonalities or our differences.

It is evident in the water community that many have already placed themselves in positions that advocate for particular solutions. There are ongoing debates about the challenges, strategies, and their associated issues, but rarely are underlying values examined. Instead of embracing common interests, we tend to harden against the various positions that others hold.

## **Problems for Policy**

The complexity inherent in these deeply held values and beliefs pose real challenges for policy makers tasked with finding compromise (Davis, 2001). Policy makers are too often forced to draw conclusions amidst conflicting viewpoints and a lack of information (Brick, Snow, & Van de Wetering, 2001). The challenge is to lessen the uncertainties, and balance the needs of both current stakeholders and future generations.

It is impossible to make all values entirely compatible. But it is necessary to make decisions that are inclusive of a variety of perspectives. We propose that recognizing the full range of beliefs and values is not just a useful starting point for tackling today's challenges; it is a pragmatic starting point. Searching for commonalities, understanding personal assumptions, and knowing how others perceive situations can foster innovative solutions.

Traditionally, the water community has focused on finding strategies to approach water challenges. This approach essentially shortcuts from the problem to the solution, without necessarily considering other alternatives and others' thoughts, points of view, or closely held interests. As Cobb & Elder (1983) point out, "*Policy problems are not simply givens, nor are they matters of the facts of a situation, they are matters of interpretation and social definition*" (p.172, emphasis added).

This subjective dimension always serves as the foundation for defining policy problems; consequently, acceptable solutions are often circumscribed by the definition of the problems (Giandomenico, 1989; Stone, 2002). It is critically important that processes for resolving complex policy problems address stakeholders' values and beliefs with the same seriousness as they set forth the causal factors typically assessed in water debates.

Herein lies an opportunity. If we address the social precursors to how problems are identified and defined, some set of common interests will emerge, as will differences. Common values help build trust that leads to a willingness to consider differences as legitimate interests. And when individuals realize that their own beliefs are not widely shared, they may reconsider issues, or at least make some compromises. In this process, tolerance for diverse opinions and greater flexibility in one's positions can occur (Giandomenico, 1989). In short, a discussion of values and beliefs may help Colorado and the West to resolve water challenges in ways that are more effective and collaborative.

## Getting from Here to There: Finding Commonalities among our Differences

*When it [the West] fully learns that cooperation, not rugged individualism, is the pattern that most characterizes and preserves it, then...it has a chance to create a society to match its scenery.* (Stegner, 1972)

Typically, the water community focuses on what strategies are best to approach water challenges. But before we can effectively determine *what* strategies to take, we need to understand *how* varying values and beliefs in the water community mold interpretations of the most pressing water problems we face.<sup>4</sup>

A survey of 84 representative members of the water community across Colorado was conducted to capture the varying beliefs held and challenges identified by diverse interests. Table 1 provides the affiliations of the survey respondents.

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*Capturing how priorities relate to each other is important to move contentious groups toward constructive conversations.*

<sup>4</sup> Recently, a stakeholder evaluation was conducted for the Statewide Water Supply Initiative project. One component incorporated stakeholder preferences to capture the values individuals assigned to each objective as to "allow for discovery of common ground." (Colorado Water Conservation Board (CWCB), 2004, p. 9-3). This subjective dimension of values, beliefs, and preferences is increasingly seen as a critical aspect to incorporate in the decision-making processes.

**Table 1. Survey Participant Affiliations (n=84) <sup>1,2</sup>**

AFFILIATION	% OF PARTICIPANTS
Agriculture	33%
Municipal Water Provider	26%
Water Conservancy District	21%
Elected Official	20%
Environmental/Conservation	20%
Public Utility	18%
Recreation/Tourism	16%
Other <sup>2</sup>	16%
Consultant	14%
Private Enterprise	14%
Irrigation District	12%
Water Conservation District	11%
Mutual Irrigation District	7%
Engineering	6%
Legal	4%
Research/University	4%
Rural Water District	4%

<sup>1</sup> Multiple affiliations were possible; therefore total percentage exceeds 100%.

<sup>2</sup> See Appendix A for more information about affiliations.

Q-methodology was used as the survey instrument. The strength of the Q-methodology over traditional survey techniques is that it requires participants to prioritize their beliefs in relation to other beliefs (Brown, 1993). Q-methodology uncovers how groups of perceptions cluster together to form unique combinations of complex views of the subject under investigation. Some groups will hold similar perceptions of certain beliefs or challenges, suggesting that commonalities exist. But it is also how the groups differ, e.g., the perceptions they hold that are not in common, that sets them apart from each other.<sup>5</sup> Life choices are always a trade-off and capturing how priorities relate to each other is important to move contentious groups toward constructive conversations.

The survey results in this section frame five essential components to fully incorporate beliefs and values into decisions about water. These components are:

1. Clarify the interests
2. Recognize the commonalities
3. Understand the differences
4. Face the challenges
5. Work toward innovative strategies

<sup>5</sup> Typologies are built through quantitative analysis and labeled by the researcher based upon the statements that cluster together. See Appendix A for more information about Q-methodology and the method of analysis.

## 1. Clarify the Interests

Incorporating values into decisions about water requires us to closely evaluate our interests in a particular water issue. The challenge is to understand our and others' individual positions as well as the reasons *why* we hold them (Bingham, 1997).

It is crucial to distinguish between *positions* and *interests*. A *position* is a stance that we take on a particular issue. *Interests* are the underlying reasons for the position. For example, very few of us want water for the sake of wanting water. There is usually an underlying interest to use it in some way that is meaningful to our values, such as farming or recreating. Trying to meet interests collectively is more constructive than trying to reconcile positions. Interests can be met in many ways; positions are much more rigid (Bingham, 1997).

For example, a kayaker may *position* himself in opposition to a water storage project, while a dairy farmer may *position* herself in favor of the project. The kayaker's *interest* in taking the no-storage position has to do with how he values the opportunity that free-flowing rivers provide for recreation. The dairy farmer's *interest* in taking the pro-storage position has to do with her desire to provide for late-season water needs and thus profitable operation. These interests are not necessarily mutually exclusive, but the positions certainly are.

*A position is a stance that we take on a particular issue. Interests are the underlying reasons for the position.*

## 2. Recognize the Commonalities

Most conversations about water do not start with beliefs. Conversations tend to start with either a definition of the problem or with favored solutions. The first narrows the consideration of acceptable solutions (Stone, 2002), while the second has the effect of constructing the problem to fit the solution (Rockefort & Cobb, 1994). Both approaches limit our understanding of the underlying interests that tend to drive policy choices. Values are left unexamined by stakeholders, despite their dominant role in determining a group's favored definition of the problems (Guess & Farnham, 1989; Rockefort & Cobb, 1994). Open discussion of how different groups frame underlying causes is needed to foster constructive dialogue, cooperative problem solving, and innovative solutions (Giandomenico, 1989).

In the survey of beliefs among Colorado stakeholders, three areas of overwhelming agreement emerged:

1. *Water is fundamental to the economy.* No matter where you live in the state, what type of work you do, or what your vision is for a secure water future, everyone agrees about the interdependency between water and a healthy economy.
2. *An appropriated right does not mean water will be available for use.* Whether one is a senior or junior water rights holder, there is no misunderstanding about what a water right means. Droughts, interstate compacts, other upstream or downstream water rights all affect the physical and legal availability of water.
3. *Agricultural water is the prime target for water transfers to urban and recreational uses.* All participants in the survey agree that whether you own it or want it, agricultural water is the most likely source for shifting water to new demands.

Beyond the three areas of consensus, five separate beliefs are held by a majority of participants:

1. *Money has become the means for allocating water.*
2. *The market is not always the appropriate method for allocating water.*
3. *Protecting existing individual water rights is important,* and this is the case whether one believes the system is broken or not.

*We need more open discussion about why groups frame water problems differently.*

4. *Water court decisions have been favorable to agricultural interests*, a belief that those inside and outside the agricultural community hold.
5. *Current water law is quite functional*—it is neither outdated nor unable to handle new demands.

Recognizing that people across a wide spectrum hold some beliefs in common is essential to productive conversations. If nothing else, we can all agree that our respective economic interests—be they private gain or public good—are somehow dependent, to a greater or lesser extent, upon water. While we differ on which interests should be prioritized, it is useful to realize that different positions oftentimes are rooted in the same value.

*Recognizing that people across a wide spectrum hold some beliefs in common is essential to productive conversations.*

### 3. Understand the Differences

Effective decision making requires that we understand the differences that exist within the water community. Understanding is accepting that another person's beliefs are "true" for that individual, even if these are contrary to one's own personal beliefs and values (Flick, 1998). Understanding does not mean agreeing with an interest, nor does it require that we surrender our own beliefs and values.

Ultimately, solutions arise from a thoughtful consideration of our differences. From our common beliefs, we can begin to discuss where we diverge. In the survey of Colorado water stakeholders, there are five areas of significant disagreement:

1. The "*use it or lose it*" doctrine is seen by some to encourage wasteful use of water, while others believe it has no detrimental impact.
2. There is a strong division of opinion on whether there is a *connection between land use and water planning*.
3. Some respondents believe the *recent drought proved the inadequacies of the current water system*, while some felt just the opposite.
4. Some respondents think there is *plenty of water if used wisely*, while others see a shortage and think *new water needs to be developed*.
5. There is significant disagreement as to whether or not *environmental claims have limited legal recognition*.

The Colorado survey reveals that there are six distinct combinations of beliefs about water. These six groups listed below are described in detail in the subsequent table.

*Statewide Economic Growth*  
*Environmental Concerns*  
*Living within our Limits*

*Stay the Course*  
*Broken System*  
*State Rights*

While some beliefs are held in common across several groups, differences among their other beliefs set them apart from one another. The following discussion provides examples of these dynamics.

The first three belief types focus on lifestyles: *Statewide Economic Growth*, *Environmental Concerns*, and *Living within our Limits*. The second three belief types focus on the management of water: *Stay the Course*, *Broken System*, and *State Rights*. The division of these belief types into "lifestyles" and "management" categories give some indication as to how differently water stakeholders prioritize water issues. If one person thinks about water from a "lifestyle position," e.g., environmental needs, and another from a "management process," e.g., the impact of current law and compacts, there is potential for misunderstanding. But is there common ground to be found? Yes, absolutely. Is it always obvious? No, not usually. It is important to listen to how people frame issues—is it about the type of life worth pursuing in the West, or is it about the state of water management?

*Understanding is accepting that another person's beliefs are "true" for that individual, even if these are contrary to one's own personal beliefs and values.*



It is also possible to find agreement among differences. A comparison of *Statewide Economic Growth* versus *Environmental Concerns* provides a good example. People who are concerned about water issues from a *Statewide Economic Growth* perspective may appear to clash with the *Environmental Concerns* perspective. But there are similar values expressed by both, including the belief that environmental needs should have similar standing in water law, and that markets are not always the appropriate mechanism for allocating water.

These shared values make sense. Generally, all sectors of the economy matter to those people concerned about *Statewide Economic Growth*, including the sectors that support riparian and aquatic habitats for fisheries or recreational water activities. Similarly, market-based allocations alone might not create full-spectrum economic development because not all sectors, including those in the *Environmental Concerns* group, are equally rich in financial resources. Additionally, market externalities can undermine some economic gains and harm non-value uses. Here is an example of where starting from shared values presents an opportunity to find common ground among differences.

Differences, however, cannot be overlooked. Indeed, it is usually the differences that drive our discussions. Looking, again, at *Statewide Economic Growth* and *Environmental Concerns*, it is apparent that some differences will be difficult to reconcile. These two groups have diametrically opposed beliefs about the relationship between land use planning and water planning. The *Statewide Economic Growth* group believes the current system is working fine. People who align with *Environmental Concerns* strongly believe there is a disconnect between the two types of planning which is detrimental to the long-term sustainability of water. If groups focus on only the differences, such as land use and water planning, little headway can be made. If, on the other hand, discussions begin with common values and beliefs, such as how water is fundamental to the economy, or whether current water law is able to accommodate the water demands of today, there is the potential for new partnerships to form and innovative strategies to emerge.

Another fruitful avenue for understanding is found in the *State Rights* group. What makes this group unique is their concern about the potential negative effects that interstate compacts and federal government involvement might have on state water allocation. While it is not realistic for Colorado to remove itself from interstate compacts, federal lawsuits, and federal involvement in such issues as endangered species protection, there is an interbasin lesson that can be drawn from this group. Citizens who have borne the brunt of water reallocation resulting from compact obligations may be extremely wary of interbasin negotiations. Reluctance, if not resistance, to engaging in interbasin “solutions,” is rational. For interbasin negotiations to be successful, understanding and accommodating the differential impacts of external forces upon basins is the key to finding our collective way to a sustainable water future.

The six types of beliefs, reflected in the clustering of survey statements, are outlined in Table 2. Some may see themselves in more than one type, e.g., resonating with both a quality of life type and a water management type, but many are likely to recognize a type that best describes their top priorities. More important than finding one’s own beliefs is examining the beliefs of others. In reviewing these stakeholder belief types, ask yourself:

- Who am I?
- Do I know people in the other types?
- Do I see new information?
- Do I see commonalities I did not know or had not considered before?
- Do I see differences between myself and others that I can better appreciate, even if I do not agree with them?
- How can this information help me/my region/my basin as we deliberate about the future of water?

*If discussions begin with common values and beliefs there is the potential for new partnerships to form and innovative strategies to emerge.*

*Ultimately, solutions arise from a thoughtful consideration of our differences.*

**Table 2. Types of Beliefs in the Colorado Water Community<sup>1</sup>**

Belief Type	Defining attributes	Commonalities <sup>2</sup>
<p><i>1. Statewide Economic Growth</i></p>	<ul style="list-style-type: none"> <li>• Water is fundamental to all sectors of the economy.</li> <li>• A lack of water will slow economic growth.</li> <li>• Water is fundamental to maintenance of ecosystems and species.</li> <li>• Non-consumptive uses deserve water rights.</li> <li>• Current land use and water planning are working fine.</li> <li>• Water conservation and restrictions are important policies to implement.</li> <li>• Less water will not lower our quality of life.</li> </ul>	<ul style="list-style-type: none"> <li>• Current water law is functional.</li> <li>• Market is not always the appropriate mechanism for reallocating water.</li> </ul>
<p><i>2. Environmental Concerns</i></p>	<ul style="list-style-type: none"> <li>• Water is fundamental to the maintenance of ecosystems and species.</li> <li>• Water quality is as important as water rights.</li> <li>• Less water will not lower our quality of life.</li> <li>• Money is driving the allocation of water.</li> <li>• There is limited legal recognition of non-consumptive uses.</li> <li>• There is a disconnect between land use and water planning.</li> <li>• Conservation must be pursued because there are no significant new sources of water to develop.</li> <li>• Politics is the barrier to solving water problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Market is not always the appropriate mechanism for reallocating water.</li> </ul>
<p><i>3. Living within our Limits</i></p>	<ul style="list-style-type: none"> <li>• West slope is fighting water transfers to East slope.</li> <li>• Population growth is driving the need for more water.</li> <li>• Money is driving the allocation of water.</li> <li>• Consumptive and non-consumptive demands are recognized in current water law. No sector has been favored.</li> <li>• There is plenty of water if used wisely.</li> <li>• There are no significant new sources of water to develop.</li> </ul>	<ul style="list-style-type: none"> <li>• Water rights need to be protected.</li> <li>• Market is not always the appropriate mechanism for reallocating water.</li> <li>• Current water law is functional.</li> </ul>

<sup>1</sup> All six types share three common beliefs: (1) Water is fundamental to the economy. (2) An appropriated right does not mean water is available. (3) Agriculture is the target for urban/recreation water transfers.

<sup>2</sup> Commonalities are those beliefs held by a majority of participants. The “Commonalities” column shown above identifies which of the five dominant beliefs are held by which belief types. See pages 9-10 for a description of the five commonalities.

**Table 2. (continued)**

Belief Type	Defining attributes	Commonalities
4. <i>Stay the Course</i>	<ul style="list-style-type: none"> <li>• Consumptive and non-consumptive uses are not in conflict.</li> <li>• Agricultural water transfers alone are not a long-term viable solution for solving urban water needs.</li> <li>• Use it/lose it does not encourage waste.</li> <li>• Interstate compacts are important to secure Colorado’s supply.</li> <li>• Federal government should not interfere with state water allocations.</li> <li>• Conservation cannot substitute for new storage projects; there is still significant water to be developed.</li> </ul>	<ul style="list-style-type: none"> <li>• Water rights need to be protected.</li> <li>• Current water law is functional.</li> </ul>
5. <i>Broken System</i>	<ul style="list-style-type: none"> <li>• Water is fundamental to quality of life.</li> <li>• Water quality is as important as water rights and both need to be linked.</li> <li>• Drought proved the system is broken.</li> <li>• “Use it or lose it” creates wasteful water practices.</li> <li>• Conservation alone will not solve our water shortages.</li> <li>• Consumptive and non-consumptive uses should not be in conflict.</li> <li>• Money is driving the allocation of water.</li> </ul>	<ul style="list-style-type: none"> <li>• Water rights need to be protected.</li> </ul>
6. <i>State Rights</i>	<ul style="list-style-type: none"> <li>• Interstate compacts are not in Colorado’s best interests as demonstrated in the last drought.</li> <li>• Federal government should not interfere with state water allocations.</li> <li>• Money is driving the reallocation of water.</li> <li>• Land use and water planning are disconnected.</li> <li>• West slope is not in conflict with the East slope.</li> <li>• Lack of water will not slow economic growth or population growth.</li> <li>• Agriculture’s use of water is not inefficient.</li> <li>• Non-consumptive uses deserve water rights.</li> <li>• Water recycling is an effective conservation strategy.</li> <li>• There are no significant new sources of water to develop.</li> </ul>	<ul style="list-style-type: none"> <li>• Market is not always the appropriate mechanism for reallocating water.</li> <li>• Water rights need to be protected.</li> <li>• Current water law is functional.</li> </ul>

## 4. Face the Challenges

Commonalities and differences in beliefs are linked to our perceived water challenges. The second survey asked water stakeholders to prioritize current and future challenges facing the state and the Rocky Mountain West. Three distinct types emerged: *Balancing Consumptive Use Needs*, *Water Sustainability*, and *Institutional Streamlining*.

Overall, very few commonalities emerged across these challenge types. Commonalities that did appear focused on issues about Lakes Mead and Powell. But these were not considered as important as other issues directly affecting Colorado, such as the impact of population growth, future droughts, and water quality. The relative lack of shared perspectives among the water challenges contrasts with the significant overlap between values and beliefs discussed previously and demonstrates how conflicts arise as stakeholders move from interests to positions. Table 3 illustrates the significant differences among the three challenge types.

The first group, *Balancing Consumptive Use Needs*, is focused on accommodating urban growth while protecting the agricultural economy and quality of life in rural communities. This group gives low priority to recreational and environmental water needs. Another major concern of the group is to create cooperative partnerships, from the smallest political entities and localities to federal government agencies. Also unique to this group is the challenge associated with balancing private rights, public goods, and cooperation among water basins in the state.

The issues identified within the second group, *Water Sustainability*, include a broad array of water quality challenges, but primarily surround increasing population pressures. Water conservation and balancing consumptive and non-consumptive needs are major concerns for this group. Lower priority concerns, or perhaps issues that are negatively viewed, include transferring water to high-growth sectors and streamlining state and federal processes.

The third group, *Institutional Streamlining*, uniquely identifies not only various state and federal agency processes as in need of reform, but also political and legal barriers. Their concerns about future drought preparation and conservation measures are likely embedded within their view that the current system is not set up to effectively address these issues.

A review of Table 3 demonstrates that while these three groups have very distinctive perceptions about challenges, there are also a handful of common views. For example, protecting water quality is of concern to two groups, *Balancing Consumptive Use Needs* and *Water Sustainability*. The challenge of preparing for future droughts is also identified by two groups, *Balancing Consumptive Use Needs* and *Institutional Streamlining*. And water conservation is an important challenge according to the *Water Sustainability* and *Institutional Streamlining* groups.

*When our primary focus is on perceptions of the challenges we face, opportunities for cooperation are limited.*

**Table 3. Types of Current and Future Challenges Colorado Water Stakeholders Identified<sup>1</sup>**

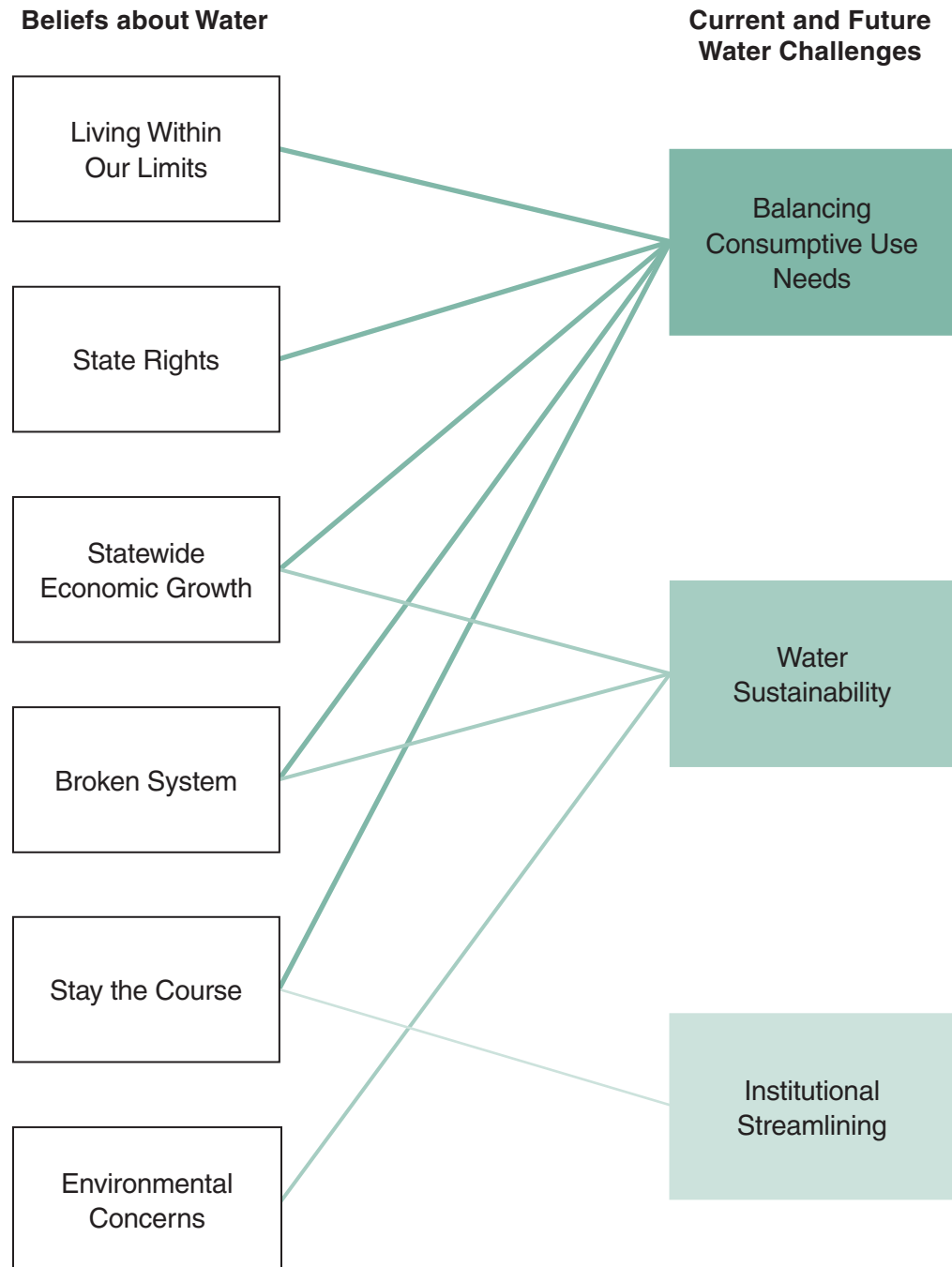
Challenge Group	High Priority	Low Priority
<p><i>1. Balancing Consumptive Use Needs</i></p>	<ul style="list-style-type: none"> <li>• Accommodating municipal growth without harming the long-term viability of agriculture.</li> <li>• Protecting the agricultural economy and way of life.</li> <li>• Solving problems through effective partnerships—local, regional, basin, federal, private, and public.</li> <li>• Increasing cooperation among basins and states where water is a shared resource.</li> <li>• Preparing for future severe droughts.</li> <li>• Balancing private property rights and public interest.</li> <li>• Protection of water quality: population increases and surface/ground water.</li> </ul>	<ul style="list-style-type: none"> <li>• Addressing recreational instream diversions in statutes.</li> <li>• Water demands between recreation and environment.</li> <li>• Ensuring adequate stream flow and reservoir levels during peak recreation season.</li> <li>• Revisiting current water law, policy, and management practices to protect the environment.</li> <li>• Incorporating water quality protections into water allocations.</li> <li>• Transferring water to high growth areas/sectors.</li> </ul>
<p><i>2. Water Sustainability</i></p>	<ul style="list-style-type: none"> <li>• Maintaining water quantity and quality while the population continues to grow, including: <ul style="list-style-type: none"> <li>➢ Connecting land use and water planning for quantity and quality;</li> <li>➢ Integrating water quality and water quantity;</li> <li>➢ Protecting the quality of surface and groundwater resources;</li> <li>➢ Incorporating water quality protection in water allocations.</li> </ul> </li> <li>• Incorporating conservation and efficiency in existing water user operations.</li> <li>• Integrating water supply for consumptive use, environmental use, and recreational use.</li> </ul>	<ul style="list-style-type: none"> <li>• Transferring water to high growth areas/sectors.</li> <li>• Streamlining the water development process.</li> <li>• Addressing federal regulations as an impediment to solving state problems.</li> </ul>
<p><i>3. Institutional Streamlining</i></p>	<ul style="list-style-type: none"> <li>• Developing institutional responses to political and legal barriers that inhibit better management of water.</li> <li>• Addressing federal regulations as impediments to solving state problems.</li> <li>• Streamlining the water development process.</li> <li>• Solving problems through effective partnerships—local, regional, basin, federal, private, and public.</li> <li>• Preparing for future droughts.</li> <li>• Balancing groundwater shortages with surface water demands.</li> <li>• Incorporating conservation and efficiency in existing water user operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Addressing recreational instream diversions in statutes.</li> <li>• Revisiting current water law, policy and management practices to protect the environment.</li> <li>• Ensuring adequate stream flow and reservoir levels during peak recreation season.</li> <li>• Accommodating municipal growth without harming long-term viability of agriculture.</li> </ul>

<sup>1</sup> All three groups agree that water shortage and management issues of Lakes Mead and Powell are of low priority for current and future challenges.

When our primary focus is on perceptions of the challenges we face, opportunities for cooperation are limited. In taking positions on the existing water problems of the West, we align within groups more associated with battles that have already been fought than with the interconnected issues of today. Fortunately, we know that these positions stem from some of our common values and beliefs.

Given the stakeholders' beliefs and their relationship to the challenges identified, increased opportunities exist for cooperative decision making. Figure 1 diagrams these linkages.

**Figure 1. Water Survey: Relationship between Beliefs and Challenges**



*Given the stakeholders' beliefs and their relationship to the challenges identified, increased opportunities exist for cooperative decision making.*

Most striking in this diagram is that some portion of all belief types, except *Environmental Concerns*, identified *Balancing Consumptive Use Needs* as a major current and future challenge. Three belief groups, *Statewide Economic Growth*, *Broken System*, and *Environmental Concerns*, identified *Water Sustainability* as a major challenge. Only the *Stay the Course* belief group identified *Institutional Streamlining* as a major challenge.

These results indicate that regardless of the beliefs that any one group holds, *Balancing Consumptive Use Needs* is a challenge that cannot be ignored. It also shows that despite the seemingly incompatible priorities between *Balancing Consumptive Use Needs* and *Water Sustainability*, these two groups contain some proponents who share the same beliefs. For example, beliefs about *Statewide Economic Development* and *Broken System* are represented in two challenges groups, *Balancing Consumptive Use Needs* and *Water Sustainability*.

Alternatively, if a group such as *Environmental Concerns* prioritizes only one set of challenges, *Water Sustainability*, it may seem there is no room for negotiation regarding other challenges. Yet, two other belief types, *Statewide Economic Development* and *Broken System*, also have concerns about *Water Sustainability* challenges. This presents an opportunity to have a coalition of interests promote the challenges that the *Environmental Concerns* group prioritizes. This coalition can occur simultaneous to the *Balancing Consumptive Use Needs* that the other groups have also prioritized. In other words, there are multiple paths that groups can take to arrive at the same position. If the conversations begin with and periodically come back to values and beliefs throughout deliberations of the problems we face, common values can emerge, allowing a wider range of positions to be accommodated.

## 5. Work Toward Innovative Strategies

Strategies that provide for individual needs while simultaneously benefiting others do exist. Extensive arrays of solutions have been proposed by the water community. However, Keeney (1992) suggests that before embracing specific strategies to address our current and future challenges, we must create a process where a variety of alternatives are recognized and seriously considered. If we begin with values, and try to create overlapping definitions of the problems, we may see that disagreements tend to recede in importance and can even transform into opportunities (Keeney, 1992).

Unfortunately, there will never be just one policy solution that serves as a permanent fix to our water challenges. Solutions are ongoing strategies for responding to an ever-changing gap between actual conditions and those that people want. We should approach our challenges collectively; maintaining, yet understanding our differences.

In the West, we have already begun to think differently about water. The State of Colorado, for example, has enacted legislation creating basin roundtables.<sup>6</sup> These roundtables are tasked with facilitating locally driven, collaborative discussions within and among water basins regarding water management issues. This process would likely benefit from a disclosure of beliefs and values, especially as they pertain to commonalities and differences among roundtable participants.

*Solutions are ongoing strategies for responding to an ever-changing gap between actual conditions and those that people want.*

<sup>6</sup> HB05-1177 creates nine water basin roundtables and one interbasin compact committee. The final version of the bill can be found at [http://www.leg.state.co.us/clics2005a/csl.nsf/fsbillcont/3F94A053189A6DE587256F6A0080FFA9?Open&file=1177\\_enr.pdf](http://www.leg.state.co.us/clics2005a/csl.nsf/fsbillcont/3F94A053189A6DE587256F6A0080FFA9?Open&file=1177_enr.pdf)

## One Basin at a Time

### The Setting

In 2004, the Colorado Water Conservation Board (CWCB) completed the first statewide water supply investigation of its kind. Its purpose is to understand and prepare for the state's long term needs through a comprehensive evaluation of Colorado's major watersheds.

The Yampa/White/Green river basins provide an opportunity to examine real issues that much of the West faces. Like many basins in the West, these basins are confronted by issues of water quality, environment, endangered species, power generation, compact entitlements, recreational interests, urban growth, and traditional uses of water for agriculture and ranching.

In Colorado, water supplies are generally not where the greatest demand is. Basins on the Western slope, like the Yampa/White/Green, tend to hold most of the water, while most of the population resides on the Eastern slope along the Front Range corridor. The Yampa/White/Green is relatively rural, with exception of a few larger resort-based communities. In 2000, the region had just over 39,000 residents, but is expected to grow at an annual rate of 1.5% (CWCB, 2004). While Colorado anticipates a general decline in irrigated lands under production in the state due to municipal and industrial growth, the Yampa/Green/White has actually identified another 20,000-40,000 acres of land that is potentially irrigable (CWCB, 2004).

Despite these anticipated increases for water demand, the basin is believed to have projects and processes in place that will allow them to meet these needs well into the year 2030 (CWCB, 2004). Critical to meeting these future water needs are enlargements to the Elkhead and Stagecoach Reservoirs.

Citizens in these basins are aware that the day will come when the growing populations on the Eastern slope and within other Western slope basins will require more water. As a relatively water rich basin, they know that they will inevitably be faced with the challenge of meeting external and internal demands.

### The Opportunity

Recognizing challenges is a huge step toward making collective decisions. In the short-term, it is easier to think about what the basin has to lose by giving water to others' needs. But if we look at today's challenges from the perspective of future impacts, the need to address multiple—even conflicting—demands becomes increasingly important.

Bill Gay, a local rancher, paints one scenario if his basin takes the short-term view. If the Yampa/Green/White basins do not cooperate on decisions to meet the state's needs, the more powerful forces will likely make decisions for them. Alternatively, if the basin takes the long-term view and plans for future external demands, residents would likely create more enduring solutions for their basin. Bill Gay observes that "we make the mistake of dividing up water issues by areas of the state instead of seeing the big picture." (Gay, B., personal communication, September 29, 2005). This is problematic because it lessens our ability to consider viable solutions for future generations. If we focus solely on our individuals needs, we lose sight of what could happen to us as a state, as a region, and as a society.



# Implementation Issues

Understanding values and beliefs helps us to formulate alternative solutions in new ways. But even sound strategies face challenges in their initiation and implementation. As we set the stage with beliefs and values, we should be cognizant of legal constraints, the political environment, economic reality, and information needs.

## The Legal Landscape

The prior appropriation doctrine has been both resilient and innovative. Deeply seated beliefs about the right to privatization continue to strengthen the doctrine, while more contemporary adaptations of the doctrine demonstrate the tenacity of today's newer values.

Evolving beliefs about how water should and should not be used are challenging long-established uses. One underlying issue affecting public discourse about water is the elusive meaning of “public ownership.” It is not clear how “public ownership” actually affects anything other than water purchased by a public entity for a public purpose (Corbridge, 1998).

In the West, states have substantial latitude to interpret their obligation to public interests (Davis, 2001). In Colorado, for example, legal protection under prior appropriation is extended only to other water users, not to public values such as water quality, ecosystems, and community values. Other states, such as Idaho, employ public interest standards and criteria for approving water right transfers and changes (Idaho Department of Water Resources, n.d.).

Western water codes were established on the principle of water use maximization—encouraging users to remove water from rivers for productive use and economic gain. Although the current concept of “beneficial” use is quite different than the historical one, the laws governing water “waste” are not much different. Such laws allow conserved water to be further appropriated in the hands of individuals, with few requirements for efficient use and often irrespective of greater public needs (Neuman, 1998). Policy initiatives in the West are confronted with the dilemma of maximizing water resources through the customs of prior appropriation while simultaneously optimizing publicly held values.

## Political Realities

The web of governmental and nongovernmental actors in the water arena is more complex than ever before. Actors range from large federal agencies like the U.S. Bureau of Reclamation to small agencies like local water districts; from Congress to water courts; and from regional interest groups like farm bureaus to watershed-based environmental groups. In addition, interstate water compacts and international obligations set parameters on the amount of water available to a state in a given watershed. Finally, if actors lose a policy battle in one decision-making arena, they often try to influence policy to suit their interests in another arena—adding to the complexity of water policy (Davis, 2001).

Regional cooperative planning that includes greater stakeholder involvement and more transparent policymaking is one approach to integrating the multiple levels of governmental and policymaking venues involved in water planning (Counsell & Bruff, 2001). Success is dependent, in part, upon the perceived severity of the problem being addressed. This underscores the importance of values in structuring policy debates and solutions.

While values take center stage, science attempts to shed light on complex, if not controversial, issues. Yet, science often finds itself a bit player in the policy-making

*Evolving beliefs about how water should and should not be used are challenging long-established uses.*

*Policy-relevant information about water must align with the timing and content needs of the decision-making processes.*

*Markets alone may not draw distinctions between water for necessities versus luxuries; nor do they account for externalities.*

*Technical aspects of research and science are not typically designed to inform policy decisions.*

arena, not because it is irrelevant, but rather because it does not fit neatly into the political process. Policy-relevant information—be it from a stakeholder group or from scientific research—must align with the timing and content needs of the decision-making process in legislatures, administrative agencies, and water districts (Kathlene & Martin, 1991).

## Role of Markets

Economic tools, too, will play a role in how the West addresses water problems. Markets (and price signals) provide a functioning mechanism for allocating water uses in ways that acknowledge explicit trade-offs among competing values. Water markets assist in moving water from low-value uses to higher-value uses (Glennon, 2005).

Current institutional frameworks such as prior appropriation often serve as impediments to moving water to its highest use via the market (Carey & Sunding, 2001; Colby, 1990). But these existing frameworks are also important to the market system because they facilitate the quantification and transferability of existing water rights. This allows for beneficiaries of the current system to profit by selling or leasing water.

Even if markets can work within existing institutions, there may still be problems with the outcomes because market values are typically economic values based on direct benefits to the buyer and seller. Markets do not account for externalities—whether they are the demise of a rural economy built upon supporting agricultural activities or the destruction of downstream habitats when water is shifted to another use (Glennon, 2005).

As the West becomes increasingly urbanized, how limited water supplies are used or valued becomes quite critical. In a municipal context, water for drinking, bathing, cooking, and sanitation is absolutely vital, while lawn watering is a discretionary use. There also exist “non-use” values of water, such as the widespread benefits associated with healthy ecosystems (Loomis, 2005). Markets alone may not draw this distinction between values. Indeed, when water allocations are driven exclusively by willingness and ability to pay, there is a distinct possibility that water may go toward luxuries at the expense of necessities. In this case, the problem becomes how to allow markets to communicate differences in values, but not at the expense of larger societal goals. Likely this will require government regulation of water as a social good (Glennon, 2005; Perry, Rock, & Seckler, 1997).

## Information Needs

Technical aspects of research and science are not typically designed to effectively inform policy decisions, despite the fact that much science is extremely policy relevant. Decision makers are often confounded with large volumes of information, from a wide variety of disciplines and interpretations, which are not easy to reconcile or apply. To compound matters, the scientific community is rarely trained to translate technical research into policy implications, thereby inadvertently creating a divide between research and politics.

According to Poff and colleagues (2003), a paradigm shift is needed to successfully integrate science into policy and management decision-making processes. For example, they propose four steps:

1. Implement more large-scale river experiments on existing and planned water management projects;
2. Engage the problem through a collaborative process involving scientists, managers, and other stakeholders;

3. Integrate case-specific contextual knowledge into broader scientific understanding; and
4. Forge new and innovative funding partnerships to support effective case studies (Poff et al., 2003, pp. 300-304).

A major challenge for the scientific community, including research universities, is to identify researchers who are conducting or will undertake research on water issues of importance to the water community, and to convert such research into accessible, timely, and policy-relevant information.

## Conclusion

When we think about water in the West, our minds often turn to images of conflict. It is difficult to identify a river, dam, aquifer, or canal that has not been at the center of a bitter contest. But it is just as western to collaborate as it is to fight. Collaboration has brought the West its greatest achievements and still holds the greatest promise for its future. History of collaboration is rich, ranging from the West-Hispano communities of northern New Mexico to the Union Colony in Greeley, which claims distinction as the first successful communal farming endeavor in Colorado. Westerners have also fashioned an astonishing array of compacts, agreements and negotiations. The Colorado River Compact—as the forebearer and perhaps most well-known of these arrangements—is just one of many such examples (Tyler, 2003).

But the water community still does not embrace dialogue and cooperation among all interests as the first and fundamental step toward addressing challenges. We have begun to talk about the potential for such approaches, but have yet to implement them in an effective manner.

The potential for cooperation within the water community is not the end all. It really is only the beginning of a process. In the first issue of the Colorado Water Congress newsletter, *Colorado Water Rights*, published in 1982, Wayne Aspinall wrote:

“...there never has been, there is not today, and there never will be a status quo in the administration of water rights under the doctrine of appropriation. The old adage to the effect that we live in an ever-changing world certainly applies to the administration of the distribution of water in Colorado.”

We are constantly adapting to new approaches, working with new coalitions, and finding common ground via solutions we had not considered previously. This paper touches on the potential for one of these approaches to move us in the direction of better adapting to our challenges. As Colorado and other states travel forward with regional compacts and legislation, we would be well-served to begin with an articulation of beliefs and values, and a commitment to shared management solutions.

While this paper points to a new approach, it does not anticipate that this is the only way or by any means a clear and easy way. Other tools and methods that work in conjunction with such a process could enhance the effectiveness of cooperative problem solving. As citizens of the West and as stewards of our most precious resource, we are obligated to consider every possible means to successfully approach water issues.

*Success depends upon adapting to new approaches, working with new coalitions, and finding previously unknown common ground.*

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## Appendix A: Q-Methodology Survey

A survey of water stakeholders across Colorado was conducted to capture the varying beliefs held and challenges identified by diverse interests. Q-methodology (also called a Q-sort) was used as the survey instrument. The methodology has been in use since the 1950s and applied extensively to contentious and complex policy domains (Brown, 1980, 1993). The strength of the Q-methodology over traditional survey techniques is that it requires participants to prioritize their beliefs *in relation to* other beliefs. Life choices are always a trade-off and capturing how priorities relate to each other is important to move contentious groups toward constructive conversations.

The goal of the Q-sort in this study is to identify and categorize stakeholders' beliefs about water in semi-arid states and prioritize the challenges facing water policy and management. By identifying and articulating these key perceptions, Q-sorts help find common ground and foster a better appreciation for differences.

Survey statements were generated by key stakeholders versed in Colorado water issues, including people representing environmental, agriculture, recreation, and urban interests as well as water providers, elected officials, and researchers. The survey was piloted by additional people in the same categories and revised according to feedback.

Participants were identified several ways: (1) key stakeholders who generated survey statements provided names of people in their interest group area who were knowledgeable about, and highly involved in, water issues; (2) speakers and panelists at basin and statewide conferences in the winter, spring and summer of 2005; and (3) members of the water basin roundtables as of October 24, 2005 (the list of members was incomplete for most basins because recruitment was still underway). The number of people invited from each basin ranged greatly, from a high of thirty in the Arkansas basin to a low of two in the North Platte basin. The list of basin roundtable members was provided by the Colorado Department of Natural Resources.

The survey was available on the Internet. The Internet was chosen in order to reach water stakeholders across the state. Five participants who agreed to participate were unable due to technological problems (e.g., lack of Internet access, computers too old or slow to handle the software needed to access the survey, or people who lacked administrative authority to load the freeware Flash program on their computer). This represents 4% of the people who agreed to take the survey.

Potential participants received either a phone call and/or an email invitation that explained why they were invited. If the person agreed to participate, an email letter of consent was sent that explained, among other information, that the survey was anonymous and included a link to the survey URL. A total of 191 people were invited, 132 agreed to participate (69%), of which 84 completed the survey for an overall participation rate of 44%. This compares favorably with other Internet surveys targeted at a specific population that receive a personalized "invitation" to participate (Couper, 2000). Table 4 shows the breakdown of participation rates by the type of recruitment group.

**Table 4. Survey Participation Rates**

Recruitment group	Number invited <sup>1</sup>	Number who agreed to participate	Percent who agreed to participate
Key interest group stakeholders <sup>2</sup>	50	47	94%
Arkansas Basin	30	18	60%
Colorado Basin	18	11	61%
Dolores/San Juan Basin	10	5	50%
Gunnison Basin	17	8	47%
Metro Basin	14	11	79%
North Platte Basin	2	0	0%
Rio Grande Basin	8	5	63%
South Platte Basin	27	16	59%
Yampa/White/Green Basin	15	11	73%
<b>TOTAL AGREED</b>	<b>191</b>	<b>132</b>	<b>69%</b>
Less # technology problems		- 5	
Less # who agreed but did not take survey <sup>3</sup>		- 43	
<b>TOTAL PARTICIPANTS</b>		<b>84</b>	

<sup>1</sup> Among the basin roundtable members, only those that had active email addresses were contacted. Not all basins had identified all their members as of October 24, 2005, or had full contact information available for the members.

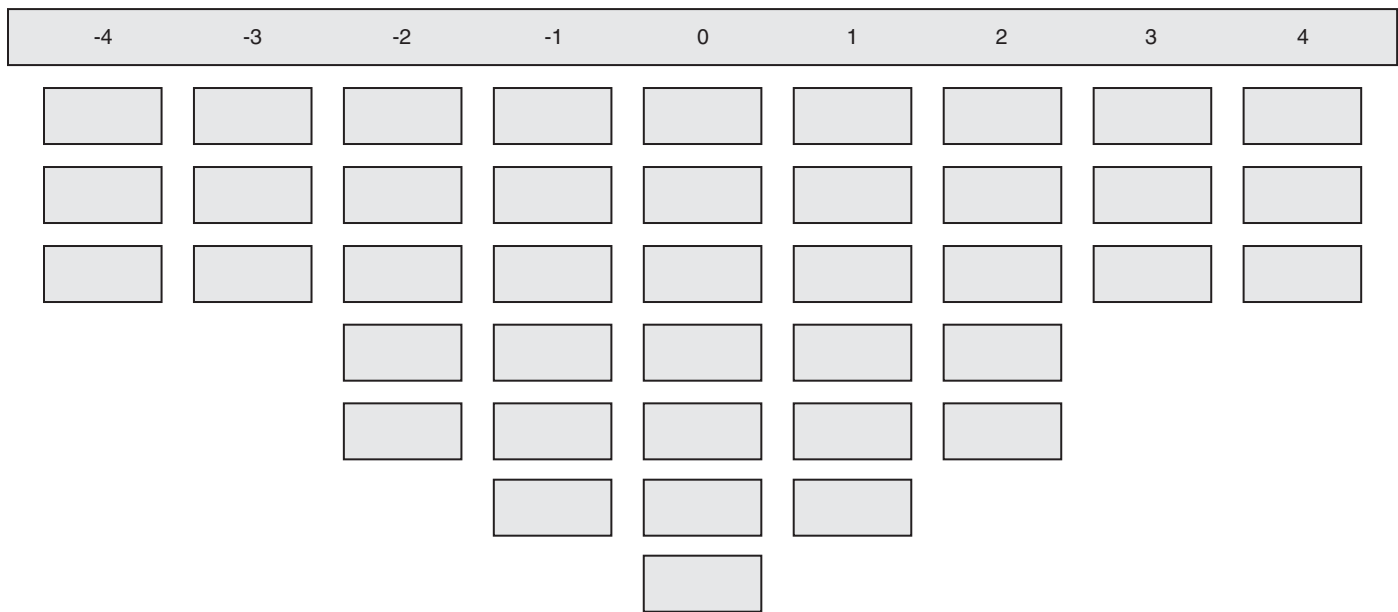
<sup>2</sup> Some interest group stakeholders were also members of a water basin roundtable.

<sup>3</sup> A reminder was sent to each participant. One person decided not to participate after viewing the survey. The remaining non-participants did not respond to the reminder.

The significantly higher rate of invitees willing to participate among the key interest group stakeholders (94%) versus the basin roundtable members (average of 60%) may be the result of the type of invitation sent. Since the key stakeholders were identified by a particular person within their “interest group” circle, invoking the referral name likely increased the number who agreed to participate. Basin roundtable members received an invitation that referenced only their membership on the roundtable, which may not have been as compelling a reason to participate.

Participants were provided with a set of 41 statements for each survey to “sort” on a continuum of extreme disagreement (-4) to extreme agreement (+4). The statements were loaded randomly each time the survey was started, thereby removing statement-order bias. The scale in Figure 2 illustrates that there is a fixed number of statements allowed under each value; the purpose of which is to force participants to prioritize their beliefs (survey 1) and perceptions of challenges (survey 2). For example, only three statements can be placed under each end of the scale (-4 and +4), three statements under -3 and +3, 5 statements under -2 and +2, etc.

**Figure 2. Q-sort Survey Sorting Scale**



Participants were asked to respond to the survey from the perspective of their organization, to the degree possible, rather than their personal preferences, since private views do not necessarily correspond with the public stances people take when representing water interests (Huckfeldt & Sprague, 1995; Mutz, 1998, as referenced in Wood & Doan, 2003, p. 641). Eighty-four participants completed the survey. In Q-methodology, the number of respondents is typically around 50. Research demonstrates that the addition of more participants, as long as a diverse group of stakeholders participate, does not fundamentally change the results. Q-methodology is not intended to determine the proportional distribution of the types; only to identify substantively different types. Therefore, the number of people falling into a given type does not represent the prevalence of the perceptions within the stakeholders being surveyed.

Brown and Coke (1977, p.16) summarize well the substantive, analytical and logistical advantages of Q-methodology:

1. It focuses on the controversy from the standpoint of the stakeholder, i.e., it allows each person to model his own attitude in the form of a Q-sort;
2. It requires very few subjects, 50 normally being quite suitable;
3. It can be administered, scored, and analyzed within a relatively brief period of time and at a low cost;
4. By gathering statements in rank orderings, it can indicate the relative degree of significance of each single opinion with respect to all other statements; and
5. It reveals in detail the major points of agreement and disagreement across entire segments of the population.

The data were analyzed using K-means cluster analysis to produce “typologies” within each of the two Q-sorts. Initial cluster centers are chosen using an Euclidean distance measure with subsequent iterations based upon the nearest Euclidean distance to the mean of the cluster. Multiple iterations are conducted until the cluster means no longer shift cases. This has the advantage of producing discrete groups that are usually easy to interpret. (Garson, 2006; Grant, n.d.). Once the typologies for each Q-sort were created, linkages across the typologies were made based upon a cross-correlation. This allows for the relationships among beliefs and challenges to be revealed (Brown & Byrd, 2004).

Tables 5 and 6 show the percentage breakdown of participant affiliations within each typology. Table 7 reports the demographic characteristics of the survey participants, followed by a list of the 41 statements for each survey.

**Table 5. Survey Participant Affiliations by Belief Types (n = 84)<sup>1,2</sup>**

AFFILIATION	ALL	STATEWIDE ECONOMIC GROWTH	ENVIRONMENTAL CONCERNS	LIVING WITHIN OUR LIMITS	STAY THE COURSE	BROKEN SYSTEM	STATE RIGHTS
Agriculture	33%	39%	18%	50%	50%	18%	66%
Consultant <sup>3</sup>	14%	11%	23%	--	19%	6%	20%
Elected Official	20%	28%	18%	17%	13%	12%	60%
Engineering	6%	6%	5%	--	6%	6%	20%
Environmental/Conservation	20%	11%	50%	--	6%	24%	--
Irrigation District	12%	22%	--	--	19%	18%	--
Legal	4%	11%	--	--	--	--	--
Municipal Water Provider	26%	28%	14%	50%	31%	24%	40%
Mutual Irrigation District	7%	17%	--	--	13%	6%	--
Private Enterprise	14%	28%	5%	--	19%	18%	--
Public Utility	18%	17%	18%	33%	--	18%	40%
Recreation/Tourism	16%	17%	9%	33%	13%	24%	--
Research/University	4%	--	5%	--	--	6%	--
Rural Water District	4%	6%	5%	--	--	6%	--
Water Conservancy District	21%	22%	--	33%	31%	29%	40%
Water Conservation District	11%	17%	--	17%	13%	18%	--
Other <sup>4</sup>	16%	22%	14%	--	--	18%	19%

<sup>1</sup> Multiple affiliations were possible; therefore total percentages exceed 100%.

<sup>2</sup> Bold font highlights the largest proportion of affiliations in the type.

<sup>3</sup> Consultant categories for entire sample are: Water resources (5%); agricultural (2%); water quality (2%); environmental (1%); water development (1%); government relations (1%); legal (1%); volunteer for city (1%).

<sup>4</sup> Other categories for entire sample are: County or local government (6%); state agency (2%); Colorado Water Conservation Board (2%); policy committee/roundtable (2%); county water bank (1%); federal agency, Department of the Interior (1%); mutual ditch company (1%); newspaper (1%); nonprofit watershed (1%).

**Table 6. Survey Participant Affiliations by Challenge Types (n=84)<sup>1, 2</sup>**

AFFILIATION	ALL	BALANCING CONSUMPTIVE USE NEEDS	WATER SUSTAINABILITY	INSTITUTIONAL REFORM
Agriculture	33%	<b>48%</b>	11%	<b>63%</b>
Consultant <sup>3</sup>	14%	13%	13%	16%
Elected Official	20%	23%	16%	25%
Engineering	6%	10%	3%	--
Environmental/ Conservation	20%	8%	<b>38%</b>	--
Irrigation District	12%	18%	5%	13%
Legal	4%	3%	5%	--
Municipal Water Provider	26%	28%	24%	25%
Mutual Irrigation District	7%	13%	3%	--
Private Enterprise	14%	21%	8%	13%
Public Utility	18%	13%	24%	13%
Recreation/Tourism	16%	5%	<b>30%</b>	--
Research/University	4%	5%	3%	--
Rural Water District	4%	3%	5%	--
Water Conservancy District	21%	<b>31%</b>	11%	25%
Water Conservation District	11%	10%	11%	13%
Other <sup>4</sup>	16%	10%	22%	13%

<sup>1</sup> Multiple affiliations were possible; therefore total percentages exceed 100%.

<sup>2</sup> Bold font highlights the largest proportion of affiliations in the type.

<sup>3</sup> Consultant categories for entire sample are: Water resources (5%); agricultural (2%); water quality (2%); environmental (1%); water development (1%); government relations (1%); legal (1%); volunteer for city (1%).

<sup>4</sup> Other category for entire sample are: County or local government (6%); state agency (2%); Colorado Water Conservation Board (2%); policy committee/roundtable (2%); county water bank (1%); federal agency, Department of the Interior (1%); mutual ditch company (1%); newspaper (1%); nonprofit watershed (1%).

**Table 7. Demographics of Survey Participants (n=84)**

VARIABLE	PERCENT OF SURVEY PARTICIPANTS
<b>Gender</b>	
Male	83.3%
Female	16.7%
<b>Age</b>	
31-40 years	10.7%
41-50 years	25.0%
51-60 years	40.5%
Over 60 years	23.8%
<b>Education</b>	
High school degree	1.2%
Some college	9.5%
Associate degree	3.6%
B.A./B.S.	22.6%
Some graduate school	13.1%
M.A./M.S./Ph.D.	39.3%
Professional degree	10.7%
<b>Born in Colorado</b>	
No	62.2%
Yes	37.8%
<b>Total years lived in Colorado</b>	
Less than 5 years	3.6%
5-10 years	4.8%
11-20 years	15.5%
20+ years	76.2%
<b>Years involved in water issues</b>	
Less than 1 year	1.2%
2-4 years	13.1%
5-10 years	14.3%
11-20 years	19.0%
Over 20 years	51.2%
<b>Participant owns water rights</b>	
Yes	61.9%
No	38.1%
<b>Organization owns water rights</b>	
Yes	29.8%
No	65.5%
<b>Water basin</b>	
Arkansas	16.0%
Colorado	19.8%
Dolores/San Juan/San Miguel	3.7%
Gunnison	7.4%
Metro	6.2%
North Platte	2.5%
Rio Grande	7.4%
South Platte	27.2%
Yampa/White/Green	10.0%

## Statements used in the Q-methodology Surveys

### Survey 1: Beliefs/Values

1. Colorado's unused water entitlements are being lost to fountains in Las Vegas and Los Angeles.
2. The "use it or lose it" doctrine encourages waste.
3. Colorado West slope's mantra is "not one more drop" to the East slope.
4. Agriculture's use of water is inefficient.
5. People usually have a detrimental impact on natural ecosystems.
6. The state's water law is archaic and not adaptable.
7. The public cannot adequately understand the complexity of water issues.
8. Land use planning and water planning are disconnected.
9. It takes at least 20 years to develop a water project.
10. We have to restrict water use to get through hard times.
11. Using less water will lower our quality of life.
12. Water flows uphill towards money.
13. Water is essential to maintaining ecosystems and non-human species.
14. There is plenty of water if we use it wisely.
15. Water is a fundamental component of our economy.
16. Recreational uses of water are good for the economy.
17. Environmental water rights are less important than other beneficial uses.
18. Environmental use and consumptive use cannot be met simultaneously.
19. Conservation and efficiency are not substitutes for new storage projects.
20. Recreation is not a beneficial use of water deserving of a water right.
21. States allocate water and the federal government should not interfere.
22. Water quality regulation should not interfere with the exercise of water rights.
23. An appropriated right means the water is available.
24. Agriculture to urban water transfers is not a viable solution to solve urban water shortages.
25. A lack of reliable water supplies will slow population growth.
26. A lack of reliable water supplies will slow economic growth.
27. Water is best allocated and managed by market forces.
28. Population growth is at the root of all of the West's water problems.
29. The recent drought has shown most of the state's water systems to be robust and resilient.
30. The SWSI report projections of water supply and demand are reliable.
31. Compacts have proven their value in the last drought.
32. There is significant water that can still be developed.
33. Climate change will significantly change precipitation in the Rocky Mountain West.
34. Colorado has a strong interest in reaching accommodations with other states.
35. There is limited legal recognition of environmental needs/claims.



36. Water recycling is an effective method for conserving water.
37. It is important to protect existing individual water rights.
38. Water court decisions are not generally favorable to agriculture.
39. Agriculture water is the target for urban and recreational water demands.
40. Water conservation will solve water shortages.
41. Water problems are political more than scientific or engineering-related.

## **Survey 2: Challenges/Problems**

1. Connecting land use decisions and water planning for both quality and quantity.
2. Integrating water quality and water quantity.
3. Addressing the localized, balkanized system of water development.
4. Integrating water supply for consumptive use, environmental use, and recreational use.
5. Solving problems through effective partnerships—local, regional, basin, federal, private and public.
6. Streamlining the water development process without compromising full analysis of water demands.
7. Addressing federal regulations as an impediment to solving state problems.
8. Addressing the spread of invasive species.
9. Meeting growing human water demand on the Front Range while preserving the economic future of the West Slope.
10. Balancing groundwater shortages with surface water demands.
11. Balancing private property rights and public interest.
12. Determine the most effective role state government can have in water decisions.
13. Maintaining the environment (water quality and water quantity) while population is growing.
14. Protecting agricultural economy and way of life.
15. Incorporating conservation and efficiency into existing water users' operations.
16. Incorporating water quality protection into water allocations.
17. Preventing erosion and invasive species where irrigated agriculture is stopped.
18. Accommodating municipal growth without harming the long-term viability of agriculture.
19. Revisiting current water law, policy and management practices to protect the environment.
20. Protecting the recreational economy.
21. Mitigating future Lake Powell shortages.
22. Mitigating future Lake Mead shortages.
23. Transferring water to high growth areas/sectors.
24. Creating new management strategies for Lake Powell and Lake Mead.
25. Meeting the treaty obligations to deliver Mexico's full allocation.
26. Revising statutes to better facilitate recreational instream diversions.
27. Involving younger generations in water issues.
28. Addressing water needs for growth and sustainability of the tourism industry.
29. Balancing the demand for water recreation with aquatic and riparian needs.
30. Developing institutional responses to political and legal barriers that inhibit better management of water.

31. Preparing for future severe droughts.
32. Addressing impact on water resources of continued energy development (e.g., coalbed methane extraction).
33. Making existing and future water infrastructure more sustainable.
34. Protecting the quality of surface and ground water resources.
35. Increasing flexibility of water policy and management to address climate variability and uncertainty.
36. Increasing cooperation among basins and states where water is a shared resource.
37. Finding solutions for communities exceeding the carrying capacity of their watershed.
38. Balancing competing water demands between consumptive uses and non-consumptive uses.
39. Improving management of forests to increase ecological health.
40. Ensuring adequate stream flows and reservoir levels during peak recreation season.
41. Balancing water supplies and demands on the Colorado River.





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