

# **Water Storage Policy for Colorado**

Neil S. Grigg<sup>1</sup>

Department of Civil Engineering, Colorado State University, Fort Collins CO 80523

**Abstract.** During the first years of the 21<sup>st</sup> Century, three processes converged to create a water crisis in Colorado: rapid population growth, decline in construction of new water projects, and deep drought. The paper explains these trends and forces, outlines their impacts in the form of water shortages and institutional gridlock, and analyzes policies for new storage projects, management of existing facilities, and new management methods and technologies. The paper reviews past state water policy, recent initiatives, and election results from November 2003. It concludes with observations about needed changes in policy for water storage and management in Colorado's unique natural and institutional settings.

## **1. Introduction**

Water storage is an important policy instrument to provide water supplies and security against drought in Colorado. If providing more storage is needed, the state has made little progress in the last fifty years, particularly along the Front Range. In 2003, the state's attention was focused on two statewide initiatives: Referendum A and the Statewide Water Supply Initiatives Study. Referendum A failed by a wide margin, in spite of polls that show that Coloradoans favor more storage. Regardless, whether either initiative will increase water storage significantly is an open question. A number of policy issues must be confronted if the state is to come to grips with its full range of water needs. In studying them, investigators will confront institutional issues that include a property rights system for managing water, regional competition, environmental issues, and a court-based water management system.

During the drought of 2000-2002, Colorado faced a water crisis because population has increased rapidly and little new water storage had been built for decades. With historic patterns of growth and water-use, new storage may have made little difference anyway, because the drought was so severe and unpredictable that water officials would be unlikely to conserve enough water for the driest years. Regardless, water storage remains the most important policy instrument for security against drought.

---

<sup>1</sup> Civil Engineering Department  
Colorado State University  
Fort Collins, CO 80523-1372  
Phone: (970) 491-3369  
e-mail: [Neil.Grigg@ColoState.edu](mailto:Neil.Grigg@ColoState.edu)

## **2. Water storage in Colorado**

After developing the readily-available river and well water, Colorado's settlers, aided by the federal government, initiated dam-building that lasted from about 1890 to 1970. By then, Colorado had some 9 million acre-feet of reservoir storage (Grigg, 2003). Thirty years later, the state's storage capacity about the same, although some deterioration has occurred in the form of aging, sedimentation, and unsafe dams. This capacity, along with wells and direct-flow river water, serves over 4 million residents and provides about 14 million acre-feet of water to irrigated farmland.

While since 1970 growth has been rapid, with most occurring in the South Platte Basin, little new water storage has been built, exacerbating the water storage situation. Much of the storage added in the 1960s was for the West Slope's Colorado River Storage Project, and does not help Front Range water supply needs. There has been a significant decline in storage per capita, particularly in Division 1, the South Platte River Basin.

The relationship between population and storage introduces important issues, such as the shift of water from agriculture to urban use. Two important research questions about this are: how does the state measure the transferability of agricultural water to urban use and how much storage capacity per capita is required?

## **3. Policy issues**

Bringing the issues together, we can say that the driving forces of the policy issue are:

- Growing population, concentrated along the Front Range
- A declining capacity to store water on a per-capita basis
- Lack of new storage located near population centers
- Growing urban water demands

Growing population, declining per-capital storage, and growing demands lead to greater vulnerability to drought. As the drought of 2000-2002 showed us, the population-storage dilemma places Colorado's Front Range water supplies under much greater stress than a generation ago. While the drought was historically significant in severity, drought will recur in Colorado.

These policy elements point to several problems:

- Insufficient water for growth and economic development
- Deterioration of habitat and water for natural systems
- Vulnerability of water supply systems to natural and human-caused threats
- Inter-regional conflict over water

#### **4. On-going policy initiatives**

The state's legislative and executive branches study water policy continually. During the past several years, water storage has been high on the list of policy topics. Also, the drought caused water supply organizations to focus on their options. Referendum A, which failed in last November's election, would have authorized the Colorado Water Conservation Board to issue up to \$2 billion in bonds, to be repaid from revenues derived from water projects. The Statewide Water Supply Initiatives Study is an effort to compile needs by basin. Currently, it is in the phase of conducting stakeholder meetings around the state. It would be a "framework" type study, similar in scope to those undertaken after the passage of the Water Resources Planning Act in the 1960s.

#### **5. Policy research needed**

Policy research for water supply and storage involves technical, management, and institutional factors. To carry out this research in Colorado's institutional environment is challenging because of the factors that cause competition for water, such as: water transfers, city versus suburb conflicts, interstate water politics, environmental politics, rural-city and inter-rural conflicts, water quality issues, and federal vs state interests (Grigg, 2003).

The technical aspects of water storage in Colorado are daunting, but the state has studies available, such as the Metropolitan Water Supply Investigation Final Report (Hydrosphere Resource Consultants, Inc., 1999), the studies of river basins by the Colorado Water Resources Development and Power Authority, and the upcoming Statewide Water Supply Initiatives Study.

Economics define the limits of practicality of physical schemes. However, sociology also enters the picture because there are upper limits to how much organizational complexity the water community can fathom. In that sense, visionary schemes for more cooperation, for example, might founder on the rocks of every day exigencies of work and on sociological practicality. These begin to look like institutional barriers.

I compiled the following list of institutional issues that are commonly mentioned as operating in water issues, and all are operable in Colorado's water picture:

- Law (statutes, constitutional law, administrative law, case law)
- Government (political processes and relationships)
- Regulations (regulations and executive orders)
- Policy (agency policies and rules)
- Processes (policy-setting and decision making processes)

- Organizations (agencies, firms, public organizations)
- Authority (roles, authorities, shared authorities)
- Contracts (inter-local agreements, mutual aid pacts)
- Relationships (coordination arrangements, associations, informal relationships)
- Values and attitudes (financial values, valuing of social and environmental values)
- Customs (traditions, operating manuals, procedures)

This institutional structure is a complex web that determines how decisions are made. It works with a group of water users, a judicial system, and a regulatory system. A “water market” operates among the water users, but it involves relatively few participants and is tightly controlled by the regulatory system, which enforces water right priorities.

Colorado’s version of the appropriation doctrine originated in the 1876 state constitution and has been expanded by many statutes and court decisions over the years. The state’s founders implemented the doctrine in a simpler era. They would not have foreseen the tremendous complexity it must deal with today. Some of the criticisms of the system are:

- While water transfers involve relatively few participants, the number of water rights and owners is large, and water managers face data complexity.
- The legislature constantly considers bills to tune up the system. None dare to change the basic system, which is based on property rights in the use of water.
- Owners of large and valuable water rights are powerful players in the water industry, constituting an oligarchy.
- The system promotes litigation rather than cooperation, and increases transaction costs. The system is complex hydrologically. Unpredictable water quantity, quality and environmental constraints may alter yields.
- The system requires expensive control structures and systems to maintain access to water.
- Temporary exchanges and transfers should not be so difficult.
- The appropriation doctrine gives inadequate attention to public trust issues.

The state must define its problems, clarify the applicable public policies, identify alternative policies and instruments, evaluate them, and make recommendations on questions such as:

- Does Colorado need more storage, or to use its storage more efficiently?
- If it needs more storage, where should it be and which projects should be built?
- Who has responsibility?

- How should the projects be financed?
- How should systems be managed?

One might say that, although no central authority has studied these questions, the institutional structure has already provided the answers. Proponents for storage say that it is obvious that more is needed, as shown by the drought. Opponents say that we need “smart storage, not more storage” (Kassen, 2003). Both are right. Unless the state has adequate storage, it cannot grow; unless it uses storage wisely, it will continually run short of water. The problem is in the details of these questions, including both physical and institutional aspects.

On the question of which projects should be built, current state policy mostly leaves the decision to local water users. Referendum A would have provided assistance in financing but state policy does not provide for any central coordination of project development, such as occurred in California to build the State Water Plan. By the same token, current policy leaves responsibility, financing, and management to local water users.

Two over-arching areas of state interest deserve special attention. The first is balance and opportunity among regions, a policy that appears in the “principles” advocated by the state’s county governments in 2002. Competition between regions and subregions for water inhibits cooperation and coordination among power centers and fear of losing water in regions is a major cause of water wars. The second matter of state interest is environmental sustainability, where there is also broad agreement on the policy, but lack of agreement on the details.

Should the state as a matter of policy guarantee its regions water to achieve balance and opportunity and reduce tension? Doing this is an implicit goal of what Getches (2002) called a “comprehensive water planning process, basin by basin, with full public participation.” Some resist this idea because it sounds like basin-of-origin protection, a controversial policy idea that hasn’t passed in Colorado. However, balancing water opportunity does not rule out interbasin transfers; it would make sure they were negotiated with all regional interests in mind, and include compensation. By creating regional institutions to handle them on behalf of the regions, the public interest could be served better.

Opposition to this policy might come from water developers or even from farmers, who would oppose negotiation about water because they will think that it might affect the value of their water rights. Some environmental groups might also think that “guaranteeing water” to regions would unleash unbridled growth on the Front Range. These fears should be recognized and dealt with through plans and negotiation, not by covert actions and court battles.

How could an institutional mechanism provide for negotiations among regions? After all, regions are not sovereign governments, like states. It could not negotiate agreements to bind parties in a region, but it could work with power centers, including federal and state government agencies, to arrange projects and programs that would work in the state's interests. Its specific roles need to be studied.

The principle of compensatory storage or water insurance might be expanded to provide senior water right owners security that water changes would not injure them. Rather than hypothetical case-by-case water court decisions, perhaps computer-based mathematical models could show in real time what is actually happening in basins, and indicate water entitlements and compensatory schemes. Who would operate such a system would have to be determined.

To implement this approach, a regional group would prepare water supply plans and meet with neighbor regions on shared interests and agreements. All would come together in an annual meeting to evaluate water policy and results. The regional groups would look after the interests of their regions, and not be parochial. To achieve that perspective, they could be appointed by an authority with areawide interests or even be elected. They might have funding authority, depending on whether they could acquire water rights and enter into projects. They would report annually on the state of the water supplies in their regions, and a central office would report on the state's water.

Given the record of years of mistrust and false starts, designing and implementing this institutional arrangement would be slow and painful. It will not be achieved quickly or simply and it would not happen by the action of one legislative committee or even by starting a few river basin committees or commissions. However, what it needs to do is to provide mechanisms within each region or river basin to negotiate their internal interests in water and their exchanges with other regions, and to provide backup technical support to study issues and make plans.

As examples of how this can work, consider Northern Colorado and the Denver Region and the East Slope–West Slope water transfers. In the first case, a rapidly–developing I-25 corridor needs water supplies. Coordinated action will be required to supply raw and treated water to large and small water purveyors. Should this occur from the competitive actions of many players, or can the region cooperate to coordinate raw and treated water services for the economic and environmental advancement of all? A coordination mechanism could be an organization of water providers who work together to study and manage aspects of water in the corridor. While models such as Israel's National Water Carrier might be studied, Colorado's

system would have to recognize private ownership of water rights, not government control.

East Slope and West Slope interdependence involves different issues. To the West Slope, water transfer to the East Slope is a threat. While the East Slope fuels part of the West Slope's economy, some power centers oppose more water transfers and, in fact, would like to diminish existing ones. East Slope and West Slope cooperation in water management is a strategic issue because most of Colorado's unused water entitlements are in the Colorado River. Can East Slope and West Slope interests be negotiated together? Could, for example, the East Slope provide attractive compensatory enhancements for the West Slope in exchange for more access to water, and could this be done without harm to environmental values?

On the issue of environmental sustainability, simply stated, the state needs a process where more stakeholders buy into its plans and environmental interests agree that the plans implemented promote sustainability, rather than work against it.

## **6. Conclusions**

Clearly, water storage will continue to be Colorado's most important policy instrument to provide water supplies and security against drought. In studying policy alternatives, investigators will confront issues that include Colorado's property rights system, regional problems, environmental issues, and the court-based water management system. They must raise difficult questions. Some policy options seem to be blocked, such as state water management and regional organizations.

If providing more storage is needed, the state has made little progress in the last fifty years, particularly along the Front Range. It is now engaged in a continual process of converting agricultural water to urban use, rather than of building new storage. It will inevitably be difficult to build much new storage, and even with a large new project, the ratio of storage-to-population will not change much. Developing projects is left to water providers, who work in a complex and interdependent system. Their constraints lead them to focus on narrow needs, and not always in the broad public interest. There is no overall authority to coordinate among competing uses and balance the public interest.

Lack of water management capacity saps the state's capacity for growth and economic development, threatens habitat and water for natural systems, creates inter-regional conflict over water, and makes water supply systems more vulnerable to natural and human-caused threats.

Currently, the state's attention is focused on two statewide initiatives: a replacement for Referendum A and the Statewide Water Supply Initiatives

Study. Whether either of these would increase water storage significantly is an open question.

Research questions raised in the paper include this list:

- Should the state seek to provide balance and opportunity among regions in its water policy?
- What mechanism(s) should the state use to ensure environmental sustainability in water decisions?
- How much storage capacity per capita is required for urban uses?
- Is water *storage* the best policy measure to provide the needed water *management* capacity, and does Colorado need more storage, or to use its storage more efficiently?
- If Colorado needs more storage, where should it be and which projects should be built?
- How can the state measure the transferability of agricultural water to urban use to understand whether transfers can add security for dry years?
- Who should have responsibility for large, regional projects?
- How should projects be financed?
- Should new management authorities be created?

Will Colorado's future water policy be a default policy of continuing reallocation of water from agriculture, or are other solutions available? Answering these questions in Colorado's institutional environment will be challenging because of the factors that cause competition for water.

## 7. References

- Antevs, E., 1952: Arroyo cutting and filling. *J. Geology*, **60**, 375-385.
- Colorado Water Conservation Board., 2003: State Water Supply Initiative: Fact Sheet. [http://cwcb.state.co.us/SWSI/Table\\_of\\_Contents.htm](http://cwcb.state.co.us/SWSI/Table_of_Contents.htm) Accessed September 13, 2003.
- Getches, David., 2002: Guest commentary. *Denver Post*. July 10.
- Hydrosphere Resource Consultants, Inc., 1999: Metropolitan Water Supply Investigation Final Report. Boulder.
- Grigg, Neil S., 2003: Colorado's Water: Science & Management, History & Politics. Aquamedia Publications. Fort Collins.
- Kassen, Melinda., 2003: Smart storage not more storage. *Rocky Mountain News*. February 1. P. 2C.
- Simpson, Hal., 2002: Drought in Colorado: Streamflow, Impacts, Planning and Lessons Learned. *Colorado Drought Conference*. Colorado State University. December 4.