Colorado River Water Uses

21st Century Solutions for the Colorado River Basin's Unbalanced Uses

Introduction

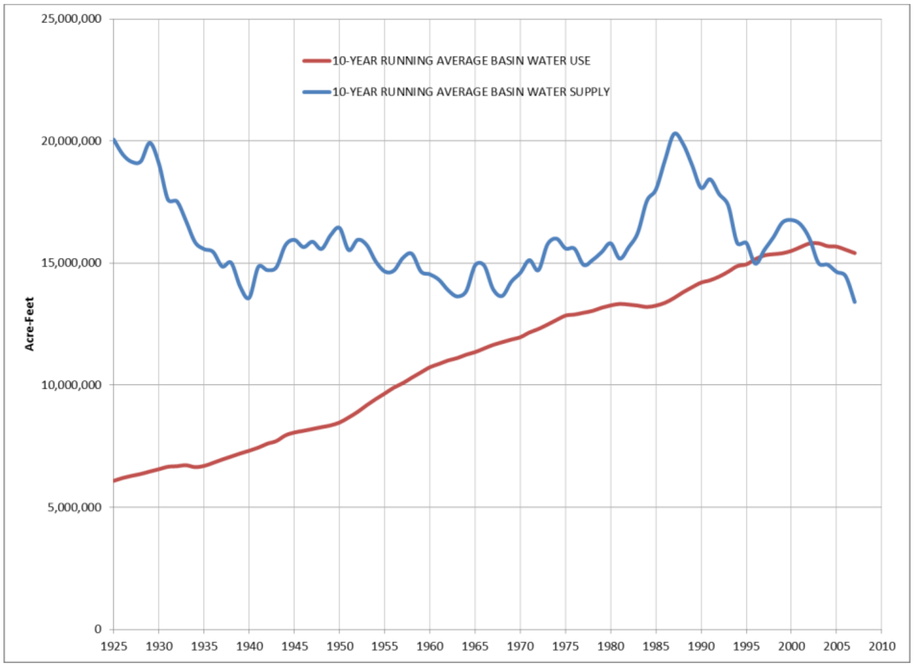
The Colorado River courses 1,400 miles from its headwaters in the Rocky Mountains of the United States, to the Gulf of California in Mexico. More than 30 million people depend on the Colorado River for their water needs, as do 4 million acres of farmland. The two largest reservoirs in the United States and the largest irrigation canal in the world are just part of the historic infrastructure system that connects the river's supply to its consumptive users.

Equally important, the Colorado River Basin provides unparalleled aesthetic, recreational, and environmental values to the United States as a whole. The Basin spans an area greater than 240,000 square miles that includes some of the most spectacular scenic landscapes and geological formations on the planet. The Basin supports world-class rafting and freshwater fishing industries, with the total economic value of fishing, hunting, and wildlife viewing calculated at more than 10 billion dollars annually.[1]

Unfortunately, there is not enough water in the Colorado River to meet the Basin's current water demands – let alone future demand increases from growing population or future supply reductions from climate change. The latest report from the Bureau of Reclamation clearly demonstrates that within the last decade, use of Colorado River water has exceeded the amount of water supplied (Figure 1).

The Colorado River is the lifeline of the Southwest and is, to a very real extent, the economic foundation of a significant portion of the western United States. Managing the over allocated Colorado River in ways that are congruent with growing needs in the Basin – both consumptive and non – is thus a formidable but inescapable task.

Figure 1. Demands for Colorado River water now outstrip supply.[2]



Traditional v. 21st Century Approaches

While agriculture is by far the largest consumptive water user in the Basin – and will likely remain so – the Bureau of Reclamation reports municipal and industrial demand increased by nearly 60 percent from 1971 to 1999. This trend continued through 2010, as evidenced by population in the Basin states growing at some of the most rapid rates in the United States (Table 1). Growth is projected to remain high for several more decades to come.[3]

Table 1. States in the Colorado River Basin are some of the fastest growing in the nation – a trend expected to continue.

State	2010 Population	2000-2010 Change (%)	Rank in US	2000-2030 Projected Change (%)	Rank in US
Arizona	6,392,017	24.6	2	108.8	2
California	37,253,956	10.0	22	37.1	13
Colorado	5,029,196	16.9	9	34.7	14
Nevada	2,700,551	35.1	1	114.3	1
New Mexico	2,059,179	13.2	17	15.4	26
Utah	2,763,885	23.8	3	56.1	5
Wyoming	563,626	14.1	13	5.9	44

As stakeholders in the ongoing planning processes that seek to meet these growing municipal needs, the conservation community fully recognizes the importance of preparing for our water future. However, we are concerned that many traditional water supply strategies have resulted in adverse impacts to rivers and streams and their associated environmental, recreational, and economic values. Rather than continuing old patterns, 21st Century water development must account for instream flow needs, minimize the adverse environmental impacts of water supply strategies, and even improve streamflows or other environmental conditions on rivers that are already depleted.

Healthy, flowing rivers are among the West's most vital natural resources — nurturing the environment, supporting communities, powering the economy, and drawing residents and visitors alike to this region's world-famous natural areas. Maintaining a high quality of life in the West demands that we preserve our waterways.

Water flowing in rivers and streams sustains a diversity of life, from fish, invertebrates, and a host of other species that live directly in the water, to birds and large mammals that rely on streams for habitat and food supplies. In the West, 65% of the species rely on the riparian and aquatic environment, which makes up less than 5% of the land area. Flowing rivers and streams also provide clean drinking water supplies, dilute water pollution, and support greenways in many communities, thus contributing to quality of life and the West's attractiveness to residents and businesses. Furthermore, healthy waterways are key to the region's outdoor recreation and tourism industries, which inject billions of dollars into the national economy (Table 2).[4]

Table 2. Fishing, Hunting, and Wildlife Viewing contributed more than $10 billion dollars to economy in 2006.

Basin State	**Fishing**		**Hunting**		**Wildlife Viewing**	
	Direct Expenditures	Flow-On*	Direct Expenditures	Flow-On	Direct Expenditures	Flow-On
Arizona	$ 813,921,000	$ 2,075,499,000	$ 327,370,000	$ 834,795,000	$ 850,337,000	$ 2,168,359,000
California	$ 29,696,000	$ 75,725,000	$ 20,092,000	$ 51,236,000	$ 103,263,000	$ 263,322,000
Colorado	$ 214,363,000	$ 546,627,000	$ 175,325,000	$ 447,078,000	$ 547,908,000	$ 1,397,166,000
New Mexico	$ 29,204,000	$ 74,470,000	$ 33,176,000	$ 84,599,000	$ 60,0004,000	$ 153,010,000
Nevada	$ 35,926,000	$ 91,611,000	$ 15,401,000	$ 39,273,000	$ 43,219,000	$ 110,209,000
Utah	$ 189,166,000	$ 482,374,000	$ 139,564,000	$ 355,887,000	$ 287,731,000	$ 733,715,000
Wyoming	$ 96,650,000	$ 246,458,000	$ 25,440,000	$ 64,873,000	$ 73,184,000	$ 186,620,000
Total	**$ 1,408,926,000**	**$ 3,592,764,000**	**$ 736,368,000**	**$ 1,877,741,000**	**$ 1,965,646,000**	**$ 5,012,401,000**

Total Direct Expenditures in the Basin: $ 4,110,940,000
Total Flow-On Impact in the Basin: $ 10,482,906,000
**Flow-On* includes the indirect and induced impacts of the activity.

Yet today, many Western rivers and streams suffer from severely diminished stream flows. Developing additional water supplies to provide for a growing population threatens to make the problem worse. Water planning must quantify and meet instream flow needs with the same level of energy, enthusiasm, and financial resources applied to developing traditional supplies, and become wholly integrated into water planning efforts. No longer can rivers and streams be an afterthought, bearing the adverse impacts of water development projects. As we plan for a sustainable water future, instream non-consumptive needs must play a much larger role than they have in the past. These challenges require new ways of thinking and new tools.

Gone are the days when a utility knew exactly how much water a new dam could reliably provide. Huge unknowns surround the future price of energy that will be necessary to power long water pipelines. "Stationarity is dead" said Milly et. al. in 2008; "risk" and "uncertainty" are the new words of water planning. Indeed, it would be a grave mistake to look for ways to increase the region's water security by simply subscribing to the same 20th Century thinking that caused the Basin's imbalance problem in the first place (i.e. large-scale, expensive, and inflexible, concrete and steel approaches).

Thus, the challenge is how to forge an alternative, innovative path forward that breaks the habit of getting water at the expense of our rivers and streams. This ultimately boils down to managing our existing water supplies in better ways. Meeting growing municipal demands in the Basin during the 21st Century will require a strong combination of water efficiency, reuse, voluntary sharing with agriculture, and small structural projects. These strategies are the path forward to a sustainable water supply in the Colorado River Basin, and can be done in a way that doesn't damage our Western rivers and cultural heritage.

Urban Efficiency & Water Conservation

Water conservation and water efficiency are synonymous: a permanent reduction in per capita water usage resulting from long-term implementation of water saving practices and technologies. The practice of implementing water efficiency programs is often called demand management, and it will be the future of water management in the Colorado River Basin. Efficient water use is one of the few variables in the Colorado River supply and demand equation that can be readily controlled and deliberately improved at will.

Water conservation is often the cheapest, fastest, and smartest way to gain "new" water supply. While conservation does not increase the total amount of water a provider can utilize, water that is saved through conservation can be put to other uses, in effect, stretching existing supplies. Conserved water can be used by a utility to fulfill new customer demands, increase supply reliability, or provide additional flows to the environment.

Water conservation also creates ancillary benefits for a water utility. Reductions in per capita demand allow utilities to delay and/or downsize expensive new water source, treatment plant, and system expansion projects. Water conservation demonstrates leadership to the customer base, addresses community values, can decrease operating costs for the water provider (especially through decreased energy use), and often results in mutual benefits to other water sectors. Furthermore, improving water efficiency is a "no-regrets" strategy that enables water providers to maintain local control of their water supply, and it is inherently flexible, able to move and shift as need dictates.

Water efficiency can be achieved through a variety of practices and technologies. Conservation programs can be focused at the utility level, such as leak detection and repair, or at the customer level, such as clothes washer rebates. Conservation efforts can be price-based, like adjusting water rates, or non-price-based, like educating consumers about the value of water. City land use planning and state-level legislative efforts can also promote conservation. And conservation can be focused on indoor or outdoor measures, aimed towards commercial or industrial customers, and approached through regulatory or voluntary measures. In short, there is a multitude of ways to use water more efficiently.

Future Savings Potential

Water efficiency has already played an important role in supporting the growth of major cities that depend on Colorado River water – and more can be done. A recent Pacific Institute study shows that water efficiency practices executed over the last 20 years has reduced demands (or alternatively, stretched supply) in the Basin by 1.4 million acre-feet – a remarkable amount of water.[5] This was achieved by implementing consistent, yet modest water efficiency programs and practices that reduced the total per capita water use in the Basin by an average of at least one percent per year from 1990 to 2008.

Published literature, state planning documents, consultant analysis, and the past experience of water providers clearly indicates that per capita water use can be significantly reduced over the next several decades through existing conservation techniques, practices, and technology.[6] A conservation target of reducing demand at 1% per year is a realistic and cost-effective approach for municipal water providers – a target achieved by many water providers already and one adopted as a future goal by several more.[7] Importantly, achieving a 1% per year reduction will not require measures, lifestyle changes, or landscaping modifications beyond those already being implemented in many communities across the West.

Achieving this level of reduction in per capita water use will require real effort and investment by water providers, as well as by state and local governments. There will be financial costs to achieving a high level of conservation savings, but they will be significantly cheaper than traditional approaches to water supply development.[8] These savings will not happen overnight. However, just as water supply projects are not built by themselves, water conservation savings must be achieved through concerted effort, and multiple decades is a substantial amount of time to implement effective conservation programs and attain real water savings.

Important Efficiency Programs

Water loss tracking and reduction, price-based tools, and land use planning are three of the most promising water conservation practices that will need to be maximized in order to achieve a 1% per year reduction in per capita use.

Addressing Water loss

Water lost from the distribution system – both from water physically leaking out of pipes (real losses), and from poor record keeping or meter inaccuracies (apparent losses) – is a major area for efficiency improvement. Reducing system losses allows less water to be withdrawn from a source and/or more water to make it to the end user. The water loss management toolbox includes, but is certainly not limited to: leak detection and repair programs; meter repair and replacement; water pressure management; water accounting practices and technologies; and comprehensive water system audits.

In the past, 10% was considered a general benchmark for system water loss, but a report by the American Water Works Association encourages its members to express water loss in terms of actual volume,[9] as this quantity of water can be directly translated into lost revenue. This same report identified several key issue areas for water loss policies in a national survey it conducted on reporting practices by state agencies. The results of this survey for the Colorado River Basin, updated by Western Resource Advocates, suggest there is room for improvement in water loss policies within all states (Table 3).

Table 3. Arizona and California have adopted strong water loss reduction policies; other basin states have significant room for improvement.

Water Loss Reduction Best Practice	AZ	CA	CO	NM	NV	UT	WY
Definition of Water Loss	X	X					
Water-Loss Policy	X	X			X	X	X
Accounting and Reporting Methods	X	X	X				X
Goals and Targets	X	X	X	X		X	
Planning Requirements	X	X	X		X	X	
Compilation and Publication of Loss	X	X					
Technical Assistance	X	X	X	X	X		
Performance Incentives Offered		X					
Auditing and Enforcement	X						
TOTAL	8	8	4	2	3	3	2

Appropriate Rate Structures

Price-based tools, such as an increasing block rate structure, have been found to be the most effective method of reducing urban demand as compared to all other methods.[10] Water rates play an essential role in communicating the value of water to customers.

Water utilities must ensure that revenues from water sales are sufficient to recover supply costs, but the "value" of water also includes the social and environmental opportunity costs of losing other benefits of water in its natural state and location, including the loss of ecological and recreational values. Integrating all of these costs into a water rate structure is challenging (both financially and politically). Properly designed rate structures:

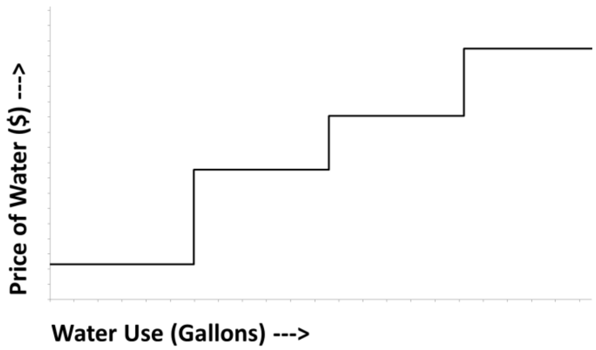
- Provide water at low prices for basic and essential needs, so all customers can afford it.
- Reward conserving customers with lower unit rates.
- Encourage efficient use by sending a strong conservation price signal.
- Assign supply and development costs proportionally to the customers who place the highest burden on the supply system and the natural supply sources.
- Maintain a stable flow of revenue to the water provider.

Inclining block rates are generally the most effective at communicating the value of water to customers. With inclining block rate designs, the unit price for water increases as the volume of water consumed increases, with higher prices being set for each higher block of water use (Figure 2). Customers using low volumes of water are charged a modest price and are rewarded for conservation, while those using higher volumes of water pay higher prices. This approach provides a financial incentive to conserve and ensures that lower income consumers are able to meet basic water needs at an affordable cost.

Effective rate structures – those that actually encourage conservation – share several key elements:

- **Right-Sized Blocks** – For residential customers, the size of block 1 should be based on an efficient level of monthly indoor use. Block 2 should be based on the landscape needs of a moderately landscaped property. Additional blocks should capture inefficient or wasteful water use.
- **Block Price Differentials are Meaningful** – The change in price between blocks should be large enough to be noticed by customers when their usage bumps them into a higher rate block.
- **Avoiding High Fixed Service Charges** – A high fixed service charge may provide more stable revenues, but it directly offsets the conservation incentives provided by increasing block rates.

Figure 2. In an inclining block structure, higher rates of use are charged more money for each gallon.



Appropriate Land Use Planning

Proper planning for the region's new residents is perhaps the greatest opportunity to secure water efficiency savings. New developments can be planned and built to use much less water than the status quo, yet this model has been slow to catch on.

Planning future development according to the principles of Smart Growth – think urban redevelopments with smaller lots, live/work buildings, and communal park spaces – has the potential to drastically reduce water use, infrastructure costs, and water loss when compared to traditional western suburban sprawl.[11] Local planning agencies and utilities can incentivize this style of development by offering density bonuses, discounting tap fees, and prioritizing funding for water-smart projects. Local governments and water providers are also on the front lines of integrating land use and water supply planning and should communicate more thoroughly about how each group's decisions impact one another. Including a water use element in a community's master plan, or basing future demand projections on land use patterns are just two of the ways these entities could improve their interaction.

In addition to incentives, ordinances will likely play a critical role in the implementation of water-smart development strategies. Ordinances can require compact forms of development, limit outdoor irrigable area, ensure new developments demonstrate an adequate supply of water before approval, or require the installation of high efficiency fixtures, among others.

Building water-smart entails the use of high-efficiency indoor appliances and fixtures and the planting of regionally-appropriate landscapes. Several builders across the West are pursuing green building practices in new homes and are using measures like high-efficiency toilets, ENERGY STAR® appliances, and WaterSense® fixtures to differentiate their water-conserving homes in the market place. Homes landscaped according to the principles of xeriscape and that utilize smart irrigation controllers and alternative sources of water supply (like rainwater harvesting), can drastically reduce outdoor water needs. These water-smart building techniques lock water savings into the home and do not require behavioral changes from homeowners, ensuring reduced water use into the future.

One example of a water-smart development is the Civano community in Tucson, Arizona. Key aspects of this development are:

- Mixed densities of mixed uses.
- Relatively small residential lot sizes, averaging less than 5,000 s.f.
- Comprehensive xeric landscapes on private lots and in common areas.
- Reclaimed water delivery system serving all landscape irrigation.
- 35 percent of development area is dedicated as open space.

In 2007, the newest development within Civano reported an average use of 67 gallons per capita per day (gpcd), significantly less than the Tucson average of 123 gpcd. It is important to recognize that the Civano development was made possible with the cooperation of Tucson Water, whose main subsidy to the project consisted of extending its reclaimed water service to the community. Although the development required higher up-front costs to cover its water efficiency infrastructure, long-term benefits are expected from significant water and energy savings.

Water conservation and efficiency will play one of the largest roles in meeting future water needs across the Colorado River basin. These conservation savings can be used to meet new demands, increase supply reliability, and benefit healthy river flows. The path will not be easy, it will take concerted effort and require more integration, but the science of water efficiency is rapidly evolving and successes will continue to be achieved.

Reuse of Existing Supply

Water reuse is any arrangement that utilizes legally-reusable municipal return flows to increase water supply. Return flows are water that returns to a river after being treated at a wastewater treatment plant or to alluvial aquifers via percolation. Reuse can be accomplished in at least two ways: 1) return flows can be physically reused for non-potable and potable purposes (like through a purple-pipe system); or 2) return flows can be reused under various substitution or exchange arrangements – for instance, a junior user makes available to a senior user water that is owned by the junior (e.g., reusable effluent), in exchange for permission to use or divert an equivalent amount of water to which the senior user would otherwise be entitled.

Water providers across the West are rapidly improving their ability to fully reuse existing supplies. With the consumptive use rate of municipal deliveries near 50%, there is the theoretical potential to almost double a provider's supply. While this full opportunity may not exist in many areas due to legal considerations, reuse presents a significant opportunity for additional water supply to the Basin's municipal users.

Along the Front Range of Colorado, a 1999 state study estimated that Denver area water users were utilizing approximately 54,000 acre-feet of reuse water per year, less than half of 133,000 acre-feet of reuse water potentially available.[12] One Front Range example of a utility's progress in developing reusable supplies since 2000 is Aurora Water's Prairie Waters Project. The Prairie Waters project collects Aurora's wastewater return flows in the South Platte River from wells near the river's bank more than 30 miles downstream from the city. The water is then piped up to a purification facility, blended with other water supplies, and delivered to Aurora customers. The project is expected to increase water supply by 3.3 billion gallons annually. According to Aurora Water, benefits of the project include:

- Use of in-basin resource is cheaper, consumes less energy, and is better for the environment than purchasing and transporting water from outside of the basin.
- Project was developed quickly, significantly reducing purchasing time and transaction costs.
- Greatly reduces the demand on more energy-intensive filtration.

Another example is California's Groundwater Replenishment System, the world's largest wastewater purification system for indirect potable use, which is a cooperative project between the Orange County Water and Sanitation Districts. It treats wastewater for seawater intrusion protection and groundwater recharge that would have otherwise been discharged to the ocean. The system produces 70 million gallons of water every day – enough to meet the water demands of almost 600,000 residents in Orange County – and decreases the provider's dependence on water from the Sacramento-San Joaquin Delta and the Colorado River Basin.

These types of water reuse projects create a locally-controlled, reliable supply of high-quality water that is drought resistant. In many cases, reuse projects use much less energy than the original source supply, as is the case for Southern California and the Las Vegas Valley. Reuse systems are successful where research, education, and monitoring are rigorously discussed with the public and one needs only to look at Singapore for an indication of how far the technology can go for meeting future needs.

Voluntary Sharing with Agriculture

Agricultural and urban land use patterns in the Colorado River Basin have changed over the last 30 years. Driven to some extent by urban areas growing over farmland, but also other factors more directly related to agriculture, there has been a general reduction in agricultural water use across the Basin.[13] As the largest water user in the Basin, agriculture is a natural partner for the municipal sector to court in developing new water supplies.

While the agricultural community sometimes views the growing urban demand as a threat, it is also an opportunity. The major benefit of ag/urban sharing arrangements to agricultural interests is the ability to lease water at an attractive price on a schedule established well in advance of the actual re-allocations, without losing control of the resource. Innovative arrangements, such as rotational fallowing, interruptible supply agreements, water banks, crop shifting, and deficit irrigation, could allow for temporary transfer of irrigation water to municipal uses without permanently drying irrigated lands.

The coupling of voluntary land fallowing and water leasing is not unprecedented. For instance, it has been utilized on a small-scale in Colorado between the Fort Morgan Water Company and Xcel Energy, and on a large-scale in California between the Metropolitan Water District of Southern California and the Palo Verde Irrigation District. A large-scale fallowing program is also currently being explored in the Arkansas Basin of Colorado under the name of Super Ditch.

These types of sharing arrangements must meet the needs of both the municipal and agricultural communities, but there is no formal template on how to move forward. Many in the agricultural community express the following concerns:

- All transfers of water from agriculture to the municipal sector must be based on a willing buyer/willing seller model.
- Temporary transfers must be protected against claims of forfeiture for non-use or loss of priority.
- Transfers should be shareable among multiple participating farmers in order to provide flexibility.
- Transfers must not affect the water supplies of non-participating farmers or ditch companies.
- Market tiers and associated prices must be established to allow participation by entities with water of varying reliability.

For the municipal community, concerns mostly surround the issue of permanency. Providers have difficulty constructing new infrastructure and selling taps if water supplies are not guaranteed for a substantial amount of time.

These concerns have been adequately addressed in the existing ag/urban sharing agreements, which can serve as a blue-print for future water sharing opportunities. In the future, the structure, if not the details, of agreements will need to be standardized to reduce time and administrative commitments necessary for both their negotiation and implementation. However, the potential of utilizing even a small percentage of the water agriculture currently uses is just too big an opportunity to dismiss for the future sustainability of all the Basin's water users.

Constructed Water Projects

Reservoirs have been part of the West's water development strategy since the late 1800s, in response to this region's highly variable stream flows. Today, the upper Colorado River Basin has a combined storage capacity of more than 30 million acre-feet in just the major Colorado River Storage Project reservoirs – not including the many hundreds of other smaller reservoirs located throughout the states. In the lower basin, reservoirs on the main stem of the Colorado alone can store an additional 30 million acre-feet. The traditional purpose for building these reservoirs has been to capture excess runoff, which occurs in large volumes and relatively infrequently. Consequently, traditional reservoirs are fairly large and located directly in a stream channel. In addition to their environmental impacts, such large, on-stream reservoirs have other major limitations:

- Reservoirs are costly to build and cannot easily be expanded incrementally in response to growing demands. Rather, they must be paid for and constructed "up front," which increases their financial risk and diminishes their economic feasibility.
- As a basin becomes over-appropriated, additional storage produces ever-diminishing returns, in terms of water yield, because unappropriated runoff occurs less frequently and storage carry-over periods become longer.
- Evaporation losses compound the diminishing yield problem, becoming a major limiting factor in reservoirs' ability to provide relief, both over extended drought conditions and during severe droughts that occur every few decades.
- Sedimentation of reservoirs further decreases yield and can only be remedied through the manual removal of accumulated sediment, which is both time-intensive and very costly.

New pipeline proposals — becoming more popular in the traditional water supply planning dialogue — are marred by the same problems because reservoirs are still needed to store any water transferred through a pipeline. Pipelines are also extremely costly to build and operate. The Colorado Water Conservation Board has explored the costs of six potential pipeline proposals in the state, determining that each one would cost in the range of $8-10 billion for capital costs alone.[14] Any new pipeline will also require a significant amount of energy to pump water over great distances, making operations and maintenance a significant part of ongoing costs. Furthermore, these proposals generally require pumping large quantities of water from remote areas of the Basin, where compact entitlement concerns, water quality issues, relationships with neighboring states, and the local political unpopularity of these projects add to the list of hurdles.

With these limitations in mind, some water providers are increasingly developing "smart storage" — smaller reservoirs designed to optimize already-developed supplies. Smart storage is now commonly developed as a means for capturing and re-regulating reusable return flows, increasing the yields of exchange rights and augmentation plans, re-regulating the yields of changed irrigation rights to meet municipal demand patterns, and increasing yields from existing water rights. In some cases, existing traditional storage capacity has been rededicated to smart storage purposes, with resulting increases in yields.

Recognizing there is a place for additional structural water development approaches, new projects should be built incrementally and with a precautionary approach. Throughout the ongoing water planning processes in Colorado, the conservation community has recommended that future water supply management and development efforts adhere to a set of basic smart principles. The smart principles are offered as a guide to assure protection of rivers and other natural resources against damage that often results from structural water supply projects. The smart principles are:

- Make full and efficient use of existing water supplies and reusable return flows before developing new diversion projects.
- Improve use of existing water supply infrastructure by integrating systems and sharing resources among water users to avoid unnecessary new diversions and duplication of facilities.

- Recognize the fundamental political and economic inequities and the adverse environmental consequences of new transbasin diversions.
- Expand or enhance existing storage and delivery before building new facilities in presently undeveloped sites, and expand water supplies incrementally to better utilize existing diversion and storage capacities.
- Recognizing that market forces now drive water reallocation from agricultural to municipal uses, structure such transfers, where possible, to maintain agriculture and in all cases to mitigate the adverse impacts to rural communities from these transfers.
- Involve all stakeholders in decision-making processes and fully address the inevitable environmental and socioeconomic impacts of increasing water supplies.
- Design and operate water diversion projects to leave adequate flows in rivers to support healthy ecosystems under all future scenarios, even if water availability diminishes in the future as a result of climate change or other factors.

Conclusion: Thoughts on the Path Forward

Water is critical to every component of life in the West. The high quality of life we enjoy is at risk, however, unless decision-makers shift to more innovative, balanced, and cost-effective approaches for supplying water to our growing population while sustaining our rivers and streams. We must look beyond old ways of thinking and change the mindset away from grandiose pipedreams. None of the strategies described above are “new”, there just needs to be more focus and effort on implementing them at all levels of policy and planning. Our efforts moving forward should recognize that there are many 21st Century approaches for meeting future water needs, and the time is now to focus on real, achievable solutions.

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