WISE WATER STEWARDSHIP THROUGH PARTNERSHIP

by Uli Kappus, P.E.
Executive Vice-President, GEI Consultants, Water Resources Services

USGS: Denver Basin aquifer contains 400,000,0

The following speech was presented at the 22nd annual Colorado Water Workshop held in Gunnison, Colorado, July 30 - August 1, 1997.

Earlier today I heard someone say, "Be sure and be here for lunch because Uli Kappus is going to talk, and he's going to be very controversial." I always find that interesting because in the water business, if you have a little bit of a vision, invariably you're branded as "controversial." And I think that says a lot for the water business, in general.

I will go so far as to say that the Endangered Species Act (ESA) is the best tool our neighboring states have in terms of keeping Colorado from developing more of its compact entitlements.

What I would like to do today is share with you some thoughts about partnerships that have worked and also about some of the partnerships that are in progress, particularly in the Denver metro area. I believe, as Chips Barry said earlier today, that these partnerships will really form the basis of meeting our obligations to future generations. I've lived in the Denver metro area for about 20 years, and what is really scary to me is that in the last few years, Denver has become a microcosm of Los Angeles. I used to be able to drive to work in 18 minutes, and now it takes me 42 minutes on C-470 in the morning. That is scary when you see that projections indicate that in the next 30 years, the population is going to double again. The question then is, "Where is the new water going to come from?"

I always start my talks with some definitions because it is important to make sure the speaker's definition of terms is clear. As you well know, we in the water field all have a different perspective on nearly everything. After working in the water field for over 32 years, I've come to realize that water is really not a natural resource, it's a political fluid. It's a tough battle, but I believe that battle can be won if some of these projects are structured correctly, and that means getting local support for moving a project ahead.

Stewardship is a term I define as a "long-term perspective of managing the asset with proper regard for the rights of others." The Denver Water Department is one of GEI's clients, and I had never read their mission statement until last week. But the term 'stewardship' is, in fact, in their mission statement. I personally think that Denver has done a good job of balancing the needs of the Denver metro area with some of the other challenges. As you know, in accordance with the newer philosophy of the Board under Chips' direction, they're working very diligently with the metro area to provide some water they have in times of plenty to areas in the southern portion of the Denver met area. That, in fact, includes the fastest growing white-collar community in the whole country -- Douglas County.

I define partnership as a "close cooperation between parties havin specific and joint rights and responsibilities." Successful partnerships require that stewardsl and sharing philosophy be practic among the parties. That is critical because, as Fred Anderson said last night, a partnership can't succeed if you're not willing to strike a balance, whether you're in a marriage with your spouse or if you' trying to construct a "marriage" with another water user. you try to get more than your fair share, it's not going to succeed.

I'm afraid that, in most of the water battles that we've fought in this state, the mentality and the attitude has bee "I want more than my fair share." I do think that as time goes by, the increasing demands for a finite resource are going to cause heightened tensions, not just internally within the state of Colorado, but also with our downbasin compatriots, particularly California. I will go so far as to say that the Endangered Species Act (ESA) is the best too our neighboring states have in terms of keeping Colorado from developing more of its compact entitlements. I suspect that until we resolve some of these very dicey issues, it will be a very tough row to hoe.

Successful water partnerships minimize the expenditure o public funds. I live in Littleton, and I pay about $1200 fo my half-acre foot per year, which is quite a bit. We get ou water from the Denver Water Board, and by the time it's passed through numerous hands, I pay a high price. My water rate has gone up over the years, and it will continue to go up. But every time my water rate goes up, it helps pay for the water engineers (like myself), the attorneys, ar a lot of other people that have their finger in the pot. So w need to look at our water rate as nothing more than anothe de-facto tax that we all pay. And if we don't become mor efficient in some of our activities, the rate is going to keep increasing disproportionately to the value we add to that water.

I also believe that in successful water partnerships, you must be willing to yield some control. In the water business, up until very recently, every major water manager has wanted absolute control. He wanted to wear the "water crown." That, of course, doesn't work, especially when you have whooping cranes, squawfish, and others at the water table. When you look at the ESA from an engineering perspective -- even though I realize some of the attorneys here will argue with me -- it has really made the Prior Appropriation Doctrine subservient to the federal mandate.

When you look at the ESA from an engineering perspective -- even though I realize some of the attorneys here will argue with me -- it has really made the Prior Appropriation Doctrine subservient to the federal mandate.

Eighteen years ago, I managed the original whooping crane study on the Platte River system, on a little project called Grey Rocks Dam and Reservoir. Having gone through that process, I know the power of the ESA. In that case, the critical habitat in Nebraska wasn't even designated at the time the Laramie River Station power plant was being constructed, and the project participants had invested $400 million in an $800 million project. Then, when the critical habitat was designated, Nebraska, in my opinion, saw this as an opportunity to say, "We don't want Wyoming to evaporate 20,000 acre-feet a year for the cooling towers because that water now flows to us and we get it for nothing." Despite the fact that the water belonged to Wyoming under the compact, Nebraska said, "Ah-Ha, critical habitat is now designated, and you haven't addressed it in an EIS."

I firmly believe that the U.S. Fish and Wildlife Service, U.S. Forest Service, and other federal agencies have a mission. They have a mandate. They didn't create the ESA; Congress did. So, one has to be mindful of that...

Well, of course it hadn't been addressed, because the critical habitat didn't exist when the project was permitted. By the time it was completed, that project came within one day of being terminated by the federal judge. I spent a lot of time, with others, trying to get the ESA amended. After about six months, I told my client, "We're wasting our time and money." The bottom line is that to be in the water business, you've got to abide by the body of law that exists today. For better or for worse, Colorado is blessed with a lot of endangered species. We're also blessed, quite frankly, with being one of the primary playgrounds in the U.S.A. So there are a lot of out-of-state interests here, in addition to our own personal interests, and we need to be cognizant of that.

In a successful partnership, you must also have a balance between the notion of first allocating water for habitat protection and then providing a reliable water supply for human use, as a secondary priority. I firmly believe that the U.S. Fish and Wildlife Service, U.S. Forest Service, and other federal agencies have a mission. They have a mandate. They didn't create the ESA; Congress did. So, one has to be mindful of that, and I'm always fond of saying "Be constructive in your criticism of the bureaucrats, because they have a very rough row to hoe." They're trying to do their job, and if they don't do their job properly, what happens? They get sued and then everything is stopped by a third party, generally the environmental coalitions because they're watching this very carefully also. In partnerships, it's very important to clearly define what the costs will be, who bears what cost, who gets what benefit. Without an honest discussion about the equity, it's not going to work. Again, everybody wants the other guy/gal to pay more than his/her fair share.

Risk control is another important consideration. When you get involved in a major water project, you must make early decisions. Otherwise, you're going to end up throwing good money after bad, and then most of these water wars, if I can draw a poor analogy, will end up like Vietnam: -- some of the leadership was getting bad information, and we got in deeper and deeper, and it never seemed to end until we lost. That may be an overstatement, but it may also be a good analogy.

Most importantly, you must be part of the solution, not part of the problem. If you think you can ram something down somebody else's throat, it just won't work, because people tend to be very stubborn. The attachment that I provided in your written material includes an article called, "The Age of Smart Dams." I coined that phrase when I was interviewed by *U.S. Water News*. They called and asked me about our business of building dams, because right now GEI is working on seven major dams around the country. There are over two dozen dams, that I'm aware of, that are currently in either the permitting, design, or construction phase. So the notion that the dam business is dead is foolish.

The federal component of the dam business is maybe one exception that I'm aware of. With the exception of the Animas-La Plata project, the big federal dam era is over because the federal government is basically finished

providing seed money and incentives to develop water projects. Former Secretary of the Interior, Mr. Ziglar, spoke here some years ago, and he pointed out that the entire federal subsidy for western U.S. water projects is smaller than the subsidy provided to the Washington, D.C. subway system. That sounded outrageous to me at the time, but I checked it out and it's true.

Former Secretary of the Interior, Mr. Ziglar, spoke here some years ago, and he pointed out that the entire federal subsidy for western U.S. water projects is smaller than the subsidy provided to the Washington, D.C. subway system. That sounded outrageous to me at the time, but I checked it out and it's true.

A "smart dam" is simply an off-channel structure, preferably, or a structure on a smaller tributary stream. From a permitting perspective, if you try to dam a major river nowadays, you're not going to succeed. But some of these off-channel structures are huge. For example, California's East Side Reservoir is 800,000 acre feet! Our company was recently part of the team that developed one of the biggest water projects in the country 14 miles outside of San Diego, including a 325-foot high dam at a $520 million investment. It took us five years to complete the permitting cycle, but we got everybody together at the beginning and, believe it or not, we don't have one threatened lawsuit. So, it can be done. And in my opinion, California has tougher restrictions than Colorado. They have the California Environmental Quality Act, which is tougher than the NEPA (National Environmental Policy Act).

After seeing what happened at Two Forks, I am of the opinion that maybe we had better look at water not only as the resource we need for future growth, but also as a fully-integrated resource, employing the use of alluvial water and surface water when it's available, and then non-tributary groundwater during a drought or when we have exceptionally high-growth areas.

Of the examples of recent partnerships, my favorite is probably the Wolford Mountain project. That project is described in the attached paper entitled, "The Last Dam in the West: Is the Western Water Project Really an Endangered Species?" Obviously, the answer to that question is no, it is not. I believe that smart dams will continue to be built, and there are some planned by the Northern District, the River District, Parker, and a few others. But I think all of these smart dams also need to be related to conjunctive use opportunities and better use of ground and surface water, which I will address in a minute.

The other project that I would like to mention as a recent partnership is the Platte River Recovery Program. Fifteen years ago, I thought that problem was pretty well solved through the designation of the critical habitat and a $6.5 million whooping crane maintenance trust fund that was generated from the Grey Rocks Dam and Reservoir project. But we finished that work over 15 years ago, and here it is still being recycled. Somehow, we all have to work harder to achieve closure on some of th issues, or we're never going to advance very far.

The third item I'd like to comme on briefly is the Denver Water Supply Partnership. When I tell you these numbers, probably nor of you will believe them, but they're true. These come from t USGS, which generates very hig quality data. Under the greater Denver area, there are literally hundreds of millions of acre-feet of untapped, n tributary water. Douglas County, on the south side of Denver, relies on that almost 100 percent. Believe it or the greater Denver area has over 400 million acre-feet of water. That's 20 times the storage in Lake Powell. In th five-county Denver metropolitan area alone, there are 15 million acre-feet of water. That water can be developed with no federal permits, it can probably be developed in less than two years; it's immune to drought; it's of high quality; and it's not located 150 miles from home. It's under our feet. I've never understood why the discourse about non-tributary water implies that it's almost immor to use it. I say, from a permitting perspective, are we an better off trying to go 100-150 miles away from home and bu big pipelines and tunnels at tremendous expense, rather the first using what we have under our feet?

After seeing what happened at Two Forks, I am of the opinior that maybe we had better look water not only as the resource need for future growth, but als as a fully-integrated resource, employing the use of alluvial water and surface water when it's available, and then nc tributary groundwater during a drought or when we have exceptionally high-growth areas. Once you create that h when you mine the water, it can be developed at $4,000-5,000 an acre-foot. Building a big dam and pipeline tunnels will cost 2-3 times that amount by today's standards, and there are minimal delivery costs involved developing non-tributary water. The point of all this is t we need to have a conjunctive program that fully recognizes that potential, because once you mine that water, you've got a hole in it and you can recharge it du wet periods.

When I was with the Water and Power Authority, we actually did the first study of that type in the State of

Colorado for the City of Parker, and it worked very well. We recharged 50 acre-feet, and it was recovered later. It didn't go anywhere because non-tributary water simply means there is essentially no recharge from the surface. It is very stable, moving less than a foot per year. I believe very strongly that we need to pursue this with a lot more vigor than we have in the past.

In conclusion, I think the whole area of water project development will get a lot more creative --not controversial -- but creative. I also believe that we have to adequately fund the bureaucrats in the state who serve as the "water cops." They have the responsibility of doing a good job of managing the resource. We must have a stronger "win-win" philosophy in terms of what we're trying to do in the water business. We also need to make sure that our water projects are successful and demonstrate characteristics of the five "F" words (which are not what you think). They must be good for farmers, families, fish, fowl and, most importantly, finances. One of the first things I always ask my clients is, "How are you going to pay for the project?" And you'd be amazed at how many clients haven't thought about that. If you don't think about how you're going to pay for it up front, you could be in serious trouble.

Finally, I think it's critical that we negotiate our water partnerships during non-stress times. We've been very lucky in that we haven't had a serious drought in Colorado since the early 1950s. We had one drought, but it only lasted a year and, as you know, a drought has to last 2-3 years to really draw the reservoirs down. But it's coming folks! The tree ring surveys that they've been talking about – that's all real evidence. When I spent time in Saudi Arabia working on water issues, there was an old Bedouin parable that said, "When the water gets low enough, the lions drink with the sheep." You might want to think about what that means.

Thank you for your kind attention.

WATER MANAGEMENT: THE EQUITABLE SHARING OF A SCARCE RESOURCE

by Hamlet 'Chips' Barry, Manager
Denver Board of Water Commissioners

INTRODUCTION

I am pleased to return to the Colorado Water Workshop. I have not been here for the last four or five years, but it is here that I learned the basic counter-intuitive rules involving water in Colorado.

For example, have you ever tried to explain to those from the east (that is East Coast, not East Slope!) that in Colorado water courts, it is possible to file a "statement of opposition in support." Or that we actually have something called "not non-tributary water." Do you think we could bottle water under that label? And that we will all fight over five or ten acre-feet of water, all the while supporting the statutory fiction that certain classes of our many thousand domestic tributary wells have no effect on streamflow, despite a ton of evidence to the contrary.

It is no wonder, therefore, that those outside of these long and troublesome issues believe that we are all nuts.

ASSIGNED TOPIC -- WATER MANAGEMENT

I have struggled to define the topic and figure out what to say. Using a fairly narrow definition, this is an easy topic. Except when Vice President Gore is in town, water is a very predictable and manageable commodity. It generally obeys the laws of physics: it flows downhill regularly, and evaporates on hot days. Unlike customers, the federal government, and water lawyers -- it does what it is commanded to do. Thus -- "management of water" -- once you have it -- is relatively easy. The hard part is, of course obtaining the water in the first place, and thereafter managing the people and the issues.

Given these thoughts, it would make little sense to talk about "water management" in a narrow context. I think thi topic must have been intended as an open-ended invitation to discuss any relevant western water issue that has some relationship to a broader, more inclusive definition of wate management. I will therefore discuss some of these larger "water management" issues, and how Denver will approac them.

Grd Jct Sentinel 8/20/99

Walcher: West Slope must get involved in state water issues

By DAVE BUCHANAN
The Daily Sentinel

COPPER MOUNTAIN — The future of Western Slope water hinges on western Coloradans becoming actively involved in Front Range growth issues, said Greg Walcher Thursday.

Walcher, the executive director of the Colorado Department of Natural Resources, made his remarks to nearly 200 members of Trout Unlimited attending the conservation group's national convention here.

Continued growth on Colorado's Front Range is fueling increasing demands for Western Slope water, but Walcher, refuting comments attributed to him recently, said he personally is opposed to more transmountain diversions — especially when there still are Front Range water resources to be developed.

It's contingent on the Western Slope to help Front Range cities find and utilize those as-yet unexploited resources, Walcher said.

"The Western Slope has 70 percent of the water in the state yet 90 percent of the people live on the Front Range," Walcher said.

"The Western Slope has to be involved in the decisions of the Denver and Front Range water problems. We can't wait for them to make the decisions first."

Walcher, formerly the president of Club 20 and a fifth generation Coloradan, said the era of huge transmountain water diversions is "mostly over," although current diversions will continue.

"But sending more water to the Front Range won't solve their issues over growth, and we must address the growth issue first," emphasized Walcher.

GREG WALCHER

"Sending them more water isn't a solution. Once all the water is gone, what then?"

Walcher said the state is conducting a groundwater survey in the Denver metro area, focusing on an immense underground aquifer separate from the large Ogallalla Aquifer currently being tapped by parts of eastern Colorado and western Nebraska and Kansas. Walcher said the Denver aquifer might hold a 1,000 years' supply of water.

In other remarks, Walcher said the failure of the U.S. Fish and Wildlife Service to adequately define when an endangered species is sufficiently recovered has hindered recovery projects, including those with native fish in the Colorado River.

"We have been making huge progress on the Colorado River fish, particularly the squawfish (now the pikeminnow)," Walcher said.

"We have millions of squawfish swimming around in the Colorado. They have been delisted in Colorado but not delisted federally because (the fish and wildlife service) hasn't defined recovery."

He accused the fish and wildlife service with having "an abysmal" record when it comes to recovering endangered species, mainly because no one can say what is adequate for recovery.

"I have offered to write the (recovery) goals for them, but so far they haven't taken me up on my offer," Walcher said.

Walcher was effusive in his praise for the relationship between Trout Unlimited and the state of Colorado, saying he considers Trout Unlimited an "important partner" and "immensely helpful" on issues such as in-stream flow protection and water quality.

Trout Unlimited is a national coldwater conservation group boasting more than 700,000 members nationwide.

The national convention, marking the group's 40th anniversary, continues through Saturday.

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Executive Summary

The Metropolitan Water Supply Investigation (MWSI) was initiated by Governor Romer and the Colorado General Assembly in 1993 to explore cooperative solutions to future metropolitan Denver area water supply needs that would minimize the conflicts often associated with development of large scale water supply infrastructure such as transbasin diversion projects. The primary focus of the MWSI was the analysis of supply-side options involving the cooperative use, operation and/or linkage of existing water supply systems in a manner that would enhance water yields. By design, the MWSI did not explore new water development projects involving significant new infrastructure, nor did it examine the potential savings from additional water conservation programs.

The MWSI identified and evaluated cooperative water supply options in four primary categories:

- **conjunctive use**
- **effluent management**
- **interruptible supply arrangements**
- **other system integration opportunities**

The MWSI demonstrates that cooperative water supply options exist with respect to conjunctive use, effluent management, and other system integration opportunities to help meet a large part of the anticipated future needs in the major geographic sub-regions[1] of the metropolitan Denver area. For several reasons, interruptible supply arrangements between farmers and cities appear less promising at this point in time.

The cooperative options, as examined in this investigation, would not require construction of new transbasin diversion facilities, though additional transbasin diversions using existing facilities and water rights could be necessary to fully realize the potential of conjunctive use in the South metro sub-region and other system integration options available to the Northwest metro sub-region. Reusable return flows associated with increased transmountian diversions in turn help to expand cooperative options in the area of effluent management. Improvements to the existing water storage and distribution infrastructure serving the metropolitan area would be necessary, but such improvements would not entail major new on-stream reservoirs.

[1] For purposes of understanding how cooperative water supply options can function, the metro Denver area is best viewed as a collection of geographic sub-regions defined by their primary sources of supply. These sub-regions are referred to in this report as the Denver Central, the South metro, the City of Aurora, Northeast metro, and Northwest metro. Cooperative water supply options vary between sub-regions due to each region's unique water supplies and water development history.

Prepared for the Colorado Water Conservation Board, Colorado Department of Natural Resources by
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While each water supply category evaluated in the MWSI appears to present significant, technically feasible cooperative opportunities, each also raises several issues that present serious obstacles to implementation without considerable additional work.

The table below summarizes the MWSI's findings.

Cooperative Supply Category	Supply or Yield Potential	Actions Items/Unresolved Issues
Conjunctive Use	up to 60,000 acre-feet of surface water yield under example project analyzed	South Platte and Blue River stream depletions Water right constraints Feasibility of long-term, large scale recharge IGA's among participants Balancing groundwater depletions with increased use of surface waters
Effluent	up to 120,000 acre-feet of excess reusable return flows; specific project yields were not investigated	Relatively high costs Public acceptance of potable reuse Effects of exchanges on water quality Effects on instream flows
Interruptible Supply	up to 190,000 acre-feet of interruptible supply; specific project yields were not investigated	Would require major institutional changes Impacts to agricultural communities Geographic/cost considerations
Other System Integration Opportunities	up to 20,000 acre-feet of yield under example projects analyzed	Water right constraints IGA's among participants Federal action (Chatfield storage reallocation)

COOPERATIVE WATER SUPPLY OPPORTUNITIES

Conjunctive Use would involve the linkage of groundwater systems currently serving communities in parts of Douglas and Arapahoe counties with the Denver Water system. Water available from the Denver system in average and wet years could be used to meet demands and for recharge of Denver Basin aquifers. Groundwater sources would be used to meet demands not fully satisfied by surface water sources and during periods of drought. For the example project analyzed, conjunctive use arrangements could yield up to 60,000 acre-feet per year to meet new demands or reduce existing groundwater pumping from the Denver Basin aquifers.

Conjunctive use presents a promising solution to continued dependence upon non-renewable groundwater resources by the growing communities in the South metro sub-region. Conjunctive use also raises several unresolved questions. To the extent that a conjunctive use project would rely on additional transmountain diversions from existing facilities and water rights, this would raise objections from West Slope interests. However, the operational flexibility inherent in a conjunctive use project could allow for mitigation of some impacts while still generating significant yield. Other issues and uncertainties associated with conjunctive use include changes in water rights, the feasibility of large-scale recharge over the long term, and the challenges associated with securing required intergovernmental cooperation among potential conjunctive use participants.

Effluent Management involves cooperative and coordinated approaches for utilizing metro Denver area providers' reusable return flows. The metro Denver area currently generates reusable return flows in excess of its current reuse needs of approximately 80,000 acre-feet per year. These undeveloped reusable return flows are projected to increase to more than 120,000 acre-feet per year under providers' current plans as the metro Denver area grows.

Significant cooperative effluent management opportunities exist in all of the metro Denver area sub-regions. However, full use of reusable return flows would eventually require development of additional storage below the Metro wastewater plant and extensive implementation of potable reuse. Relatively high costs, public acceptance, intergovernmental coordination, and effects on water quality and instream flows also are issues of concern.

Interruptible Supply would involve cooperative arrangements with agricultural water users along the Front Range that would give cities the right to use agricultural water during times of drought in exchange for financial compensation to farmers. This report provides an overview of possible types of interruptible supply arrangements, estimates of gross supply potential, and discussion of perceived barriers to implementation. The total amount of dry year, high quality water supply potentially available for interruptible supply arrangements is approximately 190,000 acre-feet. This supply estimate does not reflect the potential competing needs of long-term (beyond 2020) future growth in the Northern Front Range. Example projects involving this source and specific project yields were not investigated.

During the course of analysis, awareness of major legal, institutional, political, geographical, and infrastructure barriers to using this supply in the metro Denver area emerged. These barriers exist for each of the cooperative water supply categories evaluated in the MWSI, but are especially pronounced and evident with respect to the Interruptible Supply category. Without additional work and dialogue between the metro Denver area and northern Front Range farmers and communities over the next three to five years, interruptible supply arrangements do not appear to be promising water supply options for the metro Denver area at this time.

Other Systems Integration Opportunities identified in the process of conducting the MWSI are the focus of ongoing studies involving the Northeast and Northwest sub-regions and Chatfield Reservoir. Other cooperative approaches identified but not investigated include possible development of joint storage for regulation of supply from the Windy Gap and Moffat systems, and creation of a market for water saved through conservation initiatives. These ideas will likely be the subjects of future investigations by interested parties.

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THE BROADER BENEFITS OF THE COLLABORATIVE MWSI PROCESS

The MWSI has been both a technical evaluation of cooperative water supply opportunities and a continuing process of dialogue, mutual education, joint inquiry, and collaboration among over 60 Front Range water providers and representatives of other key stakeholders including environmental organizations, agriculture and the West Slope. While this diverse group has focused principally on the opportunities and limitations associated with the four cooperative water supply categories, participants also developed and shared considerable information regarding the future water needs of the metro Denver area and individual water providers' plans that are in place for meeting those needs.

This information, summarized in the table and text below by sub-region, provides valuable context that enhances understanding of the roles and benefits of the cooperative water supply opportunities evaluated through the MWSI.

Sub-region	Projected Future Water Demand, AF	Basis of Projection	Reasonably Certain Future Supply, AF (1)	Future Unmet Needs, AF (2)	Applicable Cooperative Supply Opportunities (3)
Denver Central Sub-region	454,000 (4)	build-out	410,000	14,000 to 44,000 (5)	conjunctive use with South sub-region, effluent management with Northeast sub-region, system integration with Northwest sub-region and Aurora
South Metro Sub-region	127,000	build-out	127,000	0	conjunctive use with Denver, effluent management within Cherry and Plum Creek basins
City of Aurora	105,000 (6)	2030	75,000	30,000 (6)	effluent management with Northeast sub-region, coordinated reservoir operations with Denver
Northeast Metro Sub-region	125,000	build-out	61,000 to 100,000 (7)	25,000 to 64,000 (7)	system integration and effluent management among Denver, Aurora, Brighton, South Adams County WSD, Thornton and the Barr Lake companies
Northwest Metro Sub-region	100,000	build-out	90,000	10,000	system integration with Denver, effluent management within Clear Creek and Big Dry Creek basins
Total	911,000		763,000 to 802,000	79,000 to 148,000	

(1) Based on their planning efforts to date, water providers have a relatively high degree of confidence in these supplies.
(2) Providers have a relatively lower degree of confidence in their plans to meet these needs, based on uncertainty factors and the comparatively longer time frames before these supplies would be needed.
(3) Cooperative supply opportunities could be used to meet future unmet needs or as an alternative to reasonably certain future supplies.
(4) Includes Denver Water and Englewood; includes Denver Water's 30,000 AF safety factor.
(5) Based on the expected range of Denver Water's future safety factor.
(6) Includes Aurora's 10,000 AF planning reserve.
(7) Depending on the degree of implementation of Thornton's Northern Project.

The table illustrates that most Denver area water providers have planned for the future very well and currently have strategies in place to meet projected water needs to the year 2030 and in some cases considerably beyond that date. As described further below, the cooperative water supply opportunities evaluated in the MWSI could supplement or partially replace the plans individual water providers already have in place.

The Denver Central Sub-region is comprised of the Denver Water Combined Service Area, including the City and County of Denver, 75 fully dependent contract providers, and over 20 partial supply contracts; the City of Englewood; and other small providers in the Bear Creek basin. The main sources of supply available to the this sub-region consist of native South Platte River water, transmountain diversions from the Blue, Fraser and Williams Fork Basins and water reuse. Non-tributary groundwater is available but not used to any significant degree. Water conservation measures also are in place and serve to reduce demand.

Denver's Near Term resource strategy, as developed in its Integrated Resource Planning process, is projected to yield 401,000 acre-feet compared to a raw water demand at build-out of 445,000 acre-feet, including a 30,000 acre-foot safety factor. Assuming that Denver is successful in implementing its Near Term strategies, Denver has a remaining need of 14,000 acre-feet to 44,000 acre-feet, depending on its safety factor. Denver anticipates meeting this remaining need through additional water conservation, potable reuse and development of additional supplies through the use of its water rights, which could be achieved by Denver alone or through cooperative actions with others. Denver has sufficient potential yield from its own water rights to meet its build-out needs and obligations. Denver has not yet chosen a specific long-term water supply strategy, and remains interested in additional water conservation, effluent management, conjunctive use, and additional surface storage to meet its long-term needs.

The City of Englewood, included in this sub-region, does not anticipate significant growth in its water demands and has sufficient existing water supplies to meet its ultimate future water needs, projected to be about 8,500 acre-feet per year.

The South Metro Sub-region includes the water provider members of the Douglas County Water Resource Authority[2] and other small providers in Douglas and Arapahoe Counties. Throughout this sub-region, Denver Basin groundwater is the primary source of supply.

The build-out water demands for this sub-region are projected to total about 127,000 acre-feet per year (exclusive of those providers supplied by Denver and Aurora). Water providers in this sub-region have sufficient decreed groundwater rights, surface supplies, reuse/augmentation plans and contract deliveries to meet their projected build-out needs. There is no significant unmet need projected for this sub-region, assuming that Denver Basin groundwater will continue to be used as a major water supply source.

However, the sub-region is actively working to increase the renewable portion of its water supplies by employing effluent management approaches that would maximize the reuse of its groundwater return flows, and by acquiring additional surface supplies. The

[2] The water provider members of the Douglas County Water Resource Authority include Arapahoe County Water & Wastewater Authority, Centennial Water & Sanitation District, Parker Water & Sanitation District, East Cherry Creek Valley Water & Sanitation District, Town of Castle Rock, Roxborough Park Water & Sanitation District, Stonegate Village Metro District, Inverness Water & Sanitation District, Meridian Metro District, Castle Pines Metro District, Castle Pines North Metro District, Cottonwood Water & Sanitation District, North Douglas County Water & Sanitation District, Pinery Water & Sanitation District, Donala Water District and Willows Water District

region is particularly interested in expanding the roles of reuse and conjunctive use of surface and groundwater as ways to reduce its future use of Denver Basin groundwater.

The City of Aurora currently meets its water needs through a combination of changed irrigation rights, transmountain diversions, alluvial and nontributary wells, water reuse and water conservation.

Aurora has not yet projected an ultimate or build-out demand for its service area. Instead, Aurora anticipates future population growth to average 50,000 people per decade with an associated increase in water demands of 10,000 acre-feet per decade. Aurora therefore projects a total water demand of 95,000 acre-feet by the year 2030. Aurora has plans in place to meet its projected year 2010 demands with acquired Arkansas basin agricultural rights, additional effluent reuse, rehabilitation of its Cherry Creek alluvial wells, and other minor projects.

Aurora's plans for meeting its needs beyond the year 2010 include the Eagle River Conjunctive Use Project (in cooperation with the City of Colorado Springs), the South Park Conjunctive Use Project, and additional water reuse. Aurora is participating in cooperative planning activities of effluent management in the Northeast Metro sub-region described below. Aurora is also working with Denver Water to explore cooperative opportunities involving those entities' existing South Platte reservoirs.

The Northeast Metro Sub-region includes Thornton, South Adams County Water & Sanitation District and Brighton. Also included in this sub-region are the irrigation companies associated with the Burlington Ditch/Barr Lake system (the Barr Lake Companies). The water supply sources currently available to municipal providers in this sub-region include municipal and changed irrigation rights on the South Platte and Clear Creek, alluvial and nontributary wells, and exchange rights.

The long-term municipal water demands for this sub-region are projected to be about 125,000 acre-feet per year. Most of this demand is associated with the build-out demands of the City of Thornton. Providers in this sub-region have plans in place to meet between 60,000 to 100,000 acre-feet of this need. This range is due to uncertainties about the ultimate degree of implementation and associated yield of Thornton's Northern Project.

Current planning efforts are focused on meeting 20,000 to 40,000 acre-feet of the remaining needs for this area, which are primarily associated with anticipated growth in Brighton and the South Adams County Water and Sanitation District. Denver and Aurora are also involved in these planning efforts because of their interest in water reuse opportunities and because portions of their service areas are located in this sub-region. Current planning efforts are focused on development of storage facilities, maximizing exchanges and finding uses for Aurora's and Denver Water's presently undeveloped supplies of reusable effluent. Providers are particularly interested in addressing water quality problems associated with municipal diversions located downstream of most of the urbanized metro Denver area. Options under consideration include development of additional gravel pit storage capacity and use of storage capacity in Barr Lake and the Beebe Draw under cooperative arrangements with the Barr Lake Companies.

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The Northwest Metro Sub-region includes Arvada, Broomfield, the Consolidated Mutual Water Company, Golden, Northglenn, Westminster and other small providers in the Clear Creek basin. The water supply sources currently available to this sub-region consist primarily of Clear Creek municipal rights and changed irrigation rights and partial service contracts with Denver Water, which are mostly satisfied via deliveries from the Moffat Tunnel Collection System.

The long-term water demands for this sub-region are projected to be about 100,000 acre-feet per year. Most of the sub-region's projected increase in water demand is associated with anticipated growth in Arvada and Broomfield. Providers in this sub-region have plans in place to meet about 90,000 acre-feet of this need. Cooperative planning efforts for meeting the remaining 10,000 acre-feet of need in this sub-region are focused upon coordinated use and sharing of existing or new storage and conveyance facilities and expanded reuse.

Within each of these sub-regions, cooperative water supply approaches could play an important role in meeting future water supply needs in a manner that could potentially reduce the costs and environmental permitting risks associated with other options.

RECOMMENDATIONS

1. It is recommended that a continuing state-sponsored cooperative supply planning forum be established.

The MWSI has improved communication, mutual understanding and cooperation between metro Denver area water providers, West Slope interests and environmental interests. Is has resulted in several ongoing collaborative studies which are designed to increase water supplies in mutually acceptable ways. It has also had a major effect upon other ongoing planning efforts addressing issues of critical importance to the metro Denver area's water supplies. These include:

- Quadrant investigations of various cooperative water supply opportunities
- The Platte River Cooperative Agreement and EIS process
- The Upper Colorado River Basin Study
- The Colorado River Endangered Fish Species Water Availability Study
- The Chatfield Reservoir Reallocation Feasibility Study
- The USFS's South Platte Wild & Scenic Study and associated negotiations.
- The Northern Regional Water Coalition's investigation of long-term future M&I water needs of the Northern Front Range

These studies and planning efforts are proceeding independently, but are highly interrelated and deal with complex issues that affect numerous parties. It is therefore recommended that a continuing state-sponsored forum be established to serve the following functions:

- Coordination and integration among interested parties regarding these interrelated studies and planning efforts.

- Provide an opportunity for parity to be maintained between large and small providers and other interest groups; facilitate open discussion and resolution of issues and concerns, thereby reducing the potential for litigation

- A forum for addressing State policy issues and access to state agency technical expertise

- An opportunity for regular and periodic updating of the MWSI database

This may be best accomplished by regular periodic meetings convened by an appropriate state agency such as the Colorado Water Conservation Board.

2. It is recommended that the MWSI database be periodically updated through a state-coordinated effort as part of the continuing state-sponsored forum.

The MWSI has resulted in development of a relatively comprehensive and detailed database base on metro Denver water supply providers and their water supply systems. This database has improved the understanding of the overall operation and interplay between metro area water supply systems and the status of individual providers' planning efforts. For example, information from this database was used to formulate Colorado's Plan for Future Depletions pursuant to the Platte River Cooperative Agreement. This database should be maintained and periodically updated so that it continues to be useful for cooperative municipal water supply planning and assessment of regional and basin-wide issues. Ultimately this database should be incorporated into the South Platte Decision Support System.