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Water worries: Planning for an unpredictable future

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ASPEN — Global warming will make Aspen and the Roaring Fork Valley hotter, right? That's the easy one.

Runoff might well come earlier, summer will last much longer, and homegrown tomatoes will be more of a reliable proposition.

Now, how about precipitation? More or less?

That's a far trickier question, and climatologists studying the Colorado River Basin have long struggled to agree, because computerized climate simulations remain coarse — too coarse to show mountains as much more than bumps. And the scale was so large that Independence Pass and wheat fields in Kansas could be in the same geographic grouping.

But a new $1 million study recently released by Colorado water officials suggests wetter — if still substantially shorter — winters during coming decades in the Aspen area as well as much of northern Colorado. The state's southern mountains, however, may turn drier.

Everywhere, though, summers will be much, much longer — and therefore hotter and drier. That may mean that the existing water infrastructure, such as reservoirs, may be inadequate in coming decades to keep both hay fields and front lawns verdant through late summer.

You might not want to bet the house on any of these projections, but local and state water officials have been chewing them over in recent weeks since release of the draft version of the Colorado River Water Availability Study (http://cwcb.state.co.us/). Authorized by the Colorado Legislature two years ago, the study is described by water officials as cutting edge in the American Southwest.

“This breaks new ground,” says Eric Kuhn, general manager of the Colorado River Water Conservation District, a Glenwood Springs-based agency responsible for water affairs across much of the Western Slope. “Will it happen that way? We don't know. But from a planning perspective, there is good information from these models.”

“I don't know of any other state that is putting the time, resources and money into this,” said Jennifer Gimbel, executive director of the Colorado Water Conservation Board, a state agency charged with overseeing protection and development of Colorado's waters.

A cloudy crystal ball

About three-quarters of the state's water originates west of the Continental Divide, in the headwaters of the Colorado River and its tributaries, much of it in the form of snow. Through transmountain diversions, virtually all of Colorado's five million residents depend to some extent upon water from the Colorado and its tributaries.

The image of Colorado's water resources in the future remains a blurry one. Laurna Kaatz, a climate scientist with the Denver Water Department, said decisions involving multimillion-dollar water infrastructure should not be made based on the results so far.

“To say you're going to plan for a single future based on one of the climate models with one emissions scenarios is, I don't think, a responsible way of using the information,” she says.

But more than anything else, the study suggests that management of water resources will become more difficult.

That's the view of Mark Fuller, the executive director of the Ruedi Water and Power Authority. Needs of endangered species and population growth have already made management more complicated. “Our margins for error for who we manage water are getting thinner and thinner,” he says.

He points out that existing infrastructure, institutions and policies were designed for water on a crude scale. The uncertainties of the future suggest a need for more subtlety, he says.

All water officials and scientists agree this and other studies estimating the possible effects of global climate change on the American West are hardly the last word.

“We will have to recognize that 20 years from now we will know a lot more than we know now,” said Kuhn.

Calculating the odds

In plotting the possible futures for 2040 to 2070, the climate scientists, hydrologists and water engineers contracted to conduct the study examined 112 existing computer simulations of climate change. Conducted by various universities and agencies in recent years, the simulations varied for many reasons, including uncertainty about the volume of future greenhouse gas emissions.

Because of the complex atmospheric conditions that create what we call weather — and, over time, climate — the models have been unable to simulate the mountainous topography of the Colorado River's headwaters. That topography, in turn, greatly influences precipitation. Despite its relatively proximity to Crested Butte and Beaver Creek, for example, Aspen can have very different snow levels. The differences with Telluride, for example, can be dramatic.

Investigators in this study believe that “downscaling” techniques allowed them to get a better bead on precipitation. The news for northern Colorado suggests plenty of snow will remain — if also drenched more often with rain.

“It doesn't seem to indicate there's a doomsday scenario for the ski industry or the fisheries of the upper Colorado River,” says Kuhn.

Kuhn describes the study like a casino slot machine. While there is no certainty with any one pull, the odds favor the house. Similarly, the downscaling compilation of the computer simulations shows the likelihood of a distinctly drier Colorado River Basin.

The dryness is the result of increased temperatures everywhere, although proportionately greater in lower elevations and in the more southerly areas. Crops such as corn and alfalfa will need more water.

Effects suggested by the modeling vary by location. For example, temperatures by 2040 at the farming town of Delta, located about 100 miles west of Aspen, may rise 3.3 to 3.7 degrees Fahrenheit. Growing season will last 15 to 22 days longer. And crops will need 2.6 to 6.7 inches more of water per year. Ridgway Reservoir, which impounds snowmelt from the San Juan Mountains for use by farms, may start showing shorelines in June instead of July or August.

But even reservoirs located on drainages with increased winter precipitation may struggle to meet water demands.

In effect, global warming will speed up the calendar by two or three weeks — and perhaps leave too little water for some farmers during late-season irrigation.

“When I saw these graphs, there was one word that came to my mind, and that was storage,” said Eric Wilkinson, who directs the Northern Colorado Water Conservancy District, at a public unveiling of the draft report in January.

Wilkinson's agency diverts water from the Colorado River near Rocky Mountain National Park to cities along Colorado's northern Front Range and to farms all the way to the Nebraska border. In other words, he sees the need for additional dams in discrete locations for use in years when more precipitation falls.

Gimbel similarly sees evidence for greater management. “Without some new storage projects in particular places, we won't be able to use that water most efficiently,” she says. “It's is definitely showing us it's a time of limits, but we need to work more diligently on managing that water, so we can meet the needs within those limits.”

That's also the view from Glenn Porzak, who represents various water districts and ski companies in Summit and Eagle counties. “Storage is still the name of the game, and this will only accentuate the need for storage,” he says.

But existing storage reservoirs could become less adequate as growing demand pushes the limits on an unpredictable water supply. As hydrological regimes change over the next 30 or 40 years, says the River District's Kuhn, reservoirs built 40 years ago might be insufficient.

The Aspen picture

Aspen and the Roaring Fork Valley could be vulnerable to these changes in several ways. Part of its appeal to locals and visitors lies in the cosseted valley floor, verdant through August. But as in the fields at Delta, increasing heat will drive up the water needs of plants. Supplies may not last through the extended summer heat.

“My concern is that it will create a real crunch beginning in mid-August and continuing until mid-October,” says Kuhn.

The Aspen area has little in the way of reservoir storage, holding back spring flows for use later in summer and fall. The only large reservoir is actually on the adjacent Fryingpan River, behind Ruedi Dam, which was first filled in 1968. But in 1986, Aspen and Pitkin County financed installation of hydroelectric generating capacity at Ruedi, and that plant now provides roughly two-fifths of Aspen's power needs.

If Ruedi gets drawn down more readily during longer, hotter summers, that could impair electricity production. Ruedi Water and Power Authority's Fuller explains that the sooner the reservoir is filled and the longer it stays filled, the turbines operate most efficiently.

Aspen and the Roaring Fork Valley could be impacted by this changed hydrological regime in yet a third significant way. Farming districts and cities located on Colorado's Eastern Slope still hold substantial but undeveloped rights to water in both the Roaring Fork and Fryingpan valleys, in addition to the several major diversions that already exist.

If global warming crimps the supplies of those farms and cities, Kuhn says, that could fuel efforts to increase diversions from the Roaring Fork Valley.

The study also attempts to get a firmer thumb on how much water Colorado can develop under compacts that apportion water among the seven states in the Colorado River Basin. Lower-basin states — California, Nevada, and Arizona — long ago developed their shares.

But Colorado long believed it still has rights to retain additional water for cities, farms and other uses. Just how much has been disputed. Kuhn, for example, estimates a maximum of 150,000 acre-feet, but more liberal estimates run up to 1.4 million acre-feet. This study reports a range of zero to one million acre-feet.

Pitkin County Commissioner Rachel Richards drives home that same point. “The wide range of water availability cited in this study, somewhere between not another drop left to an additional million acre-feet, should concern all

headwater communities who are targets for future or increased transmountain diversions," she says.

Richards credits the state for undertaking the study, but adds that it seems incomplete.

"For me, it raises more questions than it answers."

More studies coming

Some of those questions might be answered in a second investigation planned by Colorado state officials. The Colorado Water Conservation Board's Gimbel characterizes it as a "what-if type" study. It will attempt to get a better handle on Colorado's water situation if those who own conditional rights — such as oil companies looking to develop oil shale in Western Colorado — actually begin using that water.

One major what-if is whether Aaron Million, the Fort Collins-based entrepreneur, is successful in getting rights to develop major quantities of water from the Green River, a tributary to the Colorado, at or near the Flaming Gorge Reservoir on the Utah-Wyoming border. The question is what that would mean for water availability in other parts of Colorado, including the Western Slope.

That second study was originally slated to begin immediately, but may be delayed because of the state's declining revenues.

Parallel to and somewhat overlapping the Colorado River Water Availability Study is one commissioned by the Front Range Water Users Alliance. This second study takes a more narrow look at the headwaters on both sides of the Continental Divide, including rivers located near the ski towns of Winter Park, Breckenridge, Vail, and Aspen, which are all tapped by Front Range cities.

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