

Colorado has grown rapidly over recent decades, as more and more people crowd into our borders. Our water, unfortunately, is a limited resource. **And we're almost out.**

Dry Times

by PATRICK DOYLE *and* NATASHA GARDNER

Illustrations by The Department for Information Design at Copenhagen



GO INTO THE KITCHEN. Turn on your faucet. Nice, right? Last winter, those drops of water most likely fell as snowflakes, somewhere high in the Rocky Mountains. Maybe up by Winter Park; maybe up above Dillon; maybe in the foothills. The snow melted, found a river, was piped into the city by Denver Water, and right now you can turn a knob and fill a glass with pristine snowmelt.

There's just one problem, and it's a big one: Colorado's water is running out. Fast.

Just 20 years from now, we'll have packed another 2 million people into the state, on top of Colorado's current 5 million residents. That's 2 million water guzzlers taking showers, washing clothes, watering gardens, hosing down lawns, and sucking down water after their workouts.

Those 2 million people will run our streams and wells dry: Experts say we'll be short 630,000 acre-feet* of water annually. That's about the same

amount of H₂O that Denver and the suburbs currently gulp down every year. Read that again: We need to find enough water for Denver and the 'burbs, over again, in the next 20 years. And it's only going to get worse: By 2050, our state's population will likely double to 10 million thirsty souls.

Take a look at the two maps below. On the left is a map showing where our precipitation falls. You'll notice that about 80 percent drops to the west of that yellow line—the Continental Divide. Now, take a look at the population map on the right. You'll notice that the vast majority—in fact, 80 percent—of state's residents live along the Front Range, just east of the Continental Divide.

Therein lies Colorado's greatest challenge: Our water is separated from our population by a series of mountain ranges—mountains that divide North America in two. Getting the water from west to east isn't easy: We essentially have to push the water

uphill, which takes a lot of time, energy, and money.

And that's only part of the predicament. Because of interstate compacts, we owe water to downstream states like California and Nevada. Meanwhile, our aging infrastructure is breaking down, causing water main breaks and leakage, while contaminated drinking water impacted more than 150,000 Coloradans in 2008. There's also the not-insignificant problem of climate change, which is wildly unpredictable. We're not sure if we need to prepare for future floods or droughts—or, possibly, both.

Right now, we have enough water for everyone—for the cities, farmers, ski resorts, fishermen, rafters, manufacturers, and energy producers. If we want enough water for the future, we're going to have to change course. We not only have to find new sources of water, but we also have to use the water we do have in smarter ways. Here, a guide to Colorado water in the 21st century.

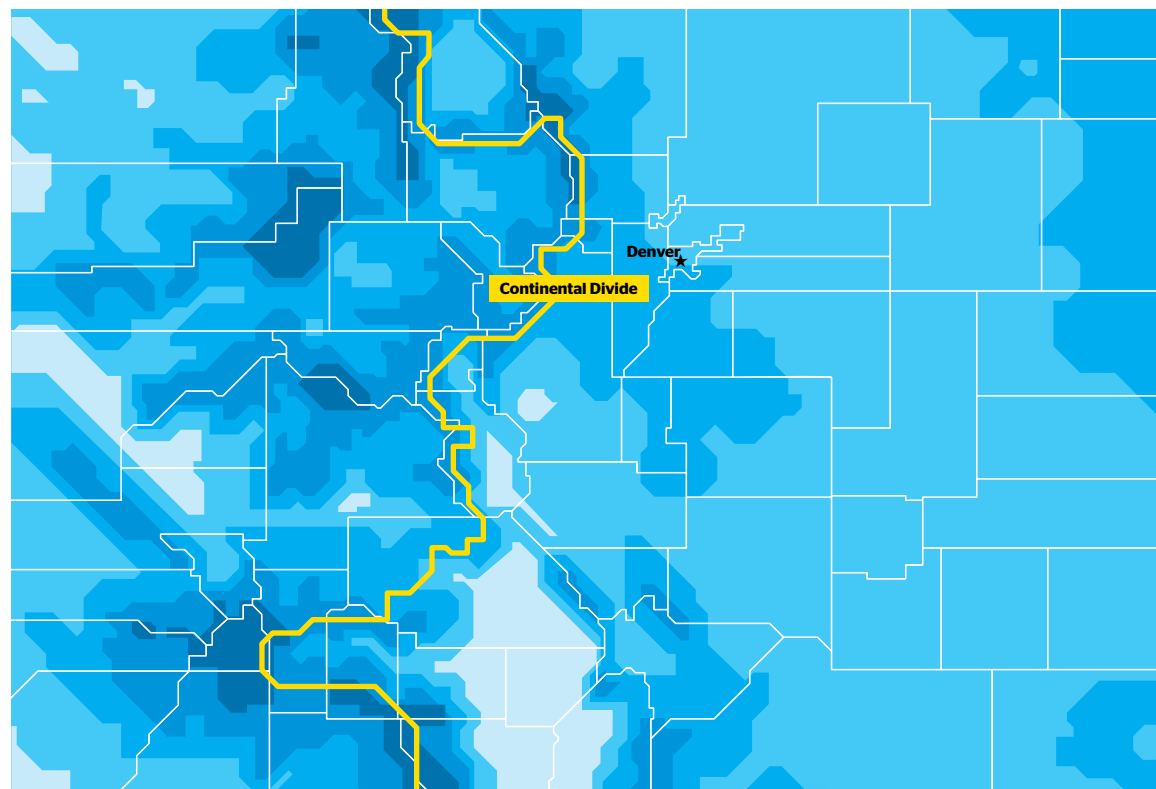
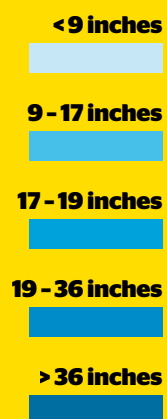


Acre-foot

A measurement of water equal to 325,851 gallons. Imagine a one-acre lake that is one foot deep. One acre-foot of water provides enough H₂O for two to three Colorado families each year.

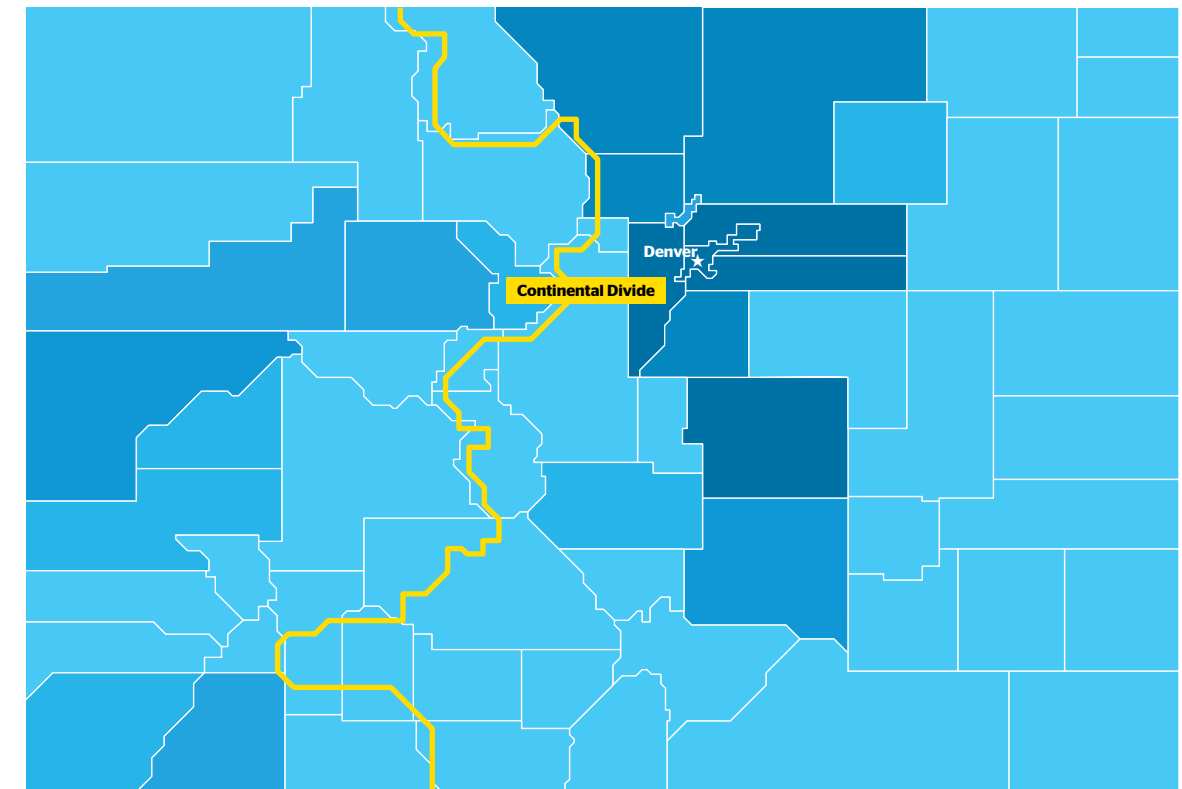
Where the Rain Falls...

Rainfall in Colorado from 1971 to 2000



Percentage of precipitation found on either side of the Continental Divide.

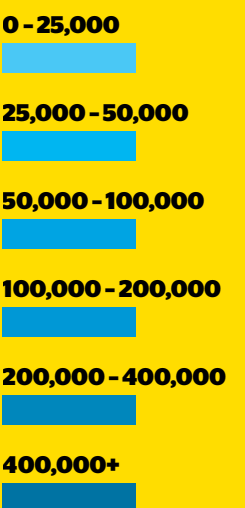
Data source: PRISM Climate Group, Oregon State University



Percentage of population found on either side of the Continental Divide.

...And Where Everyone Lives

2008 population by county



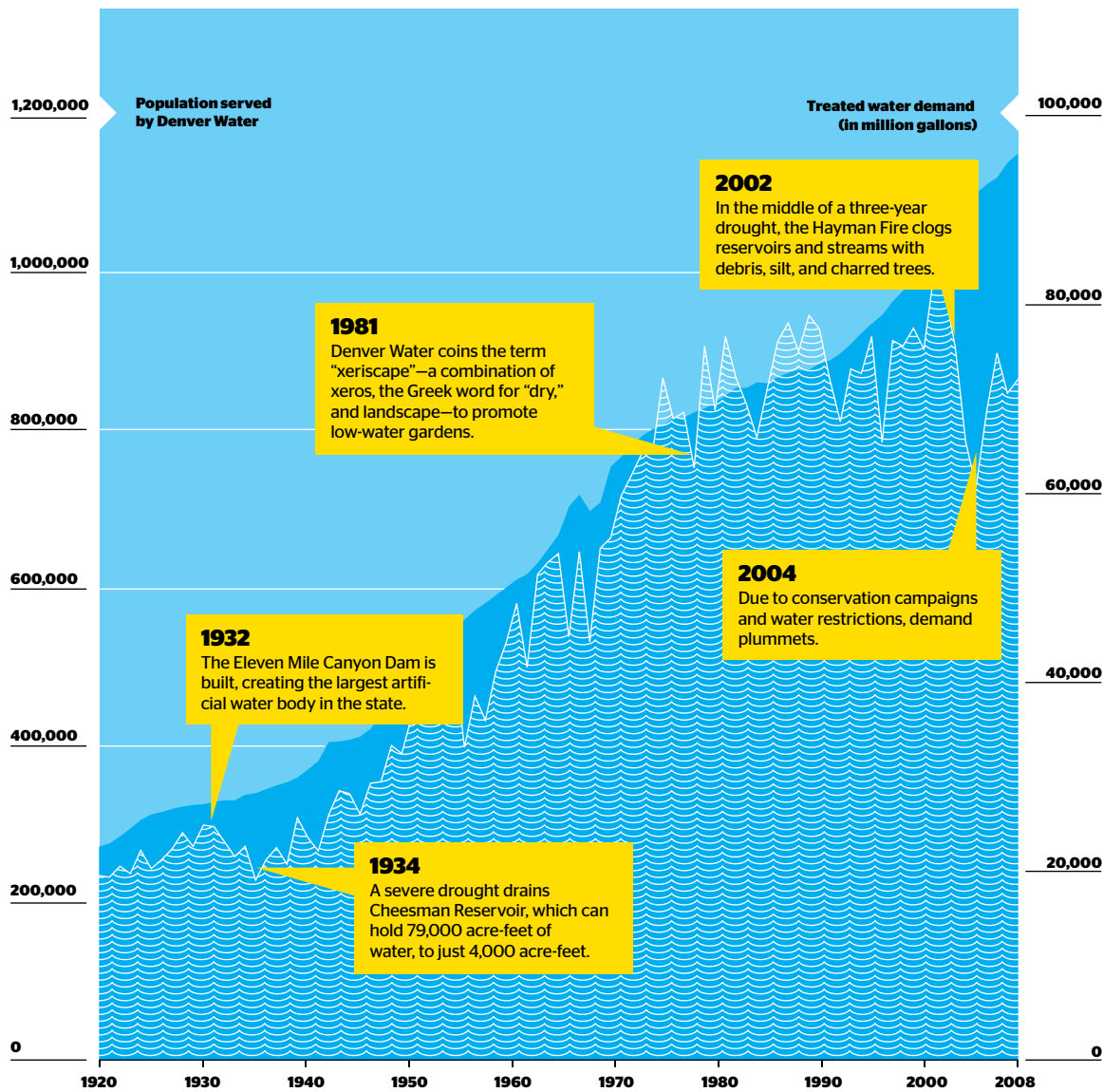
Source: Colorado State Demography Office

While Denver's population has grown more than 35 percent in the past two decades, precipitation has remained virtually the same: State-wide, arid Colorado gets an average of 17 inches each year. As our population skyrockets, so too does our thirst, forcing Denver Water—the state's largest water utility—to find new ways to meet spiking demand.

Population served by Denver Water (left axis)

Treated water demand (right axis)

Boom Town



Source: Denver Water



TRICKLE DOWN How water gets to your home tap

Most of the metro area's water comes from the Blue and South Platte rivers, which surge during the spring. The water is stored in a series of reservoirs, until Denver Water transports it to a treatment center where plant operators use negative and positive charges, like magnets, to create Nerds candy-size particles of sediment and other contaminants that are heavy enough to sink to the bottom of large tanks. The water is then sent through a giant Brita-like filter, before fluoride and disinfectants are added to clean and supplement the water. Throughout the process, plant operators are constantly testing the water's pH levels (acidity and basicity) to make sure the water delivered to your tap is clean.

TIM GRAHAM/GETTY IMAGES

COURTESY OF DENVER WATER

THE CLIMATE IS A CHANGIN'

Our drier, dustier, flash-flooding future beckons

A

AS IF POPULATION GROWTH weren't a big enough problem—albeit, a predictable one—Colorado also faces a wildcard: climate change. Taking global climate models and pinpointing their effects on a regional level is difficult, but the models agree that climate change will wreak havoc with Colorado's delicate water cycle. "The best thinking right now is that the wet areas get wetter and the dry areas get drier," says Brad Udall, the director of Western Water Assessment, a joint program between the

Cooperative Institute for Research in Environmental Sciences at the University of Colorado and the National Oceanic and Atmospheric Administration. "And that's a problem."

Colorado is mostly dry: Our semiarid climate averages a parched 17 inches of precipitation a year. As temperatures rise—and recent studies show that Colorado's average temperature could increase by 4 to 5 degrees Fahrenheit or more by 2050—snow will melt earlier in the spring. Our spring runoff could move up by several weeks, threatening to overwhelm our rivers and reservoirs. Even if the mountains do receive more snow and rain—which is possible—we'll have a difficult time capturing it without increasing our storage (see "Colorado's dam problem" on page 90).

The earlier snowmelt also means we'll have longer, hotter summers, causing more of our precious H₂O to evaporate from reservoirs—at the same time farmers need more water to keep their crops growing. And,

frighteningly, the temperature increase also has repercussions on the amount of water we'll have in our rivers: a 4 degree Fahrenheit temperature jump results in a 10 percent reduction in runoff amount as the thirsty air and ground soak up more water than usual. A one-percent decrease in runoff on any river can be problematic—10 percent would be catastrophic, with junior water right users, including municipalities, going dry.

Battling climate change on a state level is difficult, if not unrealistic—national and international leaders need to make some difficult decisions but seem unwilling or unable to do so—which leaves us to respond to the crisis as individuals and communities. "Being able to reuse the supply is a good idea," says Eric Kuhn, the general manager of the Colorado River Water Conservation District, a Western Slope water group. "Conservation and reuse are going to be necessary, and we'll see some ag-urban transfers. But there really are no good solutions."

10%
reduction
in runoff
from a 4°F
temperature
rise

FIRST COME, FIRST SERVED An explanation of Colorado's water rights

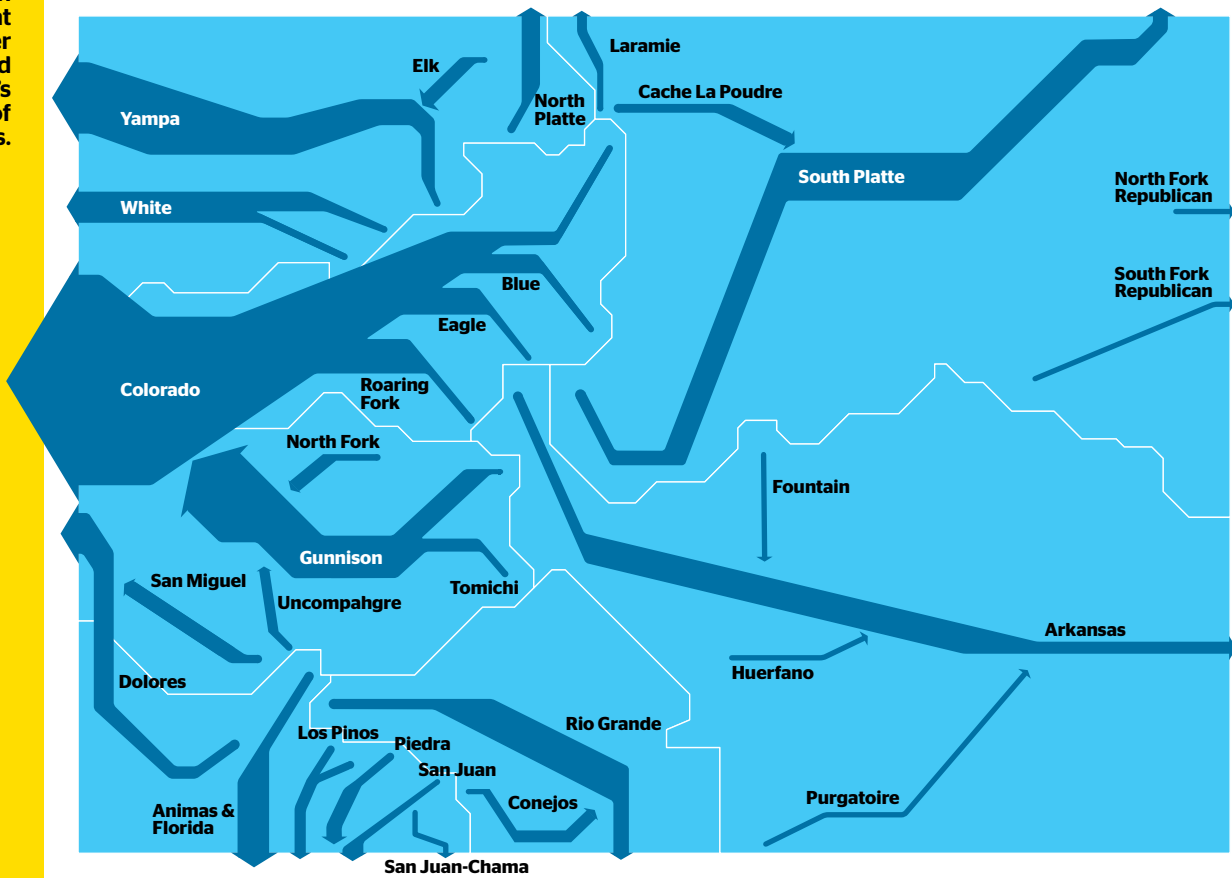
When miners and settlers began pouring into Colorado in the late 1800s, they divvied up water rights in a simple manner based on a "first in time, first in right" method, called "prior appropriation." Think of it this way: In Colorado, water rights are treated like a family-style bowl of spaghetti where Grandpa gets first dibs, followed by Mom, and so on, in age order. The kids' table gets the dregs. In good years, when there's ample precipitation, the bowl is heaping full with portions for everyone. During droughts, though, the youngest may go hungry. And that means that entities with newer water rights, like cities, have to get in line behind those with more senior rights, like mines. "With prior appropriation, your ability has nothing to do with a social goal," explains Hamlet "Chips" Barry III, Denver Water's manager. "A brothel with an 1880 water right gets water before a hospital with a 1980 water right."



A 1936 Denver Water campaign.

Come spring, the 39,479 miles of streams in Colorado are flush with snowmelt that supplies water to 19 states and Mexico. Here's where some of it flows.

Going, Going, Gone



Source: Office of the State Engineer, Colorado Division of Water Resources

8,867,450 acre-feet flowing west

1,373,000 acre-feet flowing east



Sounding Off

"Why do people renegotiate anything? It's either because they think they have the power to renegotiate or they have something to gain. [Colorado] didn't get a bad deal, in my view. I'm sure that Las Vegas would be happy to renegotiate the contract and get more water." —*Chips Barry, manager, Denver Water*

THE IMPOSSIBLE DREAM

Crafting the Colorado River Compact

One of the mightiest rivers in the West starts as a trickle—it's so tiny that you can almost straddle it—high in Rocky Mountain National Park. Drawn by gravity, this minuscule stream of melting snow tucks and tumbles as it travels more than 1,400 miles to the Pacific Ocean. But as the West's population grew, and grew some more, and then exploded in the early 20th century, the states that relied on this almighty water source began to get a little nervous—and fight. Desperate to claim more water, the states in the Colorado River Basin sent representatives in 1922 to negotiate a compact.

Colorado's representative was Greeley attorney Delph Carpenter, nicknamed the Silver Fox of the Rockies, who not only negotiated the compact, but also helped write it. The plan was simple: Divide the river in two. Half of the flow would go to the upper-basin states (Colorado, New Mexico, Wyoming, and Utah), while the other half would be split among the lower-basin states (Nevada, Arizona, and California). To ensure that the lower basin would always receive water—even in

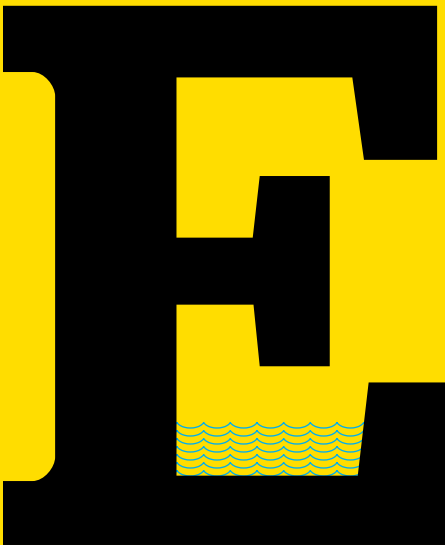
dry years—the states agreed in 1922 to guarantee that, on average, 7.5 million acre-feet would reach the lower basin each year.

It would have been a dandy arrangement if their water data weren't flawed. The delegates assumed that the mean river flow was as much as 18 million acre-feet a year. However, at the time, the area was enjoying one of the two wettest periods in the past 400 years, and the historical flow of the river is closer to 14.9 million acre-feet. Complicating the error, the compact's language was too precise, stipulating amounts rather than percentages, meaning that no matter how low the river flowed, the upper basin was required to ship an average of 7.5 million acre-feet of water downstream each year.

It took years for experts to realize the error, but the West's population kept growing and growing. When a drought worsened in 2002, the West began pulling water out of its main reservoirs, Lake Powell and Lake Mead, until the levels dropped so low that, by 2005, the reservoirs that took years to fill were drained by 50 to 60 percent.

WATER TALKS: FRONT RANGE VS. WESTERN SLOPE

Does Colorado need a water czar?



EVEN WITHOUT THE IMPACT OF CLIMATE CHANGE, Colorado is running out of water. Our river basins are almost fully allocated (read: divvied up among users)—and some are

over-allocated. And that's all of the water we have left.

So, we're almost out. We can reallocate our water from farms to cities, or from industry to energy, but right now it's a free market. Tomorrow, every single farmer could decide to sell his water to Front Range cities, or snowmaking ski resorts, or energy companies interested in oil shale. There's no single entity in charge of overarching decisions on what's best for Colorado.

Thankfully, groups who've long competed over water are starting to work together. Relations between the east and the west have thawed in recent years, as Front Range providers have begun to work with, rather than against, the mountain communities from which we get our water. And the Interbasin Compact Committee, a group of 27 high-powered water folks from around the state that formed in 2005, is bring-

ing together people that formerly sniped at one another. But at the end of the day, the IBCC is a think tank—it has no authority over the state or water.

Water power players in Colorado tiptoe around the topic of a water czar, but hint that the state, at the very least, needs to take a more authoritative role in mediating between groups—and maybe even planning for the future. "The role of the state is leadership," says Jennifer Gimbel, director of the Colorado Water Conservation Board, "and to force people to sit down and talk about how we can move forward and solve these problems."

Even so, it might be necessary for the next governor to appoint a water czar—or give the IBCC authority to make decisions for Colorado's future. As Peter Binney, the former director of Aurora Water, says: "We are all in this together. We are all Coloradans."

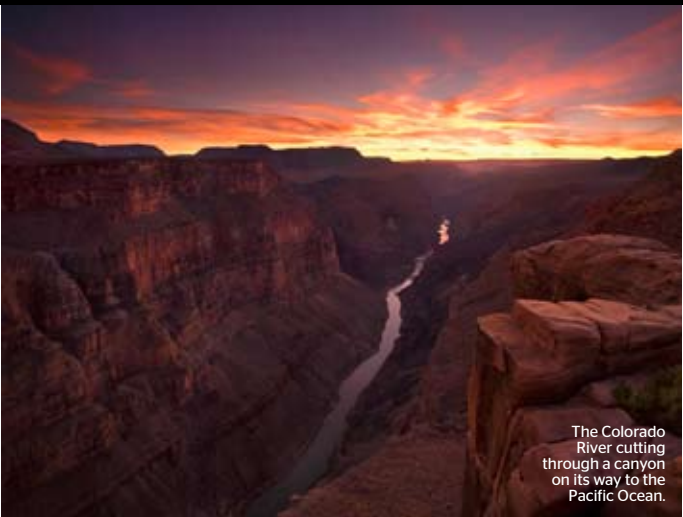
1,400 miles of Colorado River flow

A NEW DAY

Should we renegotiate the compact?

In 2008, when Arizona Senator John McCain—eyeing the White House—suggested revising the Colorado River Compact, then-Colorado Senator Ken Salazar bit back, saying: "Over my dead body." But with Arizona, Colorado, New Mexico, Utah, and Nevada expected to add an estimated nine million more people in the next 20 years, is it time to rethink the compact?

Colorado has a lot to lose if any changes are made. Currently, the state receives about 3.88 million acre-feet annually, making it the second-biggest recipient behind California, which receives 4.4 million acre-feet even though it has seven and a half times the population. Any renegotiation is guaranteed to be drawn out and probably would end up in the U.S. Supreme Court, which doesn't solve immediate water-shortage issues. Water experts agree: For now, the compact should stand.



The Colorado River cutting through a canyon on its way to the Pacific Ocean.

The Other Compact Dating back to the 1940s, the Arkansas River Compact—between Colorado and Kansas—has caused its own share of hullabaloo. Kansas sued Colorado in 1985, claiming that irrigation wells, among other things, were stealing flow intended to cross the state border. A legal battle ensued, lasting years and going all the way to the U.S. Supreme Court, which sided with Kansas in 1995.



Sounding Off

"I think the compact is flawed, but it can remain a solid base for moving forward. If you remove that foundation, no one knows where they stand." —*Jennifer Pitt, senior resource analyst, Environmental Defense Fund*

AGRI-WARS

Buying (and drying) the farm

COLORADO COULD SOLVE ITS WATER CRISIS tomorrow with a simple measure: Municipalities and industrial users could buy up all the water rights from farmers. Ag-urban transfers*, as they're known, have been popular for decades: It's a helluva lot cheaper to buy water from the farmer down the road than dropping millions (or billions) to divert it from the Western Slope with a massive pipeline. Considering that more than 80 percent of the state's water goes to agriculture, there's plenty of water available for buying.

If we buy out agricultural water, though, most of those farms will dry up, and we'll have Dust Bowl-like conditions on farms that have been around since the settling of Colorado. Besides destroying a historical part of the state's economy, this also means that we'd have to ship most of our food from out of state, disemboweling the "eat local" movement and food security.

"Buying and drying" of some land is inevitable—more than a couple of farmers view the future sale of their water rights as their 401(k)s—but nearly everyone in the water business would like to avoid the destruction of farming. "Are there incentives we can give people to keep farming and stay in the industry?" asks Jennifer Gimbel, the director of the Colorado Water Conservation Board. "Or at least preserve their most productive land?"

While conservation techniques such as drip irrigation*, the growing of less water-intensive crops, and rotational fallowing hold promise, some municipalities are working with farmers to buy water only

80%
of our
water is
used by
farming

during relatively dry years, which would allow them to maintain crops during wetter periods of time. Large-scale projects also hold potential to bolster agriculture: The Northern Colorado Water Conservancy District is pushing forward the Northern Integrated Supply Project (NISP), which will help provide those cities and towns with 40,000 acre-feet of water while saving 69,000 acres of farmland. Environmental groups are worried about the effect on the Cache la Poudre River—which would be partly diverted into new reservoirs during wet years—but agriculture groups have signed on with the cities.

"NISP is a project that embodies what agriculture is looking for—a way to continue to exist with urban development," says Jim Miller, the deputy commissioner of Colorado's Department of Agriculture. "The best part is that it doesn't siphon water from the Western Slope; it's simply developing water from eastern supplies."

Still, count on more farms to disappear, while others transition from water-intensive crops like alfalfa (cultivated for cattle feed) and corn (grown for cattle feed and ethanol) to crops that require less water. "The agricultural industry that we have now is not the same one that we had 75 years ago," says Miller, pointing out that Colorado was once home to more hogs, corn, and oats, before switching to beef. "And 75 years from now, it's probably not going to be the same as today."



WE LOVE THAT DIRTY WATER

Contamination stains Colorado's crystal-clear reputation

From salmonella poisoning to kitchen water that ignites because of methane, let's face it: Water can make us sick. In 2008 alone, 150,000 Coloradans drank from contaminated sources. "Our ability to detect these things exceeds our ability to explain why they are there and how they affect us," says Denver Water's Brian Good. "Even the most sophisticated of treatment systems can't treat everything." Our snow-fed water sources, nevertheless, are quite clean. The Environmental Protection Agency—which tracks water supplies nationwide—even praises Colorado's water standard program "as one of the most innovative in the country." We'll drink to that.



Liquid Gold

Despite its scarcity, water is a steal

Denver Water increased rates—again—this year, meaning that the average customer will cough up an additional \$40, for a total of \$340, in 2010. But don't complain. "The price of water is so cheap that people don't value it properly," says Brad Udall, Western Water Assessment's director. Nailing down a proper price for water that incorporates the environmental, economic, and social costs is a difficult, if not impossible, task. Water experts applaud efforts made by big utilities like Denver Water and Aurora Water, which bill big-time users more than the typical customer.



Ag-urban Transfer

When a farmer sells his water rights to a city for municipal use.

Drip Irrigation

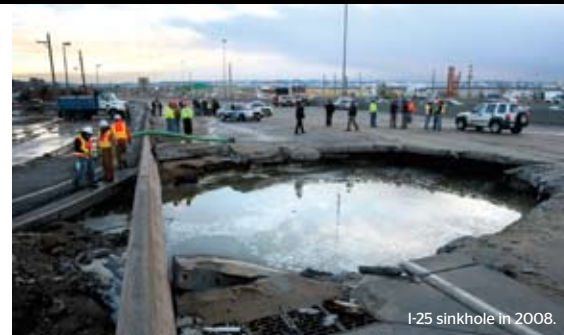
Farmers use irrigation pipes to deliver water directly to the roots of their crops. The equipment is costly but loses less water to evaporation than crop flooding or overhead sprinklers.

BREAKDOWN

The price of our aging infrastructure

The call woke Bob Steger, Denver Water's manager of raw water supply, at 4:45 a.m. one morning this past summer. A heavy rainfall—an inch or two—miles upstream was working into Strontia Springs Reservoir and down Waterton Canyon in south Denver. With it, debris and sediment from old fires was turning the pristine mountain water into a muddy mess. Working fast, Denver Water stopped the mucky water.

Since the 1996 Buffalo Creek Fire and 2002 Hayman Fire, tons of debris have settled in reservoirs and continue to wreak havoc on Denver Water's transportation system. To boot, dredging this sediment is just part of the upkeep. Colorado's freeze-and-thaw cycles torment Denver



Water's more than 3,000 miles of pipe—some made of cast iron and dating back to the 1800s. When breaks happen, like in 2008 when a 66-inch conduit pipe carrying water to north Denver ruptured and tore a sinkhole larger than a volleyball court in I-25, they're front-page news.

Still, Denver Water only loses about 50 million gallons of water a year because of leaks—a relative drop in the bucket. "We spend \$7 million annually on preventative repairs," says Brian Good, Denver Water's director of operations and maintenance. "We try to do as much predictive and preventative work as possible, but like a car, eventually we're going to have to replace the engine."

MARK T. OSLE/PIEVE PHOTOGRAPHY

FROM TOP: TIM ROBERTS/GETTY IMAGES; EMORY KRISTOF/GETTY IMAGES

FOOD, FUEL, AND THIRST

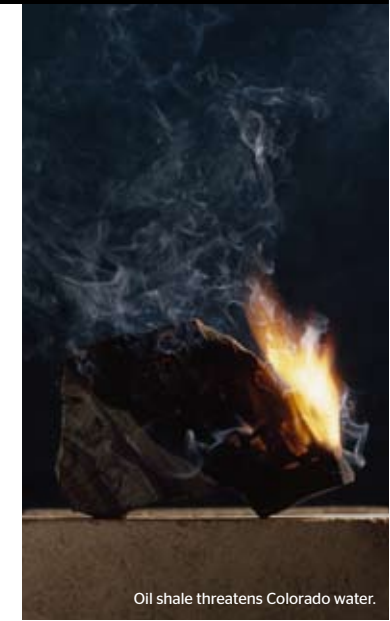
Do we want to drink our water? Or turn it into gasoline?

Since farmers started growing corn for ethanol use, we've witnessed the exploitation of one precious commodity (water) to create another (energy). Here in Colorado, we produce around 125 million gallons of ethanol annually, which requires billions of gallons of water.

Meanwhile, on the Western Slope, energy companies are once again considering construction of plants to mine oil from shale deep below the Earth's surface. The extraction is

both energy and water intensive, requiring vast quantities of water for cooling the equipment.

Environmental groups are concerned that oil shale extraction will waste water and potentially damage the environment, but there's little they can do: Energy companies bought water rights decades ago. While that water is currently unused, oil shale production could use as much as 400,000 acre-feet of water annually by 2050, leaving the Colorado River dry.



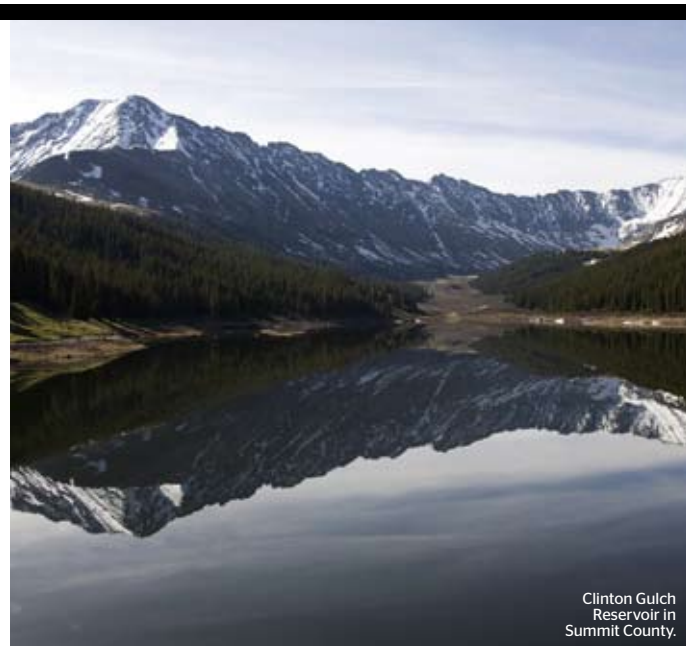
Oil shale threatens Colorado water.

THE WATER BANK Colorado's dam problem

Twenty years ago, Denver Water and its suburban cohorts were ready to drop more than \$600 million on the Two Forks Reservoir, which would have created a 1.1 million acre-feet reservoir on the South Platte River and solved water supply issues for 35 years. Environmentalists were outraged and called for greater urban water conservation, but the city water providers were not moved. And then, in a shocking development, the Environmental Protection Agency under President George H.W. Bush vetoed the project, simultaneously ending the era of big dams and reservoirs and, somewhat paradoxically, initiating an era of conservation.

Conservation has improved drastically since then—the average Denver Water customer uses 128 gallons of water a day, down from 151 in the late 1990s—but the argument of conservation versus storage still rages. Environmentalists and Western Slopers argue that we can't build our way out of the problem, while Front Rangers and water providers take the opposing tack, countering that we can't conserve our way out of the problem.

Denver Water, facing a 34,000 acre-foot shortage by 2030, is hoping that while increasing conservation efforts (saving 16,000 acre-feet), it'll also be able to add storage, with an 18,000 acre-foot expansion to the Gross Reservoir in the foothills northwest of Golden. Smartly, Denver's also promised to help regulate flows on the Western Slope to assist water sports and the environment, which placates the local communities. The Northern Colorado Water Conservancy District, hoping to add 30,000 acre-



feet of annual water storage, is doing the same: negotiating instead of fighting.

"Denver and Northern are doing it in a way that minimizes problems to areas they're diverting the water from," says Mark Pifher, director of Aurora Water. "They're doing some tremendous outreach and even relinquishing water to areas that don't have a legal right to it."

The specter of climate change—with stronger storms, earlier runoff, and hotter summers—means that water providers are anxious to have storage ready. "This state needs more storage," says Northern Water's Eric Wilkinson. "Runoff is going to be earlier, and with crop irrigation demand more spread out, you have to grab water when you can and store it." Even Alexandra Davis, the assistant director for water at the Colorado Department of Natural Resources and the director of the Interbasin Compact Committee, concedes, "We cannot conserve our way out of the gap. More storage definitely provides flexibility in drier times."

Each new project, though, is unlikely to add a tremendous amount of storage—they're big drops in the bucket, but drops nonetheless. "People think that climate change means more dams, but I'm not sure that's true," says Brad Udall, the director of Western Water Assessment. "We already have 150 dams in Colorado—if we build five new ones, we're not going to see a major increase in water."

WATER RUSTLERS Recreation users rethink water rights



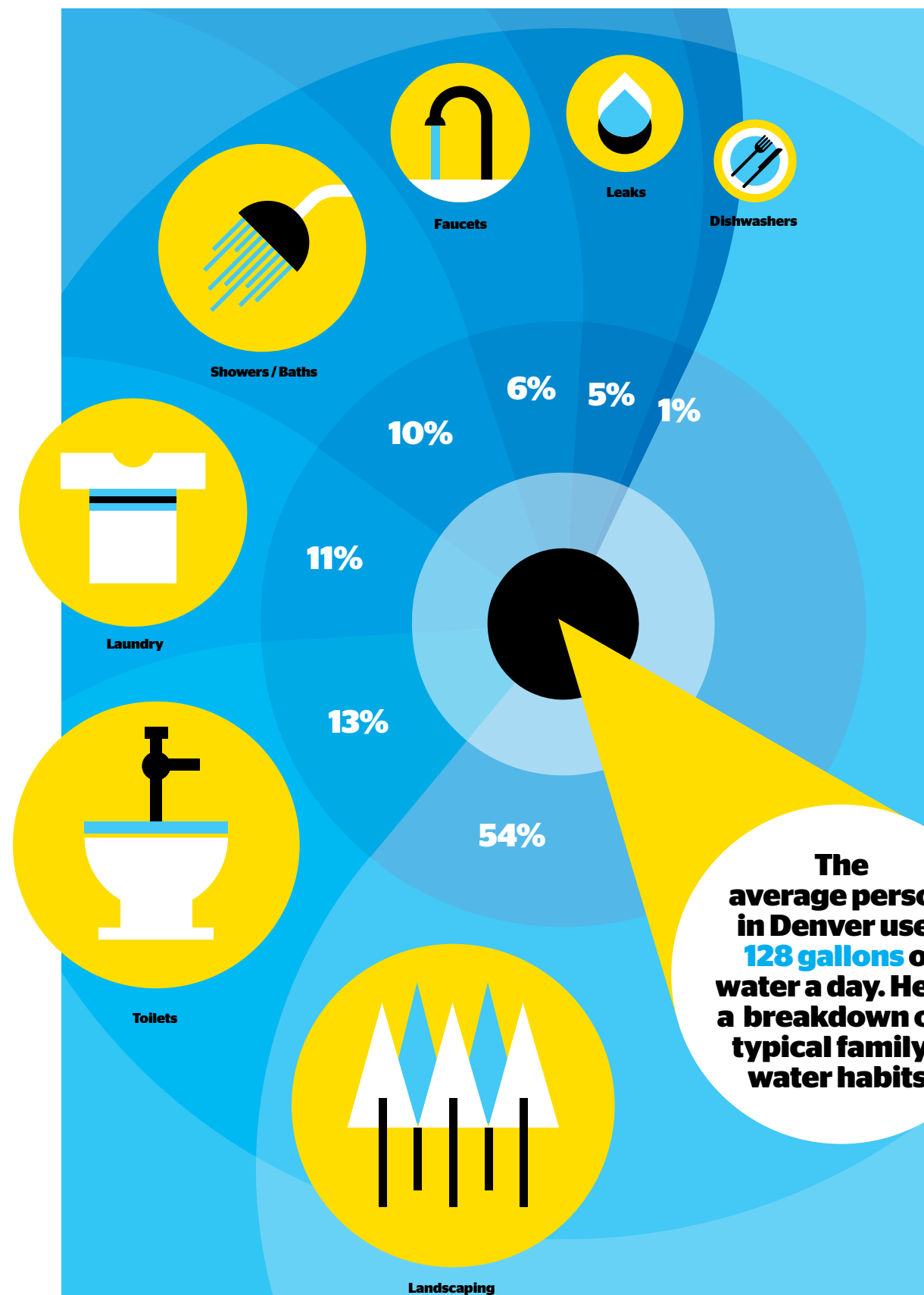
From spacious skies to purple mountain majesties (yes, poet Katharine Lee Bates penned "America the Beautiful" after summiting Pikes Peak), Colorado's beauty nets \$10 to \$15 billion in tourism revenue each year—a good chunk of the state's GDP. Skiers, anglers, rafters, and kayakers play in our mountains—and then fuel up on grub and gas in nearby towns. In Grand County alone, water-related tourism brings in about \$170 million annually.

Despite those substantial dollar figures, recreation users—often a non-consumptive* water use—have had little sway in water wars historically. It wasn't until the 1970s that the state was even allowed to file for water rights for kayakers and anglers. Today, these junior rights stand at the back of the line while the water establishment wages battle. Which is too bad, because these users rely on healthy rivers, brimming with fish in the summer and raging with rapids in the spring. They don't need to use the water; they just want to play in it. And if senior water rights have sipped too much water off a river, that isn't possible. "There are a lot of straws in our rivers," says Randy Scholfield, communications director for Trout Unlimited's Western Water Project. "We are at a tipping point. You can only take so much from the rivers before they reach a point where they cannot give anymore."

To prevent that, recreation users are looking for creative ways to work with senior water rights to protect stream flows and access, outside of the old "first come, first served" water right model. Advocacy groups negotiate with landowners to gain access to private land on the South Platte or cooperate with the towns of Winter Park and Fraser to ensure that the Fraser River has deep pools and a consistent, fast flow. The goal? Ensure that Colorado's gold-medal fishing and Class V rapids don't go dry and tourism dollars keep flooding the state.

FROM TOP: MICHAEL S. LEWIS/GETTY IMAGES; BRIAN BAILEY/GETTY IMAGES

Down the Drain



The average person in Denver uses **128 gallons** of water a day. Here, a breakdown of a typical family's water habits.



Quench the Thirst

Five ways to cut your home's monthly water use by as much as 5,088 gallons

1. Fix leaks, like a malfunctioning toilet. **You save:** 600 gallons

2. Set a timer to cut your shower time by five minutes. **You save:** 200 gallons

3. Step on your lawn. If it springs back, you don't need to water. **You save:** 750 to 1,500 gallons

4. Install a high-efficiency washing machine. **You save:** 216 to 288 gallons

5. Plant low-water, xeriscape plants and shrubs. **You save:** 1,666 to 2,500 gallons

Source: Denver Water

Non-consumptive

A water use that does not permanently remove water from a stream flow.

Now What?

Doomsday predictions aside, we've got a little bit of time before Denver and the West face a huge water gap. What we know is that a cure-all doesn't exist. More likely, a three-pronged approach that blends conservation, the transfer of water rights, and new systems for storage and treatment will keep our rivers—and taps—full.

RECYCLING WATER AGAIN AND AGAIN AND AGAIN...

Aurora's ground-breaking water reuse project

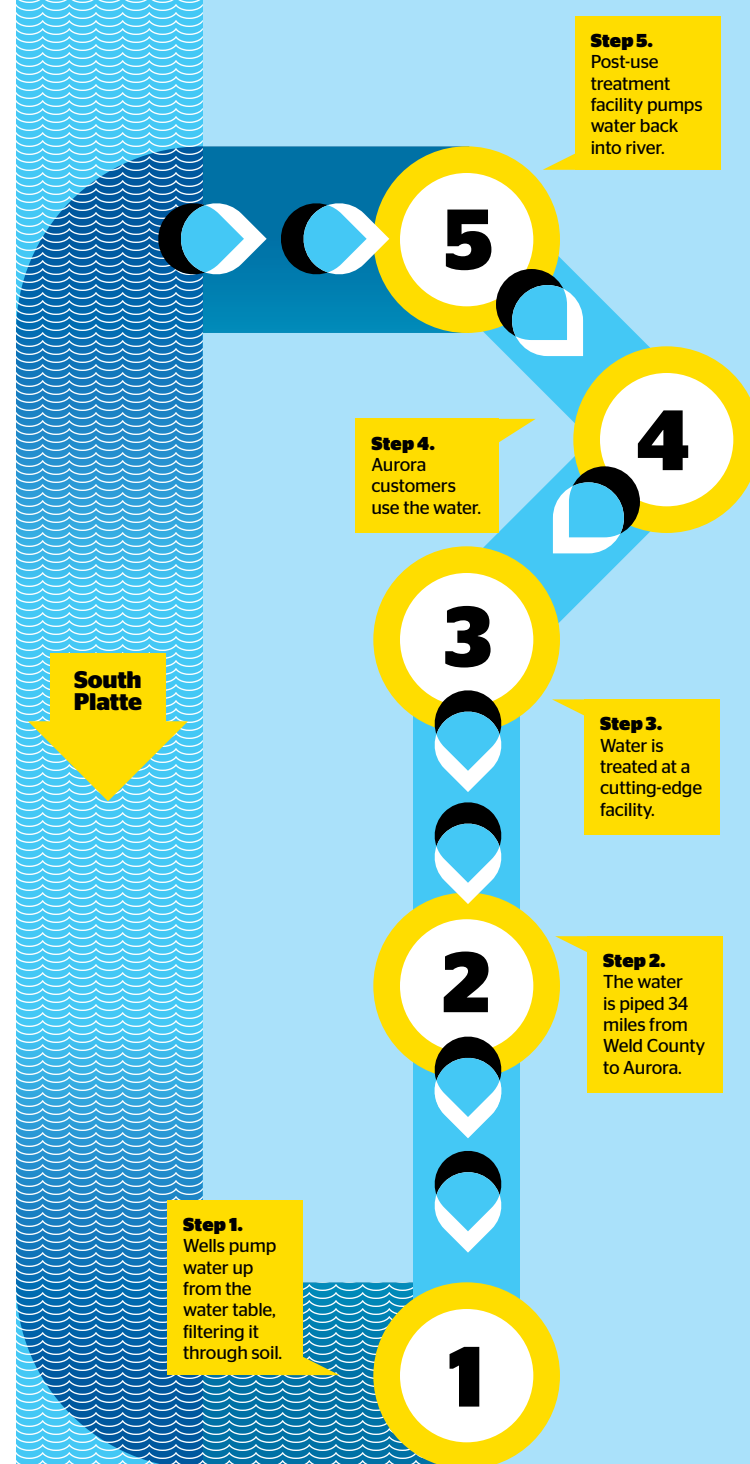
Aurora Water faced a major problem early this decade: The 2002 drought had brought reservoirs to dangerously low levels, and the next summer, ash from the Hayman Fire polluted what little water was left, making water treatment difficult and time-consuming. It was a wake-up call for the city: If 2004 hadn't brought more precipitation, the city could have dried up.

"People don't worry about water until it doesn't come out of the tap," says Peter Binney, then director of Aurora Water. "The drought showed the vulnerability of the system."

Aurora's options were limited: The city could buy up more agricultural water or attempt to build a politically charged (and expensive) transmountain diversion and take water from the Western Slope. But both those solutions were unrealistic. So, over a beer, Binney took his pen and a bar napkin and drew up what would become Prairie Waters—a system modeled on several European water providers, which, as he puts it, "is an elegant way to use the water we already had."

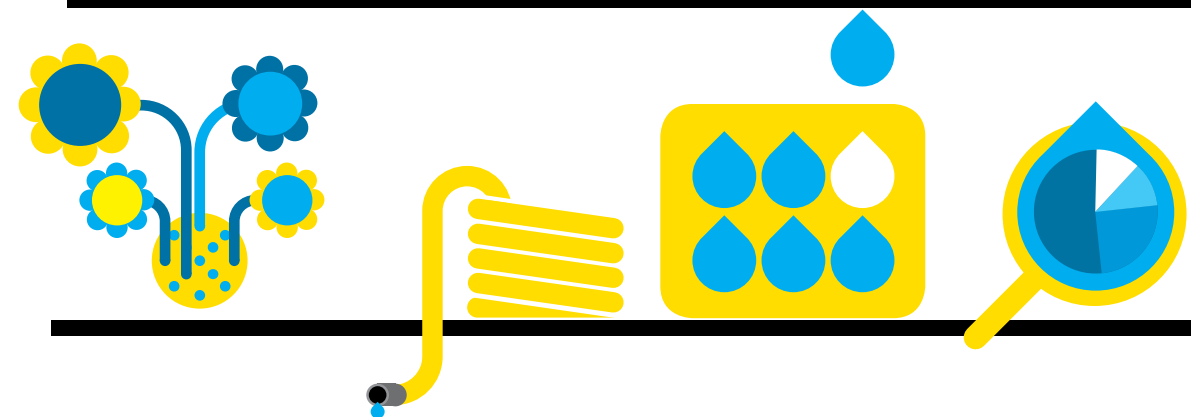
Prairie Waters is relatively simple: Instead of returning the city's used, treated water to the South Platte River, only to see it disappear downstream for good, Aurora would create a loop system. The city's return flows would be allowed to head downstream into Weld County, where they would be removed again by wells placed a few hundred feet from the riverbanks. The water would first be naturally filtered by the earth, then pumped up a 34-mile pipeline to Aurora to be treated at a traditional water plant. (See illustration at right.)

The \$700 million system, which should be up and running by the end of this year, will instantly provide Aurora with another 10,000 acre-feet of water, which is enough for about 20,000 families per year. Eventually, after upgrades, Prairie Waters could provide the city with 50,000 acre-feet, as well as a model for the rest of the region—Colorado Springs is already planning a similar project. (Denver Water, with its older water rights, hasn't needed to go the Prairie Waters route yet.) "The availability of water on the Western Slope is just not there, between the high cost of infrastructure and its political value," says Binney. "I think we'll see a lot more projects like Prairie Waters in the future."



Sounding Off

"We received a wake-up call after the 2002 drought. You don't plan for the average; you have to plan for the dry spells." —Mark Pifher, director, Aurora Water



Do Over

Every time you warm up the shower, gallons of pristine, treated water—called "graywater"—go down the drain. But now, more water utilities are reusing that wastewater for non-drinking purposes, like watering city parkways and flowerbeds. In Denver, recycled water—some of which could be treated graywater—is transported in a separate system of purple pipes to keep the city verdant. Eventually, homes could have separate lines for pristine water and recycled water—some purple pipe systems have already been installed in developments in Australia. After all, your grass—or your toilet—doesn't need hyper-clean, fluorinated water.

Case Study Stapleton, in north-east Denver, uses recycled water to keep open space, parks, and tot lots lush. The water-conscious development decreases water use by about 40 percent—thanks, in part, to other conservation efforts.

Rest Easy

Productive farming operations rely on fallow fields—land left idle for a growing season—to allow soil to rejuvenate minerals and nutrients. But there is an added benefit: Without plants, fallow farmland soaks up less water, and, in turn, the farm has less demand from streams to irrigate crops. Instead, that water can be "water banked" (the farmer receives compensation for lost yield) for use by municipalities, or left in streams for rafters and anglers to enjoy.

Why It Works Water banking replaces the old system of "buy and dry," where senior agriculture water rights were purchased and the farmland would go dry without irrigation. Also known as rotational fallow, this new system allows senior water rights to be used for different purposes—watering fields in wet years and supporting cities in dry times—without destroying farmland.

Store It

It may sound like a crazy HOA edict, but thanks to prior-appropriation water rights, it is illegal to collect rainwater that falls on your roof to water gardens and flowerbeds. The reason? That water belongs to another user downstream. But rainwater harvesting—in its most basic form, a barrel placed underneath a rainspout—could cut your water use by at least 30 percent. Last year, Colorado made steps to legalize it so that individual well owners can now collect rainfall, and the state is planning a pilot program for large-scale harvesting programs in neighborhoods.

Do Your Homework Because of low precipitation, Colorado roofs collect a mess of contaminants, from asphalt to bird droppings, between storms. Smart harvesting relies on flush systems that allow impurities to settle or be removed. Warning: For now, if you don't have a well, you can't collect.

Keep Track

In 1999, the Denver Zoo conducted a water audit—with the help of Denver Water—to see how, exactly, it used more than 300 million gallons each year. Surprisingly, the biggest water hog wasn't the polar bear pool or the fish tanks, but the bird department. The flamingo pond alone sucked up 40 million gallons. Armed with this information, the zoo made small and large changes over the next decade that cut use to 180 million gallons—a drop of 40 percent.

At Home Take a short survey at Wateruseitwisely.com to conduct a simplified water audit on your home—and find ways to cut back your consumption.

30% water savings from rainwater harvesting



Gray-water

Wastewater from washing, showering, and other domestic uses (with some exceptions, such as toilets) that could potentially be reused.

Pipe Dreams

If you can't find an untapped water source in Colorado, go elsewhere. At least, that is the thinking behind several pipeline proposals that would bring water from Wyoming, Oregon, and even as far away as the Mississippi River. But each proposal is fraught with problems, ranging from environmental concerns to cost, and these ideas garner even more opposition than in-state pipelines. Prognosis: It's unlikely we'll be sipping water from the Mighty Mississippi any time soon. ▲

