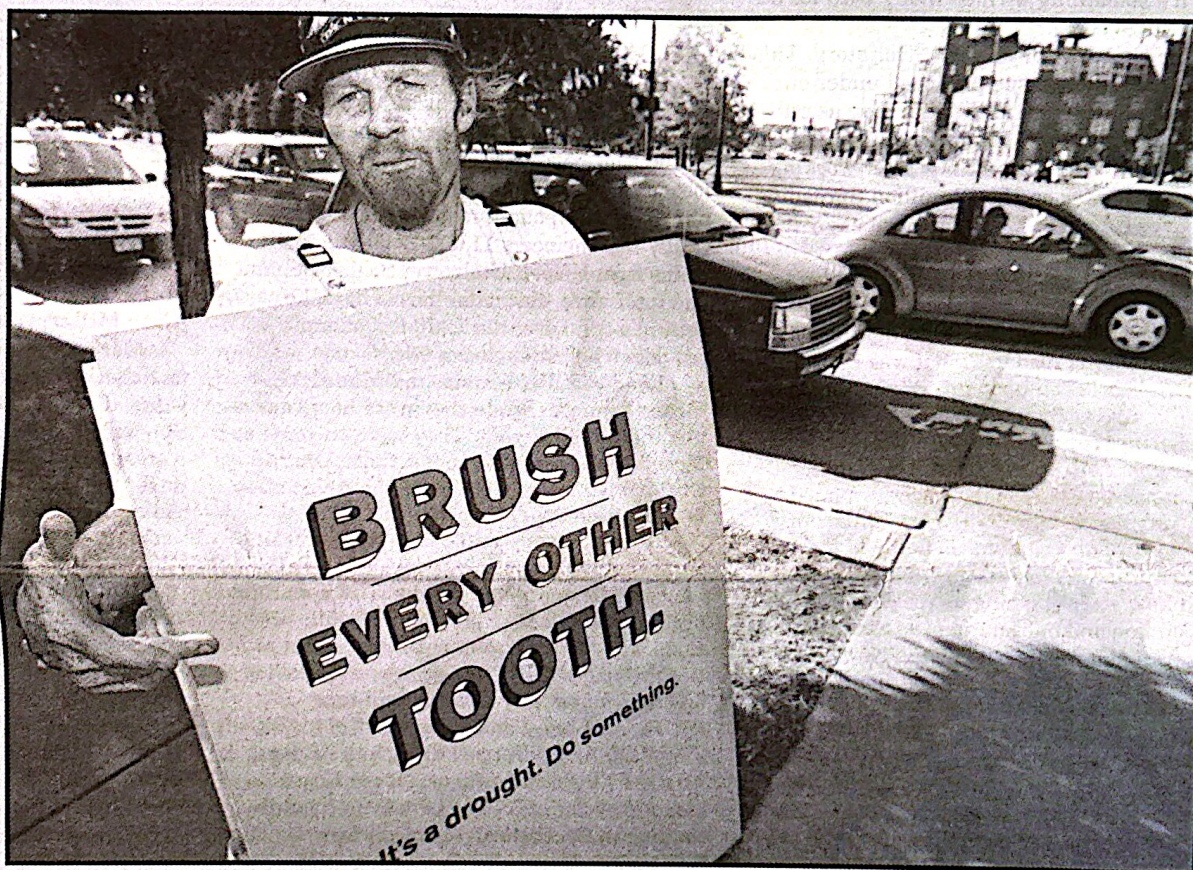


THE GREAT WESTERN APOCALYPSE

GRIN AND BEAR IT: The Denver Water Department kicked off a conservation effort last month with sandwich boards that read: "It's a drought. Do something." Denver's reservoirs are at their lowest levels in 37 years (AP/Wide World photo).



The drought of 2002 has left the West blistered and burnt, and scientists predict worse to come. Have we learned anything yet?

By Lolly Merrell

The former mining hamlet of Gothic, Colo., is just a few miles outside of Crested Butte, where lamppost banners announcing "Wildflower Capital of Colorado" flap to tatters in a hot, hard wind. Wilted and paltry and limited to a few drought-hardy varieties, the wildflowers, far as I can tell, look pitiful. The town has taken to nurturing a handful of landscaped beds of the showiest blooms, leaving the meadows to fend for themselves.

Closer to Gothic, down a dirt road crowded with sunburned mountain bikers, the valley floor winnows into a high mountain pass, and a few more varieties of plants pop up between sagebrush. In years past, this meadow has been a jaw-dropping circus of color. This year, like much of the West, Gothic is in the throes of a sustained drought, and the meadow is, well, boring.

This is terrific news for some of the residents here. Gothic, as it happens, is the home of the Rocky Mountain Biological Laboratory. Scientists from around the world bunk here for months, or sometimes years, chasing down grasshoppers or digging up soil parasites, their field hats flopping like moths as they troll across the hummocky landscape. For many of the researchers, the changes that have accompanied the extreme conditions this year make for unparalleled data.

Scientist John Harte, who has come to the lab for nearly 30 years, is concerned. "This is really grim," he says as we approach his research plots, scattered over a meadow on the edge of the 20 or so clapboard cabins that make up the town site. Demarcated by string into 10 rectangles of about 160 square feet each, half the plots have long heat lamp tubes hung precariously over them. The others are left alone. Both are baked.

"Over the years, in the heated plots, sagebrush dominates," he explains, pointing out the scrubby tufts. In the nonheated control plots, a few limp wildflower remnants grow from milk-chocolate-colored patches of dirt. "Normally, the controls would be full of forbs. But this year, only a few forbs — those are nonwoody plants, the wildflowers — are here."

Throughout the West, we've watched the drought unfold with uncontrollable wildfires, insect infestations, crispy lawns, water-rights battles and fatally thirsty fish, rodents and grazers. Media around the world have capitalized on the disastrously dry conditions out here, inevitably using the same Dust Bowl references and sensational, speculative headlines that accompany every dry summer.

At *High Country News*, which is only a couple of hours from Gothic, we've watched our local river shrink to a brook while reports of woefully dry conditions come in from correspondents throughout the West. And, like most everybody out here, we've been struck with a foreboding déjà vu: Wasn't it like this last year? And a couple years before that? In fact, a quick scan through the *HCN* archives nets plenty of stories that warn of drought-induced apocalypse and — dare we admit it — quite a few Dust Bowl references.

But this year, even as the monsoons begin to flood the streets of Santa Fe and wash ash down valley from the fire-flattened forests of Arizona and Colorado, we've been asking some unsettling questions: What have we learned from the past decade? What's different about this year that has scientists like John Harte on alert? How can we recognize if this is, finally, the beginning of a sustained natural disaster?

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For the West, things will get worse

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Officially, it is worse than ever before. For the first time in history, almost every state in the West has met all four definitions of drought, as identified by the National Center for Atmospheric Research. These include meteorological drought, or a severe drop in a region's normal precipitation; agricultural drought, which happens when soil moisture can't support established crops; hydrological drought, or a marked drop in reservoirs, lakes and rivers; and socioeconomic drought, which occurs when a shortage of water impacts people.

This is no surprise to John Harte.

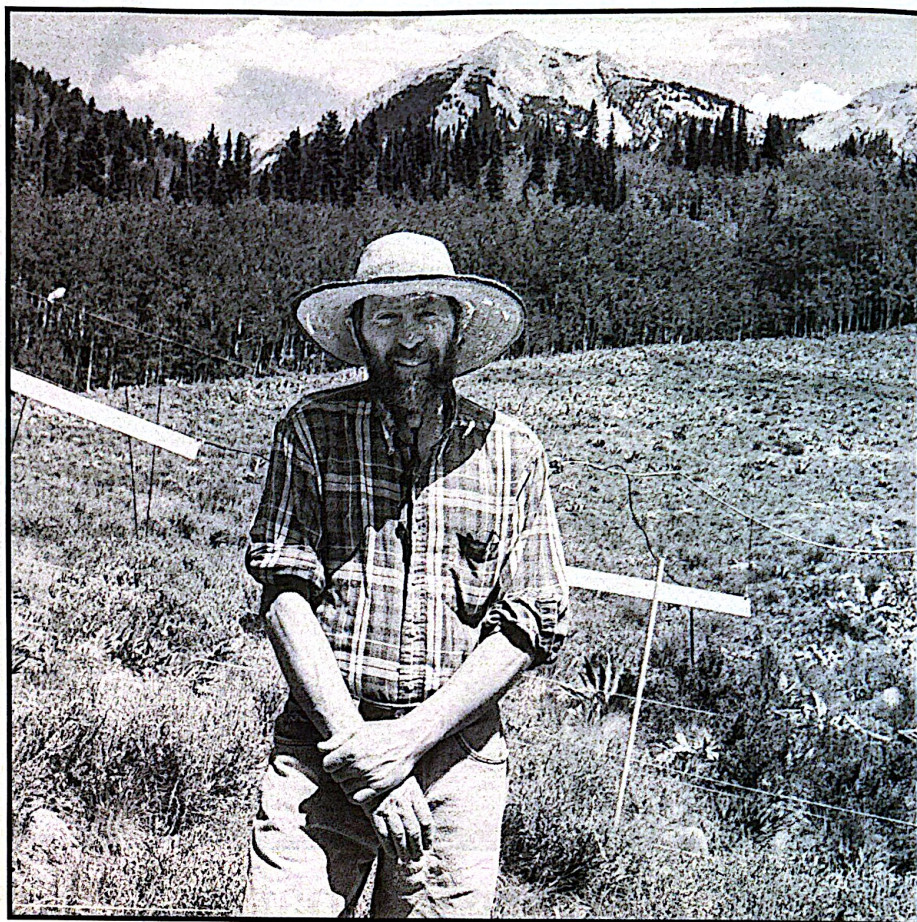
In the early 1990s, at the height of the scramble to provide scientific evidence of global warming, Harte set up his Gothic experiment to study how an increase in temperature would affect a subalpine meadow. At higher altitudes, he explains, the ecosystem feels climate change much faster and with a greater punch. And while his heat lamps only raise the temperature around the plants by 3 degrees Fahrenheit, the impact is huge: Insects and animals accustomed to fragile forbs are suddenly short of food. Soil composition changes, and over time, the vegetation begins to resemble the sagebrush hills down valley.

This year, nature has done the heating for Harte, and this, he says, is only the kick-off. "I project that in 30 years, these meadows will be sagebrush-dominated," he says, as we sit down at the edge of the plots.

Across the valley from us is an amoebic patch of snow clinging to the side of 12,625-foot Gothic Mountain. That meager snowfield, Harte explains, is what everyone, from ecologists to entomologists, is really alarmed about. "It's not the lack of rain, really, that has changed things," he says, adjusting his straw hat in the blistering sun. "It's the fact that the snowpack has melted out months earlier."

Typically, Harte explains, these mountains hold snow until late May, but this year, the snowpack disappeared as early as April. In parts of Utah, the snowpack was 40 percent of normal, in New Mexico, as low as 16 percent, and in Arizona, 31 percent. The lack of snow, Harte explains, exposes fragile plants to sun for a longer period of time, thereby stunting — or eliminating — large swaths of vegetation. This changes the soil's composition and alters the amount of carbon dioxide released by plants and soil, which ultimately affects the atmosphere (and the animals and insects that depend on the plants) and aggravates the human-made causes of global warming.

So how do we know this isn't just some short-lived anomaly? It's true that sustained, devastating drought is a recurring theme in history. Data generated from tree rings in the Southwest show frequent severe droughts in the last few centuries, which — as archaeologists love to argue — may have initiated the demise of the Anasazi. Sediment cores drilled out of lake beds support the theory that a drought during the Middle Holocene, about 8,000-10,000 years ago, shrank Lake Tahoe, Owens Lake and Lake Bonneville — which once covered most of northwestern Utah — to nearly nothing, causing wildlife to migrate to wetter, cooler climes, or die off altogether.



SKI SEASON IN CRESTED BUTTE, C. 2030? John Harte in front of the heat lamps he uses to raise the temperature of the meadow for his global warming experiment (Lolly Merrell photo). Below, varied growing conditions are indicated by the widths and darkness of tree rings (Peter Brown photo courtesy NOAA).

But there's something different happening now. Tree rings, sediment cores and even ice cores drilled from far-away glaciers show one thing: The last 50 years have been the warmest and driest on record. It's a trend, scientists say, that could only be a result of increased carbon dioxide — from cars, power plants, even plants — in the atmosphere, creating a nice warm quilt over the planet.

Although they acknowledge that climate modeling is still an imperfect art, scientists predict that things in the West will get worse. Dust, which is exacerbated by grazing and agriculture, initiates rainfall (water clings to particles, then falls as rain) but too much spreads out a cloud's vapor, making raindrops so small, they evaporate before they hit the ground. Drought-tolerant grasses — like the African import buffelgrass in the Southwest, or cheatgrass in the Great Basin — proliferate, then die, creating a blanket of wildfire fuel.

Ant populations explode during droughts and increased temperatures. Mosquito populations decline, but their "viral maturation rate" increases, creating carriers for a few very infectious diseases, including West Nile Virus, which in recent months has been marching toward the Rocky Mountains. Farms — and fish — could disappear as urban centers buy up water rights like gold bullion. The West's water buffaloes may exhume proposals for dams and other water projects. And as we drain our aquifers, as we have drained the sprawling Ogallala Aquifer under the Great Plains, we tap into the bottom layers of "fossil" water that are, ultimately, irreplaceable.

But nature has some curious coping strategies. When rivers and streams, such as the Dolores River in Colorado, the Pecos and Rio Grande in New Mexico, shrink and then warm, their trout populations drop. When possible, however, the fish simply move north to cooler water, while warmer freshwater fish like largemouth bass and carp take their place. Trees produce more anthocyanins, or colored pigments, in their leaves as they store up their photosynthesizing tools to survive the winter. Bears may show up at your dinner table. And shorebird popula-

tions, surprisingly, may skyrocket, thanks to an abundance of small fish to eat (large species of fish, which eat the little fish and have longer life cycles, don't rebound during sustained droughts, giving smaller fish a boost).

Of course, the still-unanswered question is how we humans will cope as our population grows while the amount of water available to us shrinks. In this issue of *High Country News*, we report on some telling challenges and surprising successes across the region. In the end, we hope to gauge what we've done, look at the long, dry road ahead, and try to get some things right.

For a town like Crested Butte, which has no doubt felt the estimated 10 percent drop in Colorado's tourism this year, uncertainty lies ahead. "They're losing snow at the beginning of the season and the end," says John Harte, as we wind back down from his meadow. "Pretty soon there won't even be a ski season in Crested Butte."

As for the Wildflower Capital of Colorado? Well, scientists have discovered the molecular mechanism that drought-resistant plants produce to survive sustained dry conditions. Maybe with a little genetic engineering ...

Or perhaps the solution is more simple.

So far, we've dabbled earnestly in quick fixes: "water education" campaigns to teach household conservation, limitations on suburban sprawl, cloud-seeding generators fixed near reservoirs, restoration programs for endangered riparian habitat, and rejiggering water rights to find some equitable balance for fish, farmers and city-dwellers, to name a few.

But, Harte says, the only way to keep the lid on warming and future drought is to burn less fossil fuels. "It would cost too much not to fix this problem."

He's right. But even if we manage to avoid a global apocalypse, the West will remain dry. All our quick fixes are only the first steps in creating a society that can work in an arid climate.

Then again, we could take a cue from the desert tortoise, and disappear, burrowing underground for a few decades at the first sniff of drought, hiding where it's cool and moist, to emerge only when the weather is fine. ■

Lolly Merrell is senior editor at *High Country News*.

