How California's weather catastrophe turned into a miracle

Gushing waterfalls, swollen lakes and snow-covered mountaintops transformed the state's arid landscapes.

By Scott Dance

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FRESNO, Calif. — Californians were preparing for another year of unrelenting drought in 2023. Instead, they got months of incessant rain and some of the heaviest snowfall they have ever seen.

They feared blasts of spring warmth would quickly turn snow into floods, adding to the havoc from a series of winter storms. But, until recently, temperatures remained mercifully cool, allowing for a slow and steady melt.

The result: a return of water to California that has erased drought maps, poured into long-dry irrigation systems and raised expectations that, after months with water bursting from their gates, reservoirs will end the summer melt filled to capacity.

It has been a stark transformation, with arid landscapes and trickling rivers replaced with swollen lakes, gushing waterfalls and snow-covered mountaintops. Instead of pumping groundwater to keep crops alive, farmers have access to brimming canals carrying more water than they could use.

The same Californians thanking the heavens for their good weather fortune are still wary, to be sure. A series of moisture-laden storms known as atmospheric rivers brought Central Valley flooding, coastal landslides and mountain blizzards — a change from years of drought and wildfires, but hazards all the same. Scientists say shifts in the Golden State's climate could mean more dry years, interspersed with extremely wet ones like 2023.

Meanwhile, there are reminders around the globe of the sort of extreme weather California has largely dodged in recent months: persistent record-setting heat across the southern United States, Europe and Asia; an unprecedently massive swarm of wildfires in Canada; damaging flash floods from Vermont to India to South Korea.

Californians know good weather fortune can only last so long, what with a newly accelerating El Niño climate pattern that threatens to bring more extreme flooding and landslides.

The coursing rivers and flush irrigation canals nonetheless give Sarah Woolf a sense of relief. The water consultant who works with farms like her family's in Madera County, north of Fresno, said California needs to take maximum advantage of the precipitation when it hits.

After all, she said, it's better to have too much water than not enough: "With water, you have more options."

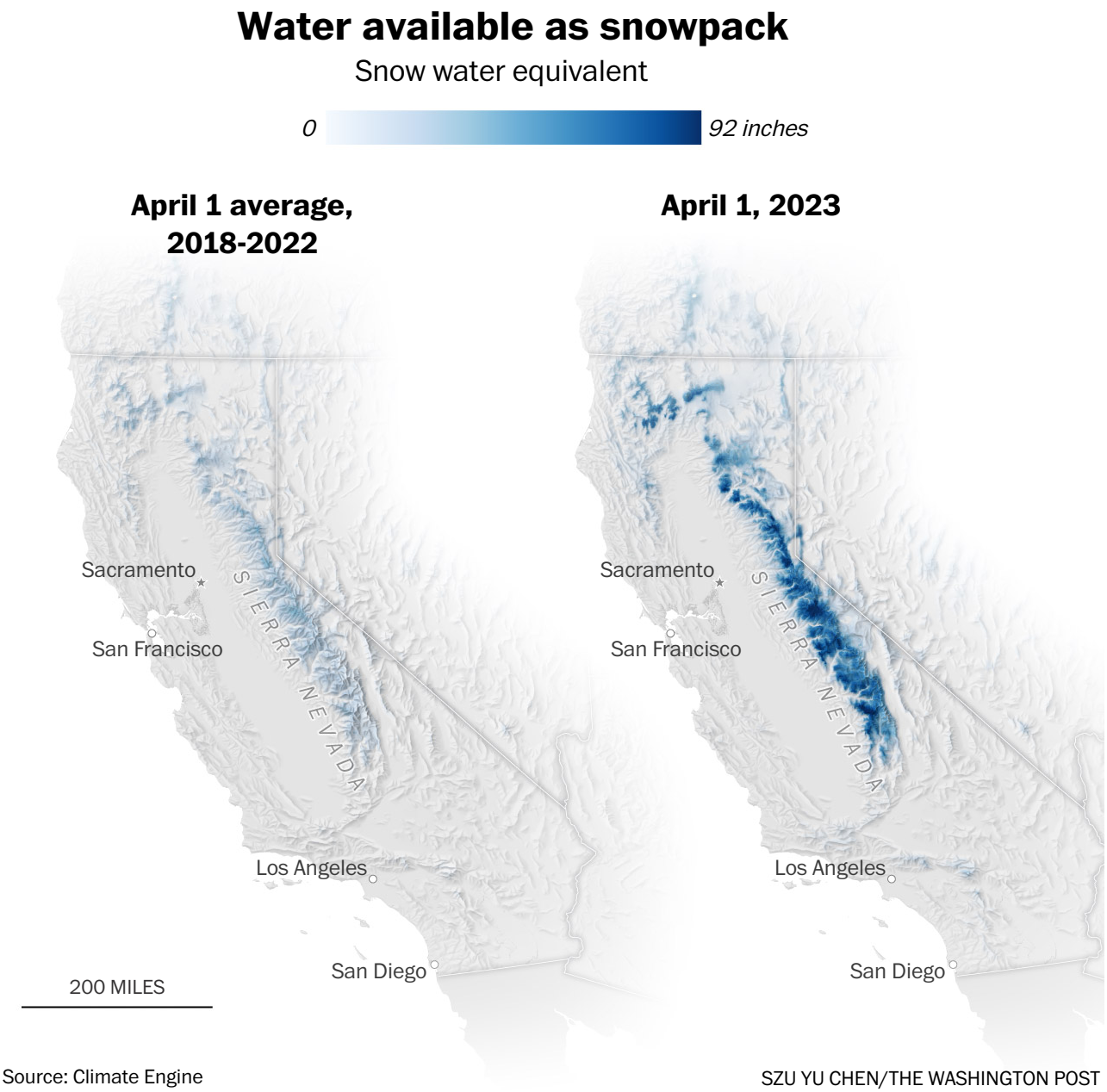
Snowpack at astounding depths

The Sierra Nevada snowpack is the backbone of California's water system. It runs most of the length of the state, stabilizing a supply of water that has always been known for boom-and-bust cycles.

In the years when it is thinnest, there are few options once it quickly melts. In 2015, a snowpack that was only 5 percent of the normal size meant farmers and ranchers had to drill ever deeper to tap the groundwater supply.

But this year, snow accumulated at depths that astounded even the most seasoned surveying teams. Sean de Guzman, manager of snow surveying for the California Department of Water Resources, said teams prepared to measure snow as deep as 20 feet found themselves needing extra equipment in many spots.

"This is by far some of the deepest pack they've ever measured," he said in April, when a key survey revealed that this year's deluge of snow tied a record set in 1952.



Source: Climate Engine

SZU YU CHEN/THE WASHINGTON POST

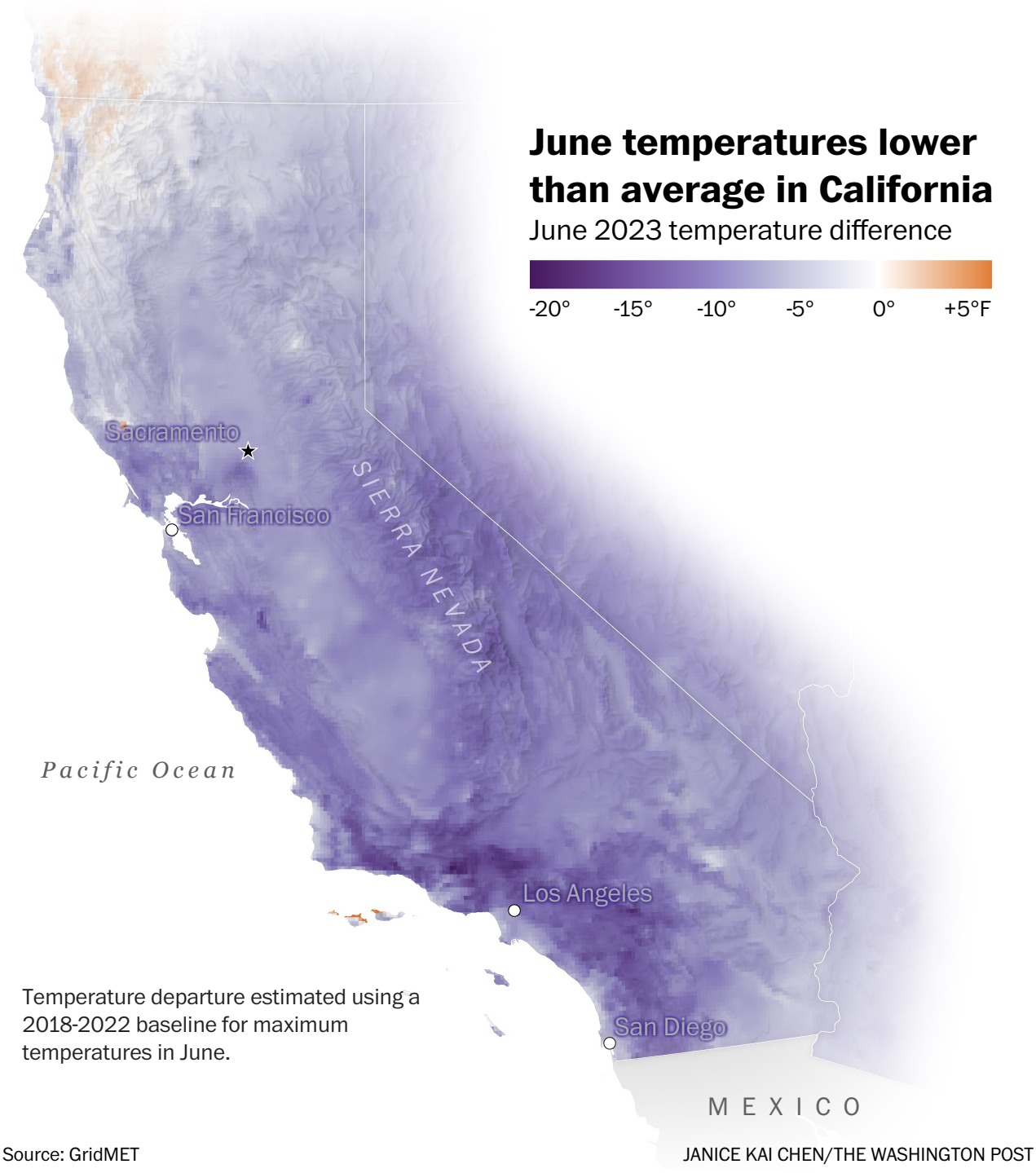
Data suggests that, as a consequence of climate change, California's precipitation patterns are becoming ever more volatile, said Dan McEvoy, an associate research professor at the Western Regional Climate Center. But global warming is also translating to earlier and warmer springs, he added, melting snowpack more quickly.

In light of that, McEvoy said, it wasn't the snowpack's size that astonished him.

"I think the surprise was how cold it stayed," McEvoy said.

Indeed, the sheer amount of snow had raised fears of a rapid, surging melt when the first early spring and summer heat waves hit. Only, they never did.

Sustained stretches of triple-digit heat are common for California's Central Valley in June, if not May. But in communities from Sacramento to Fresno to Bakersfield, it wasn't until the end of June that the mercury topped 100 degrees.



Source: GridMET

JANICE KAI CHEN/THE WASHINGTON POST

As a result, the snowpack remains deep well into the heart of summer — so deep that some were still measuring it in early July. Steve Haugen, executive director of the Kings River Water Association, said snow depth information is still needed as he works to prevent any flooding impacts as the final slugs of snowmelt flow downstream.

In the mountains of the Kings River watershed, in the southern Sierra, Haugen said snowpack records dating back to 1895 show only a single July snow measurement taken at a single location — ever.

But at the start of this month, teams deployed by helicopter found snow at 10 sites, Haugen said. At two of them, snowbanks were still holding as much water as the teams would normally expect to find in April.

Reservoirs could end the season nearly full

When the first of California's atmospheric river storms hit in late December, those tasked with managing the state's precious water supply had reason for optimism. For years, their jobs were relatively simple: maximizing what little water supply flowed downstream.

That job got a lot more complicated in 2023.

It now means careful measurements of the snowpack, and forecasts and calculations of how much will melt, and how fast, as temperatures warm. At reservoirs, water managers and dam operators must take that into account as they determine how quickly to drain the lakes to make room for snowmelt that just keeps coming.

Some of the state's largest reservoirs, including Lake Shasta and Lake Oroville, were little more than half full at their lowest points last December, but are now approaching the end of the snowmelt season nearly full.

Water levels in California's largest reservoirs

Data represented in acre-feet, a unit used to measure large quantities of water, shows most of the state's largest reservoirs are nearly full.

Data as of July 14

Some reservoirs filled so quickly that, as the parade of storms continued into early spring, some began to worry: Could this be more water than California could handle?

For Calvin Foster, that moment came when perhaps the worst of the winter storms hit in early March. Dumping as much as a year's worth of rain at elevations as high as 8,000 feet, the storm sent runoff racing down the Sierra slopes toward the Central Valley, where Foster oversees several dams for the Army Corps of Engineers.

Late that night at Schafer Dam near Porterville, he watched as water begin trickling into a spillway, and then gushing through it. The Army Corps was already in the process of expanding the spillway so that Success Lake could better handle large storms.

Just to the north, at Pine Flat Dam on the Kings River, Pine Flat Lake rose 18 feet within 24 hours. Flows from even downstream of the dam were so intense that the Army Corps had to delay releases from the reservoir for days.

Over the following three months, concern simmered that a sudden heat wave could create yet another water crisis for the state. Water authorities constantly inspected and repaired levees and cleared debris from drainage systems to keep water flowing safely, while dam operators maintained massive flows from many dams to prepare for any sudden surge of snowmelt into reservoirs.

Their worst fears never came to pass.

“Mother Nature’s cooperated with us,” Foster said.

The unusual season means that, by the end of this month, reservoirs up and down the state may sit filled to the brim. By that point, snowmelt will taper off enough to meet downstream irrigation and drinking water demands without much, if any, drain on reservoir levels.

Until then, it is hard for water managers like Jenny Fromm to relax. With so much snowpack lingering so late into the summer, “we’re not out of the woods yet,” Fromm, chief of the water management division in the Army Corps’ Sacramento office, said in June.

But the historic year of snow was expected to end, at last, with another new extreme: A record-setting heat wave that set in last week probably will melt the last traces of it. Hydrologists at the California Nevada River Forecast Center said that while the heat could send some rivers surging on the eastern side of the Sierra, any rise in California rivers was forecast to be minor.

In the valleys, enough water to plan for the future

On the valley floor, water has returned to canals and irrigation ditches that were dry for years. For crops long watered only with pumped groundwater, there is an abundance to be diverted from coursing rivers.

“It’s been a wild year,” said David “Mas” Masumoto, a Fresno County farmer and author. “We forget, November and December, it looked like another drought. We all braced for that and planned for that.”

In the Westlands Water District west of Fresno, for example, virtually no water has flowed into irrigation canals in years. The area is home to some 700 farms, each nearly 900 acres on average.

In a year like this one, the district has rights to enough water to cover its farms 2.6 feet deep, but the last time it was allowed to take that much was in 2017. In 2020, its farms got 20 percent of that allocation; in 2021 and 2022, there wasn’t enough water flowing for them to receive a drop.

“Everyone was bracing for a third year of a zero percent allocation,” said Elizabeth Jonasson, a spokeswoman for the district.

Instead, most farms are not only irrigating their crops without pumping an ounce of groundwater, but also are putting water back into sapped aquifers.

Under a decade-old state law designed to achieve groundwater sustainability by 2042, farmers have been required to track how much of it they’re withdrawing. This is the first year they’ve gotten a chance to make deposits into sapped aquifers, spreading surplus water across fallow fields and into basins so it can percolate into the ground.

“It’s very nice to have this option,” said Woolf, the irrigation consultant. “It’s a change in thinking for everyone.”

What that means for groundwater remains to be seen, though U.S. Drought Monitor data suggests some impact. A year ago, more than 97 percent of California was in severe to exceptional drought. Now, moderate drought covers about 6 percent of the state.

It’s also not a sure thing that the abundance of water will translate into gains in crop yields. All that moisture can mean increased pressure from insects and weeds, Woolf said.

And Masumoto counts himself lucky. For other farmers, flood impacts were grave. Some of the storms inundated fields — including those now beneath Tulare Lake, which dried up more than a century ago — or hit during key stretches for pollination of almond and pistachio blossoms.

But the return of water to California over the past six months at least provides some hope for dry years ahead, so long as the state can figure out how best to capture the deluges when they occur.

That's how Masumoto sees it when, on a clear day, he can see snowy peaks in the distance.

"It's like seeing the future for years to come," he said.

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