

FT BIG READ. A WORLD WITHOUT WATER

After three years of drought California's farmers are pulling their crops, residents are worrying about shortages and the state's politicians are desperately trying to find a solution.

By Pilita Clark

Thirst for life

With his military fatigues and the holstered gun at his hip, Lieutenant John Nores Jr is a slightly unnerving sight as he slips through the woody foothills overlooking the southern edge of California's Silicon Valley. But what the 45-year-old game warden has come to look at is more alarming.

Here in the late summer heat, not far from the sleek headquarters of technology giants Apple and Google, he leads the way to a carefully hidden patch of terraced ground pockmarked with hundreds of shallow holes that until very recently contained towering marijuana plants.

"There were about 2,000 plants here," says Lt Nores as he explains how he and his colleagues from California's fish and wildlife department recently launched an early morning raid on the plantation, ripping out a crop worth about \$6m to the Mexican drug cartel that grew it.

California pioneered laws allowing marijuana use for medical reasons. But it has yet to follow states such as Colorado that permit recreational use and, in any case, this crop was on public land, making it illegal and dangerous to eliminate - Lt Nores has witnessed several shoot-outs over the past decade.

He estimates that each of the state's 2,000-odd cartel pot farms contains an average of 5,000 plants, and that each one sucks up between eight and 11 gallons of water a day, depending on the time of year. That means at least 80m gallons of water - enough for more than 120 Olympic-size swimming pools - is probably being stolen daily in a state that in some parts is running dry as a three-year-old drought shrinks reservoirs, leaves fields fallow and dries wells to the point that some 1,300 people have had no tap water in their homes for months.

Jerry Brown, California's governor, declared a state of emergency in January after the driest year on record in 2013, but as the annual wet season beckons, the prospect of a complete drought recovery this winter is highly unlikely, government officials say.

"Marijuana cultivation is the biggest drought-related crime we're facing right now," says Lt Nores as he pokes at a heap of plastic piping the growers used to divert water from a dried-up creek near the plantation.

But California's drought is exposing a series of problems in the US's most populous state that are a reminder of an adage popularised by Michael Kinsley, the columnist: the scandal is often not what is illegal but what is legal.

Growing competition

The theft of 80m gallons of water a day by heavily armed marijuana cartels is undoubtedly a serious concern, not least when the entire state is affected by drought and 58 per cent is categorised as being in "exceptional drought", as defined by the government-funded US Drought Monitor.

However, this is a tiny fraction of the water used legally every day in a state that, like so many other parts of the world, has a swelling population driving rising competition for more heavily regulated supplies that have long been taken for granted and may face added risks as the climate warms.

California has always been a dry state. For almost six months of the year many of its citizens get little rain. There have been at least nine statewide droughts since 1900, not counting the latest one.

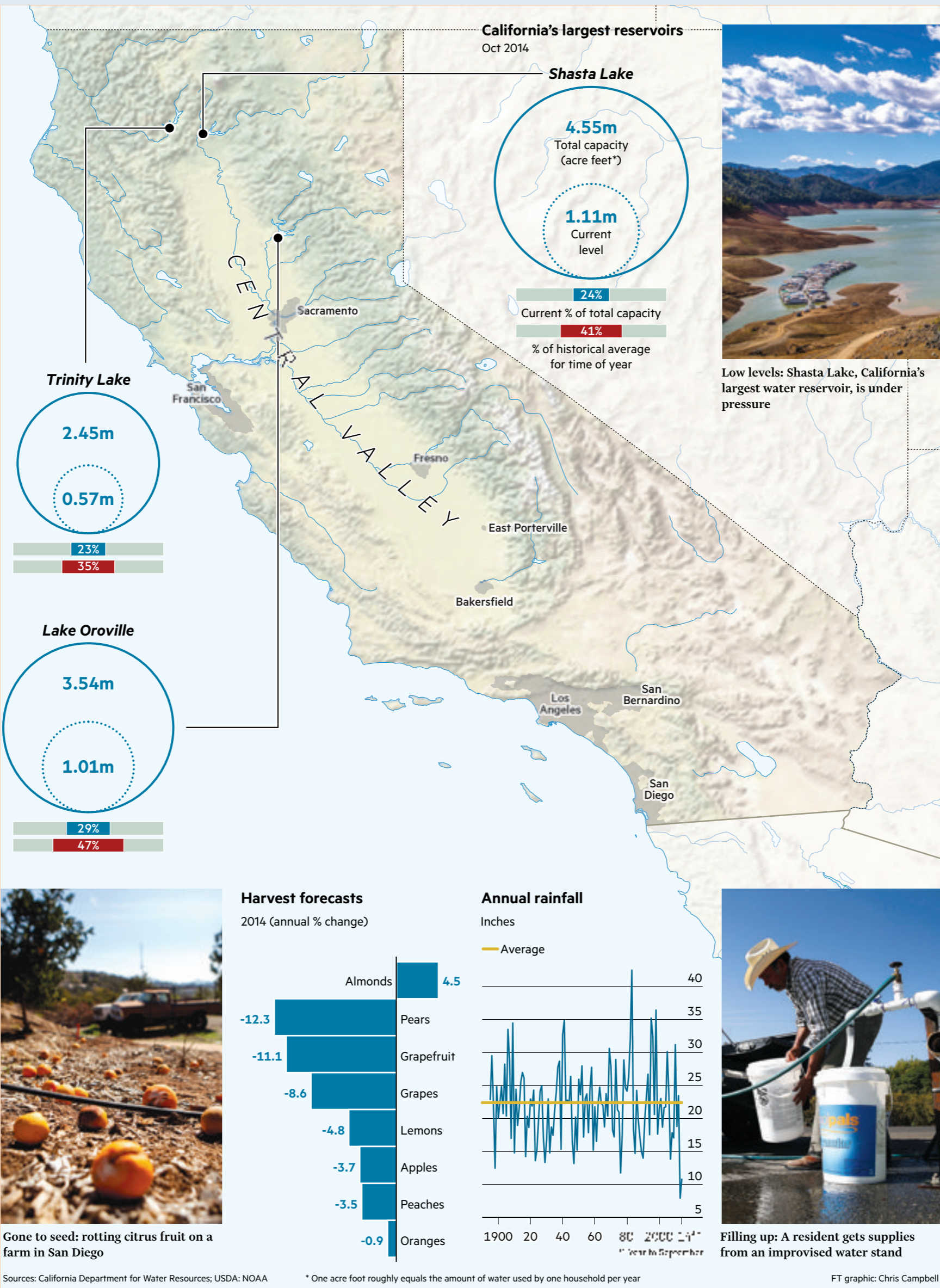
The state's history is littered with water wars, among them the conflicts surrounding Los Angeles's move to siphon off most of the Owens river last century that inspired the classic 1974 film, *Chinatown*. That dispute was over just one part of a vast system of canals and reservoirs built in the last 100-odd years that are the reason California is sometimes called the most hydrologically altered landmass on the planet.

The system channels water from wetter to drier spots, using rivers and streams that in a normal year fill with melted snow from mountain ranges ringing the state, supplying about a third of California's farms and cities.

The crisis is more severe because a decline in snowfall has compounded problems caused by the lack of rain. The state's mountain snowpack was just 18 per cent of its average earlier this year, a situation scientists say could be repeated as the climate warms.

As a result eight major reservoirs were last week holding less than half their average storage for this time of year.

Dried out How water shortages are affecting the Golden state



The entire state is affected by drought and 58 per cent of it is placed in the most extreme category

Reservoir levels sank worryingly when a bad drought hit California in 1976-77, but there were fewer than 22m people in the state then, compared with 38.3m now.

There were also fewer laws such as those protecting creatures such as the endangered Delta smelt, a finger-sized fish that can be affected by the management of the canal system, prompting restrictions on pumping the water used by a farming sector that accounts for nearly 80 per cent of the state's human water use. Those laws regularly inflame debate between conservationists and farmers during droughts - and are doing so again today.

The farmer's story

"I farm in a very environmentally conscious manner, but these regulations have made it much worse for the farmers," says Barat Bisabri, a citrus and almond farmer whose property lies in the Central Valley, one of the regions worst hit by the drought.

This flat, fertile strip runs south for about 450 miles from the northern reaches of the Sacramento Valley through the heart of the state and grows a lot of what America eats. Nearly half the fruit and nuts grown in the US come from California, including 80 per cent of the world's almonds.

Much of that produce comes from the Central Valley, where farming is carried out on an industrial scale. Crops and orchards grow up to the edge of people's houses. Driving down the valley's long, straight roads, it is striking to see an orchard of dead, brown trees next to another with puddles of water around healthy ones.

This may partly be a symptom of a century-old water rights system that critics say is so weak and archaic it makes it hard for regulators to tell whose supplies should be cut during a drought.

Mr Bisabri's grim predicament shows why one study estimates the drought will cost the state \$2.2bn in 2014.

From the windows of the roomy farmhouse that overlooks row upon row of the property's citrus trees, Mr Bisabri points to two of California's main waterways, the Delta-Mendota Canal and the California Aqueduct. Both run straight through his farm but because of the drought, authorities have sharply limited the amount of water many users can take from them.

"Unfortunately we cannot get water from either of them this year," says Mr Bisabri, as he explains how, a few weeks earlier, he used bulldozers to rip out 85 acres of healthy mandarin, orange and grapefruit trees that would have used so

much water it would have made the rest of the crop far less valuable.

"I had to make a decision to kill some so the other ones could survive," he says, as he drives to the bare patch where the trees once stood. "Had I not made that decision and kept all the citrus that we had, then I would have run out of water in the middle of August."

It is a dilemma facing farmers across the Central Valley, many of whom have shifted from crops such as tomatoes or peppers to more valuable almonds or other trees that cannot be left unwatered in a dry year.

Perennial crops such as nuts and grapes accounted for 32 per cent of the state's irrigated crop acreage in 2010, up from 27 per cent in 1998. The shift has been even more marked in the southern Central Valley, so when drought hits, farmers face difficult choices.

A few miles down the road from his farm, Mr Bisabri stops at a jaw-dropping sight by an almond orchard of withered trees: a huge earthmoving machine is scooping up several at a time and feeding them into another machine that grinds them with an ear-splitting roar into great mounds of woodchip.

"That is exactly the same machine that we used on my farm," he says.

Mr Bisabri has had to bring in water from other sources this year, but he says

the price was almost \$1.2m, 10 times what it was the previous year.

That does not include the \$250,000 he spent on digging new wells to try to get supplies from the one source farmers and communities have always turned to in times of drought: groundwater.

In a normal year, aquifers supply about a third of the state's water. In a drought, that can rise to as much as 60 per cent. But one of the most alarming aspects of this drought is that groundwater levels are plummeting.

"Water levels are dropping at an incredibly rapid rate in some places, like 100ft a year," says Michelle Sneed, a hydrologist with the US Geological Survey who monitors groundwater in the Central Valley. "It is very extreme. Ordinarily, talking with hydrologists, if you would talk about a well dropping 10ft a year that would really get somebody's attention, like wow! Really? Ten feet? And now we're 10 times that."

The depletion of this vital resource is not just a concern because it is so difficult to refill some aquifers when drought eventually subsides. It is also creating extraordinary rates of subsidence because as the groundwater disappears the land above it can sink.

In one part of the valley, land has been subsiding by almost a foot a year, which Ms Sneed says is among the fastest rates anywhere in the world.

This is damaging the very canal system California built to reduce reliance on groundwater, she says, because these waterways depend on gravity for a steady flow and when parts of a canal start sinking it creates a depression that needs more water to fill it before flows can resume.

'We ran out of water in June'

Two hours' drive south from Mr Bisabri's farm, the town of East Porterville has more pressing groundwater worries. At least 1,300 people in the town rely for drinking and bathing water on wells that have gone dry as the drought has deepened.

"We ran out of water in June," says Donna Johnson, a 72-year-old retired counsellor who delivers water to dozens of dry households from the back of her pick-up truck. Ms Johnson depends on a hose running to her home from a neighbour whose well is still working.

Until now, California has been notable among dry, western states for a pump-as-you-please approach to groundwater. A powerful agricultural lobby resisted repeated attempts at reform.

But the severity of this drought finally led to a package of measures signed into law in September requiring local agencies to monitor and manage wells, or face state intervention. Some critics say it is too little too late: many local agencies will have five to seven years to come up with plans, and until 2040 to implement them. Still, it is a lot better than nothing, say others.

"It's a giant step for California," says Robert Glennon, a law professor at the University of Arizona and the author of *Unquenchable: America's Water Crisis and What To Do About It*. "You cannot manage what you don't measure, full stop."

The crisis may also encourage approval of another measure to be voted on in November allowing billions of dollars to be borrowed for new reservoirs and other steps to strengthen drought resilience.

None of this will help farmers such as Mr Bisabri or the residents of East Porterville this year. Still, it is one more example of how the state often responds to a serious drought, says Jay Lund, a water expert at the University of California, Davis.

"Every drought brings a new innovation where we say, 'Oh, here's something we haven't been doing that would really be helpful,'" says Prof Lund, pointing to irrigation systems, reservoirs and water markets rolled out after past dry spells. "In this drought, it's groundwater regulation so far," he says. And will it eventually work? "It opens the door."

That is small comfort when the latest outlook from the US Climate Prediction Center suggests the drought "will likely persist or intensify in large parts of the state" this winter.

"If there's no water for people to live, and you don't have the basic necessities of life, your population is going to leave," says Andrew Lockman, the emergency services manager responsible for East Porterville. "Our primary economic driver is agriculture. If there's no water to water crops, we're not going to have any agriculture business, so you could see the economy of this area just decimated."

Video
Pilita Clark reports from California's Central Valley on fresh questions about how water is used
ft.com/drought

Interactive
Water scarcity
Read the rest of the series and view the interactive guide
ft.com/water