Will Southern California ski resorts survive climate change?

by Brooke Staggs

(13–17 minutes)

In the not-so-distant future it might not be possible to attempt a uniquely Southern California tradition: surfing and skiing in the same day.

Snowfall, which was nonexistent this season until just this week, has long been sporadic in local mountains due to our trademark warm and sunny weather. That inconsistency is one reason why Big Bear’s Snow Summit resort helped pioneer the art and science of man-made snow more than 60 years ago.

But a new study out of Dartmouth shows those conditions have also made snowfall in our mountains particularly sensitive to climate change. So sensitive, in fact, that ski resorts might be hard pressed to stay in their current business.

Global warming has caused total snowfall levels to decline significantly across the Southwest over the past 40 years, the study shows. Some spots now often get 40% less snow than they averaged before 1980.

For now, local snow droughts are still being interrupted — more often by more extreme storms, like last winter’s blizzards that blocked tourists from getting to the San Bernardino Mountains for a week and wreaked havoc on some communities for months. As global warming accelerates, though, lead researcher Alex Gottlieb said even winter storms will increasingly mean rain, not snow, for local mountains. So annual snowfall totals are projected to drop more rapidly here, in the Northeast and in parts of Europe in the decades to come.

“I think the picture moving forward is pretty unambiguous. We expect snow to continue to decline and to decline faster,” Gottlieb said. And absent “really, really aggressive mitigation of climate change,” his team’s research indicates that the possibility of Southern California having little to no snow in its mountains “is a very likely reality by the end of the century.”

For now, man-made snow can help fill the gaps. Area resorts, which have access to solid capital thanks to increasing consolidation in the ski industry, point to multi-million dollar investments they’ve made in snowmaking equipment to make that process more efficient. Mike Reitzell, president of industry trade group Ski California, said Southern California resorts now have some of “the best snowmaking systems around.”

Still, weather conditions have to be right, and water must be available, for crews to build a solid base from man-made snow. And global warming doesn’t bode well for the long-term future of those elements, either.

That’s of course bad news for those who enjoy hitting the slopes in the San Bernardino and San Gabriel mountains. It’s also, potentially, an existential crisis for residents of places like Big Bear, Running Springs and Wrightwood who work at local ski resorts or hotels, shops and restaurants that depend on the income bump snow chasers provide each winter. (A drop in snowpack, of course, also has serious implications for Southern California’s water supply, but that’s a topic for another story.)

That’s why Gottlieb said communities should make near-term and long-term plans: one to get through increasingly volatile storms and the other to survive winters with little or no snow at all.

“That is really what we’re hoping comes out of some of this work is giving some warning that enables that kind of longer-term adaptation to occur,” Gottlieb said.

“If you wait until you’re in this place where you’re experiencing these really rapid and dramatic declines, you’re sort of managing an emergency,” he said. By planning now, he added, mountain communities can “avoid some of the worst impacts of the loss that looks pretty inevitable in a lot of these places.”

Downward trend is clear

Ask long-time mountain residents about winters over the years and you’ll often get a similar response.

“It’s definitely changed,” said Rick Jaeger, 67, who’s called Big Bear Valley home since his parents moved him to town as a teenager in 1970. “We don’t get near the snow that we used to.”

Jaeger recounts one winter in the late ’70s when snow reached the eves of homes, after piling up as temperatures stayed cold through storm after storm. Or when an actress, whose name he can’t recall, posed for photos next to a car parked on Big Bear Lake when the lake was frozen solid.

These days, visitors have to be rescued each winter when they try to walk on thin ice that forms at the lake’s edge. And even if there is a decent storm, Jaeger said, the ice often starts to melt the next day, which means it just never seems to accumulate like it used to.

While such observations are anecdotal, they also match with data gathered by climate scientists.

Researchers at Dartmouth compiled historic snowpack totals from across the Northern Hemisphere each March. They found spring snowpack has dropped 5% to 10% per decade across the Southwest for the past 40 years.

To determine whether those drops were caused by humans burning fossil fuels, Gottlieb’s team turned to climate models. Researchers can run complex computer programs that show how the Earth functions with or without heat-trapping emissions, and how those emissions change snow levels.

“Where those two things look really different — where what we’ve observed in the real world is incredibly unlikely to have been able to arise just from natural, unforced variability alone — those are the places where we can really, confidently attribute our snowpack trends to climate change,” Gottlieb said.

They found the trends are the most clear and dramatic in the Southwest and Northeast regions of the United States, and in western and central Europe.

The snowline just keeps creeping higher up the mountains in these communities, Daniel Swain, a climate scientist at UCLA, noted during a discussion about recent storms in the area. While mountains above 8,000 feet are, so far, generally doing OK, Swain said global warming is making it harder for snowpack to accumulate at lower elevations. That, in turn, means it’s more likely that these places will see rain instead of snow.

Local mountain towns sit between 6,000 and 7,000 feet, while resort peaks range from around 7,800 feet at Snow Valley to 8,800 at Bear Mountain. That puts these communities right on the threshold between rain and snow, something residents saw play out Wednesday and lasted through Thursday, as the storm alternated between rain and snow in much of Big Bear Valley.

Areas further north and at higher elevations, where winter temperatures consistently average 17 degrees or below, are still seeing the same or even higher levels of snowfall, per the Dartmouth study. That’s because global warming means there’s more moisture in the air, which leads to more intense storms and more snow in very cold places like Siberia. But since local mountains have average winter temperatures in the 30s, Gottlieb said that makes them extremely sensitive to minor increases in global temperatures.

While the global temperature has risen 2 degrees since 1850, the rate of that increase has tripled over the past four decades. And Gottlieb said the impact on snow levels in sensitive spots like Southern California also is speeding up.

“You lose more and more snow with each degree of warming,” Gottlieb said. “And so what you get are these rapidly emerging and accelerating losses.”

Blips are part of the pattern

Last winter’s storms, which dropped up to 277 inches on local resorts, might suggest a “return to normal” for an area that’s long had cyclical precipitation patterns. But Gottlieb said that’s missing the forest for the trees.

Given the added moisture in the air due to global warming, he said it’s expected that we’ll still see some significant snow in local communities at this stage of global warming.

“We are absolutely still going to get big snowstorms, and even these incredibly snowy winters, like 2023, in the near to medium term, when things line up so that you’re getting hit by atmospheric rivers at a time when it’s cold enough that that happens to be falling as snow instead of rain.”

This new pattern, though, with longer snow droughts interrupted by more extreme snow storms, is already causing problems for resorts and other businesses that depend on them.

Instead of having multiple storms throughout the season that might dump six inches to a couple feet of snow, building up in colder temperatures as it did in Jaeger’s teens, the bulk of last year’s snow fell in short windows. That led to roofs collapsing, people getting stuck in their homes and a host of other problems. It also meant roads were closed to tourists for days.

Those storms — followed by Tropical Storm Hillary, which last summer wiped out a stretch of Highway 38 — really drove home the need to get local infrastructure ready for the likelihood of more wild weather in the years to come, according to Erik Sund, city manager for Big Bear Lake. That includes discussions around purchasing more snow removal equipment, boosting drainage, upgrading roads and making other improvements to systems his city inherited when it incorporated in 1980.

But the long-term data over recent decades still shows a clear pattern of less snowfall accumulating across the Southwest. And “the more we warm the planet,” Gottlieb said, “the more we’re loading the decks” for any future storms to bring rain instead of snow to local mountains.

Ski industry meltdown

The drop in snowfall and warming temperatures already are impacting ski resorts worldwide.

Last winter, conditions forced many resorts in Europe to close mid-season. Tour operator Ski Vertigo recently put out a study identifying five popular resorts in the Alps — from Chamonix in France to St. Moritz in Switzerland — that it says are most at threat from climate change.

This year, some resorts in Canada have already shut down, while Powder magazine reports that some never opened at all.

Dozens of independently owned resorts in places like Vermont and New Hampshire have closed in recent decades, Gottlieb said, because they don’t have the capital to invest in pricey snowmaking equipment. There were 66 fewer resorts across the United States in the 2022-23 season than there were in the 1991-92 season, per data from the National Ski Areas Association.

That drop has stabilized in recent years thanks in part to consolidation.

Local resorts illustrate the trend. Snow Summit and Bear Mountain were competitors for decades, until they merged in 2002 to become Big Bear Mountain Resorts. In 2014, Mammoth Mountain bought the Big Bear resorts. Then, in 2017, Colorado-based Alterra Mountain Company bought them all. And a year ago, Alterra made Snow Valley part of Big Bear Mountain Resorts.

Snow Valley turns 100 this year, and Justin Kanton, spokesman for Big Bear Mountain Resorts, said they’re working on upgrading that resort’s snowmaking equipment and other infrastructure. He called it a positive to be part of a larger company in times resorts can use a financial buffer, like when seasons start slowly as this one has.

Snowmaking buys time

Local resorts always aim to start the season before Thanksgiving, so they can capture crowds during that long holiday weekend. But over the past 24 winters (which is as far back as Big Bear Mountain Resorts’ official records go), there have been 14 Novembers where local resorts got zero snow.

This year, Snow Summit and Bear Mountain opened the Sunday after Thanksgiving, on Nov. 26, thanks to man-made snow. Mountain High opened Nov. 30 and Snow Valley opened Dec. 9.

To launch a ski season without help from Mother Nature, resorts often make just enough snow to establish a strip down their main runs. That process is expensive and takes lots of resources. That’s why, even though equipment can allow resorts to make snow at just about any temperature, Kanton said they only crank their systems up when humidity is low and the temperature is around 27 degrees or colder, conditions that ensure the snow they make is going to stick around.

Big Bear resorts get water for snowmaking from nearby Big Bear Lake, a man-made reservoir that’s not used for drinking water. The lake is entirely dependent on rain and runoff from melting snow, which makes it highly sensitive to drought. During a dry spell in 2004, the ski resorts extended their pipelines several feet deeper into the lake to ensure they could keep making snow.

Ski operations reduce the lake by up to six inches each winter, with up to 85% of that water returning to the lake when the snow melts in spring.

So long as resort towns have water supplies and cold enough temperatures, Gottlieb said snowmaking can buy them some time.

“But, at a certain point, even that is going to become increasingly challenging when you just have fewer days on which you can realistically make snow.”

A snow-free future?

When asked about predictions of a potentially snow-free future in Big Bear, Kanton pointed out how forecasts called for another dry winter last year before those massive storms hit.

Still, he said Big Bear Mountain Resorts has been trying to make better use of its facilities in the summer months. Snow Summit opens its lifts and runs to mountain bikers, and Kanton said they’re trying to get permits to do the same at Bear Mountain. They’ve added ziplining and other non-winter activities, too.

It helps that visitors who flooded mountain towns during the COVID-19 pandemic and worsening heat waves haven’t seemed to stop coming. Sund said recent tax revenues from area hotels and restaurants is on target despite the lack of snow at the start of the season.

There are ongoing talks about how to boost tourism to Big Bear during the shoulder seasons, Sund says. That includes adding more events, such as concerts, and other entertainment options.

“Those are exactly the types of conversations that need to be happening,” Gottlieb said.