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# **Mt. Shasta glaciers keep growing, despite warming**

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MOUNT SHASTA, Calif. (AP) - Global warming is shrinking glaciers all over the world, but the seven tongues of ice creeping down Mount Shasta's flanks are a rare exception: They are the only known glaciers in the continental U.S. that are growing.

Reaching more than 14,000 feet above sea level, Mount Shasta is one of the state's tallest peaks, dominating the landscape of high plains and conifer forests in far Northern California. Nearby Indian tribes referred to its glaciers as the footsteps made by the creator when he descended to Earth. Hikers flock to Shasta's peak every summer to scale them.

With glaciers retreating in the Sierra Nevada, the Rocky Mountains and elsewhere in the Cascades, Mount Shasta—the southernmost volcano in the Cascade range—is actually benefiting from changing weather patterns over the Pacific Ocean.

"When people look at glaciers around the world, the majority of them are shrinking," said Slawek Tulaczyk, an assistant professor of earth sciences at the University of California, Santa Cruz, who led a team studying Shasta's glaciers. "These glaciers seem to be benefiting from the warming ocean."

Climate change has cut the number of glaciers at Montana's Glacier National Park from 150 to 26 since 1850, and some scientists project there will be none left within a generation. Lonnie Thompson, a glacier expert at Ohio State University, has projected the storied snows at Africa's Mount Kilimanjaro might disappear by 2015.

Climate change has cut the number of glaciers at Montana's Glacier National Park from 150 to 26 since 1850, and some scientists project there will be none left within 25 to 30 years. Lonnie Thompson, a glacier expert at Ohio State University, has projected the storied snows at Africa's Mount

Kilimanjaro might disappear by 2015.

But for Shasta, about 270 miles north of San Francisco, scientists say a warming Pacific Ocean means more moist air. On the mountain, precipitation falls as snow, adding to the glaciers enough to overcome a 1.8 degree Fahrenheit rise in temperature in the last century, scientists say.

"It's a bit of an anomaly that they are growing, but it's not to be unexpected," said Ed Josberger, a glaciologist at the U.S. Geological Survey in Tacoma, Wash.

By comparison, the glaciers in the Sierra Nevada, more than 500 miles south of Mount Shasta, are exposed to warmer summer temperatures and are retreating.

The Sierra's 498 ice formations—glaciers and ice fields—have shrunk by about half their size over the past 100 years, said Andrew Fountain, a geology professor at Portland State University. He inventoried glaciers in the continental U.S. as part of a federal initiative.

He said Shasta's seven glaciers are the only ones scientists have identified as getting larger.

Glaciologists say most glaciers in Alaska and Canada are retreating, too, but there are too many to study them all.

Although Mount Shasta's glaciers are growing, researchers say the 4.7 billion cubic feet of ice on its flanks could be gone by 2100. For the glaciers to remain their current size, Shasta would have to receive 20 percent more snowfall for every 1.8-degree Fahrenheit increase in temperature, Tulaczyk said.

The Shasta glaciers have been advancing since the end of a drought in the early 20th century. The mountain's smallest glaciers—named Konwakiton, Watkins and Mud Creek—have more than doubled in length since 1950.

Hikers seeking to cross Shasta's glaciers—marked with crevasses as deep as 100 feet—say they are much larger than the boundaries drawn on geological maps.

"I noticed I was traveling down farther than the maps were showing it," said Eric White, a U.S. Forest Service ranger who has climbed Shasta for 23 years.

Four glaciers at Washington's Mount Rainier are staying about the same size. Those glaciers—shielded from the sun on the mountain's north and

east sides—have received just enough snow to keep them from shrinking.

The added ice on Mount Shasta might be good for the state's water supplies. Hydrologists believe the glaciers feed springs and aquifers, though they say it's unclear precisely how the water travels underground.

Until recently, the same phenomenon that is benefiting Shasta's glaciers was feeding glacier growth in southern Norway and Sweden, the New Zealand Alps and northern Pakistan, according to the U.N. Intergovernmental Panel on Climate Change.

In each area, scientists say, more snowfall temporarily offset warming temperatures in the 1990s and early 2000s. But rising temperatures since then have begun to shrink the ice.

Climate change is causing roughly 90 percent of the world's mountain glaciers to shrink, said Thompson, the Ohio State glacier expert.

"Best that we keep our eye on the big picture," Thompson said in an e-mail about Shasta's unique position. "The picture points unfortunately (to) massive loss of ice on land, which has huge implications for future sea level rise."

Global forecasts show temperatures warming from 2 degrees to 11.5 degrees Fahrenheit by the end of the century if no major efforts are undertaken to reduce greenhouse gas emissions. At that rate, California's snowpack and its remaining glaciers are among the most vulnerable of its natural resources.

Even without global warming, another threat to Shasta's glaciers could come far more quickly: a volcanic eruption could melt them, creating mud flows that could bury the surrounding small communities.

Over the last 4,000 years, Shasta has erupted about every 250 to 300 years, and did so most recently about 200 years ago, said William Hirt, a geology instructor at the College of the Siskiyous.

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On the Net:

Shasta-Trinity National Recreation Area:

<http://www.fs.fed.us/r5/shastatrinity/recreation/nra/index.shtml>

