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High and dry

Shorter, drier winters and earlier springs could foretell a future of water shortages, savage wildfires and shorter seasons for the ski industry

JEFF DELONG

RENO GAZETTE-JOURNAL
Posted: 5/13/2007
STORY CHAT(read or post comments)

In the Sierra, the stakes of a warming climate could be as high as the towering peaks of granite.

Climbing temperatures already are taking their toll as ice melts, trees dry and wildfires scorch a vulnerable landscape.

In the years ahead, precious winter snow that now coats the mountains, providing the water critical to both Nevada and California, could be replaced by rain. Water storage could be affected, in some cases severely, and damaging winter floods could become increasingly frequent.

"The overall ecological health of the Sierra Nevada is so important we would be remiss not to take this seriously," said Jeff Underwood, Nevada state climatologist. "If there's a place that's going to have a horse in this race, it's Reno. We have a big stake in this."

For years, intense debate has swirled around the issue of global warming. Many experts have long insisted that documented temperature increases around the globe are directly

The experts

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SPECIAL REPORT | The Warming Sierra

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associated with human-caused greenhouse gas emissions.

Critics countered that the phenomenon is likely part of a natural cycle of varying temperatures that has been improperly characterized by alarmists.

In February, a panel of international scientists sought to close debate over an issue they said threatens the planet's future. The Intergovernmental Panel on Climate Change, composed of experts from 113 governments, declared that global warming is real and that humans are "very likely" its cause.

"We're creating a different planet," the report's co-author, Kevin Trenberth of the U.S. National Center for Atmospheric Research, told the Associated Press in Paris.

The IPCC predicts global temperature increases of between 2 and 11.5 degrees Fahrenheit by the year 2100. The United States could experience a 10-degree temperature rise by the end of the century, scientists agreed.

Sea levels could rise. The number of droughts and catastrophic storms could increase. The panel detailed many potential consequences of a warming planet.

In early May, the IPCC issued another report encouraging significant cuts in gas emissions through increased reliance on renewable energy, improved fuel efficiency and similar efforts. Such steps, if pursued aggressively, could realistically slow the dangerous trend of a warming climate, the panel concluded.

Not all experts are convinced humans are responsible for rising temperatures. Richard S. Lindzen, a scientist at the Massachusetts Institute of Technology, believes it's all part of a natural cycle that has nothing to do with greenhouse gases.

"Climate is always changing, for crying out loud," Lindzen said. "We used to just remark on it. Now we're deciding we're responsible."

Efforts to put the blame on humans, Lindzen argues, "trivializes the dynamic nature of the world we live in."

But even if the cause of the phenomenon remains open to debate by some, Lindzen and others agree that the very real impacts of a warming climate must be addressed.

Sierra temperatures up



TIM DUNN / RENO GAZETTE-JOURNAL



Ice forms from water leaking out of a wooden flume above the Truckee river during January's persistent cold snap.



"We used to have races across Donner Lake. Back then it would stay at zero for two or three weeks. It's been quite awhile since we've had that," says Reg Smart, 90, who moved to Truckee after World War II.

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In the Sierra, John Muir's famous "range of light," changes are already being observed.

At Reno's Desert Research Institute, scientists have been tracking rising temperatures in the Sierra and across California as part of that state's efforts to confront climate change.

Researchers have compiled temperature records from nearly 200 stations statewide that indicate mean temperatures have risen about 2 degrees over the last 30 years, said Kelly Redmond of DRI's Western Regional Climate Center. Changes have been particularly striking when one looks at nighttime minimum temperatures, which have risen more than 2 degrees.

It was certainly noticeable in Reno last June, when nighttime low temperatures stayed in the 70s for an unusually long span.

"That was unheard of in Reno's history until 10 or 15 years ago," Redmond said. "Reno has had a great deal of very warm nights, nights that we would never have expected to see around here."

At Tahoe City, where historic temperatures often dipped below zero, Redmond said subzero temperatures weren't experienced for 12 years straight. The span was broken by a cold snap last January, when temperatures dipped to 2 below zero for a single night.

The January event, which burst water pipes across the region, is not a surprise, Redmond said. Exceptions to a gradual warming trend that started roughly 50 years ago and significantly accelerated in the mid-1970s are to be expected, he said.

Worldwide, the winter of 2006-2007 was the warmest on record, according to the National Oceanic and Atmospheric Administration. March was the second-warmest on record across the U. S. and the fifth warmest on record worldwide, the NOAA reported.

In a process that Redmond compared to piecing together evidence at a crime scene, researchers have documented warming trends in different ways. Weather balloons launched by the National Weather Service in Reno indicate the atmosphere is heating up at "roughly the same rate" as the surface, Redmond said. Bore holes drilled into the ground indicate the heating is occurring downward from the surface and into the rock as well, he said.

"Most of the pieces of evidence are pointing in the same direction," Redmond said. "If we have multiple lines of evidence that all fit together, that tells us something is going on."

While he once questioned conclusions that the trend in temperature increases is definitely linked to human discharges of carbon dioxide and other greenhouse gases, "the doubt is starting to disappear in my mind," Redmond said. "It's becoming harder and harder to say why else it is happening."

Residents notice change

Some folks feel the change in their bones.

Born and raised in Truckee, Mary DeLisle remembers many cold winters while growing up. Once, temperatures plummeted to 37 below, a frigid point in time that she said people dealt with by stoking pot-bellied stoves and sleeping in flannel sheets.

"You'd breathe and your breath would freeze," recalls DeLisle, 86. "It was terrible."

She has noticed the changes in recent years.

"It used to be below zero a lot," DeLisle said. "It is warmer now. It's something I've noticed, I don't know for how long. Quite a few years, I guess."

This winter's cold snap, which produced frigid temperatures across the region -- freezing Donner Lake over for the first time in years -- reminded 90-year-old Reg Smart of the old days.

Smart, who moved to Truckee to open a restaurant after World War II, said deep cold used to hit the area much more frequently.

"We used to have races across Donner Lake," Smart said. "Back then, it would stay at zero for two or three weeks."

Decades ago, extended periods of subzero temperatures would come every three or four years, Smart recalls.

"It's been quite a while since we've had that," he said.

Glaciers on the go?

At some of the Sierra's highest peaks, warming is taking a toll on mountain glaciers.

Glaciologist Andrew Fountain and students at Portland State University have studied the retreat of glaciers in mountains across the West for several years.

In the Sierra, their work has focused on six glaciers located just near Yosemite National Park and Kings Canyon. Researchers gauge the degree and rate of glacial retreat by comparing photographs taken of the ice masses since 1900.

They found that, on average, melting Sierra glaciers retreated between 50 percent and 75 percent over the last century. The rate of retreat has slowed in recent years because the glaciers are now mostly in shadowed terrain, Fountain said.

"The environment they're in now is the most cozy, protected part of the topography," Fountain said. "It's like when a boxer goes into a more protected position. It's harder to knock them out."

If temperatures continue to climb at the present rate, the Sierra's glaciers could disappear as soon as 80 years from now, Fountain said.

The glaciers are small today -- maybe the equivalent of a few football fields put together -- and their loss would have no major impact on water resources, Fountain said.

What is significant is what the trend could mean for precious water stored in the snowpack.

"The glaciers are really a harbinger of what's going on in the Sierra," Fountain said. "They are the poster child of what's happening to the snowpack. That's why people get worried -- that's where your water is coming from."

Plants react

Thermometer readings and photographs aren't the only way scientists have tracked a warming climate. One oft-cited study focused on the timing of snowmelt runoff and the blooming of lilac and honeysuckle bushes across the West.

The study found, essentially, that spring has been arriving sooner since the mid-1970s, with both the snowmelt coming earlier and plants blooming earlier because of rising temperatures.

"We are pretty confident spring has advanced by an average of a week," said the report's co-author, Daniel Cayan of the Scripps Institution of Oceanography. "I think these are important because they are independent measurements of warming."

Researchers suspect the early arrival of spring is due in part to a natural fluctuation in weather

tied to ocean temperatures in the north Pacific.

But that phenomenon can't explain the changes in runoff and plant blooming entirely, Cayan said.

"Something else is a player, and our suspicion is that global temperature change, global warming, is probably a factor," Cayan said.

Connie Millar, a senior research scientist with the U.S. Forest Service, worries about how warming could impact the Sierra's plants and trees. Research indicates that some tree species in the subalpine region, generally between 9,000 and 11,000 feet in elevation, appear to be migrating upward as temperatures warm, Millar said.

That could put them at risk of what researchers have dubbed as "elevational squeeze."

"As temperatures warm, plants will want to move uphill, and as they move uphill, they run out of space," Millar said, adding that similar trends are occurring east of the Sierra in Nevada's Great Basin.

A changing climate also appears to be prompting trees to migrate into Sierra meadows -- places where it was previously too cold for them to thrive, Millar said.

"It wants to become a forest. That's where climate is driving it," Millar said. "Meadow habitat across the Sierra is being lost because it is warming up."

Millar also studied a significant die-off of high-elevation limber pine in the eastern Sierra between 1985 and 1995. That event is believed to have resulted from the combined effects of a warming climate and a protracted drought, which stressed the trees and made them vulnerable to attack by pine beetles.

Increasingly, Millar said, beetles are attacking trees in western mountains at higher elevations than has been seen before. Dead and dying trees could bring wildfires to altitudes where they were never previously a problem, she said.

That has already occurred in the Cascades, Millar said, and "we would anticipate seeing that in the Sierra as well."

Animals on the move

The Sierra's critters appear to be reacting to changes as well.

That's one possible conclusion by scientists from the University of California Berkeley's Museum of Vertebrate Zoology. They have been retracing the work of biologist Joseph Grinnell, who hiked the forests and meadows of Yosemite National Park 90 years ago to study the animals found there.

Studying the same areas in modern times, researchers found some interesting changes, said James Patton, a biologist and museum curator.

Several different species of rodents in Yosemite appear to have moved substantially upwards in elevation -- sometimes by thousands of feet -- since Grinnell did his original research, Patton said.

One was the pinon mouse, which previously was never found above 7,800 feet on the park's eastern side. Researchers now find the mouse living as high as 10,500 feet.

The alpine chipmunk, once commonly found in Tuolumne Meadows and other areas of the park at elevations around 7,600 feet, has disappeared there.

"It's not there anymore," Patton said. "We only find it above 9,600 feet today."

While researchers aren't certain global warming is entirely responsible for the animals' upward movements, the change is "concordant" with other evidence of climate change in the Sierra, Patton said.

DRI's Redmond described the evidence of animal movement as important.

"That's the animals voting with their feet where they want to live," he said.

Reaction needed

The time to debate global warming is over and the time to take serious action to reverse the trend caused by greenhouse gas emissions is at hand, said Michael Dettinger, a Scripps climate scientist.

Dettinger said the Sierra, where the snowpack and the vital water it provides is at real risk, could offer one of the more dramatic examples of the dangers posed by a warming climate.

"I'm concerned that 'we don't know enough to do anything' is a dangerous tactic to take," Dettinger said. "This isn't something we'll be leaving for our grandkids. We'll be lucky if we're retired before we start seeing changes that are of practical importance.

"I believe we're right on the verge. I feel a lot of urgency."

DRI's Redmond agrees.

"This does matter for us," Redmond said. "It's not just academic."

Story Chat

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Good to focus on the consequences

Sun May 13, 2007 5:35 pm

Although it is laughable to say that scientists don't know if global warming is natural or manmade, I understand why the paper said this. There are many people who try to distract from the problem by saying it is natural, which is hogwash. I am glad that the paper focused on the consequences, which will hit the Reno-Sparks community hard sometime in the future, perhaps sooner than we think. Public officials need to start planning for the future without as much water, or at least, not as much water in the form most useful (snow in the mountains) and not at the right time of year. Don't buy a house on the river, and don't buy stock in ski resorts. The sad thing is that while the deniers try to throw up smoke-screens, it is really just a technological solution. What does it harm us to change our technology and become more efficient? That kind of change will only bring progress and make the capitalists happy. Aren't we always patting ourselves on the back for improving productivity? Here is a grand opportunity to raise our productivity with more efficient uses of energy. The only reason to argue against changing our ways is if you believe that the oil companies deserve all those billions of dollars of profit that they are getting. I say pay them back. Leave them in the dust. Find a better technology to keep our economy running. Otherwise we risk paying a much higher cost down the road when everything begins to go haywire. By then it may be too late.

More Climate Data

Sun May 13, 2007 5:28 pm

Howdy, folks.

Biggestlittle, you seem to have overlooked some of the tables on that link you posted. I see several record highs set since 2000, including the all-time record of 108 July 11th, 2002.

Here's an article from NOAA with some relevant data on the statistic most often discussed in relation to climate change, specifically mean temperatures rather than extremes such as record daily highs and lows. Hope y'all enjoy.

<http://www.ncdc.noaa.gov/oa/climate/research/2007/jan/jan07.html>

Reader Comment

Sun May 13, 2007 10:18 am

It would be very smart to stop producing greenhouse gases regardless of whether it's causing global warning. It's almost impossible to say if our planets warming is caused by us or a natural cycle of warming and cooling, but being "green" cannot hurt.

Article VERY LIGHT ON DATA

Sun May 13, 2007 9:30 am

Here is the offical governement data. The last monthly record set for a high in Reno was set in 2000. SEVEN years ago. What has happened the last 7 years? Maybe the RGJ should do an article series on the 7-year cooling trend.

<http://www.wrcc.dri.edu/summary/Climsmnv.html>

climate change

Sun May 13, 2007 8:42 am

I cannot understand how a scientist at MIT can ignore basic science. I learned that greenhouse gases, CO2, methane, water vapor, kept the heat in and prevented the earth from having a climate like Mars in eighth-grade science class in 1971. I remember thinking that increasing those gases would increase the amount of heat left in. I remember discussions in the 70s about the potential coming of the next ice age, and that increasing greenhouse gases may prevent the ice age or make its effects less. The science of the "greenhouse effect" has always been correct; it's the extent of warming or whether it would just dampen the next ice age that was the question. Now, based on a myriad of evidence, global warming is a fact. How can a PhD in climatatology still ignore that substantial increases in the very substance that prevents our planet from being like Mars would not increase the amount of heat that the atmosphere keeps in? Uncertainty remains, but the basic cause and effect relationship is certain.
Tom

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