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Climate Change Threatens to Strip the Identity of Glacier National Park

By MICHAEL WINES NOV. 22, 2014

GLACIER NATIONAL PARK, Mont. — What will they call this place once the glaciers are gone?

A century ago, this sweep of mountains on the Canadian border boasted some 150 ice sheets, many of them scores of feet thick, plastered across summits and tucked into rocky fissures high above parabolic valleys. Today, perhaps 25 survive.

In 30 years, there may be none.

A warming climate is melting Glacier's glaciers, an icy retreat that promises to change not just tourists' vistas, but also the mountains and everything around them.

Streams fed by snowmelt are reaching peak spring flows weeks earlier than in the past, and low summer flows weeks before they used to. Some farmers who depend on irrigation in the parched days of late summer are no longer sure that enough water will be there. Bull trout, once pan-fried over anglers' campfires, are now caught and released to protect a population that is shrinking as water temperatures rise.

Many of the mom-and-pop ski areas that once peppered these mountains have closed. Increasingly, the season is not long enough, nor the snows heavy enough, to justify staying open.

What is happening here is occurring, to greater or lesser extents, in mountains across the North American West. In the Colorado Rockies, the median date of snowmelt shifted two to three weeks earlier from 1978 to 2007.

In Washington, the Cascades lost nearly a quarter of their snowpack from 1930 to 2007. Every year, British Columbia's glaciers shed the equivalent of 10 percent of the Mississippi River's flow because of melting.

The retreat is not entirely due to man-made global warming, though scientists say that plays a major role. While the rate of melting has alternately sped up and slowed in lock step with decades-long climate cycles, it has risen steeply since about 1980.

And while glaciers came and went millenniums ago, the changes this time are unfolding over a Rocky Mountain landscape of big cities, sprawling farms and growing industry. All depend on steady supplies of water, and in the American West, at least 80 percent of it comes from the mountains.

“Glaciers are essentially a reservoir of water held back for decades, and they're releasing that water in August when it's hot, and streams otherwise might have low flows or no flows,” Daniel B. Fagre, a United States Geological Survey research ecologist, said in an interview. “As glaciers disappear, there will be a reduction in the water at the same time that demand is going up. I think we're on the cusp of bigger changes.”

But shrinking glaciers are only the visible symptom of much broader and more serious changes. “We're a snow-driven ecosystem, and glaciers are just a part of that,” Dr. Fagre said. “The way the snow goes is the way our ecosystem goes.”

Lately, the snows are not going well.

Mountain snowpacks are shrinking. In recent decades, rising winter temperatures have increasingly changed snows to rain. Rising spring temperatures are melting the remaining snow faster.

“Imagine turning on your faucet in your sink and all your water runs out in an hour's time,” Thomas Painter, a research scientist and snow hydrologic expert at NASA's Jet Propulsion Laboratory, said in an interview. “Loss of snowpack earlier in the year compresses runoff into a shorter period of time.”

Glaciers and year-round snowfields — accumulations of snow in colder locations, like shadowed mountainsides, that never fully melt — pick up the slack in summer. But they, too, are vanishing: In Glacier National Park, the number of

days above 90 degrees has tripled since early last century, and the summertime span in which such hot days occur has almost doubled, to include all of July and most of August.

Winters are warmer, too: A century ago, the last brutally cold day typically occurred around March 5. By last decade, it had receded to Feb. 15.

Dr. Fagre, the park's resident expert on snowpacks, glaciers and climate change, can see the changes firsthand. Grinnell Glacier, one of the park's most studied ice sheets, feeds a frigid lake on the flanks of Mount Gould, more than 6,000 feet above sea level. "At the beginning, we had a 25-foot-high wall of ice that we were actually concerned about from a safety standpoint," he said. "And now the entire glacier simply slopes into the water, with no wall of ice whatsoever.

"All of that has melted just within the last 10 years."

At Clements Mountain, with a summit some 8,800 feet above sea level, what used to be a glacier is now a shrinking snowfield surrounded by 30- and 40-foot heaps of moraine, stones piled up by the ice as it pushed its way forward. One recent fall day, freshets of melted snow tumbled over rock ledges and down hills, past stands of Rocky Mountain firs.

But that will change.

"This snowfield will vanish," Dr. Fagre said. "When that happens, this whole area will dry up a lot. A lot of these alpine gardens, so to speak, are sustained entirely by waterfalls and streams like this. And once this goes, then some of those plants will disappear."

For wildlife, Dr. Fagre said, the implications are almost too great to count. Frigid alpine streams may dry up, and cold-water fish and insects may grow scarce. Snowfall may decline, and fewer avalanches may open up clearings for wildlife or push felled trees into streams, creating trout habitats. Tree lines may creep up mountains, erasing open meadows that enable mountain goats to keep watch against mountain lions. A hummingbird that depends on glacial lilies for nectar may arrive in spring to find that the lilies have already blossomed.

Trekking across what is left of the Clements snowfield, Dr. Fagre unexpectedly encountered a long-clawed paw print: from one of perhaps 300

wolverines said to remain in the lower 48 states. These solitary, ferocious animals have come back after trappers nearly eliminated them decades ago, but conservationists and federal wildlife experts are sharply at odds over whether rising temperatures imperil them.

“Wolverines need deep snows to build their winter dens,” Dr. Fagre said. “I’m not sure what’s going to happen to them.”

For people, the future is somewhat clearer.

Rising temperatures and early snowmelt make for warmer, drier summers as rivers shrink and soils dry out. That is already driving a steady increase in wildfires, including in the park, and disease and pest infestations in forests.

But in the long term, the ramifications are more ominous than a mere rise in fires or dying trees.

Moisture loss from early snowmelt is worsening a record hydrological drought on the Colorado River, which supplies water to about 40 million people from the Rockies to California and Mexico; by 2050, scientists estimate, the Colorado’s flow could drop by 10 percent to 30 percent.

In the usually arid West, where reservoirs are vital, earlier and bigger snowmelt will disrupt the task of balancing water demand and supply. Experts anticipate an increase in disputes over water rights as a growing population competes for a shrinking resource. And farming, a major industry across much of the Rockies, will become even more of a gamble than fickle weather makes it.

Indeed, complications have already surfaced. Dennis Iverson runs a 140-head cow-and-calf operation on several thousand acres about 25 miles northeast of Missoula, Mont. Five hundred acres are hayfield, irrigated with water from the Blackfoot River about one and a half miles away.

Twenty years ago, the water flowed through an open ditch, and from the time the irrigation pumps were started on May 20, “we were able to irrigate the whole ranch,” he said. “There was always enough water, even to do some irrigating in July and August.”

Now, Mr. Iverson starts the pumps on May 10, because a hotter spring has already dried out his pasture. The open irrigation ditch has been converted into an 8,000-foot underground pipe to prevent evaporation. “If we hadn’t done that,

we wouldn't even be getting water to the ranch," he said. "There's that much less water in the stream than there was 20 years ago."

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