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WALK IN THE PARK: THE AUTHOR'S PARTY ENCOUNTERS AN UNUSUAL MARCH THAW ALONG GLACIER'S GOING-TO-THE-SUN ROAD.

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Ghosts of Glacier

This park's rivers of ice have flowed for 7,000 years; they'll be gone in 30. *By Michael Lanza*

YOU DON'T BUY BACKCOUNTRY SKIS so you can carry them on your back. They ruin your balance, snag on low branches, and weigh more than a winter tent. Yet here we are, on the last day of March, at nearly 4,500 feet in Glacier National Park, reluctantly strapping 10-pound boards to our packs and toeing the dirt like kids whose baseball game has just been cancelled.

Grumbling a little about the extra weight, we gather around Dan Fagre, senior climate-change ecologist at

Glacier and the leader of our four-day trip into the park's backcountry. A serious 54-year-old with a Ph.D. refined by two decades of field research, Fagre is the author of several studies on the impact of warming temperatures on the park's spectacular landscape and biodiversity. For the last 16 years, he's managed a team of a dozen researchers and field workers at the West Glacier field station of the USGS's Northern Rocky Mountain Science Center, tasked to track climate change in the park. Fagre was one of

the first scientists to predict, based on computer models his group developed, that the park's glaciers would disappear within the lifetimes of most people reading this story.

But computer models lack the drama and gut-punching reality of what we're seeing here. We expected the Rising Sun parking lot to be snow-covered, but the asphalt is bare. A month ago, Fagre recorded 4 feet of snow here, typical for late winter at this elevation. Then came several days above 60°F—heat rarely seen in Glacier before July—and a massive melt-off. We peer through the mist for the snow line, finally glimpsing it on the surrounding mountain slopes when the low, gray clouds momentarily part. It's hundreds of feet above us.

This is climate change up close. In late March, the park's snowpack should still be growing; it should still be a month away from reaching its maximum depth. Yet at nearly a mile high, it's melted away. For the Glacier veterans in our group, the altered landscape is almost too bizarre to comprehend. It's as if we'd thrown our beach towels in the trunk and driven to Malibu only to discover the Pacific had receded a few dozen miles.

"Welcome to the global-warming world," murmurs Fagre.

PHOTOGRAPHER COREY RICH AND I have joined Fagre and two of his assistants, Karen Holzer and Chris Miller, to witness firsthand how this park is melting. Our plan was to ski a flat 4 miles along unplowed Going-to-the-Sun Road to a rustic one-room cabin in the woods. The next day, we'd ascend 3,000 feet on skis to Preston Park, an alpine basin where Fagre is conducting a multiyear study of snowpack depth. Instead, we're hiking pavement that's bare as far as we can see.

As we walk, Fagre calls out signs of climate disarray. At Dead Horse Point, where snow from avalanches usually accumulates into a hill so big that Fagre's team has to drop off the road to skirt it, we stroll across a lingering patch of white a few inches deep. Fagre



MAKING TRACKS: SPARSE SNOW FORCES DAN FAGRE TO SHOULDER HIS SKIS ON THE APPROACH TO GLACIER NATIONAL PARK'S PIEGAN PASS TRAIL.

nods at one mountainside of bare rock and turf with scattered ribs of snow. "Wow," he mutters, almost to himself. "That's normally all white now. This looks like June."

Noting the unusually high snow line on the slopes above us, Fagre explains how these early melts occur. In a typical winter, the snow near the ground is much colder than the surface snow, which absorbs more solar heat. As a result, the insulated cooler bottom layers won't melt until their temperature rises above 32°F, even if the air temp breaks the freezing mark. But this year, much of the snow accumulated in warmer-than-average temperatures (30°F instead of 20°F), and the snowpack never got very cold. When the recent heat wave hit, the pack was primed to liquefy, and what should

have stuck around for many more weeks disappeared within a few days.

We reach the cabin without clicking into our skis. Fagre shakes his head. He's shocked by what he's seeing, even though he's far more informed than most about what's in store for North America's mountains and glaciers.

Fagre (pronounced *FAY-gree*) is stocky and a bit shy of 6 feet tall, with straight hair neatly parted to one side, giving him the well-scrubbed look of a grown-up altar boy. Today, with a house just outside the park's west entrance, he knows Glacier as well as his own backyard. But back in 1991, when he accepted his current position as Global Change Research Coordinator, he'd never seen the park up close.

Like many of his colleagues, Fagre was led to this work by his abiding

love for the outdoors. While attending Arizona's Prescott College in the mid-1970s, he contemplated a career in outdoor recreation. Since then, he has become one of the country's most sought-after authorities on alpine climate change. His resumé is packed with academic degrees, awards, and published articles and books, and he speaks at conferences all over the world. Before our trip, Fagre had emailed an apology for his delayed response to a note I'd sent him: "I've been in the backcountry for a snow collection, testifying at our state legislature, and, today, must answer a congressional inquiry."

Later that night, we sit around the cabin's woodstove, trading the typical tales of folly and adventure that backpackers enjoy. Fagre begins to relax; he's no longer the dispassionate scientist I met at a January climate conference. As he talks about a close call with crumbly rock on a climbing trip in Glacier, he shakes his head and a broad smile creases his face. He laughs heartily, just another guy who loves being in the mountains. Soon, he's cutting loose with stories culled from years of climbing, skiing, and hiking, including one Baja epic about his group running out of water, only to find it a day later when Fagre climbed a peak and spied the lush valley they'd been seeking.

Always in demand for his expertise, Fagre now makes fewer backcountry trips than he'd like, but his assistants backpack and ski in almost every week. They do the scientific legwork; this weekend, they'll use avalanche probes and hollow metal pipes to check snow depth. They also gauge stream runoff and the rate at which trees are advancing into subalpine meadows. Their objective? To predict what consequences a warming climate will bring to this million-acre park.

Already, the team's findings leave no doubt that Glacier's landscape and ecosystems are in for a major overhaul. Fagre expects, among other things, more frequent and catastrophic wildfires, resulting in a more homogeneous



GAUGING WINTER:
USGS SCIENTIST
KAREN HOLZER
RECORDS SNOW-
DEPTH DATA AT
PRESTON PARK.

forest habitat and more days of diminished air quality and views. Treeline will creep higher over the next few decades, gobbling up Glacier's eye-popping subalpine meadows, the primary habitat for mountain goats and marmots. Snow will melt out in the mountains earlier in spring (it already melts nearly three weeks earlier than it did 50 years ago), with a host of repercussions for stream flows and aquatic life, including trout. And water shortages will affect millions of people in the West, where modern life depends on a regular supply of snowmelt.

"Some of these things are already happening in Glacier," says Fagre, "and within 50 years they will profoundly change the alpine environment here."

But the most devastating change in real and symbolic terms will be the

disappearance of the park's namesake glaciers for the first time in at least 7,000 years. The melt actually began in 1850—the close of the 300-year Little Ice Age—but its recent acceleration has made Glacier the poster park for global warming. The mean summer temperature here has jumped 3°F in the last century, at least double the worldwide increase. Of the 150 glaciers in the park in 1850, only 27 remain; the glaciated area has declined by 72 percent, ice volume by 90 percent. Most surviving glaciers are tiny remnants—little more than glorified snowfields.

"The glaciers are undoubtedly going to disappear within a few decades," Fagre says matter-of-factly. I question the unequivocal nature of his statement: "What if we change our ways?" I ask. "Isn't there some chance of

reprieve?" He pauses before giving me the layperson's explanation. Carbon, he says, lasts for decades in the atmosphere; even assuming the impossible, that humans stopped burning fossil fuels tomorrow, the gases we've already pumped into the sky will continue raising average temperatures through this century. The glaciers here don't stand a chance.

One model predicts that the park's glaciers will disappear by 2030, but the reality is more complicated—and possibly scarier. That model was based on mid-'90s data, and temperatures since then have risen faster than most models projected. Fagre points to a 1998 analysis of the park's biggest ice sheets, Blackfoot and Jackson, which confirmed that they had shrunk to the size scientists didn't expect to see until 2010. Across the park, Fagre says, "glaciers are melting approximately 10 years ahead of the predicted rate." A few stragglers might survive past 2030 as they retreat into north-facing cirques,

but he now believes they'll be the exceptions.

HEARING THIS, I FORM A MENTAL image of a summer day a couple decades from now, when the park's last square foot of gleaming glacier melts away into the cracked mud. I wonder if Americans will notice, or if the occasion will pass quietly as that last fleck of ice dissolves to water. Fagre and his team won't let it go without a fight, but the country's current indifference troubles me. What will it take, I wonder, to grab everyone's attention?

In the morning, we start up the road on 2 inches of new snow. Flurries trickle from a low, iron-roofed sky. As we turn up the steep Piegan Pass Trail, a full-on squall envelops us, painting white highlights on the forest of towering Douglas firs. Later, the sun moves in and out of clouds as we ascend into Preston Park, where narrow bands of subalpine firs alternate in neat rows with snow-blanketed meadows. A

horseshoe of peaks—Piegan, Siyeh, and Matahpi—corrals this mile-long basin, their huge walls plastered with tongues of ice and snow. Beyond Piegan Pass loom the 2,000-foot cliffs of the Garden Wall, the bladelike rampart forming the Continental Divide. Holzer points out a pair of eagles circling on the wind.

I ask Fagre if this landscape has lost any of its appeal for him, after nearly two decades. He answers quickly. "You never get tired of it. I think every year you wake up to it anew, and it's just like the first time you ever saw it."

Then he points above the western edge of Preston Park toward Piegan Glacier, which sits just below 8,000 feet in the shadow of a high cliff. The glacier's abundant shade and snowfall preserved it for centuries, but no longer. "The warming has overwhelmed all of those advantages," he says. "Last summer, we began to notice exposed ice [on the glacier], which is a strong indication that unprotected glaciers are melting at an even more accelerated rate."

I'm struck by a sadness that my two children, 6 and 4, will never see what I'm seeing today. By the time they reach my age, this park will look radically different. Mountains and glaciers, arguably the most dramatic landscapes on earth, will change the most, as their layers of ice and snow diminish greatly and disappear. Much of this outcome is inevitable—our carbon-dependent lifestyle has cast the die. The question still to be answered is whether the emerging reality of melting glaciers and vanishing species motivates us to act.

By late afternoon, the overcast sky dims to a flatter gray; the air grows noticeably colder. Fagre and his team pack up their equipment. We have three hours of daylight left, and it will take that long to ski back down to the cabin. As I click into my skis, it occurs to me that Fagre has both his dream job and the grimmest of tasks. He clearly loves these mountains, but he's also assigned to document their demise. Whatever satisfaction he may get from

the attention his research brings to global warming must be mitigated by the fact that—for the glaciers of his favorite national park—it's too late.

I ask him about this, expecting to unearth some hidden anger. But it's not there. "We can't stop the glaciers from melting," he says. "But we can use these events in an instructive way, as a teachable moment, to catalyze action."

Fagre is encouraged by recent steps taken by park officials. Starting in 2006, interpretive rangers have received training to speak to visitors about climate change. This summer, free biodiesel shuttles operated along all 53 miles of Going-to-the-Sun Road, making stops at several trailheads. New exhibits at the Jackson Glacier Overlook and Grinnell Glacier trailhead explain the impact of global warming on park landmarks.

But there's much more to do, and a larger audience to reach. Fagre hopes that his work, and the imminent loss of the park's iconic glaciers, will shock the voting public into action. To that

end, his schedule stays packed with outreach efforts, including an invitation to testify before Congress.

For now, though, we're just five powder hounds chasing a last run. We ski downhill, a long, fast glide, with a few deep turns on steeper pitches. Clouds wrap like loose scarves around the peaks. Except for the hiss of our skis, the forest is so quiet you can almost hear an era coming to a close. ❧

PLAN IT GLACIER NATIONAL PARK

Map Trails Illustrated 215, *Glacier/Waterton Lakes National Parks*

Outfitter Glacier Guides (800-521-7238, glacierguides.com)

Reading *Hiking Glacier and Waterton Lakes National Parks: A Guide to More Than 60 of the Area's Greatest Hiking Adventures*, by Erik Molvar

Permit Reserve a backcountry permit (\$5/person/night) between June 15 and October 31; the fee is \$30. Half of backcountry campsites are assigned first-come no more than a day in advance. The park entrance fee is \$25 per vehicle for 7 days.

