



The Big Melt

BRITISH COLUMBIA'S
GLACIERS ARE RECEDING—

**there is
no doubt**

—BUT WHAT DOES THIS MEAN
FOR THE FUTURE OF THE PROVINCE
AND ITS INHABITANTS?

BY ANDREW FINDLAY

📷 STEVE OGLE

Illecillewaet Glacier
viewed from Mt. Sir
Donald



THE ILLECILLEWAET GLACIER IS ONE of my geological touchstones. On family trips to the mountains, from the time when I was barely old enough to form lasting memories, I spotted its silvery tongue licking down from the broad flat névé between Perley Rock and Glacier Crest. And over the years, I have watched its steady retreat, like water evaporating in the desert.

In the late 19th and early 20th centuries, William Vaux and siblings George Jr. and Mary made numerous trips from their home in Philadelphia to Rogers Pass, making first ascents and taking a keen interest in glaciers. They were arguably North America's first pioneering glaciologists. In 1887, William loaded a horse with glass film plates and a cumbersome view camera, headed up the trail from the Canadian Pacific Railway's Glacier House through the lush forest of the Illecillewaet Valley. He stopped at the point where the forest cleared enough to offer a full view of the glacier and set up his tripod. The black-and-white photos he took show the glacier's tongue reaching valley bottom trees. Today, more than one hundred years later, the change is dramatic. The Illecillewaet has receded more than a kilometre, almost to the height of land visible from the Trans Canada Highway, leaving behind a vast area of polished bedrock that in Vaux's time was covered thick in ice thousands of years old.

IF THERE WERE any doubts that our climate is changing rapidly, those were banished by the last two years of consecutive low-snow winters and hot, dry summers. In 2014 and 2015 glaciologists like Brian Menounos, professor of earth sciences in the geography program at the University of Northern British Columbia (UNBC) and Canada Research Chair in Glacial Change, recorded annual glacial retreat at three to four times historical averages. Menounos co-authored the study *Projected deglaciation of western Canada in the twenty-first century*, which was published last April in the journal *Nature Geoscience*, and it paints a stark picture of what our province will look like in the future. Using a combination of field observations and monitoring and climate change models, Menounos and his team predict that at least 50 percent of Coast Mountain glaciers and 90 percent of glaciers in the Canadian Rockies and other interior ranges will have vanished by the end of the 21st century.

Which makes me wonder, what will we call Glacier National Park when the park's more than 130 glaciers are extinct?

"For me, flying over the axis of the Coast

Mountains was really eye-opening this past summer. In places snow coverage was down to five percent of a glacier's surface area, when in past years, 50 percent coverage is normal for midsummer," Menounos tells me over the phone from his office at UNBC.

Menounos developed an interest in mountains and glaciers as an undergraduate in Colorado where he got into climbing. A casual interest coalesced into an academic focus while he pursued a PhD at the University of British Columbia where he was studying the record of geologic change captured in sediments of alpine lakes. Today, glaciology is a hot topic.

Funded by the Hakai Institute, Menounos' research associate Robert Vogt flew above Vancouver Island last summer in a small plane equipped with LiDAR—a remote-sensing technology that uses laser

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light to create incredibly detailed models of an object's surface topography. They recorded surface lowering on some of Vancouver Island's pocket glaciers that hit six metres in a single year. An extremely low snowpack—which in 2015 in southwest B.C. was less than 15 percent of normal for April—and searing hot summers are the obvious culprits. However, Menounos is exploring a third factor compounding glacier melt: the impact of forest fires and the resulting accumulation of soot on glaciers, which darkens the surface and causes ice to absorb rather than reflect solar radiation. The bigger picture issue is human-caused greenhouse gasses and climate change.

"A lot of people think that what we're experiencing is part of a natural cycle, but in reality we should be entering another

cooling phase. We've aborted that with climate change," Menounos says.

ANYONE WHO HAS ever gazed at, worked in or travelled through the mountains of B.C. is having a conversation about glaciers. Mountain guides, backcountry skiers and climbers have witnessed dramatic changes; massive crevasses opening up on glaciers where before there were none and once-straightforward approaches rendered dangerous and exposed to rockfall as ice retreats exposing unconsolidated earth and rock beneath.

Jan Neuspiel, lead guide and owner of Vancouver Island-based Island Alpine Guides, leads climbs and skis with clients in both the Vancouver Island Ranges and the mainland Coast Mountains. This summer, he visited Matchlee Mountain, just outside of Strathcona Provincial Park near Gold River, half a dozen times, giving him the chance to observe up-close a glacier in rapid retreat on the mountain's north side. Thanks to extremely dry weather on Vancouver Island last winter, Matchlee's glacier was reduced to bare ice in June, lacking the winter snow cover that feeds and nourishes glaciers. Between visits, he says, he watched the toe recede by metres.

As a heli-skiing guide with Bella Coola Heli Sports, he has also witnessed profound changes in the massive icefields that carve through the Coast Mountains. The icy landscape is changing to the point where glacier ski runs that were once bankable routes for guides are no longer skiable. In some cases, helicopters are even unable to land because once crevasse-free zones have been transformed into treacherous icefalls littered with slots and seracs.

"On Vancouver Island, there's always been an understanding that these glaciers are at the end of their lives. They're like ice cubes, some of them are so small," Neuspiel says. "On the coast it's much more shocking to see the rapid change because these icefields have a feeling of permanence to me."

Ross Berg, a Whistler-based mountain guide, says thinning glaciers is substantially changing the way people move through mountains. Some peaks have become un-climbable due to impassable crevasses, while alpine rock routes are getting longer as "new" rock is exposed by disappearing ice every year.

"This summer, I was trying to free a route on the Minaret in the Bugaboos. The guidebook said the first pitch 5.9 [a method to grade rock climbs known as the Yosemite Decimal System] but ▶



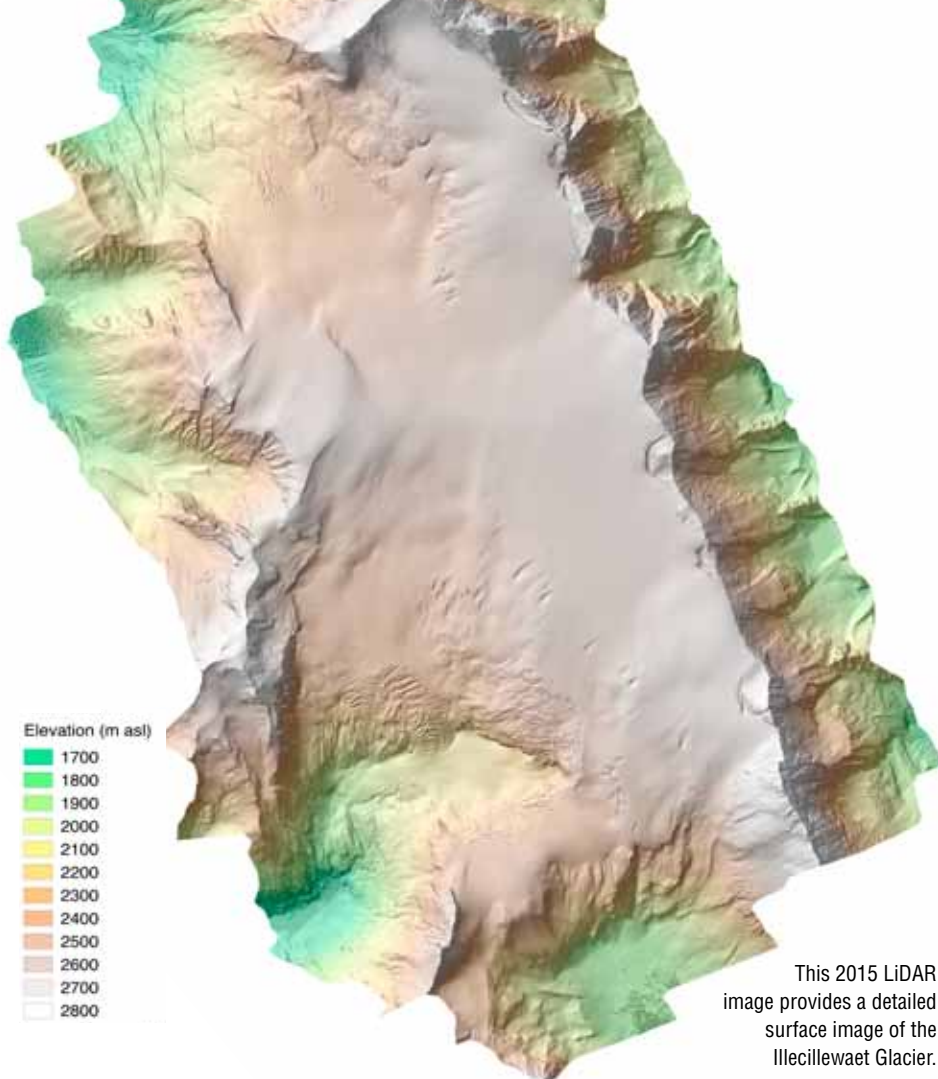
1905

This image shows the size of the Illecil-lewaet Glacier more than 100 years ago.



2002

This comparison photo from the same spot shows the extent of the deglaciation.



This 2015 LiDAR image provides a detailed surface image of the Illecillewaet Glacier.

when I was there, 20 metres of hard, glacier polished, unprotectable slab stood in front of this ‘first’ pitch,” Berg says.

Backcountry skiing in glacier country is also becoming a more serious undertaking than it was in the past when skiers could count on a deep winter snowpack to bridge crevasses and bergschrunds.

“I have seen multiple crevasse falls and so many close calls in the Whistler backcountry,” Berg says, adding that topographic maps rendered from 30-year-old survey data now need to be interpreted with a healthy dose of suspicion.

For more than two decades, Tanis Dakin, co-owner of Sorcerer Lodge, has been hiking, skiing and mountaineering in this remote region of the Selkirk Range near the northern border of Glacier National Park. Her relationship with the Nordic Glacier, which rises above the lodge, is best described as intimate. She’s walked on it, skied it, put pieces of it in her scotch and watched it up close and personal for many years. Dakin has witnessed the lake at its foot grow year after year, while the ice walls and caves retreat hundreds of metres back revealing rock bands and ledges covered in rocky rubble. The change has been as noticeable as the deepening lines on

the face of a well-weathered mountain guide. From a mountain traveller’s perspective, glacier morphology is either an inconvenience or an ever-changing route finding puzzle that keeps the mountains fresh and challenging.

“Ten years ago it looked like that—now it looks like this. So what?” Dakin says. “There are larger questions to ponder, like the impact of ice loss on the landscape, the economy, wildlife and water resources. That’s what really matters.”

GLACIERS ARE MOTHER Nature’s water coolers, nourishing creeks, rivers and adjacent ecosystems with a spring and summertime supply of freshwater. The human implications of receding glaciers are profound. Rocky Mountain glaciers often account for 30 percent or more of a river’s summertime flow, meaning prairie cities like Calgary in our neighbouring province, can, in a century, expect vital rivers like the Bow to be flowing at two-thirds or less of historic levels. The potential ripple effects for nature are equally daunting. Lower water flow and water temperature impacts the smallest aquatic creatures like salamanders or water spiders, bull trout and salmon that require cool and

clean freshwater to thrive and the birds and mammals that depend on healthy riparian ecosystems.

There’s another impact of glacier recession that is starting to show its face more frequently: landslides. Last September, a torrent of mud and debris roared down the mountainside in Birken north of Pemberton, destroying the home and property of Rob and Erin Stewart Elliott. The slide is believed to have been caused by a combination of heavy rain and unstable glacial till once entombed in ice. A mountain guide flying above the Coast Mountains this summer snapped a photo of a massive landslide event that swept across the Tiedemann Glacier. UNBC’s Menounos believes that we’ll experience more and more of these landslide events in the wake of retreating glaciers.

If glaciers disappear to the extent that Menounos believes they will by the end of the century, the concern on a lot of minds is how to prepare for this new ice-free paradigm. That’s why in 2013 the Columbia Basin Trust (CBT) formed the Canadian Columbia Basin Glacier and Snow Research Network. The goal is to help coordinate research and efforts among a range of stakeholders, including UBC, UNBC, Parks Canada, BC Hydro and the BC Ministry Environment, to better understand the glaciers and snowpack of the massive Columbia River watershed and their contributions to downstream water resources and ecosystems. As part of a five-year-study that will conclude in 2018, researchers have been studying in detail six glaciers, including the Nordic and Illecillewaet, monitoring glacier size using both airborne LiDAR technology and surface measurements, high-elevation snowpack and downstream hydrological gauges.

Kindy Gosal, the CBT’s director of special initiatives, says the number-crunching will soon begin as scientists analyze this growing body of data and try to determine, “what it means practically to people” living in the Columbia Basin, one of the most important transnational watersheds in North America.

However, there is plenty of evidence so far, both from the scientific rigor of Brian Menounos and other researchers, as well as anecdotal observations of mountain travellers like myself that the glaciers that gave B.C. its rugged geological character are fading fast. And watching these vestiges of ice retreat ever higher, becoming ever smaller in their final high elevation redoubts is like saying a long goodbye to an old friend; an old friend like the Illecillewaet. 🏔️