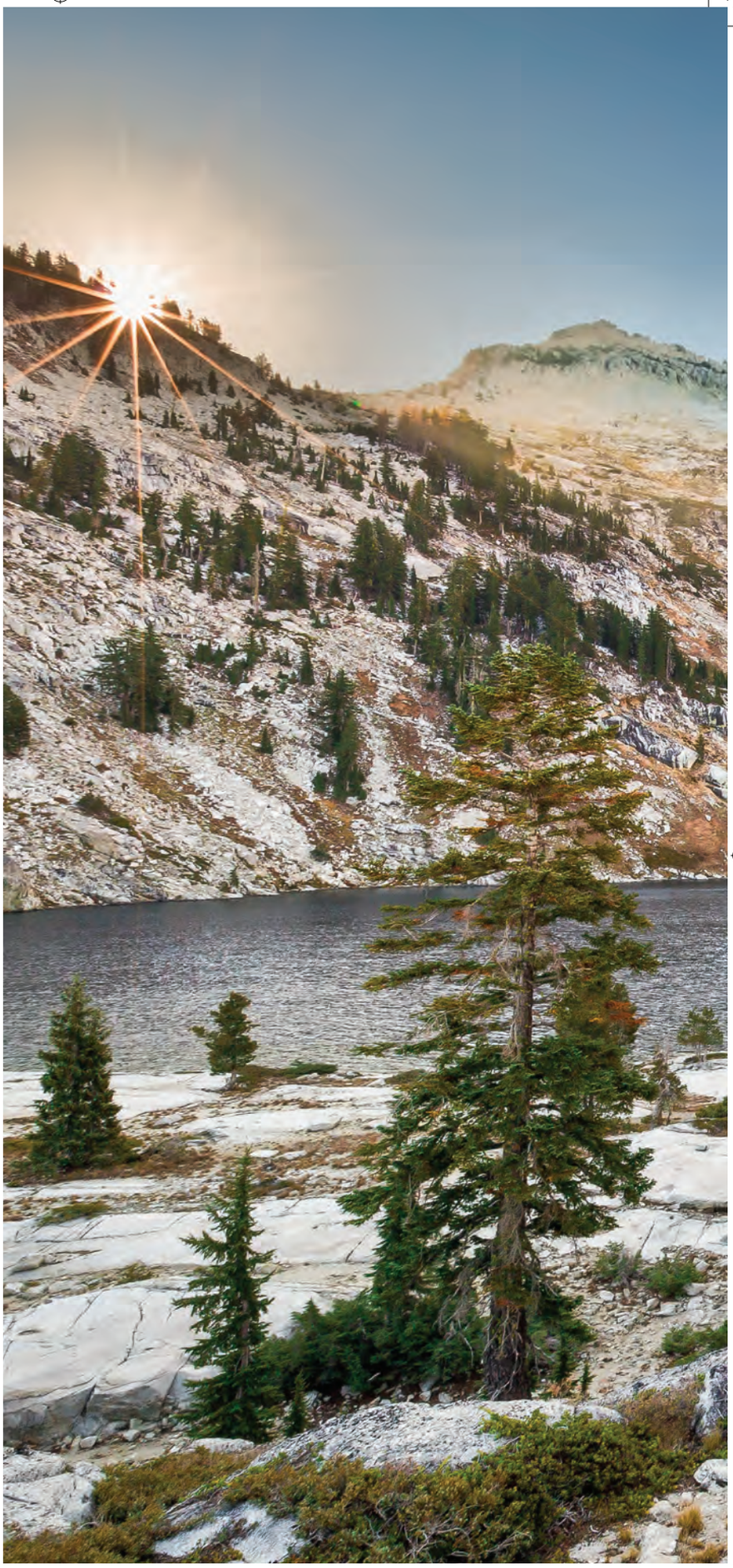
Three scientists chronicle life, death, and the last stand of the Grizzly Glacier.

By **Bill Donahue**

THE VIEW AT THE END



PAUL IMPERIA

The Grizzly Glacier sits above Grizzly Lake high in California's Trinity Alps.

Usually, geology is a slow drama, large and impersonal, unfolding over millennia. On the evening of September 12, 2009, however, the movement of rocks and ice sped up crazily on the steep slope of Grizzly Glacier, 8,000-odd feet above sea level in the remote Trinity Alps of northern California. It was as though the cacophonous sound of frozen blocks crashing and the low grinding of ice against bedrock granite was a geologic symphony directed at a single man.

Justin Garwood, a wildlife biologist, was camping solo at the foot of the glacier that night, just uphill from Grizzly Lake, a deep reservoir of glacial melt. He was 35 years old and days removed from completing his master's thesis, which involved censusing an amphibian, the Cascades frog, in the high lakes of the Trinity Alps, a subrange of the Klamath Mountains that sprawl across an area the size of Maryland.

Garwood is a fervent believer in field science, so that even then, on a six-day Klamath Mountains backpacking trip conceived as an escape from the rigors of thesis writing, he was keeping a journal whose neat all-caps block lettering revealed a hunger to imbibe and decipher the wonders of the natural world. "Here," the journal reads, "the stream is very low gradient and sinuous with small cobble substrate. ... On the third low gradient shelf is a grove of quaking aspen. ... Last frog seen @ 2135M elevation."

Garwood was strolling the edge of the glacier when he heard the first crash. "It was a shock, like a train going by when you didn't know it was coming," he says now. "It was a heavy, loud, bass-y boom coming from deep within the ice." At 6:14 p.m, Garwood grabbed a sweat-stained scrap of paper from his pack and wrote, "1814 Huge Boom," for he knew that he was witnessing something momentous. Glaciers calve, chunk off, and collapse in on themselves all the time, but not like this. The Grizzly Glacier was sounding off, as if raising the alarm that it was beginning to die, like so many glaciers are now. And for Garwood, climate change isn't some nebulous, nefarious force; it's something he can see at the end of a trail.

The Grizzly, which is today still a glacier covering roughly four acres, likely first began to form in about 1300 AD, when the warm climes of the medieval period ceded to what geologists now call the Little Ice Age. First, snow lingered all summer, then the snow compacted, and soon (geologically speaking) it met the official definition of the word "glacier:" It became a single mass of slow-moving ice. When the Little Ice Age ended in about 1885, the Grizzly was 60 acres in size, according to a 1960 paper by Robert P. Sharp, a geologist at the California Institute of Technology. It soon began to diminish. Then, in the 1970s, as the grotesque warp of climate change took hold, the Grizzly's diminution accelerated. In 1972, it covered 15 acres. By 1994, it was down to 11. Soon—almost certainly within the next 50 years—it will break apart and stop moving. It will become just a snowfield. The exact timing of the Grizzly's endgame is unclear, though. "We can predict when a turtle will die, because there are so many turtles," Garwood says. "But we can't do that here. This is a unique situation. The microclimate around every glacier is localized."

Garwood is tall and scruffy, with blue eyes and a hint of white in his sideburns. When he hiked into Grizzly Lake basin in 2009, it was almost as though the world was on fire. The preceding winter had been scant on snowfall; the summer had been warm. And now it was the end of the alpine snowmelt season, which is when glaciers move most. He didn't expect to hear the Griz groan, but he was ready to record its death rattle nonetheless. "1822 Small Crack," he wrote. "1825 Big Crack."

Over the next three hours, until he curled into his sleeping bag at 9:14 p.m., he heard the glacier sound 30 more times. "Big Crack," he wrote. "Small, Small, Small ... Big Boom. .. End."

Garwood's documenting was rooted in his devotion to the Klamaths. He grew up in Trinity County, California, and first ventured into the Trinity Alps in 1987, on a seventh-grade field trip that saw several students—not him—floating their own private icebergs out onto a cold lake. He attained both his undergrad and master's degrees at nearby Humboldt State University and came to regard the Klamath as "one of the most beautiful and biodiverse places on the planet." He is now so attuned to the range that in his free time he is, for Backcountry Press, co-editing a 400-page book, *The Klamath Mountains: A Natural History*, due out next year.

Professionally, Garwood, now 45, is a herpetologist and fish specialist for the California Department of Fish and Wildlife. The book project is extracurricular for him, as is his continued focus on Trinity Alps glaciation. For the past decade, with the help of two fellow wildlife biologists, Garwood has returned to the Alps nearly every year to map with GPS both the Grizzly and a static snowfield a kilometer to the east, that was, until 2015, rightly called the Salmon Glacier. The trio has also studied satellite imagery of the glaciers and shot their own aerial photos from planes. Their work, scheduled to be published this spring in *Northwest Science*, yielded a fine-grained, incremental look at two glaciers in their death throes.

The *Northwest Science* paper comes at a pivotal time. Last year, in a letter to the journal *Nature*, 15 of the world's leading earth scientists noted that, between 2006 and 2016, nine of the earth's 19 glaciated regions lost between .5 and 3 percent of their ice volume every year. "Under present ice-loss rates," they wrote, "most of today's glacier volume would thus vanish in the Caucasus, Central Europe, the Low Latitudes, Western Canada and the USA, and New Zealand in the second half of this century."

Garwood's paper delivers the same rigor and precision, but it is not the work of professional glaciologists. It's an amateur production, a labor of love, and as such it suggests a new way of looking at climate change: What if all of us moved beyond our apocalyptic, big-picture take, beyond our fixation on the Greenland Ice Sheet and far-away islands in the Pacific, and instead focused on the incremental changes transpiring in the places we love?

Paying attention to nearby nature requires us to look up from our computers and phones. We won't unmelt

the planet doing it, but we could at least render the changes affecting our earth more tangible, more personal. We might even feel a little less paralyzed by climate change's ominous force.

Like almost everyone else, I've tended to think of climate change in terms of headlines about the latest wildfires. I wanted to register it on the ground. I wanted, also, to see what's likely in store for the majority of the at least 200,000 glaciers scattered across the earth's seven continents. So perhaps hypocritically, I upped my carbon footprint last September and flew all the way across the country, from my home in New Hampshire to the California coast, to meet up with Garwood and his two coauthors—Michael van Hattem and Ken Lindke, who also work at CDFW—for a three-day backpacking trip to Grizzly Glacier and Salmon snowfield.

California Department of Fish & Wildlife biologist Justin Garwood

PHOTO BY DAVID WAHLMAN / WAHLMAN PRODUCTIONS

"YO, ARE THE BEERS on ice?"

"Where'd you get those sweet binocs, dude?"

"How many miles this car have on it, anyway, Woody?"

We're wending along back roads, traveling four hours east from Arcata, California, to the incredibly remote Klamath wilderness. Slumped in the back seat of Garwood's weary 2002 Toyota 4Runner and snacking on beef jerky, Michael van Hattem will spend the majority of the journey zinging wry insults up toward the driver's seat. "Woody's always got an ulterior motive," van Hattem says, invoking Garwood's nickname as he laments his friend's proclivity to turn every backpacking trip into a laborious exercise in field research. "There's no such thing as chilling with Woody."

Forty-six years old with a medium build and a salt-and-pepper beard, van Hattem is the most famous of my three co-travelers, being a CDFW enforcement specialist who frequently shows up in the media to excoriate criminals who have, say, stolen a rare coastal succulent, *Dudleya farinosa*, to sell in Asia. Beside van Hattem in the back seat, Ken Lindke—who is 41, black-haired and bearded—is the team's data cruncher and tech specialist.

Lindke is the inventor of a rare cocktail, the glaciertini, that the trio ritually consumes on their annual glacier retreat. The vodka base for this year's glacertinis is in Lindke's pack, and I'm

sure that no other liquid in this vehicle is as important—except perhaps the beers, which van Hattem has fastidiously taxonified, by making reference to "camping beers," "breakfast beers," "post-hike beers," and "football-game-afterwards beers."

The principal bonding point here, though, is science. I've embedded myself in a wilderness party that carries a cult-like regard for the discipline, even as science is politically under siege—from, for example, over 25 percent of Americans who think that climate change is a fiction, according to calculations made by the Annenberg Public Policy Center.

After a night at the trailhead, Garwood wakes up early and, over a cup of coffee, speaks to me with hushed reverence of a legendary California field biologist, Joseph Grinnell, who in the early twentieth century endeavored to describe the fauna of the entire state.

"Grinnell started the method of being observant," Garwood says, slightly overstating things in his enthusiasm. "He was an incessant notetaker. He'd sit in the passenger seat of a car and record what he saw. He wrote everything down, and then he'd review his notes in the evening."

For at least 25 years, Garwood has aspired to be, as he puts it, "Grinnellian." Mostly this has meant doing extracurricular, unpaid field science. After finishing his master's thesis, he continued his study of the Cascades frog, climbing to the Trinities' high mountain lakes several weekends each year to check in on an amphibian he describes as "golden, with super inky black spots" to ascertain how it's faring as it faces three challenges—disease, predatory trout airdropped into the Trinities' lakes for fishermen's benefit, and climate change, which reduces snowmelt and, by extension, water levels in the frog's habitat.

Garwood has now continued his frog study for 17 straight years, all against the backdrop of glaciation in the area, making him a rarity. Increasingly now, wildlife agencies eschew field work and endeavor to understand the natural world via computer models. "The issue is that field work is hard," says John Anderson, a College of the Atlantic wildlife biologist who has written about the phenomenon for American Scientist. "It's expensive, so the vast majority of research in the US is done by waves of grad students. The typical PhD is five years. A five-year study is fine if you're looking at fruit flies and perhaps mice, but it doesn't work very well if your critter lives for 45 years and breeds for 41 of those years. We're less able to get a thorough understanding of how nature works."

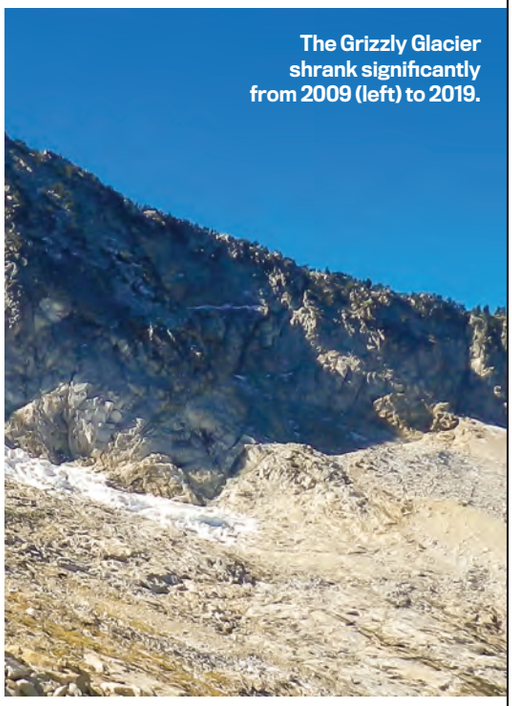
Vanishingly few state and federal scientists do fieldwork on their own time, says Anderson. Garwood decided to commit himself to the Trinity Alps' two glaciers in hopes, he says, of attaining a "snapshot in time." Earlier scientists visited and described these ice floes in 1903 and 1960. Back in 2009, Garwood figured that if he made one data-gathering mission to the glacier and then weighed in with a scientific paper, he'd be replicating the roughly 50-year interval. He soon discovered, though, that a single time stamp wouldn't be enough as the story was quickly evolving. Between 2013 and 2015, April 1 snow levels in the Klamath were devastatingly low for three years running. The glaciers were shrinking with unprecedented haste. To be thorough, Garwood needed to measure them year after year, as he's done with the frogs.

September 2018 was supposed to be the last glacier trip of a decade-long sequence for Garwood and his comrades. But now, in September 2019, with their *Northwest Science* paper a few revisions away from completion, the scientists are taking "one last glory lap," to use van Hattem's words—for my sake and also to savor what their old friends, the glacier and snowfield, look like in the wake of an oddly abundant twenty-first century snow year, the winter of 2018-19.

If field science had a patron saint and a feast day, this hike would be its pilgrimage. Over breakfast, the scientists are giddy with purpose. "Coming out here into the mountains makes me feel like a biologist again," says Lindke, who professionally spends less than 10 percent of his time in the field. "I'm always learning out here."

"You have to do it to say it," van Hattem says of field biology. "It's about going out into the woods and getting beat up so that you can be stronger and sharper. You can't just go to school and punch a keyboard and call yourself a scientist."

And so we shoulder our packs and begin climbing.



The Grizzly Glacier shrank significantly from 2009 (left) to 2019.

WHAT IF ALL OF US MOVED BEYOND OUR APOCALYPTIC, BIG-PICTURE TAKE, BEYOND OUR FIXATION ON THE GREENLAND ICE SHEET AND FARAWAY ISLANDS IN THE PACIFIC, AND INSTEAD FOCUSED ON THE INCREMENTAL CHANGES TRANSPIRING IN THE PLACES WE LOVE?

PHOTOS BY JUSTIN GARWOOD

THE KLAMATH MOUNTAIN RANGE is one of the most biodiverse places on earth. It's a different, more subtle kind of diversity than that of the Amazon River Basin, the Ecuadorian Rainforest, or the Daintree Rainforest, which meets the Great Barrier Reef on the coast of Australia. Belched into being 200 to 400 million years ago by a series of volcanic eruptions that mixed magma with the granites of an ancient sea floor and chunks of the earth's core, the Klamath Mountains are jagged and folding, composed of a succession of steep drainages, each with its own array of vegetation, its own patterns of rainfall, and even its own soil types.

Moving slowly on foot through the Klamath, we're able to experience the range's wild, Dr. Seuss-like variety. Early on, before we reach 4,000 feet, the trail is littered with sugar pinecones, which are 18 inches long and weighted with sap. I keep looking skyward, into the canopy, leery of being walloped by a falling lunker.

Garwood and I are the first to begin climbing toward a little plateau, China Springs. Speckling the woods now are foxtail pines, rare and endemic to California, whose bristly green needles point upward on gnarled branches twisting around a red trunk. Later we'll see the Brewer's spruce, a spindly, droopy evergreen and another Klamath endemic, that somehow looks sad. We get to the top. We rest. I keep looking for the first shimmering glimpse of mountain ice.

The Klamath is not the glacier capital of the world. In fact, it's biodiverse in part because, in previous ice ages, it was relatively unglaciated, making it a haven for numerous plant species. Still, during the frigid, 2.5-million-year Pleistocene epoch, which ended around 10,000 BC, more than 30 giant glaciers, some over 11 miles long, lay here, carving the peaks of the Trinities into sharp crests on which the rough granite spires jut skyward like so many spikes of gelled hair on a punk rocker's scalp.

When we arrive, after eight miles of toiling, on the gentle planes of Grizzly Meadow and pause in the shade to dip our water bottles into the small creek, we can at last see Grizzly Glacier. A sheer, 600-foot rock cliff is in front of us, bisected by a thin, cascading braid of Grizzly Falls. The white of the glacier is just above that, and it's almost a marvel that it's still there at all.

One of the smallest of California's 150-plus glaciers, Grizzly is by far the lowest. It sits 1,700 feet beneath the next-lowest glacier, which is on Mt. Shasta, and it persists largely because, like Salmon Snowfield, it sits in the shade of the Trinities' glacially wrought summits, facing north. On an average day in September, when they most need to hang onto the previous winter's snow, both Salmon and Grizzly are protected from the sun by noon. Still, like all glaciers, they've been shrinking since the end of the Little Ice Age.

To understand the trend, Garwood hasn't only been considering the glaciers. He's been tuning into their respective watersheds, searching for qualitative changes over the decades. So after we drop our packs, he shows me a photo taken here in 1911 by an earlier explorer, Annie Alexander, the founder of the Museum of Vertebrate Zoology in Berkeley. Then he jitters up a small rise until he is standing exactly where Alexander took her long-ago picture. "Deep time," he says as he shoots his own iPhone snap. "Deep time."

WHEN I LOOK AT THE Garwood's and Alexander's pictures together and see that scores of white firs have come in over the last 110 years, thanks to warmer temperatures and the mounting gush of glacial meltwater, I grasp the power of climate change—and also how Garwood's engagement with glacial demise stands out. For most of us, climate change is a huge, overwhelming thing that moves us to woe. This was clear, certainly, last September when 200 people hiked up to the dying Pizol glacier, in Switzerland, wearing classic black mourning garb—veils, top hats, austere black blazers—to attend a "funeral" at which a priest delivered a stirring eulogy for the deceased river of ice.

A glacial funeral seems apt. Climate change is grievously sad to behold. Still, it's a bit off to think of glaciers in binary terms, as being either "alive" or "dead." Glaciers support a vast network of tiny life, and it's instructive to become familiar with it. I tried to do just that, pre-hike, when I began boning up on a ground beetle that's endemic to the Trinity Alps. *Nebria praedicta* tends to live, amazingly, on snow and ice. I called David Kavanaugh, the California Academy of Sciences entomologist who in 2009 described this 15-milimeter long, bacteria-eating, antifreeze-blooded freak, to ask if it would die once the Grizzly ceases to be a glacier.

I expected Kavanaugh to say yes. Instead he said, "Not necessarily." An expert on the world's *Nebria*, which are cold climate beetles, he noted that one species, a Colorado resident that lives amid glaciers and snow at 11,000 feet, has also adapted to survive at a relatively balmy 6,000 feet in a New Mexico creekbed. Will every species be that lucky? "No," Kavanaugh told me, before giving me an overview of how climate will shake out. "It's a lottery," he said. "Think of a forest fire ripping through a neighborhood. Some houses are burnt to ashes; others aren't touched. The history of the earth is like that. At every turn,

what happens is a one-off. We don't know what will happen with *Nebria praedicta*."

In studying the Trinities' glaciers, Garwood and his team are looking for patterns amid the tumult of natural history. One thing they've noticed is that vegetation has, in recent decades, been taking root on Grizzly's foreland, the land at the bottom of the glacier that was formerly ice-sheeted. For a second journal paper now in the works, the scientists are delivering a picture of what the plant cover looked like on the foreland in 2014. On that year's trip, they brought two colleagues and documented the distribution and abundance of 75 or so different plant species in 150 randomly selected one-meter squares throughout the 22 acres of Grizzly foreland. They are still crunching the numbers.

Eventually, we reach a flat, rocky plateau—the shore of Grizzly Lake. The craggy slopes of Thompson Peak and Caesar Peak form a 270-degree cirque embracing the lake, which is 180 feet deep and clear as a glass of water, giving way, on its one flat edge, to Grizzly Falls.

I pitch my tent on a rocky peninsula jutting out into the lake. Across the water, Grizzly Glacier is so close, it seems, that I can almost reach out and touch it. As I drift off to sleep, I can hear the scientists atwitter over how invigorated it looks, still piled with much of last winter's snow. It's difficult to capture the depth of the rapport the scientists share with this nook of the Trinities.

"It's nice to see this place rejuvenating," says van Hattem.

"The ice on that crevasse," Garwood says, "it looks almost blue."

IT'S POSSIBLE FOR A GIVEN winter to abound with snowfall, but the general trend of climate change is inexorable. As Garwood puts it, "Everything's getting pinched. The Klamath has been above average for summer temperatures every year since 2001, and the precipitation season is getting shorter. The horse has left the barn."

We try not to think about that grim reality the next day, Saturday, for it's the day we've been waiting for. Today, we have, as Garwood promised in an email, "a whole day without packs up on top of the world." We're hiking a mile or so to a ridgeline above us to check out, first, what was formerly the Salmon Glacier.

In September 2015, Garwood wrote me, he and van Hattem "stood at the last remaining block of ice on Salmon Glacier. It was the size of a small car." Even hiking in, Garwood knew that this tiny remnant of a contiguous sheet of ice, once 48 acres across, was ill-fated. But now what he grimly predicted had come true. Like a bucket of ice cubes chucked to the curb, Salmon had disintegrated into countless small pieces, each one exposing surface area to the sun. It was sure to melt away to nothing by his visit next year. He was filled, he wrote, with "a powerful feeling of loss."

When we traverse the ridge and descend a little to the Salmon, we find that it's in transition again. Numerous boulders have caromed off the snowfield's steep headwall just hours and minutes earlier, so that we can still see the tracks they cut sliding downhill, through less steeply pitched expanses of snow. The biggest of the fallen rocks are the size of washing machines, and they sport little melting flecks of slush on their shoulders, like epaulets.

Garwood speculates that a freeze-thaw cycle has cracked the headwall—and that the cliff would have been a little less rowdy circa 1850 when it was sheathed in at least 50 feet of rock-stabilizing glacial ice.

What's certain is that we've stepped into a giant's bowling alley. We've reached this snowfield at the most volatile time of year in the most volatile decade of its long life, and Garwood can hardly contain his excitement. "Geologic dynamism!" he exults. Then, with the glee of a kid pantomiming the clutch moves of his favorite football player, he shows me how he'll duck behind a large rock if boulders start tumbling. "Just get low," he advises me, "real low."

I'm a little scared, so gingerly I entice Garwood to the lower reaches of the snowfield, where a falling boulder would at least be moving more slowly. It's a strange world down there. The snow is watermelon pink, thanks to a seaweed-like, single-cell, red-pigmented algae, *Chlamydomonas nivalis*, that swims through the trickle of snowmelt, dividing and multiplying as it goes.

The dimpled pink surface spreading before us is an enchanting sight, but also a sobering one for, I've read, the color in algae-flecked snow draws heat. "Imagine wearing black instead of a white T-shirt in the sun," Stefanie Lutz, a geobiologist at GFZ German Research Center for Geosciences, told *The New York Times* in 2016. "It is the same for the snow: More heat means more melting." And what's worse, the heat engenders a feedback loop: In melting snow, the algae swims—and proliferates—more freely.

The mood is too bright for such downers, though, and as Garwood and I hop from rock to rock we admire the miniature ponds that the snowfield's streams have formed in trapezoidal cracks in the granite. One is as large as a motel pool. "Imagine taking a howler swim in that one!" Garwood says.

Soon, he's stooped to a greenish patch the size of a dinner table and pointing as he revels that we're witnessing the geological processes that enable once glacial territory to become vegetated. "The rocks fall down on the smooth granite," he tells me, gesturing toward an array of grapefruit-sized stones, "and it creates a zone for smaller sediment."

He picks up a pinch of gravel and rolls it in his fingers. "The rocks trap this sediment, and that allows for these mosses to grow." The moss visually dominates the patch we're looking at, like green felt on a pool table and, Garwood says, "It provides substrate for plants. This is a bud saxifrage coming on here," a tiny white flower. "If you look over here, it's even more developed." He revels over three rare wildflower species.

Listening, it's clear that the story of climate change is not unremittingly bleak. Life always springs out of death, in new and surprisingly varied forms, and if you're an ecologist tracking the change, it's impossible not to be excited by the intrigue it holds.

AS WE WALK, THE SCIENTISTS cogitate on a question, still not definitively answered, from one of their *Northwest Science* reviewers: Why did the Salmon Glacier recede so much more than the Grizzly?

In their paper, Garwood and his team suggest that the Grizzly Glacier may have survived because its high point is 57 meters above the Salmon's. Its orientation is slightly more easterly, meaning it gets less afternoon sun. It seems possible that this could have saved it.

But the question of why the Grizzly and not the Salmon persists will never be answered definitively, which is the case with so many glacial questions. David Kavanaugh, the entomologist, says that, of the 500 known species of *Nebria* beetles, scientists have identified the larvae of less than 10 species. "We can't follow their life cycles," Kavanaugh says, "and some species that were only discovered a decade ago are already disappearing."

A certain tragedy shadows this expedition. The scientists may never see an intact Grizzly Glacier again. As we eat lunch on the ridge between Caesar


Grizzly Lake

and Thompson, peering down a cliff that drops 700 feet, they grow wistful. They reminisce about their 2012 trip, when they walked into an ice cave under the toe of Grizzly. "We saw the scrape marks the glacier made in the bedrock, sliding downhill," van Hattem says.

The ice cave was gone by 2015. That year, van Hattem says, "We stood at the top of the glacier and watched giant chunks of ice break off beneath us. We've sessioned pretty hard here," he adds. "We were lucky to catch this glacier when it was falling in on itself."

The scientists' afternoon plan is to hike down past the foreland, so that they can enjoy a glaciertini by a small stream, where they stayed in 2014 as they studied plants.

This cocktail party will double as an edit session for these *Northwest Science* co-authors, so I head off on a solo hike. I continue west along the rim and then scramble up a steep slope and along a knife-thin ridge until I am standing amid gnarled, wind-dwarfed whitebark pines atop Thompson Peak, which is the apex of the Trinities at 9,004 feet. Fending off vertigo, I inch out to the very edge of the cliff. Grizzly Glacier is right below me. It looks almost cared for by the mountain, at once shaded by the slender towers above it and cradled in the concave slope. It also looks small. It's a patch of white in a sea of gray.

LIFE ALWAYS SPRINGS OUT OF DEATH, IN NEW AND SURPRISINGLY VARIED FORMS, AND IF YOU'RE AN ECOLOGIST TRACKING THE CHANGE, IT'S IMPOSSIBLE NOT TO BE EXCITED BY THE INTRIGUE IT HOLDS.

When I finally descend to our lakeside camp at dusk, my legs are scratched and cut up by rocks. I'm tired, but I find that there is a glaciertini waiting for me, with two olives in it. The mood in camp is upbeat, so I ask Garwood, "Won't you guys miss this place?"

"No," he says. "We're scientists. Now that we've described everything we need to on these glaciers, we want to learn something new. We'll do more projects together. It just won't be here."

I don't buy this answer. I mean, I understand that these three guys have come here to record data. I respect and admire their focus on science, but I've also seen how attached they are to the Klamath, and later Garwood will concede that, really, he and his friends are not poker-faced bean counters of climate change. "We love this mountain range," he says, "and when you lose the glaciers, you will lose a dimension of the landscape, of its solace and beauty. It's not like we're just recording the death of these glaciers and moving on."

PHOTOS BY (LEFT) JUSTIN GARWOOD (2); PAUL IMPERIA

Left to right: Scientists Ken Lindke, Michael van Hattem, and Justin Garwood. Photo by Bill Donahue

ON THE 9-MILE TREK back to the trailhead, Garwood is, per usual, the fastest hiker in our group. Never mind that he's the only one among us who never goes to the gym. "He's country strong," says van Hattem. When we have to climb a two-mile rise in the woods, I watch him cutting in and out of the trees above me, his arms windmilling as he weaves through scattered pinecones and rocks. When Garwood reaches a small, unnamed creek a mile from the car, he's got about 20 minutes to kill before we catch up, so he dips a small net into the water. For yet another side project, he's catching and studying the coastal tailed frog, an ancient species, trying to discern why some, but not all, of its tadpoles sprout a decoy "eye spot" on their tails. He wonders, "Is it to trick predators into biting their tails instead of their heads?"

He doesn't know yet, but by now I'm wondering: How can Garwood sustain such an unwavering belief in data, even as the world melts? Isn't he just counting deck chairs on the Titanic? I ask him, and his answer is wonderfully earnest. "Science is service," he says. "You catalog what's there on the landscape now so that future generations can look back and understand what happened, or so that people right now can try to predict the future. I think data is important. That's why we're still looking at the data Grinnell gathered. Objective people want data, and you don't have to be a scientist to be objective."

There's a deep hope to Garwood's words, I think—a faith that, going forward, people will act reasonably, with concern for the Earth, if only they could understand what the data say. I admit that this hope doesn't erase the sadness I feel, knowing that the Salmon Glacier has died and the Grizzly will soon be gone, too. The accelerated demise of these ice floes is alarming; it tells a clear local story of how humans are ruining the Earth. And now the charge upon us is to not look away—to become familiar with the nature near our homes as it morphs its way through the Anthropocene. How can we possibly be stewards of our environment if we don't know the particulars of its suffering?

We keep walking, our muscles aching. The trail climbs a small hill and I cast my eyes skyward again for those sugar pinecones. When we open the cooler in the back of the 4Runner, the after-hike beers are still cold. The sun is warm on our backs now, on this early fall afternoon. Sadly, I think to myself, it feels a little too warm.

Bill Donahue contributes regularly to the magazine. His last story was about a kidnapping on the PCT.