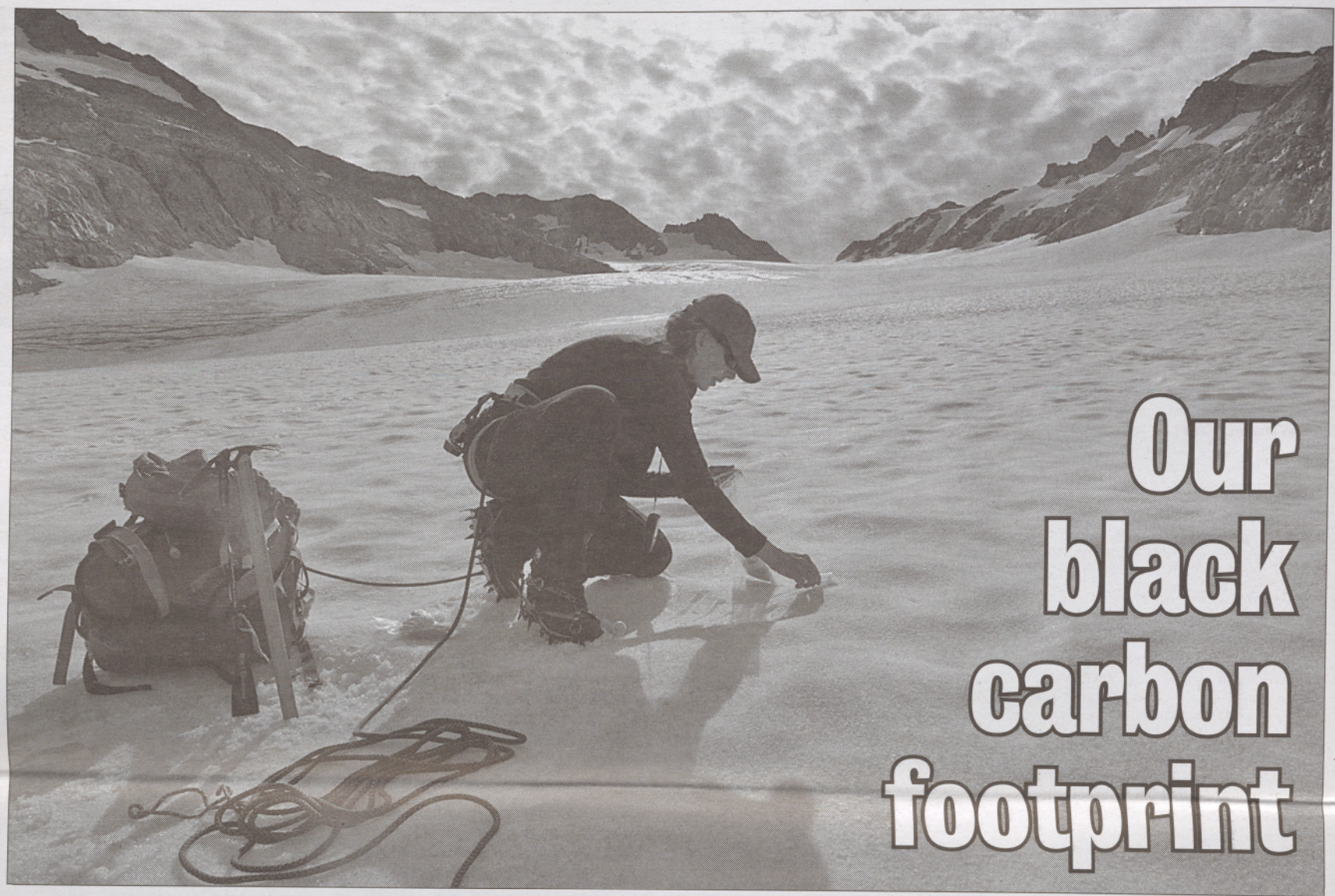

Our black carbon footprint

PHOTO COURTESY OF SUSAN KASPARI

Susan Kaspari collects snow samples from South Cascade Glacier, a large alpine glacier in the North Cascades of Washington, last fall. Kaspari has been studying black carbon concentrations in the Cascades with her graduate students from Central Washington University.

Climate scientist Susan Kaspari studies how black carbon from wildfires contributes to the Cascades' snowmelt

BY EMILY GREEN
STAFF WRITER

As snowpack levels hit record lows, and wildfire seasons hit record highs, a geological sciences professor in Washington is studying the connection between forest fires and accelerated snowmelt.

In the early 2000s, Susan Kaspari was working on her master's degree at the University of Maine, and part of that meant studying ice cores carved out of mountain glaciers in the Himalayas.

During that time she heard a broadcast of James Hansen, a prominent climate scientist, talking about how black carbon is playing a big role in the acceleration of ice melt. He said not much was known about it, but that ice core records could be used to study this correlation.

Kaspari perked up. She was in Asia – which has some of the highest concentrations of black carbon in the world – and she had ice core records. She decided to delve into that topic for her doctorate. In doing so, she and her research team discovered significant increases in black carbon concentrations on Mount Everest in the last quarter of the 20th Century.

After graduating, Kaspari says she was excited to find an opportunity to continue her black carbon research as a professor at Central Washington University. Raised in Colorado, Kaspari is a self-described lover of snow, and she had previously spent summers climbing Washington's mountains and glaciers.

We asked Kaspari to tell us what she learned from her research, and how increased wildfires in the region affect snowpack levels.

Emily Green: *So what is black carbon and why should we care about it?*

Susan Kaspari: A common name people refer to it as is soot. So it's the same thing you see when you burn wood in your wood stove. It's the black stuff left over that's made up of black carbon. The sources are fossil-fuel burning and biomass burning. When it's in the atmosphere, it absorbs energy from the sun and causes atmospheric warming, and then when it's deposited on snow and glacier surfaces, it ends up absorbing more solar radiation. It actually causes the surface of the snow or the glacier to become a little bit darker, so instead of incoming energy from the sun being reflected back out to space, that energy is absorbed, and that leads to accelerated melting.

E.G: *It seems to me like black carbon creates a vicious cycle, that, once started, is impossible to stop. Black carbon can lead to early snow melt, which can lead to early fire seasons, which can lead to more black carbon – is this a fair assessment?*

S.K: There are a lot of other factors to the increase of wildfires. You have to consider what happens to black carbon in the atmosphere and when it's deposited onto the snowpack. When it's in the atmosphere, it's a dark, absorptive particle that absorbs energy from the sun and causes atmospheric heating. But greenhouse gases are doing that too – CO2 is the largest cause of the warming that occurs.

Black carbon is different, compared to the greenhouse gases, in that it's a particle so it has a more regional nature to it, and it doesn't stay in the atmosphere as long. Greenhouse gases: we emit them and they stay in the atmosphere, depending on how much gas you're talking about, from decades to thousands of years. Whereas black carbon is emitted, it's a particulate so it stays in the atmosphere more on a scale of days to weeks.

In North America and Europe, we industrialized sooner than some other places that are at the peak of their industrialization right now. As part of that process, some of the fuels being burned are a lot dirtier, so earlier in the United States' history, we were burning way more coal than the oil and natural gas that are burned more heavily now, and that coal emitted a ton of black carbon. Now we still burn coal, but we've moved away from that.

But if you look at what's happening in Asia, where they're growing really quickly, they are burning a lot of coal, so they've had more of a ramping up of black carbon concentrations in the last several years.

The ice core that I worked on when I was over there showed a threefold increase in black carbon being deposited in the Himalayas in the 1970s, so that's later than what we're seeing to have occurred in North America. So in terms of the idea that it's like a vicious cycle, yes, you could say, "OK, black carbon, it's going to heat the atmosphere and it's going to lead to more warming, which is going to cause us to have more forest fires, and the forest fires contribute more black carbon." That feedback could exist, but there are so many other factors besides it being between those two things.