

# < Is There A Ticking Time Bomb Under The Arctic?

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DAVID GREENE, HOST:

Come with us on a journey inside the Earth. Well, inside a special layer in the Earth. A quarter of the Northern Hemisphere is covered with what's called permafrost, and for the first time in centuries, the permafrost is beginning to warm up because of climate change.

TOM DOUGLAS: And that's a mammoth bone right there.

MICHAELEEN DOUCLEFF, BYLINE: Whoa. It's just sticking out of the wall.

DOUGLAS: Just sticking out of the wall.

GREENE: As it thaws, the permafrost is unleashing something that could affect the whole world. NPR's Michaelaleen Doucleff reports.

DOUCLEFF: We start off 40 feet underground inside a tunnel about as wide as an SUV. All around us are signs of extinct creatures. Tusks are sticking out from the ceiling, and a skull pokes out from the ground. Ancient bones.

DOUGLAS: Where we are here has been dated at about 14,000 years ago.

DOUCLEFF: I think this is one of the coolest places I've been to.

DOUGLAS: Really? All right. Cool. Neat.

DOUCLEFF: That's Tom Douglas, a geochemist with the U.S. Army. He says, back in the 1960s, the Army dug this tunnel so they could study the permafrost. All the walls are covered in a soft brown dust, but what's underneath is hard as concrete.

DOUGLAS: If I tap on this now, you'll see it's hard as a rock.

DOUCLEFF: Yeah.

DOUGLAS: That's permafrost. Anything in there is frozen. You can even see the little marks on there. It's pretty hard.

DOUCLEFF: Permafrost is technically frozen soil, but think of it in terms of chocolate cake. Typically that cake is spongy, soft. But if you take that cake and dip it into water and freeze it, it turns hard. That's exactly what happens to soil when you freeze it. You get permafrost. We walk deeper into the tunnel.

DOUGLAS: All right. So keep going.

DOUCLEFF: Those woolly mammoth bones aren't the only bizarre thing hidden in permafrost. Just then we walk right through another one.

OK.

DOUGLAS: So here's a nice wedge.

DOUCLEFF: It looks like a giant wall of ice, but it's really an upside down iceberg buried in the earth, and the tunnel cuts right through it.

It's a huge chunk of ice all around us.

DOUGLAS: Yeah. I mean, it's basically the size of a house or something.

DOUCLEFF: Wow.

These icebergs are buried throughout Alaska. They're buried under homes, under office buildings, bridges. And they've been frozen solid for centuries, even longer. They actually hold the ground together. Here's the problem.

DOUGLAS: That's about 99 percent water ice by volume.

DOUCLEFF: So when the ground warms up...

DOUGLAS: Imagine turning that into water. You'll leave a trench in the ground that people could fall into, right?

DOUCLEFF: Or, this whole tunnel could collapse?

DOUGLAS: Exactly.

DOUCLEFF: That's exactly what's happening across Alaska. A study in 2016 found that these giant buried icebergs are melting rapidly. New lakes are forming in some places. They're draining in others. Rivers are appearing where they never were before, and the land is sinking. Clearly this is going to be a big problem for Alaskans and other people up North. But that's not what worries Tom Douglas the most. There's something else hidden here that could affect the whole world.

DOUGLAS: Keep going down. Watch your head.

DOUCLEFF: Douglas takes me deeper down into the tunnel.

DOUGLAS: This is really an amazing feature of the tunnel. It's the only place we see it.

DOUCLEFF: He shines his flashlight up to the ceiling.

DOUGLAS: What does that look like to you?

DOUCLEFF: Like grass.

DOUGLAS: Green grass, right?

DOUCLEFF: Yeah. It's green?

DOUGLAS: It's green grass.

DOUCLEFF: Whoa.

DOUGLAS: Yeah. See that?

DOUCLEFF: Wait. We have to tell people that, like, the grass is actually growing down.

DOUGLAS: Upside down.

DOUCLEFF: Yeah.

DOUGLAS: This was in ice, and had been preserved that way for 25,000 years. I mean, if I...

DOUCLEFF: Wait. This is 25,000-year-old grass?

DOUGLAS: Yeah.

DOUCLEFF: That's incredible.

DOUGLAS: Yeah. Really amazing.

DOUCLEFF: You see, the thing is, basically anything that's died in the Arctic over the past hundred-thousand years is buried and preserved down here. The permafrost is packed with plants, like this grass, and dead animals, like those woolly mammoths we saw earlier. All this life is made of carbon. In fact, there's a massive amount of carbon down here. There's more carbon trapped in this permafrost than all the carbon humans have spewed into the atmosphere, first with steam trains then with their cars, planes, coal plants, everything we've done since the Industrial Revolution.

DOUGLAS: The permafrost contains twice as much carbon as is currently in Earth's atmosphere, 1,600 billion metric tons.

DOUCLEFF: Right now this carbon is trapped, frozen. So the big question is what happens to this carbon as the permafrost thaws? Because, you see, there's not just dead creatures in the permafrost. Down here, we are also surrounded by something that's coming back to life.

DOUGLAS: See, that white flag right there is where you've got the 27,000-year-old material.

DOUCLEFF: A few years ago, Douglas and his colleagues ran a very simple experiment. They brought big drills into the tunnel and cut out chunks of ice.

DOUGLAS: We collected basically pieces about the size of a Coca-Cola can.

DOUCLEFF: They took the ice back to the lab...

DOUGLAS: Let it slowly come up to room temperature.

DOUCLEFF: ...And then looked for signs of life. A few days later, something started growing like gangbusters - ancient bacteria.

DOUGLAS: This is material that stayed frozen for 25,000 years old, and, given the right environmental conditions, came back alive again vigorously.

DOUCLEFF: Once the bacteria warmed up, they were hungry, and they started eating the dead plants and animals, turning their carbon into gases.

DOUGLAS: Both carbon dioxide and methane.

DOUCLEFF: Those are the two main gases that cause climate change. Now, that was in the lab. But imagine these bacteria waking up as the permafrost thaws all around the Arctic - in Canada, Greenland, Russia, here in Alaska. Charles Miller is a chemist at NASA's Jet Propulsion Laboratory who studies permafrost. He says that in the past few years they've started seeing the microbes here waking up, warming up and releasing gases.

CHARLES MILLER: There's been quite a tremendous change in the temperature of the permafrost. This warming is causing carbon dioxide to be liberated from the land surface so we see a net release of carbon from the land back to the atmosphere.

DOUCLEFF: Miller says they don't know yet how much carbon will get released from thawing permafrost or how fast it will happen. It's a big wild card of climate change. But once gases start coming off, it could form this type of feedback loop.

MILLER: Over which we would have essentially zero control.

DOUCLEFF: Where the gas coming from the ground warms the Earth, in turn causing more gas to be released, and more and more warming.

Michaeleen Doucleff, NPR News.

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