



Minister makes herself at home, 1B

Barr reviews Mueller report, 3A

Insight: Trump's 'socialist' rhetoric is lazy, 12B

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## Emissions rising in alpine tundra

CU research shows thawing permafrost is emitting more greenhouse gas in mountains

By Charlie Brennan  
Staff Writer

John Knowles took a break Friday from his field work in the Sonoran Desert to talk about some disturbing findings concerning what is happening in the

mountains west of Boulder — and likely, in other similar environments.

Knowles is the lead author on a newly published study that shows that thawing permafrost found in high-altitude mountain ecosys-

tems might be an underexplored contributor to atmospheric carbon dioxide emissions.

Now a postdoctoral researcher in ecosystem science at the University of Arizona, Knowles' research into carbon dioxide emis-

sions in alpine environments, which spanned more than 10 years, was completed when he was a doctoral student in the University of Colorado's Department of Geography and a researcher at the Institute of Arctic and Alpine Research.

He left Boulder for Arizona in September 2017.

"I'd say the most important takeaway from our findings is this is the first work to suggest a mountain analogue to the well-established

See THAWING, 10A

### Boulder County bomb squad



Photos by Lewis Geyer / Staff Photographer

Boulder County bomb squad member Scott Pierce adjusts one of the squad's two robots on Feb. 20 during training at the Longmont Police Department firing range. Visit [dailycamera.com](http://dailycamera.com) for more photos.

## Robot use under scrutiny

Officer safety commended while critics raise concerns

By Madeline St. Amour | Staff Writer

Local police can see into a home without ever stepping foot inside thanks to technology.

While supporters argue that such technology, namely robots, saves lives, critics contend it conflicts with the Fourth Amendment, which protects people against unreasonable searches and seizures.

Longmont police stress they never go against the Constitution and never reach for robots as their first law-enforcement tool.

#### A new robot

The Boulder County Hazardous Device Response Team, also known as the bomb squad, has been using military-grade robots since the mid-2000s. As its models age, in 2020 it plans to ask for funding to buy a new one, according

See TECHNOLOGY, 9A



A screen helps an operator control one of the Boulder County bomb squad robots during training on Feb. 20.

### Border wall vote

## Gardner walking familiar tightrope

Republican Senator's base, unaffiliated voters are very different

By Justin Wingerter  
The Denver Post

It was the "no" vote heard across Colorado — and beyond.

U.S. Sen. Cory Gardner — whose every word and action is being dissected by Democrats eager to oust him from office — backed President Donald Trump on March 14 when he declined to join a dozen of his Republican colleagues blocking the president's declaration of an emergency along the U.S.-Mexico border.

Politicos on the left and the right said the predictable things, while everyone else was left to wonder why Gardner did it and what, if anything, it means for his re-election chances in 2020.

Strategists and pollsters on both sides of the aisle, including those who know Gardner, say the junior senator from Colorado, as politically astute as any elected official in the state, carefully weighed both the practical and political implications before settling on a decision. That decision, they say, fortifies his support with a base that has both moved closer to Trump and also grown weary of Gardner's dissensions from the president.

"I think it was smart, politically, to avoid any headaches with the Republican base," said David Flaherty, a Republican pollster. "However, among likely 2020 voters, it's a difficult vote for voters to look past."

See GARDNER, 11A

### Weather

High: 54 | Low 34

Mostly cloudy  
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Complete index, Page 2A

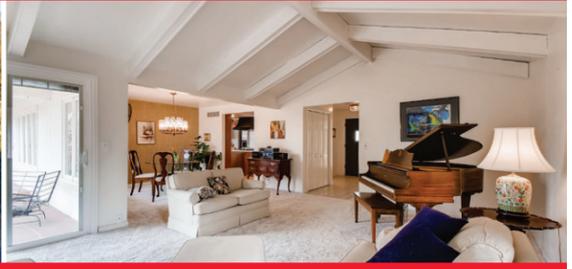
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## THAWING from Page 1A

Arctic tundra permafrost feedback to climate change," Knowles said.

What Knowles is referring to is research in recent decades that has shown that in the Arctic regions, melting permafrost is now unearthing long-frozen tundra soil and releasing CO2 reserves that had been trapped and buried for centuries.

Knowles and his colleagues collected data at Niwot Ridge Long Term Ecological Research site in Boulder County's Indian Peaks Wilderness across seven years, 2008 through 2014, gathering samples of soil CO2, then used radiocarbon dating to estimate how long the carbon forming that CO2 had been in the landscape.

There results showed, to the researchers' surprise, that wind-scoured tundra landscapes above 11,000 feet emitted more CO2 than they captured each year, and that some of that CO2 released in the winter was relatively old, the first such finding of its kind in temperate latitudes.

"During the three-month growing season, when the plants were active, there was some CO2 removed from the atmosphere by plants and brought into tundra," Knowles said.

"But through the whole rest of the year, the other nine months, the tundra lost that CO2 through the microbes breathing it back out, about six times more, back into the atmosphere. When you add it all up, this ecosystem was persistently emitting CO2 into the atmosphere."

It is not good news, he said, that although mountains are generally viewed as carbon sinks, places where carbon accumulates and is effectively stored for long periods of time, their tundra regions—and particularly their perma-



Camera file photo

Seven years of sampling the surface-to-air transfer of carbon dioxide at the Niwot Ridge Long Term Ecological Research site in far west Boulder County have shown that thawing mountain permafrost is emitting more of the greenhouse gas than it is storing.

frosted areas — may counter that dynamic.

"This is a mechanism, a previously unaccounted for mechanism, by which we could be getting more CO2 into the atmosphere. And we all know what that means," Knowles said.

He acknowledged that while the Arctic regions hold vast, deep and continuous reserves of permafrost, "mountain tundra has a lot less. It's patchy, it's only on the mountaintops, et cetera. So in a global sense, our results don't move the needle, probably, terribly much with respect to the Arctic."

However, he said, in the western United States, "We're showing in our

paper, we probably need to temper the value that we're assigning" mountains as a carbon sink.

Other co-authors of the study include Peter Blanken of CU Boulder's Department of Geography; Mark Williams of CU and Institute of Arctic and Alpine Research, as well as Corey Lawrence of the U.S. Geological Survey.

Funding for the research was provided by the National Science Foundation. It was published Thursday in the journal *Nature Communications*.

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