

How Front Range cow waste and car exhaust are hurting Rocky Mountain National Park's ecosystem

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For decades, gases from car exhaust and cow waste have drifted from Colorado's Front Range to harm plants, fish and wildlife in Rocky

Mountain National Park, and while a decades-long effort to slow the damage is working, it's not moving as quickly as environmentalists hoped.

Nitrogen and ammonia, largely generated by heavy traffic along the Front Range and by agriculture in Larimer and Weld counties, are carried by air currents to the highest elevations of the treasured national park and deposited by rain and snow onto sensitive alpine tundra, where thin soil and delicate plants struggle to buffer the pollution.

If the contamination worsens, wildflowers could disappear and algae could bloom in alpine lakes, changing the waters' look and endangering fish, scientists told The Denver Post.

"This issue gets worse as you go up in elevation as the sensitivity gets higher," Jim Cheatham, an environmental protection specialist with the National Park Service's air resource division, said during a recent meeting with Colorado's Air Quality Control Commission.

Over time, the excess nitrogen—largely from vehicle exhaust—acts as a fertilizer to plants and changes the ecosystem, said Jill Baron, a research ecologist for the U.S. Geological Survey and senior research scientist at Colorado State University.

"You're fertilizing Rocky Mountain National Park," Baron said. "But you don't really want to fertilize a national park."

Baron, who has spent her career studying [excess nitrogen](#)'s effect on the park, said she has seen the beginnings of algae growing in mountain lakes because they are getting nutrients from increased nitrogen in the air.

"It's a change from pristine conditions," she said. "We are not at the

bright green and stinky stage yet, but we are at the beginning."

The point of creating national parks was to preserve pristine land across the United States, so scientists want to protect Rocky Mountain's natural beauty and prevent as much human-caused change as possible, Cheatham said.

"The tundra is the primary resource the park was created to protect," he said.

Over the years, state and federal air quality regulators have managed to reduce the amount of wet nitrogen—how the main pollutant is identified once it becomes trapped in rain or snow—that drifts into the park. But the amount of wet nitrogen falling in the park is 0.6 kilograms short of a 2022 goal of 2.2 kilograms per hectare per year, according to an Aug. 15 milestone report presented to the Air Quality Control Commission.

Ammonia pollution exceeds nitrogen

One component of wet nitrogen—[nitrogen oxides](#)—has been reduced since the project began nearly 20 years ago.

However, ammonia—which is also a form of nitrogen—has increased, according to the Rocky Mountain National Park Initiative's 2022 Nitrogen Deposition Milestone Report. In fact, ammonia is now a bigger pollutant in the park, exceeding nitrogen deposits since 2013.

The push to clean the air in the Rocky Mountain National Park began in 2004 when the Environmental Defense Fund and Trout Unlimited petitioned the federal government for improvement. Over the years, the U.S. Environmental Protection Agency and the Colorado Department of Public Health and Environment have created plans to reduce air pollution that damages the park's ecosystem.

This project is different than another effort to reduce the haze that is visible from Rocky Mountain National Park and other federally protected areas. That haze is created by severe ozone pollution in the region. And Rocky Mountain National Park isn't the only Colorado park impacted by the haze.

Every five years, scientists from the National Park Service and the state health department present a report to the Air Quality Control Commission, which establishes rules to regulate air pollution in the state. The most recent report was presented in August, and the next one is due in 2029. The latest Rocky Mountain National Park Initiative report is open to public comment until Sept. 23.

In between reports, scientists monitor the park's air quality and work with various partners, including the Colorado Livestock Association and Colorado Dairy Farmers, to figure out ways to reduce pollutants flowing into the park.

The bulk of the nitrogen pollution comes from the nitrogen oxides produced by burning fossil fuels through driving gasoline-powered cars and trucks, as well as oil and gas production.

Rocky Mountain suffers from the same severe ozone pollution seen in metro Denver and the northern Front Range, Cheatham said. So any attempts to improve air quality through [emissions reductions](#) in lower elevations will help the park.

Scientists have recorded a 15% reduction in nitrogen pollution in the past five years, Cheatham said.

However, ammonia pollution has increased, with the highest recorded levels occurring in 2021, according to the presentation given to the air commission.

That pollution is generated by agriculture, primarily in Weld and Larimer counties. Cattle waste, particularly from feed lots, contains ammonia and fertilizer poured onto crops contains nitrogen. Overall, the number of beef cattle in the region increased between 2018 and 2022, which was the period studied, and the number of dairy cattle reached maximum capacity in 2021, according to the latest report.

In the spring and fall when upslope weather patterns carry air from the south and southeast into the park, the ammonia from the cows is swept into the mountains, said Jeffrey Collett Jr., a CSU professor of atmospheric science.

"All of these things get pushed up the slope of the mountains," Collett said. "As that happens, the air is expanding and cooling and you often form clouds, and that results in heavy precipitation."

Agriculture in Larimer and Weld counties generates more than \$2.5 billion annually for Colorado's economy, according to an Aug. 15 presentation by Bonnie Laws of the Colorado Livestock Association.

Preserving 'icons of pristine national beauty'

Beef producers and [dairy farmers](#) want to do their part in reducing emissions and protecting the national park, but it's a tricky balance, Laws said during her presentation.

"Sometimes when you control air emissions you could end up creating a water quality problem or you could end up with practices that increase greenhouse gases," she said.

Farmers and ranchers try to reduce pollutants by being more efficient with food or fertilizer that contains nitrogen. The more difficult challenge is finding ways to minimize it on the back end.

One of the tools available is an [early warning system](#) for agricultural producers that notifies them when an upslope storm is in the forecast. The producers receive emails and text messages days ahead of the predicted storm so they can change how they manage their livestock.

For example, a feedlot manager could hold off on cleaning big manure piles, which kicks up ammonia, or change their pen cleaning schedules until the storm passes, Collett said.

Some are testing whether wetting a pen's surface ahead of a storm reduces the amount of pollutants lifted into the air. Others are looking at whether changing the nitrogen and protein in animal feed would make a difference.

"There are people working on trying to test these different practices to find ways to reduce these ammonia emissions without impacting their ability to produce beef or milk or whatever their goal is in the operation," Collett said.

Megan McCarthy, a senior air quality planner with the state health department, said the combined efforts are slowing the potential damage to the park and the various agencies and organizations involved are a one-of-a-kind effort in the country.

Baron, the ecologist, said there are some things, such as large-scale global warming, that cannot be controlled by people in Colorado. But efforts to reduce nitrogen oxide emissions statewide not only help the park but also people who suffer from respiratory ailments.

"Catching it early rather than waiting until it's a crisis has been very helpful," she said. "These parks are important to the American people as well as all over the world. The lakes themselves are icons of pristine national beauty. It's one of the few places on Earth where things are

protected.

"Those things are fixable if we have the social and political willpower to do so."

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