Agricultural Best Management Practices:

Helping to Reduce Nitrogen Impacts at Rocky Mountain National Park

Rocky Mountain NP, Colorado

What is the issue and who is involved?

Nitrogen emissions from a variety of human made sources, including ammonia from agricultural production, contribute to an increasing rate of atmospheric nitrogen deposition at Rocky Mountain National Park (RMNP) in Colorado. In 2006, Colorado's crop and livestock producers and researchers at Colorado State University (CSU) began collaborating with the National Park Service (NPS), the Colorado Department of Public Health and Environment, and the U.S. Environmental Protection Agency, to address nitrogen deposition impacts at RMNP.

Why is excess nitrogen harmful to Rocky Mountain National Park?

Although nitrogen is an important part of the park's ecosystems, deposition of excess atmospheric nitrogen at twice the tolerable rate is impacting natural resources. Three-quarters of the park is above 9000 feet where high elevation ecosystems, developed under low nutrient conditions, are especially susceptible to excess nitrogen. Within these ecosystems, alpine tundra, aquatic plants, soil and water quality are most affected. Scientists are also concerned that excess nitrogen may promote non-native plants and reduce forest health. The NPS monitors nitrogen deposition rates and impacts in order to protect RMNP resources for the enjoyment of this and future generations.

What are the sources of excess atmospheric nitrogen?

Nitrogen in the atmosphere comes from a variety of natural and human made sources. Sources of human made or excess atmospheric nitrogen include power plants, vehicle exhaust, oil and gas production, wastewater treatment plants, landfills, fertilized crops, and livestock production, as well as municipal and residential activities such as lawn care. Research shows that excess nitrogen comes into RMNP from both urban and rural areas in Colorado as well as from other states.

How is atmospheric nitrogen transported into the park?

Winds blowing from the west regularly transport to and deposit nitrogen in RMNP. In addition, past weather data and recent research show that common spring and summer weather events, with upslope winds from the east, are transporting and depositing nitrogen in the park. During these weather events, nitrogen is transported by wind, combined with moisture in the air, and then deposited in the park by rain or snow.

What is being done about it?

State and federal agencies are working with industry to reduce significant sources of nitrogen emissions. The State of Colorado will use nitrogen oxide reduction strategies including engine regulations, vehicle standards, and power plant controls to achieve a 41% reduction in statewide nitrogen oxides emissions by 2018. In addition, Colorado's crop and livestock producers are exploring ways to further reduce agriculture's contribution.

Research at CSU is focused on identifying and refining voluntary best management practices (BMPs) for agricultural production activities to improve efficiency and reduce nitrogen emissions from ammonia. Many agricultural producers already employ beneficial BMPs and broader use of science-based BMPs can help reduce emissions even more. BMPs aim to reduce ammonia emissions by: 1) reducing nitrogen inputs, 2) keeping more nitrogen in the final agricultural product, or 3) preserving more nitrogen in the soil on the farm.

For example, one promising BMP being developed by CSU's Dr. Jay Ham, is an "early warning system." This system would advise agricultural producers to avoid high nitrogen-emitting activities, such as certain methods of manure handling and crop fertilizing, during specific weather events that could readily transport nitrogen into RMNP.

Other BMPs being evaluated by CSU include, reducing dietary crude protein and using animal feed additives and hormones. Together these techniques may help increase fed nitrogen retention to improve production or animal rate of gain, and reduce nitrogen lost to the environment. **More information on ammonia BMPs is available at** http://ammoniabmp.colostate.edu.

The efficiency of nitrogen use in crop production is also improving with advances in fertilizer application that optimize fertilizer amount, timing, and placement. Conservation tillage techniques, precision watering, and crop technology are also important ways to improve nitrogen use efficiency.

Why should agriculture producers care about voluntary ammonia best management practices?

Voluntary implementation of ammonia reducing BMPs will benefit Colorado agriculture by:

- Increasing efficiency resulting in the use of less nitrogen, keeping more on the farm for production, and lowering costs.
- Providing producers the opportunity to assist in the refinement of BMPs that are culturally and operationally acceptable and economically viable.
- Reducing the need for mandatory BMPs or regulations in the future.
- Extending land stewardship beyond the farm by helping to address current ecosystem impacts and avoid future impacts to Colorado's natural systems.
- Helping to reduce nitrogen deposition impacts and preserve RMNP and other lands for the enjoyment of this and future generations.

How can producers get involved?

You may join other crop and livestock producers and industry representatives at quarterly meetings of the Rocky Mountain National Park Agriculture Subcommittee which strives to better understand and address nitrogen challenges for both producers and RMNP. This subcommittee reviews BMP science and research, documents agriculture's accomplishments, develops outreach efforts, and exchanges updates and recommendations with state and federal agencies. Adding your voice to this collaborative effort can help keep agriculture on a voluntary and successful path forward.

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RMNP air quality websites:
www.cdphe.state.co.us/ap/rmnp.html and
www.nature.nps.gov/air/Permits/aris/romo

United States Environmental Protection Agency · Colorado Livestock Association · Colorado Department of Public Health and Environment · West Greeley Conservation District · Colorado Pork Producers Council · National Park Service · Colorado Association of Wheat Growers · Rocky Mountain RMAA Agribusiness Association · Colorado Dairy Farmers · colorado Corn · NRCS Natural Resources Conservation Service · Colorado State University · Rocky Mountain Farmers Union