Agricultural Best Management Practices:

Helping to Reduce Nitrogen Impacts at Rocky Mountain National Park

What is the issue and who is involved?

Nitrogen emissions from a variety of man-made sources, including ammonia from agricultural production, contribute to excess 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 (State), and the U.S. Environmental Protection Agency, to address nitrogen deposition impacts at RMNP. With the help of Colorado agriculture, nitrogen deposition can be reduced and the nutrient balance can be improved.

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 with thin, granitic soils 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 to protect RMNP resources for the enjoyment of this and future generations and because, as agricultural producers understand, proper nutrient management is the right and responsible course of action.

What are the sources of excess atmospheric nitrogen?

Nitrogen in the atmosphere comes from a variety of natural and man-made sources. Sources of man-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 and waste disposal. 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 nitrogen and deposit it into 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 is using nitrogen oxide reduction strategies including engine regulations, vehicle standards, and power plant controls to achieve a 37% reduction in statewide nitrogen oxide 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 agriculture to improve efficiency and reduce ammonia emissions. Many agricultural producers already employ beneficial BMPs and broader use of science-based BMPs can help further reduce emissions. BMPs aim to reduce ammonia emissions by: 1) reducing nitrogen inputs, 2) keeping more nitrogen in the final product, or 3) preserving more nitrogen in the soil on the farm.

One promising BMP in development is an "early warning system," which 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 ammoniabmp.colostate.edu.**

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

Why should agricultural producers care about voluntary best management practices to reduce ammonia emissions?

Voluntary implementation of ammonia reducing BMPs will benefit agriculture by:

- Lowering costs by using less nitrogen and keeping more on the farm for production.
- Allowing agricultural producers the opportunity to refine 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.
- Reducing nitrogen deposition impacts and preserving RMNP and other lands for the enjoyment of future generations.

How can agricultural producers get involved?

Implement BMPs for even greater nitrogen efficiency on the farm. This will reduce the total amount of nitrogen lost from raw materials, decrease ammonia-related odor complaints, and result in more valuable products.

Sign up to participate in the warning system at www.rmwarningsystem.com. Signing-up will allow you to receive warnings in advance of weather events likely to carry nitrogen into RMNP from selected counties. Producer participation in this collaborative effort can help keep agriculture on a voluntary and successful path forward.

For more information:

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RMNP air quality websites:
www.colorado.gov/cdphe/rmnpinitiative
www.nature.nps.gov/air/Permits/aris/romo
http://naqsat.tamu.edu