Compost Management and Application 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 compost management and application, 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's composters, 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 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 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, livestock production, composting, and biosolids application, 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?

Compost Best Management Practices can help!

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 Colorado's nitrogen oxide emissions by 2018. Colorado's crop and livestock producers are also exploring ways to further reduce agriculture's contribution.

Many agricultural producers and composters already employ beneficial best management practices (BMPs), and broader use of science-based BMPs can help reduce emissions even more. BMPs aim to reduce ammonia emissions by keeping more nitrogen in the final compost product. BMPs for composters to avoid ammonia volatilization include:

- Achieving proper C:N ratios (~30:1)
- Minimizing aeration and turning, which should be done as infrequently as possible (but sufficient to maintain aerobic conditions and control pests)
- Maintaining acidic pH (i.e., less than 7)
- Maintaining a moisture content between 40 and 60%.

One promising BMP in development by the Colorado Livestock Association and CSU is an "early warning system." This system would advise agricultural producers, biosolids applicators, and composters to avoid high nitrogen-emitting activities, such as turning compost wind rows, forming new windrows immediately prior to a warning period, and load out or application operations that might be delayed by a few days, during specific weather events and in specific locations from which nitrogen could readily be transported into RMNP.

Why should composters care about voluntary ammonia emissions reductions?

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

•Increasing the nitrogen content of produced compost, resulting in a more valuable end product for customers.

•Allowing 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.

•Helping to reduce nitrogen deposition impacts and preserve RMNP and other lands for the enjoyment of this and future generations.

How can composters get involved?

Implement BMPs that preserve nitrogen in compost. This will reduce the total amount of nitrogen lost from raw materials, decrease ammonia-related odor complaints, and result in a more valuable product.

Sign up to participate in the warning system at www.rmwarningsystem.com. This will allow you to receive warnings in advance of weather events that carry nitrogen into RMNP for selected counties 2-3 days in advance of the event. When you receive a warning, simply respond by indicating whether or not you are able to change practices for the period indicated. Your participation will help make a producer-friendly and effective system that will preserve our natural resources at RMNP, while allowing for needed flexibility for agricultural producers and composters.

For more information:

Contact:
Brock Faulkner, faulkner@tamu.edu
Elizabeth Sapio, elizabeth.sapio@state.co.us
Jim Cheatham, jim_cheatham@nps.gov

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