NRCS
Natural Resources
Conservation Service

United States Department of Agriculture
Natural Resources Conservation Service

Air Quality and Atmospheric
Change National Technology
Development Team

Fact Sheet -- Air Quality and Atmospheric Change

Ozone Precursors and Animal Operations

What is Ozone?

Ozone is a gas composed of three oxygen atoms and is the primary component of smog. Although ozone in the upper atmosphere forms a layer that provides protection from ultraviolet radiation, ozone in the lower atmosphere and at ground level can be harmful.

Ground-level ozone is currently considered a “criteria air pollutant” which means that the US Environmental Protection Agency (EPA) has identified it as a pollutant that causes significant health (respiratory) and environmental (visibility and vegetation damage) effects. They have currently established National Ambient Air Quality Standards (NAAQS) for ozone.

While ozone is not typically emitted directly from agricultural operations, it is formed in the lower atmosphere through the chemical reactions of nitrogen oxides (NOx) and volatile organic compounds (VOCs) which are regulated as ozone precursors. NOx and VOCs are known as ozone precursors because they are identified as pollutants that form ozone. NRCS looks at ozone precursors as an aspect of the Air Quality and Atmospheric Change (AQAC) resource concern because of the health effects, visibility problems, and damage to vegetation that can result from ground-level ozone.

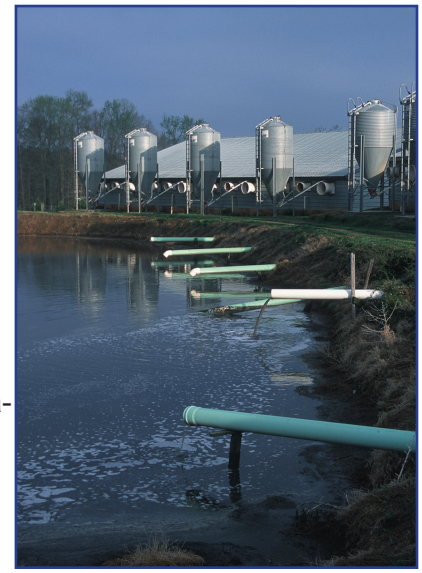
Where is Ozone an Issue?

Ozone is typically a local or regional issue. Greater emphasis on addressing ozone is likely to occur in areas that do not meet the ozone NAAQS.

How Do Animal Operations Affect Ozone?

Animal operations can influence ozone concentrations in a variety of ways, including:

- Biological organisms (including animals) emit VOCs naturally.
- The breakdown or decomposition of biological materials such as manure, feed, or mortalities can produce VOCs (through incomplete breakdown/decomposition) and NOx (mainly from the nitrification/denitrification processes).
- Combustion in on-farm equipment or the burning of biological material produces NOx, and VOCs.



Helping People Help the Land

What Can I Do?

Many common practices and management activities can help reduce the likelihood of ozone impacts from animal operations. The following suggestions are not all-inclusive but offer some options that are available for managing the emissions of ozone precursors. Talk with your NRCS conservation professional about what specifically will work best on your land.

Concentrated Operations

- Maintain appropriate cleaning techniques for spilled feed, bedding, etc.
- Maintain appropriate moisture content in and on open-lot surfaces.
- Use a solid manure management system instead of a liquid manure management system.
- Cover the surface of storage piles of manure, bedding, feed, etc.
- Utilize feed management or feed additives to minimize intestinal and manure VOC production.

Grazed Operations

- Use prescribed grazing and/or range management to minimize manure accumulation and reduce the need for burning.
- Implement alternatives to the burning of excess biomass on rangelands through prescribed grazing or the development of biofuels.
- When rangeland burning is necessary, promote an efficient and effective burn through the development and implementation of prescribed burn and smoke management plans.

Miscellaneous

- Avoid spilling feed or manure, and clean materials up quickly when spills do occur.
- Replace older, less efficient combustion sources or engines with more efficient or alternative fuel combustion or electric heating/power sources.

For More Information

NRCS is currently developing guidance and conservation practice standards for addressing ozone precursors at animal operations. For more information, contact the Air Quality and Atmospheric Change National Technology Development Team (http://www.airquality.nrcs.usda.gov/) at the West National Technology Support Center in Portland, Oregon. (Primary contact: Greg Zwicke, 503-273-2434, greg.zwicke@por.usda.gov)

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