EQUUS BEDS RESEARCH FINDINGS

An intensive two-year study assessed the potential leaching of nitrogen into the Equus Beds aquifer in south central Kansas. The study was conducted by United States Geological Survey scientists, with funding through the Environmental Protection Agency and the Kansas Department of Health and Environment. Nitrate concentration in groundwater collected from shallow domestic wells was not correlated with intensity of the nitrogen fertilization in the area around the well. Highest nitrate concentrations were generally in wells close to intensive livestock production. Higher nitrogen fertilization, however, was correlated with higher root zone nitrate concentrations.

These research findings are consistent with the Best Management Practices for minimizing nitrate concentration outlined in this publication.

For additional information see Extension publications:

Corn Production Handbook C-560
Grain Sorghum Production Handbook C-687
Management Practices Affecting Nitrogen Loss from Urea MF-894
Using Legumes in Crop Rotation L-778
Wheat Production Handbook C-529

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WATER QUALITY

Best Management Practices for *Nitrogen*

Nitrogen management is an important concern to producers and the general public in Kansas. Nitrogen has significant economic benefits, but can create some unwanted water quality problems.

All users of nitrogen fertilizers should use Best Management Practices to protect water supplies.

BENEFITS OF NITROGEN

- The major nutrient input on most crops, helping provide a low-cost, abundant food supply.
- Helps keep landscapes green and healthy.

CONCERNS ABOUT NITROGEN USE

- Can move from crop fields, pastures, turf grasses, septic systems, and livestock facilities into surface or ground water.
- At high concentrations in drinking water, causes health problems for babies and livestock.

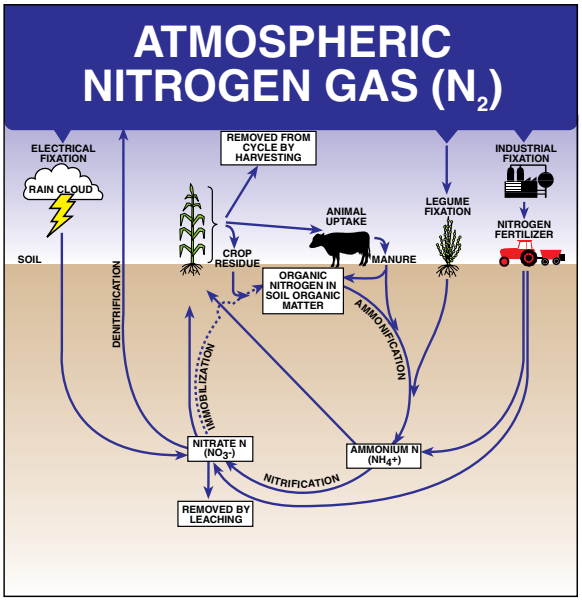
In Kansas, a large percentage of fertilizer nitrogen is used for agricultural purposes. This publication addresses Best Management Practices for the major users of nitrogen — agricultural producers. The same principles and some of the same practices also apply to landscape and other nonagricultural uses.

GOALS OF NITROGEN MANAGEMENT

To manage nitrogen well:

- Determine the optimal nitrogen rate to use on each site and apply no more than necessary,
- Use the right source of nitrogen for the plant, soil, and plant residue situation, and
- Apply the nitrogen at the right time, either as a single application or in two or more split applications.

The importance of developing an overall nitrogen management strategy should not be underestimated. Once nitrogen is applied to the soil, it is very dynamic and can be difficult to control. Effective management is based on an understanding of the nitrogen cycle.



THE NITROGEN CYCLE

The major sources of nitrogen include commercial fertilizer, animal manure, plant residues, and biological fixation by legumes. Regardless of the source, all nitrogen undergoes the same pathways in the cycle.

Most sources of nitrogen, except fertilizer nitrate, initially mineralize into ammonium. In this form, nitrogen is tightly held by the soil. Once soil temperatures reach 50 degrees or more, certain soil bacteria begin to convert ammonium into nitrate. Plants can take up nitrogen as either ammonium or nitrate.

Nitrate moves easily in soil water and is the form of nitrogen that is most difficult to control. In the nitrate form, nitrogen is very susceptible to leaching. This is a concern, especially on environmentally sensitive soils, such as sandy soils overlying ground water supplies and near sources of water for human or livestock consumption.

BEST MANAGEMENT PRACTICES

As the nitrogen cycle demonstrates, there is no way to prevent a portion of the nitrogen in the soil from being converted into nitrate. This is true even if all nitrogen is applied as organic nitrogen or ammonium. Producers can, however, minimize the amount of nitrate in the soil at any given time. The chart on the opposite side of this brochure lists some of the BMPs available for nitrogen management.

One of the most critical, yet least used, Best Management Practice in nitrogen management is the profile nitrogen soil test.

SPECIAL SITUATIONS

Sandy Soils — Nitrates can leach more rapidly through sandy soils than finer textured soils. It is important to set realistic yield goals and use split applications or a nitrification inhibitor.

Manure Applications — Over application of nitrogen is a common problem when using manure on cropland. Have the manure analyzed and calibrate the spreader.

Areas Near Water Supplies or Drainage Inlets — Nitrogen applied or handled near wells, streams, and drainage inlets is especially difficult to control. Use of buffer zones can help.

High Residue Situations — Under high residue conditions, a portion of nitrogen applied as urea can be volatilized. Try to place urea-based nitrogen below the soil surface.

Saturated Soils — When soils are saturated, nitrogen can be lost into the atmosphere through denitrification. This is an economic concern, not an environmental concern, since the nitrate is simply converted to nitrogen gas.

EIGHT BEST MANAGEMENT PRACTICES FOR NITROGEN

Practice	Description	Benefit
1. Set realistic yield goals	For crops, use actual yield records on the specific field. If desired, adjust for expectation of a 5 to 10 percent yield increase. Do not fertilize for an unattainable yield goal.	Limits potential for excess soil levels of nitrogen.
2. Soil testing	Soil samples for nitrogen should be taken to a depth of two feet and analyzed separately. Results will be used as part of the "Nitrogen Recommendation Equation." Results of a profile nitrogen soil test are more important on finer-textured than sandy soils.	Helps fine-tune nitrogen recommendations. Used in combination with yield goals and credits for previous crops and manure
3. Nitrogen timing	Split applications on sandy soils or soils with shallow water tables to match nutrient applications to crop needs at specific stages of growth.	Places nitrogen in the soil when it is most likely to be taken up by the crops. Reduces chances of leaching.
4. Site specific management	Rather than applying a single nutrient rate over the entire field, nutrient applications rates are varied depending on the actual yield history of small areas within the field,	Helps ensure that no area of a field receives more nitrogen than necessary.
5. Nitrification inhibitors	Products such as N-Serve can slow down the rate at which ammonium-nitrogen is converted into nitrate.	Less nitrate available to leach into groundwater
6. Manure management	Sample manure to know its nitrogen and phosphorus content, then calibrate the manure spreader and apply only as much manure as the nutrient requirements of the crop. Incorporate after application. Do not apply manure to frozen soil.	Helps avoid runoff problems and the application of excessive levels of nitrogen.
7. Careful handling and mixing practices	Store, handle, and mix nitrogen products away from wells and water sources. Keep manure and livestock wastes at least 200 feet away from wells to prevent problems with direct run-in.	Helps prevent accidental contamination of water supplies with large concentrations of nitrogen.
8. Buffer zones	Create "off limit" zones around environmentally sensitive areas.	Helps prevent contamination of water.