



**Figure 1. Estimated nitrification over time.**

Heavy rainfall in central Nebraska last week has caused crop producers to question the availability of nitrogen (N) fertilizer applied this spring and with good reason. Some fields may have experienced significant nitrogen loss. There are several factors which will influence the amount of loss, including rainfall amount and intensity, soil texture, soil temperature, fertilizer source and application date. Loss pathways can include runoff, denitrification and leaching.

### Runoff

If fertilizer had been recently applied to the soil surface, without incorporation or a gentle rain of 0.5 inch or more to move nitrogen into

the soil profile, substantial nitrogen loss may occur in runoff. Rainfall was very intense in some areas last week, with total precipitation exceeding 10 inches in some areas, resulting in severe erosion and loss of nutrients on or near the soil surface.

### Denitrification

The primary nitrogen loss mechanism from saturated, fine-textured soils may be denitrification. This is the process of anaerobic bacteria present in soil converting nitrate-N into gaseous forms (nitric oxide, nitrous oxide, dinitrogen) which can be lost to the atmosphere. In fields where most fertilizer nitrogen was applied preplant, likely four to eight weeks ago, much of the N may have been converted to nitrate by the microbial process of nitrification. This nitrate is then susceptible to loss via denitrification or leaching.

### Leaching

If nitrogen existed in soil in the nitrate or urea forms, significant leaching loss may have occurred, more so on coarse-textured soils. Some of this nitrogen may have leached deep enough into the root zone to be unavailable to the crop, at least early in the season. Continued precipitation or irrigation may leach this nitrogen out of the root zone entirely.

For more information on soil processes influencing nitrogen management, view the Nitrogen Chapter of the Cooperative Extension publication, Nutrient Management for Agronomic Crops in Nebraska.

### Management options

Unfortunately, there are many variables interacting to influence the potential for nitrogen loss from heavy rainfall, making it difficult to estimate how much fertilizer N has been lost, and whether producers should apply more fertilizer.

**Figure 1** and **Table 1** can be used to help derive rough estimates of potential loss. For anhydrous ammonia applied 6 weeks ago, perhaps at least 50% of the nitrogen has been converted to nitrate. If soils have remained saturated for a week, perhaps 10-20% of the nitrate nitrogen has been lost to denitrification, with additional loss due to runoff or leaching. Whether remaining nitrogen will be adequate to optimize yield potential depends on the initial application rate, and growing conditions during the rest of the season.

**Table 1. Potential field loss of nitrogen, depending on temperature and time since application**

Time (days)	Temperature (degrees F)	N Loss (percent)
5	55-60	10
10	55-60	25
3	75-80	60
Denitrification loss will be less with soils having less than 1% organic matter.		

Soil sampling is one option to evaluate what is left, but results may be difficult to interpret. If nitrogen fertilizer has been banded, many samples will be required to integrate what the plant will have access to. Samples should be collected to a depth of three feet in one foot increments. Consider having samples analyzed for ammonium as well as nitrate, since substantial nitrogen from many fertilizer sources may remain in the ammonium form. Interpretation of soil test results for both ammonium and nitrate may require help from a soil scientist. Even then accurate prediction of fertilizer nitrogen availability will be difficult.

If producers can sidedress nitrogen or apply it through an irrigation system, they may want to supplement loss they believe may have occurred. The challenge will be to know what rate to apply. Over-fertilization will increase the cost of production and potentially increase the loss of nitrogen to the environment, while under-fertilization will reduce yield.

Carefully monitoring the crop for N status may be the best option, primarily between now and silking, especially if producers have the option to sidedress, fertigate or apply nitrogen with high clearance equipment. Most corn hybrids will take up the majority of their nitrogen requirement in this period. Visual observation for signs of nitrogen deficiency (lower leaves yellowing, inverted “V” yellowing pattern of leaf tips) is one option, although yield potential may be reduced by the time nitrogen deficiency is visually evident. A chlorophyll meter may be useful in detecting nitrogen stress before it can be seen. To calibrate chlorophyll meter readings, it is best to have one or more strips in the field with nitrogen applied at a rate high enough to be non-yield limiting to serve as a reference. For more information on the use of a chlorophyll meter to manage nitrogen, see NebGuide 1171, Using a Chlorophyll Meter to Improve N Management.