

NUTRIENT MANAGEMENT  
FOR DAIRY PRODUCTION

# The pre-sidedress soil nitrate test (PSNT)

for Western Oregon and Western Washington

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## What is the Pre-sidedress Soil Nitrate Test (PSNT)?

The Pre-sidedress Soil Nitrate Test (PSNT) evaluates nitrogen fertilizer needs for field corn. The PSNT can help ensure maximum yields without excessive nitrogen fertilizer applications. The benefits are reduced fertilizer purchases and reduced risk of environmental contamination.

## Who can benefit from the PSNT?

Anyone producing corn for feed can potentially benefit from the PSNT. Growers who apply manure to their fields are especially likely to benefit. The organic matter in manure contributes nitrogen that is not well accounted for by other soil test methods.

## Why does the PSNT tell more about nitrogen availability than early spring soil tests?

Soil tests performed in early spring do not tell how much nitrogen might be available later in the growing season. Most soil nitrogen is held in organic matter, and is unavailable to growing plants. As the soil warms up, increased biological activity converts organic nitrogen into

plant-available inorganic forms (Figure 1). An early spring soil test does not take this nitrogen into account. Thus, if you base fertilization on an early spring test, you might apply too much fertilizer.



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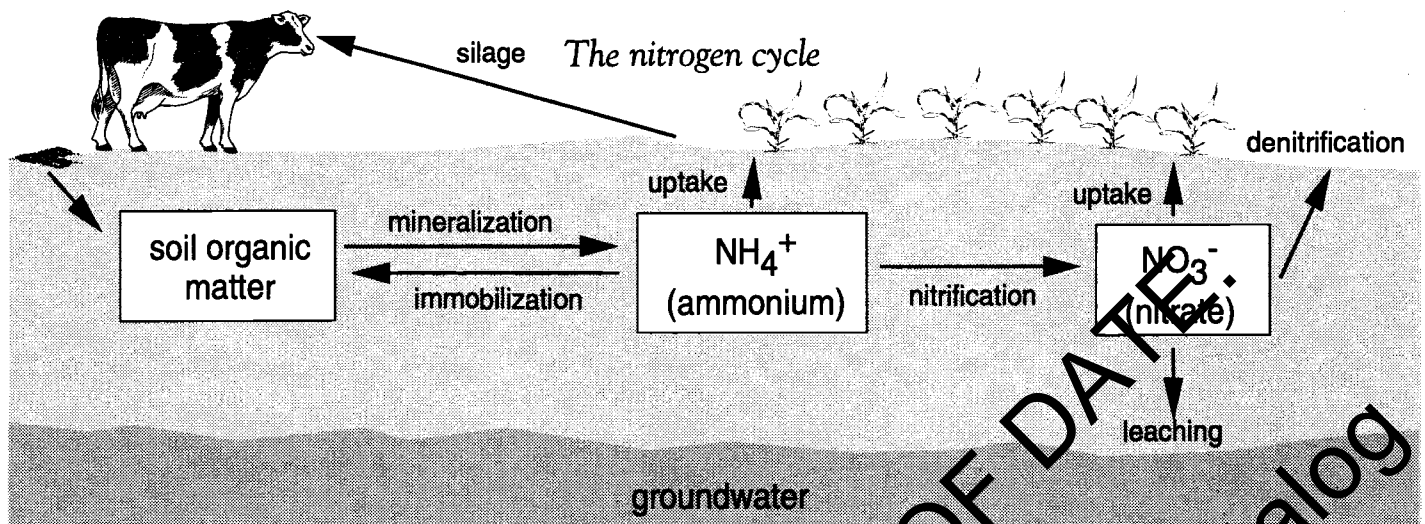


Figure 1.—Organic nitrogen in soil is converted through mineralization to plant-available inorganic forms ( $\text{NH}_4^+$  and  $\text{NO}_3^-$ ), which are taken up by growing plants.

The PSNT measures soil nitrate ( $\text{NO}_3^-$ -N) during the growing season, after some nitrogen has become plant-available and just prior to the crop's period of greatest need.

#### How much N should I apply before planting?

If needed, apply no more than 40 lb N/acre as a starter in spring. Most fields with a history of manure applications require no starter N fertilizer. If starter N is needed, it can be supplied by manure or commercial fertilizers.

Delay as much N fertilization as possible until midseason. If the midseason PSNT shows low N levels, make a sidedress fertilizer application.

#### When is the best time to measure soil nitrate?

Corn plants begin their greatest uptake of nitrogen around the 5-leaf stage, or when the plants are

about 12 inches tall at the center of the whorl. The best time to evaluate soil nitrogen is just prior to this period of rapid uptake (Figure 2).

#### How much N is enough?

A PSNT value of 25 ppm or greater is sufficient for maximum silage corn yields. If the PSNT value is below 25 ppm, apply nitrogen at the rates shown in Table 1.

Nitrogen can be supplied by manure or commercial fertilizer. Most dairies produce enough manure to supply needed N, making fertilizer purchases unnecessary. See EM 8585, *Manure Application Rates for Forage Production*, for more information.

#### What if I apply more N than the crop needs?

Excess nitrogen will not be used by the crop and will remain in the soil after harvest. During winter, rain may wash nitrate from the soil into surface and ground waters. This poses a threat to human and environmental health and wastes fertilizer dollars.

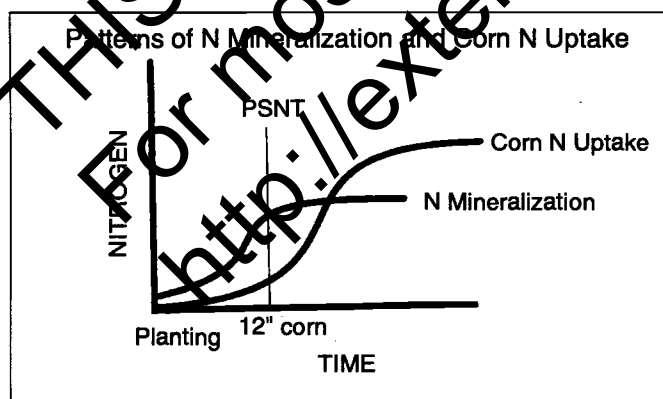


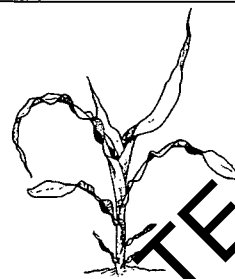
Figure 2.—Perform the PSNT when corn is 12 inches tall (before rapid nitrogen uptake by corn and after some nitrogen mineralization has occurred).

Table 1.—Suggested N fertilization rates based on PSNT values.

PSNT value (ppm $\text{NO}_3^-$ -N)	Estimated N to apply (lb N/acre)
0-10	100-175
10-20	50-100
20-25	0-50
over 25	0

# Soil sampling and handling procedures

**1** **When to sample.** Sample soil when the corn has 5 *collared leaves*, or at least a week before planned sidedressing. This usually coincides with a plant height of about 12 inches at the center of the whorl.



**2** **Where to sample.** Sample between rows, away from fertilizer bands. Avoid irregularities in the field, such as low areas or places where manure has accumulated.  
Collect a composite sample of 15–20 *cores*. The more cores you collect, the better your chance of getting an accurate measurement.



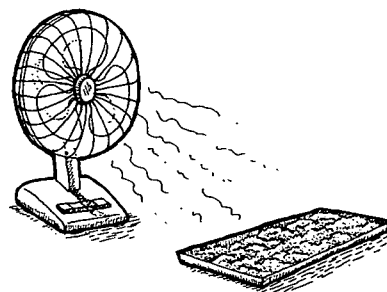
**3** **How to sample.** Sample soil to a depth of 12 inches.



**4** **Preparing the sample.** Mix the sample thoroughly in a clean container. Save a subsample sufficient to fill a soil sample bag.

*Dry this sample immediately.* Drying is important to stop biological activity, which could alter soil nitrate content. Dry the sample by spreading it on a clean piece of paper in a warm, well-ventilated area. A fan can increase air flow. Do not use a microwave oven to dry the sample.

If you cannot dry the sample immediately, refrigerate it in a cooler and dry it later the same day. If you cannot dry or deliver the sample to a lab the day it is collected, freeze it.



**5** **Soil analysis.** Send the sample to a soil testing lab to be analyzed for nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ). See FG 74, *A List of Analytical Laboratories Serving Oregon*, for a list of labs.



**6** **Interpreting results.** If soil nitrate levels are *above 25 ppm*, no additional nitrogen fertilizer is needed. If soil nitrate levels are *below 25 ppm*, apply fertilizer at the rates shown in Table 1.

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Hart, J. *A List of Analytical Laboratories Serving Oregon*, FG 74 (Oregon State University, Corvallis, revised 1996). No charge

Hart, J., M. Gangwer, M. Graham, and E.S. Marx. *Manure Application Rates for Forage Production*, EM 8585 (Oregon State University, Corvallis, 1996). \$1.00

Hart, J., E.S. Marx, and M. Gangwer. *Dairy Manure as a Fertilizer Source*, EM 8586 (Oregon State University, Corvallis, reprinted 1996). \$1.00

### Other publications

Magdoff, F. Understanding the Magdoff Residues Nitrate Test for Corn. *Journal of Production Agriculture* 4 (1991): 297-305.

Marx, E.S. *Evaluation of Soil and Plant Analyses as Components of a Nitrogen Monitoring Program for Silage Corn* (Master's thesis, Oregon State University, 1995).

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