

POTENTIAL NITROGEN LOSS - 2018

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Another wet spring here in Iowa, with high rainfall in some areas the past couple of weeks. Once again questions about nitrogen (N) loss and potential need for supplemental N application to corn. Unfortunately, this question has become almost the norm. I looked back at prior ICM News articles I've written, and I counted approximately 20 articles on the subject since 2007.

The discussion of N loss should include loss from the soil N supply and residual nitrate-N. There is usually tile drainage every spring (well, probably at some point every spring), and sometimes but not usual in the late fall (remember a couple of years ago). Also, losses can be rapid if soils become saturated (free water filling the soil pores, standing water, anaerobic conditions), soils are warm, and nitrate is present; then denitrification (biological conversion of nitrate to N gas). So some N loss from soils is typically occurring, just can be small or large depending on many factors. Prediction of the effect on N supply to corn, additional N fertilization need, etc. in wet periods is difficult. There are several approaches to take in making estimates of N status or loss.

Also remember that guidelines for N application rates for corn in Iowa do take into account "normal" N losses as N rate research trials are conducted in the field and with good management. This is especially important as those N rate trials incorporate supply and loss of soil derived-N, not just applied N. This means that the accumulation of N rate research trials, like used in the [Corn Nitrogen Rate Calculator](#), builds in some variation of soil N supply and climatic conditions.

Approaches to estimating N loss

Use the Late Spring Soil Nitrate Test (LSNT). Use of that test in Iowa corn production was recently described in a new Extension and Outreach publication ([CROP 3140](#)). At this time in most fields, we are past the calendar time and growth stage calibrated for that test and it should no longer be used.

Use modelling, which is relatively new for production agriculture. There are several models currently in the market place, including the Iowa State University Extension and Outreach [FACTS](#) web site that does supply information on nitrate-N in the soil profile (the site was recently updated). You can pick a research site near you and look at the increase and decrease in soil nitrate-N concentration between soil depths. Remember that corn is rapidly taking up N at this time, so there is expectation of decreasing overall nitrate in the profile due to uptake. However, very rapid changes would indicate leaching movement or denitrification, besides crop uptake.

Use an estimate of nitrate-N production and then loss during periods of soil saturation. An example of this was discussed in a 2014 ICM News article ([Estimating Nitrogen Loss in Wet Corn Fields](#)). Important components are the estimation of how much nitrate-N has formed from applied N by the time of wet conditions, and the length of soil saturation (which can vary greatly across fields, ex. ponded vs. not ponded areas, and runoff vs. infiltration). When soils are warm, loss can be rapid and large, but slow when soils are cool or there is little nitrate. Recent sidedress

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fertilizer N applications would be fully or partially “protected” from loss if the application included ammonium which is retained on the soil cation exchange complex and not subject to leaching or denitrification (such as urea, ammonium, and anhydrous ammonia). Anhydrous ammonia is all ammonium, urea rapidly converts to ammonium, and urea-ammonium nitrate solution (UAN 28 or 32%) is one-quarter nitrate, one-quarter ammonium, and one-half urea. Early sidedress applications were likely converted to nitrate before the recent high rainfall events.

Use the springtime rainfall total. Details of this approach were discussed in a June 6, 2016 ICM News article ([Precipitation and Nitrogen This Spring](#)). The amount of spring rainfall to trigger the potential for additional N application need was updated with research data from 2016. Those rainfall totals are now 17.8 inches from March 1 to June 30 for Southeast Iowa, and 15.5 inches from April 1 to June 30 for the majority of Iowa. These rainfall totals have about a 76 percentage chance for estimating correctly (adequate N or deficit N) if N loss is sufficient enough to consider additional N application. One does not need to wait until the end of June to add up the total. That can be done on an on-going basis and if the total begins to approach those values, then be thinking about plans for applying additional N. According to precipitation maps, we have exceeded those rainfall totals in the central to northern part of Iowa. Local rainfall measurements would provide more specific rainfall information. The more rainfall there is above those trigger totals, the more likely supplemental N would be needed. A caveat to use of the rainfall totals is if there are heavy, short duration, rainfall events. If water runs off the field, and does not get into the soil profile, then there should be a discounting off the total. Also, if the rainfall reaches those totals in the early spring, there should also be some discounting off the total due to less nitrate buildup and less denitrification with cool soils. For example, total rainfall amounts in just an individual month, like April or May, do not provide the same level of success as when June rainfall is included. The rainfall triggers are related to use of suggested economical N rates (MRTN) from the Corn Nitrogen Rate Calculator. If higher or lower N rates were applied to fields, then the odds of needing additional N go up or down.

Resources for nitrogen rate decisions

[Use of the Late-Spring Soil Nitrate Test in Iowa Corn Production \(CROP 3140\)](#)

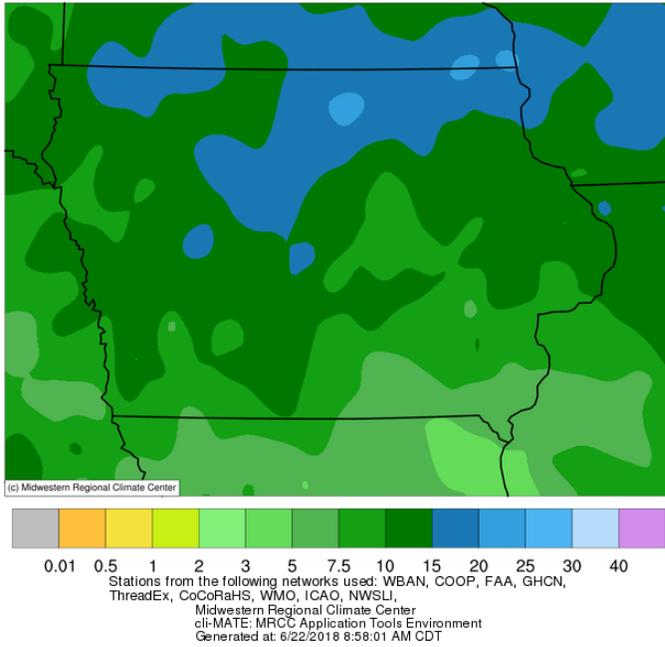
[Corn Nitrogen Rate Calculator](#)

[ISU Extension and Outreach Soil Fertility Web Site](#)

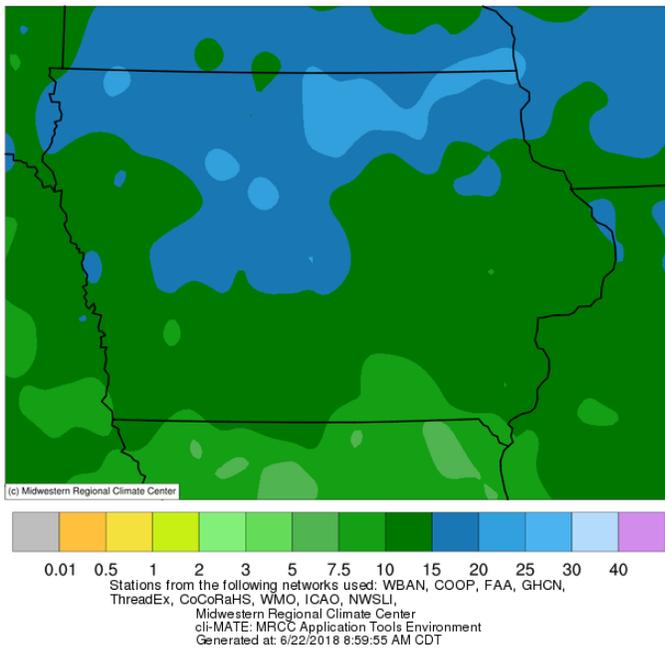
[Nitrogen Use in Iowa Corn Production \(CROP 3073\)](#)

[Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn \(PM 2015\)](#)

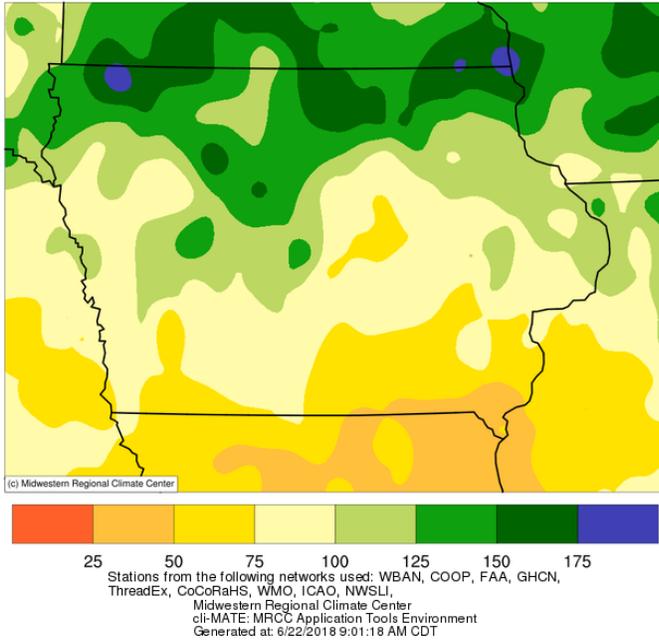
Accumulated Precipitation (in)
April 01, 2018 to June 22, 2018



Accumulated Precipitation (in)
March 01, 2018 to June 22, 2018



Accumulated Precipitation (in): Percent of 1981-2010 Normals
April 01, 2018 to June 22, 2018



Accumulated Precipitation (in): Percent of 1981-2010 Normals
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