Fall Nitrogen Management

IFCA Webinar, October 22, 2024

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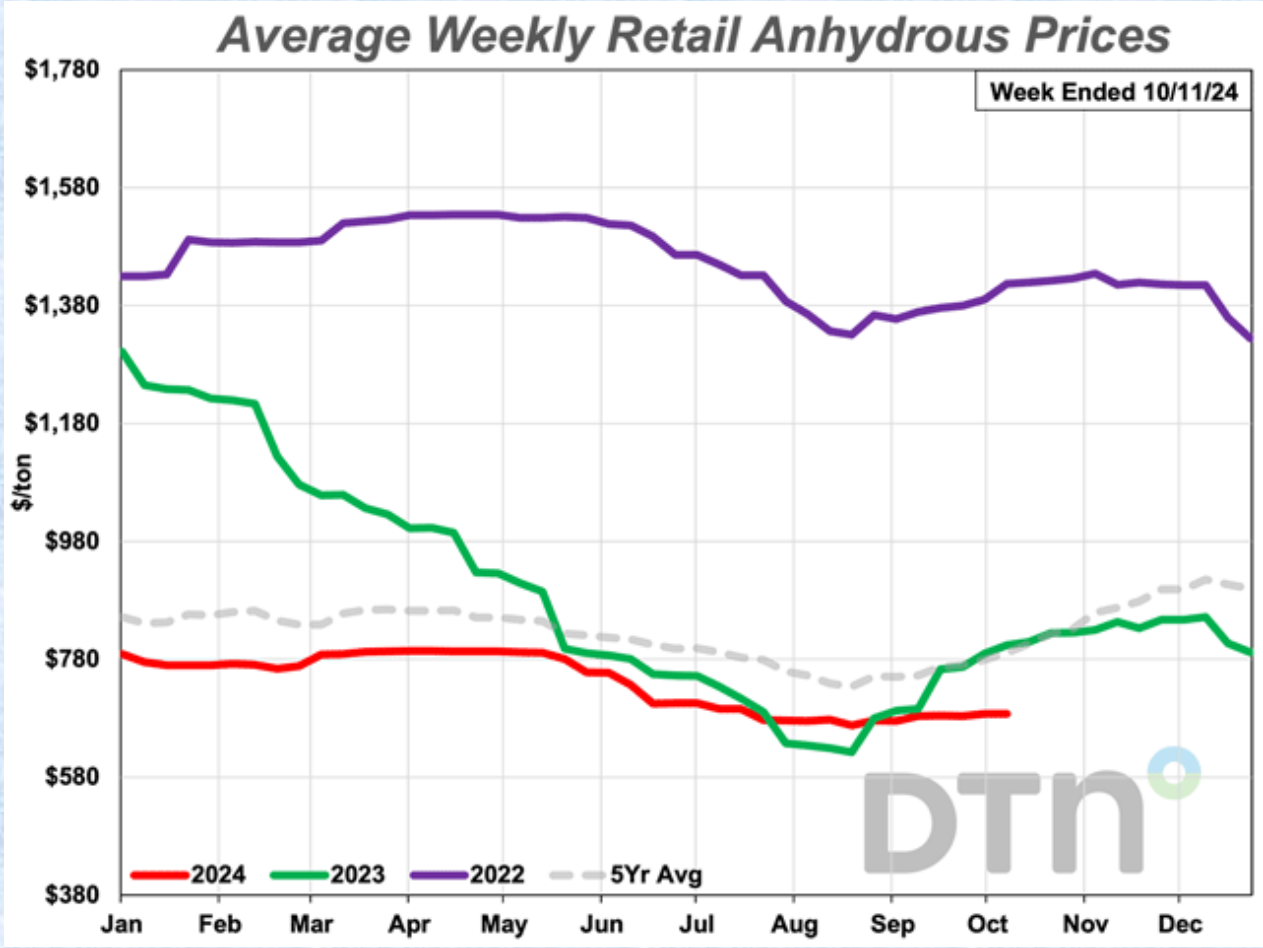
Fertilizer Prices

DTN, Retail survey, 10/15/2024

	$/ton	$/lb nutr.
NH_3	688	0.42
DAP	735	0.80
MAP	805	0.77
Potash	448	0.37



P and K Removal Numbers

Corn: 0.37 lb P_2O_5, 0.24 lb K_2O per bushel

Soybeans: 0.75 lb P_2O_5, 1.17 lb K_2O per bushel

Wheat: 0.46 lb P_2O_5, 0.28 lb K_2O per bushel

Example:

220 bushels of corn remove 81 lb P_2O_5 and 53 lb K_2O

70 bushels of soybean remove 53 lb P_2O_5 and 82 lb K_2O

*Together, that's **134 lb P_2O_5** and **135 lb K_2O**

To replace using MAP for P, total P+K cost = **$153/acre** (covering two years): corn $82; soybean $71

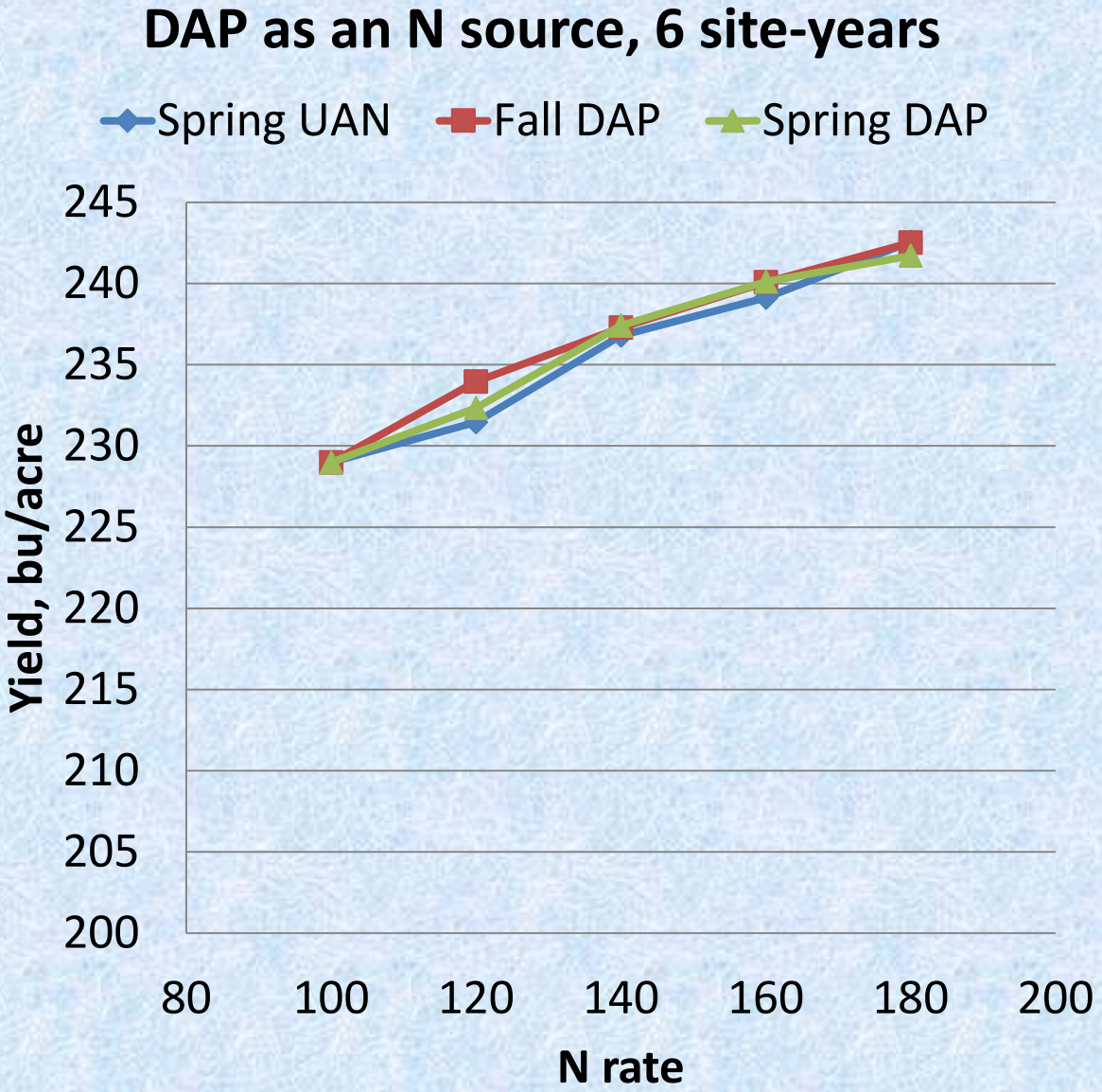
* At a 3:1 yield ratio, corn + soybean remove nearly equal amounts of P and K

Testing Soil for P and K

- Soils have been relatively dry from late summer through early October: this sends K “into its shell” where soil-test extractants don’t extract it as well, lowering K test values
- P test levels are less affected by dry soils, unless probe depth biases the sample
- One solution: apply removal amounts since the last time P and K were applied
- An alternative: sample in the spring or fall after soil is rewetted, for immediate application or for spring (or next fall) application

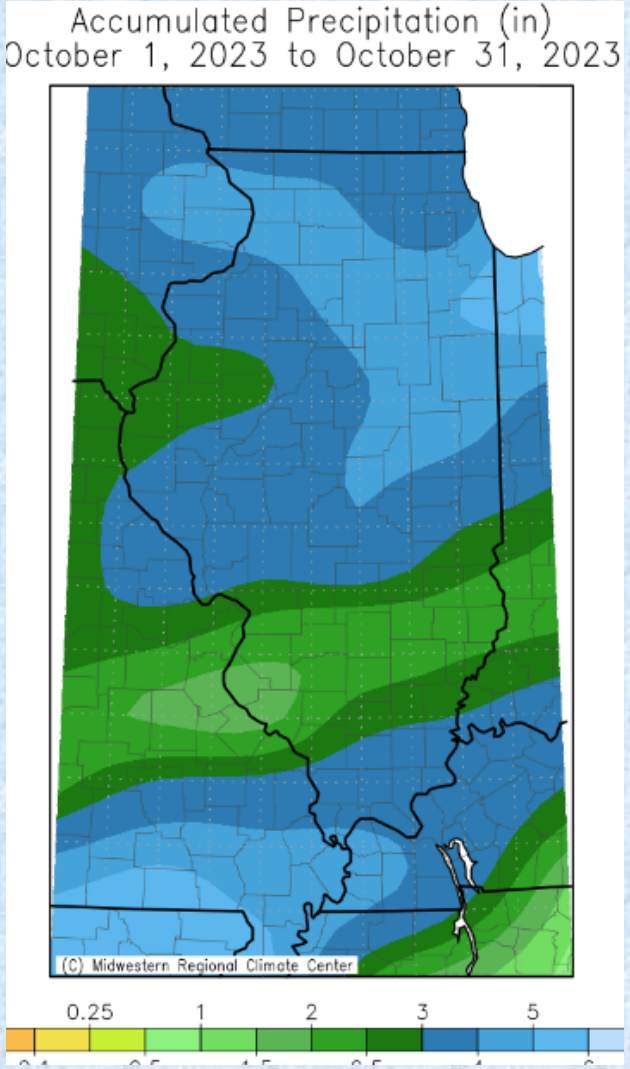
Availability of MAP/DAP N

- We ran a study over six IL sites (2 locations x 3 years) using N rates supplied by fall DAP, spring DAP, and spring urea+Agrotain, and found that yields curves were nearly the same for all three sources: most of the N from fall DAP was available to the next crop
- So: count all N from fall MAP/DAP applied after Nov. 1, or from spring-applied MAP/DAP

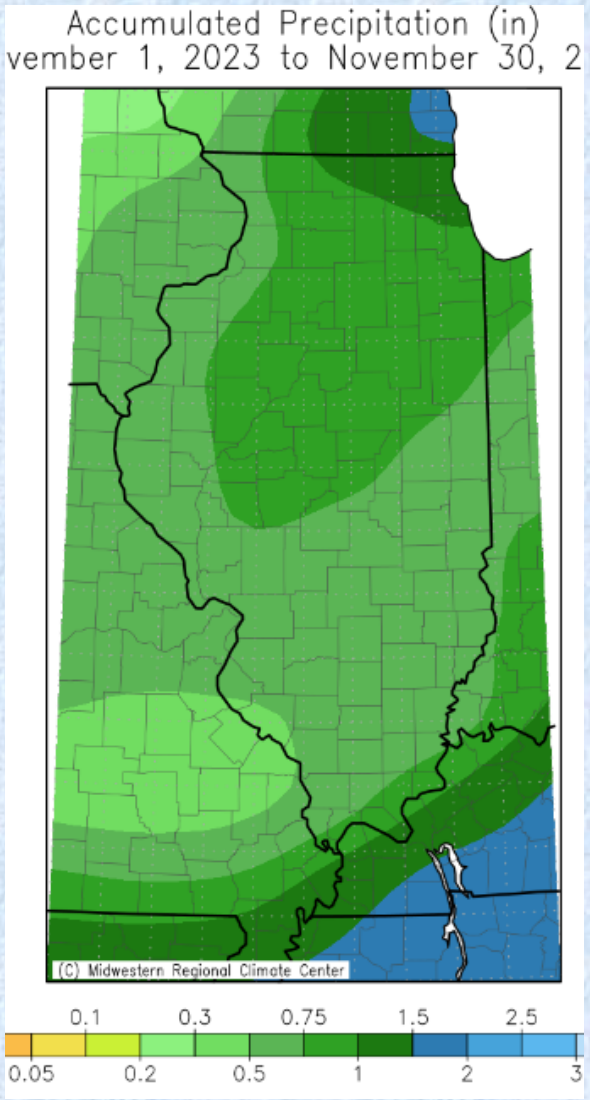


NH_3 application conditions during, and following, fall 2023

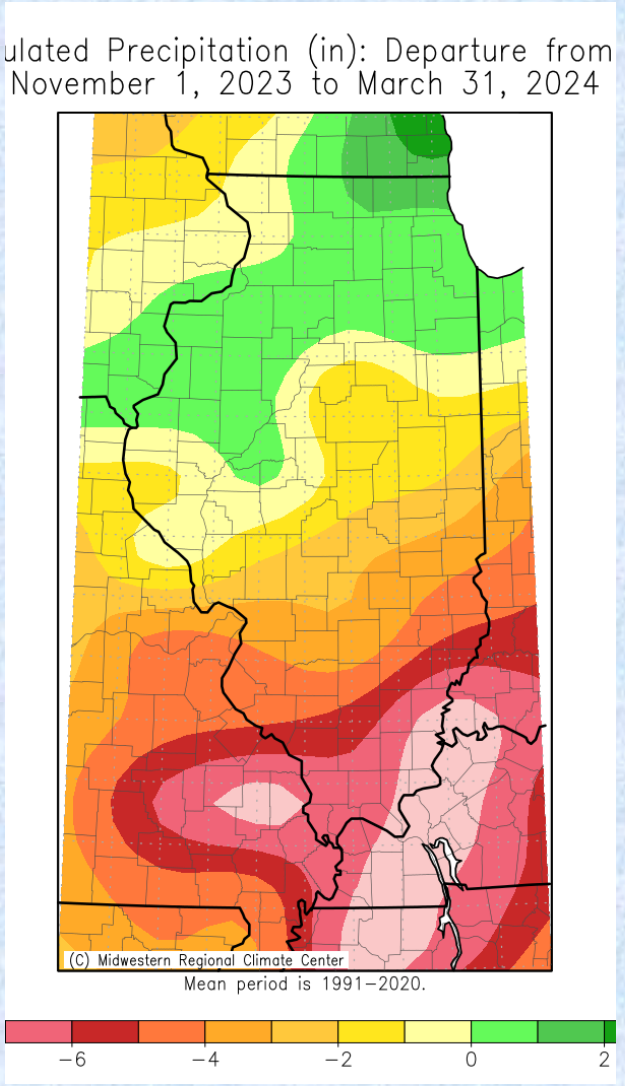
Wet late October



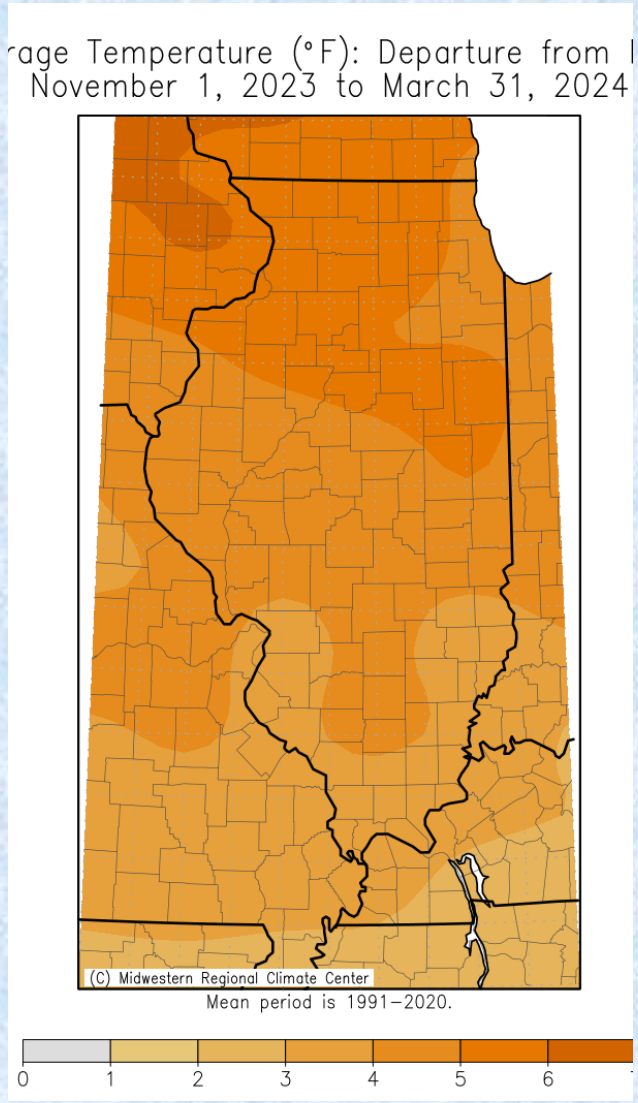
dry November



Relatively dry Nov-March



relatively warm Nov-March



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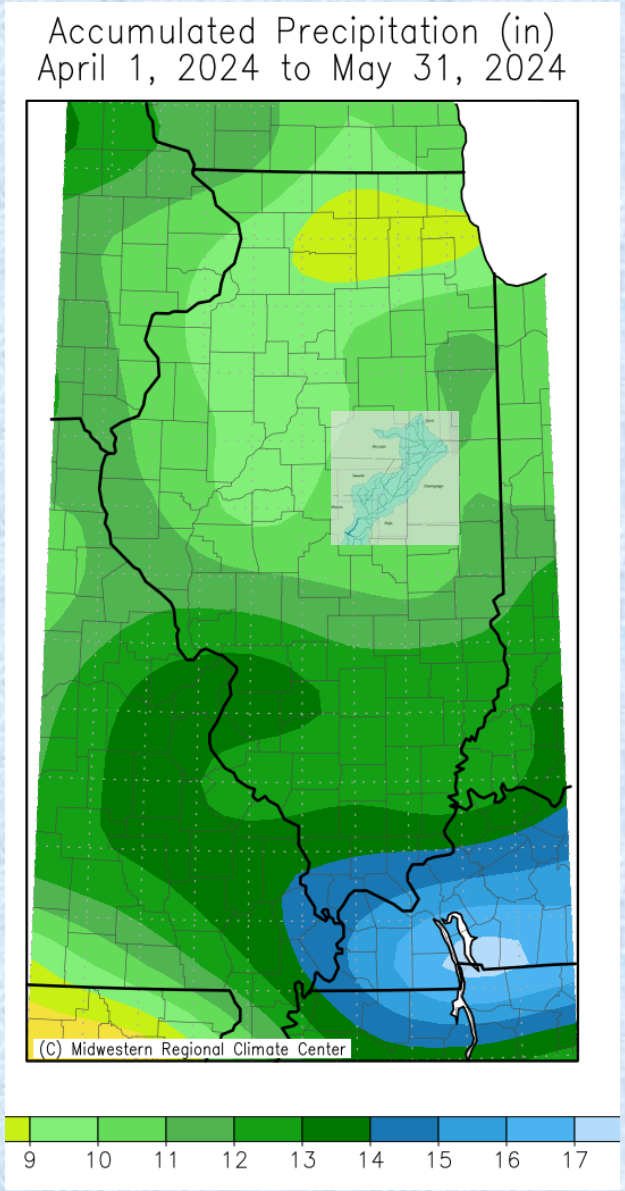
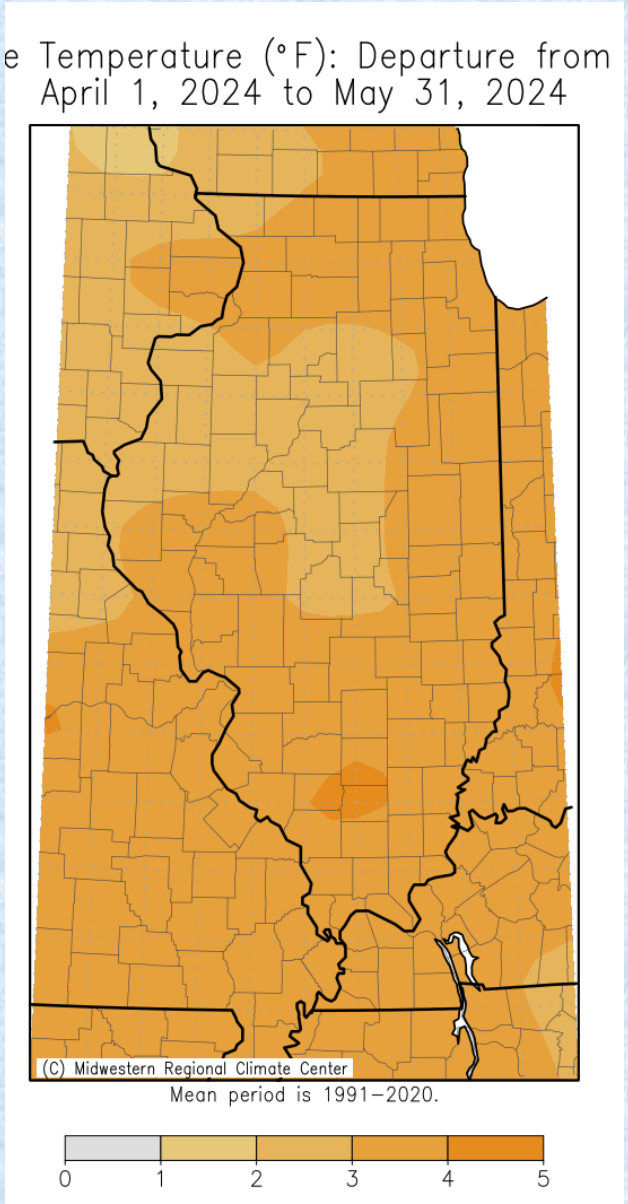
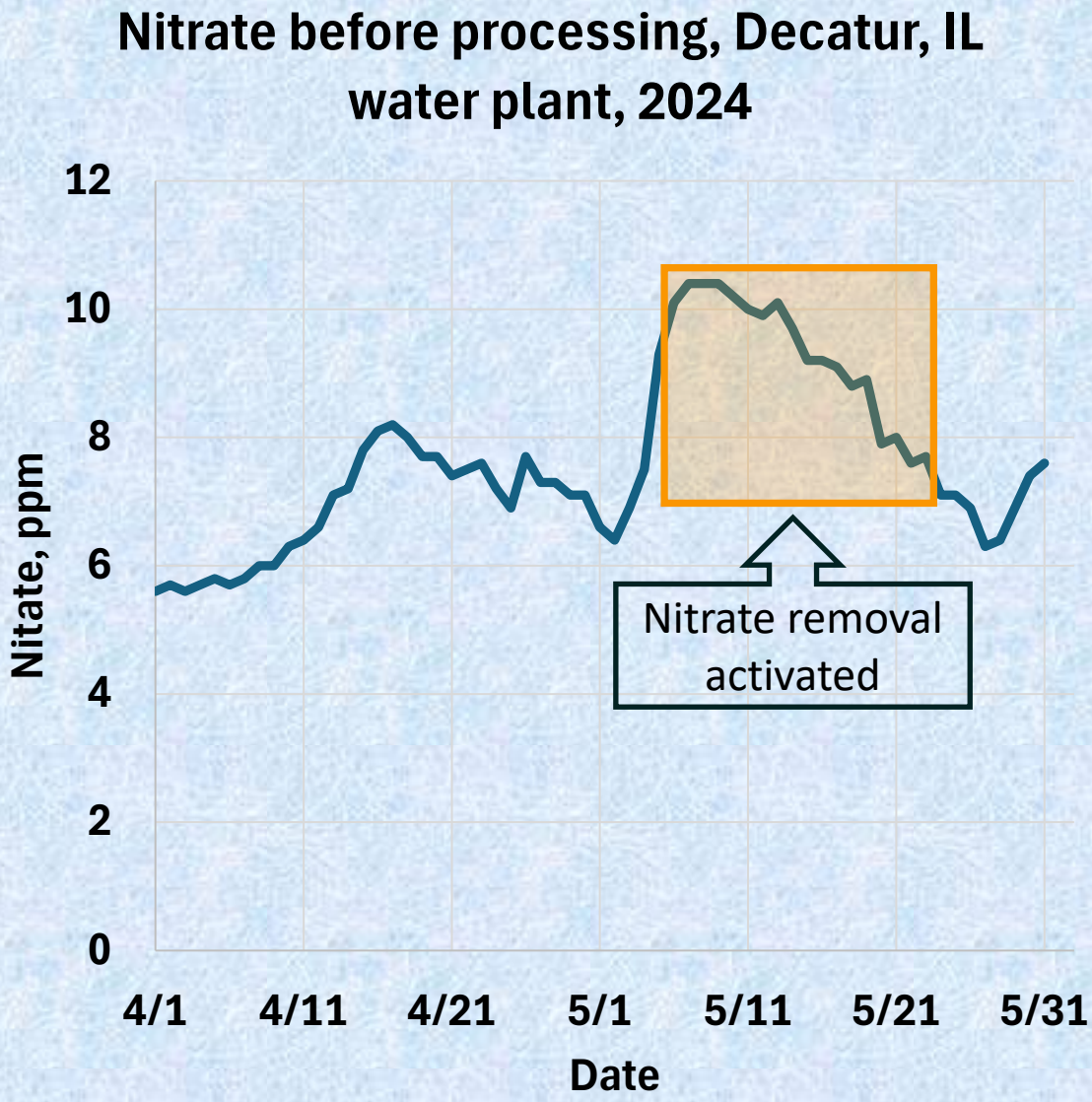
Spring weather, not fall conditions, drives N loss







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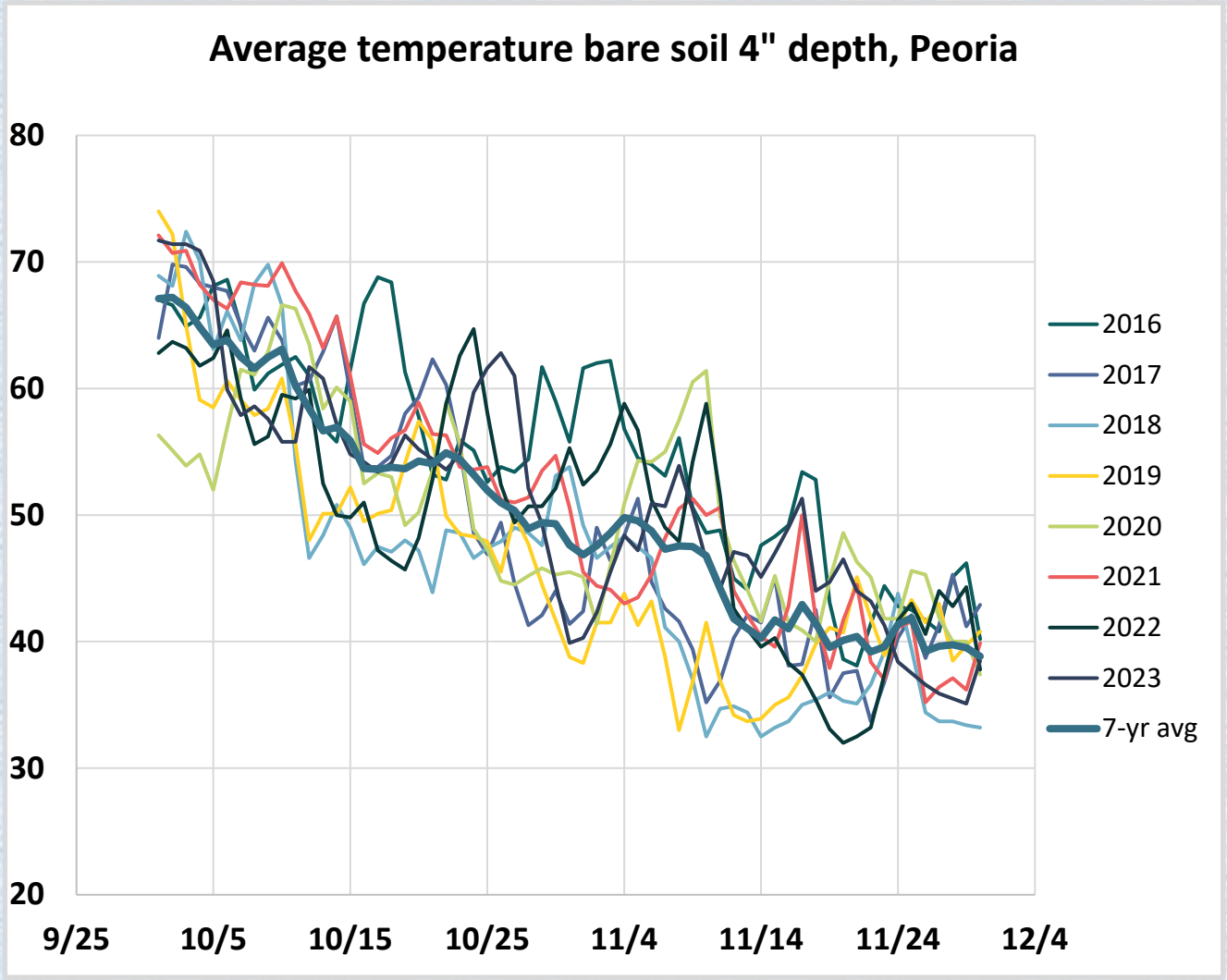
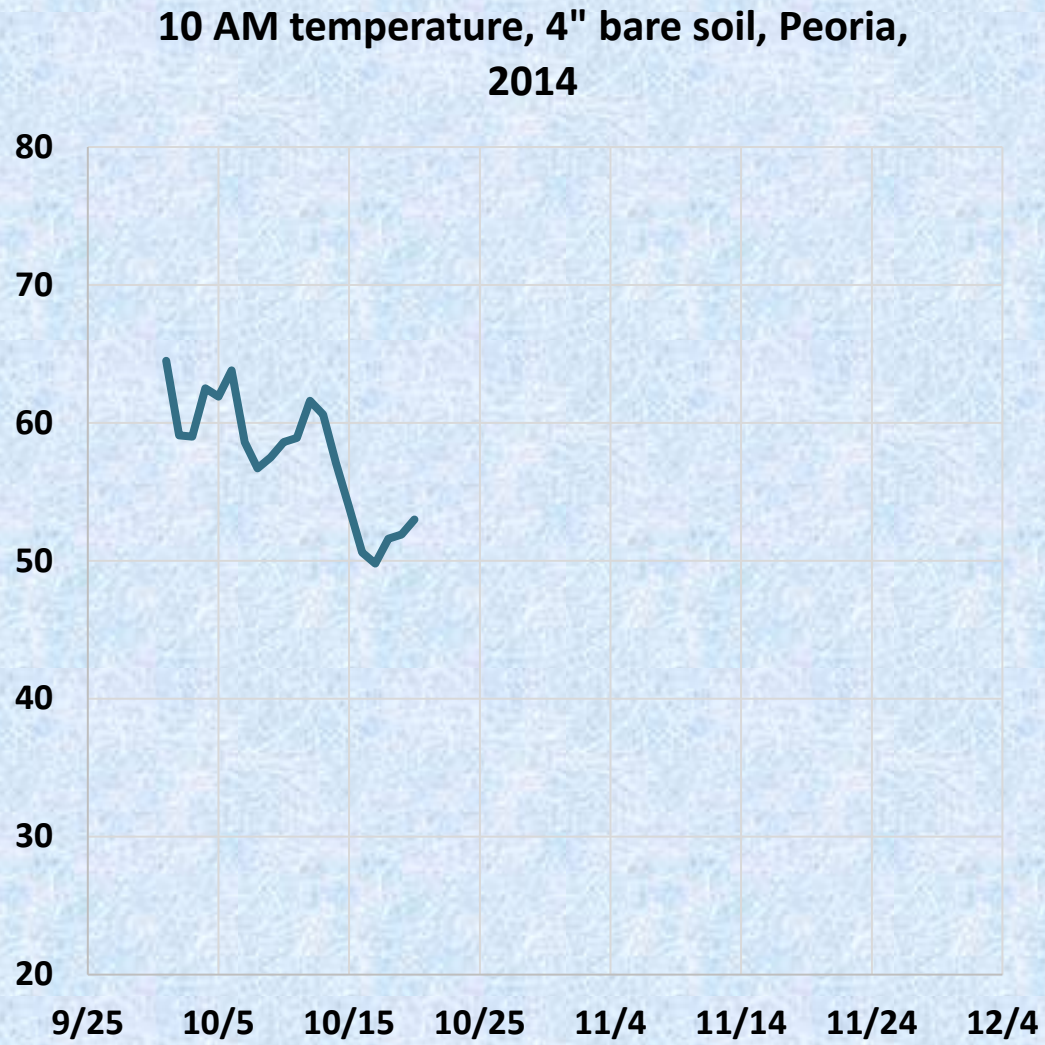
Central IL soil temperatures, October-November

https://warm.isws.illinois.edu/warm/soil/





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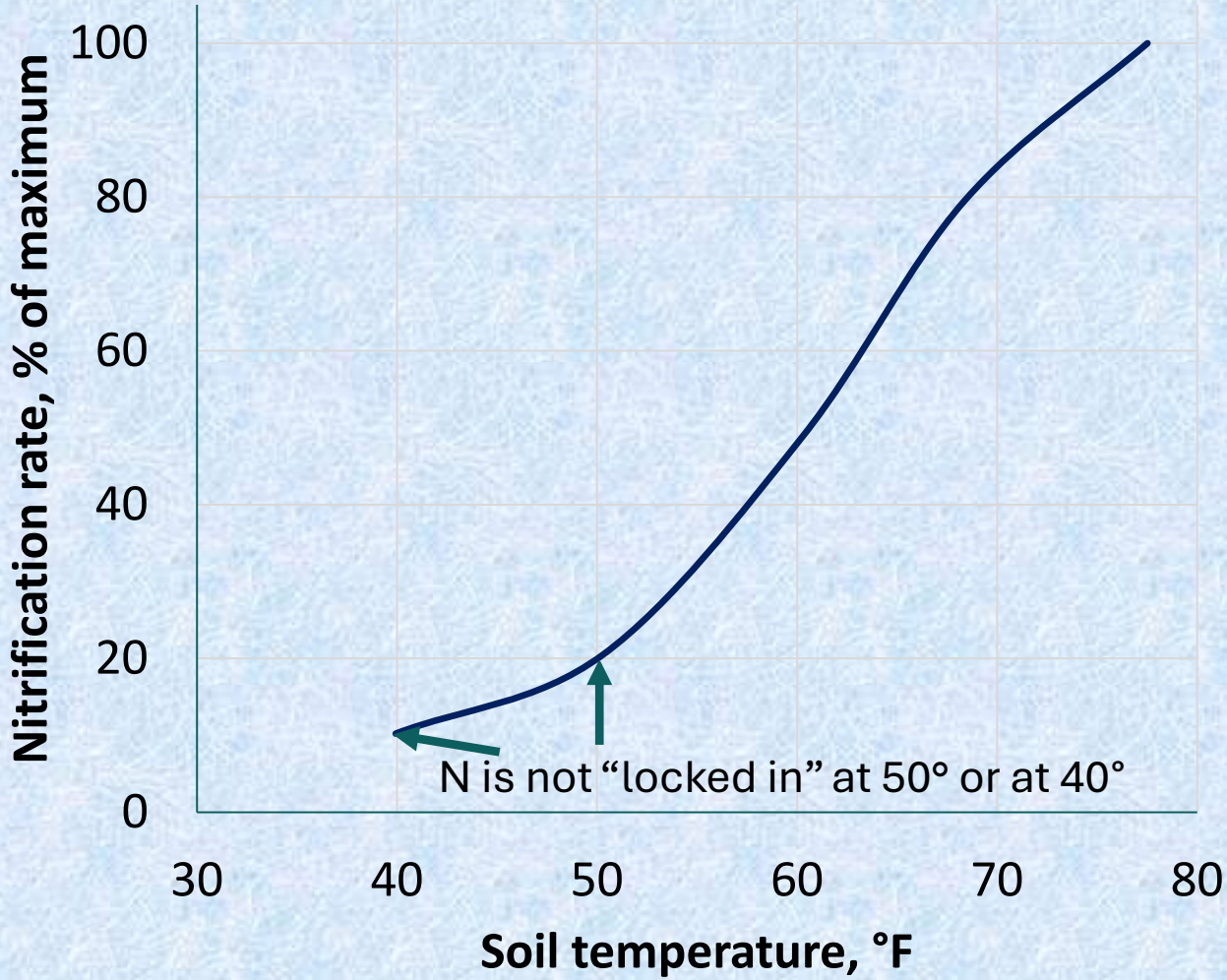
Is soil temperature really that critical?

- Yes: conversion of NH_4^+ to NO_3^- makes leaching and denitrification possible; as a biological process, rate depends on temperature
- Figure shows that nitrification is still happening at 50 °F (it doesn't stop until 32 °F) and it accelerates at temps>50
- The more nitrification, the more N will be lost once tiles begin to run
- Nitrification inhibitors can help, but they break down faster at higher temperatures, and don't normally last until (or into) May



A new MRCC tool for historical soil temp data:

https://mrcc.purdue.edu/clim/Soil-T

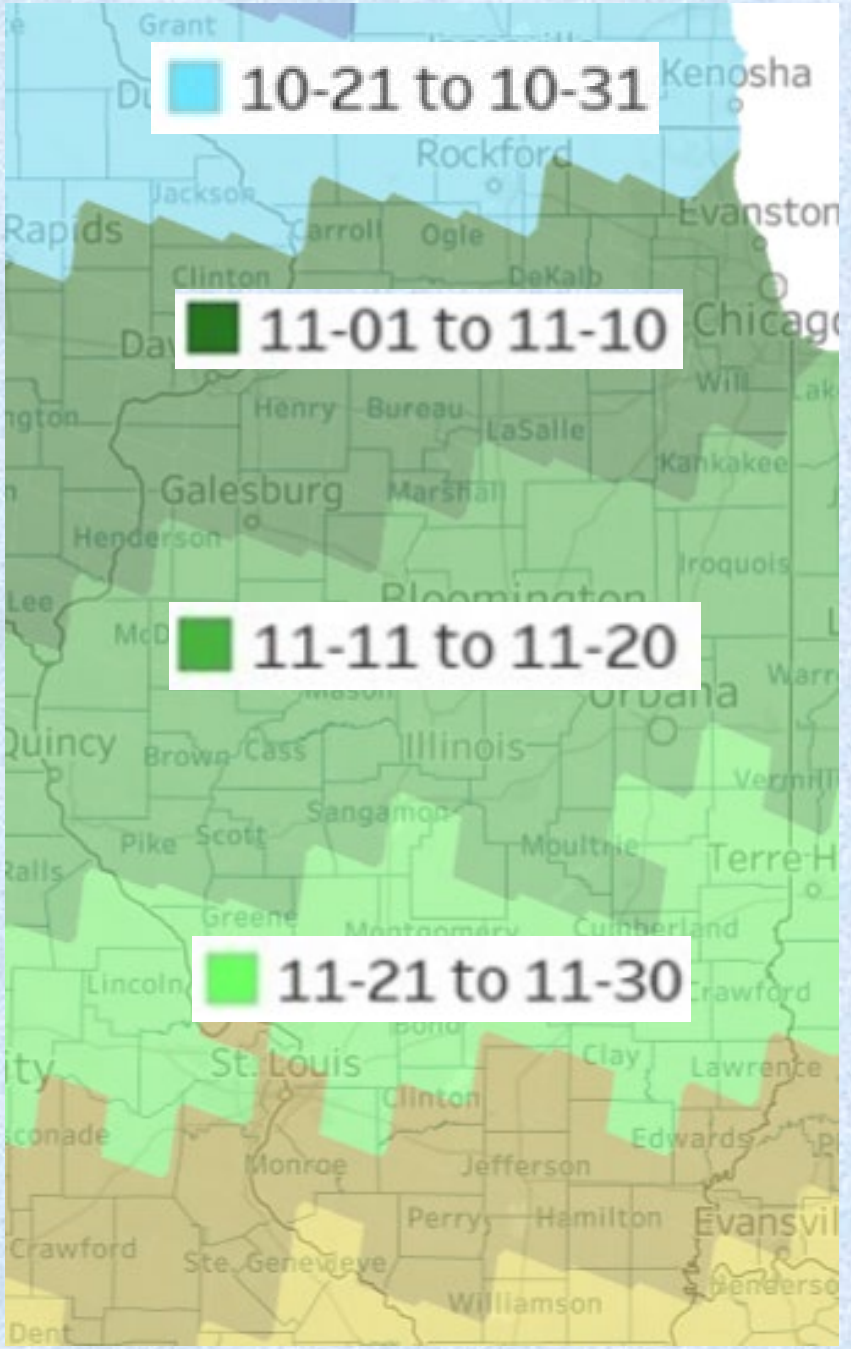
Date When Soil Temperature Cools Below 50 °F

Based on 30-yr data 1991-2020, 4” depth

Numbers are 7-day moving averages

10 days later than normal “rec” in central IL

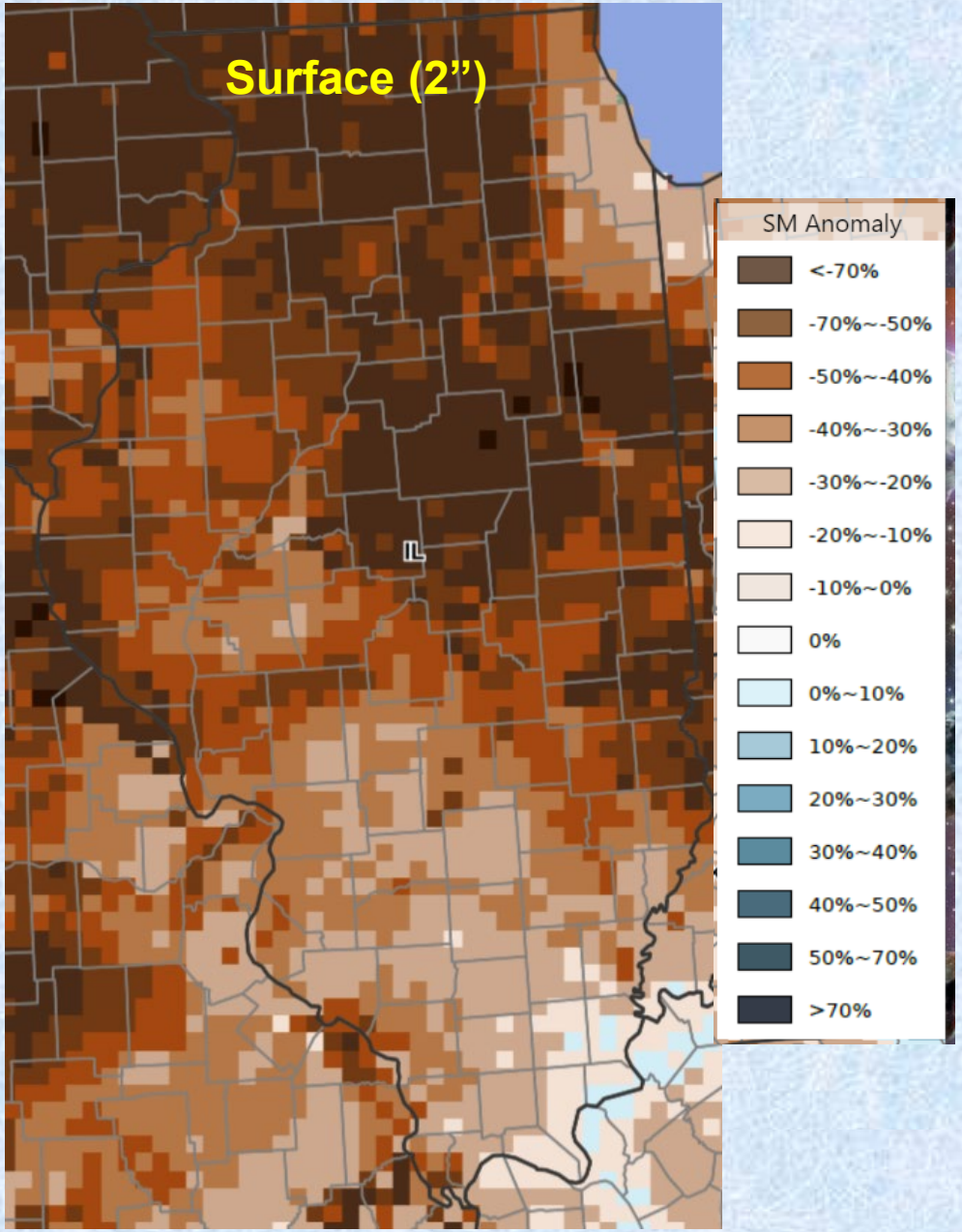
- Probably a little safer, but not much
- Doesn’t include current conditions

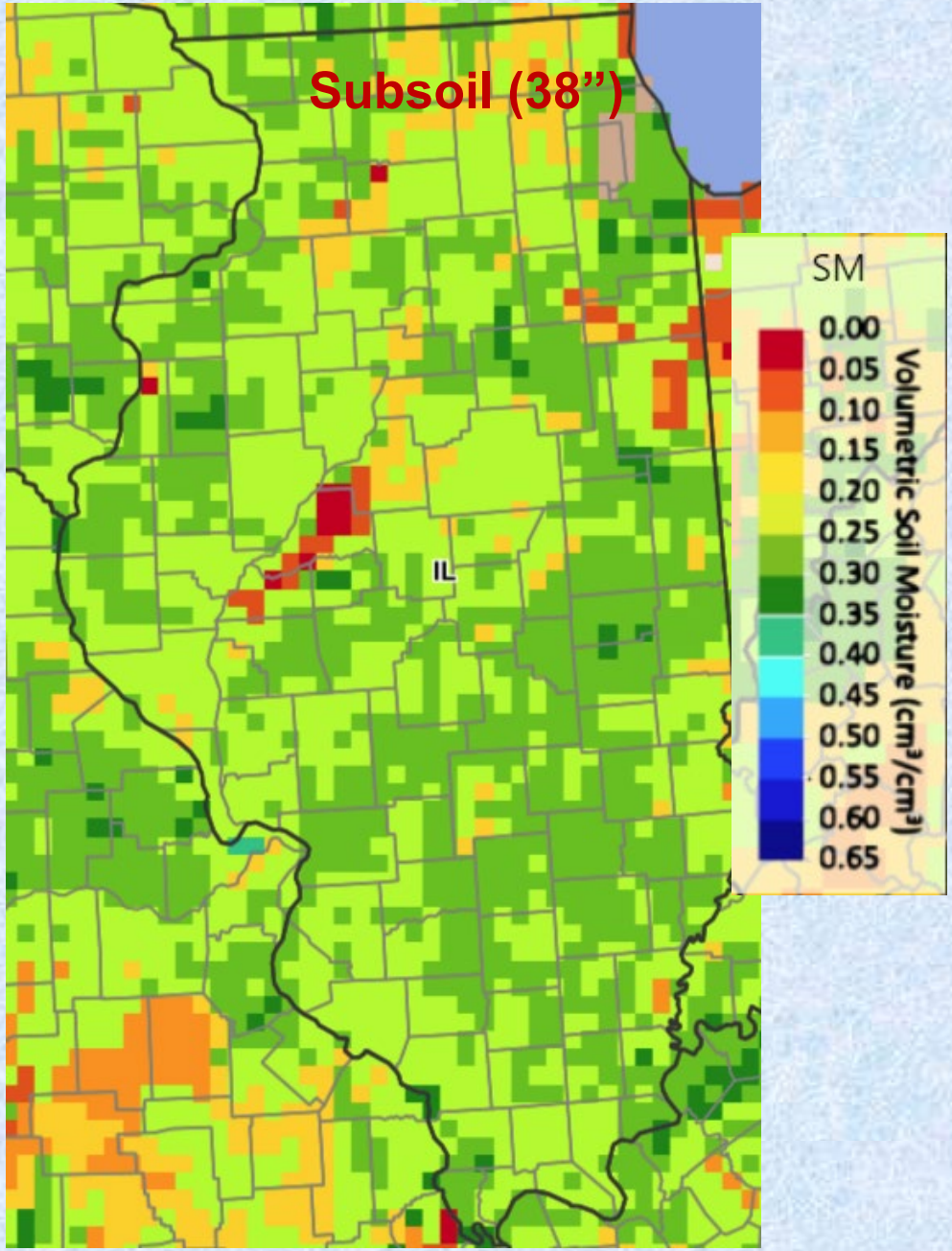


Illinois soils are dry, but not "mid-summer dry" (deep cracks) in most places:

- Crop water uptake slowed or stopped by mid-September
- Compaction from spring operations remains

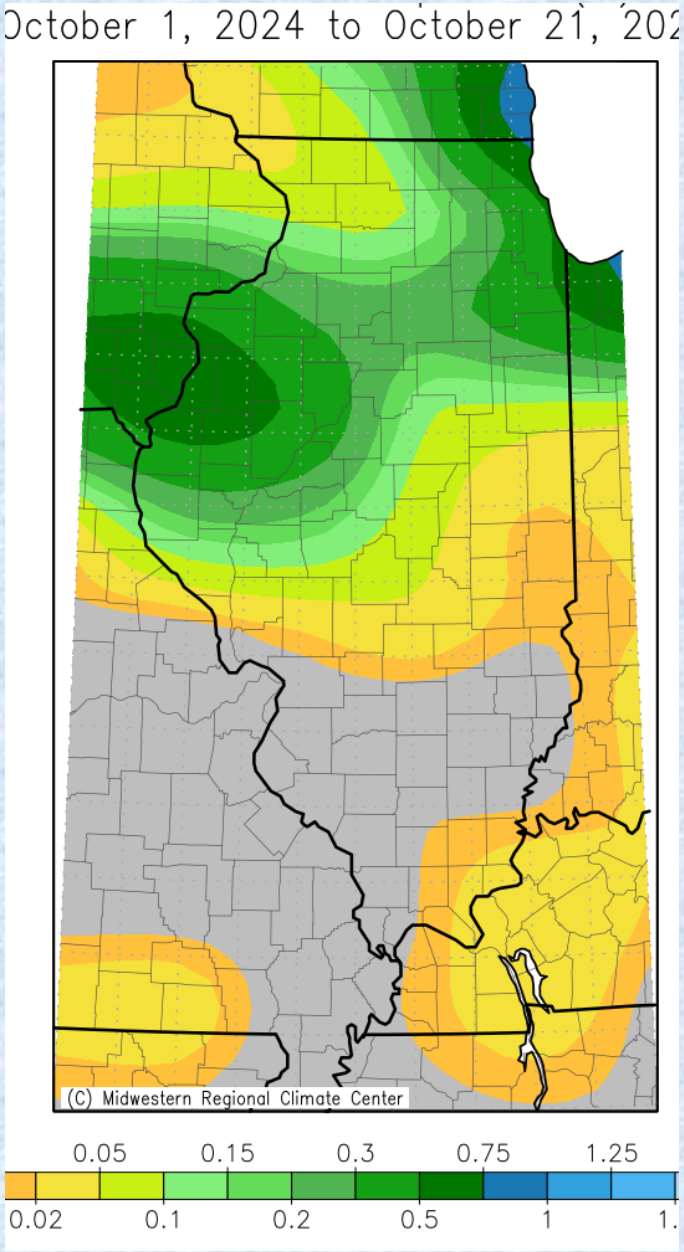
https://nassgeo.csiss.gmu.edu/CropCASMA/

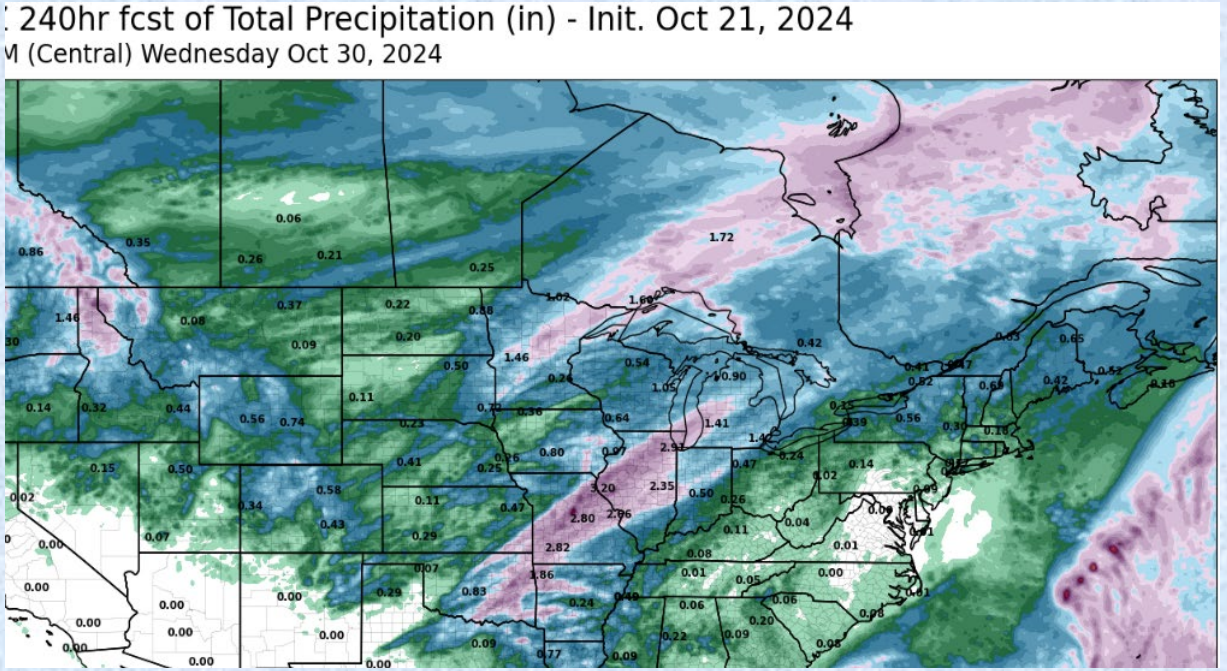


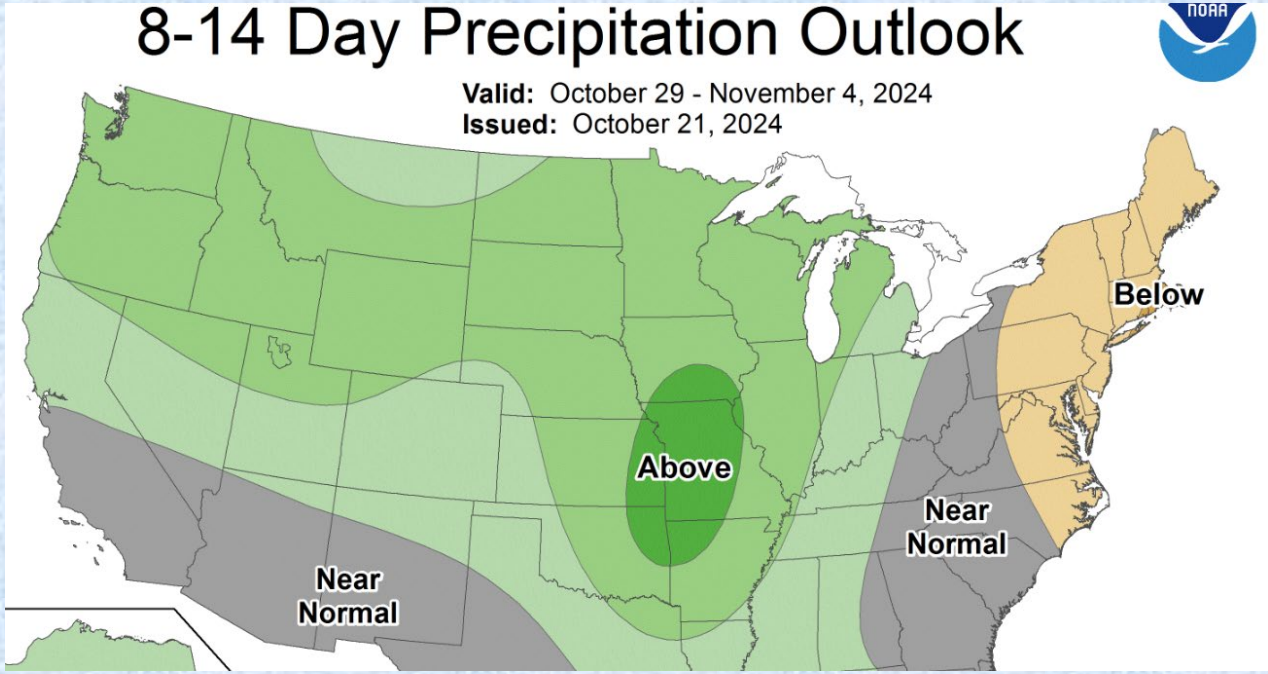


Weather outlook

- Rainfall: may be on the way, adding to the tiny amount that has fallen in October
- Temperature: average high around 70 through the end of October







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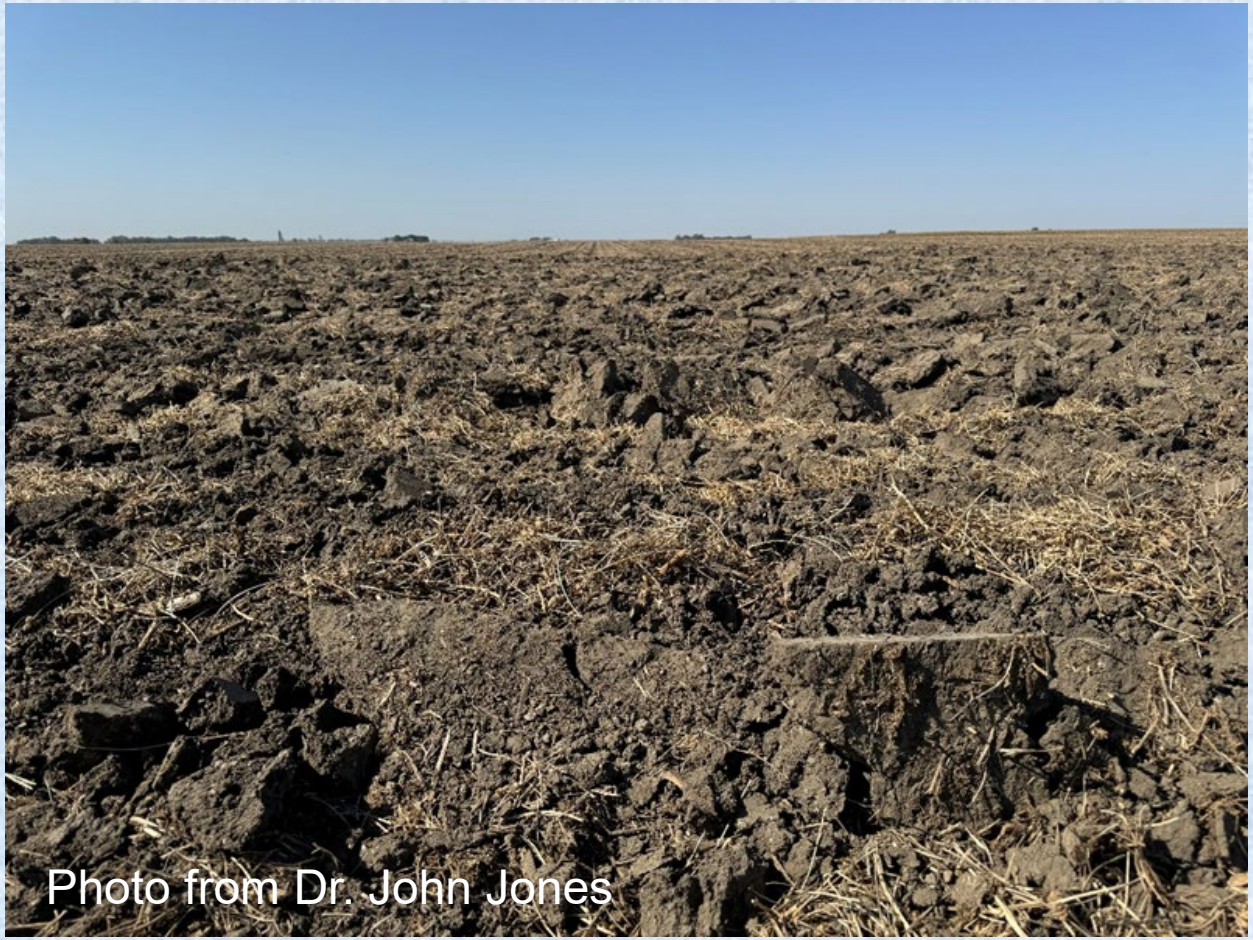
NH_3 application into dry soil

- NH_3 is extremely soluble in water, and needs minimal soil moisture to stay in the soil
  - It will spread farther into the soil if soil is very dry
- It does, though, need to encounter soil, not air, when it's released at the knife
  - This can be soil that's pulled over the application slot if surface soil is loose
  - Some tillage in recent years may be to help with placement and covering
- Mole knives can generally place NH_3 to depth, but soil shatter or poor cover can still allow too much ammonia to escape, including as soil dries after application
- Does tillage before application help?

Tilling soybean stubble?

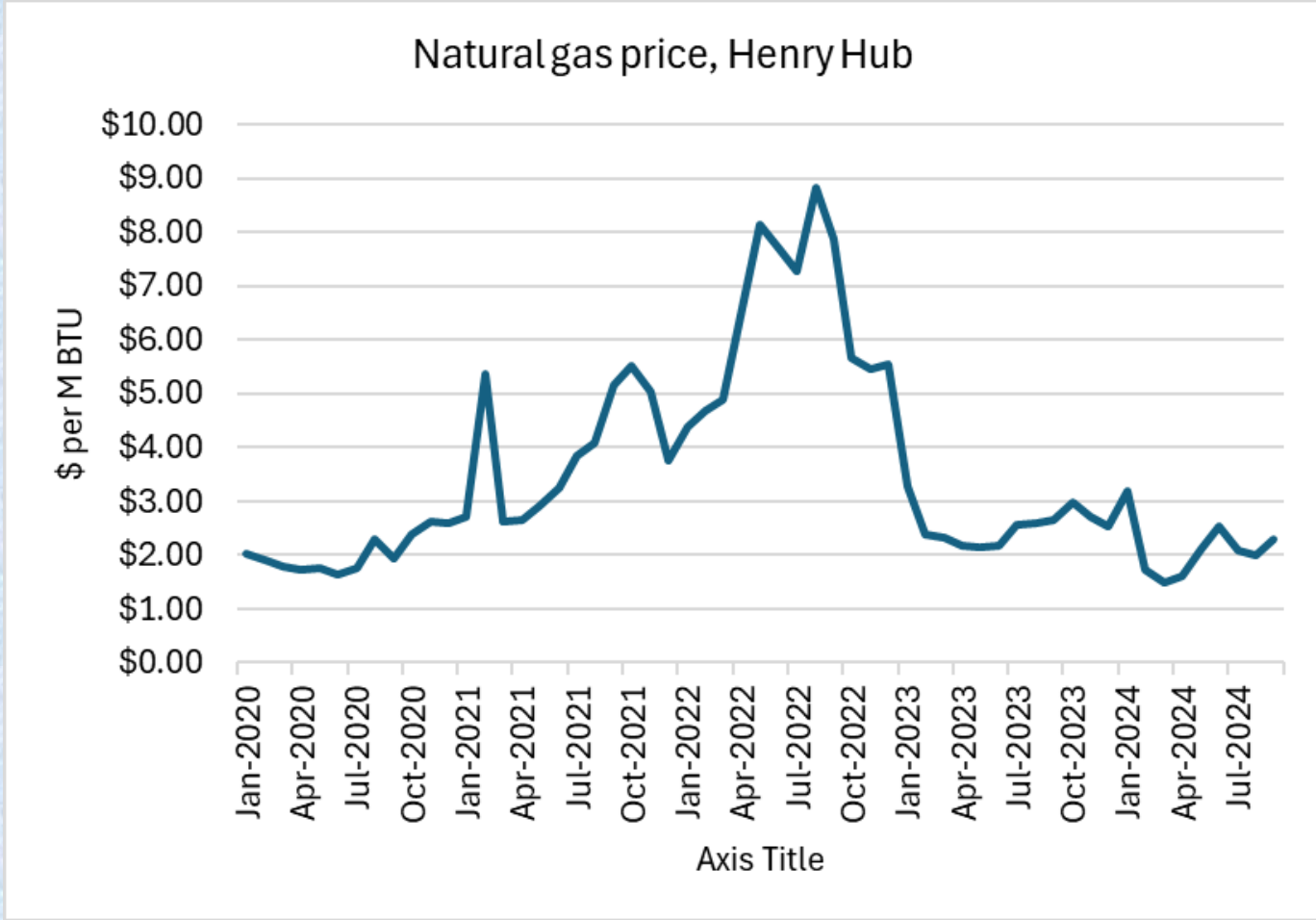


Tilled soybean stubble in Champaign County fields
Mid-October, 2024

Nitrogen rate for the 2025 corn crop

Nitrogen and corn prices are factors for the 2025 corn crop, but volatility may be less than in recent years:

- The price of natural gas (primary feedstock for NH_3 production) has remained low
- The corn price for 2025 is currently projected at about $4.25 per bushel



N rate calculator: https://www.cornnratecalc.org/

Nitrogen Price ($/lb):	**0.43**
Corn Price ($/bu):	**4.25**
Price Ratio:	**0.10117647058824**
MRTN Rate (lb N/acre):	**181**
Profitable N Rate Range (lb N/acre):	**168 - 194**
Net Return to N at MRTN Rate ($/acre):	**$379.88**
Percent of Maximum Yield at MRTN Rate:	**99%**
Anhydrous Ammonia (82% N) at MRTN Rate (lb product/acre):	**220**
Anhydrous Ammonia (82% N) Cost at MRTN Rate ($/acre):	**$77.83**

Select State *
Illinois

Select Rotation *
Corn following soybean

Select Region
Central

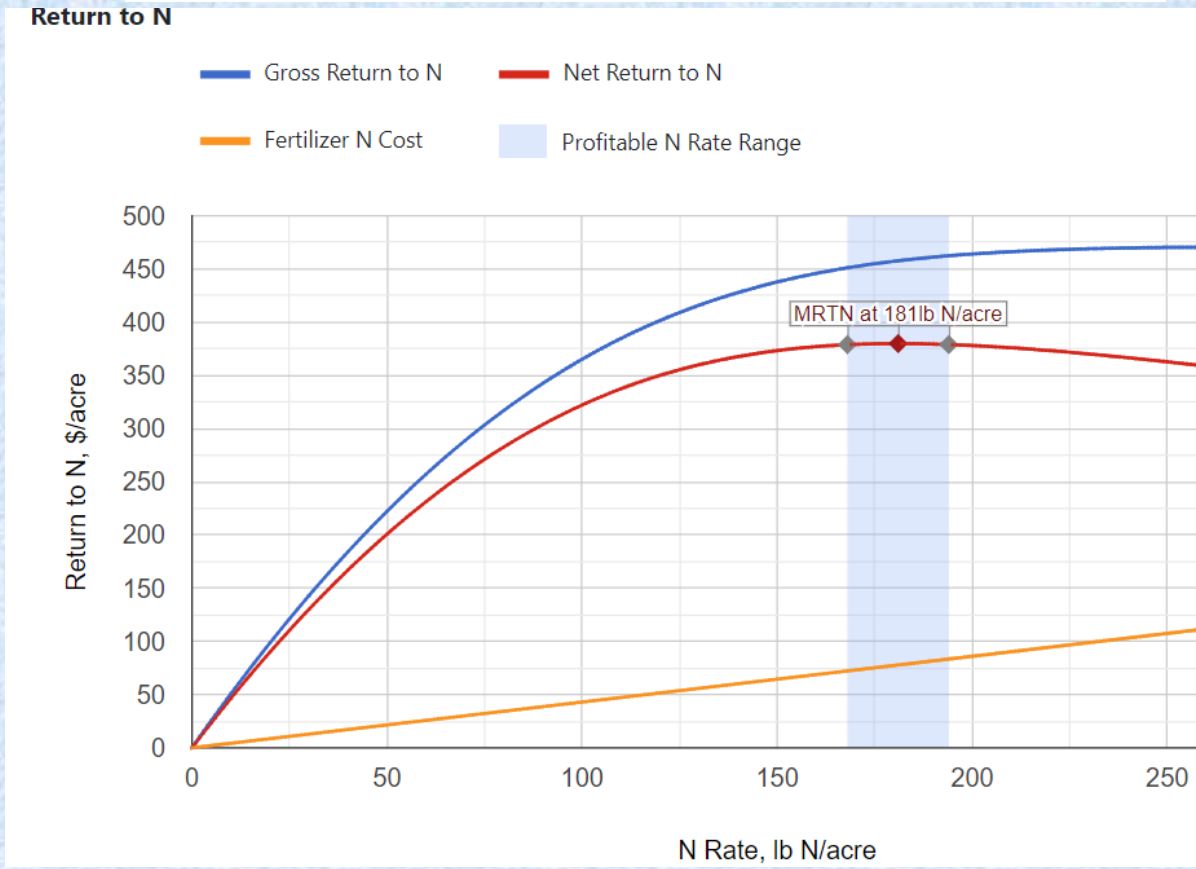
Set Corn and Nitrogen Prices *

Anhydrous Ammonia (82% N) — 700 ($/Ton)

Nitrogen Price — 0.43 ($/lb N)

Corn Price — 4.25 ($/bu)

CALCULATE RESET



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Changing MRTN with changing prices for 2025

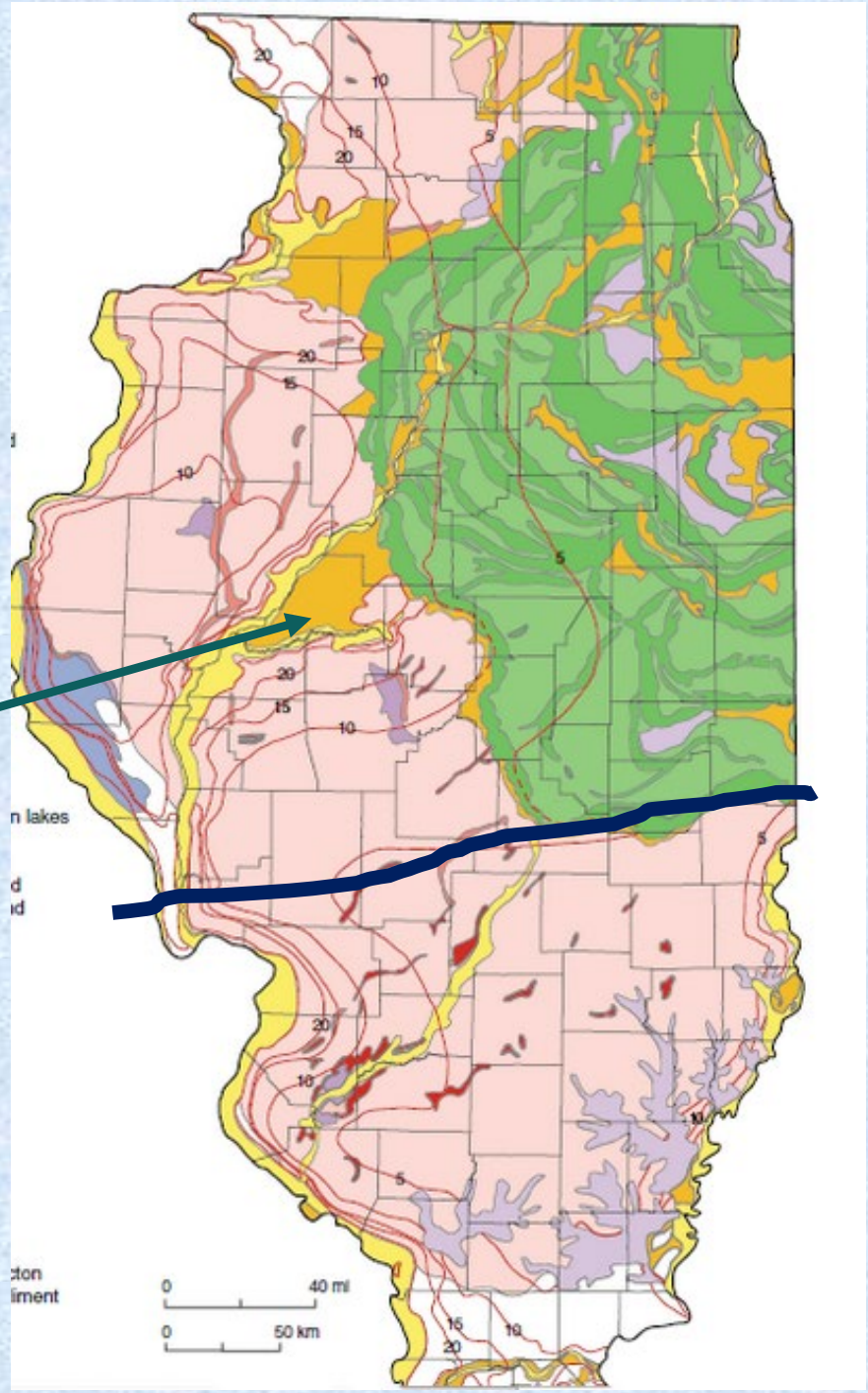
Corn at $4.00; N price as indicated

Profitable ranges are MRTN rate +/- 12-14 lb

		MRTN at N price, $ per ton NH_3/$ per lb N		
IL Region	Rotation	$600/0.37	$700/0.43	$800/0.49
North	**Soy-Corn**	**181**	**173**	**166**
	Corn-Corn	210	202	197
Central	**Soy-Corn**	**185**	**179**	**174**
	Corn-Corn	202	200	195
South (Spr)	**Soy-Corn**	**205**	**200**	**195**
(Spring)	Corn-Corn	208	198	191

Basics: apply where it's safer to apply

- Map shows approximate line —— between safe application (north) and not-very-safe application (south). Prairie soils near the line may be safer
- Waiting until December or January in southern IL would help at the start, but springs are warmer and wetter, and the risk of loss is much higher
- North of the line, sandy soils, soils with gravel underneath, and chronically wet soils are not safe for fall application
- When we pay more for N, we lose more $$s when N is lost; river nitrate goes up no matter what the N price



Bottom line(s) on fall NH_3 application

- Soil temperatures need to get to 50° (40° is better) and be headed down at the time of application to keep most of the N in ammonium form through early spring
- Use a nitrification inhibitor
- May need to wait for rainfall to get good placement and cover in fields in drier areas; tillage to aid N application comes with costs
- If NH_3 cannot be applied this fall, applying next spring remains a viable and—from an environmental and, possibly, an agronomic standpoint—a preferred option

Partial N rates this fall?

- Applying half or so of the full rate in the fall lowers potential loss amounts, but carries extra costs per lb of N applied (application, per-acre rates of nitrification inhibitor)
- It might be a reasonable option (if done properly) if it's likely that N price will be higher next spring
- It usually commits the field to plant corn next spring
- If any N will be applied next spring, the fall rate needs to be "partial" – it's total N application rate that's important, and we need to leave "space" for any spring N to be applied

THANK YOU

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