

Pre-Sidedress Nitrate Test

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Virginia Cooperative Extension
Knowledge for the Commonwealth



What is the PSNT?

- **The Pre-Sidedress Nitrate Test is a soil test for nitrate**
- **Only calibrated for corn, wheat and barley in Virginia**
- **Must be performed when corn is about 12” tall and immediately before side dressing inorganic N, or immediately before planting for wheat/barley**
- **Can be used to decrease N recommendation if soil has high nitrate**

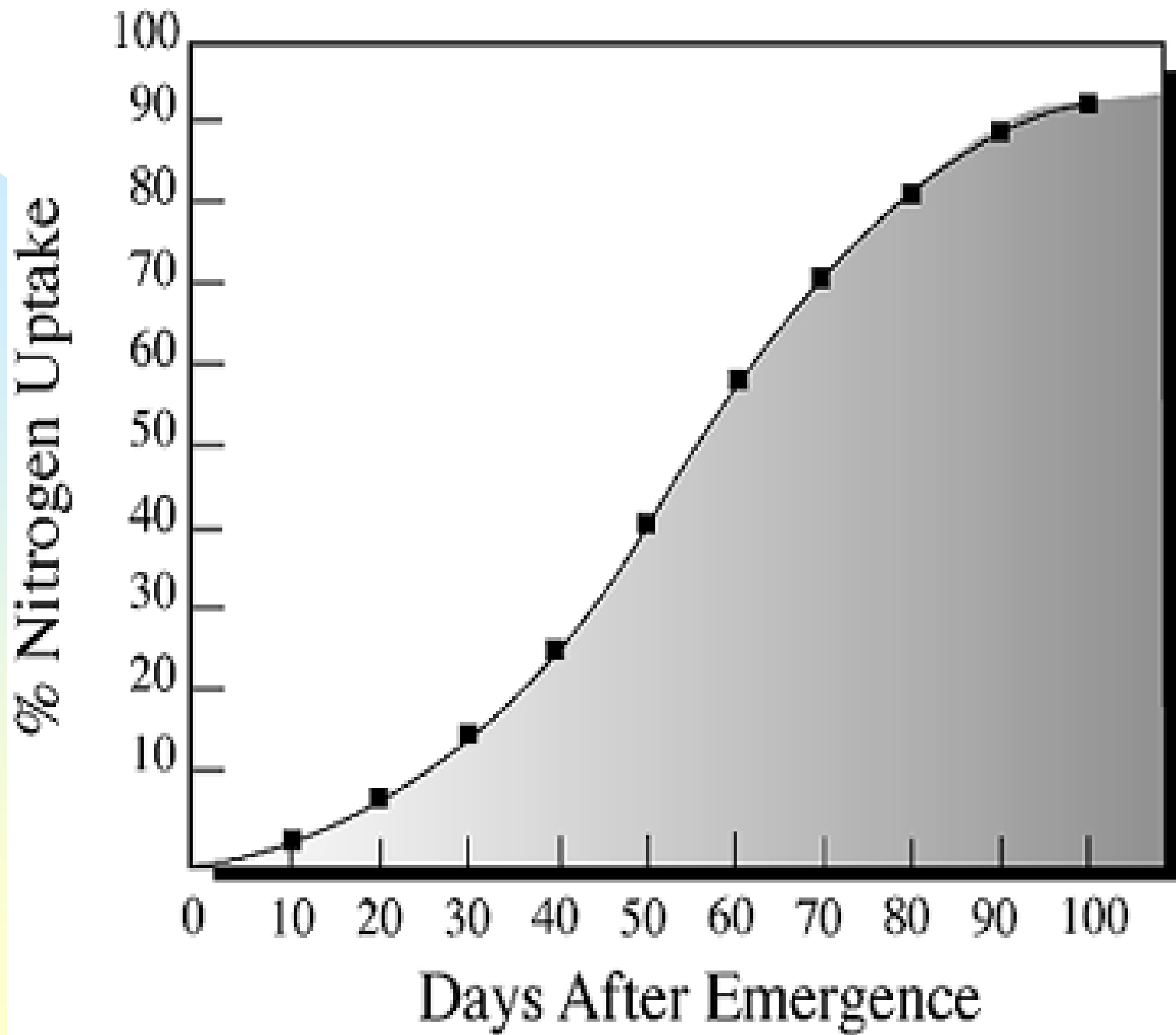
When would you use the PSNT?

- **On fields with a history of manure or biosolids applications within the past three years and you want to verify N release**
- **On fields which have received no more than 30 lbs N banded or 40 lbs broadcast inorganic fertilizer at planting**
- **Unusual weather conditions e.g wheat following drought affected corn (less N uptake than expected)**

Proportional Accumulation by Corn



N	8%	50%	28%	14%
P	6	40	37	17
K	9	65	21	5
D.M.	3	33	42	22



Organic-N

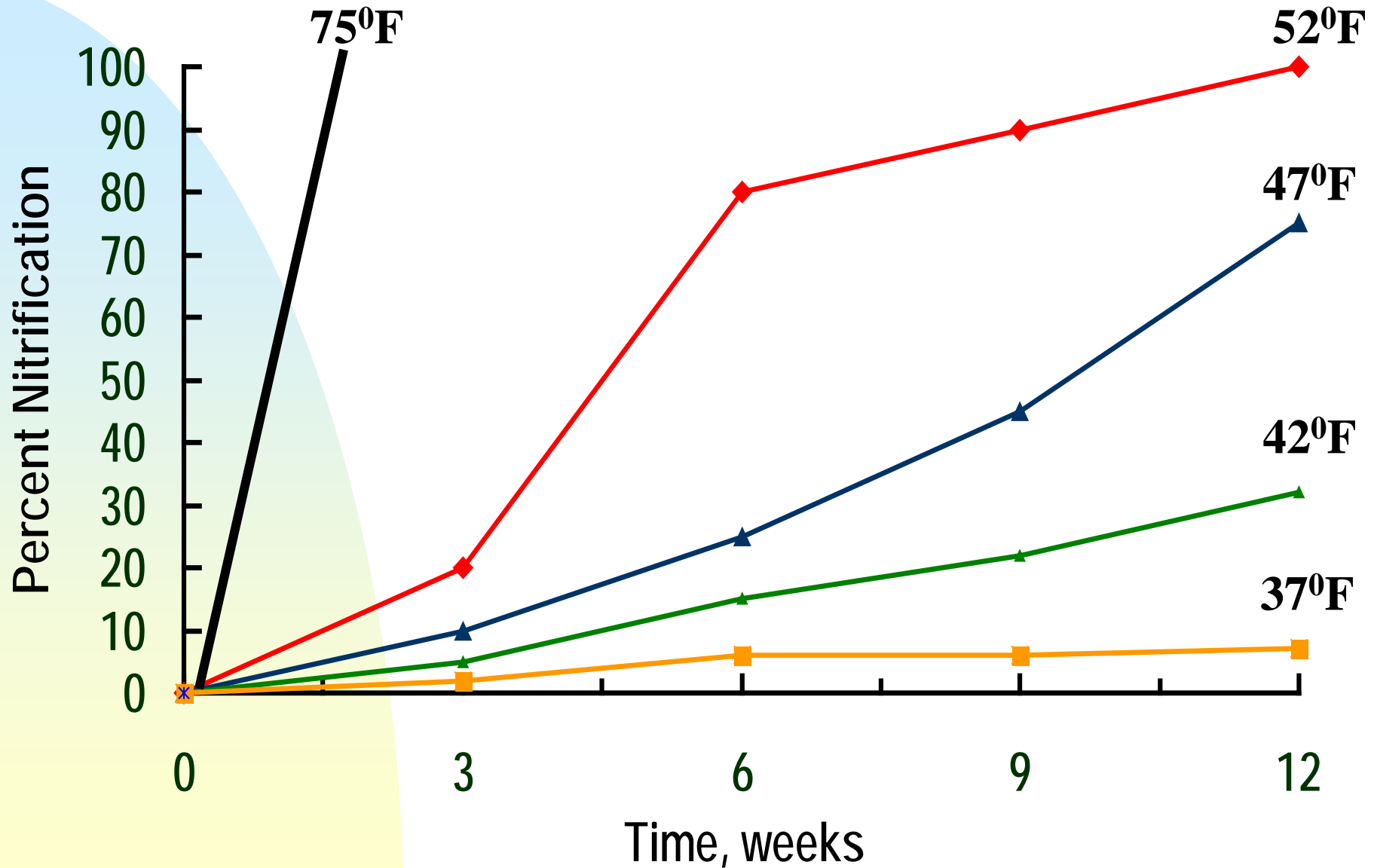
Ammonia - N

Urea

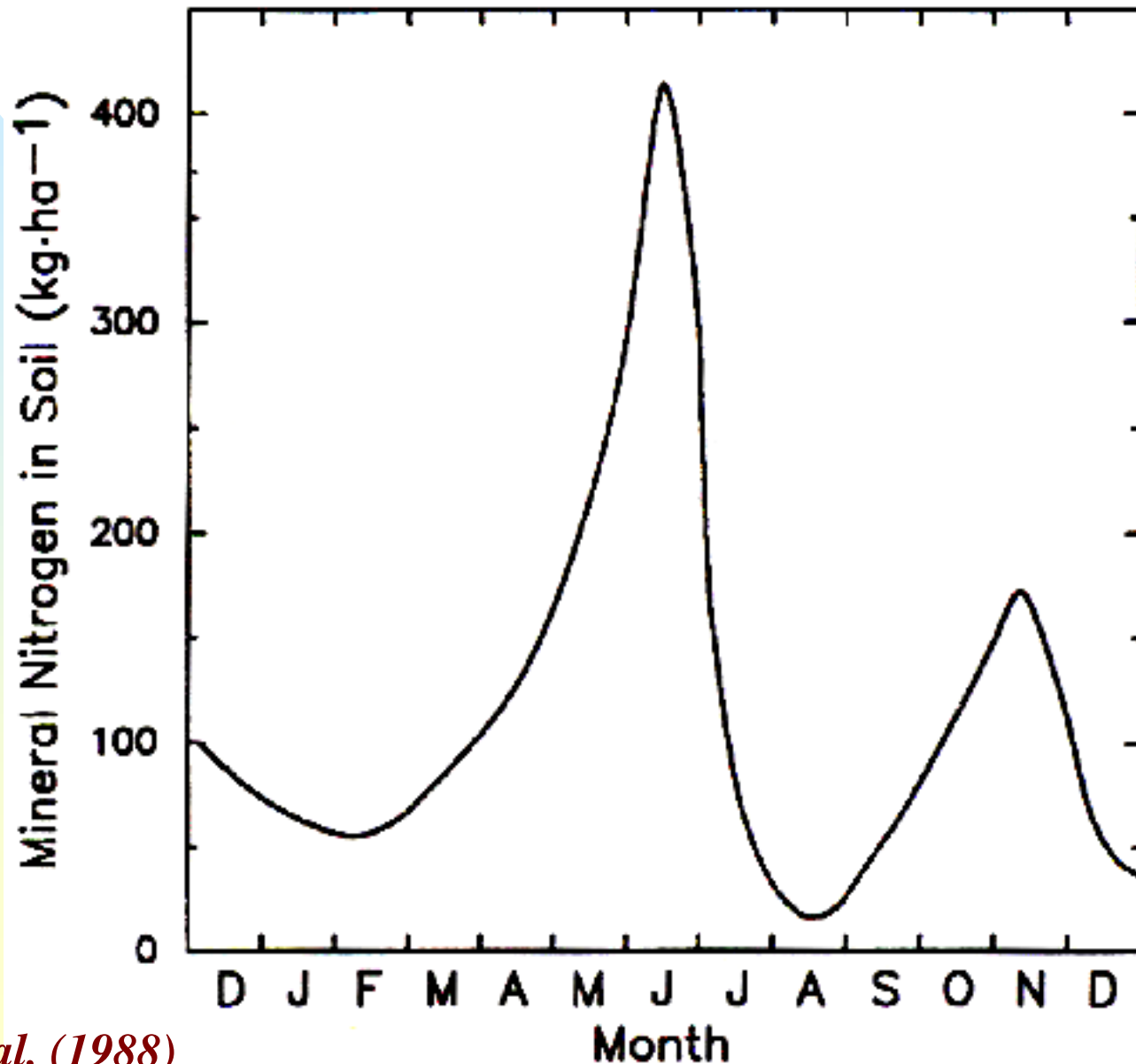
**Microbial
Reactions**

NO₃⁻

Nitrification at Various Soil Temperatures

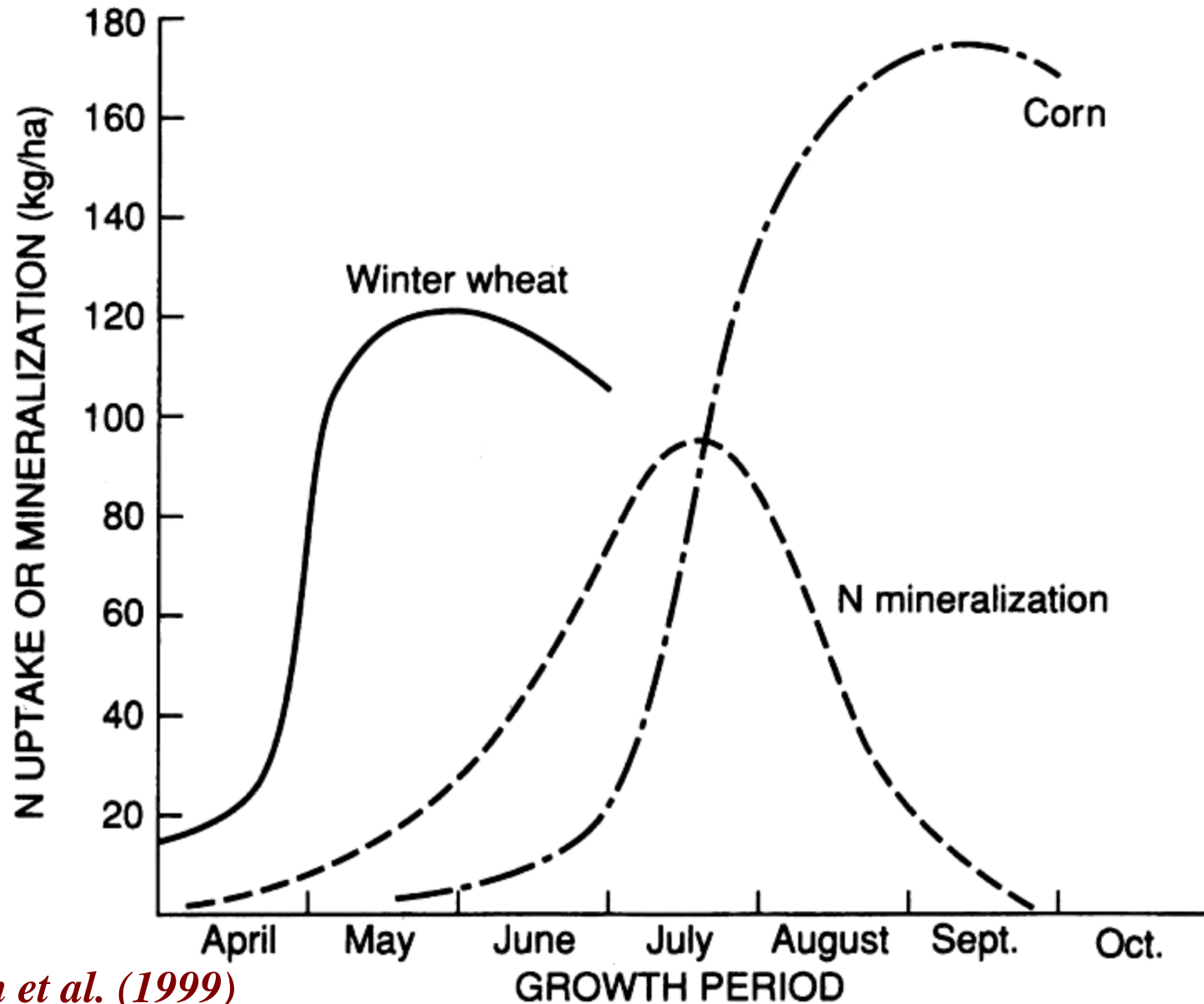


Soil Nitrate-N, surface 90 cm. Nitrogen fertilized corn, grown during summer.



Simon et al. (1988)

Synchrony of soil N mineralization and crop N uptake in corn and winter wheat



**SAMPLE WHILE
THE CROP
IS
GROWING**





PSNT Protocol

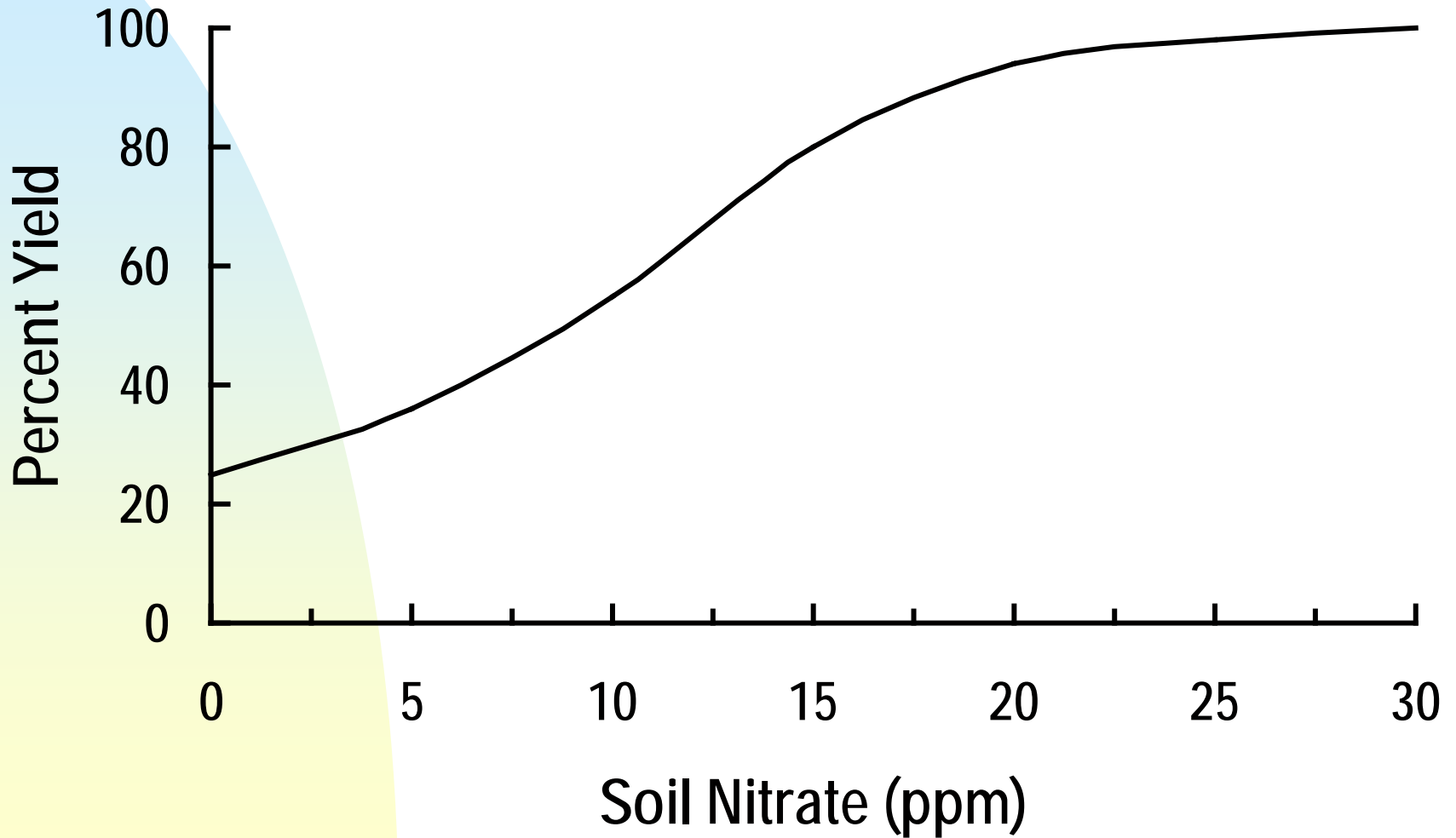
- **Corn**

- ◆ **Sample soil when corn is 10-15” tall**
- ◆ **Collect approx. 20 soil cores per 10 acre field to a depth of 12 inches**
- ◆ **Any additional N should be applied when corn is 12-24 inches tall.**

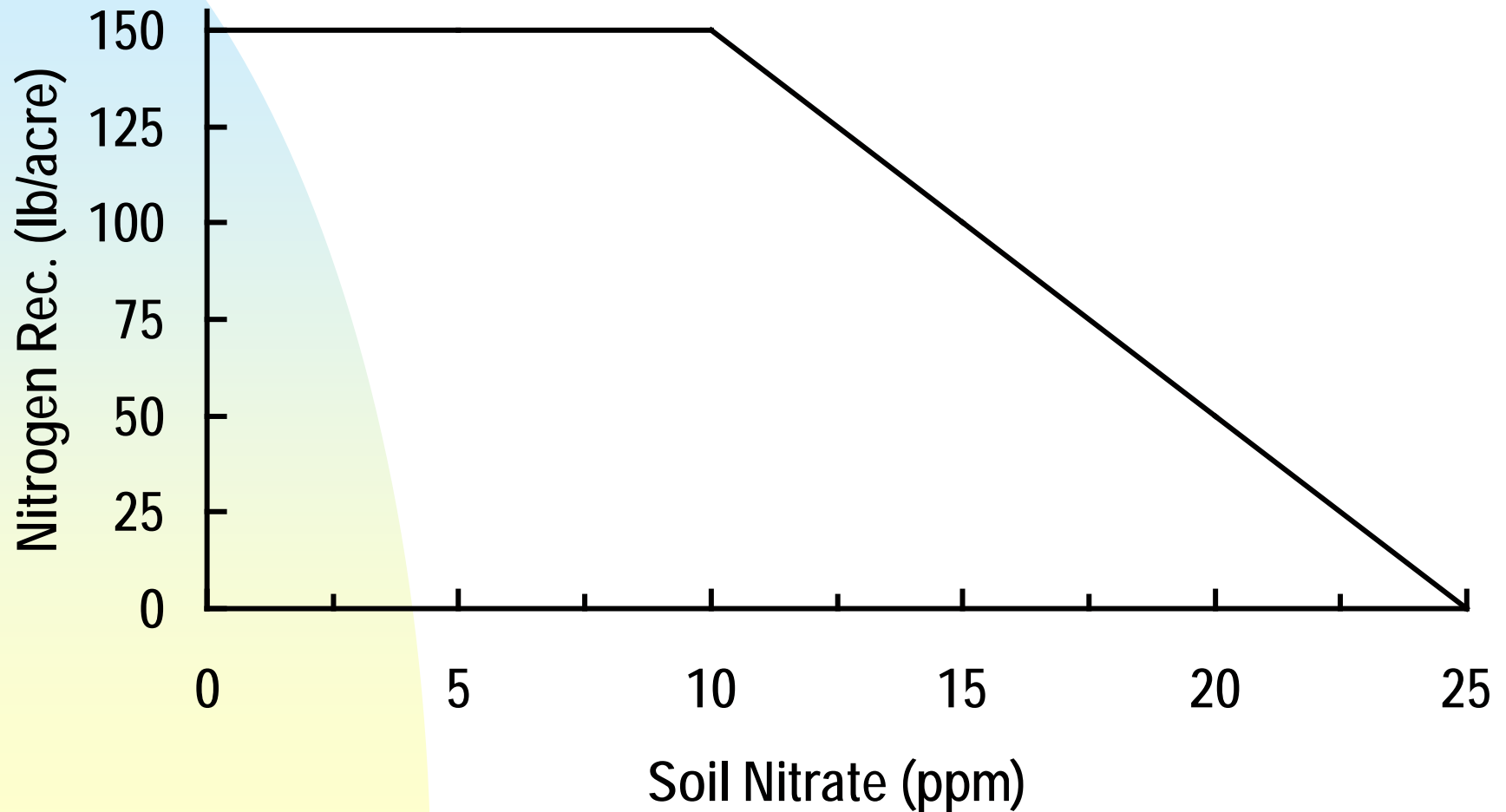
- **Wheat and Barley**

- ◆ **Sample soil immediately before planting to a depth of 6”**

Yield vs. Soil N: Corn



PSNT: Nitrogen Recommendations for Corn

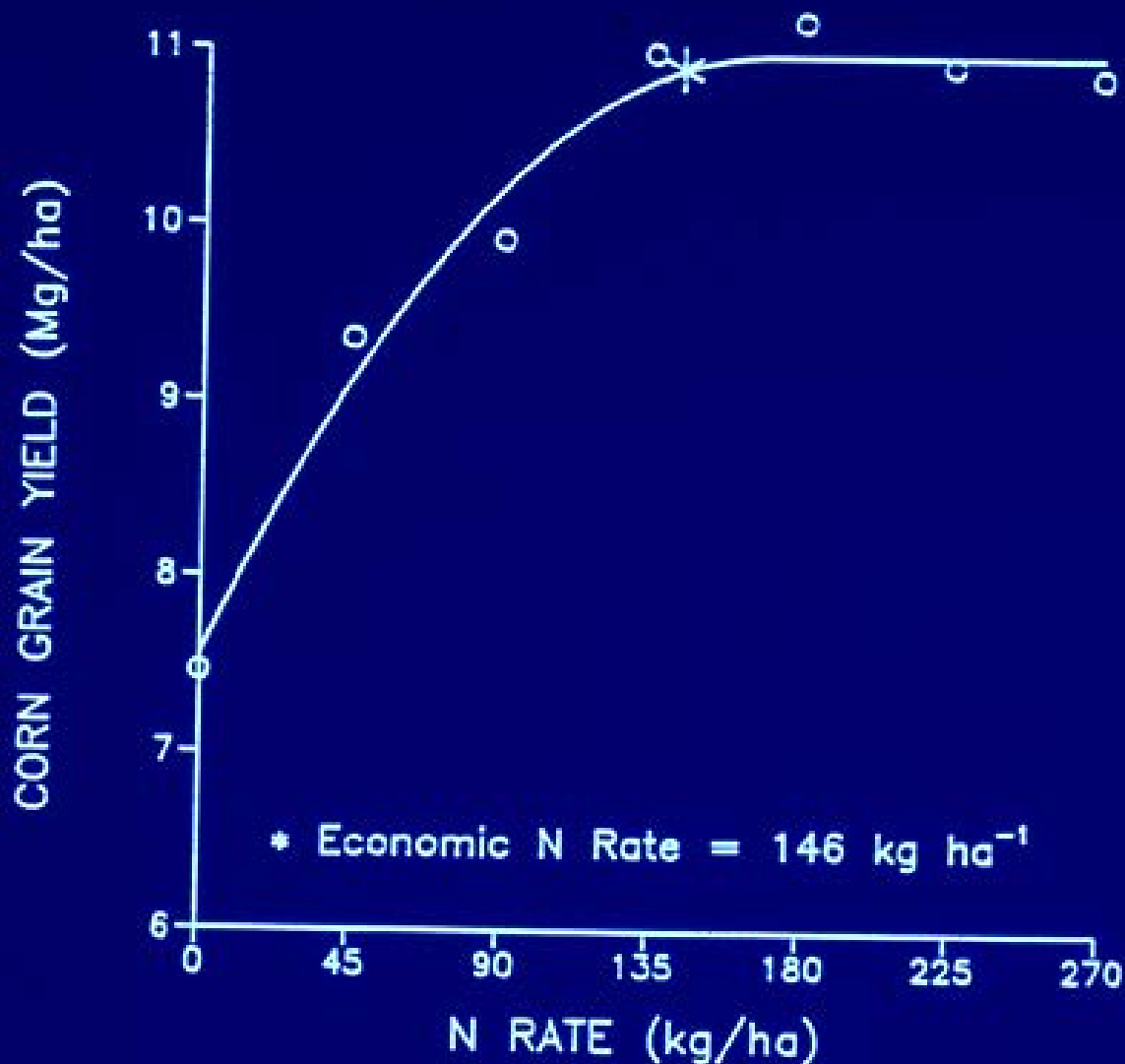


PSNT N recommendations (PA)

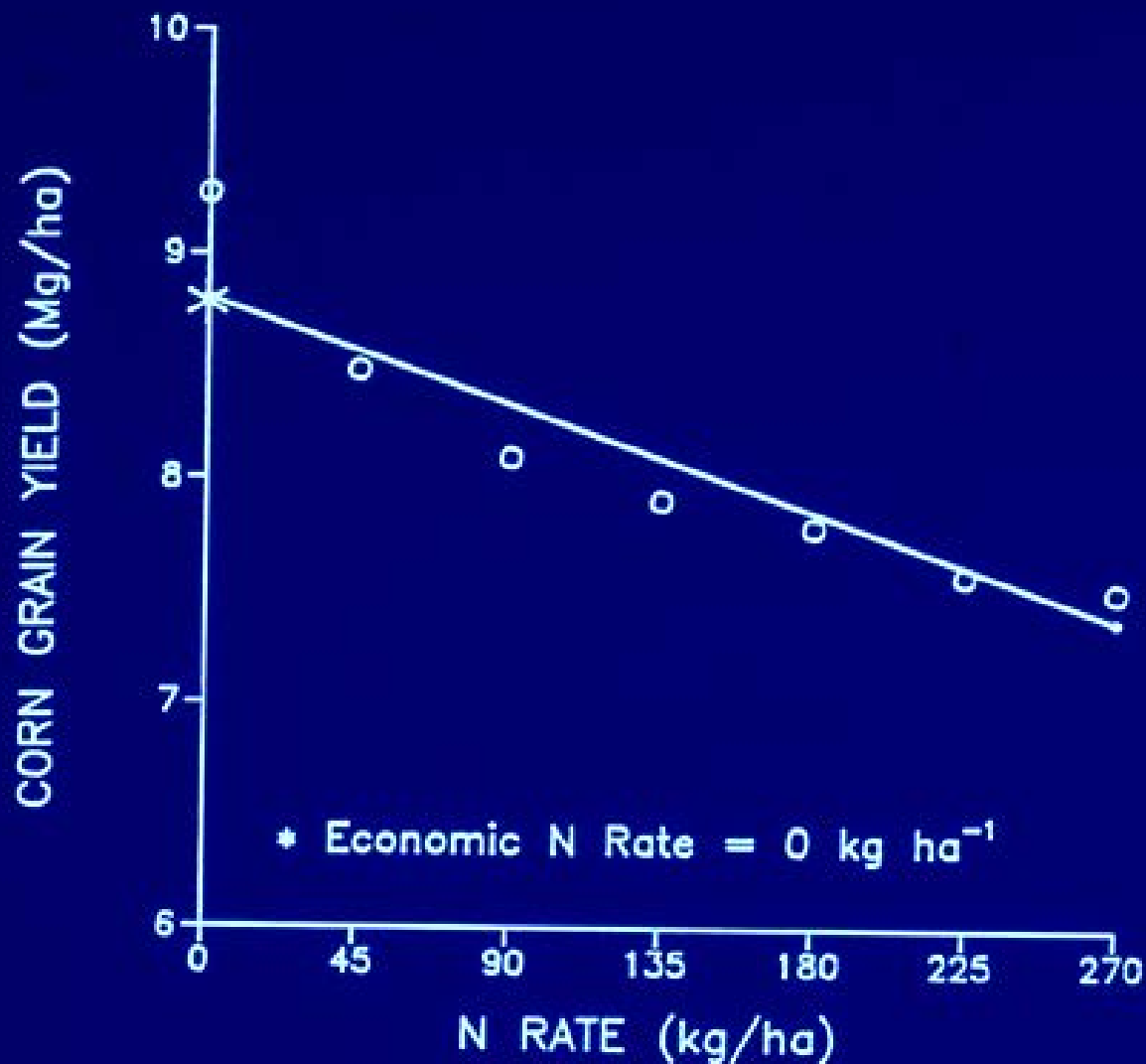
Soil Test N	100 bu corn/A	175 bu corn/A
ppm NO₃	lbs N/A	lbs N/A
0-10	100	190
11-15	75	150
16-20	50	125
21-25	25	100
25+	0	0

Site Characteristics

Physiographic Region	Series	Total No. of sites	Sites with Manure /Sludge
Coastal Plain	Pamunkey	15	4
	Slagle		
	Emporia		
	Suffolk		
Piedmont	Bucks	10	4
	Cecil		
	Appling		
Valley & Ridge	Frederick	16	5
	Buchanan		
	Wheeling		
	Marbie		

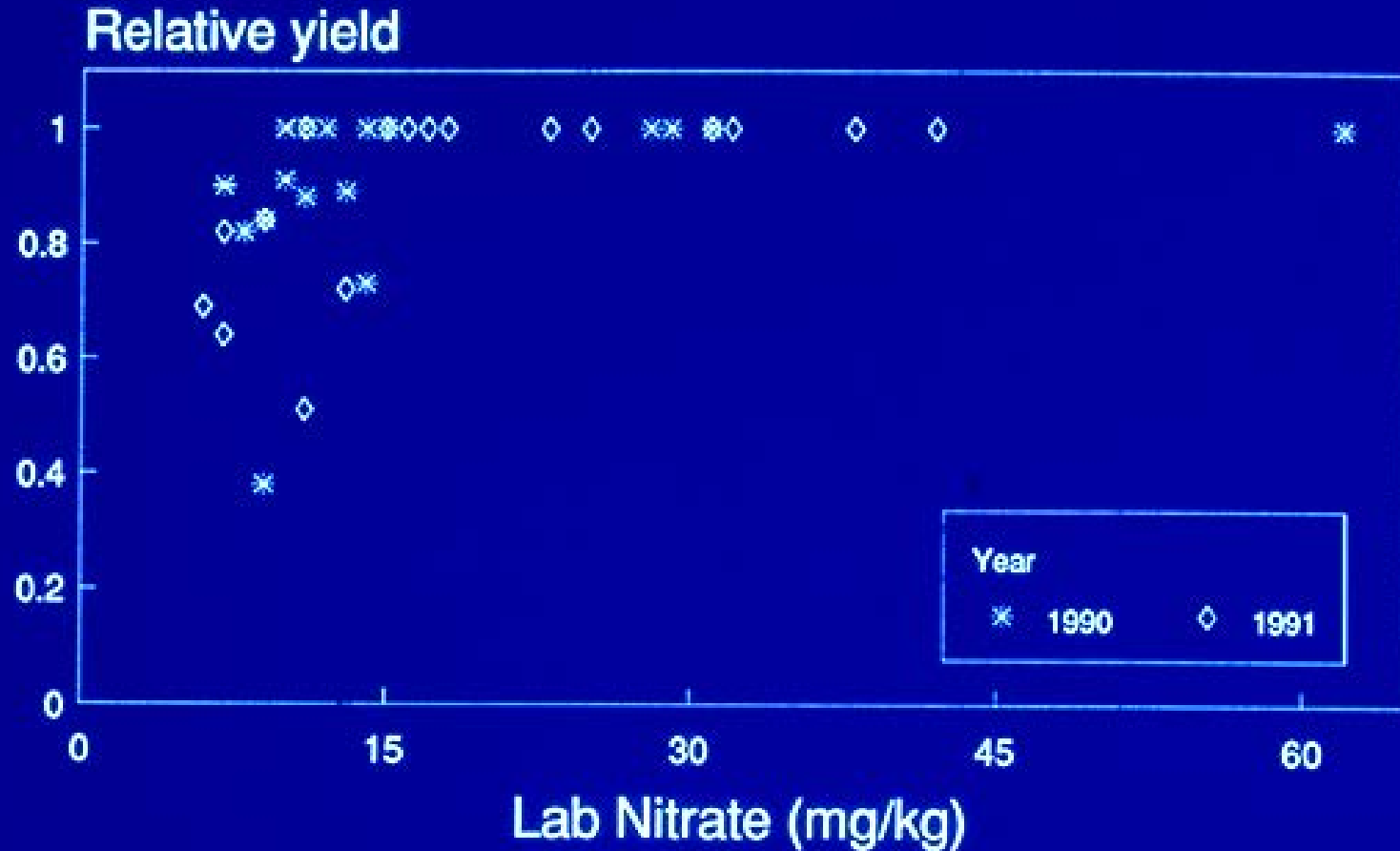


Example of yield response to fertilizer N at low PSNT concentration (6 mg kg^{-1}).



Example of yield response to fertilizer N at high PSNT concentration (31 mg kg⁻¹).

RELATIVE YIELDS Versus Lab Nitrate



Critical Value = 15 mg/kg

Determining N Recommendations for Corn using PSNT

NO₃-N Concentration	N Rate Recommendation
< 10 ppm	Apply full rate of sidedress N that is needed for the realistic yield goal for the particular soil as specified by calculations from VALUES
10-20 ppm	Possible reduction of the normal sidedress N application by 25-50%. The decision to reduce the recommended N rate must be made on a site-by-site basis and should take into account previous field history, organic N additions, and management practices.
> 20 ppm	No sidedress N is needed.

Determining N Recommendations for Wheat and Barley using PSNT

- If NO_3^- in top 6" of soil is:
 - ◆ >30 ppm, then no nitrogen is needed at planting
 - ◆ <30 ppm, then apply 15 to 30 lbs of nitrogen per acre



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Benefits and Difficulties with the PSNT

- **For corn - only relevant if side dressing N, not if supplying all N from pre-plant manure**
- **Can save \$\$ on N fertilizer by decreasing N rate, but can't increase N rate above NMP**
- **Sometimes difficult to get soil samples to 12" if soil is dry**
- **Narrow time window at busy time of year**
- **Some people group similar fields to save time**