B&M CROP Consulting

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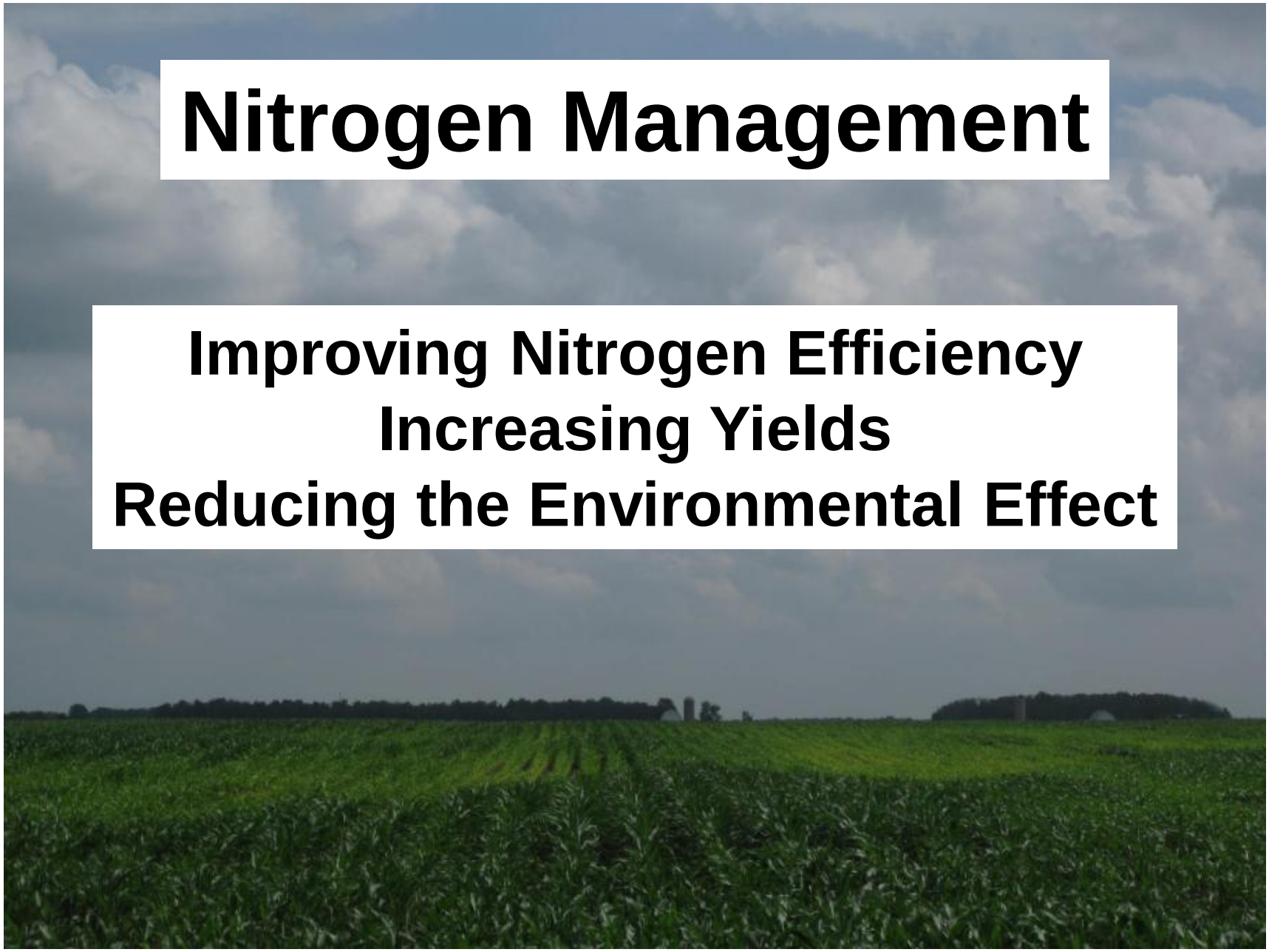
Bill & Missy Bauer

B&M Crop Consulting, Inc.

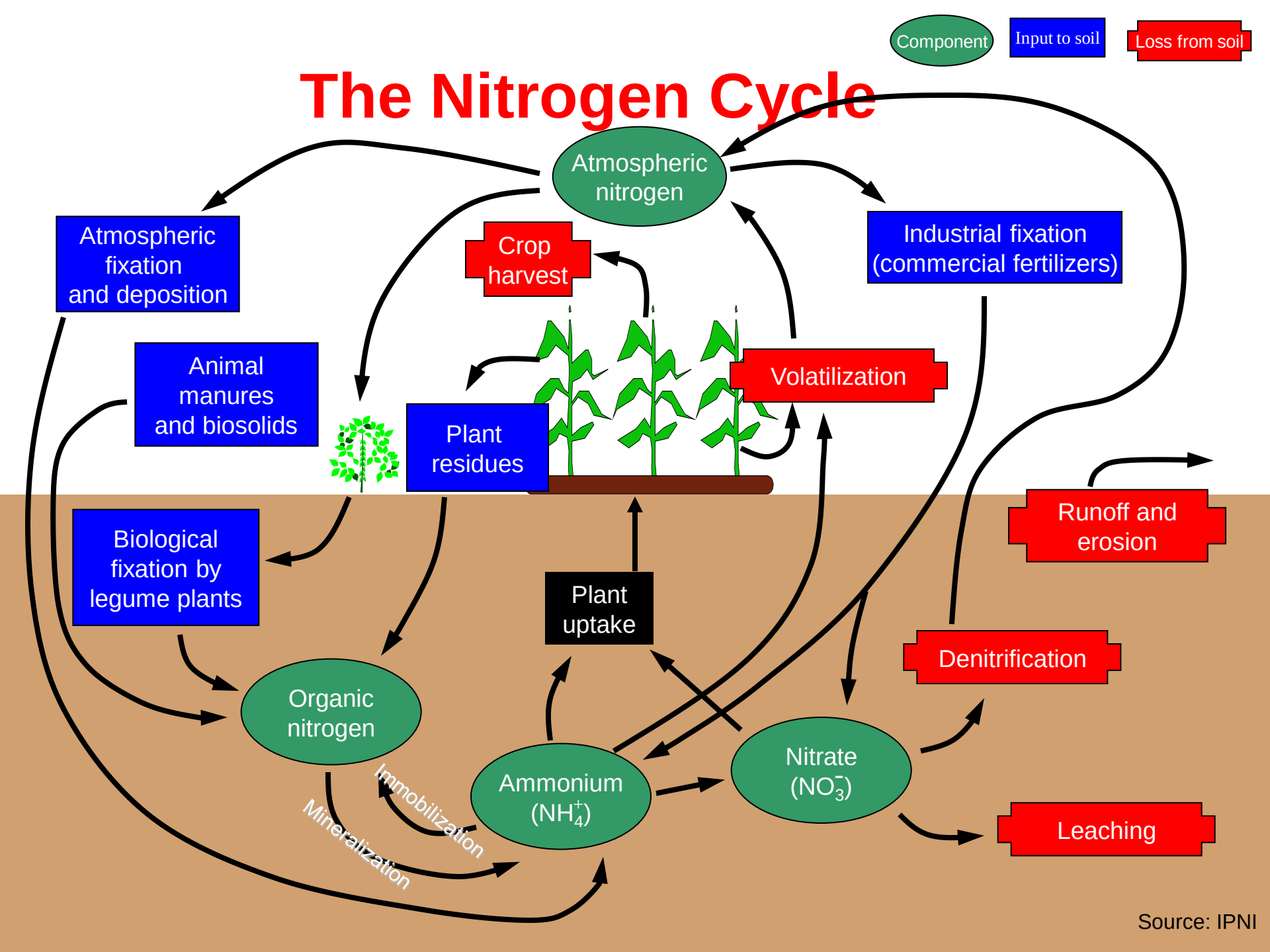
Nitrogen Timing & Placement

Missy Bauer


Nitrogen Management
Improving Nitrogen Efficiency
Increasing Yields
Reducing the Environmental Effect


The 4R's
Nitrogen Management
Right Product
Right Rate
Right Timing
Right Placement


Improving Nitrogen Efficiency


Component
Input to soil
Loss from soil
The Nitrogen Cycle
Atmospheric nitrogen
Atmospheric fixation and deposition
Industrial fixation (commercial fertilizers)
Crop harvest
Animal manures and biosolids
Volatilization
Plant residues
Runoff and erosion
Biological fixation by legume plants
Plant uptake
Denitrification
Organic nitrogen
Ammonium (NH_4^+)
Nitrate (NO_3^-)
Immobilization
Mineralization
Leaching
Source: IPNI

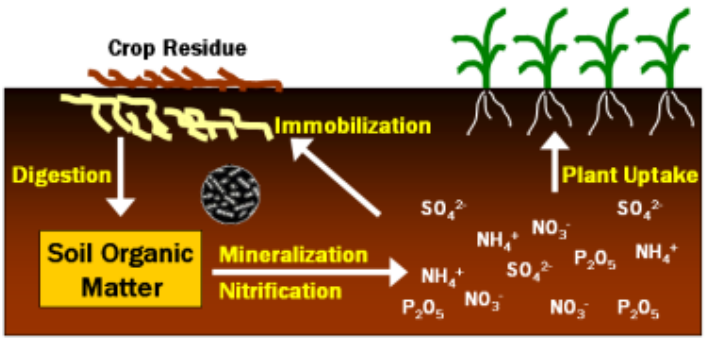
Nitrogen

- Immobilization
- Mineralization
- Losses
  - Volatilization
  - Denitrification
  - Leaching

Carbon Penalty

Carbon Management

- **Carbon-to-Nitrogen Ratios**
  - **Soybean = 30/1**
  - **Corn = 60/1**
  - **Wheat = 100/1**



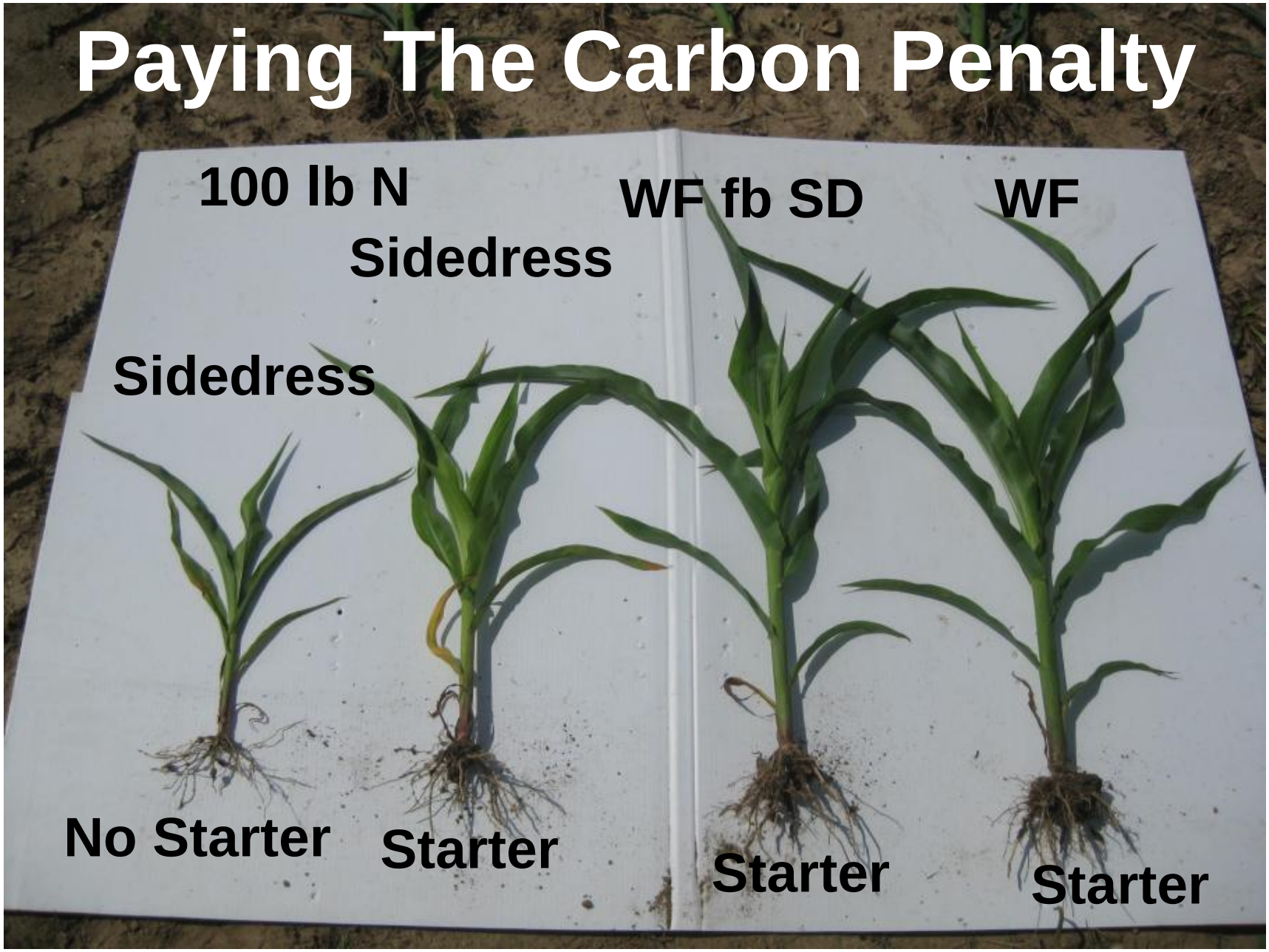
- **Takes more nitrogen to breakdown corn residue vs. soybean residue**
- **Microbes are responsible for the breakdown to 8/1 ratio (Microbes C/N is 8/1)**
- **Need nitrogen in order to do this**
- **Immobilization**

Immobilization

- **A temporary reduction in the amount of plant-available N can occur from immobilization (tie-up) of soil N.**
- **Bacteria that decompose high carbon-low N residues need more N to digest the material than is present in the residue. (Wheat/Corn)**
- **The actively growing bacteria that immobilize some soil N also break down soil organic matter to release available N during the growing season.**
- **There is often a net gain of N during the growing season, because the additional N in the residue will be the net gain after immobilization-mineralization processes.**
- **Apply broadcast N to help compensate for immobilization.**

Source: University of Minnesota, FO-03770, Understanding Nitrogen in Soils.

Paying The Carbon Penalty



Mineralization

- **Organic N that is present in soil organic matter, crop residues and manure is converted to inorganic N through the process of mineralization.**
- **In this process, bacteria digest organic material and release ammonium (NH_4^+) nitrogen.**
- **Formation of NH_4^+ increases as microbial activity increases.**
- **Bacterial growth is directly related to soil temperature and water content.**

Source: University of Minnesota, FO-03770, Understanding Nitrogen in Soils.

Nitrogen Rates

- **How much nitrogen do I need?**
- **Depends on:**
  - **Mineralization**
  - **Timing & placement**
  - **Crop rotation**
- **Rate Studies**

Nitrogen

- **Losses**
  - **Volatilization**
  - **Denitrification**
  - **Leaching**

Nitrogen Loss

- **Volatilization**
  - **Surface applied N**
  - **Fertilizer products containing Urea (Urea, UAN 28-32%)**
  - **15 ~ 20% of the urea-based nitrogen may volatilize within a week after application under warm conditions**

Source: University of Minnesota, FO-03770, Understanding Nitrogen in Soils.

Nitrogen Loss

- **Denitrification**
  - **A process by which bacteria convert NO_3^- to N gases that are lost to the atmosphere.**
  - **Takes place where there is waterlogged soil and where there is ample organic matter to provide energy for bacteria.**
  - **Heavy Soils, poor drainage**
  - **Can proceed rapidly when soils are warm and become saturated for 2 or 3 days.**
  - **Volatilization of the nitrogen gas can result in N losses of as much as 5% of the available nitrate-N per day.**

Source: University of Minnesota, FO-03770, Understanding Nitrogen in Soils.

Nitrogen Loss Through Denitrification

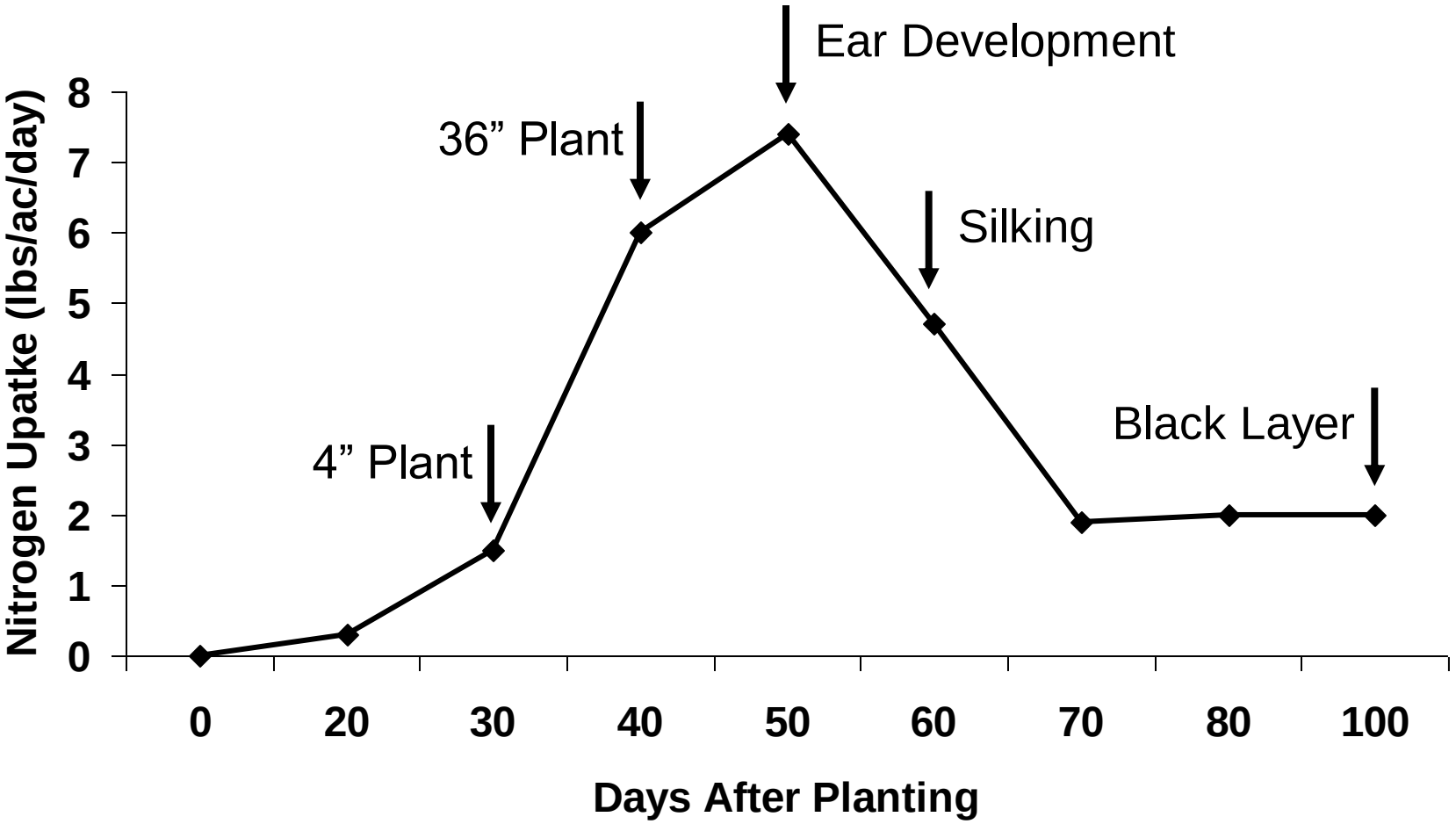
Days Saturated	Temperature	Percent Loss
5	55-60	10
10	55-60	25
3	75-80	60
5	75-80	75
7	75-80	85
9	75-80	95

Nitrogen Loss

- **Leaching**
  - **Leaching is the loss of soluble NO_3^- as it moves with soil water, generally excess water, below the root zone.**
  - **Coarse-textured soils have a lower water-holding capacity and, therefore, a higher potential to lose nitrate from leaching when compared with fine-textured soils.**

Source: University of Minnesota, FO-03770, Understanding Nitrogen in Soils.

Nitrogen Uptake vs. Growth Stage of Corn



N Timing and Placement

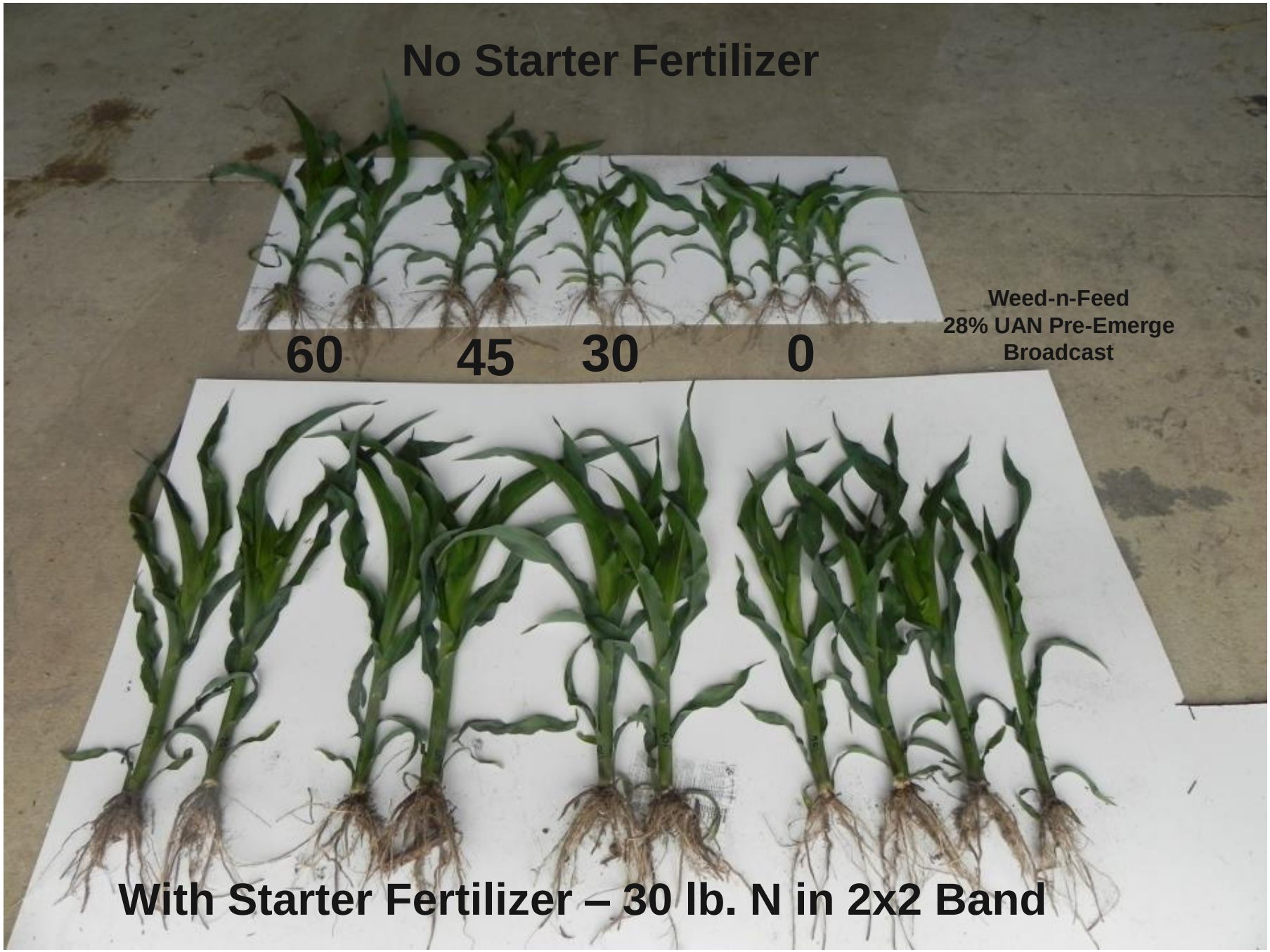
- **Residue break down, feed microbes, reduce immobilization**
  - **Broadcast nitrogen**
    - **Fall or early spring**
    - **NH4+ - (25-30 lb N/ac)**
  - **Weed-n-Feed/Preplant broadcast**
    - **Just prior to planting or pre-emergence**
    - **28% or Urea/AMS**
    - **Stabilizers/inhibitors**

Early Season Sulfur Deficiency

Need sulfur somewhere in your program

N Timing and Placement

- **Residue break down, feed microbes, reduce immobilization**
  - **Broadcast nitrogen**
    - **Fall or early spring**
    - **AMS - (125-150 lb./acre, ~25-30 lb. N/acre)**
  - **Weed-n-Feed/Preplant broadcast**
    - **Just prior to planting or pre-emergence**
    - **28% or urea/AMS**
    - **Stabilizers/inhibitors**
- **Starter Fertilizer Band or Strip-till Band**

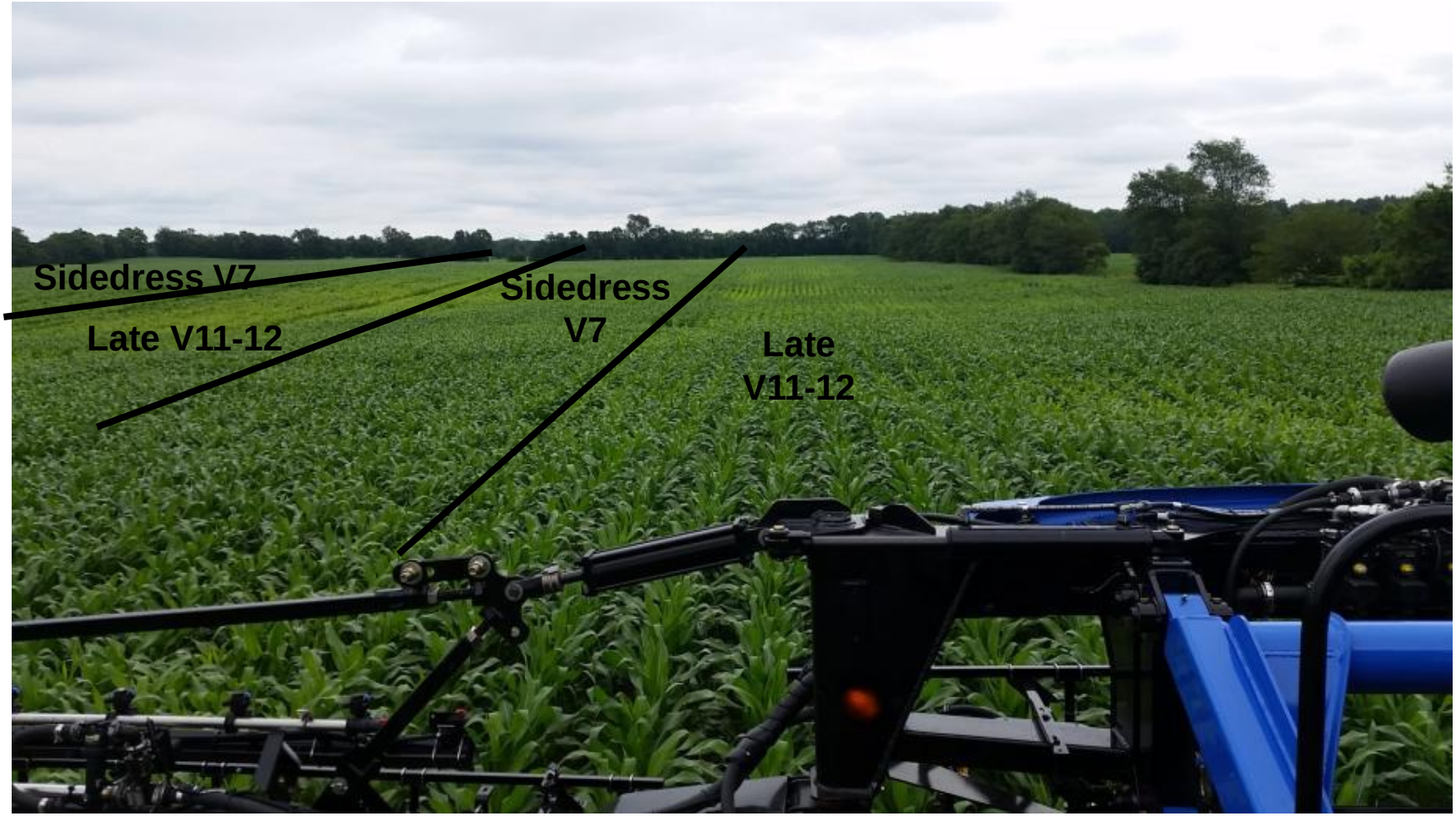

No Starter Fertilizer
60
45
30
0
Weed-n-Feed
28% UAN Pre-Emerge
Broadcast
With Starter Fertilizer – 30 lb. N in 2x2 Band

N Timing & Placement

- **Residue break down, feed microbes, reduce immobilization**
  - **Broadcast nitrogen**
    - **Fall or early spring**
    - **AMS - (125-150 lb./acre, ~25-30 lb. N/acre)**
  - **Weed-n-Feed/Preplant broadcast**
    - **Just prior to planting or pre-emergence**
    - **28% or urea/AMS (30-35 lb N, instead of 45 to 60 lb N)**
    - **Stabilizers/inhibitors**
- **Starter Fertilizer Band or Strip-till Band**
- **Sidedress Band**

Sidedress for Tip Fill

Late V11-V12 Application



96 lb N Base

Managing Nitrogen

- **Front End**
  - **AMS**
    - **25-30 lb N (timed with P&K applications)**
  - **Weed-n-Feed/Pre-emerge/Pre-plant**
    - **30-35 lb N**
  - **Starter Fertilizer (2x2)**
    - **30-35 lb N**
- **Back End**
  - **Sidedress**

N Timing & Placement

- **Residue break down, feed microbes, reduce immobilization**
  - **Broadcast nitrogen**
    - **Fall or early spring**
    - **AMS - (125-150 lb./acre, ~25-30 lb. N/acre)**
  - **Weed-n-Feed/Preplant broadcast**
    - **Just prior to planting or pre-emergence**
    - **28% or urea/AMS**
    - **Stabilizers/inhibitors**
- **Starter Fertilizer Band or Strip-till Band**
- **Sidedress Band**
- **Later applications? – Fertigation, Y Drop**

End

Fertigation


Add one more fertigation?
Based on tissue & soil samples
Apply through brown silk
VALLEY
1140

Y-Drop

Y-Drop

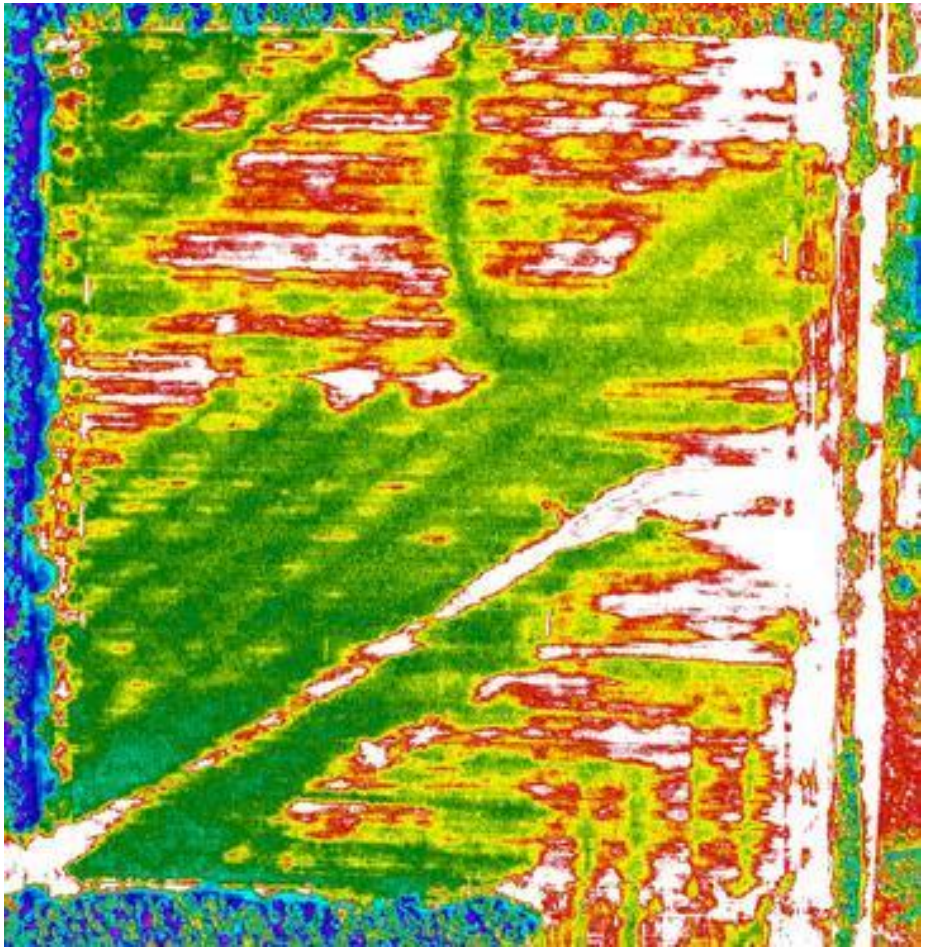
N Timing & Placement

- **Residue break down, feed microbes, reduce immobilization**
  - **Broadcast nitrogen**
    - **Fall or early spring**
    - **AMS - (125-150 lb./acre, ~25-30 lb. N/acre)**
  - **Weed-n-Feed/Preplant broadcast**
    - **Just prior to planting or pre-emergence**
    - **28% or urea/AMS**
    - **Stabilizers/inhibitors**
- **Starter Fertilizer Band or Strip-till Band**
- **Sidedress Band**
- **Later applications – Fertigation, Y Drop**

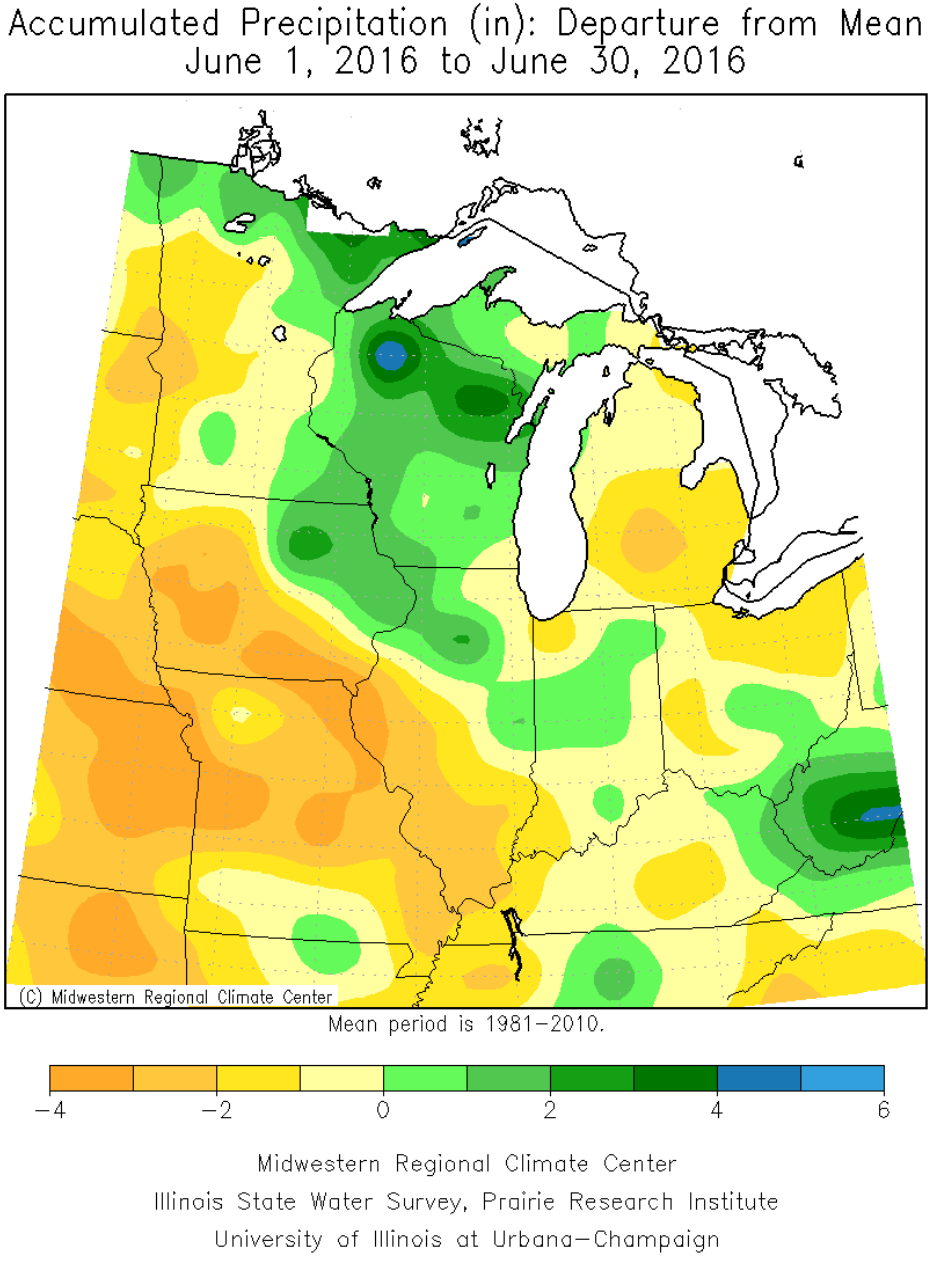
End

2015
Don’t Leave the Corn Hanging

Vegetation and Digital Images

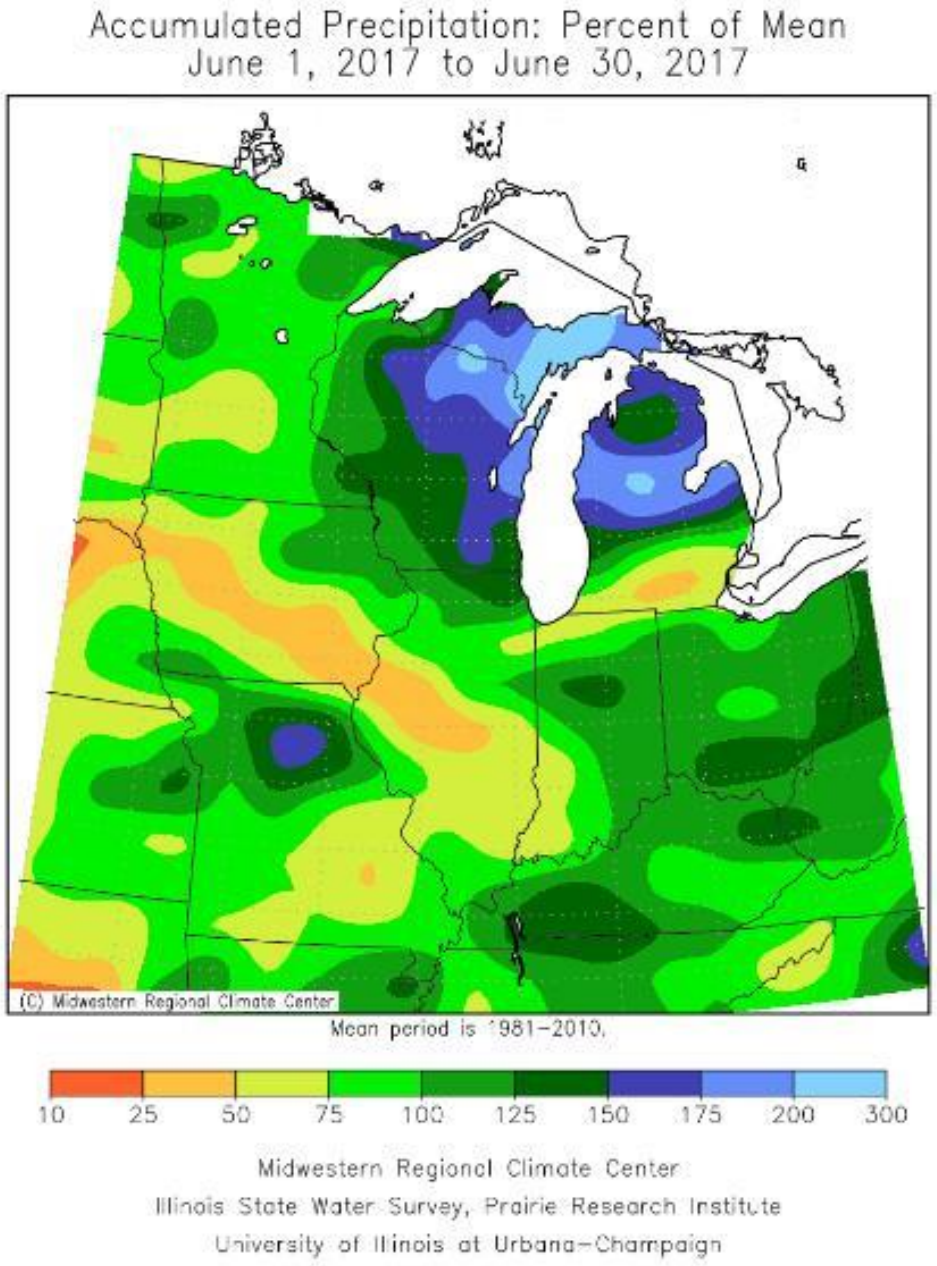


2015



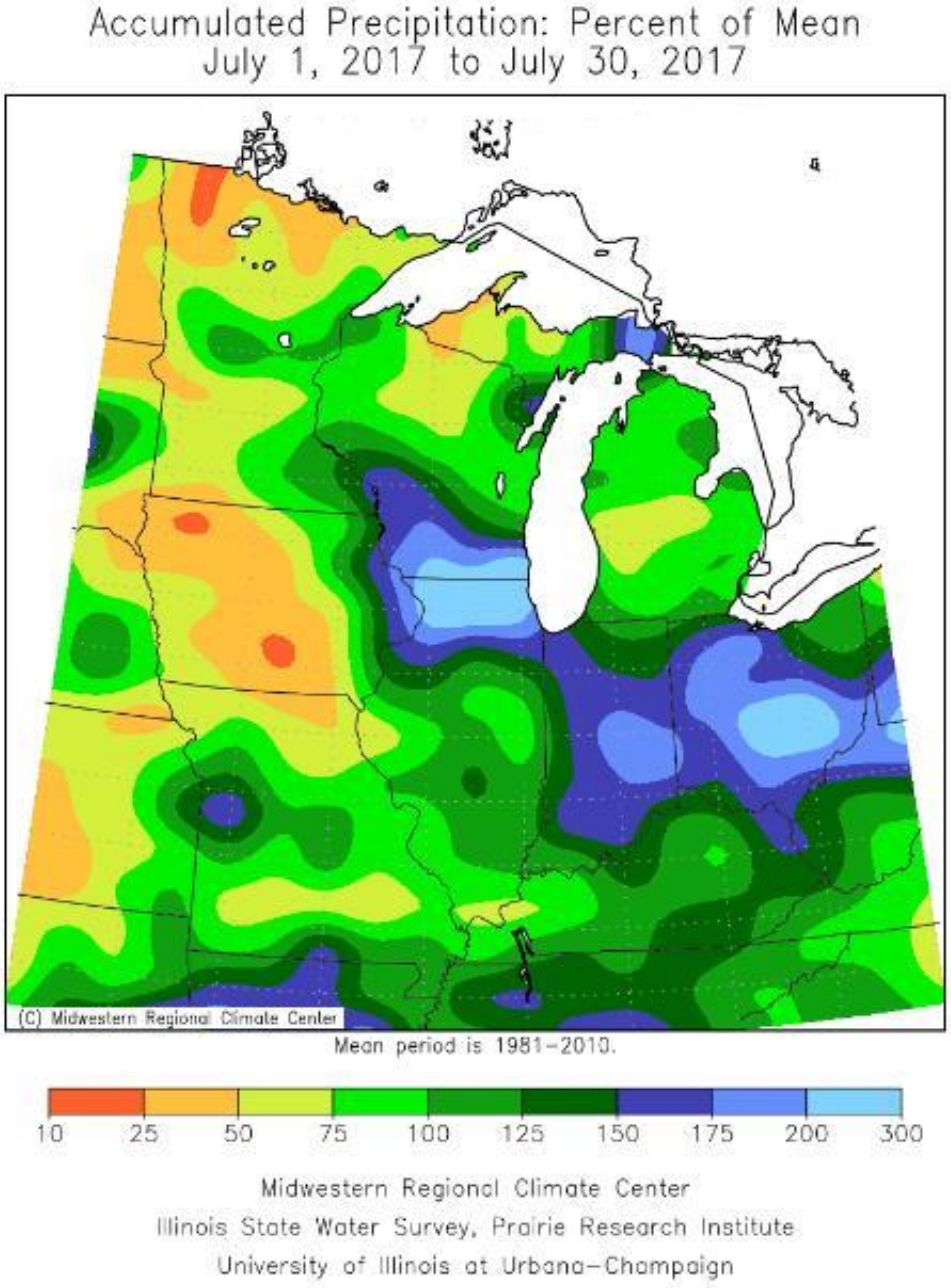
June 2016

Source: Midwestern Regional Climate Center



June 2017

Source: Midwestern Regional Climate Center



July 2017

Source: Midwestern Regional Climate Center

Green Leaves at Harvest – 302 Bu/ac

Nitrogen Management

Summary

- **Your nitrogen program should be designed to keep the crops needs met all the way to black layer**
- **Early season nitrogen deficiencies lead to loss of yield potential**
- **Late season deficiency leads to yield loss**
- **From emergence to thigh high--inches matter--placement is crucial**
- **Banding is more efficient than broad casting**
- **Know your risk of loss**

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