HERMAN ROSHOLT FARM PROJECT

A Public and Private Partnership to Improve Nitrogen Fertilizer Efficiency and Protect Groundwater

MINNESOTA DEPARTMENT OF AGRICULTURE

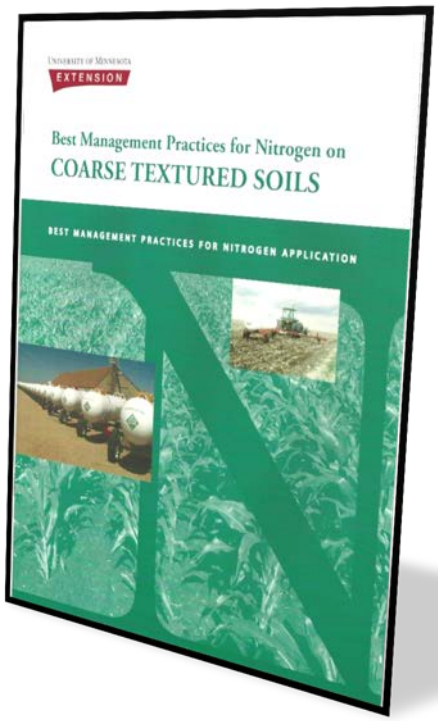
Josh Stamper

Minnesota Dept. of Agriculture

Saint Paul, MN - 651-201-6322

CLEAN WATER LAND & LEGACY AMENDMENT

Objectives



- **Revision of U of M Recommendations for Nitrogen use on irrigated, coarse-textured soils**
  - Provide Crop Response Interactions with subsequent leaching losses
- **Evaluate BMP effectiveness and long term N losses**
  - Local understanding of potential impacts to groundwater resources

MINNESOTA DEPARTMENT OF AGRICULTURE

Partnerships (2011-2015)

A partnership between public and private entities to respond to local concerns regarding N fertilizer rates, recommendations, and associated water quality impacts.

- **Minnesota Department of Agriculture** *(Clean Water Legacy Funding)*
  - WQ component, monitoring equipment, Budget, Work plan
  - Summaries, Education, Advisory
- **Pope County SWCD**
  - Administration, Project Coordination, Progress Reports, Land Owner
  - Advisory, Education, Outreach
- **University of Minnesota – Department of Soil, Water, and Climate**
  - Field Design, Treatments, Data Management, Field establishment and Harvest
  - Masters Student and Thesis, Advisory
- **Prairie Lakes Coop**
  - Agronomy functions, Tillage, Application, Irrigation
  - Advisory, Education and Outreach
- **Stearns County SWCD**
  - News releases, Education and Outreach, Lysimeter Installation
  - Advisory

MINNESOTA DEPARTMENT OF AGRICULTURE

Nitrate-N Loss Assessment

- To calculate N lost to leaching we need to know a few things:
- Concentration of nitrate-N below the root zone: Suction cup lysimeter
- The amount of water or irrigation that “flushes” the nitrate out of the root zone: Drain Gauge or a water balance

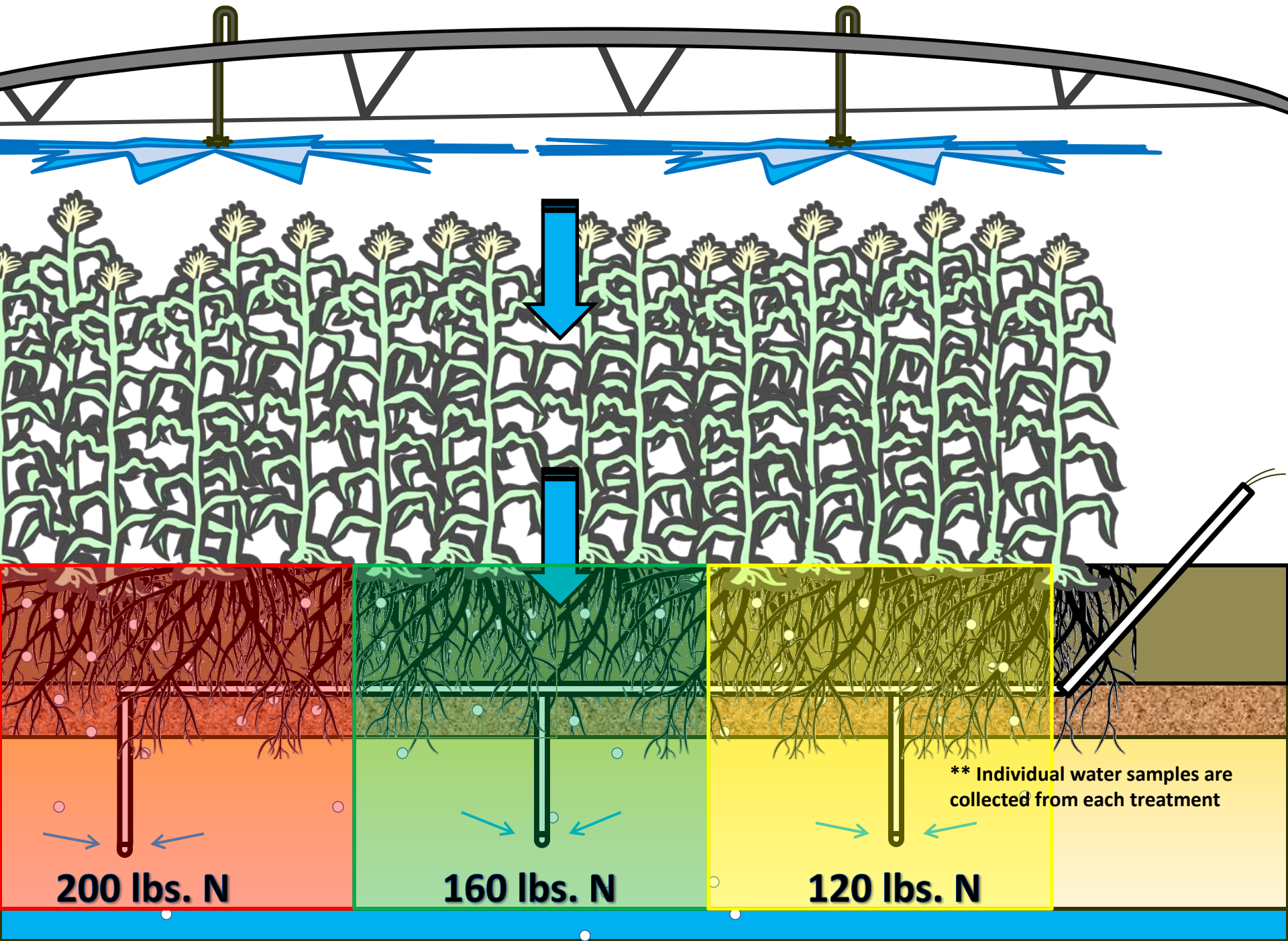
2012 Observed Data from Herman Rosholt Farm in Westport, MN

Nitrogen Rates and Treatments

Treatment ID	Product	Preplant	Sidedress	Total N	Nitrate WQ Testing
1	Urea	0	0	**0**	**Yes**
2	Urea	20	20	**40**	
3	Urea	40	40	**80**	
4	Urea	60	60	**120**	**Yes**
5	Urea	80	80	**160**	**Yes**
6	Urea	100	100	**200**	**Yes**
7	Urea	120	120	**240**	**Yes**
8	Urea	140	140	**280**	
9	Super Urea	160	0	**160**	**Yes**
10	ESN	160	0	**160**	**Yes**
11	ESN	200	0	**200**	
12	ESN/Urea	80	80	**160**	**Yes**

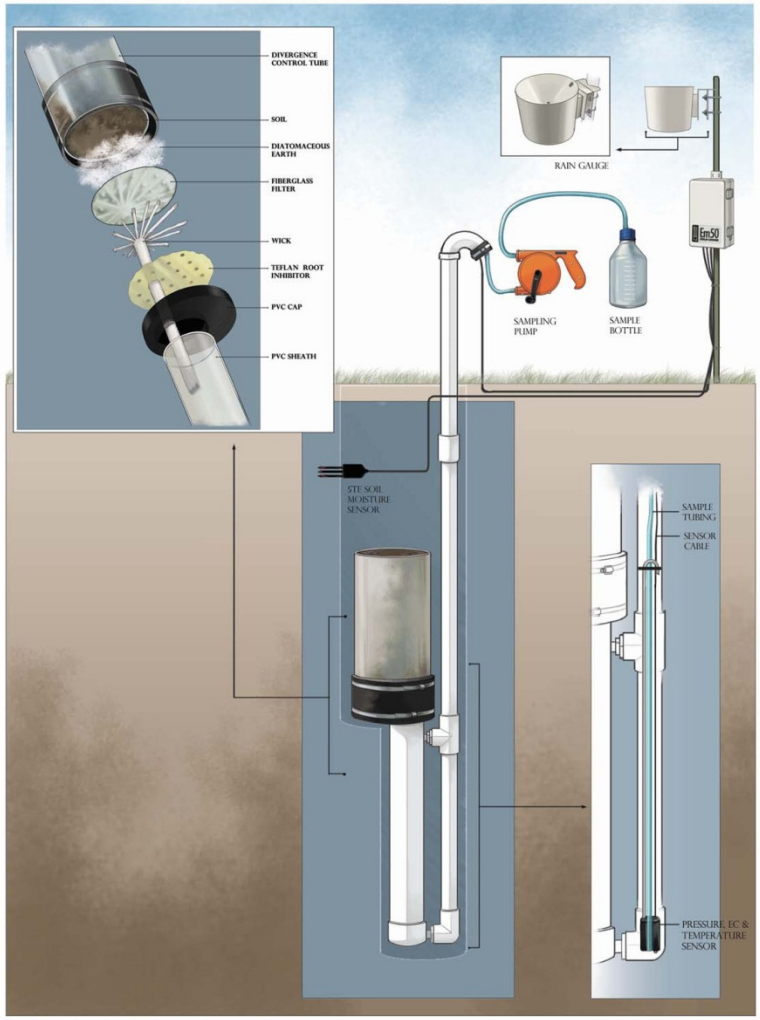
2012 Observed Data from Herman Rosholt Farm in Westport, MN

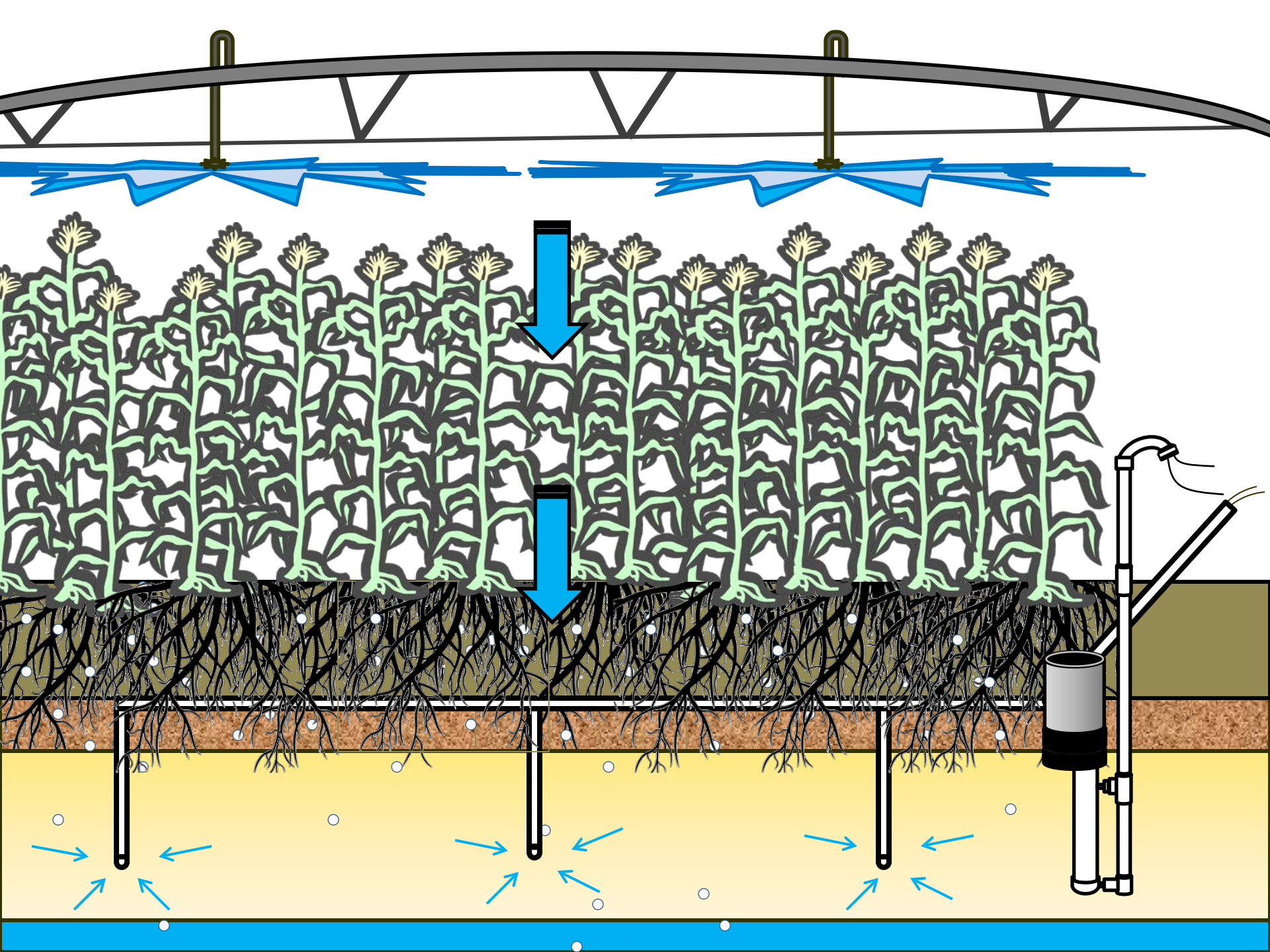
MINNESOTA DEPARTMENT OF AGRICULTURE


200 lbs. N
160 lbs. N
120 lbs. N
** Individual water samples are collected from each treatment

Additions for 2012

- Nitrate concentration data is only part of the N loss story
- Using multiple Drain Gauges to get a better handle on the volume of water leaching below the crop.
- This will allow a load (lbs/ac) of N loss to be calculated.





Weather Station

- Pope SWCD website to provide daily ET.

2012 Observed Data from Herman Rosholt Farm in Westport, MN

MINNESOTA DEPARTMENT OF AGRICULTURE

Relationship between Root Growth and N Uptake

Growth Stage	Root Length	N Uptake Whole Plant
	Miles/acre	lb/ac
VE	0	0.2
V4	54	0.9
V9	4,400	19
V12	15,700	116
VT	32,200	199
Late Silk	38,100	218
Blister	38,000	221
Grain Fill	20,700	262
Black Layer	13,700	274

Source: Mengel and Barber, 1970.

- Plants are struggling to produce the root infrastructure to assimilate early season N that is available from fertilizer and mineralization.
- Yield potential (kernels/ear) is determined in mid growth stages.

How N is Taken Up and remobilized

- N that is accumulated in leaf tissue by VT, will be scavenged by the plant during grain fill.

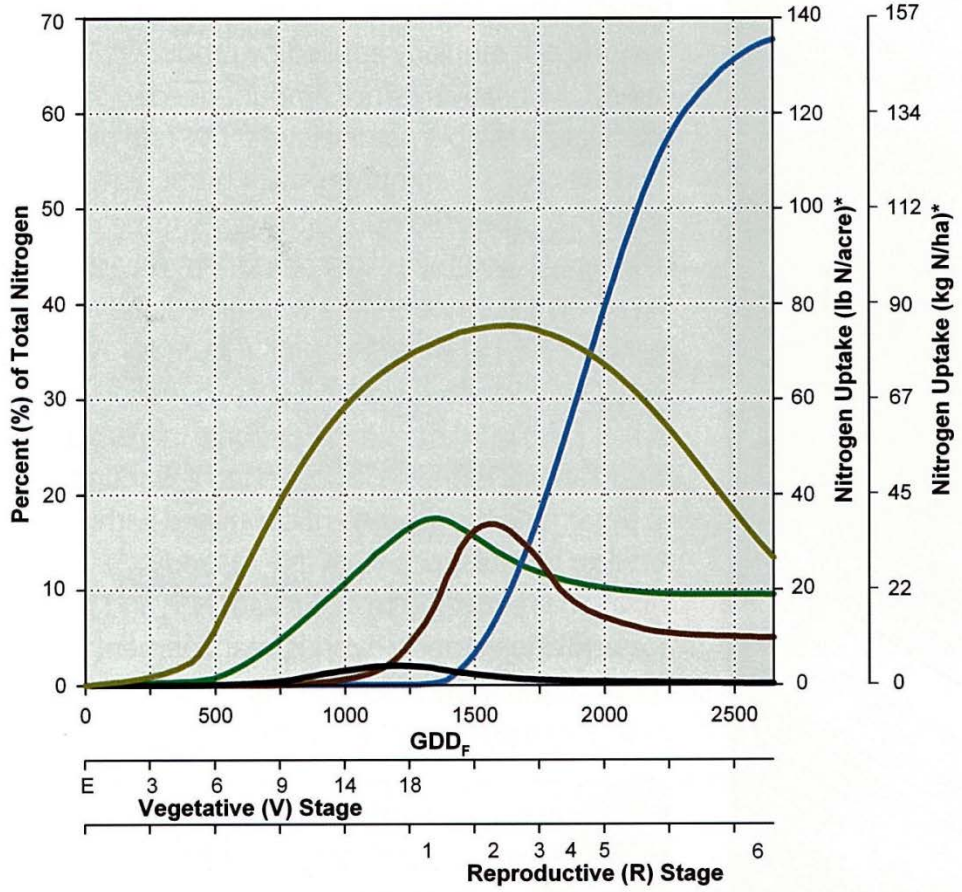


Figure 86. Nitrogen (N) accumulation of individual above-ground components.

Stalk and Leaf Sheaths
Leaf Blades
Tassel
Shank, Husk Leaves, and Cob
Grain

MINNESOTA DEPARTMENT OF AGRICULTURE

MINNESOTA DEPARTMENT OF AGRICULTURE

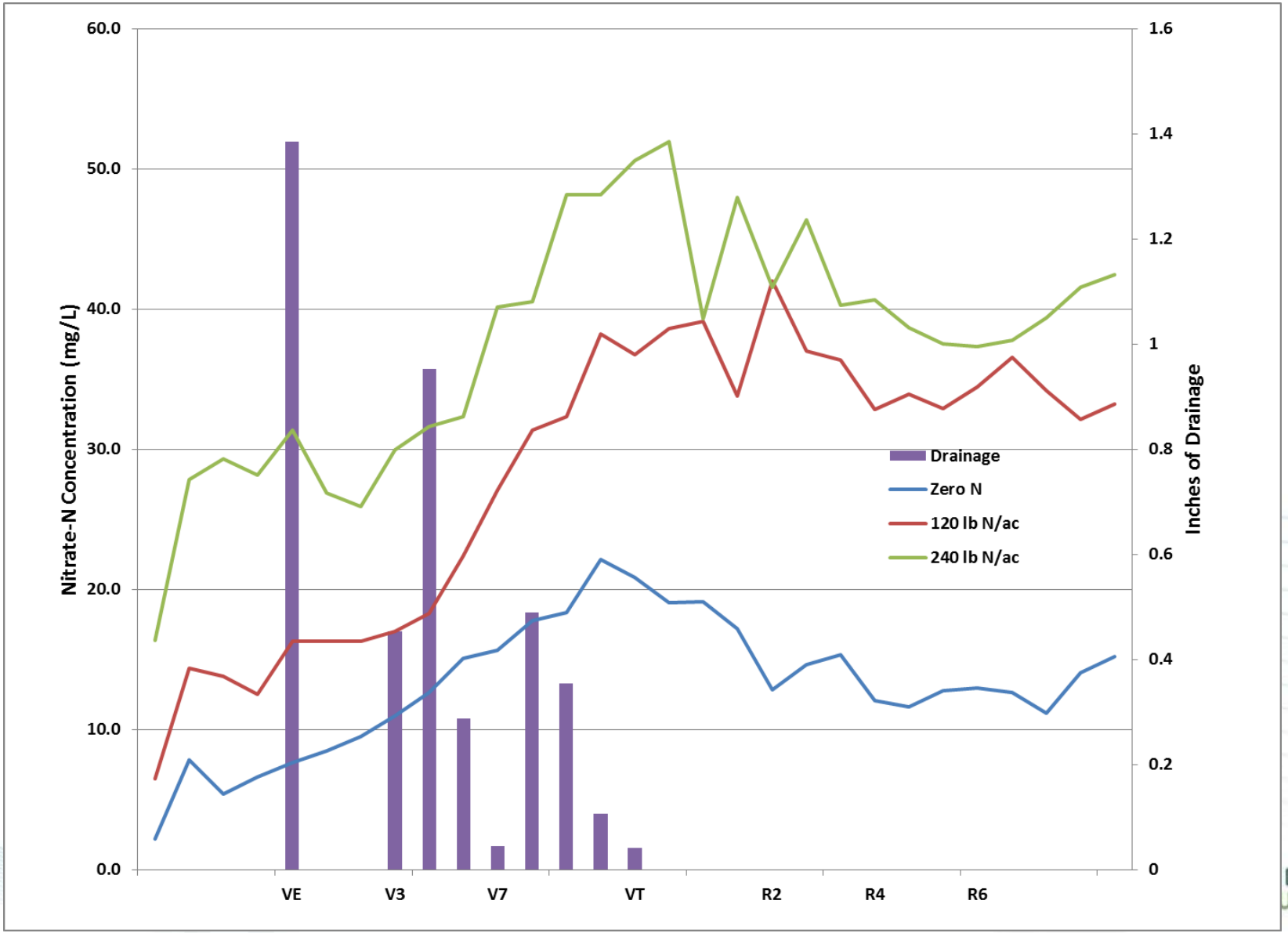
MINNESOTA DEPARTMENT OF AGRICULTURE


'08Hoek Farms
Treatment: 10
Timing: Spring
Method: John Deere
120lbs
08/05/2008

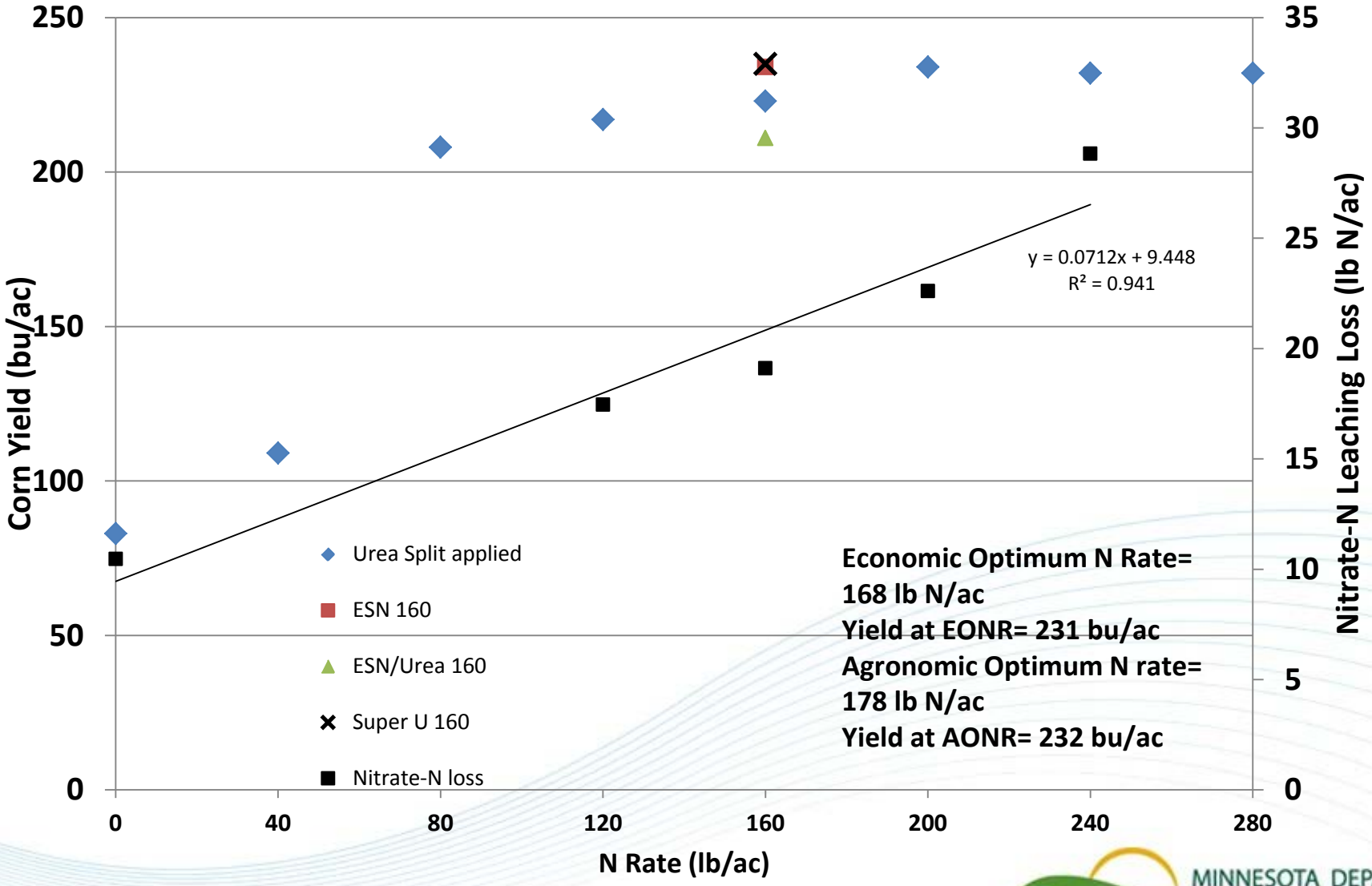
MINNESOTA DEPARTMEN
OF AGRICULTURE

MINNESOTA DEPARTMEN
OF AGRICULTURE

Lysimeter Concentrations and Drainage



CC Response to Nitrogen



MINNESOTA DEPARTMENT OF AGRICULTURE

Conclussions

- N loss in 2012 was moderate due to drought.
- Major precipitation events drive loss due to leaching.
- There is a portion of nitrate-N that is going to be lost, no matter what, in row crop production.
- Slow release and nitrification inhibitors did not reduce N loss to leaching, but may have helped restrict volatilization.
- Applying N at the EONR would result in 48% less N loss than at the 240 lb N rate.

Tools for taking your management to the next level

- Irrigation Scheduling: Quantify leaching events
- Soil moisture sensors for remote pivot control
- Split applications or slow release
- N-Rich strip and Optical Sensing*

2012 Observed Data from Herman Rosholt Farm in Westport, MN

MINNESOTA DEPARTMENT OF AGRICULTURE