SCN – Do We Need To Worry More About Future Issues?

DORIAN GATCHELL

JANUARY 5, 2016 – GRANITE FALLS, MN
JANUARY 6, 2016 - WATERTOWN, SD
JANUARY 7, 2016 - GRAND FORKS, ND

Minnesota Agricultural Services

Agvise Laboratories 2016 Winter Seminar

SCN – Do We Need To Worry More About Future Issues?

How to mess up your intensive soybean production.

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About me:

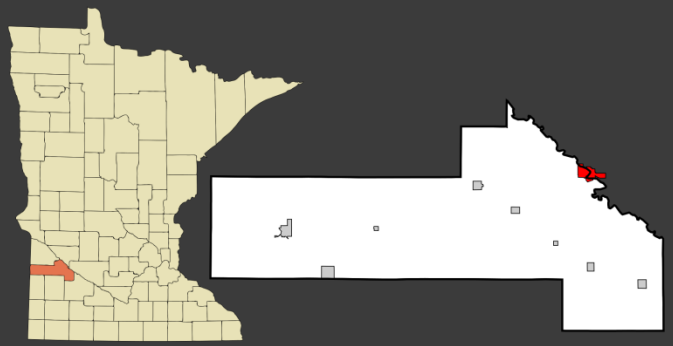
Background –

- grew up on farm near Granite Falls; crops and livestock
- BS – Agronomy/Soils – SDSU
- MS – Agronomy/SCN – ISU

Worked in retail setting as agronomist; dept mgr
Started MN Ag Services in 2009

Currently work in SW MN – row crops, beets, small grain, forages

Live rural Granite Falls with one wife and one son



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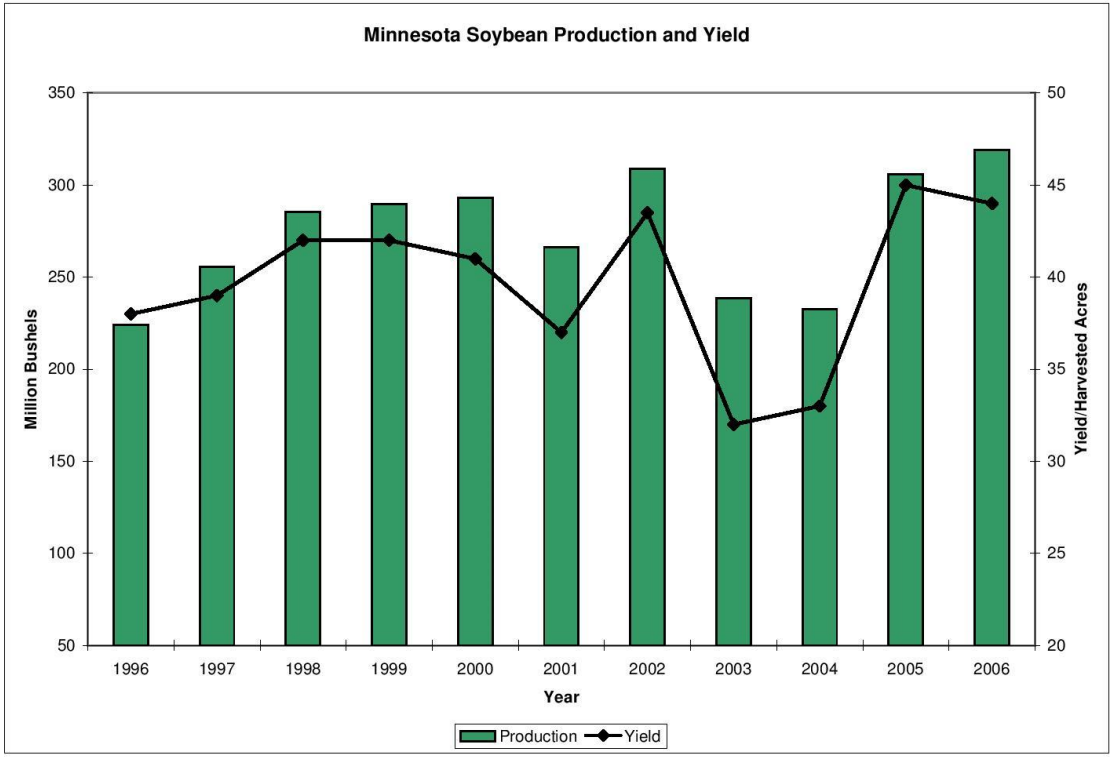
Why talk about SCN

Soybean genetics have increased yield by .5 bu/ac per year.

Is that increase being expressed?



What was yield 30 years ago?
What is yield now?

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Why Talk About SCN

SCN losses

Up to 30% yield loss – much of it before any visual symptoms can be seen.

SCN damage is directly correlated to the number of SCN feeding on roots???????

SCN interactions with other diseases

Many growers are not thinking SCN

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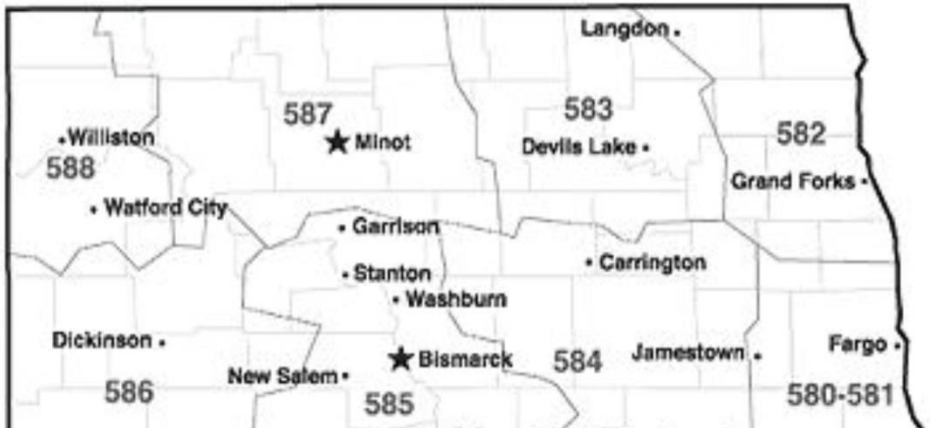
Soybean Cyst Nematode Counts: MN: 2012, 2013, 2014 & 2015								
Separated out by Zip Code regions								
				SCN egg count				
Year	State	Zip	Samples	Zero	1 - 200	201 - 2,000	2,001 - 10,000	> 10,000
2015	MN	550-551	23	2	2	7	10	2
		553	89	6	12	19	37	15
		560	250	18	27	113	82	10
		561	89	13	5	23	32	16
		562	1503	221	160	425	521	176
		563	312	65	55	107	74	11
		564	1	0	0	0	1	0
		565	830	271	138	208	161	52
		566	20	11	1	3	2	3
		567	79	32	13	18	13	3
2014	MN	553	119	3	6	35	65	10
		560	258	16	34	86	109	13
		561	40	13	7	7	8	5
		562	1320	258	197	395	412	58
		563	242	40	40	83	70	9
		564	1	0	1	0	0	0
		565	525	185	88	129	97	26
		566	6	0	0	0	2	4
		567	68	26	9	11	18	4
2013	MN	553	160	32	26	33	61	8
		560	270	13	35	103	101	18
		561	32	6	1	8	13	4
		562	938	280	144	271	202	41
		563	132	18	26	43	30	15
		564	34	12	4	11	7	0
		565	590	290	101	112	65	22
		567	32	18	6	3	3	2
2012	MN	553	48	2	6	21	13	6
		560	234	19	50	107	49	9
		561	49	10	11	7	13	8
		562	1101	326	237	323	183	32
		563	332	77	74	111	52	8
		565	927	362	188	197	123	57
		566	9	5	1	0	3	0

*Eggs/100 cc soil

Soybean Cyst Nematode Counts: SD: 2012, 2013, 2014 & 2015								
Separated out by Zip Code regions								
				SCN egg count				
Year	State	Zip	Samples	Zero	1 - 200	201 - 2,000	2,001 - 10,000	> 10,000
2015	SD	570	10	10	0	0	0	0
		572	44	23	7	11	2	1
		573	1	0	1	0	0	0
		574	2	1	0	1	0	0
2014	SD	570	25	16	6	3	0	0
		572	28	10	6	5	5	2
		573	0	0	0	0	0	0
		574	2	2	0	0	0	0
2013	SD	570	17	5	3	3	5	1
		572	40	17	11	11	0	1
		573	14	8	4	0	0	2
		574	1	1	0	0	0	0
2012	SD	570	8	3	4	1	0	1
		572	63	28	16	15	2	2
		574	15	13	0	2	0	0

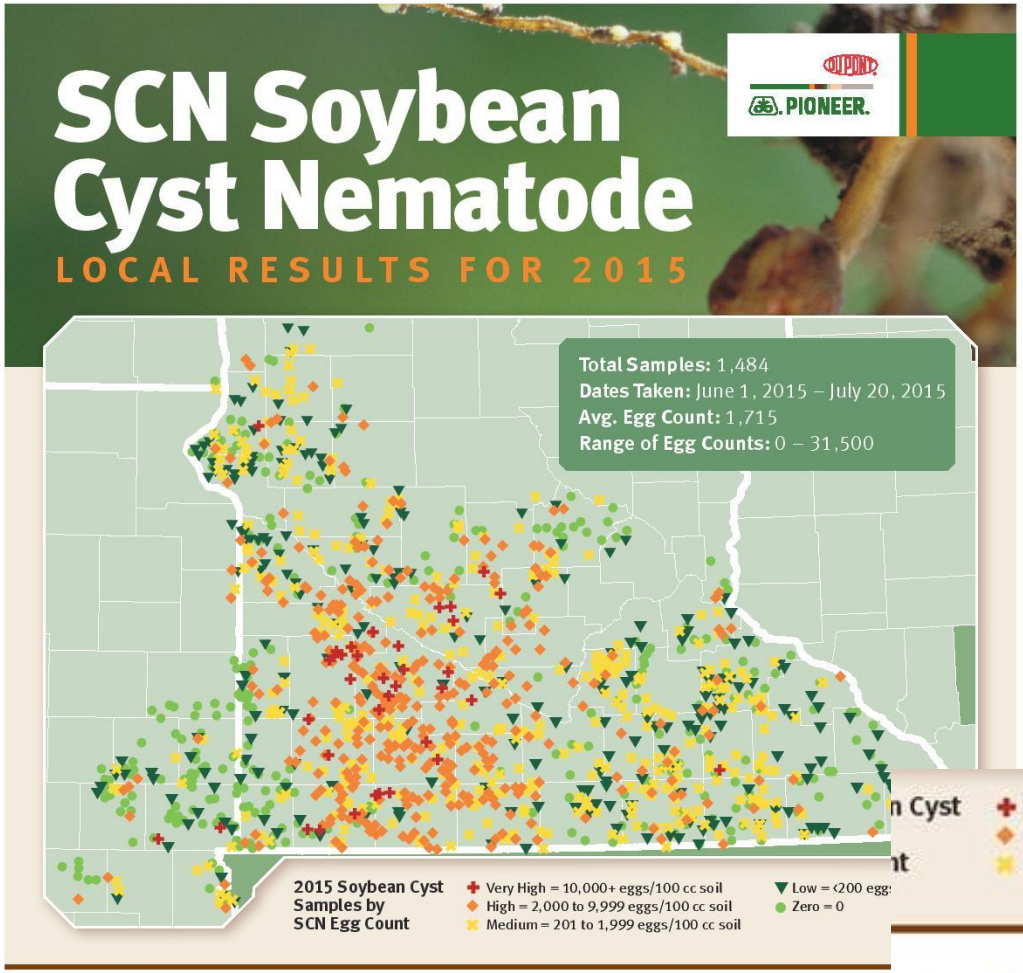
*Eggs/100 cc soil

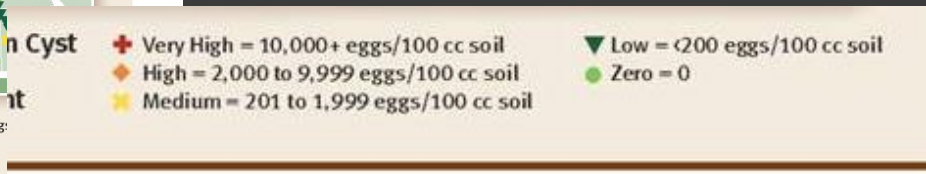
Soybean Cyst Nematode Counts: ND: 2012, 2013, 2014 & 2015								
Separated out by Zip Code regions								
				SCN egg count				
Year	State	Zip	Samples	Zero	1 - 200	201 - 2,000	2,001 - 10,000	> 10,000
2015	ND	580	364	146	52	71	65	30
		581*	923	664	142	59	34	24
		582	57	32	10	8	0	7
		583	14	9	4	1	0	0
		584	12	6	5	1	0	0
2014	ND	580	748	361	126	127	107	27
		581*	544	365	95	31	34	19
		582	33	20	3	5	5	0
		584	14	10	3	1	0	0
2013	ND	580	330	138	81	60	31	20
		581*	217	118	49	16	20	14
		582	8	5	1	2	0	0
		584	6	5	1	0	0	0
		585	2	1	1	0	0	0
2012	ND	580	527	242	100	105	55	25
		582	12	5	5	1	1	0
		584	9	6	3	0	0	0
		585	10	7	3	0	0	0



***Eggs/100 cc soil**
***Zip Code 581 may represent SCN samples throughout ND in the ND SCN Survey Project.**

Why Talk About SCN





SCN Management Practices include:

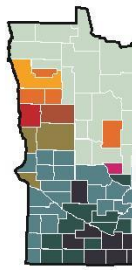
1. Plant varieties with SCN resistance sources including Peking or PI88788
2. Crop rotation with non-host crops (corn, wheat, alfalfa)
3. Seed treatments when planting soybeans

Minnesota counties infested with soybean cyst nematode by 2013.

When Discovered

- 1978 to 1980
- 1981 to 1990
- 1991 to 2000
- 2004
- 2005
- 2006
- 2007
- 2009 to 2010
- 2013

Source: University of Minnesota Extension



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- 2005
- 2006
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- 2009 to 2010
- 2013

Source: University of Minnesota Extension

SCN Biology

SCN Projects

SCN and other Stressors

SCN management, not control

Something to panic over

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SCN Biology

1st introduced into North Carolina in 1954

Life stages consist of four developmental stages (J1-J4)

Second (J2) stage that penetrates roots

Molt 3 times before becoming adult, either male or female

Female penetrates root and infects; males only around for one reason

SCN egg fate:

- ❑Hatch next year
- ❑Stay dormant until stimulus from susceptible root.
- ❑Stay dormant for extended period of time

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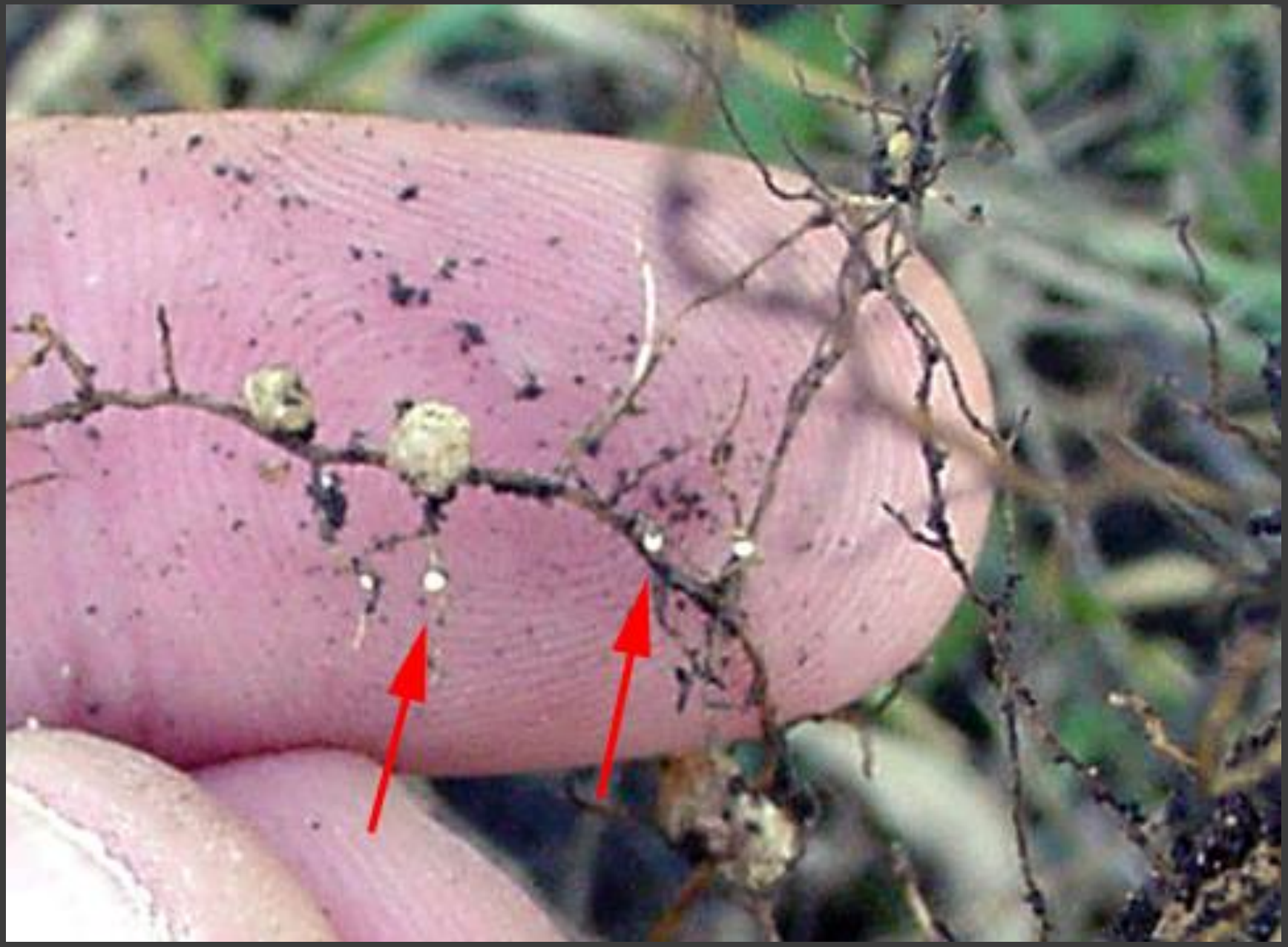
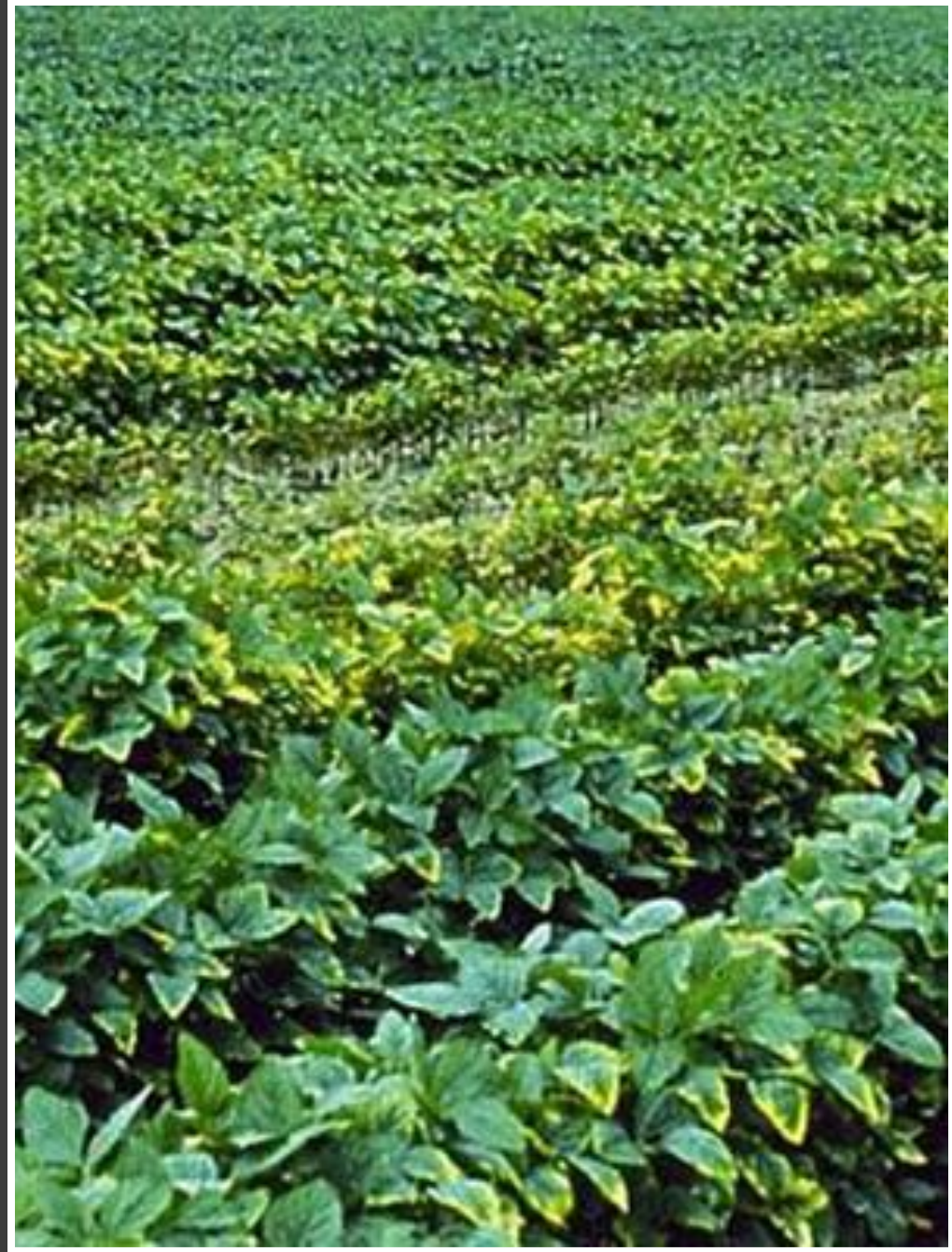


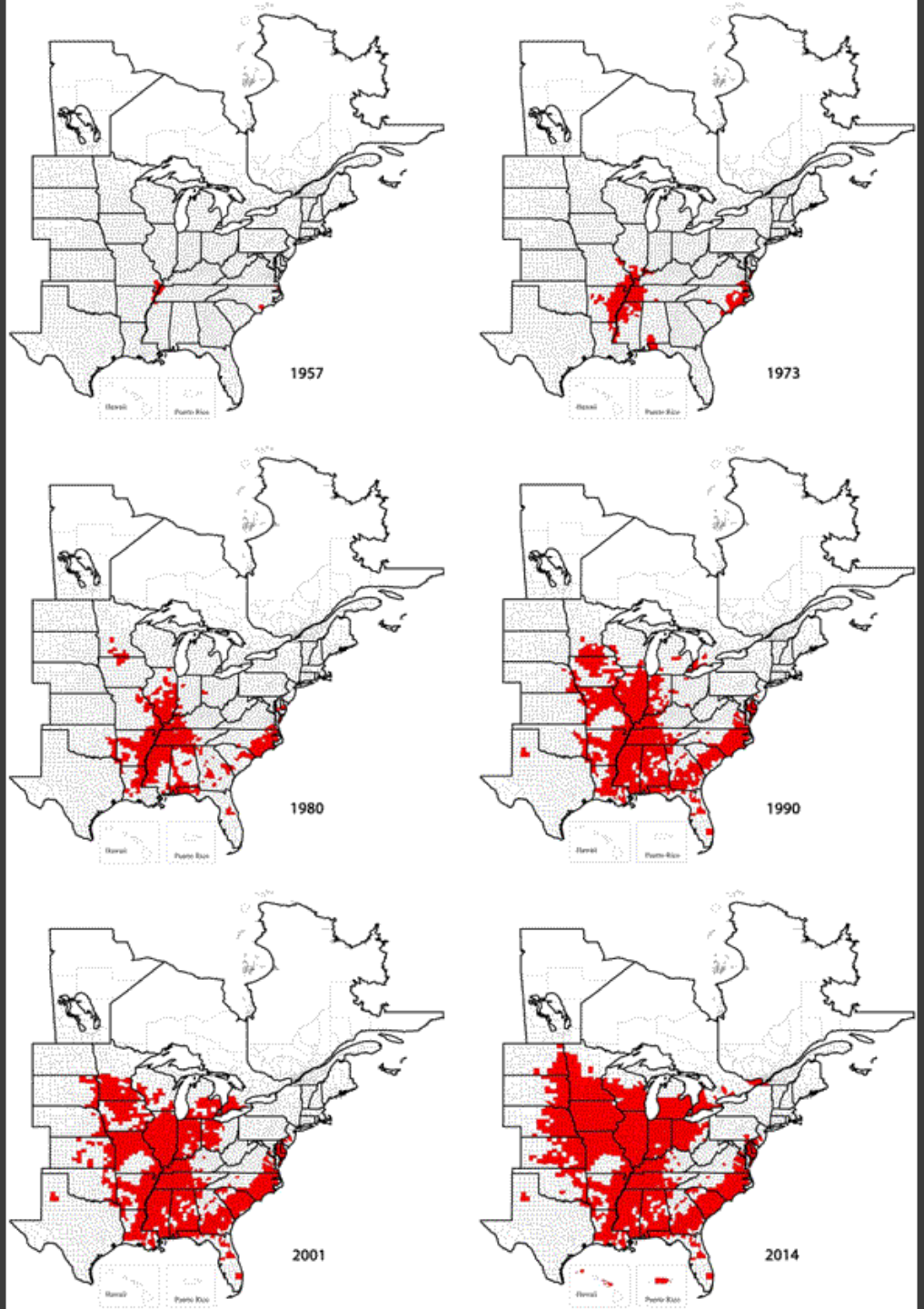


SCN Biology

Known to survive better in lighter ground

Associations with IDC, SDS, BSR, others

3-4 generations per year



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Some sampling projects

The what:

- 2011 SB, 2012 Corn, 2013 Corn, 2014 SB, 2015 Corn, 2016 part alfalfa\part wheat
- field with know SCN infestation sampled in 2011 as composite, then in thirds in 2011
- 40 acres broke into four sample locations in 2012
- Each sample point geo-referenced

The why:

- High SCN count in 2011
- Needed a better indication of spatial distribution in field.
- Wanted to see what rotation would do to counts

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Some sampling projects

2011 composite – 20600
2011 multiple - 19150,
12000,
11950

2012 – geo samples – 4750,
1400,
4000,
2100

2013 Geo samples – 4450,
4500,
11550,
4400

2014 Grid sample

2015 Geo sample – 1950
2050
4200
2500

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Aerial Map

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Maps Provided By:
surety CUSTOMIZED ONLINE MAPPING
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26-116N-40W
Yellow Medicine County
Minnesota

map center: 44° 49' 35.83, 95° 38' 6.15
scale: 9880
N W E S
8/30/2015

Field borders provided by Farm Service Agency as of 5/21/2008.

Some sampling projects

2011 composite – 20600
2011 multiple - 19150,
12000,
11950

2012 – geo samples – 4750,
1400,
4000,
2100

2013 Geo samples – 4450,
4500,
11550,
4400

2014 Grid sample

2015 Geo sample – 1950
2050
4200
2500

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This is not unexpected: one year rotation from SB can reduce SCN numbers and without a host to induce hatching, numbers stay consistent, but…..

How Many SCN per acre?

6 acre inch = 616,744,998 cm^3/100 = 6,167,450 100cc units

6,167,450 * 20,000 = 123,348,999,600

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Some sampling projects

The what:

- Two field with known SCN infestation
- One at a lower level, one at high level
- Grid sample and overlay yield data

The why:

- Wanted to create a talking point to get growers to look at SCN.
- The expectation is that lower yield areas will have higher SCN

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Some sampling projects

Known lower level SCN

Lighter soil

History of SB production issues

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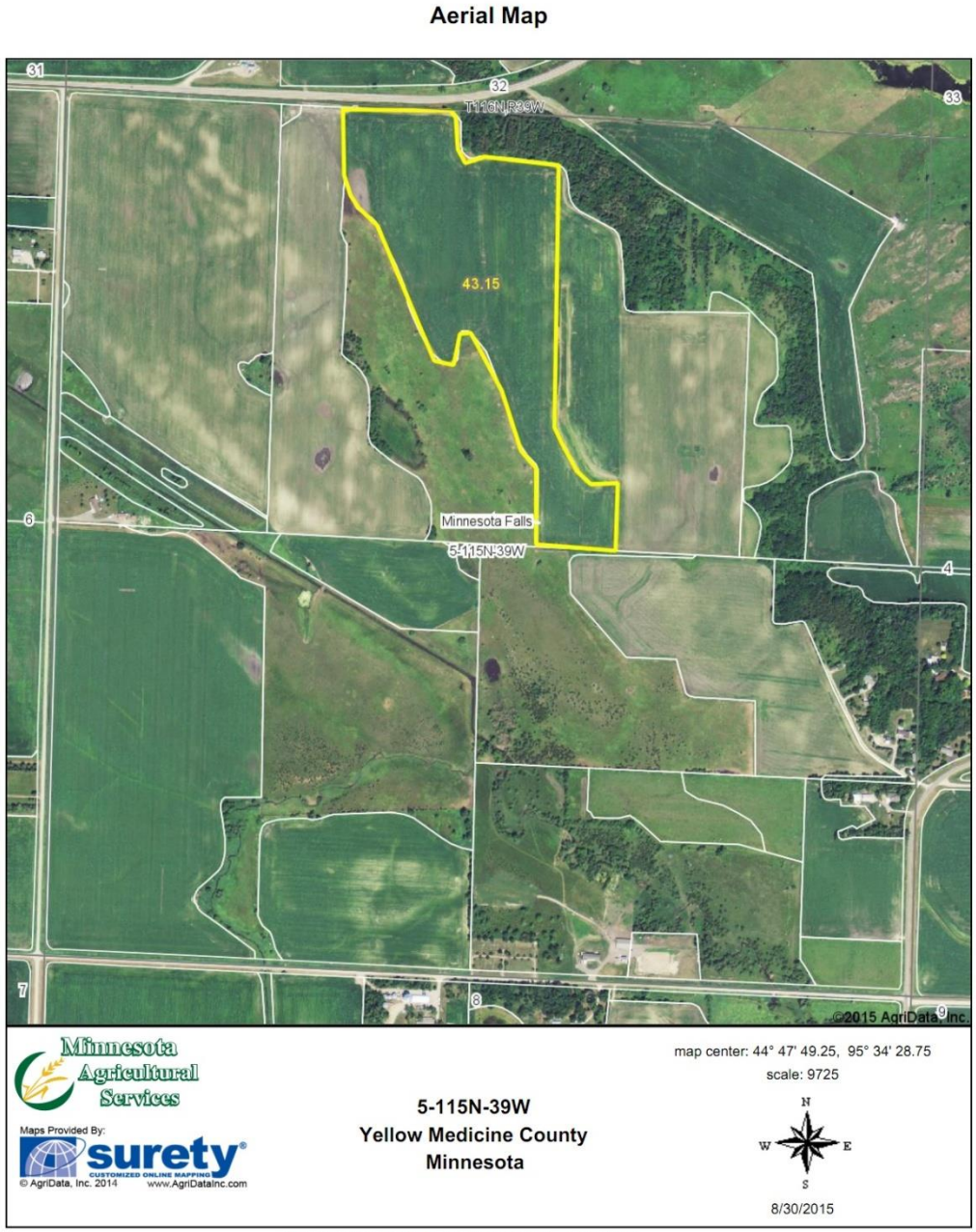
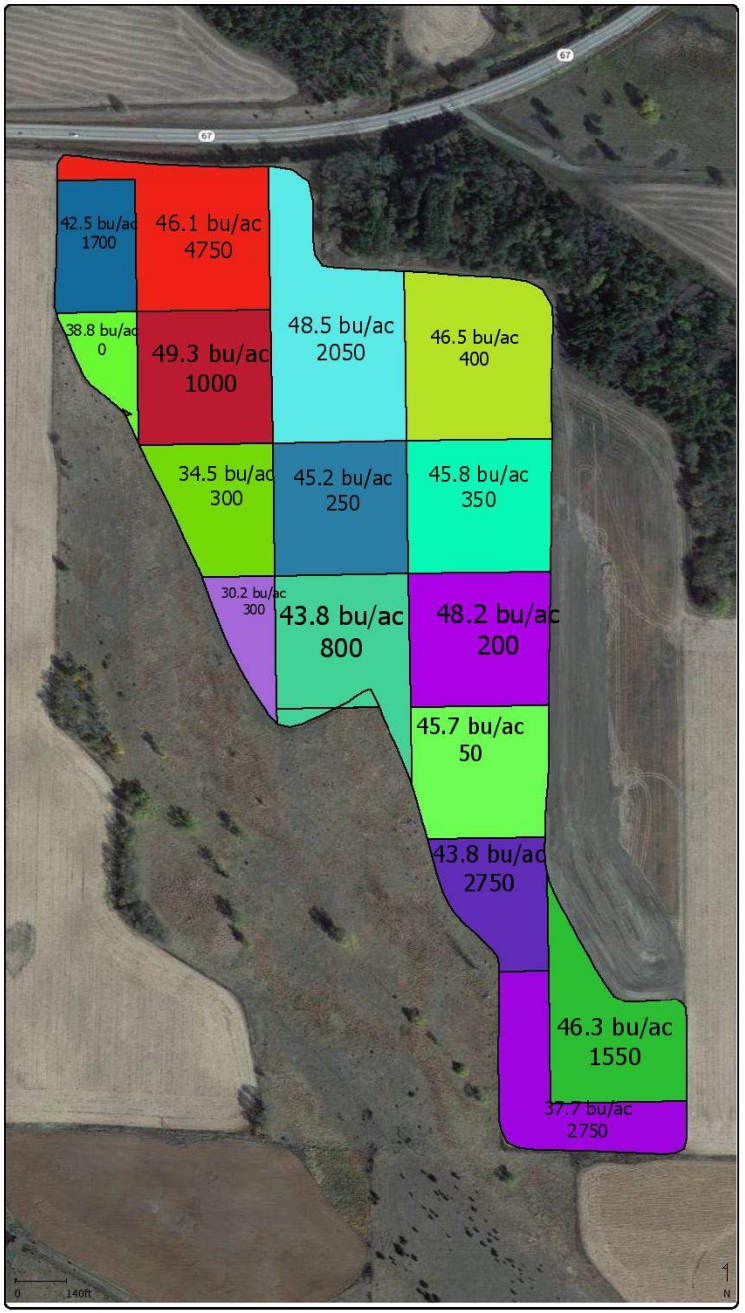


Some sampling projects

Grid data sorted by high SCN to low SCN



Bu/Ac	SCN
46.1	4750
43.8	2750
37.7	2750
48.5	2050
42.5	1700
46.3	1550
49.3	1000
43.8	800
46.5	400
45.8	350
34.5	300
30.2	300
45.2	250
48.2	200
45.7	50
38.8	0

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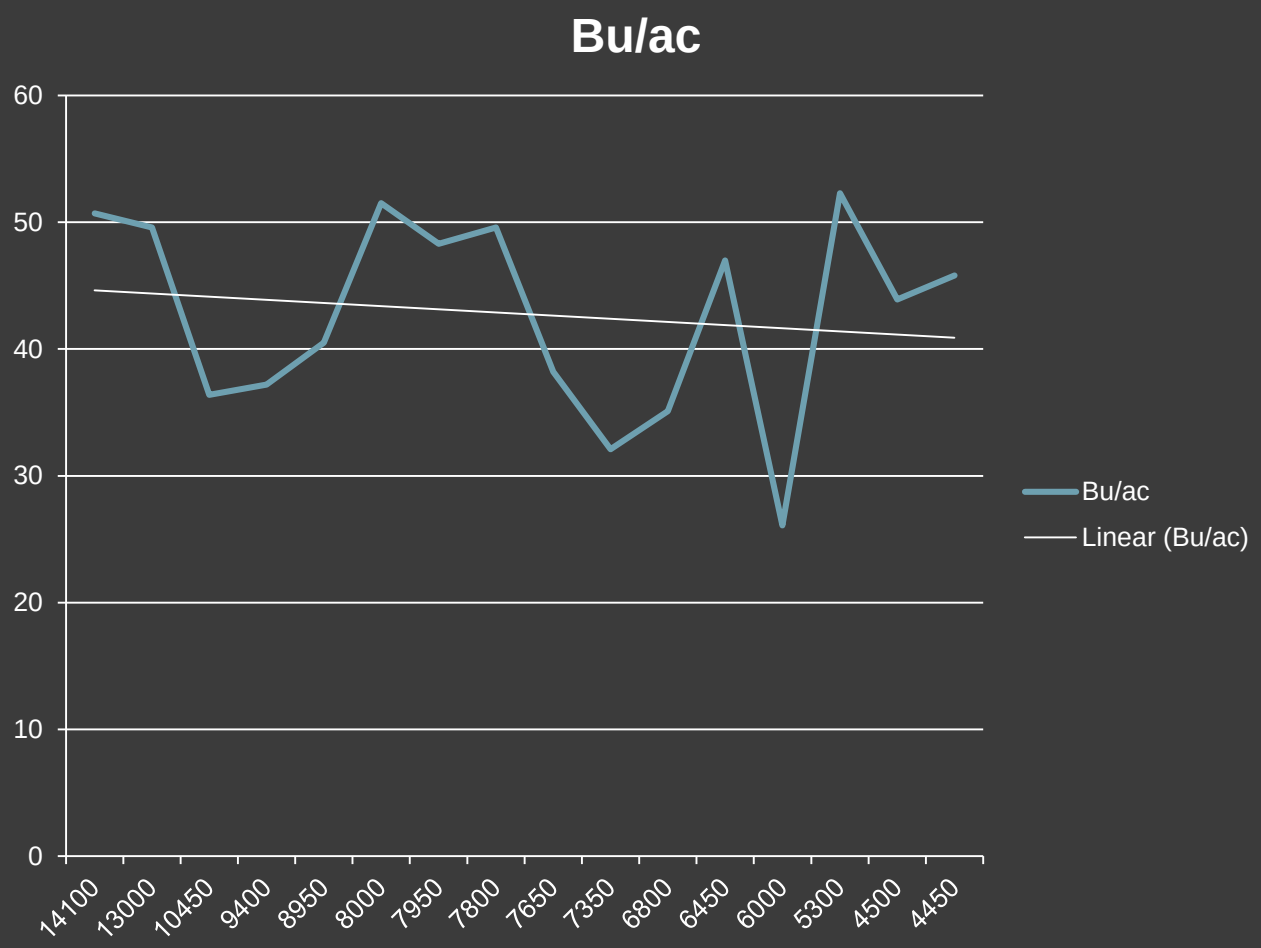
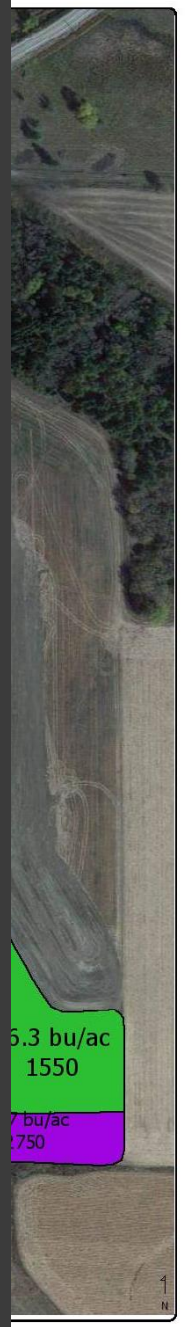
Some sampling projects





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45.8	350
34.5	300
30.2	300
45.2	250
48.2	200
45.7	50
38.8	0

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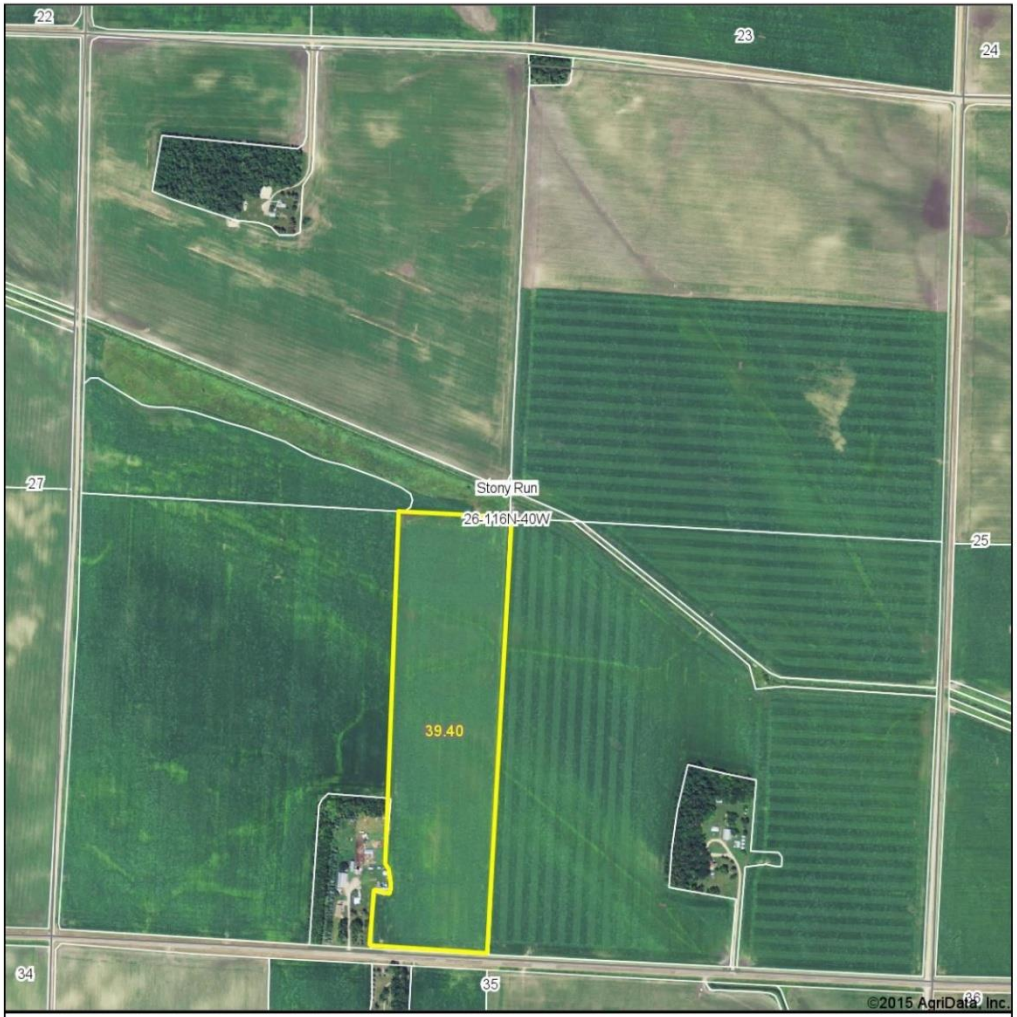
Some sampling projects

Known High level SCN

heavier soil

History of SB production issues



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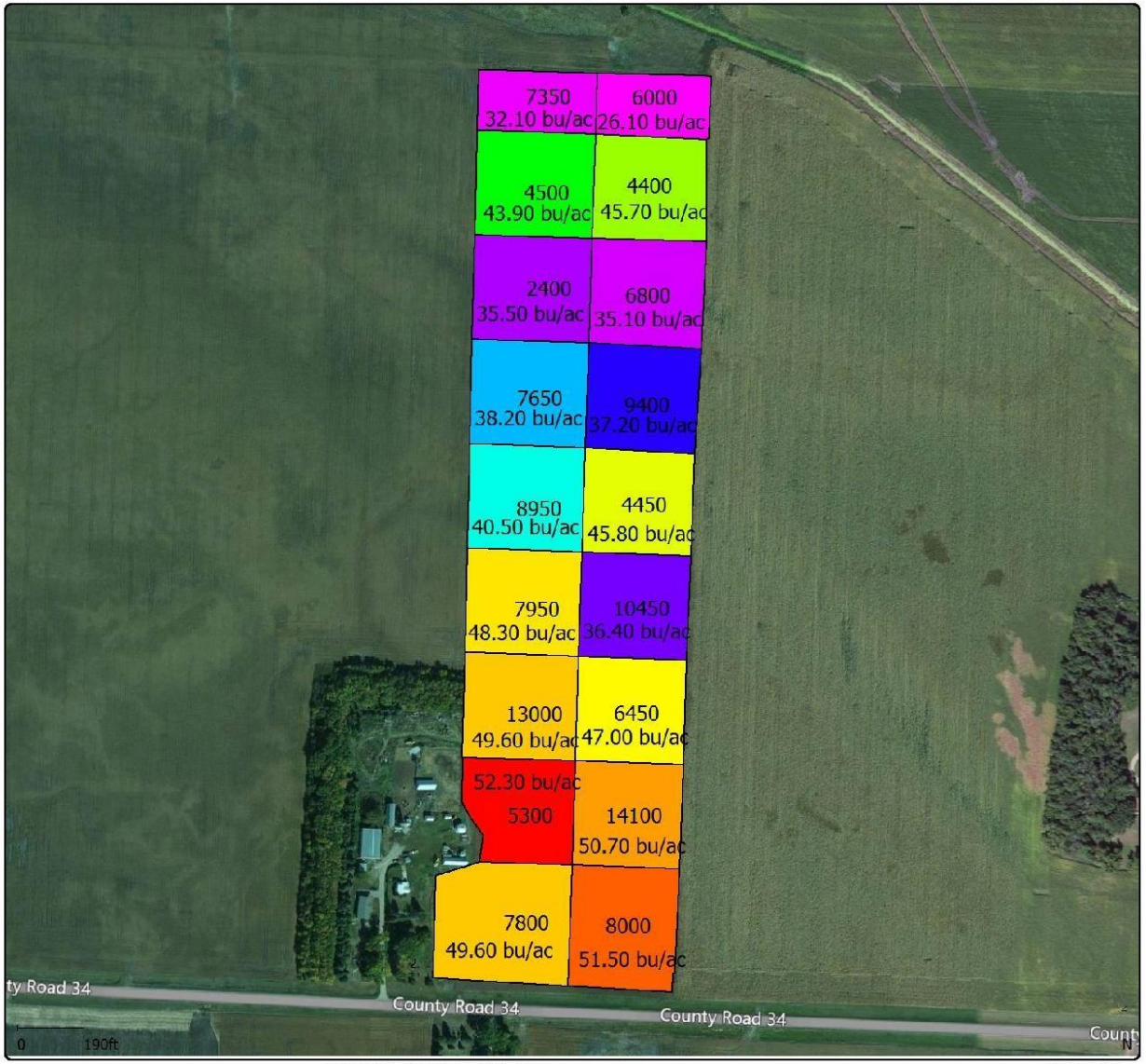
Some sampling projects

Grid data sorted by high SCN to low SCN

SCN largest to smallest

Bu/ac	SCN
50.7	14100
49.6	13000
36.4	10450
37.2	9400
40.5	8950
51.5	8000
48.3	7950
49.6	7800
38.2	7650
32.1	7350
35.1	6800
47	6450
26.1	6000
52.3	5300
43.9	4500
45.8	4450
45.7	4400
35.5	2400



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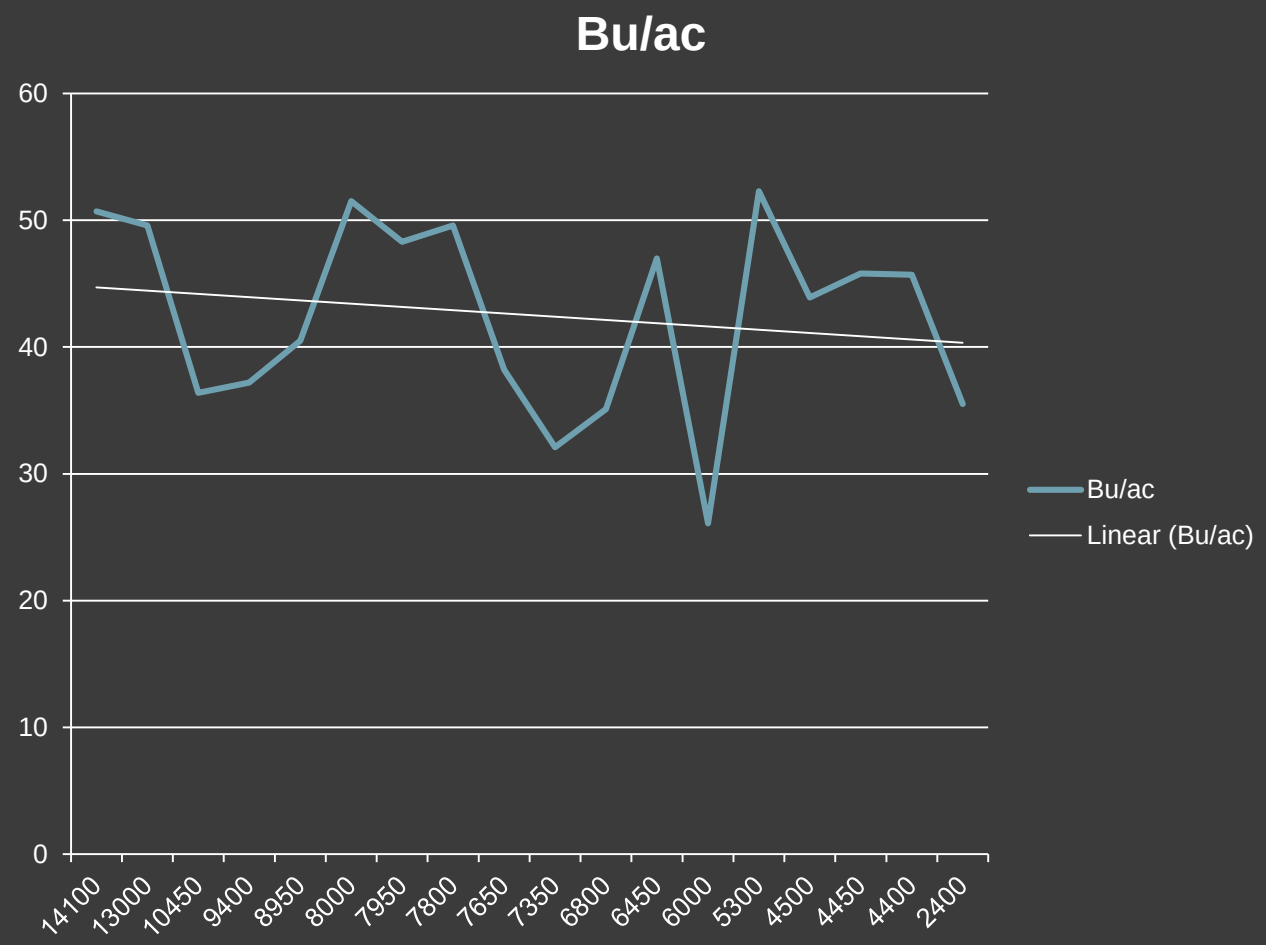
Some sampling projects



SCN largest to smallest

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43.9	4500
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35.5	2400

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Some sampling projects

Higher SCN = higher yield??

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Some sampling projects

Higher SCN = higher yield??

Why?

- High producing =higher SCN
- Able to survive SCN environment

My talking point has changed:

What would yields have been if SCN not an influence?

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Some sampling projects

The what:

- Sample wind blown soil in ditches to see if SCN eggs can be found

The why:

- Wanted to create a talking point to get growers to look at SCN.
- Expectation was that SCN in ditches hard to find

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Some sampling projects

Found 3 areas where wind blown soil is deposited in ditches

Collected soil from each location to comprise one sample

Locations were in ditches that I pass by on regular basis

Adjacent fields had no known SCN sample previously taken.

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Some sampling projects

SCN from composite sample of three sites:

- Taken 2-20-15
- 1550 eggs/100cc

Why the higher numbers

SCN from each sample site:

- Taken 3-20-15
- Site 1 = 4750
- Site 2 = 7850
- Site 3 = 8900

A fairly conclusive indication of one method of dispersal

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Some sampling projects

Next project:

- Grid sample high IDC area, test for SCN, pH, salts, carbonates
- Use soil data to determine Fe product rate, measure yield and look at SCN

Sample ID	pH	CCE% D1	Salt1	P-O ppm	SCN
1	8	6	0.28	5	19950
2	7.9	3.6	0.47	21	10900
3	8	7.8	0.37	6	16650
4	7.9	3.8	0.41	2	11400
5	8	6.2	0.39	4	16950
6	7.9	5.7	0.34	5	4100
7	8.1	13.4	0.35	4	5500
8	7.8	2.6	0.41	16	6200
9	8	8.9	0.42	7	12550
10	8	4.9	0.29	3	2500
11	7.9	3	0.4	11	1450
12	7.9	5.3	0.4	11	4750

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Does SCN interact with other diseases?

SCN penetrates and creates openings for other disease pathogens to enter the plant – especially soil borne such as *Phythim, Rhizoctonia, Phytophtora, Fusarium and Macrophomina* (charcoal rot)

SCN and SDS (*Fusarium*)

- It has been shown that SCN can hasten the development of SDS

SCN has shown to cause BSR of soybeans that are otherwise resistant to brown stem rot.

White Mold?

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Does SCN interact with other diseases?

SCN and IDC

- So far little is shown to correlate IDC and SCN infestations.
- Probably due to the dynamic nature of both.
- This relates back to having a good producing area for good SCN reproduction
- Does not mean some associations exist, just hard to find

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Does SCN interact with other diseases?

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SCN Management

Crop rotation

- Yr 1 – SCN resistant: PI88788
- Yr 2 – non host
- Yr 3 – SCN resistant different than Yr 1
- Yr 4 –Non host
- Yr 5 – SCN resistant different than yr 1 or 2, or susceptible
- Yr 6 – Non host

Peking resistance is good but will be short lived

Create the best possible growing conditions (best in my opinion)

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SCN Management

Cover crops and weeds:

- Some cover crops are known hosts
  - Many of the legumes
- Many weeds are known hosts
  - Purple deadnettle
  - Henbit
  - Field pennycress
  - Sheppard's purse
  - Small flowered bittercress
  - Common chickweek

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The rest of the story

Other SCN talking points:

- HG types
- FI index
- SCN Control Products

HG Types

Number	Indicator	Result
1	Peking	+
2	PI 88788	+
3	PI 90763	-
4	PI 437654	-
5	PI 209332	+
6	PI 89772	-
7	PI 548316	-

HG Type 1.2.5

Table 2: Percentage of SCN populations from Minnesota with Female Index more than 10 on the indicator soybean Lines

Soybean Line	1997-1998	2002	2007-2008
Peking	3.4	1.1	15.3
PI 88788	13.6	17	72.4
PI 90763	3.4	0	8.2
PI 437654	2.1	0	0
PI 209332	3.7	14.9	77.6
PI 89772		0	8.2
PI 548316		33.3	94.9

From Soybean Cyst Nematode Management Guide (UofM)

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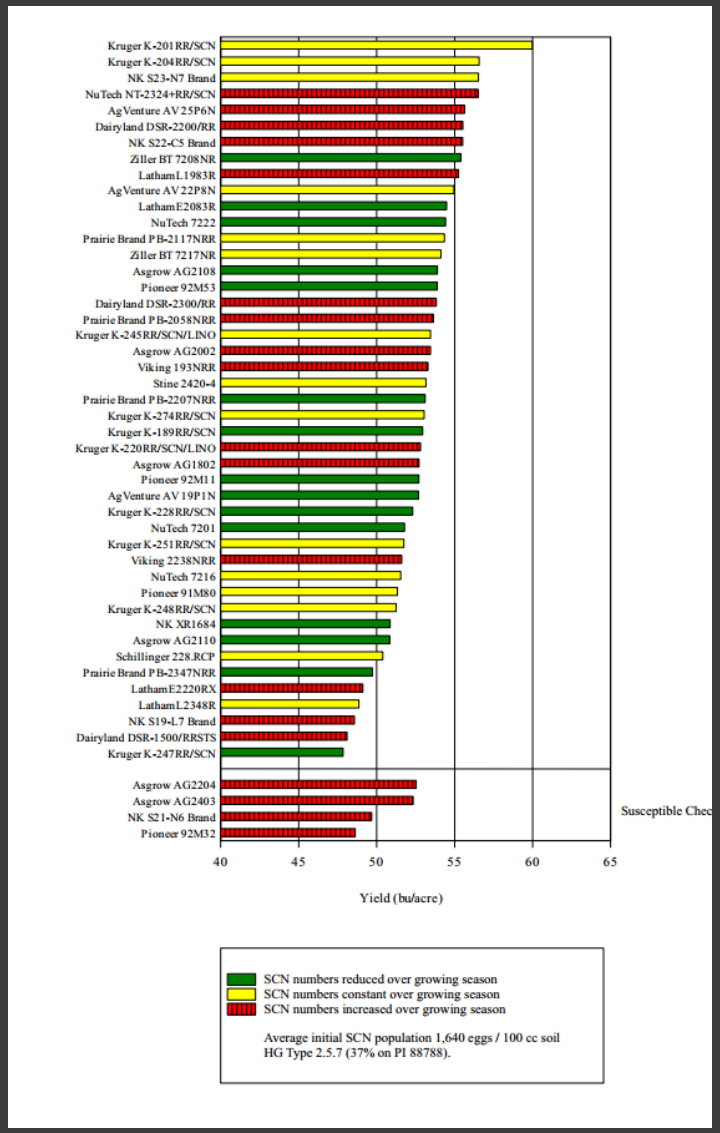
The rest of the story

Other SCN talking points:

- HG types
- FI index
- SCN Control Products

SCN Female Index

- Determined in lab assay
- Number of cysts on resistant/number of cysts on susceptible/100
- Lee 74
- FI < 10 considered resistant.



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The rest of the story

Other SCN talking points:

- HG types
- FI index

SCN Control Products

Soil Health

What should you do?

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Do you need to panic about SCN?


No!!! Not Soybean Rust.
Goss' Wilt
Soybean Cyst Nematode

Thank You

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