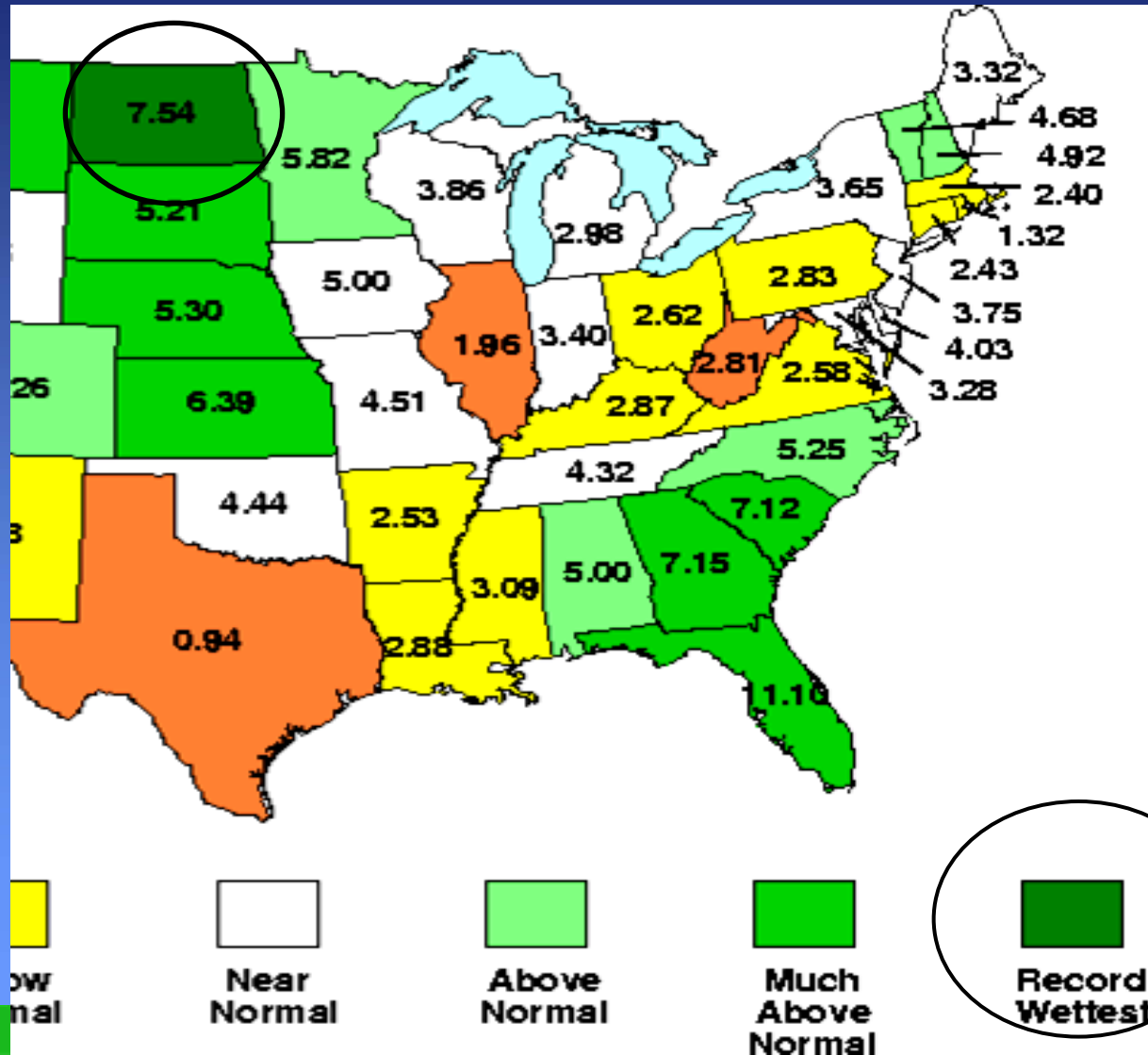


# Small Grain Diseases in ND 2005 Management for 2006

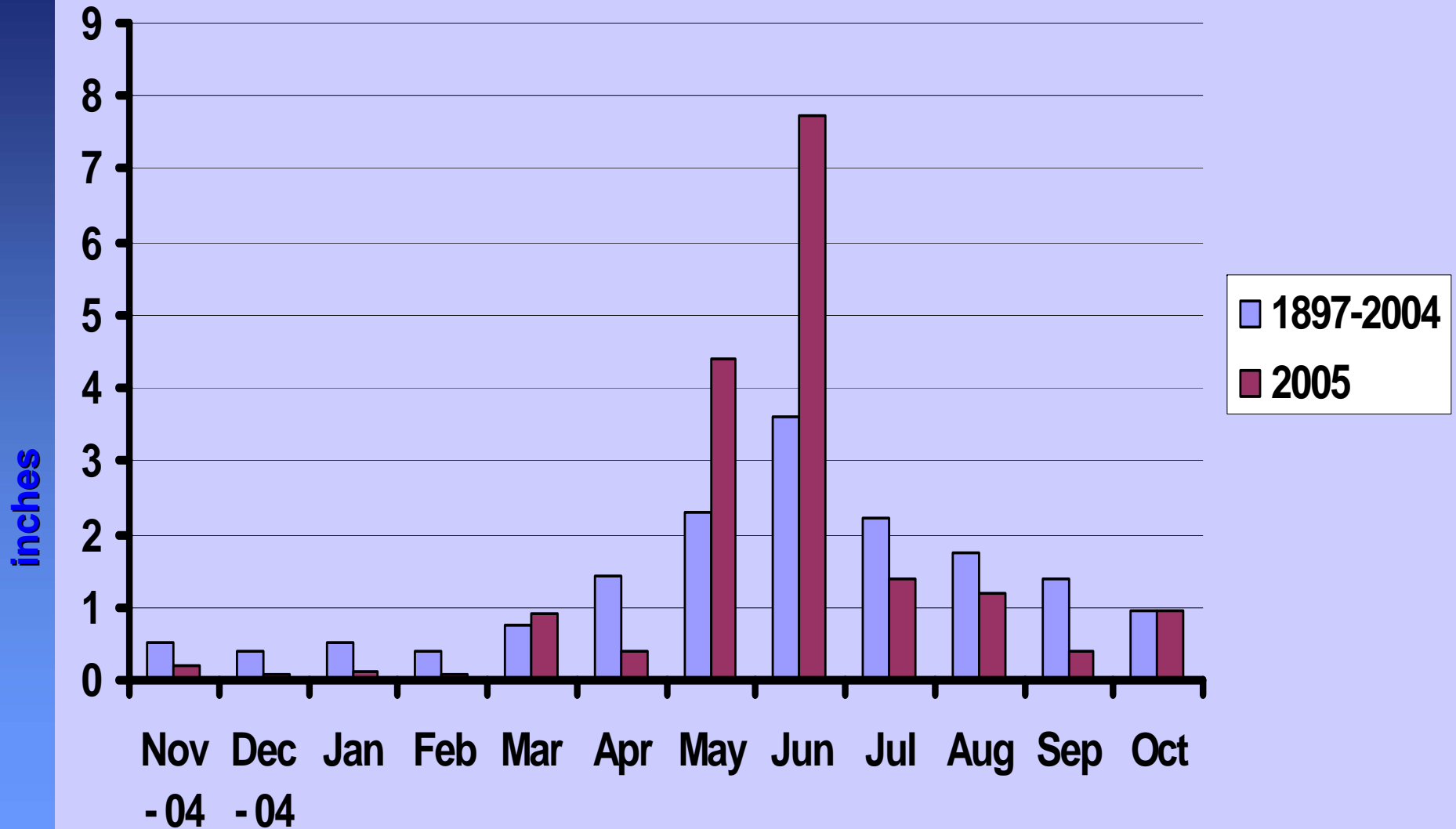


Marcia McMullen  
NDSU Extension Service and Dept. of Plant Pathology

# National Weather Service Precipitation Map June 2005



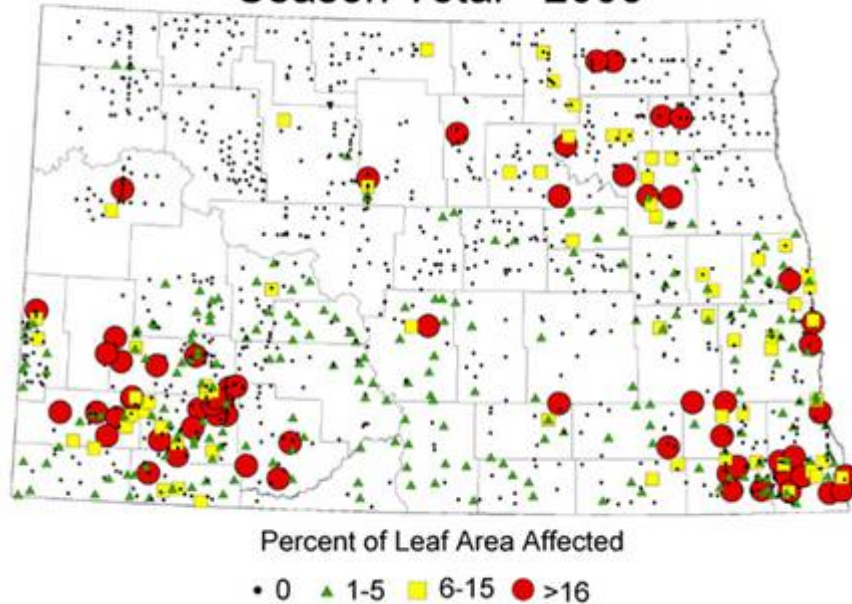
# Precipitation at Dickinson



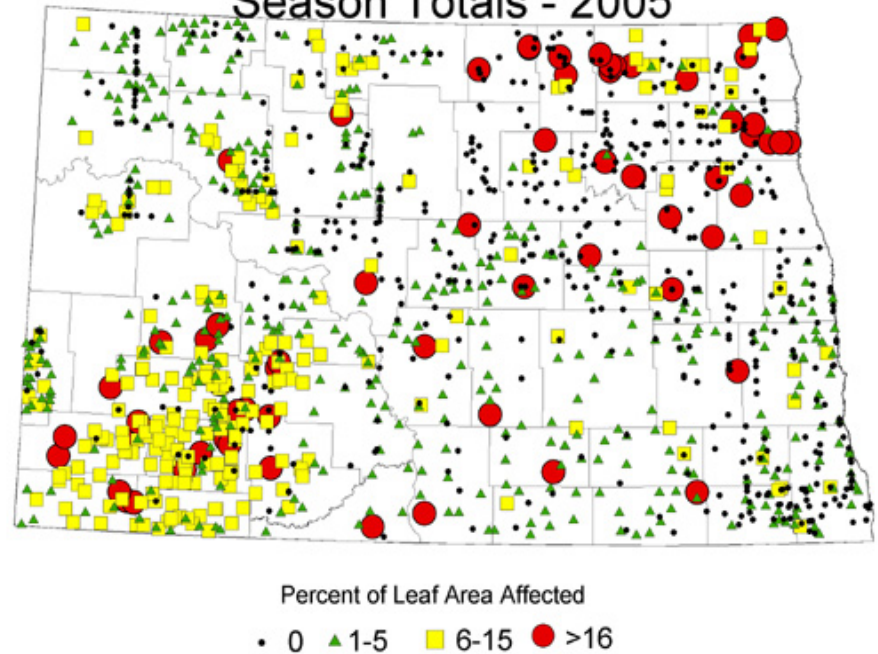
(summarized by R. Ashley)

# This Wet Weather Favored Diseases

Wheat Leaf Rust Severity  
Season Total - 2005



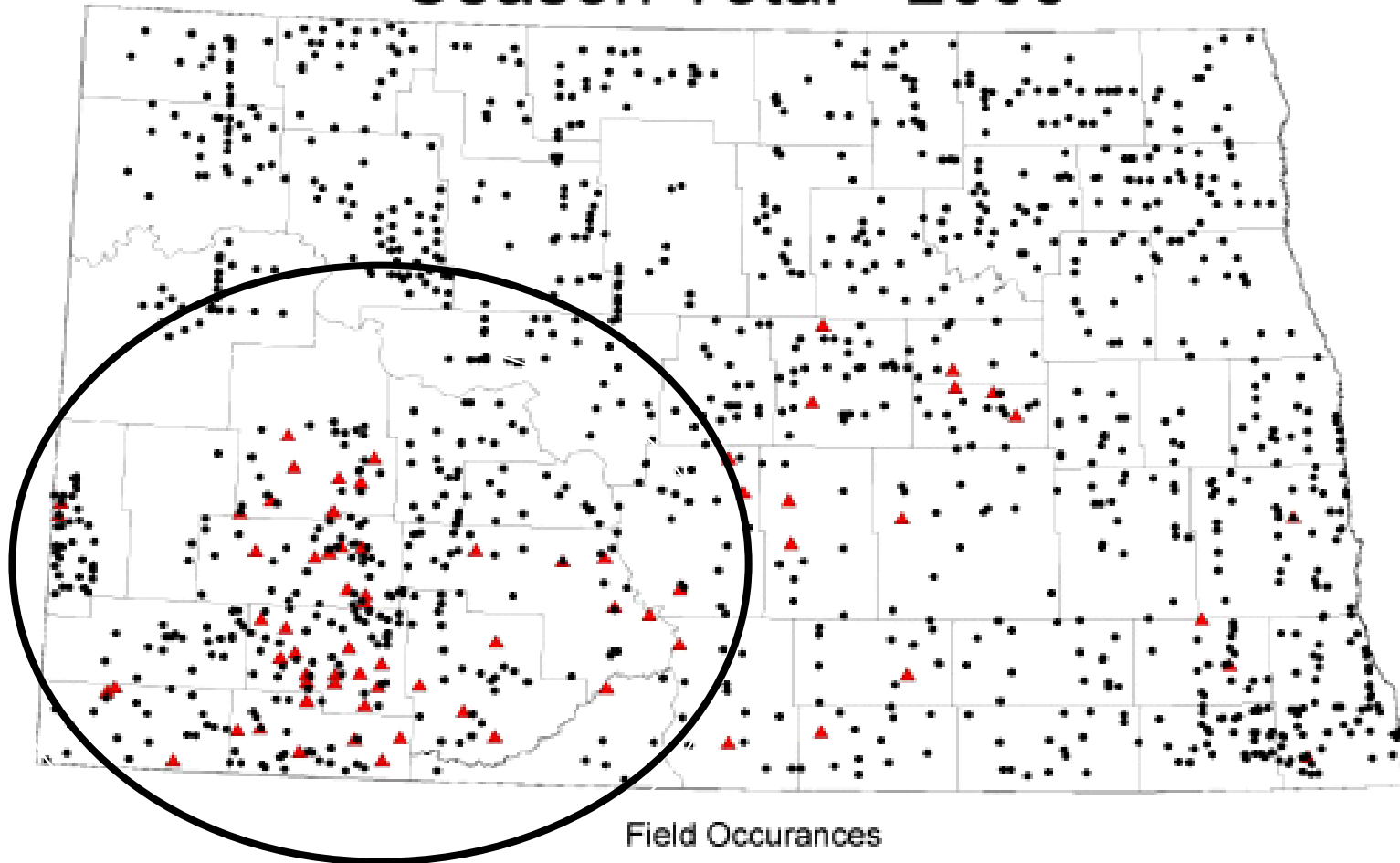
Tan Spot Severity  
Season Totals - 2005



~ 1300 wheat fields surveyed

Source: NDSU IPM Wheat Survey

# Wheat Stripe Rust Occurrence Season Total - 2005

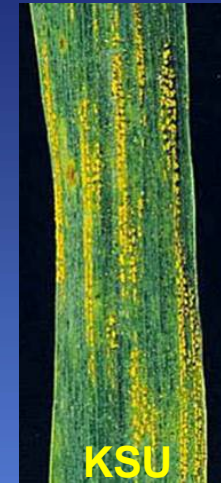
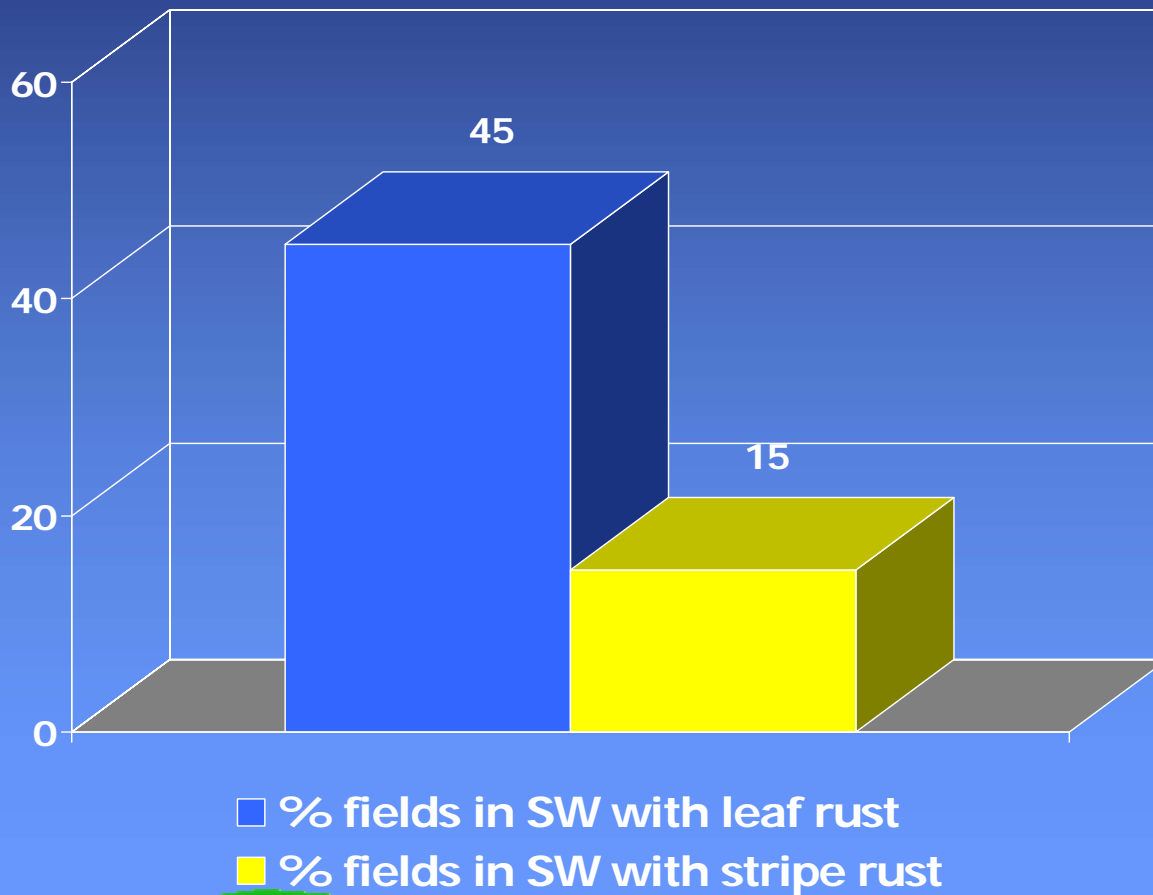


• No field occurrences

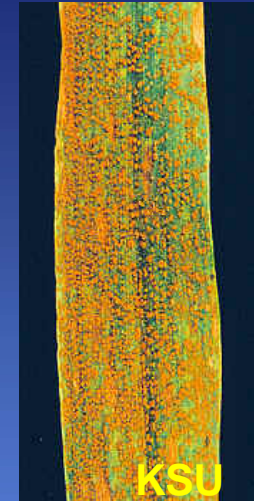
▲ Field contains an occurrence

# 2005 Wheat Leaf and Stripe Rust

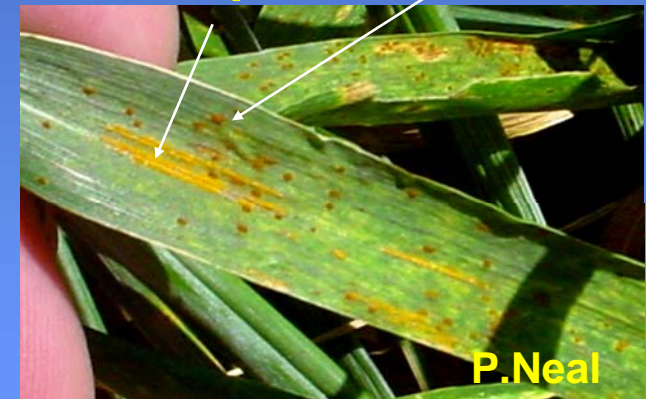
(survey summary)



Stripe



Leaf



P.Neal

# FHB (scab) Losses: Estimated Wheat Bushels Lost due scab

Based on Wheat Survey

Crop Report.Dist.	Avg. FHB Severity	*Est. bushel Loss (millions)
NE	5.6	3.6
NC	5	1.3
NW	2.6	1.2
EC	13.6	4.9
SE	10.9	3.3
C	1.7	0.5
SC	0.8	0.16
WC	3	0.8
SW	0.6	0.2
	<b>Totals</b>	<b>16 (1.2)</b>



•Bushels loss calculated on acres planted and estimated yield potential

# Disease management directed at crop and pathogen (can't control environment)

## – Improve Crop:

- Disease Resistance

## – Reduce Pathogen:

- Reduce infected stubble
- Rotations with non-hosts
- Fungicides



# Tan Spot/Septoria Leaf Spot Rxs Hard Red Spring Wheat

<u>Susceptible</u>	<u>Intermediate</u>	<u>More Tolerant</u>
Alsen	Dandy	Amidon
Mercury	SteeleND	Keene
Russ	Trenton	Ingot
Reeder	Parshall	Glenn
Oxen	Hanna	Gunner
Argent		Scholar
Dapps		Ulen
Wallworth		Knudson
Granite		Oklee
Saturn		

# Tan Spot/Septoria Leaf Spot Rxs

## Durum Wheat

Susceptible

Intermediate

More Resistant

Lloyd

Alkabo

Ben

Medora

Monroe

Rugby

Pierce

Divide

Munich

Laker

Mountrail

Plenty

Primo D'Oro

Grande D'Oro

Vic

Belzer

Maier

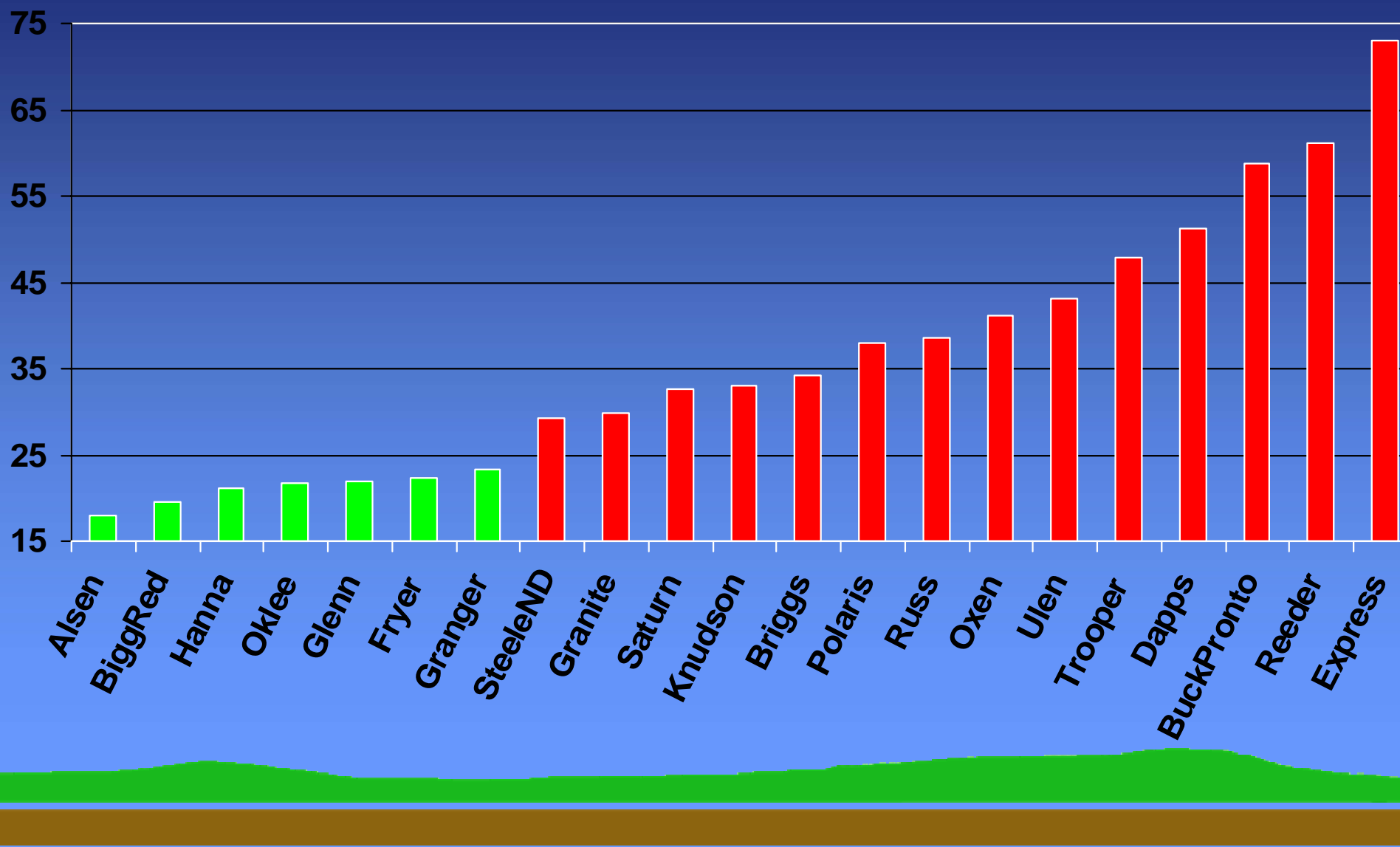
Lebsock

Grenora

Renville

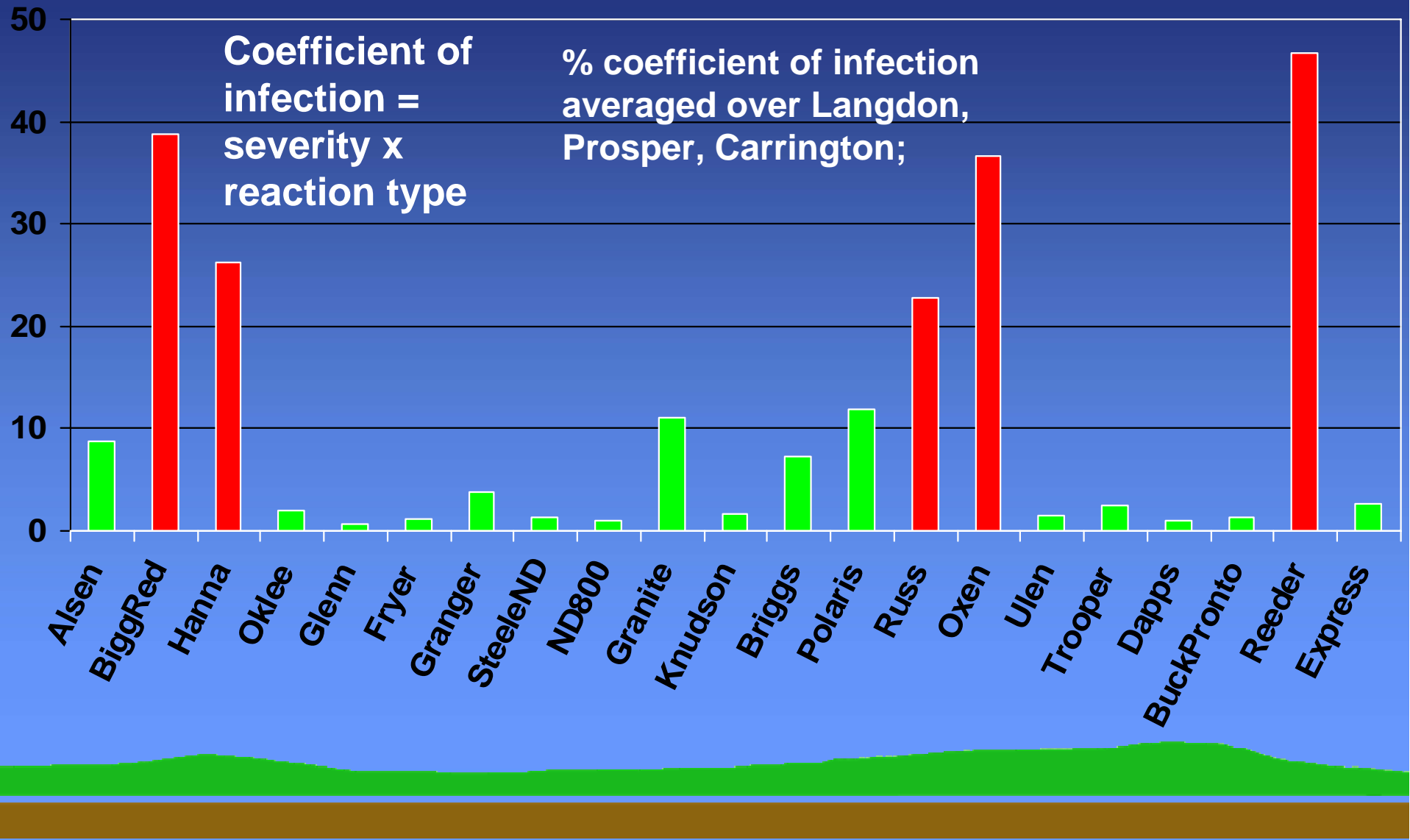
# FHB (scab) Rxs - 2005 HRSW - Prosper, ND

2005 Source: R.W.Stack, NDSU Plant Pathology Dept.



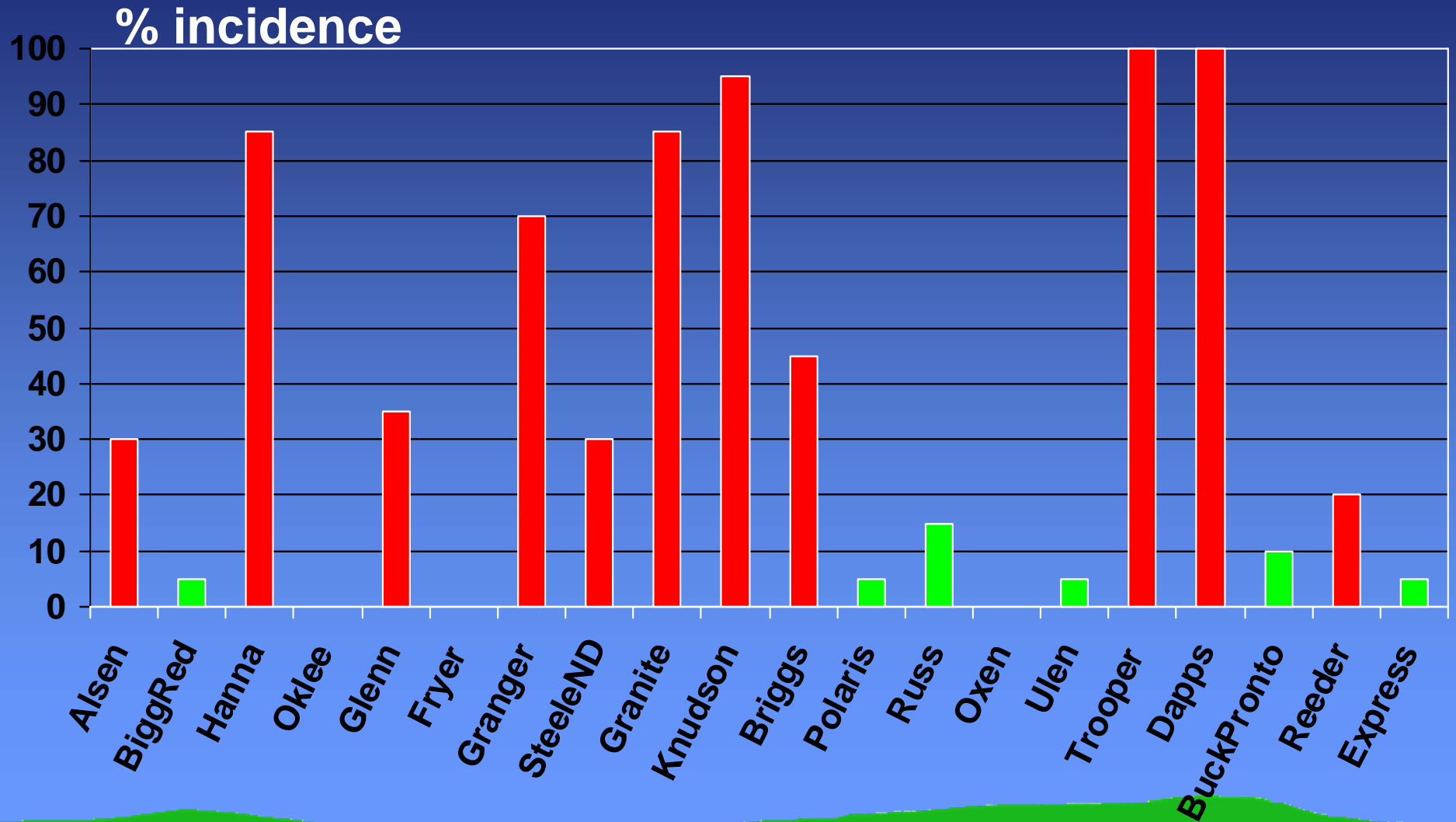
# Leaf Rust – HRSW Rxs – 2005 (3 location avg.)

Source: Dr. Jack Rasmussen, NDSU Plant Path Dept.



# Stripe Rust - HRSW Rx's

Source: Wes Messer and Josh Seekins, DREC (one location Hettinger)



# Disease management directed at host and pathogen

## – Host:

- Resistance

## – Reduce Pathogen:

- Reduce infected stubble

- Rotations with non-hosts

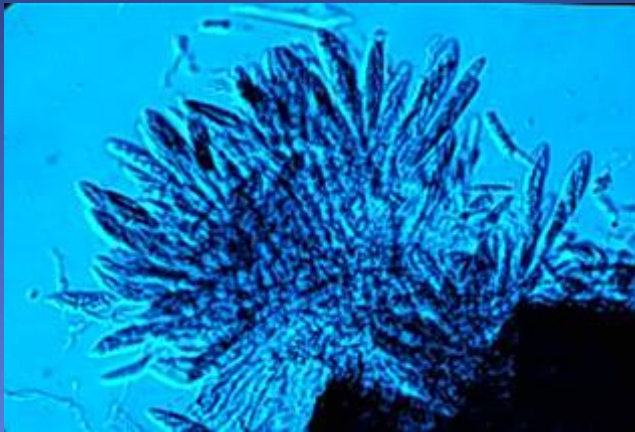
- Fungicides



# Management with Rotation



**Pathogen:** Spores of Scab fungus and tan spot and Septoria fungi develop in residue of a number of grass crops.



**Ascospores of scab fungus**



**Overwintering sites of fungi that cause tan spot and Septoria**

**Of major fungal pathogens, only Leaf rust fungus does NOT overwinter in ND**

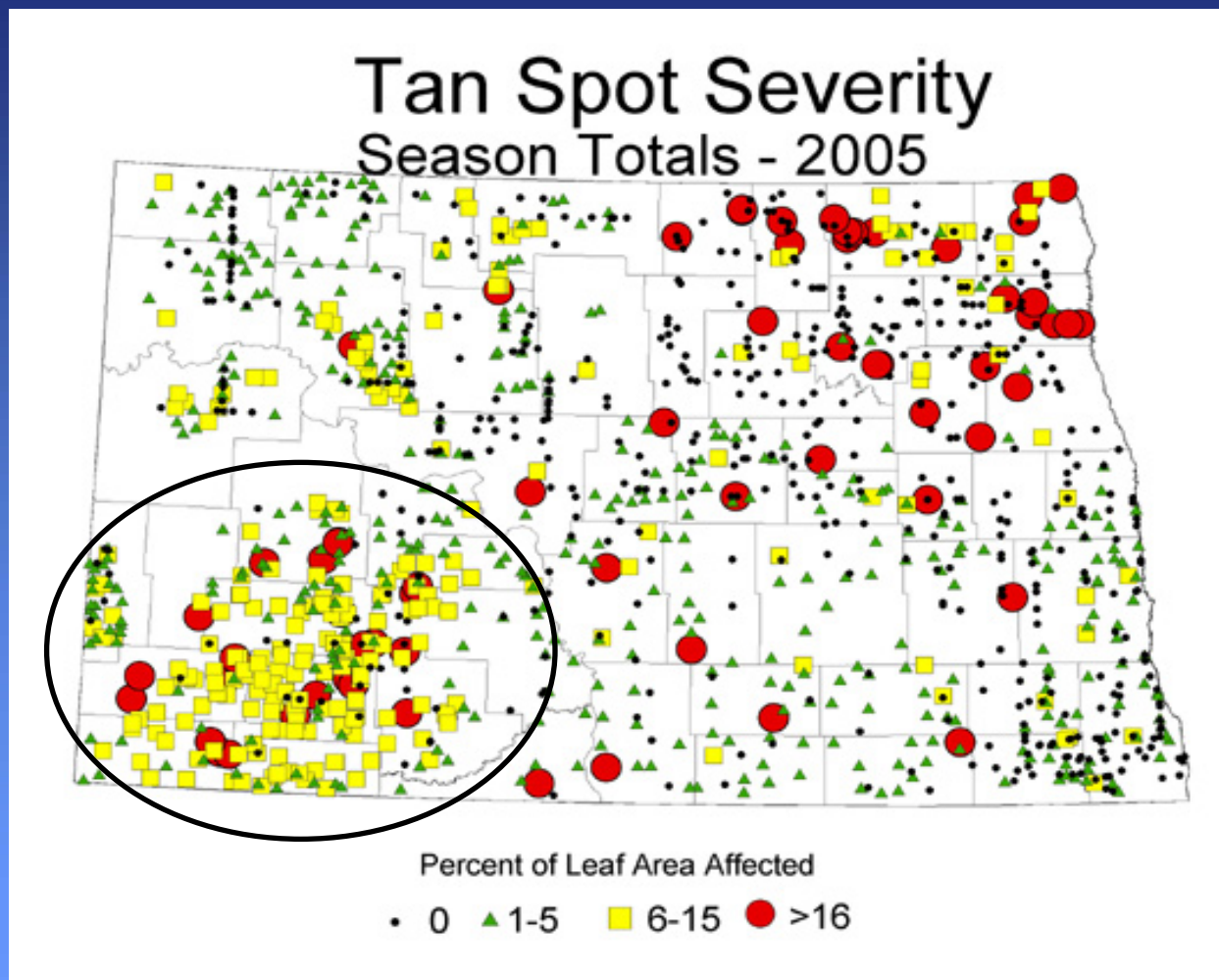


# Tan spot

- Establishes early in the growing season
- **Epidemics can occur rapidly if environmental conditions are optimum for disease development**
- If not controlled, the disease can work it's way up the plant canopy

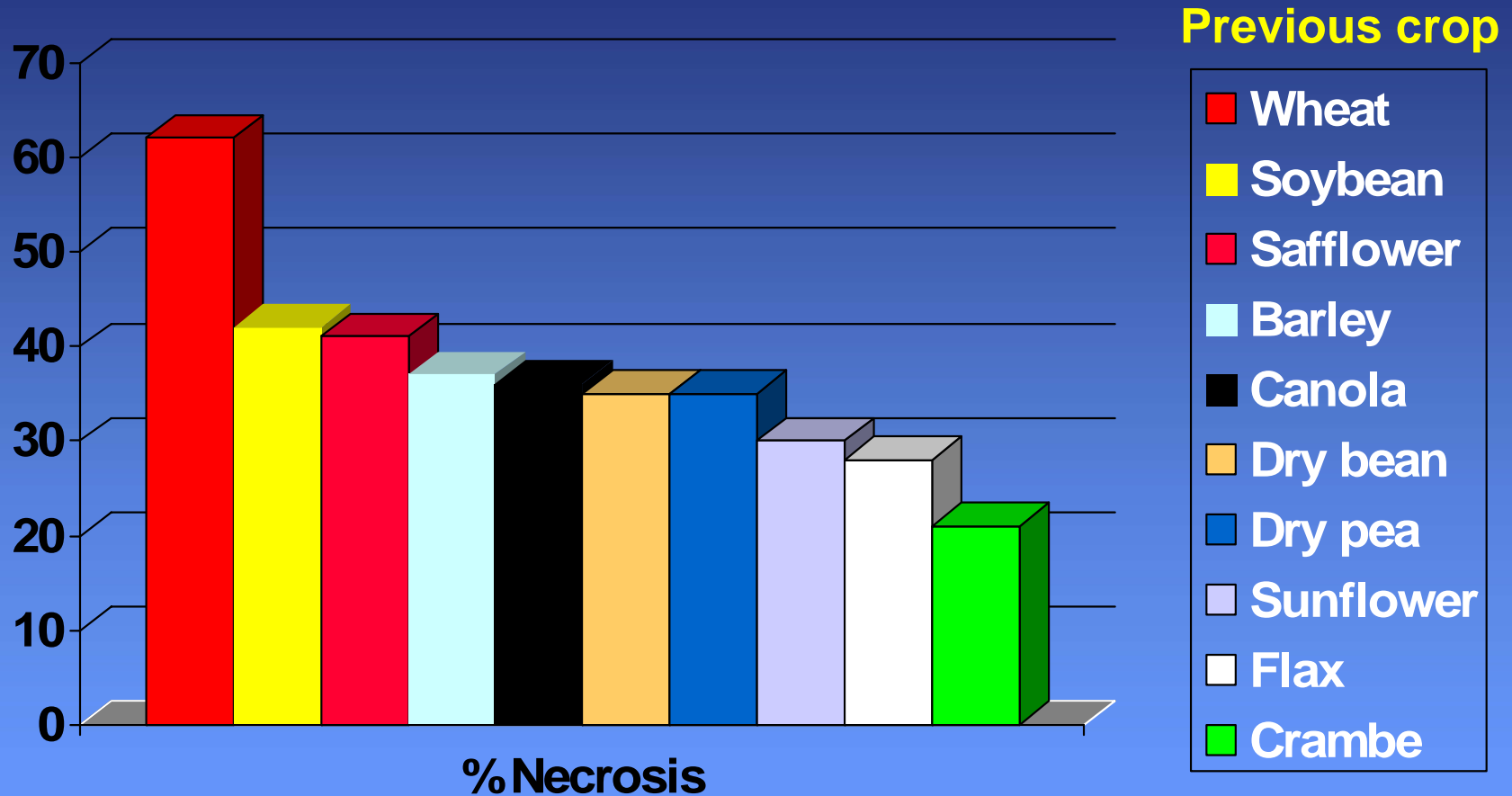


# Tan spot often more frequent in areas with shorter rotations between wheat



Source: NDSU IPM Wheat Survey

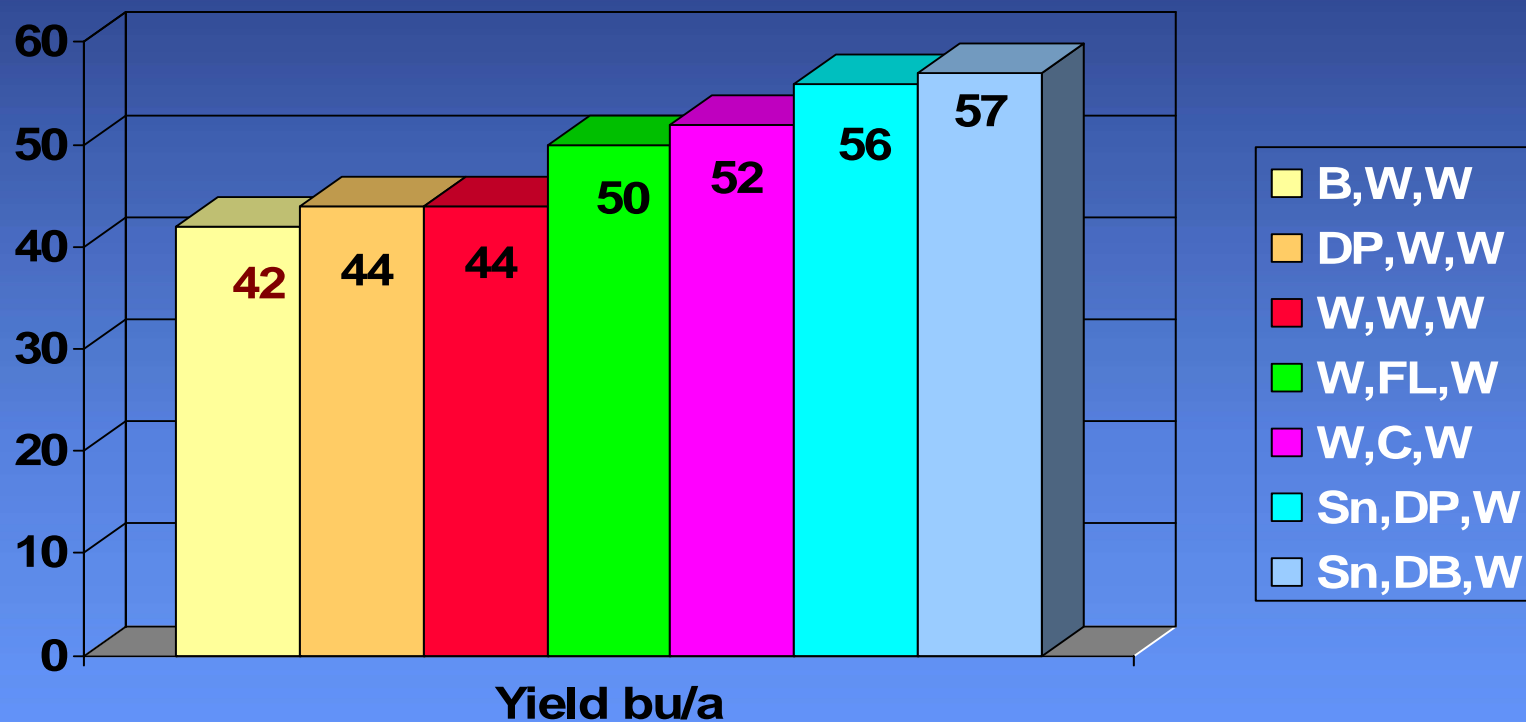
# Rotations and Wheat Leaf Spots



J. Krupinsky et al. 2002

# Spring Wheat Yield after Selected 3 Yr Crop Sequences

Krupinsky et al. 2002



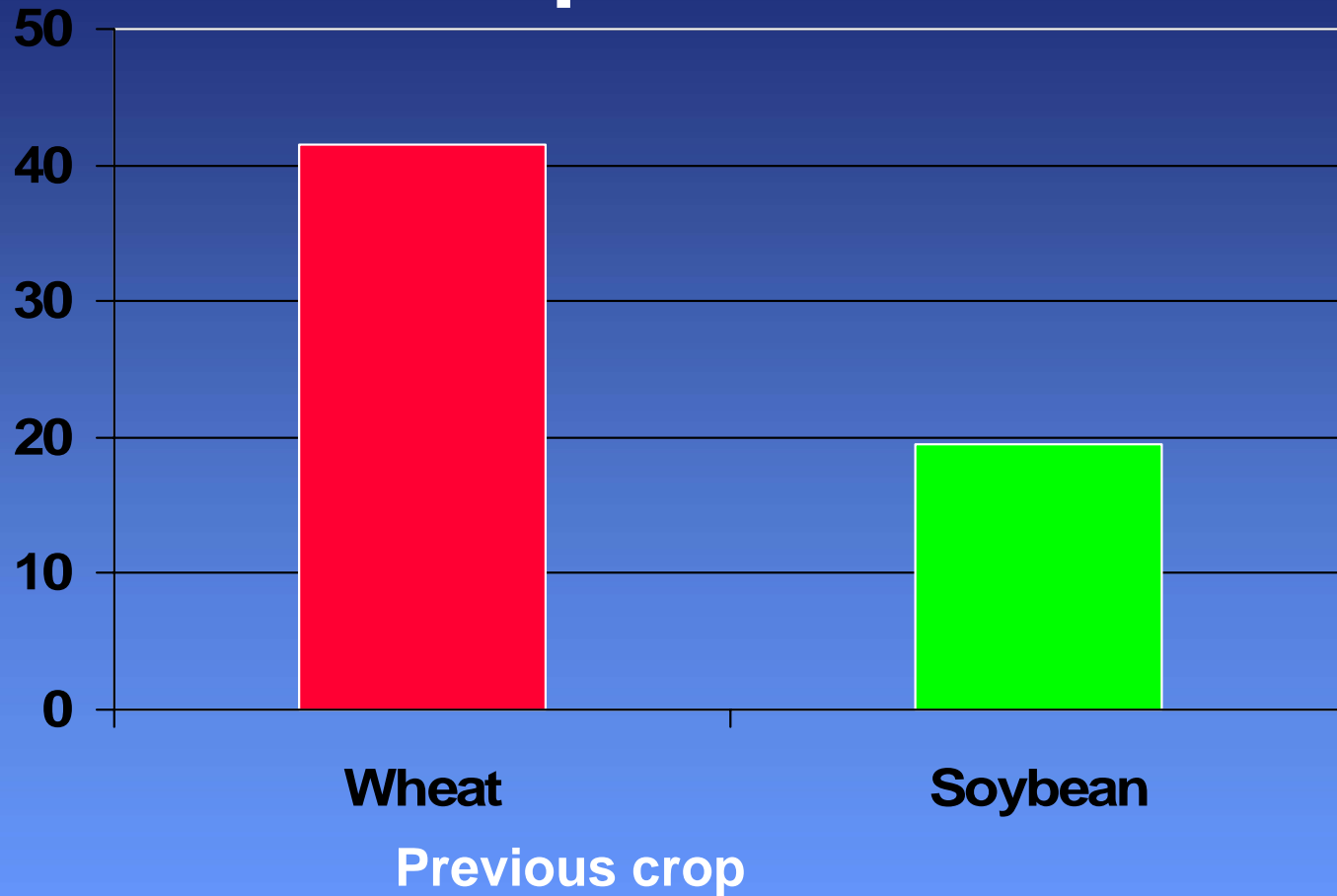
B = barley; DP = dry pea; W = wheat. FL = flax, Sn = sunflower, DB = dry bean

# Scab and Rotation: Field Results

## Rotation Impact - 2005 ND



**% Scab  
Field  
Severity**



Two adjacent fields of 'Reeder' spring wheat, Fargo. Each minimum-tilled with abundant previous crop residue.

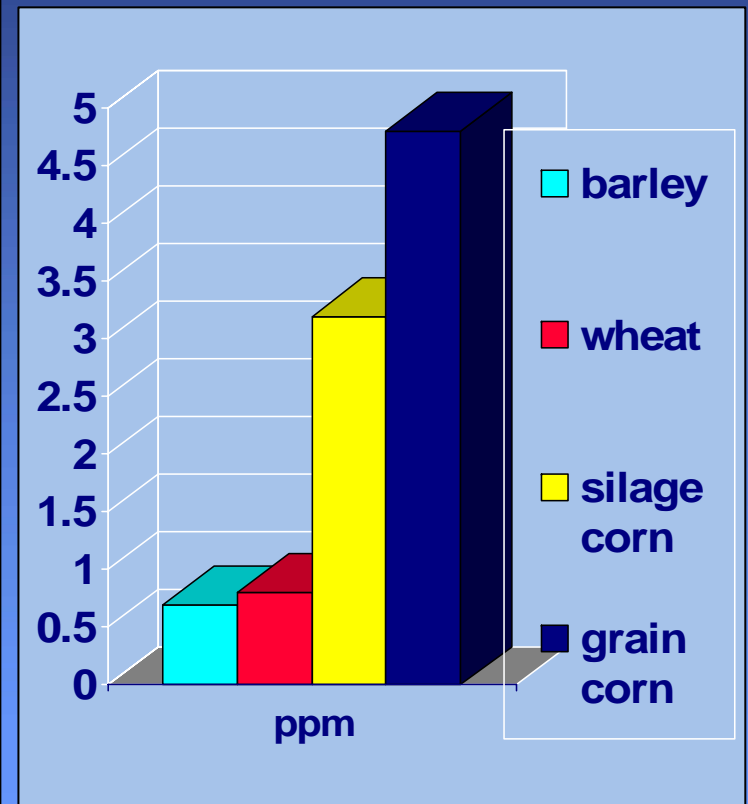
# Relative Risk of factors affecting FHB and formation of DON

## Weather & Agronomic Factors and Weighted Risk

[	Weather favorable from heading-flowering	8
o	Preceding crop - silage corn	3
7	grain corn	5
o	tillage system after corn	13
q	wheat cvs resistant	1
q	wheat cvs highly susc	4

Source: A. Obst, 1997 Fusarium Seminar

## Previous crop and DON



# Disease management directed at host and pathogen

## – Host:

- Resistance

## – Reduce Pathogen:

- Reduce infected stubble
- Rotations with non-hosts
- Fungicides



# Fungicides for Control of Leaf Diseases and FHB

**Fungicides must be used in conjunction with cultivar choice and rotations**

**Disease Forecasting System Helps Predict Necessity of Fungicides**



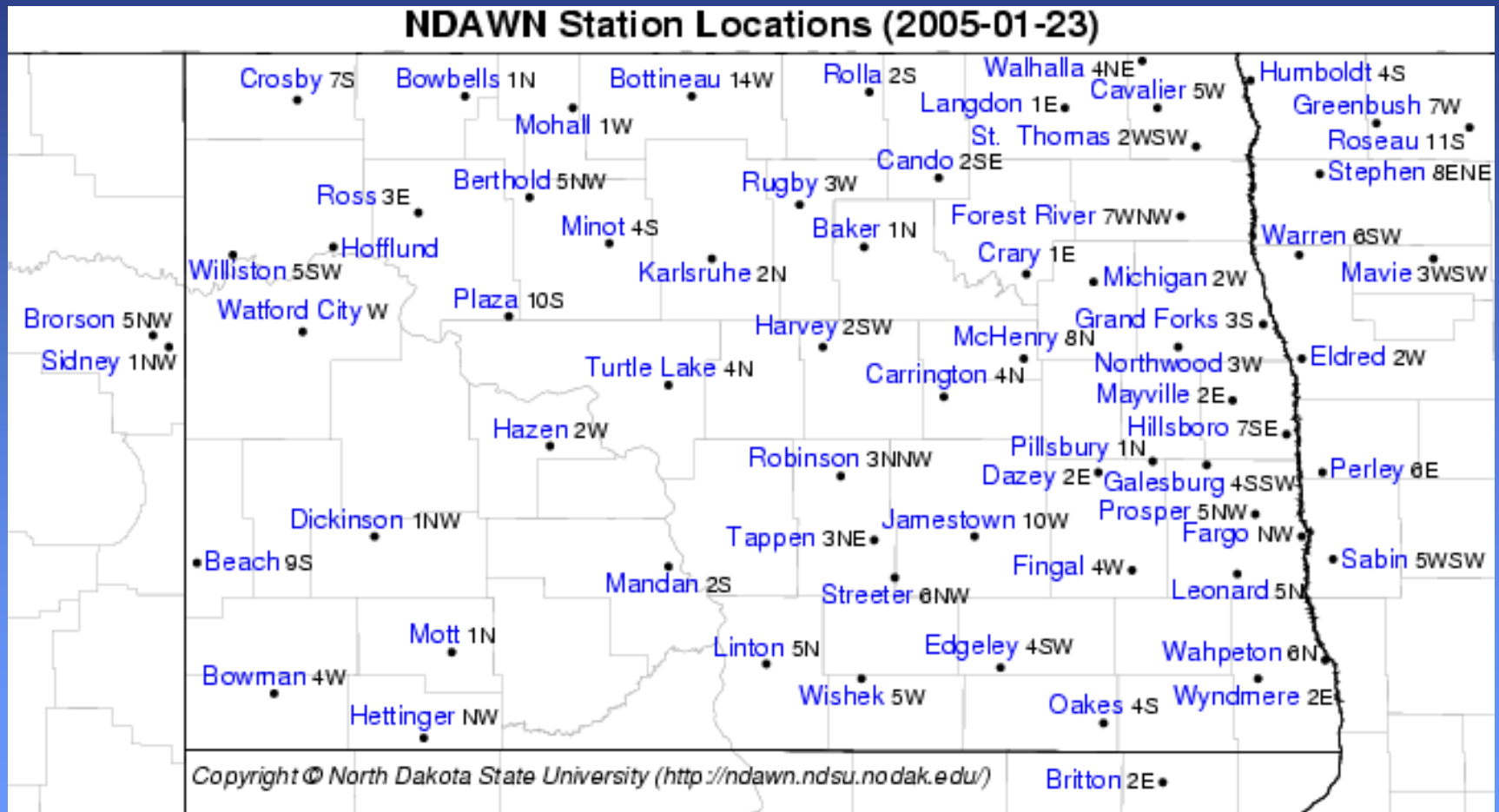
**2005 Disease Forecasting sites indicated high risk of leaf spots in June, early July**  
[www.ag.ndsu.nodak.edu/cropdisease/](http://www.ag.ndsu.nodak.edu/cropdisease/)

**Interpretation: Yes = infection likely, No = infection unlikely.**

Disease risk at Hettinger	6/14	6/13	6/12	6/11	6/10	6/9	6/8	6/7	6/6	6/5
Tan spot	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
S. Blotch	No	Yes	Yes	No	Yes	No	Yes	Yes	No	No
Leaf rust	No	Yes	No	No	No	No	No	No	No	No



# ND Forecasting system based on NDAWN weather station data

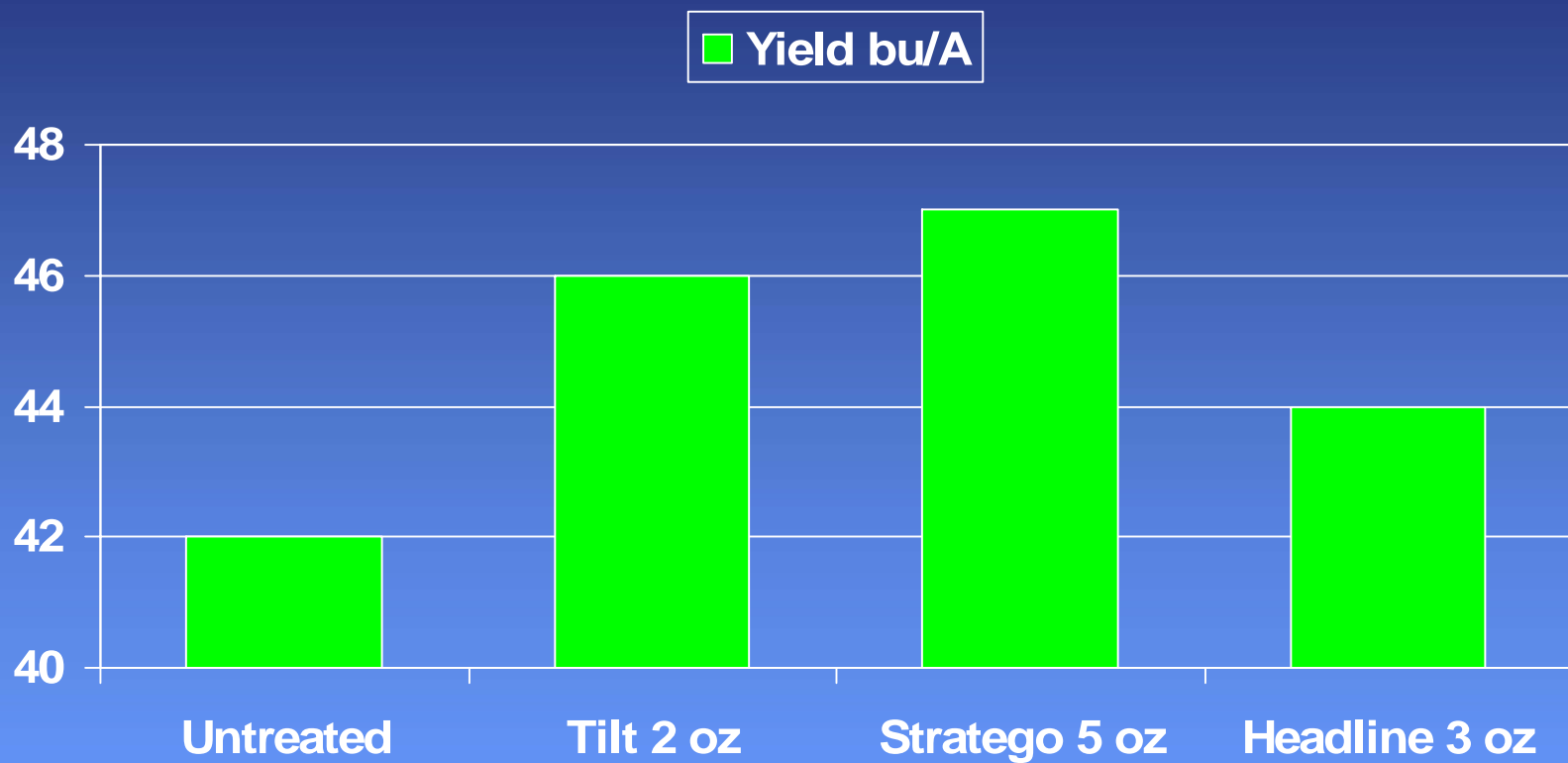


# Early tan spot infection of wheat and Early Season Fungicide Control

Tilt  
Bumper  
Propimax  
Stratego  
Quadris  
Headline  
Quilt  
Mancozebs

- ALL very good on leaf spot diseases at tillering (4 to 5) leaf stage;
- Generally applied at 1/2 full label
- Best response when wheat planted into previous wheat field

# Early season application to Reeder HRSW: DREC Trials, Regent, ND 2004 (R. Ashley)



All fungicides applied only once, at 4-5 leaf stage. Wheat planted into wheat stubble

# Early application: 2005 SW

Ben Durum, New England (R. Ashley)

4-5 Leaf Treatment and rate/acre	Early % Severity	Late % Severity	Yield* bu/a	Bu Yield +
Untreated	26.8	61.3	48.1	
Stratego 4 fl oz	6.0	40.0	56.5	6.4
Stratego 5 fl oz	4.8	37.0	53.4	5.2
Absolute 2 fl oz	3.5	53.8	52.7	4.6
Headline 3 fl oz	3.5	43.0	51.5	3.4
Tilt 2 fl oz	6.0	38.3	50.0	1.9

Absolute = trifloxystrobin + tebuconazole; Stratego = trifloxystrobin + propiconazole;

# Early application:

Averaged across Carrington & Fargo, ND, 2005 (Reeder HRSW)  
Cooperative trial with Bayer CropScience

Treatment and rate/acre	Growth stage	Yield* bu/a (+ bu)	Lb Twt incr.
<b>Untreated</b>		32.6	
<b>Stratego 4 fl oz</b>	<b>Fks 2</b>	<b>36.1 (3.5)</b>	<b>0.2</b>
<b>Stratego 5 fl oz</b>	<b>Fks 2</b>	<b>35.8 (3.2)</b>	<b>0.4</b>
<b>Absolute 2 fl oz</b>	<b>Fks 2</b>	<b>36.3 (3.7)</b>	<b>0.3</b>
<b>Headline 3 fl oz</b>	<b>Fks 2</b>	<b>37.4 (4.5)</b>	<b>1.1</b>

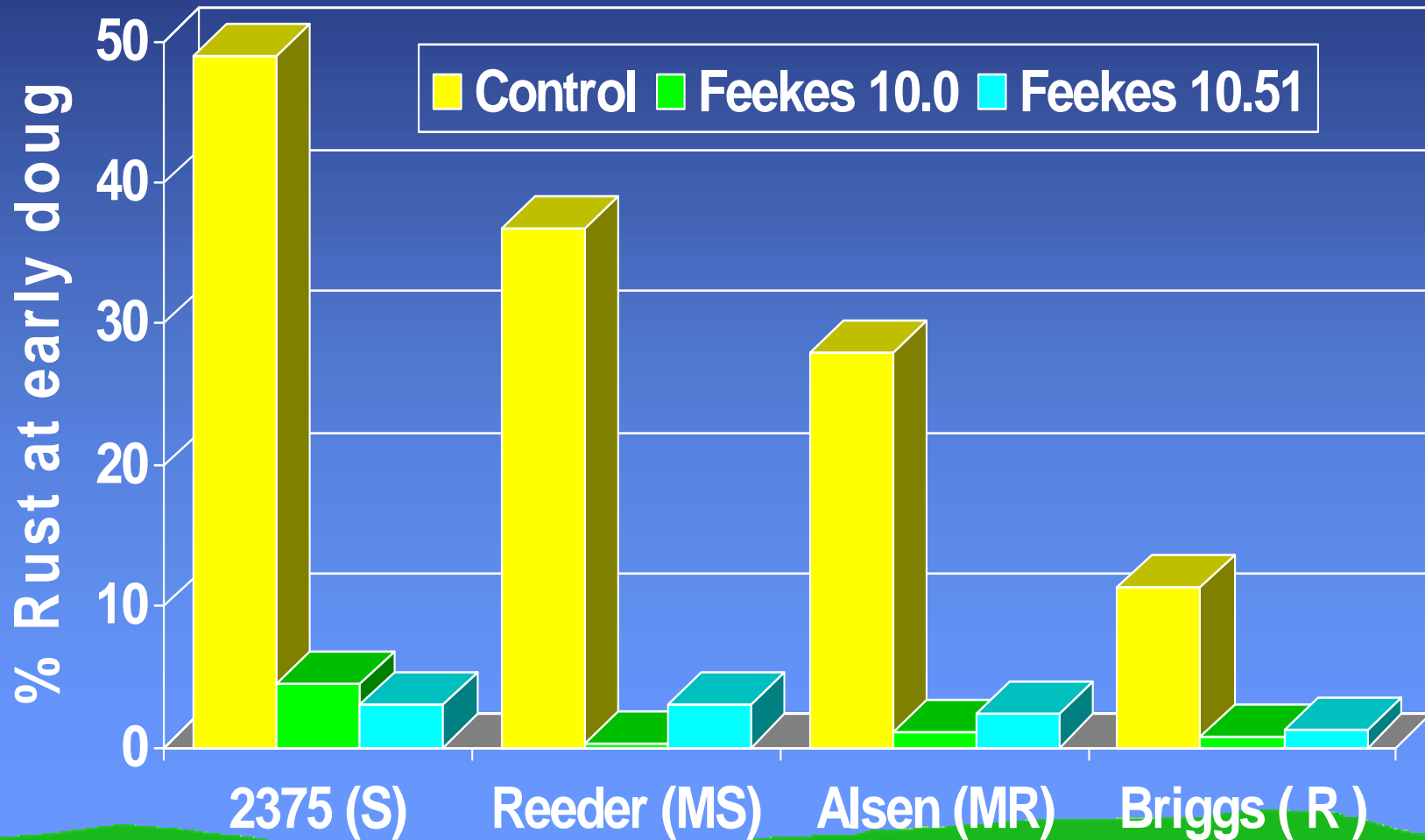
Absolute = trifloxystrobin + tebuconazole; Stratego = trifloxystrobin + propiconazole;

**\*Yield increases alone resulted in about 2x return on fungicide investment**

# Spring Wheat Leaf Rust Control

Impact of fungicide on rust in HRSW

Folicur @ 4.0 fl oz/acre 2004



# Stripe Rust Control 2005

Reeder HRSW – Hettinger

Data provided by Eric Eriksmoen

Fungicide Treatment Strategy*	# Trts	Avg. % Incidence**
Untreated		45
4-5 Leaf	6	23
Flag	2	21
Early + Flag	2	25
Flowering	2	8
Early + Flowering	4	9

•Early (Headline, Tilt or Stratego alone or with Herbicides); Flag = Headline or Caramba; Early + Flag = Headline + headline at 2 rates; Flowering = Caramba or Folicur; Early + flowering = Headline or Tilt early + Caramba or Folicur at Flowering

\*\* Incidence = % of tillers showing symptoms

# Disease Forecasting Web site also predicts risk of FHB (Scab)

**IF looked at Dickinson site on July 1, 2005**

Date	6/30	6/29	6/28	6/27	6/26	6/25	6/24	6/23	6/22	6/21	6/20	6/19
% Risk	35	38	48	48	45	47	53	57	66	59	64	56

Values above **60%** indicate high risk if crop in flowering stage



# Early + Flowering time application:

Averaged across Carrington & Fargo, ND, 2005 (Reeder HRSW)  
Cooperative trial with Bayer CropScience

Treatment and rate/acre	Growth stage	Yield* bu/a (+ bu)	% Yield incr.	Lb Twt incr.
Untreated		32.6		
Stratego, 4 fl oz, Folicur, 4 fl oz	Fks 2, 10.51	45.9 (13.3)	40.6	1.8
Headline 3 fl oz, Folicur 4 fl oz	Fks 2, 10.51	47.9 (15.3)	46.7	2.1
Absolute 2 fl oz, Folicur 4 fl oz	Fks 2, 10.51	46.5 (13.9)	42.5	1.9

Absolute = trifloxystrobin + tebuconazole; Stratego = trifloxystrobin + propiconazole;

\*Yield increases alone resulted in **2.6-3x return** on fungicide investment

# Flowering time Application: Recent Uniform Wheat Fungicide Data, ND

Averaged across Carrington, Fargo and Langdon, ND

YR	% Reduction in FHB FS	% Reduction in DON	Bu Yield +	% Yield +	Lb Twt +
'03	57	44	10	16.7	1.5
'04	58	36	10.1	18.2	2.0



Comparing untreated to treatment with 4 fl oz Folicur at early flowering; Across spring wheat and durum wheat grain classes (disease at Minot very low and data not included);

Fungicide applied with forward/backward nozzles, 40 psi, ~ 20 gpa

# 2005 Uniform HRSW Fungicide Data, ND

Averaged across Carrington, Langdon & Fargo, ND

Treatment* and rate/acre	FHB FS %	DON** ppm	FDK %	Yield Bu/A	% Yield Incr.	Twt Lbs/Bu
Untreated	17.5	9.0	13.8	40.3	58.3	58.3
Folicur 4 fl oz	9.0	6.1	7.7	49.7	23.3	59.1
Prosaro 6.5 fl oz	7.4	4.8	5.9	53.7	33.3	59.9
BAS555 13.5 fl oz	7.8	4.7	7.0	51.4	27.5	59.5
Punch 8 fl oz	10.1	5.5	8.1	47.3	17.4	59.1
LSD 0.05	4.6	1.5	2.8	2.3	0.7	0.7

\*Reeder at Carrington and Fargo; Glenn and Grandin at Langdon; Fungicide applied with forward/backward nozzles, 40 psi, 20 gpa; \* All fungicides tested are triazoles; Folicur = Sec. 18 product available to growers, others are still experimentals. \*\* DON data only available from Fargo and Carrington as of Nov. 15, 2005

# 2005 Uniform HRSW Fungicide Data, ND

Averaged across Carrington, Langdon & Fargo, ND

Treatment* and rate/acre	FHB FS %	DON** ppm	FDK %	Yield Bu/A	% Yield Incr.	Twt Lbs/Bu
Untreated	17.5	9.0	13.8	40.3		58.3
<b>Folicur 4 fl oz</b>	<b>9.0</b>	<b>6.1</b>	<b>7.7</b>	<b>49.7</b>	<b>23.3</b>	<b>59.1</b>
Prosaro 6.5 fl oz	7.4	4.8	5.9	53.7	33.3	59.9
BAS555 13.5 fl oz	7.8	4.7	7.0	51.4	27.5	59.5
Punch 8 fl oz	10.1	5.5	8.1	47.3	17.4	59.1
LSD 0.05	4.6	1.5	2.8	2.3		0.7

\*Reeder at Carrington and Fargo; Glenn and Grandin at Langdon; Fungicide applied with forward/backward nozzles, 40 psi, 20 gpa; \* All fungicides tested are triazoles; Folicur = Sec. 18 product available to growers, others are still experimentals. \*\* DON data only available from Fargo and Carrington as of Nov. 15, 2005

# Impact on Return - 2005 Uniform ex.

(over 4 trials, some locations severe FHB)

Estimated from Discount Schedule at Elevator on  
Spring Wheat, Kindred, ND Nov. 2, 2005

	No Fungicide	With Fungicide	Discount
Test Wt	58.3 lb	59.1 lb	0 for 58 lb +
Damage	13.8%	7.7%	\$0.03/% over 2%
DON ppm	7.8 ppm	5.8 ppm	\$0.05/0.5 ppm > 2ppm
Price (\$/Bu)	~\$3.00	~\$3.34	Based on \$3.66/bu
Yield	40.3	49.7	*
Return/A	\$120.90	\$151.50 (includes - 14.50/A for fungicd.)	Net from fungicide: \$30.60/A

# 2005 Uniform Barley Fungicide Data, ND

Averaged across Langdon & Fargo, ND

Treatment* and rate/acre	FHB FS %	DON** ppm	Yield Bu/A	% Yield Incr.	Twt Lbs/Bu
Untreated	4.1	2.8	77.5		46.8
<b>Folicur 4 fl oz</b>	<b>1.7</b>	<b>1.8</b>	<b>85.9</b>	<b>10.8</b>	<b>47.4</b>
<b>Prosaro 6.5 fl oz</b>	<b>1.2</b>	<b>0.9</b>	<b>89.3</b>	<b>15.2</b>	<b>47.6</b>
<b>BAS555 13.5 fl oz</b>	<b>1.7</b>	<b>1.2</b>	<b>87.4</b>	<b>12.9</b>	<b>47.6</b>
<b>Punch 8 fl oz</b>	<b>1.8</b>	<b>1.9</b>	<b>85.4</b>	<b>10.2</b>	<b>47.3</b>

\*Robust at Fargo, Tradition barley at Langdon. Fungicides applied with forward/backward nozzles, 40 psi, 20 gpa; \* All fungicides tested are triazoles; Folicur = available to producers; others experimentals.

# What about HRS Variety x Fungicide Interaction?

Carrington, 2004.

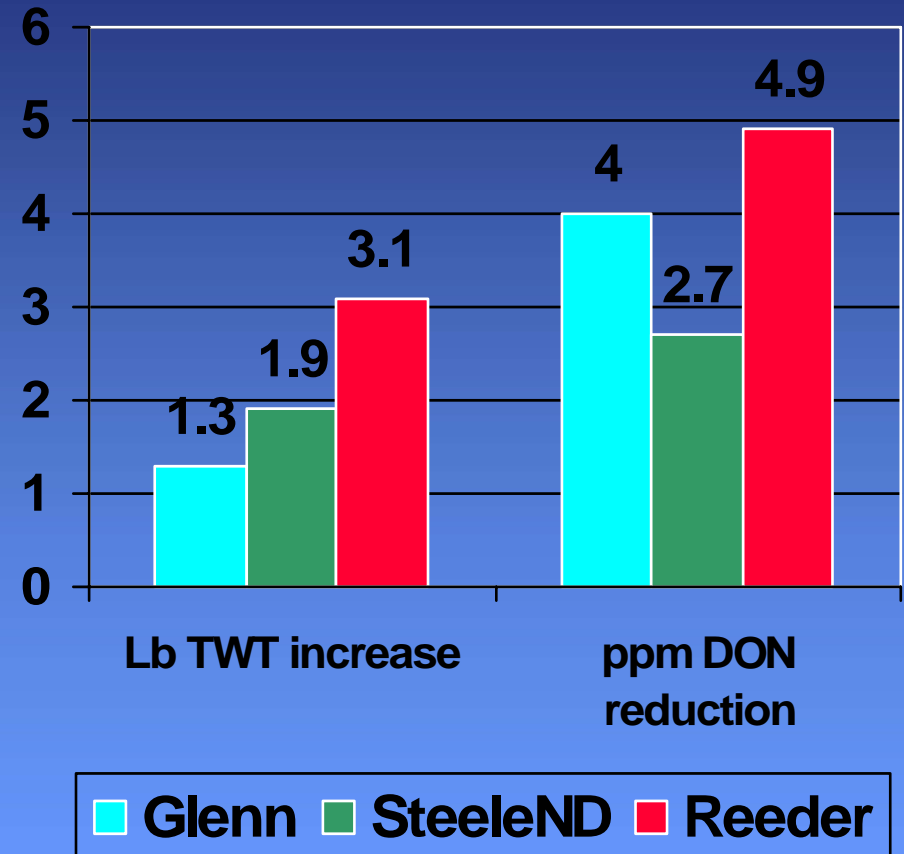
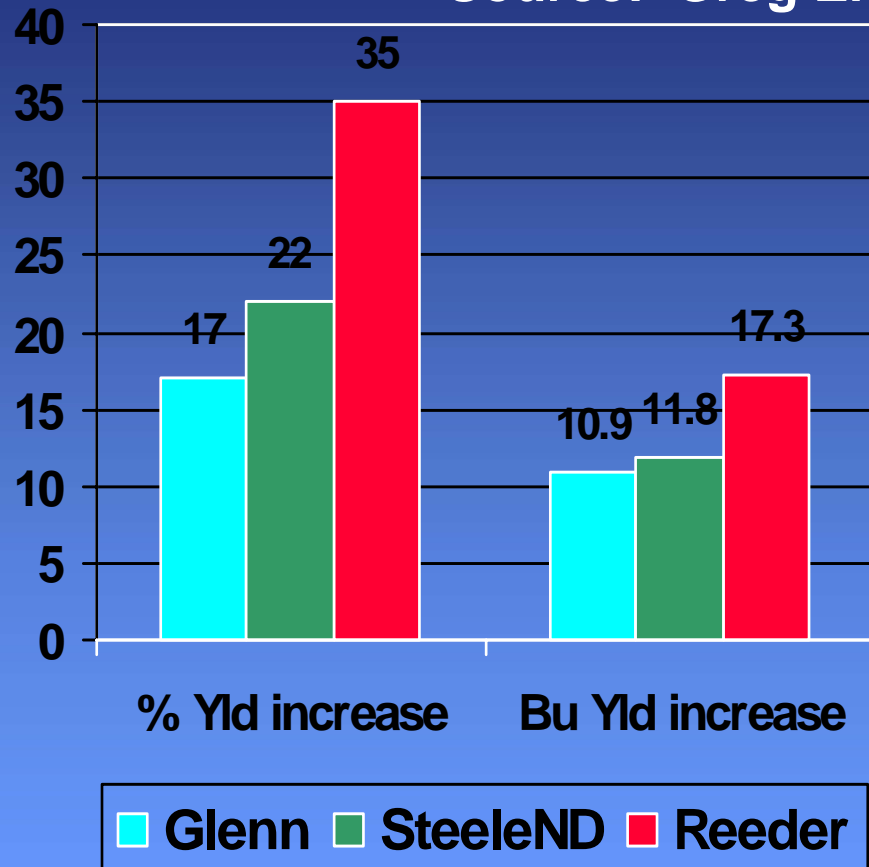
Source: Greg Endres and Blaine Schatz, CREC

Variety	Trt	FHB FS %	DON ppm	Leaf dis. %	Leaf rust %	Grain yield bu/A	Test wt lb/bu
Granger	Untrt	2.6	2.7	20	4	71.2	59.2
Granger	Folicur	0.5	1.2	4	0	79.2 (+8.0/10%)	59.9 (+0.7)
Reeder	Untrt	6.8	4.4	49	19	55.8	58.4
Reeder	Folicur	1.0	2.4	9	0	74.4 (+18.6/25%)	60.3 (+1.9)

# 2005: HRS Variety x Fungicide, Carrington

## Effect of Folicur (4 fl oz) Application at Flowering

Source: Greg Endres, Carrington REC



# Fungicides in Real World

Success has been shown both in research trials and on-farm

## Potential Difficulties:

- Continual wet weather, muddy fields
- Too high winds
- Narrow window of optimum timing
- Availability of applicators

# Summary: Disease Management

- **Wheat Diseases Best Controlled with Integrated Strategy**
- Variety choice can impact response
- **Previous crop can impact response**
- Disease forecasting models help with fungicide decisions
- **Fungicides can economically improve yield and quality if applied correctly and in combination with other strategies**

Questions?