

USA
Sunflower Survey



*Partnership of
University, USDA & Industry*

*2021
NATIONAL
SUNFLOWER
ASSOCIATION
SURVEY*

Project Leaders:

Ryan Buetow, Extension Agronomist, NDSU, Dickinson

Febina Mathew, Field Crop Pathologist, SDSU

This survey would not be possible without the help of the huge network of volunteers from universities, government, producers, and industry

Thank you to all who have helped!

Special thanks to Jarrad Prasifka, USDA-ARS Research Entomologist for his work on the insect portion of the dataset and to David Kramar, NDSU Extension Precision Ag Specialist for his assistance with mapping the dataset

SURVEY FORMAT

1. **Yield components** (*Plant population, head diameter, seed size, % good seed, % center set, bird damage*) = six components
2. **Agronomic info** (eight components)
3. **Weed assessment** (30 weeds)
4. **Diseases** - incidence and severity on 10 diseases
5. **Insect and bird damage** = In-field assessment and lab exam of seed samples – 10 components
6. **Two sites examined per field**

THUS.... $(6 + 8 + 30 + 10 + 10) \times 2 = 128$ observations /field x 201

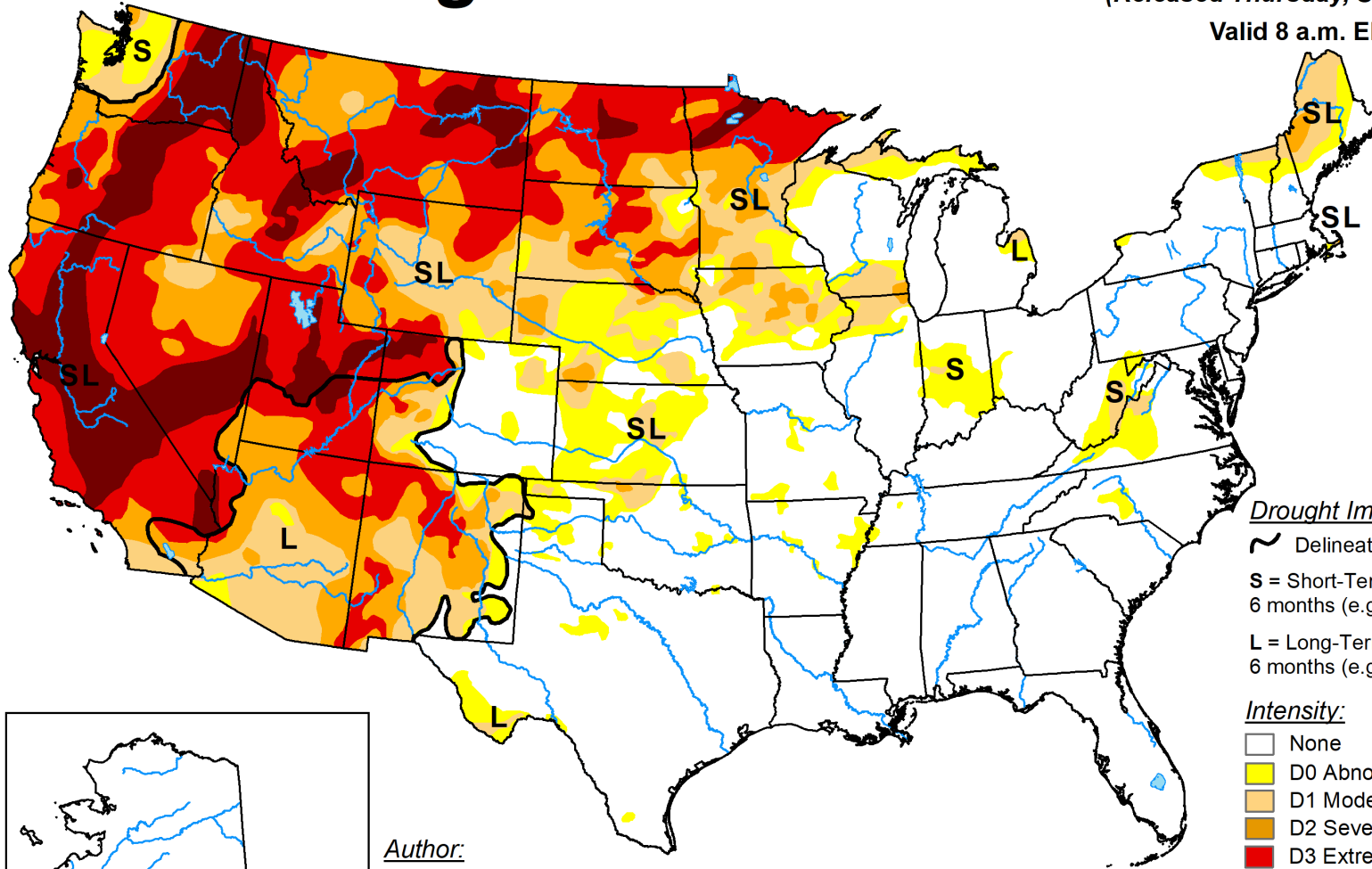
fields = **26,000 data points in one survey**

14 surveys = > 360,000 pieces of data



U.S. Drought Monitor

August 31, 2021
(Released Thursday, Sep. 2, 2021)
Valid 8 a.m. EDT



Drought Impact Types:

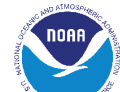
- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

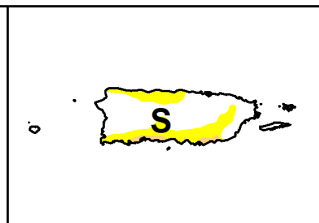
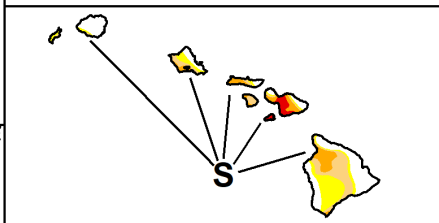
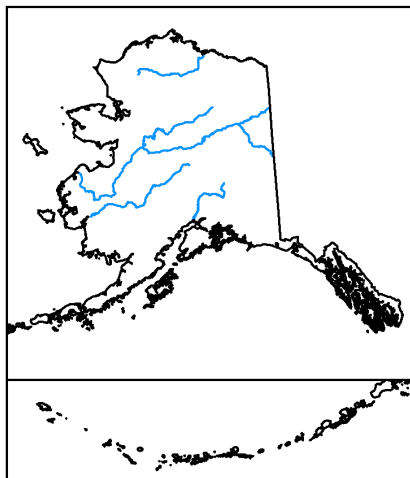
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:
David Simeral
Western Regional Climate Center

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>



droughtmonitor.unl.edu



SUNFLOWER SURVEY - # FIELDS

2019

- North Dakota - 84
- Minnesota - 6
- South Dakota - 29
- Kansas - 5
- Colorado - 5
- Nebraska - 4
- Texas - 0

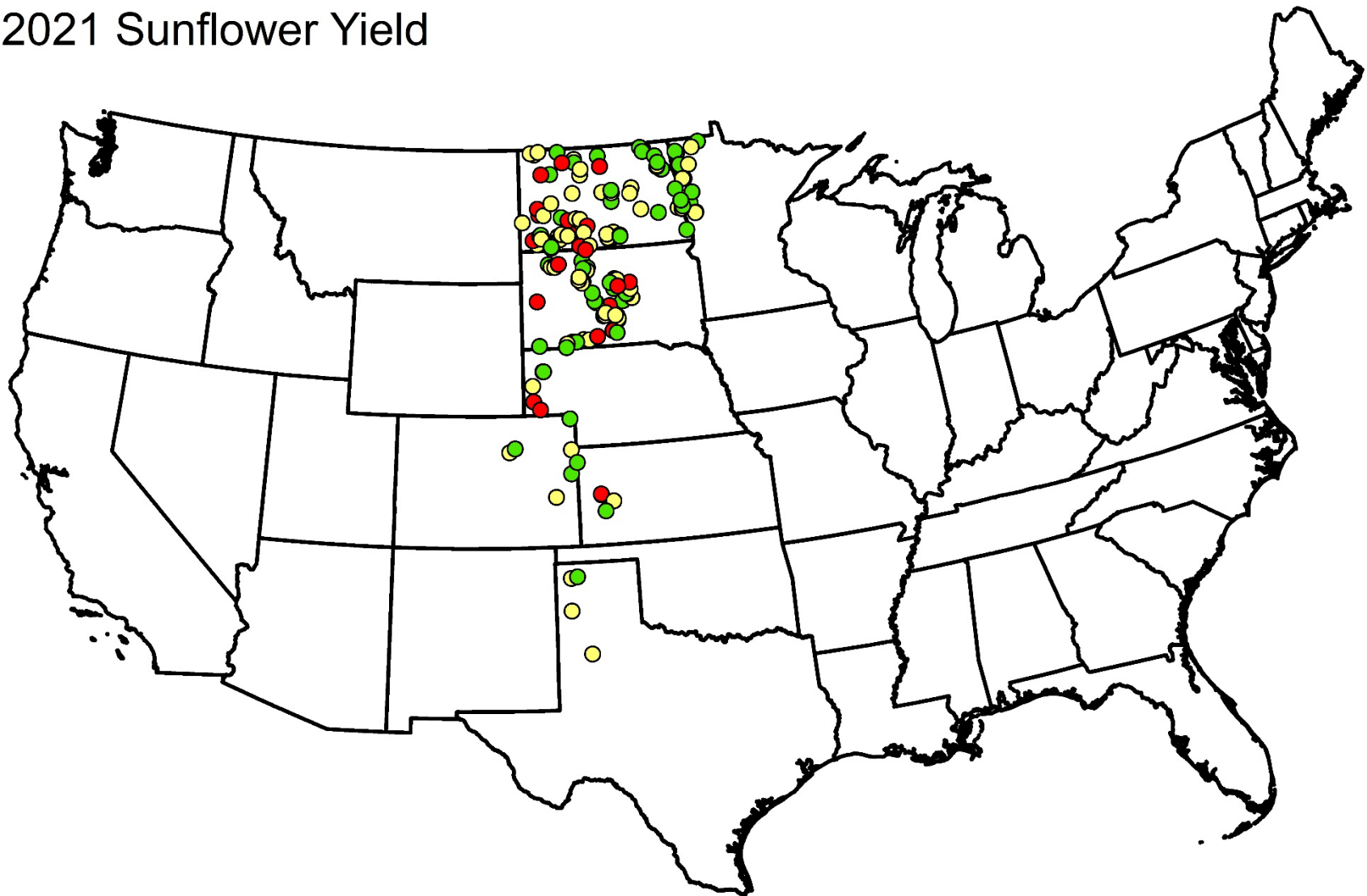
TOTAL - 133

2021

- North Dakota - 79
- Minnesota - 12
- South Dakota - 52
- Kansas - 5
- Colorado - 7
- Nebraska - 5
- Texas - 4

TOTAL - 164

2021 Sunflower Yield



Yield ● 350 - 1000 ● 1001 - 1800 ● 1801 - 14097

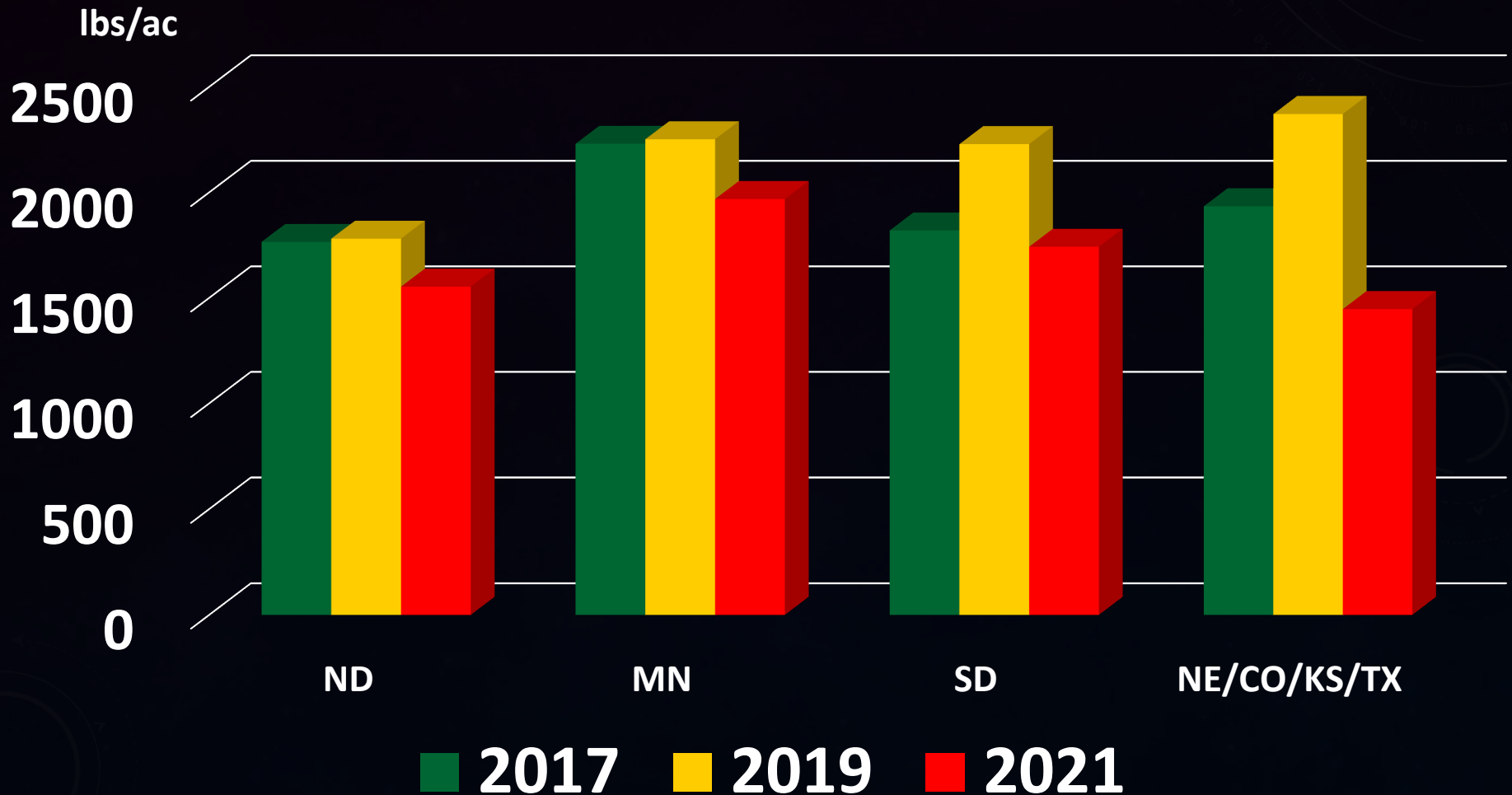
0 125 250 500 750 1,000
Miles



SUNFLOWER YIELD (LB/A)

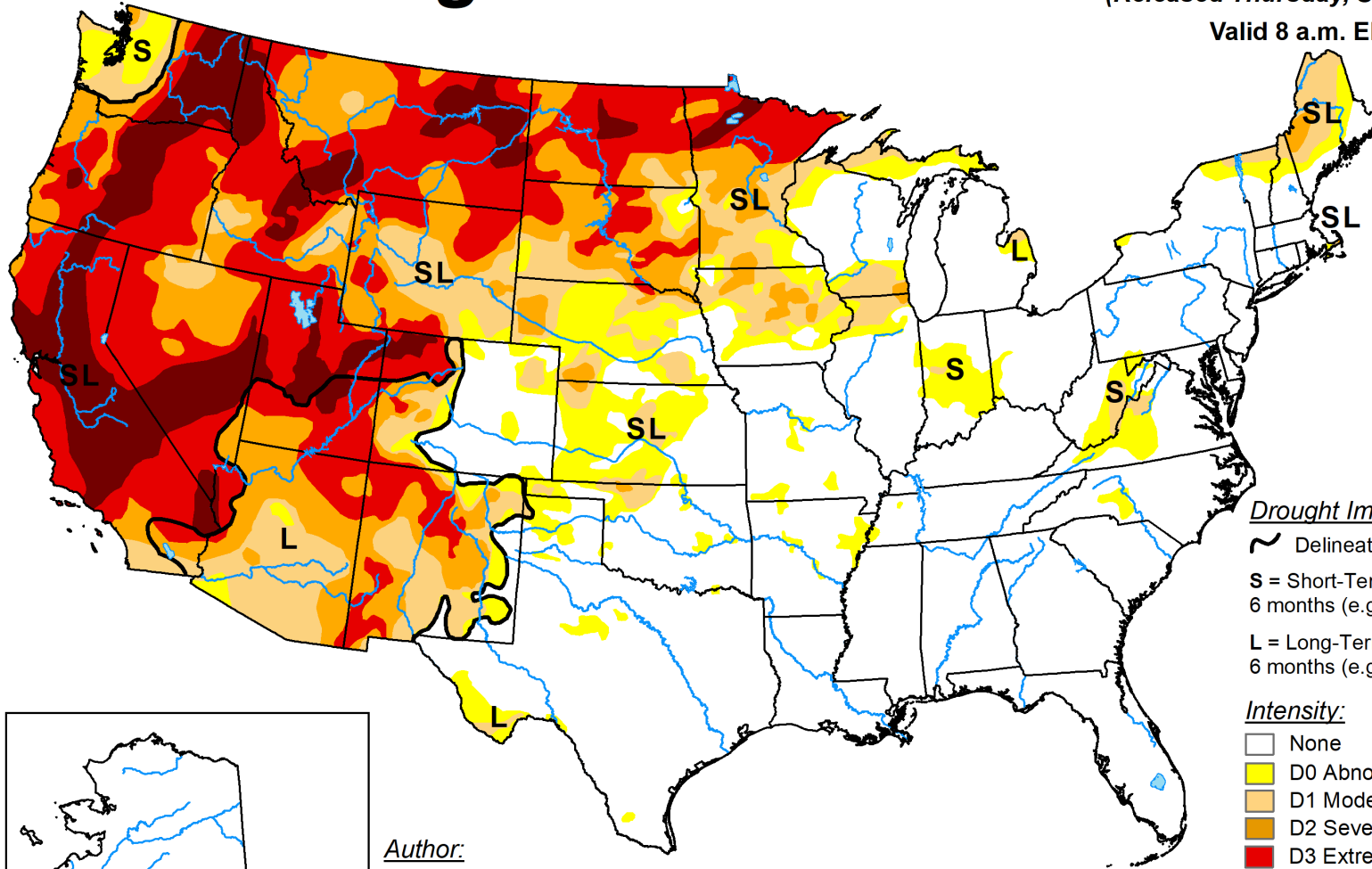
2017-2019

Sunflower Survey Yields Over Time



U.S. Drought Monitor

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Drought Impact Types:

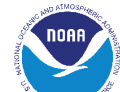
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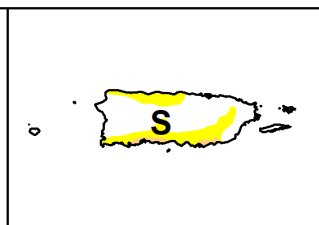
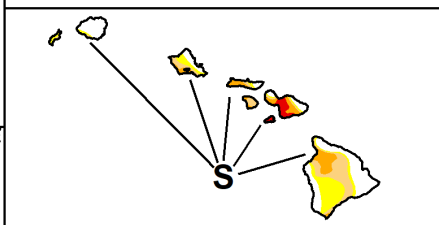
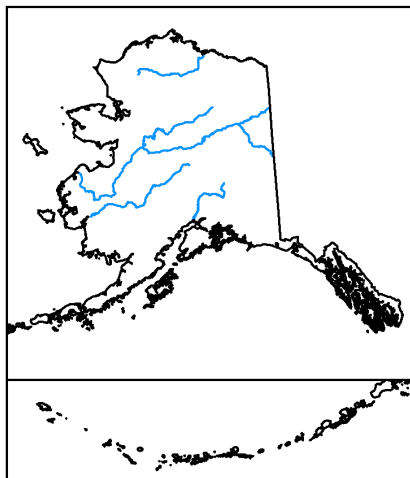
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
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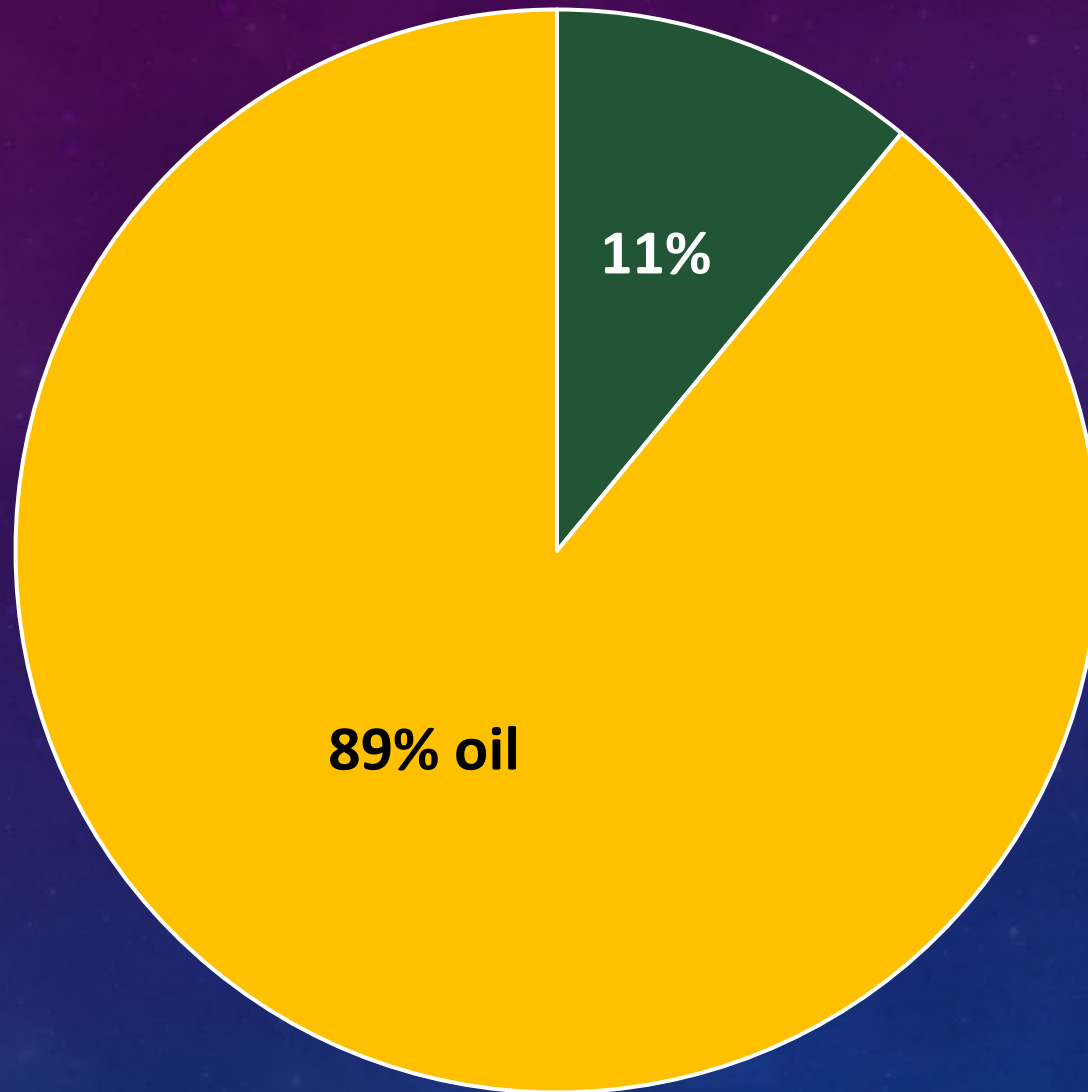
droughtmonitor.unl.edu



SUNFLOWER SURVEY YIELD

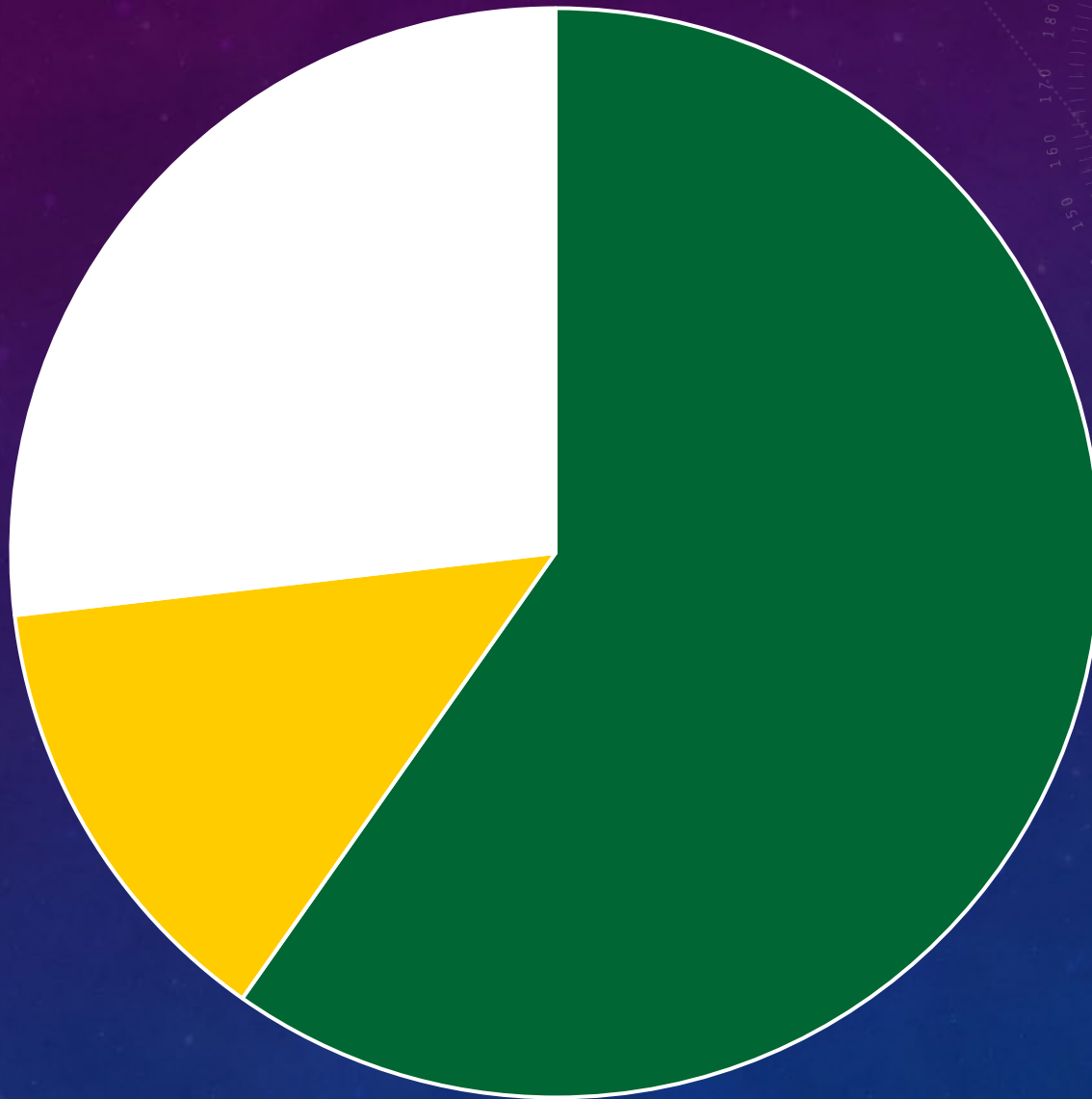
State	Average Yield	Minimum	Maximum
North Dakota	1553	350 (Billings)	3234 (Walsh)
South Dakota	1742	499 (Corson)	2646 (Perkins)
Minnesota	1968	1320 (Clay)	3440 (Roseau)
Colorado	1545	1105 (Kiowa)	2081 (Weld)
Kansas	1489	445 (Wichita)	2398 (Sherman)
Nebraska	1217	396 (Banner)	2461 (Box Butte)
Texas	1509	1006 (Hereford)	1965 (Dallam)

Sunflower Type



■ confection ■ oilseed

Surveyed field tillage type



■ no-till ■ minimal tillage ■ conventional tillage

2021 NSA Survey Yield Limiting Factor

What was the number one and number two factor that limited yield?¹

0. No problem

4. Uneven Plant Growth

8. Lodging

11. other

1. Birds

5. Hail

9. Plant Spacing
within the row

2. Disease

6. Herbicide Damage

10. Weeds

3. Drought

7. Insects

#1. _____

#2. _____

2017 #1 YIELD LIMITING FACTORS (172 FIELDS)

- **Disease** 11 %
- **Plant spacing in row** 19 %
- Lodging 3 %
- Weeds 8 %
- Birds 4 %
- Insects 2 %
- **Drought** 31 %
- Uneven plant growth 2 %
- Other 9 %
- **No Problem** 9 %



2019 #1 YIELD LIMITING FACTORS (133 FIELDS)

• Disease	25 %
• Plant spacing in row	16 %
• Lodging	11 %
• Weeds	6%
• Birds	8 %
• Insects	7 %
• Drought	2 %
• Uneven plant growth	1 %
• Other	13 %
• No Problem	8 %

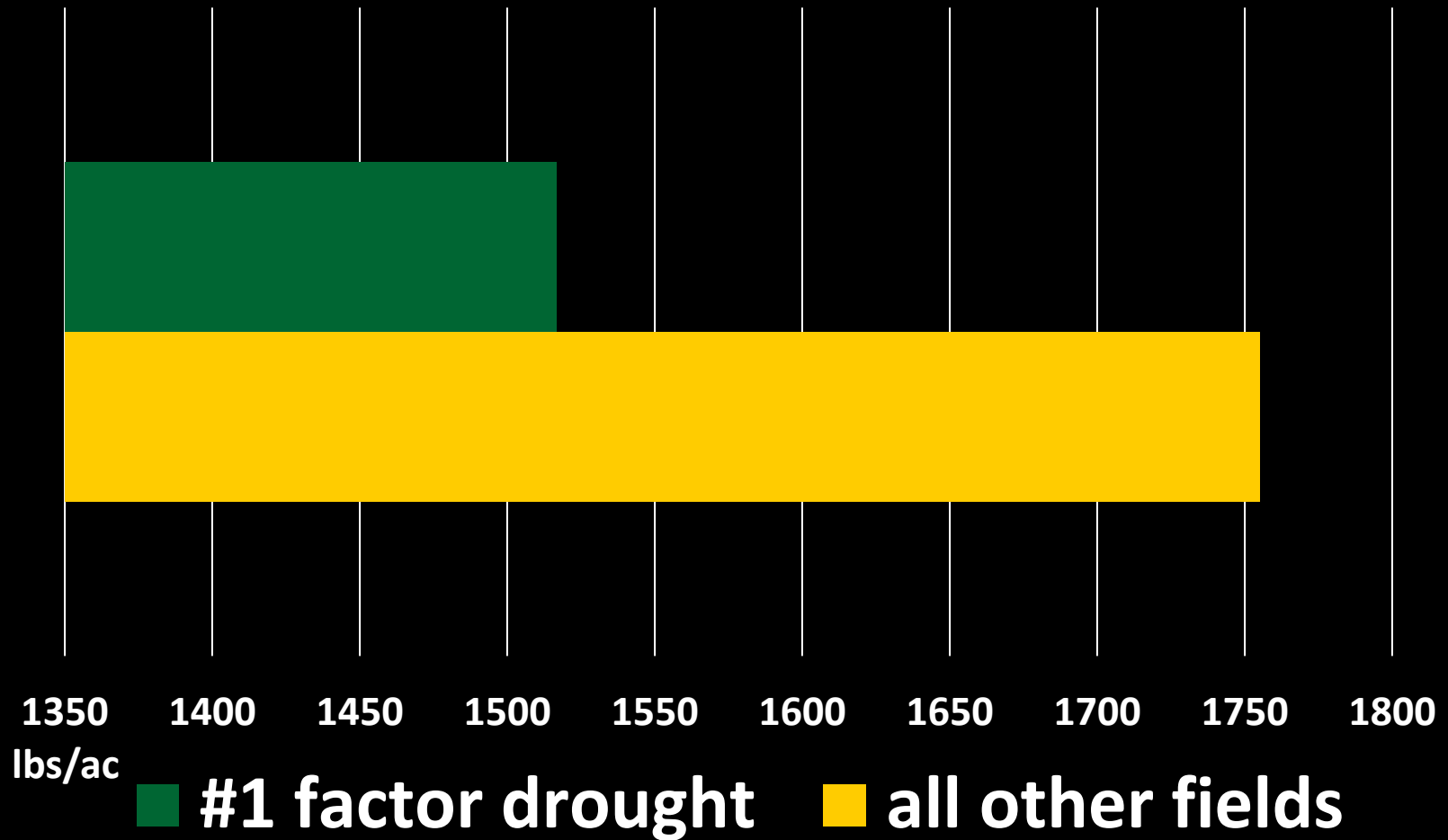


2021 #1 YIELD LIMITING FACTORS (164 FIELDS)

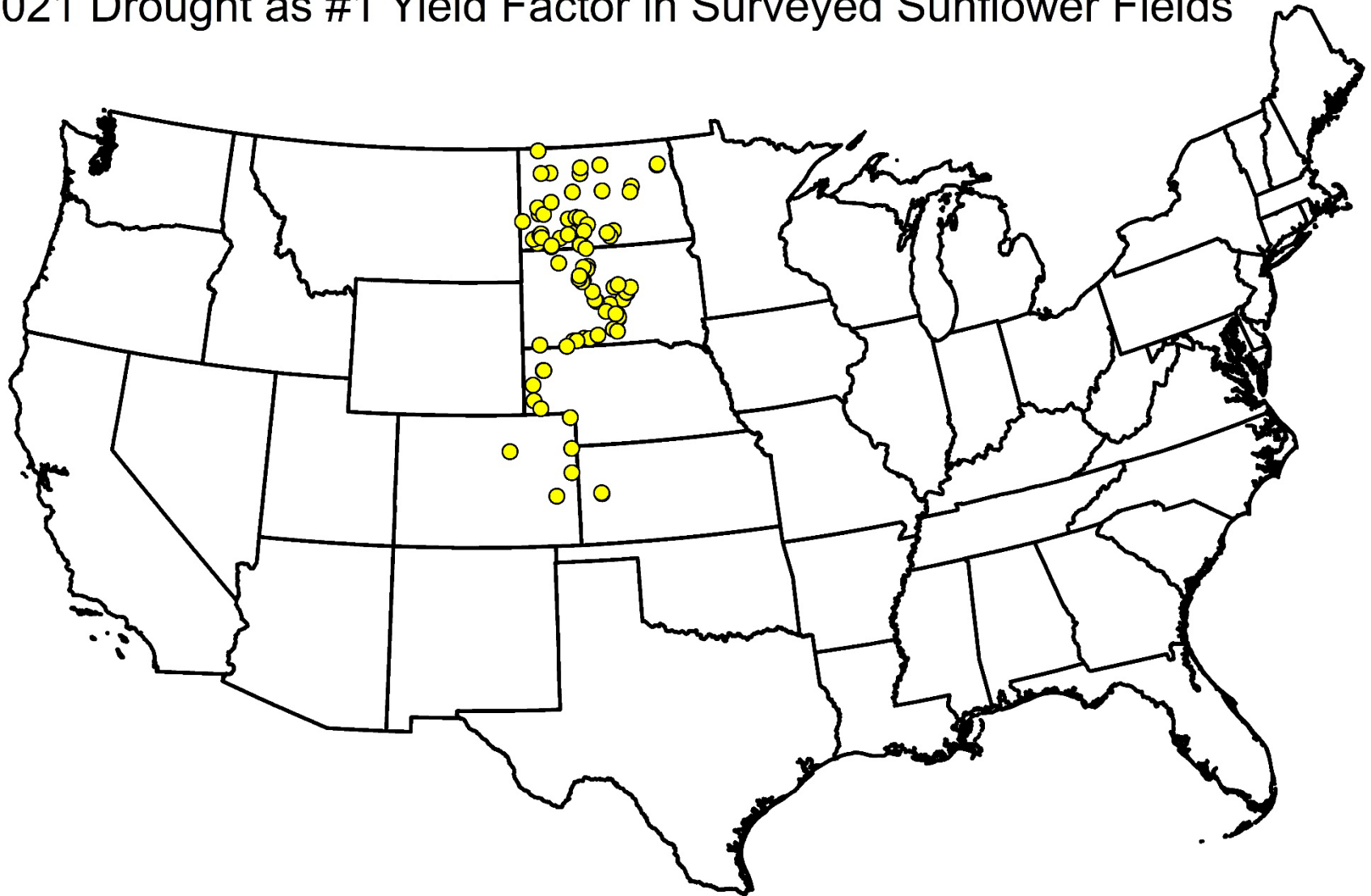
- **Disease** 7 %
- **Plant spacing in row** 9 %
- Lodging 2 %
- Weeds 2%
- Birds 6 %
- Insects 5 %
- **Drought** 51 %
- Uneven plant growth 1 %
- Other 4 %
- **No Problem** 9 %



2021 Yield by #1 limiting factor



2021 Drought as #1 Yield Factor in Surveyed Sunflower Fields



● Affected Fields

0 125 250 500 750 1,000 Miles



2017 #2 YIELD LIMITING FACTORS – (ALL 172 FIELDS)

- **Disease** 10 %
- Plant spacing in row 17 %
- Lodging 5 %
- Weeds 6 %
- Birds 2 %
- Insects 4 %
- Drought 9 %
- Hail 5 %
- Uneven plant growth 6 %
- Other 6 %
- **No Problem** 30 %



2019 #2 YIELD LIMITING FACTORS – (ALL 133 FIELDS)

• Disease	12 %
• Plant spacing in row	11 %
• Lodging	13 %
• Weeds	5 %
• Birds	2 %
• Insects	9 %
• Drought	4 %
• Hail	6 %
• Uneven plant growth	2 %
• Other	10 %
• No Problem	27 %



2021 #2 YIELD LIMITING FACTORS – (ALL 164 FIELDS)

- **Disease** 9 %
- **Plant spacing in row** 15%
- Lodging 4 %
- **Weeds** 13 %
- Birds 4 %
- Insects 7 %
- **Drought** 10 %
- Hail 3 %
- Uneven plant growth 5 %
- Other 1 %
- **No Problem** 24 %



2019 #1 YIELD LIMITING FACTORS - NORTH DAKOTA (84 FIELDS)

• Disease	21 %
• Plant spacing	12 %
• Lodging	13%
• Weeds	1%
• Birds	11%
• Insects	6%
• Drought	1%
• Hail	6%
• Uneven plant growth	0%
• Other	15%
• No Problem	6%



2021 #1 YIELD LIMITING FACTORS - NORTH DAKOTA (79 FIELDS)

• Disease	6 %
• Plant spacing	10 %
• Lodging	3%
• Weeds	1%
• Birds	10%
• Insects	3%
• Drought	47%
• Hail	0%
• Uneven plant growth	1%
• Other	6%
• No Problem	8%



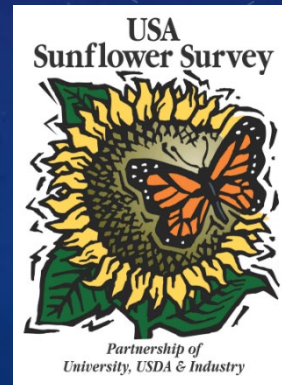
2019 #2 YIELD LIMITING FACTORS - NORTH DAKOTA (84 FIELDS)

- **Disease** 18 %
- Plant spacing 12 %
- **Lodging** 14 %
- Drought 1 %
- Weeds 4 %
- Insects 10 %
- Birds 2 %
- Uneven plant growth 1 %
- Other 14 %
- **No Problem** 17 %



2021 #2 YIELD LIMITING FACTORS - NORTH DAKOTA (79 FIELDS)

- **Disease** 16 %
- Plant spacing 11 %
- **Lodging** 4 %
- Drought 10 %
- Weeds 11 %
- Insects 5 %
- Birds 3 %
- Uneven plant growth 5 %
- Other 1 %
- **No Problem** 23 %





2019 # 1 AND #2

YIELD LIMITING FACTORS SOUTH DAKOTA

(29 FIELDS)



#1 Factor

- **Disease** 21 %
- **Plant Spacing** 28 %
- Lodging 3 %
- **Weeds** 3 %
- Birds 7 %
- Insects 10 %
- Drought 0 %
- Hail 3 %
- Uneven growth 3 %
- No problem 14 %

#2 Factor

- **Disease** 3 %
- **Plant spacing** 14 %
- Lodging 17 %
- Weeds 7 %
- Birds 0 %
- Insects 10 %
- Drought 0 %
- Hail 0 %
- Uneven growth 7 %
- **No Problem** 38 %

2021 # 1 AND #2

YIELD LIMITING FACTORS SOUTH DAKOTA

(52 FIELDS)



#1 Factor

- Disease 4 %
- **Plant Spacing** 8 %
- Lodging 0 %
- **Weeds** 2 %
- Birds 2 %
- Insects 0 %
- **Drought** 63 %
- Hail 2 %
- Uneven growth 0 %
- No problem 10 %

#2 Factor

- Disease 2%
- **Plant spacing** 12 %
- Lodging 2 %
- **Weeds** 15 %
- Birds 6 %
- Insects 12 %
- **Drought** 13%
- Hail 6 %
- Uneven growth 4 %
- **No Problem** 17 %

North Dakota and South Dakota #1 yield limiting factors noted in the 2017, 2019, and 2021 surveys.

Yield Factor	North Dakota #1 limiting factor			South Dakota #1 limiting factor		
	2017	2019	2021	2017	2019	2021
	%					
Disease	17	21	6	9	21	4
Plant spacing						
Lodging						
Drought						
Weeds						
Insects						
Birds						
Uneven growth						
Other						
No Problem						

North Dakota and South Dakota #1 yield limiting factors noted in the 2017, 2019, and 2021 surveys.

Yield Factor	North Dakota #1 limiting factor			South Dakota #1 limiting factor		
	2017	2019	2021	2017	2019	2021
	%					
Disease	17	21	6	9	21	4
Plant spacing	10	12	10	24	28	8
Lodging	3	13	3	4	3	0
Drought						
Weeds						
Insects						
Birds						
Uneven growth						
Other						
No Problem						

North Dakota and South Dakota #1 yield limiting factors noted in the 2017, 2019, and 2021 surveys.

Yield Factor	North Dakota #1 limiting factor			South Dakota #1 limiting factor		
	2017	2019	2021	2017	2019	2021
	%					
Disease	17	21	6	9	21	4
Plant spacing	10	12	10	24	28	8
Lodging	3	13	3	4	3	0
Drought	32	1	47	40	0	63
Weeds						
Insects						
Birds						
Uneven growth						
Other						
No Problem						

North Dakota and South Dakota #1 yield limiting factors noted in the 2017, 2019, and 2021 surveys.

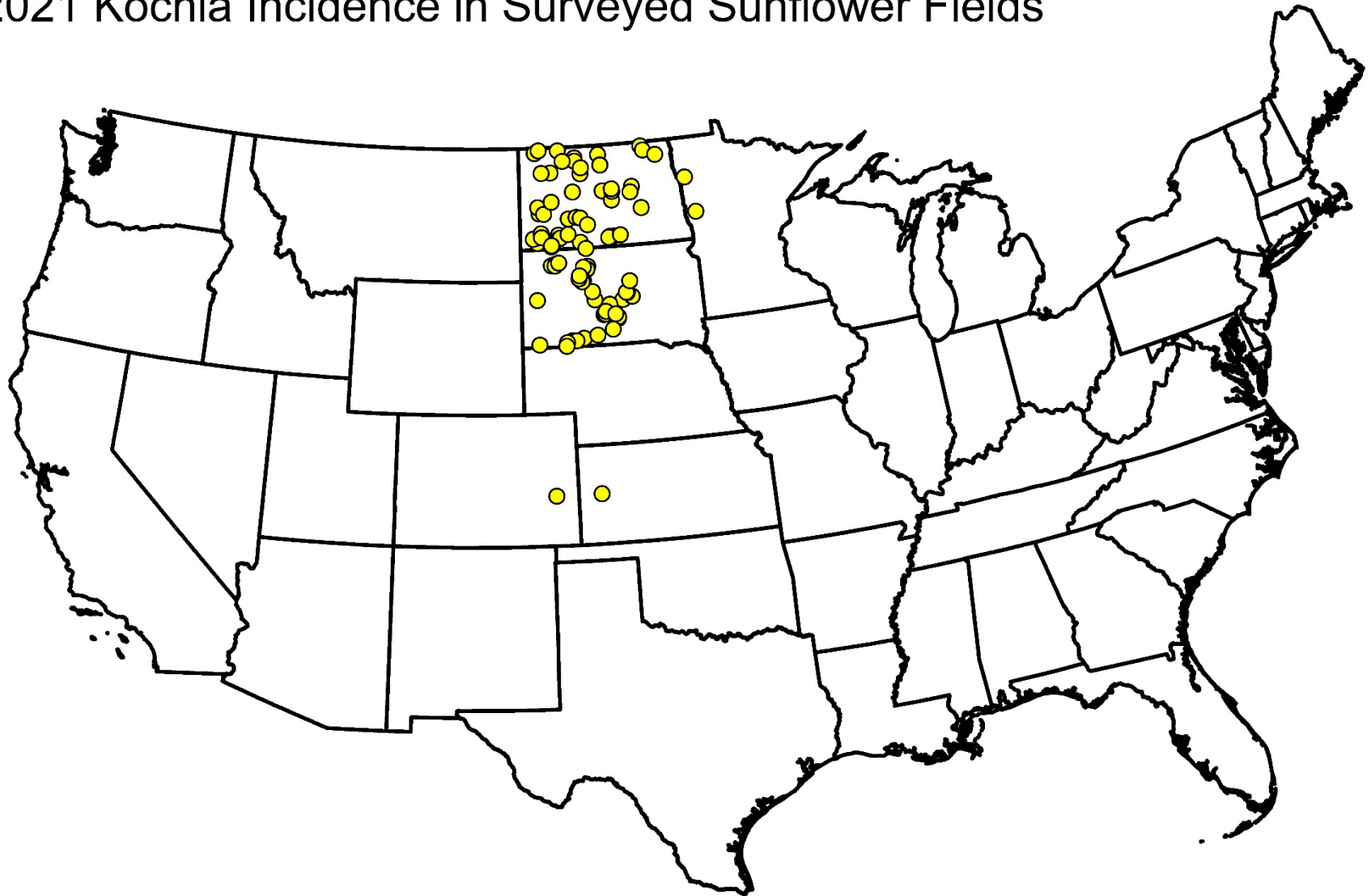
Yield Factor	North Dakota #1 limiting factor			South Dakota #1 limiting factor		
	2017	2019	2021	2017	2019	2021
	%					
Disease	17	21	6	9	21	4
Plant spacing	10	12	10	24	28	8
Lodging	3	13	3	4	3	0
Drought	32	1	47	40	0	63
Weeds	12	1	1	0	3	2
Insects	1	6	3	2	10	0
Birds	9	11	10	0	7	2
Uneven growth						
Other						
No Problem						

North Dakota and South Dakota #1 yield limiting factors noted in the 2017, 2019, and 2021 surveys.

Yield Factor	North Dakota #1 limiting factor			South Dakota #1 limiting factor		
	2017	2019	2021	2017	2019	2021
	%					
Disease	17	21	6	9	21	4
Plant spacing	10	12	10	24	28	8
Lodging	3	13	3	4	3	0
Drought	32	1	47	40	0	63
Weeds	12	1	1	0	3	2
Insects	1	6	3	2	10	0
Birds	9	11	10	0	7	2
Uneven growth	3	0	1	4	3	0
Other	6	15	1	0	0	0
No Problem	5	6	23	7	14	10

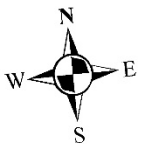
Weed Species	% Incidence
Kochia	15
Tumble Pigweed	11
Green Foxtail	8
Redroot Pigweed	5
Marestail	4
Volunteer Grain	4
Lanceleaf Sage	3
Barnyard Grass	2

2021 Kochia Incidence in Surveyed Sunflower Fields

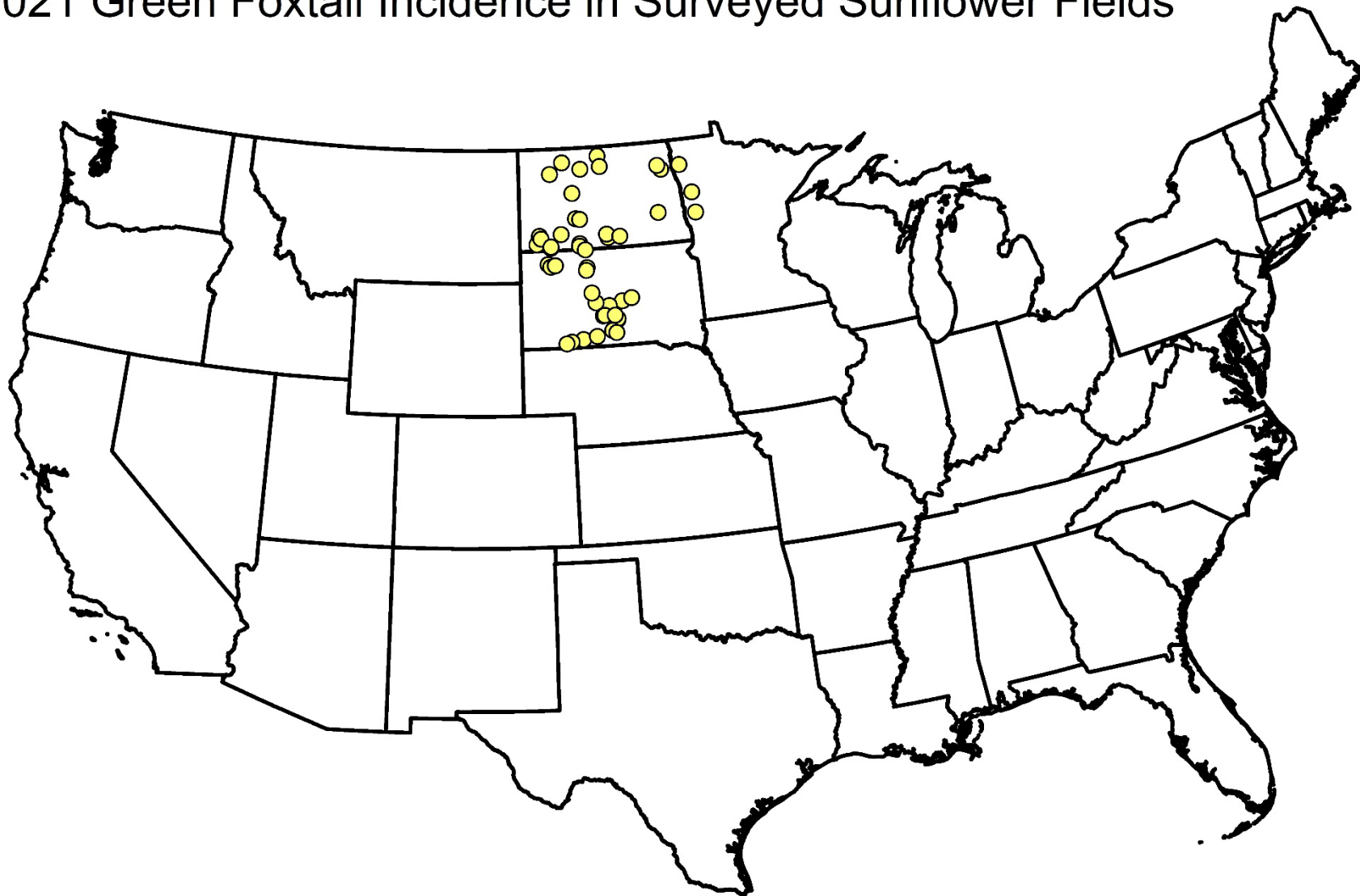


● Kochia

0 125 250 500 750 1,000 Miles

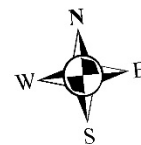


2021 Green Foxtail Incidence in Surveyed Sunflower Fields



● Green Foxtail

0 125 250 500 750 1,000 Miles



CAUSES OF LOW SOIL PH

- Parent materials
 - Granite and volcanic ash are acidic
 - Limestone and ocean sediments (shale) are alkaline
- Nitrogen fertilizer
 - $\text{CO}(\text{NH}_2)_2 + 2\text{H}_2\text{O} + \text{H}^+ \blacktriangleright \text{NH}_3 + \text{H}_2\text{O} + \text{H}^+ \blacktriangleright \text{NO}_2^- \blacktriangleright \text{NO}_3^-$

Table 1. Lime quantity required to neutralize the soil acidity produced by different N sources if all of the ammonium-N is converted to nitrate-N.

Nitrogen Source	Fertilizer Analysis	Lime Required (lb CaCO ₃ /lb N)
Anhydrous ammonia	82-0-0	1.8
Urea	46-0-0	1.8
Ammonium nitrate	34-0-0	1.8
Ammonium sulfate	21-0-0-24	5.4*
Monoammonium phosphate	11-52-0	5.4
Diammonium phosphate	18-46-0	3.6
Urea-ammonium nitrate solutions	28 to 32-0-0	1.8

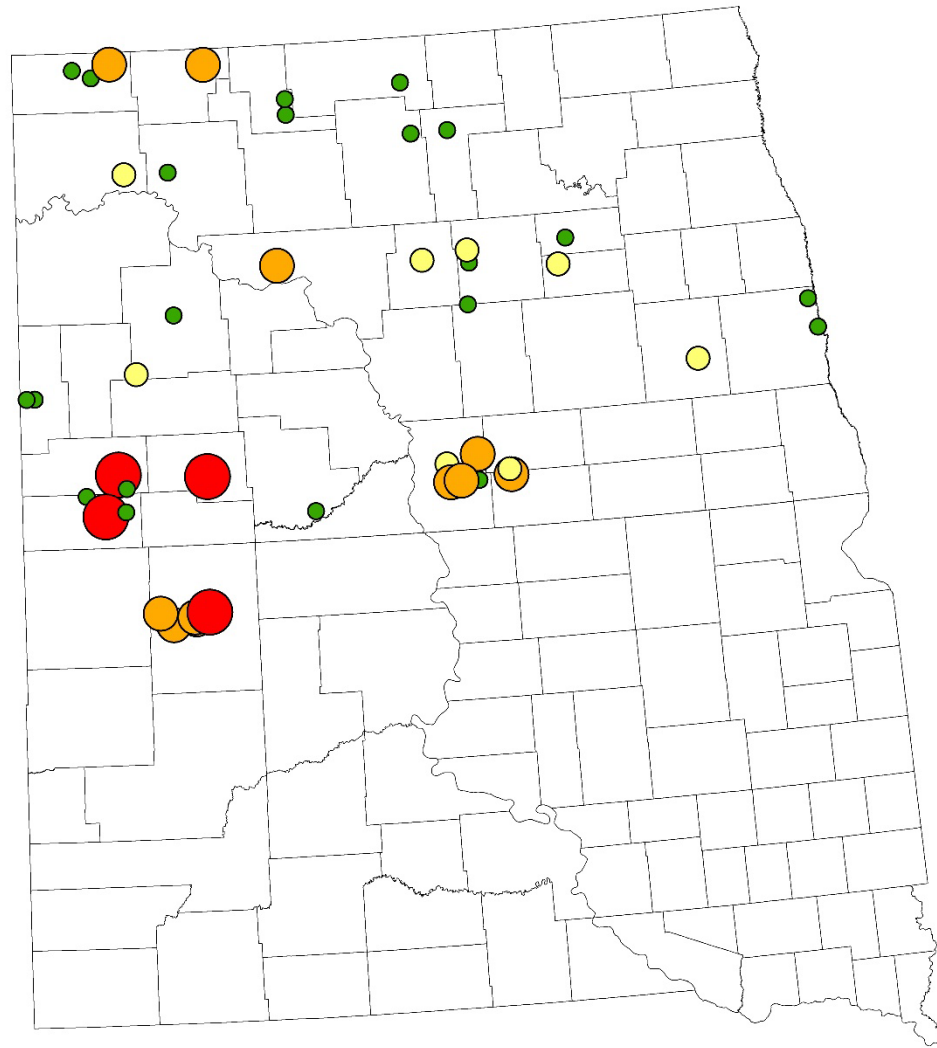
From Wortmann et al. (2015) as adapted from Havlin et al., 2005.

*The estimate for ammonium sulfate may be 50% too high (Chien et al., 2010).

HERBICIDES

- Sulfonylureas (Group 2) and Triazines (Group 5)
 - High pH->Longer herbicide persistence
 - Low pH->Shorter herbicide persistence
- Imi's (Group 2)
 - High pH->Shorter herbicide persistence
 - **Low pH->Longer herbicide persistence**
- Spartan (Group 14) and Metribuzin (Group 5)
 - High pH->More active, more crop injury
 - Low pH->Less active, less crop injury

Sunflower Samples: North and South Dakota

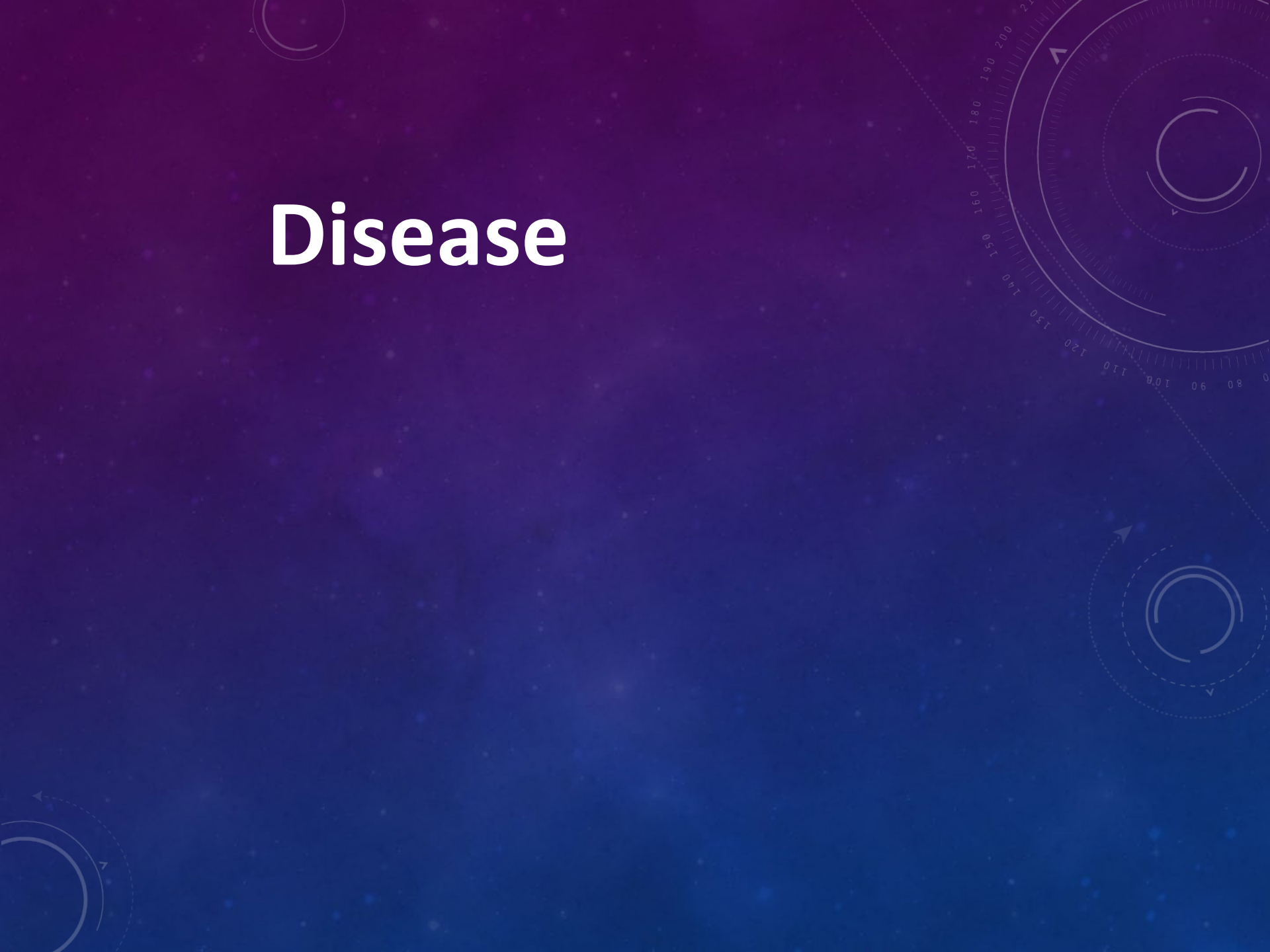


0-3" pH ● 3.90 - 4.90 ● 4.91 - 5.50 ● 5.51 - 5.90 ● 5.91 - 7.20

0 15 30 60 90 120
Miles

County	pH 0-3"	Estimated yield
Bowman	6.2	673
Bowman	4.7	1004
Bowman	7.1	2317
Slope	3.9	1456
Slope	6.8	1348
Perkins	5.1	1220
Perkins	5	2646
Perkins	4.6	868
Hettinger	4.3	1364
Burke	5.1	1839
Emmons	5.3	1181
Emmons	6.1	2134

Disease



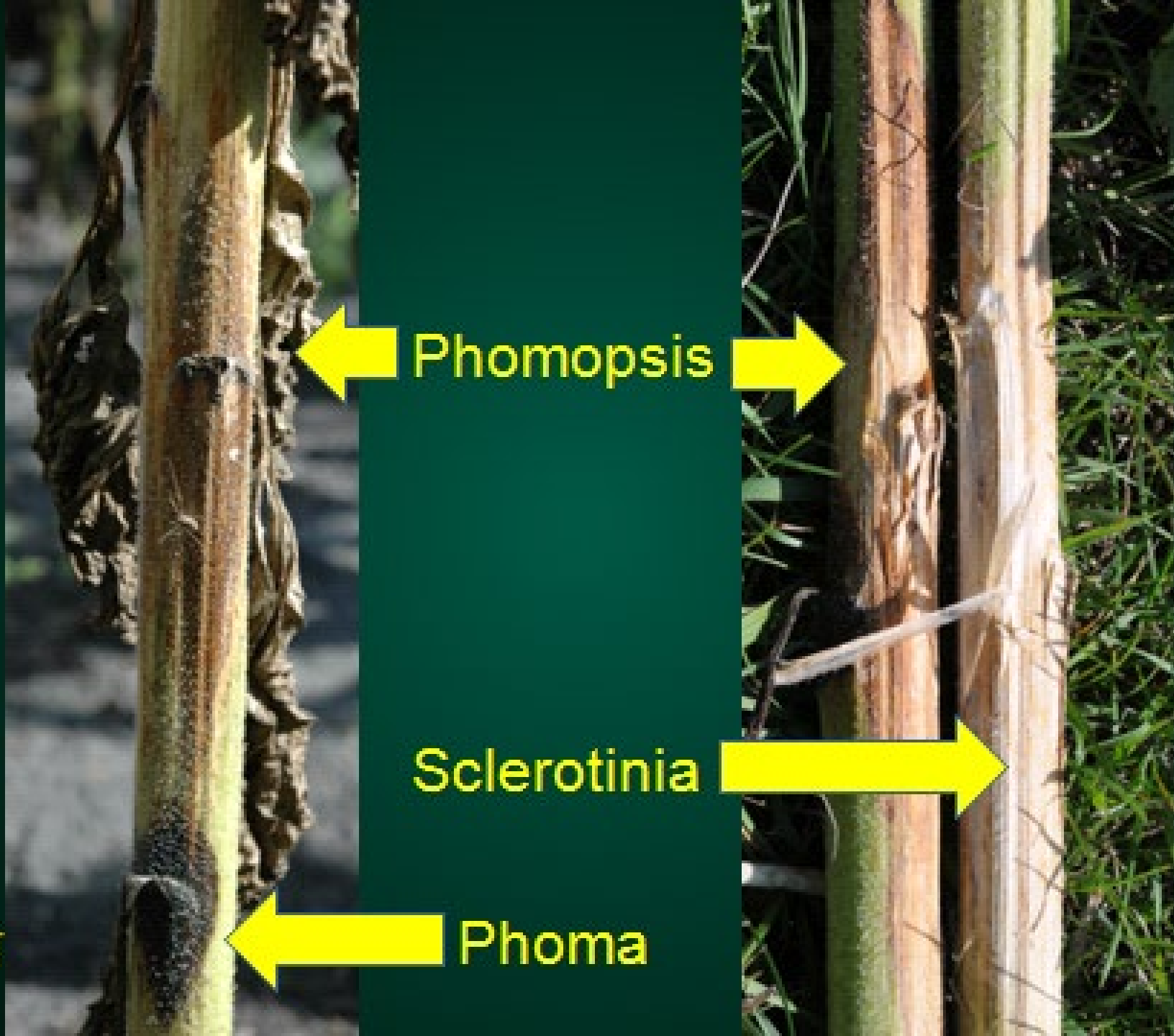


N

Phomopsis

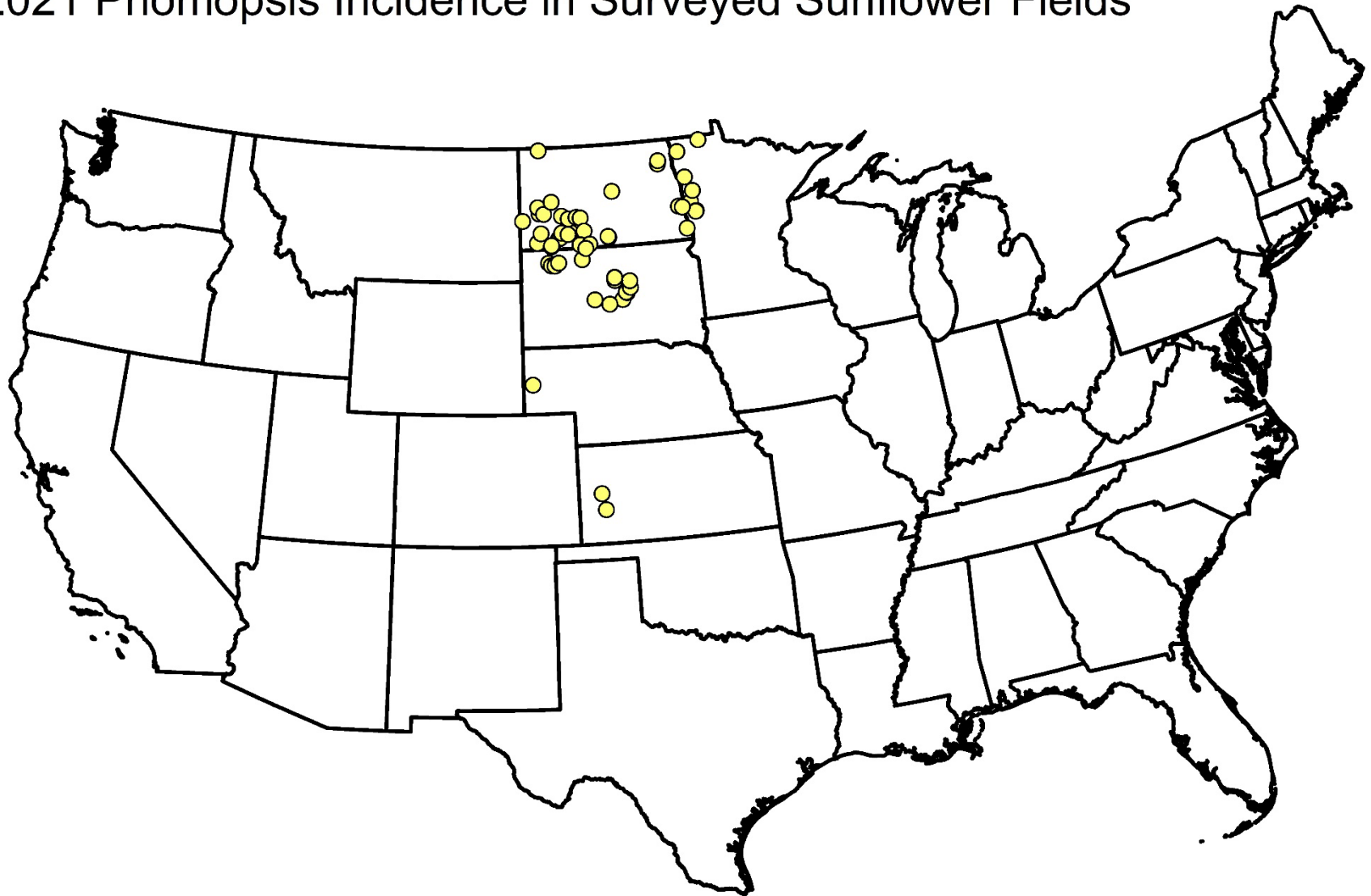
Sclerotinia

Phoma



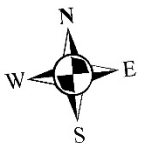
Disease	% Incidence
Phoma	55
Phomopsis	37
Sclerotinia	20
Rhizopus	17
Rust	8
Verticilium	3
Charcoal Rot	1

2021 Phomopsis Incidence in Surveyed Sunflower Fields

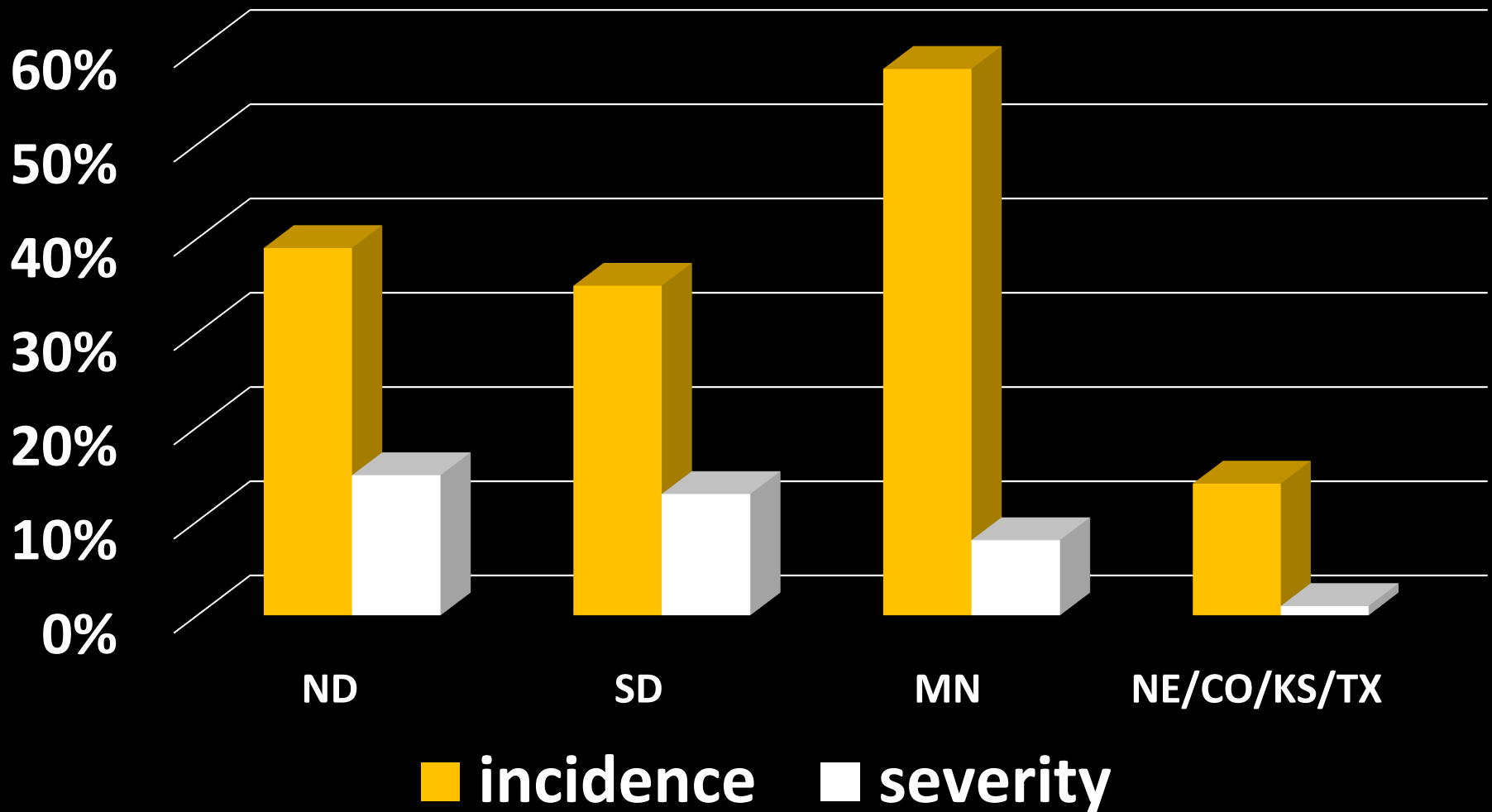


● Phomopsis

0 125 250 500 750 1,000 Miles



2021 Phomopsis



Received stalks for Phomopsis survey from 60+ locations

- Roughly 300+ stalks from five states
 - MN, ND, SD, NE and CO
- In 2019 we received stalks from 25 fields only

***2021 SUNFLOWER SURVEY
SPONSORED BY THE***

NATIONAL SUNFLOWER ASSOCIATION





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