

USA
Sunflower Survey



Partnership of
University, USDA & Industry

2017
NATIONAL
SUNFLOWER
ASSOCIATION
SURVEY

Project Leaders:

Tom Gulya, Retired Plant Pathologist ARS

Ryan Buetow, Extension Agronomist, Dickinson

Hans Kandel, Extension Agronomist

NDSU Plant Science Department

USA Sunflower Survey



*Partnership of
University, USDA & Industry*

Yield and Management Practices

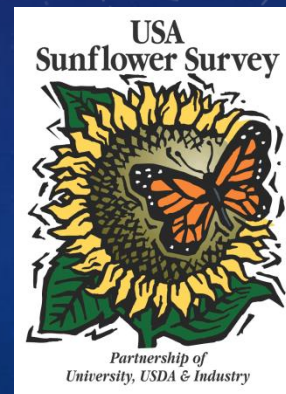
Ryan Buetow, Extension Agronomist, Dickinson

2017 SUNFLOWER SURVEY - # FIELDS

- North Dakota - 78
- Minnesota - 8
- South Dakota - 55
- Kansas - 5
- Colorado - 9
- Nebraska - 6
- Manitoba - 6
- Texas - 5



TOTAL - 172



2017 SUNFLOWER SURVEY TEAMS

- North Dakota 14 teams
- South Dakota 6 teams
- Minnesota 1 team
- Colorado 1 team
- Kansas 1 team
- Nebraska 1 team
- Texas 1 team
- Manitoba 1 team
- Texas 1 team

Total

27 teams





SURVEY FORMAT

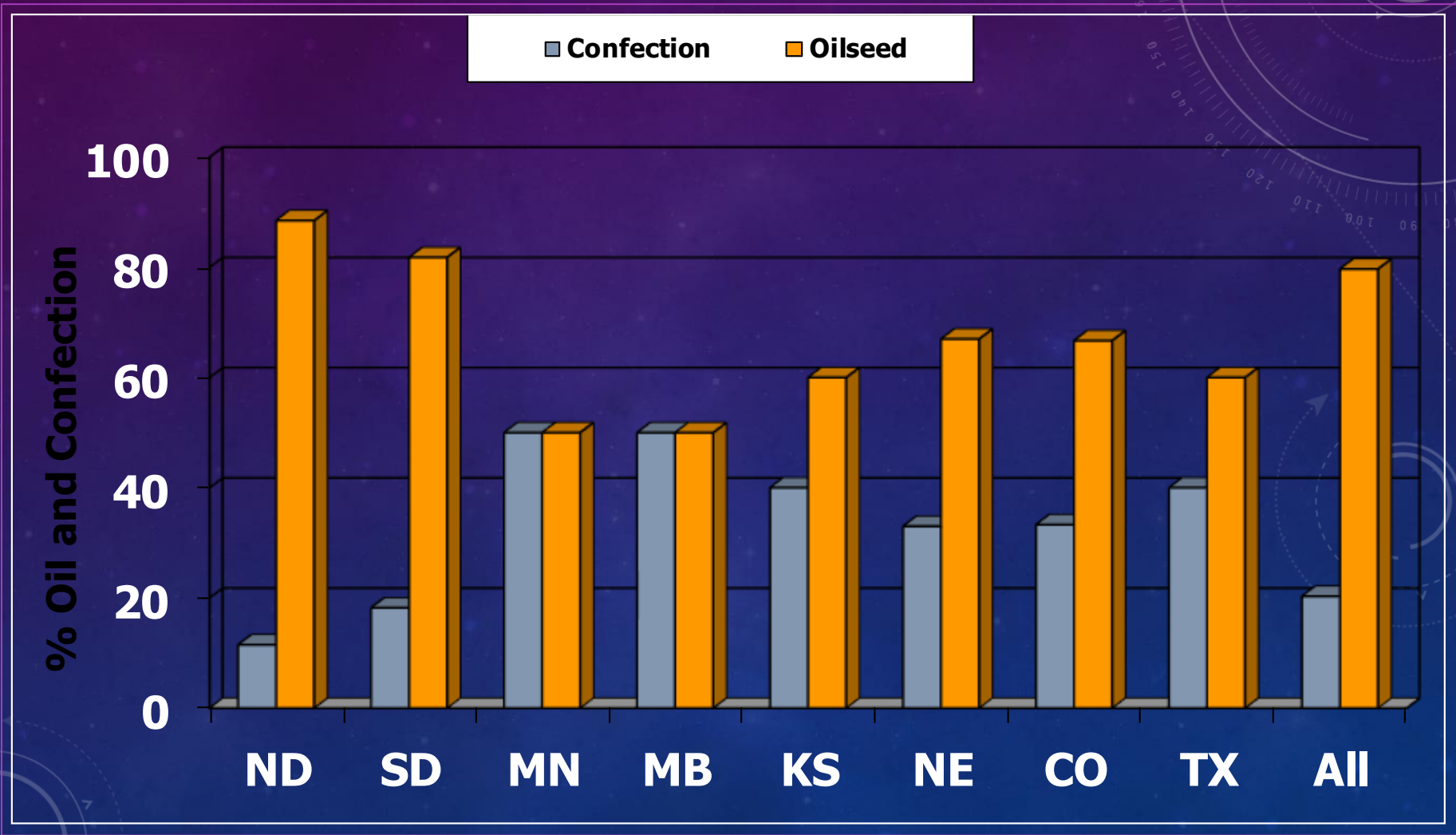
1. **Yield components** (Plant population, head diameter, seed seed, % good seed, % center set, bird damage) = six components
2. **Agronomic info** (eight components)
3. **Weed assessment** (30 weeds)
4. **Diseases** - incidence and severity on 10 diseases
5. **Insect and bird damage** = In-field assessment 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

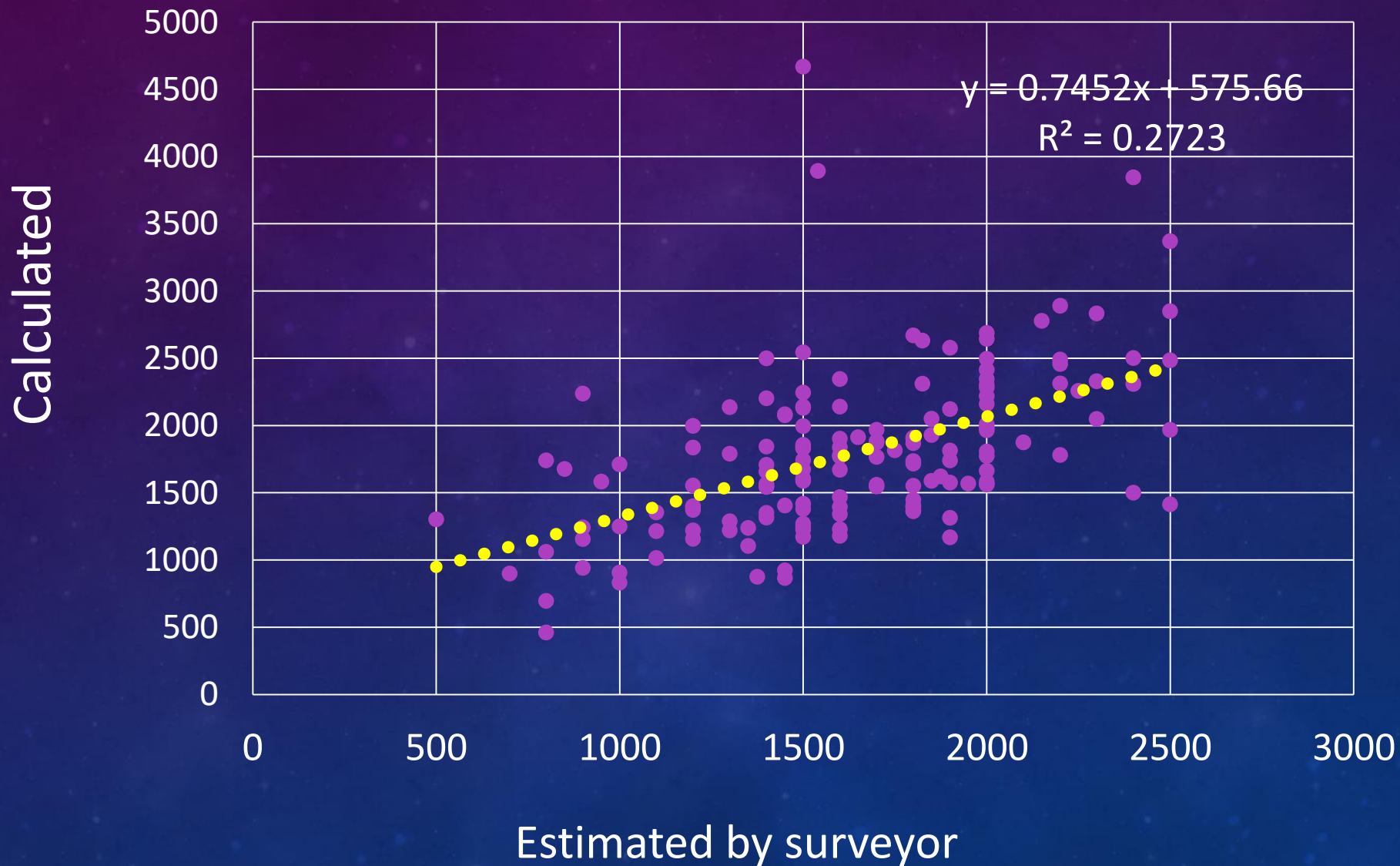
fields = **26,000 data points in one survey**

14 surveys = > 325,000 pieces of data

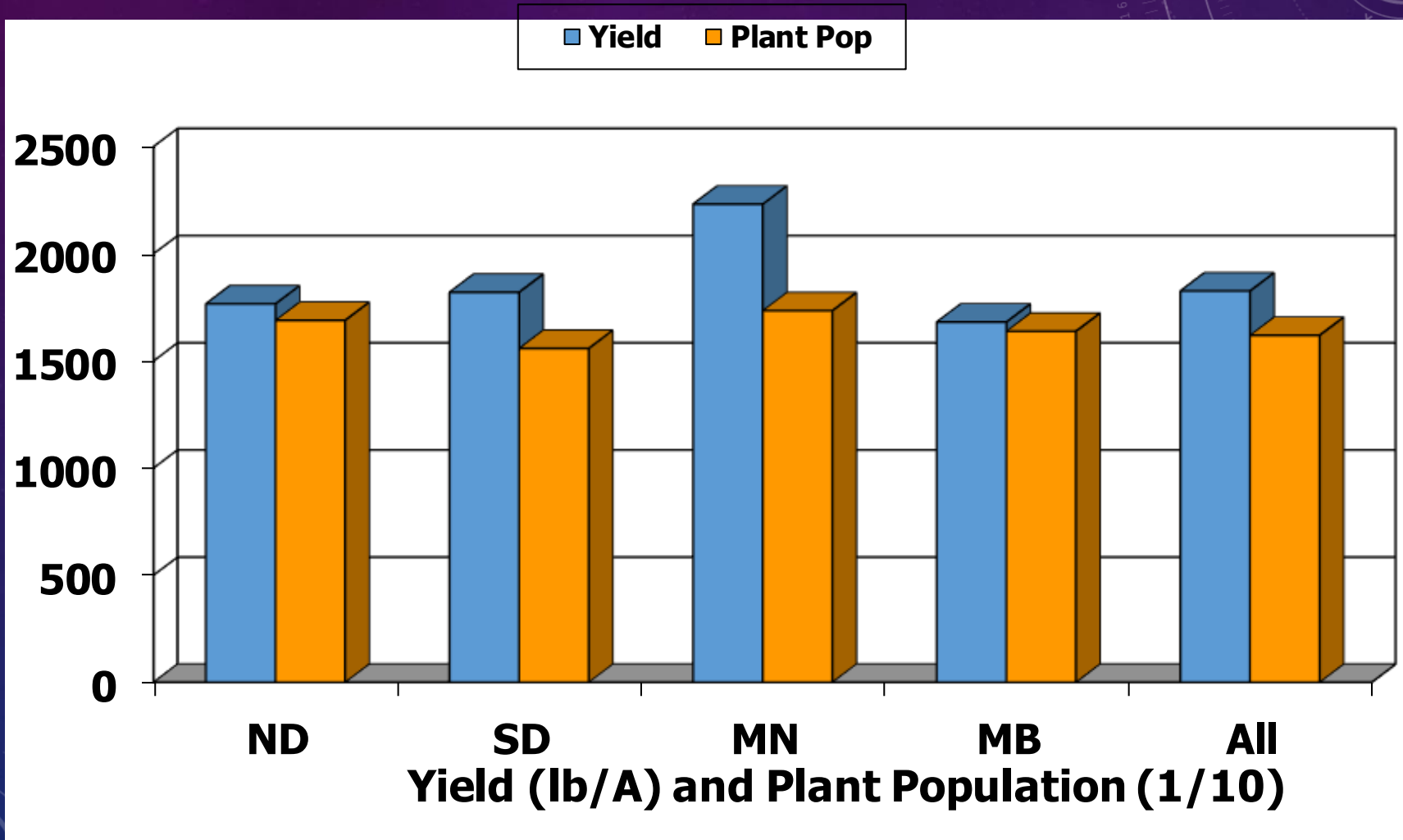
CONFECTION VS OILSEED (%) SUNFLOWER 2017 SURVEY



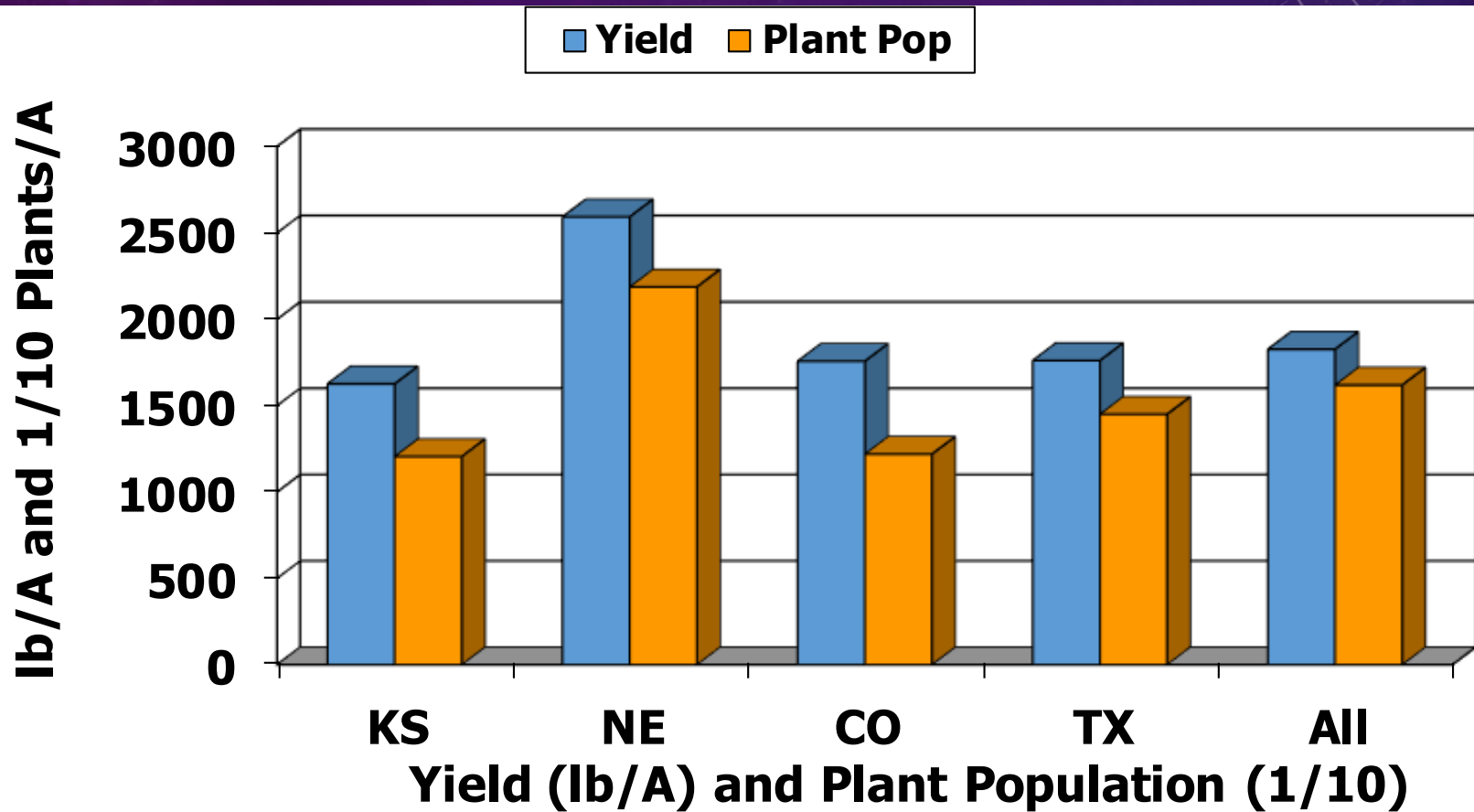
2017 SURVEYOR ESTIMATED & CALCULATED YIELD



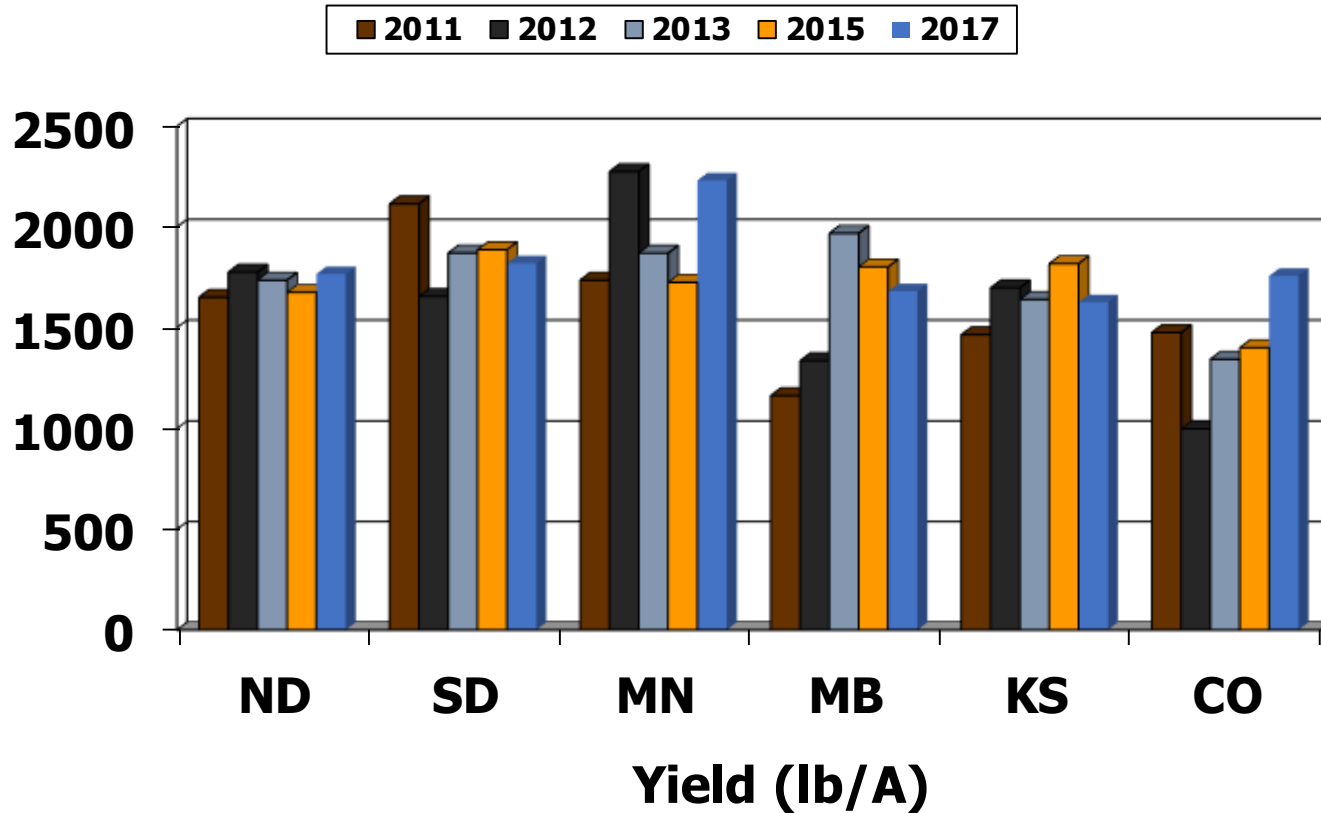
SUNFLOWER YIELD & PLANT POPULATION: 2017



SUNFLOWER YIELD & PLANT POPULATION: 2017



SUNFLOWER YIELD (LB/A) 2011-2017



2013 #1 YIELD LIMITING FACTORS (209 FIELDS)

- **Disease** 17%
- **Plant spacing in row** 26%
- **Lodging** 10%
- **Weeds** 4%
- **Birds** 6%
- **Insects** 1%
- **Drought** 15%
- **Hail** 1%
- **Uneven plant growth** 2%
- **Other** 7%
- **No Problem** 11%



2015 #1 YIELD LIMITING FACTORS (201 FIELDS)

- **Disease** 24 %
- **Plant spacing in row** 13 %
- Lodging 8 %
- Weeds 8 %
- Birds 7 %
- Insects 4 %
- **Drought** 11 %
- Uneven plant growth 4 %
- Other 9 %
- **No Problem** 11 %



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 %

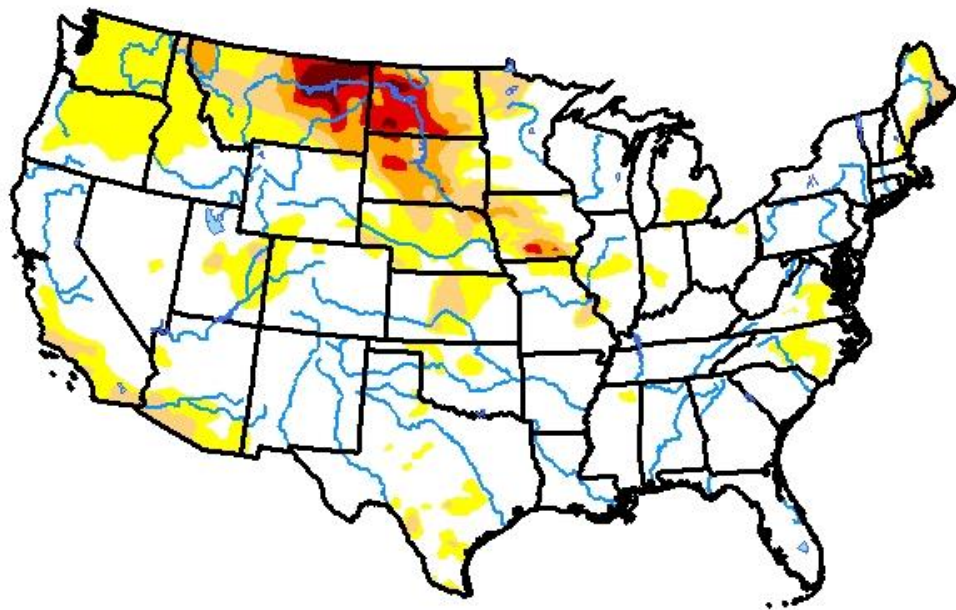


U.S. Drought Monitor Continental U.S. (CONUS)

August 15, 2017
(Released Thursday, Aug. 17, 2017)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	71.95	28.05	11.31	5.33	2.45	0.70
Last Week <i>08-08-2017</i>	70.23	29.77	11.24	5.38	2.37	0.76
3 Months Ago <i>05-16-2017</i>	83.42	16.58	5.61	1.38	0.43	0.00
Start of Calendar Year <i>01-03-2017</i>	53.89	46.11	22.53	8.63	3.15	0.96
Start of Water Year <i>09-27-2016</i>	53.60	46.40	18.96	8.10	3.20	1.16
One Year Ago <i>08-16-2016</i>	52.72	47.28	19.86	7.71	2.91	1.11



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

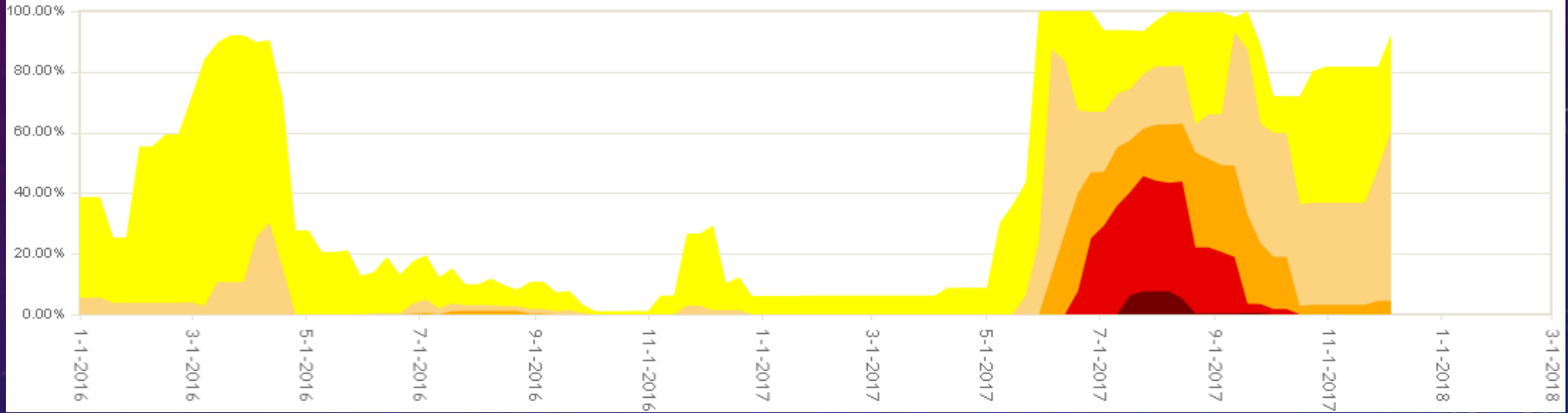
Author:

Jessica Blunden
NCEI/NOAA



<http://droughtmonitor.unl.edu/>

North Dakota Percent Area





PLANT SPACING WITHIN ROW



2015 #2 YIELD LIMITING FACTORS – (ALL 201 FIELDS)

- **Disease** 13 %
- Plant spacing in row 9 %
- Lodging 9 %
- Weeds 9 %
- Birds 5 %
- Insects 5 %
- Drought 4 %
- Hail 2 %
- Uneven plant growth 1 %
- Other 6 %
- **No Problem** 37 %



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 %



2015 #1 YIELD LIMITING FACTORS - NORTH DAKOTA (106 FIELDS)

- **Disease** 24 %
- **Plant spacing** 10 %
- **Lodging** 12 %
- Weeds 2 %
- Birds 8 %
- Insects 3 %
- **Drought** 10 %
- Hail 0%
- Uneven plant growth 2 %
- **Other** 15 %
- **No Problem** 13 %



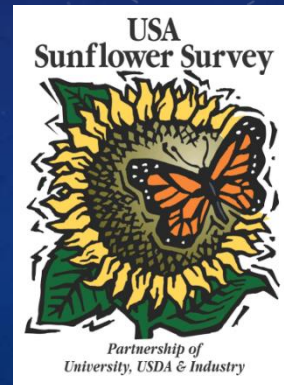
2017 #1 YIELD LIMITING FACTORS - NORTH DAKOTA (78 FIELDS)

- **Disease** 17 %
- **Plant spacing** 10 %
- **Lodging** 3%
- Weeds 12%
- Birds 9 %
- Insects 1 %
- **Drought** 32 %
- Hail 3%
- Uneven plant growth 3 %
- **Other** 6 %
- **No Problem** 5 %



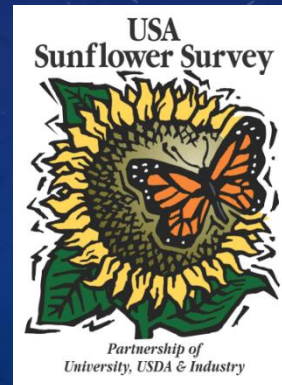
2015 #2 YIELD LIMITING FACTORS - NORTH DAKOTA (106 FIELDS)

- **Disease** 10 %
- Plant spacing 6 %
- **Lodging** 11 %
- Drought 3 %
- Weeds 6 %
- Insects 4 %
- Birds 4 %
- Uneven plant growth 2 %
- Other 8 %
- **No Problem** 47 %



2017 #2 YIELD LIMITING FACTORS - NORTH DAKOTA (78 FIELDS)

- **Disease** 10 %
- Plant spacing 18 %
- **Lodging** 4 %
- Drought 10 %
- Weeds 6 %
- Insects 3 %
- Birds 4 %
- Uneven plant growth 8 %
- Other 10 %
- **No Problem** 22 %





2015 # 1 AND #2

YIELD LIMITING FACTORS SOUTH DAKOTA (52 FIELDS)



#1 Factor

- **Disease** 21 %
- **Plant Spacing** 23 %
- Lodging 4 %
- **Weeds** 15 %
- Birds 6 %
- Insects 8 %
- Drought 8 %
- Hail 0%
- Uneven growth 10 %
- No problem 6 %

#2 Factor

- **Disease** 15 %
- **Plant spacing** 13 %
- Lodging 8 %
- Weeds 4 %
- Birds 0%
- Insects 10 %
- Drought 8 %
- Hail 4 %
- Uneven growth 2 %
- **No Problem** 25 %

2017 # 1 AND #2

YIELD LIMITING FACTORS SOUTH DAKOTA (55 FIELDS)



#1 Factor

- **Disease** 9 %
- **Plant Spacing** 24 %
- Lodging 4 %
- **Weeds** 0 %
- Birds 0 %
- Insects 2 %
- Drought 40 %
- Hail 4 %
- Uneven growth 4 %
- No problem 7 %

#2 Factor

- **Disease** 6 %
- **Plant spacing** 18 %
- Lodging 7 %
- Weeds 6 %
- Birds 0%
- Insects 6 %
- Drought 13 %
- Hail 7 %
- Uneven growth 6 %
- **No Problem** 29 %

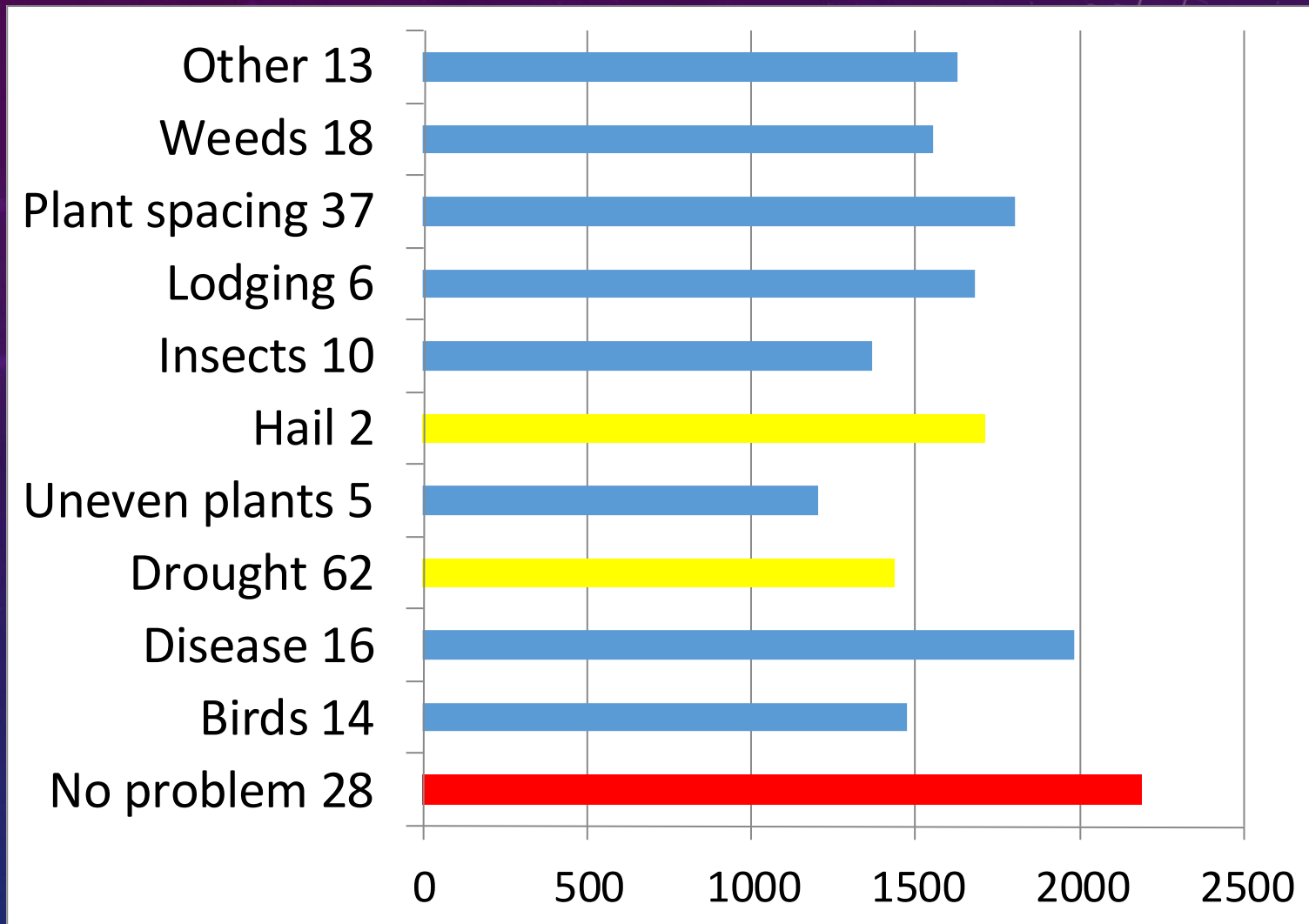
Most # 1 Limiting Factors 2011 - 2017

Sunflower Surveys

	2011	2012	2013	2015	2017	5 yr AV.
Plant Spacing	18	18	26	13	32	21
Diseases	18	7	17	24	19	17
Drought	8	29	15	11	53	23
No Problem	14	13	11	11	16	13
Weeds	8	8	4	8	13	8

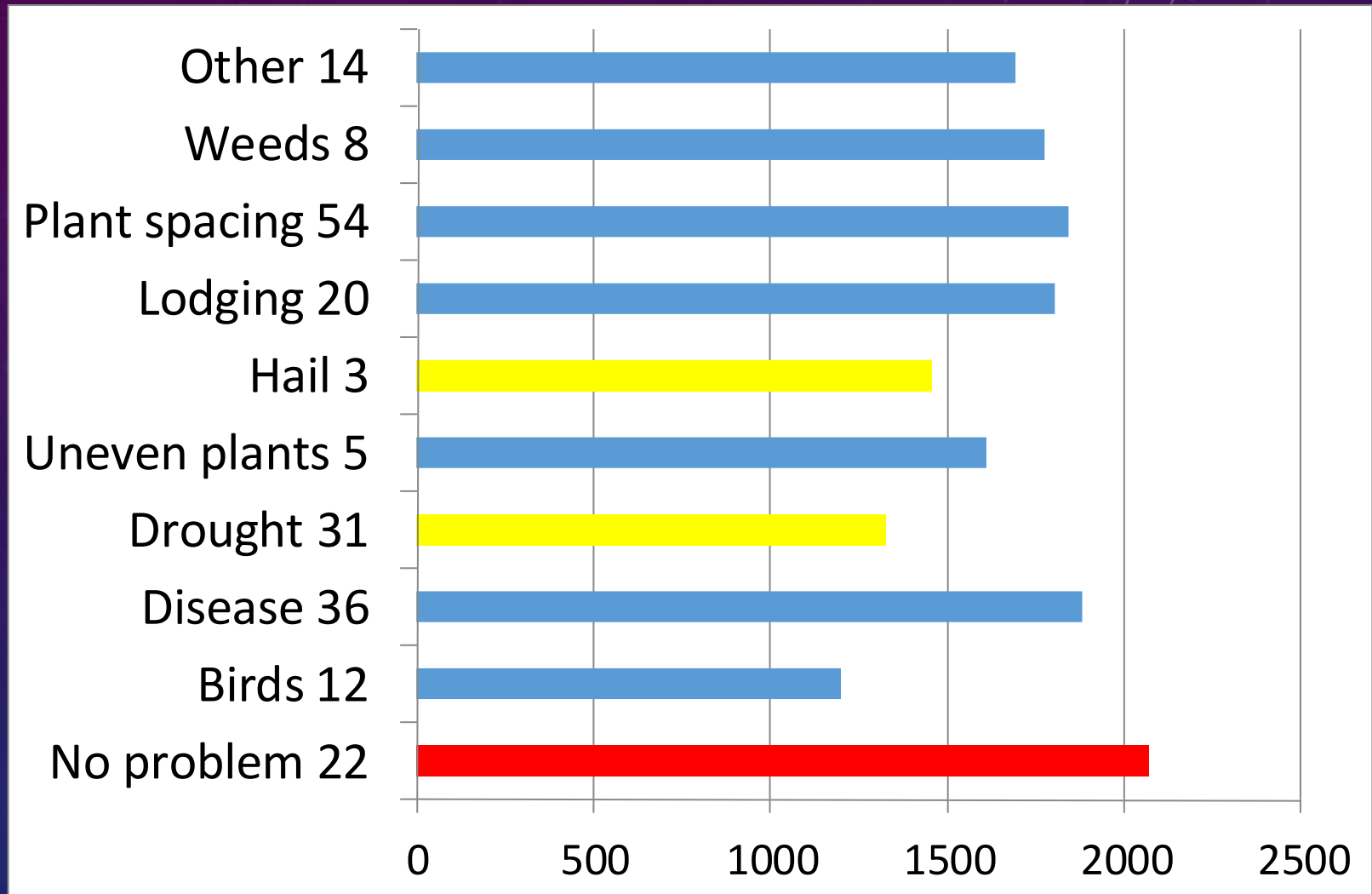
¹Based on 155 fields in 2011, 211 (2012), 209 (2013), 201 (2015) and 172 (2017) = 948 total over five years.

YIELD LIMITING FACTOR AND YIELD 2012



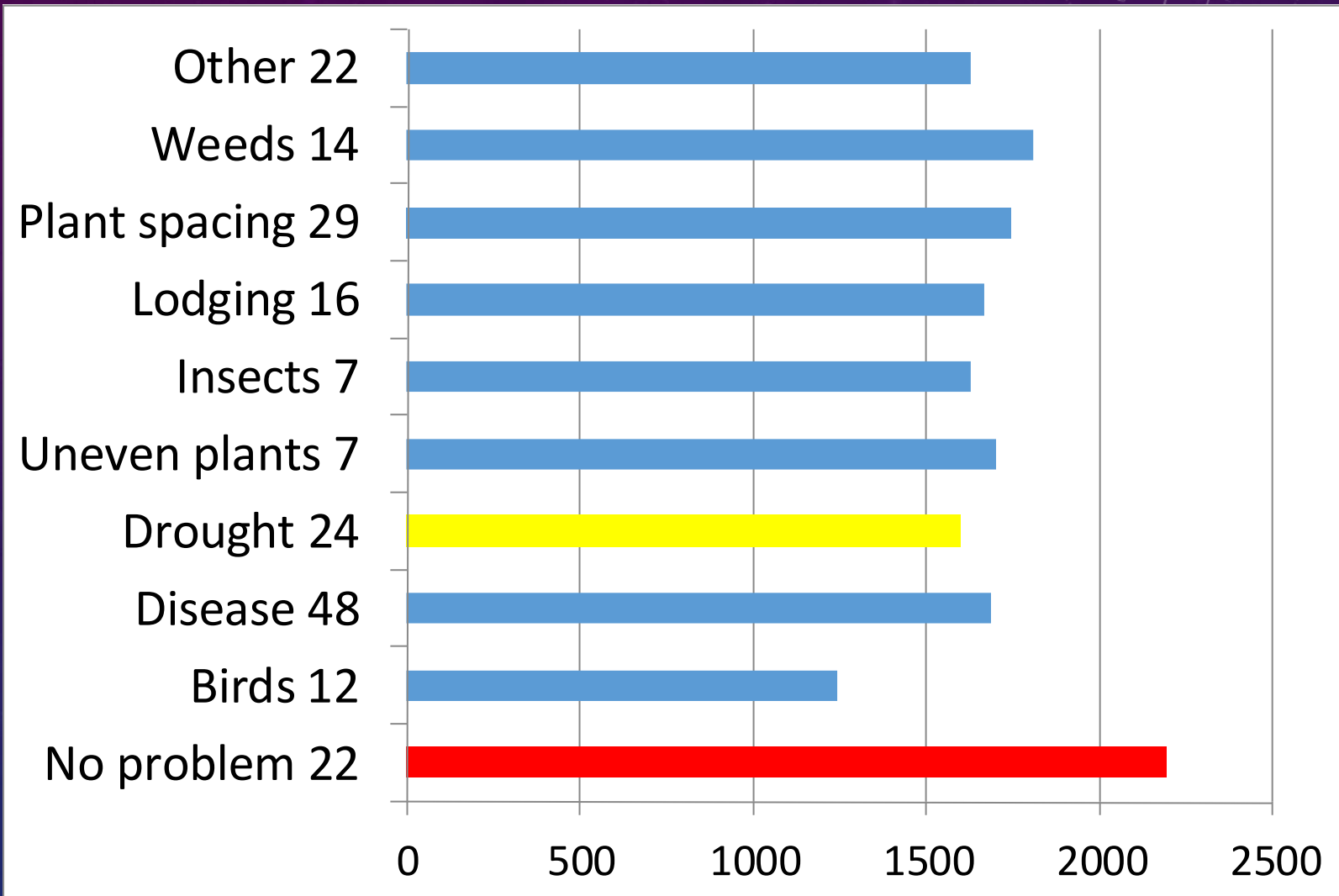
“No Problem” yield = 2188 #/A. Average of all other problems = 1524 #/A or -30%.

YIELD LIMITING FACTOR AND YIELD 2013



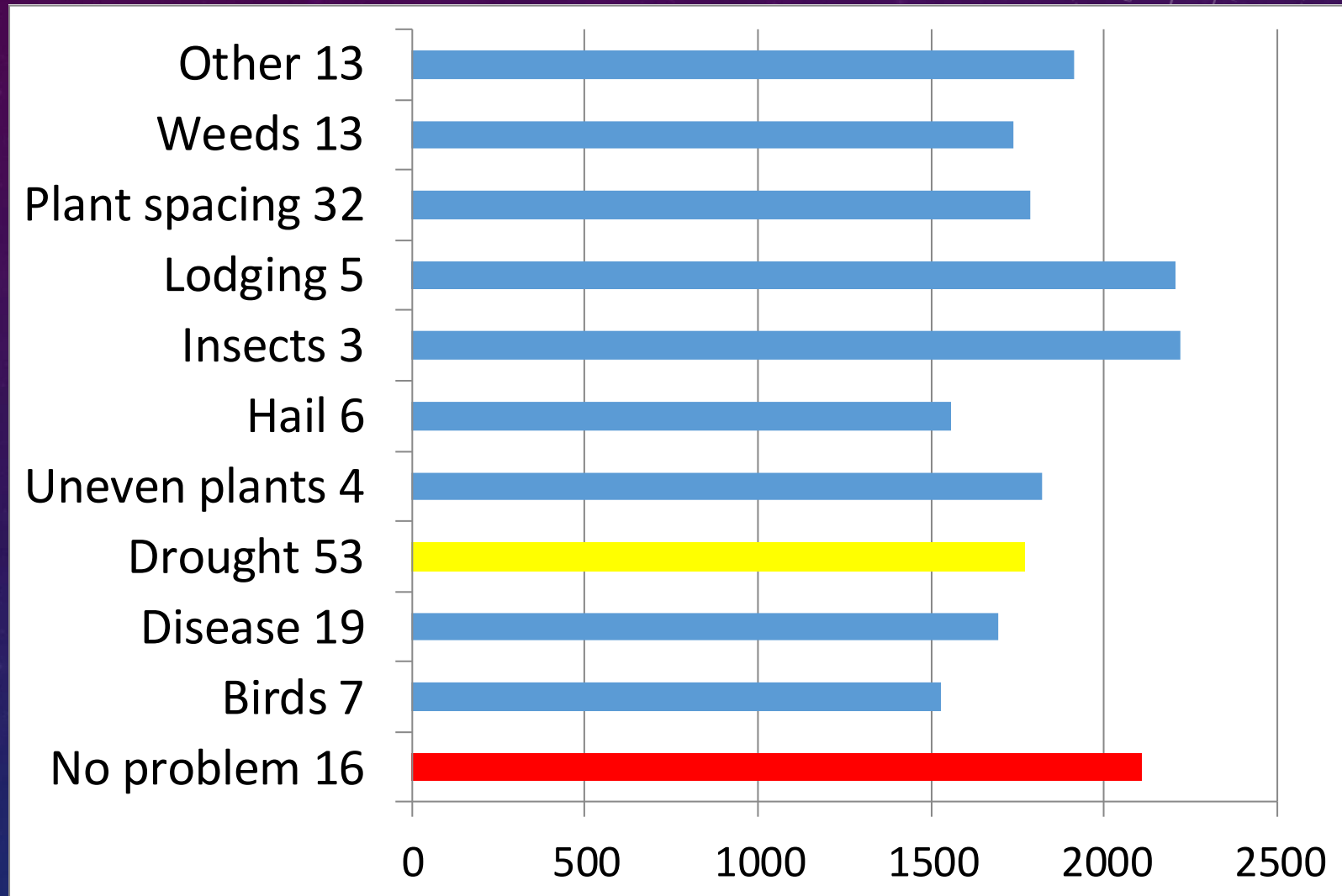
“No Problem” yield = 2070 #/A. Average all other problems = 1607 #/A or -22% yield.

YIELD LIMITING FACTOR AND YIELD 2015



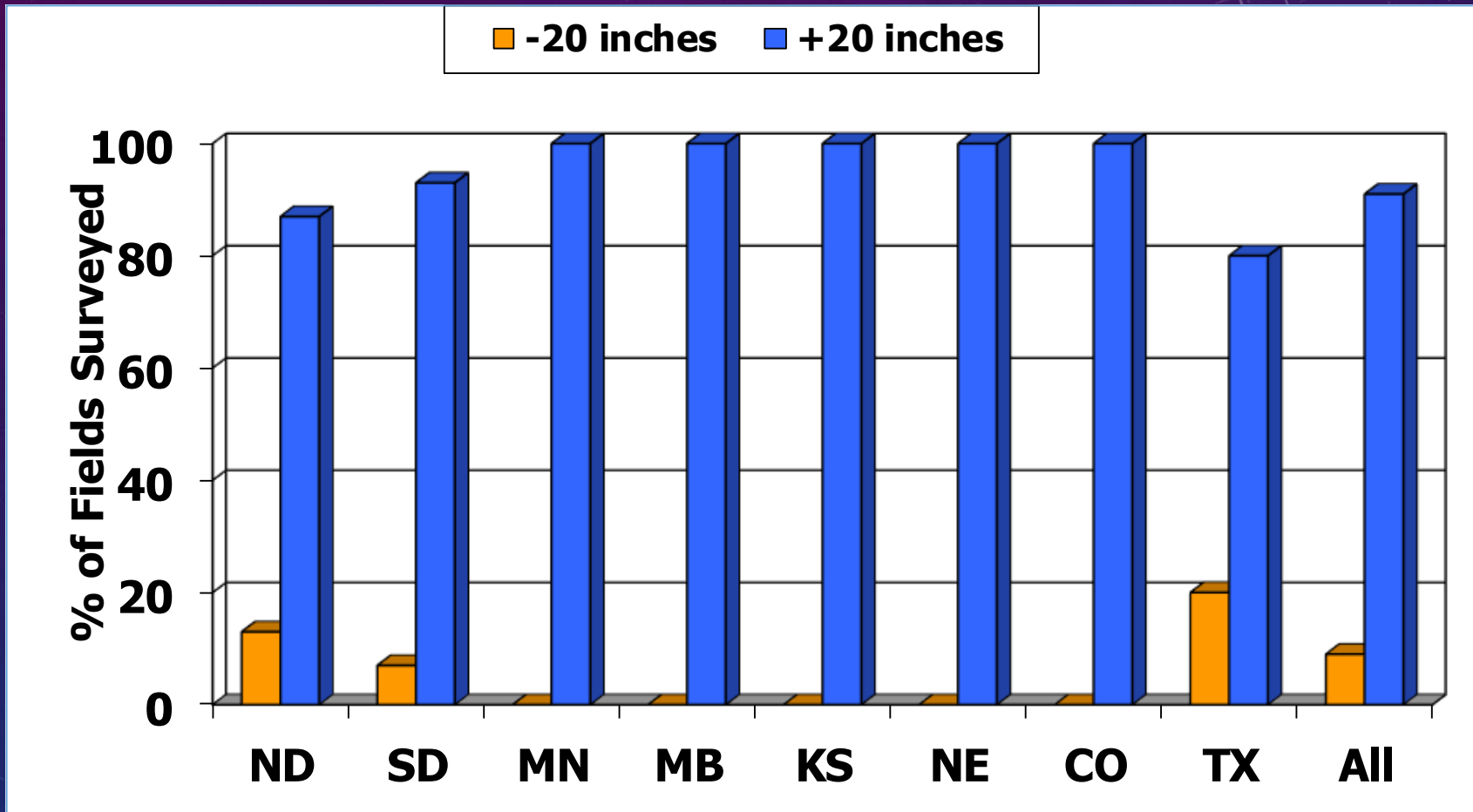
"No Problem" Yield = 2193 #/A. Average all other problems = 1634 #/A or -25%.

YIELD LIMITING FACTOR AND YIELD 2017

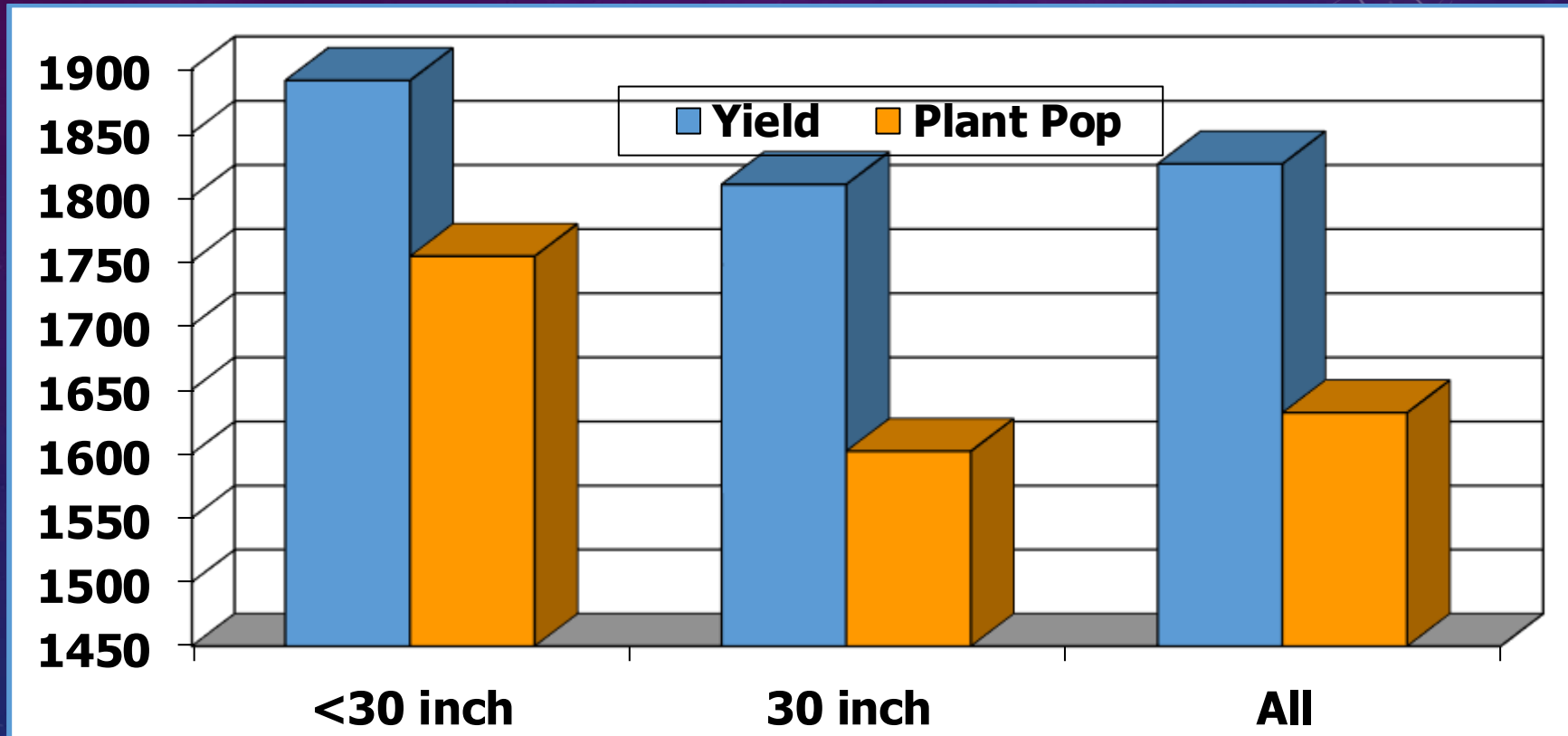


“No Problem” Yield = 2110 #/A. Average all other problems = 1778 #/A or -16%.

ROW SPACING IN SUNFLOWER - 2017

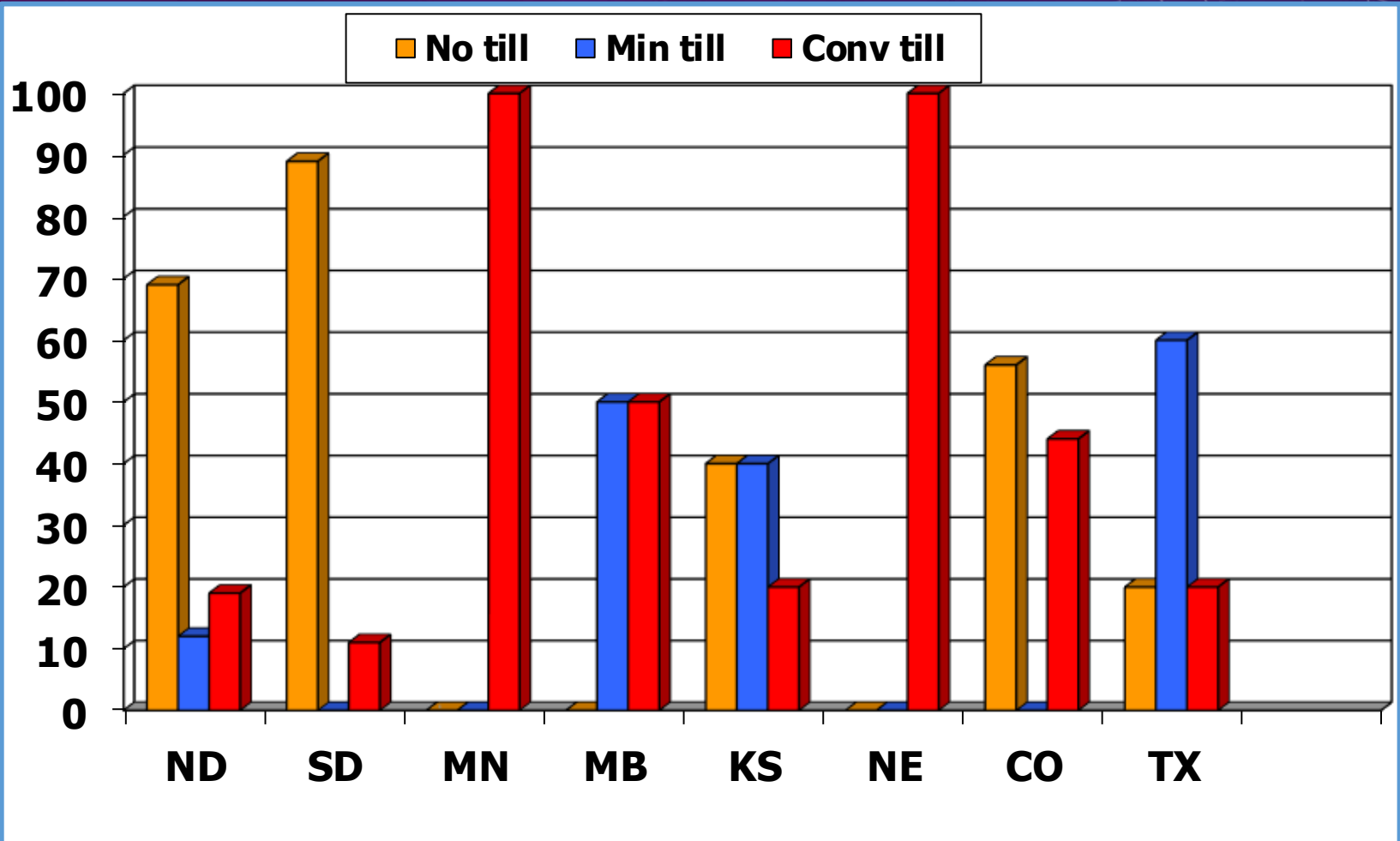


2017 SUNFLOWER YIELD & PLANT POPULATION WITH ROW SPACING

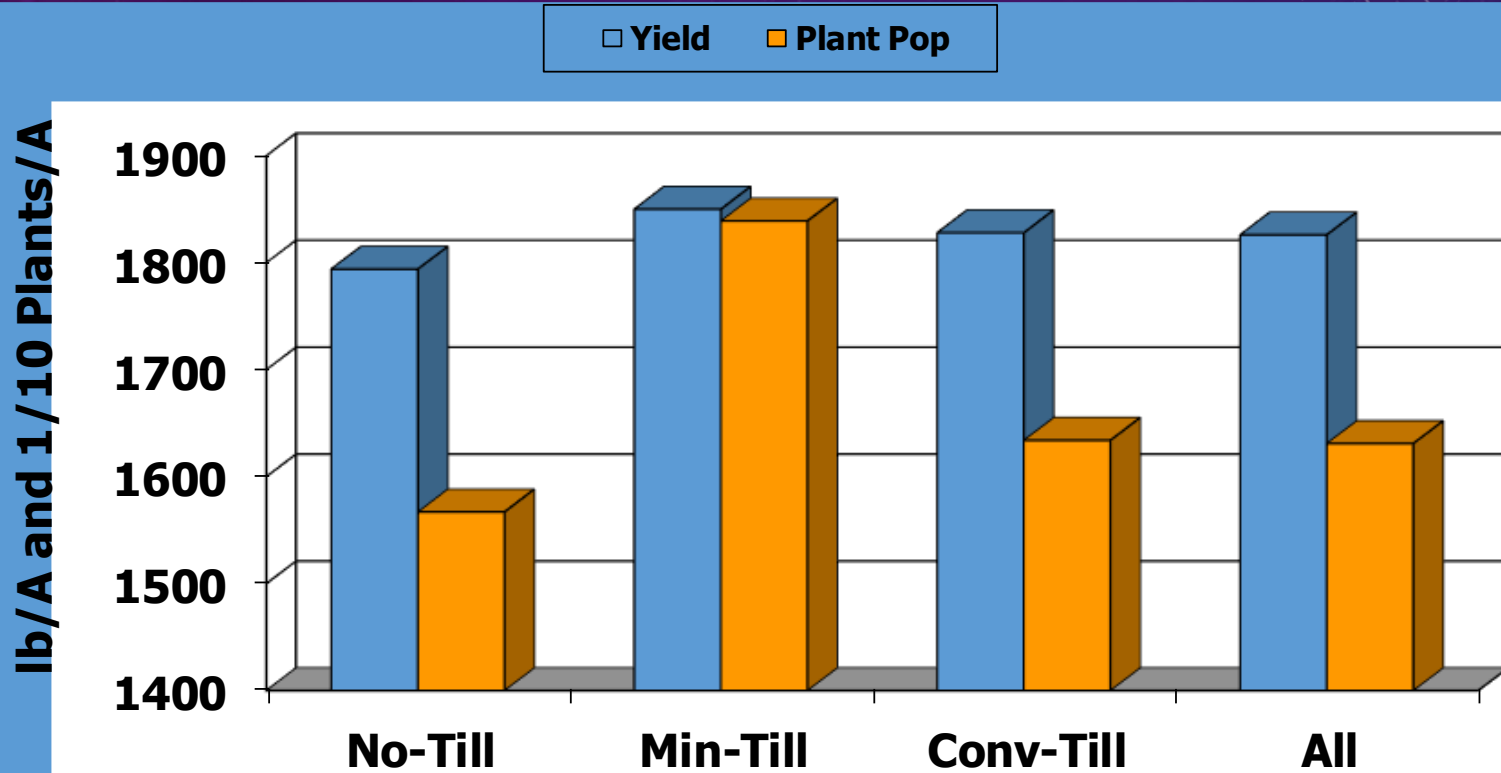


TILLAGE IN SUNFLOWER - 2017

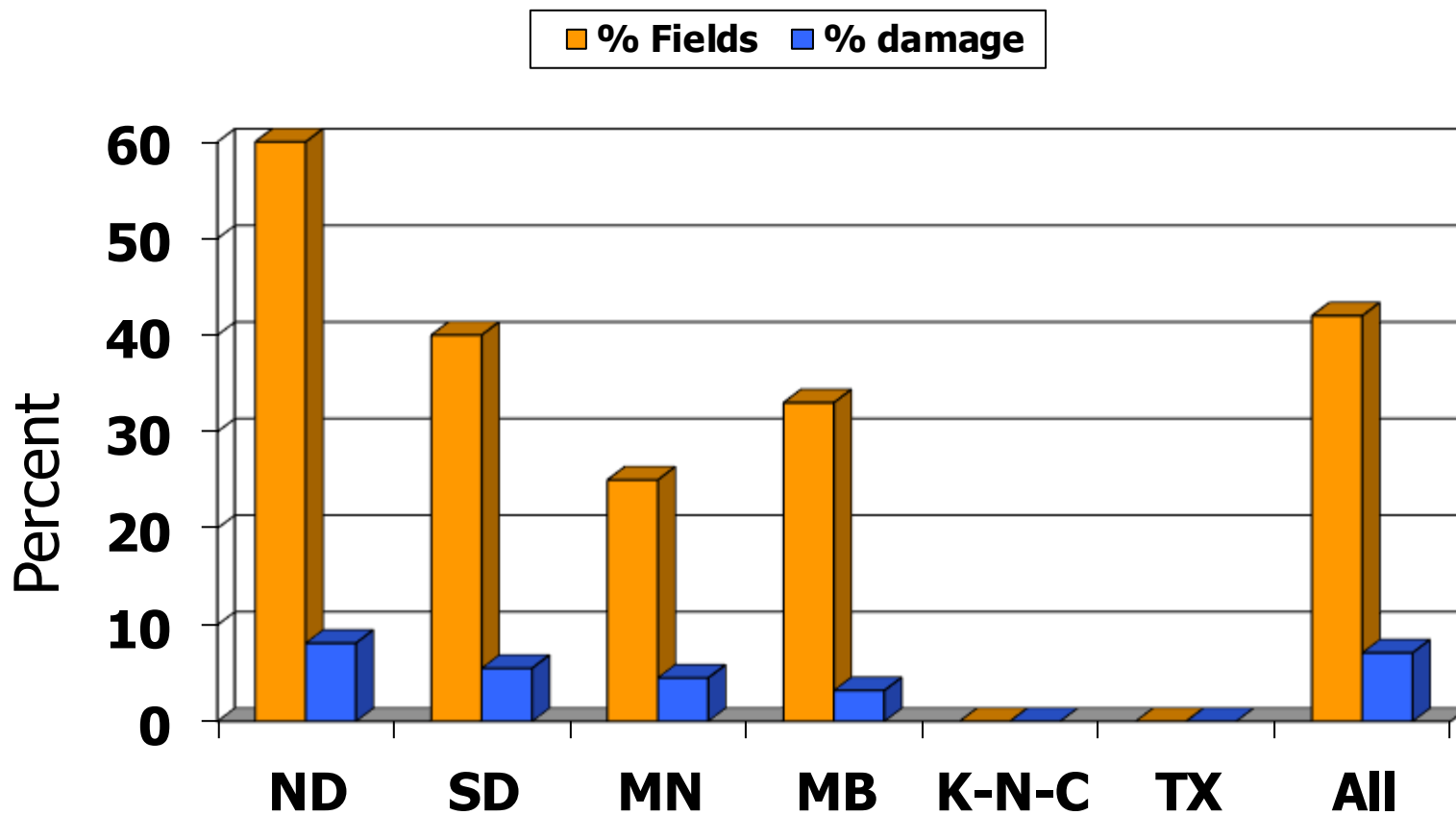
% Fields Surveyed



2017 SUNFLOWER YIELD AND PLANT POPULATION VS TILLAGE



BIRD DAMAGE INCIDENCE AND SEVERITY IN SUNFLOWER 2017



The background features a dark blue gradient with several circular gauges and scales. The gauges have white outlines and some have numbers like 160, 170, 190, 200, 210, 220, 230, 240, 250, and 260. There are also some dashed lines and arrows pointing in various directions.

DISEASE EVALUATIONS ***2017***

TOM GULYA – USDA (RETIRED)

FEBINA MATHEW - SDSU

Diseases Evaluated

- Sclerotinia Wilt
- Sclerotinia Mid-Stem Rot
- Sclerotinia Head Rot
- Rhizopus Head Rot
- Phomopsis Canker
- Rust
- Phoma Black Stem
- Downy Mildew
- Verticillium Wilt
- Charcoal Rot

GOOD NEWS – MOST DISEASES LOWER IN 2017

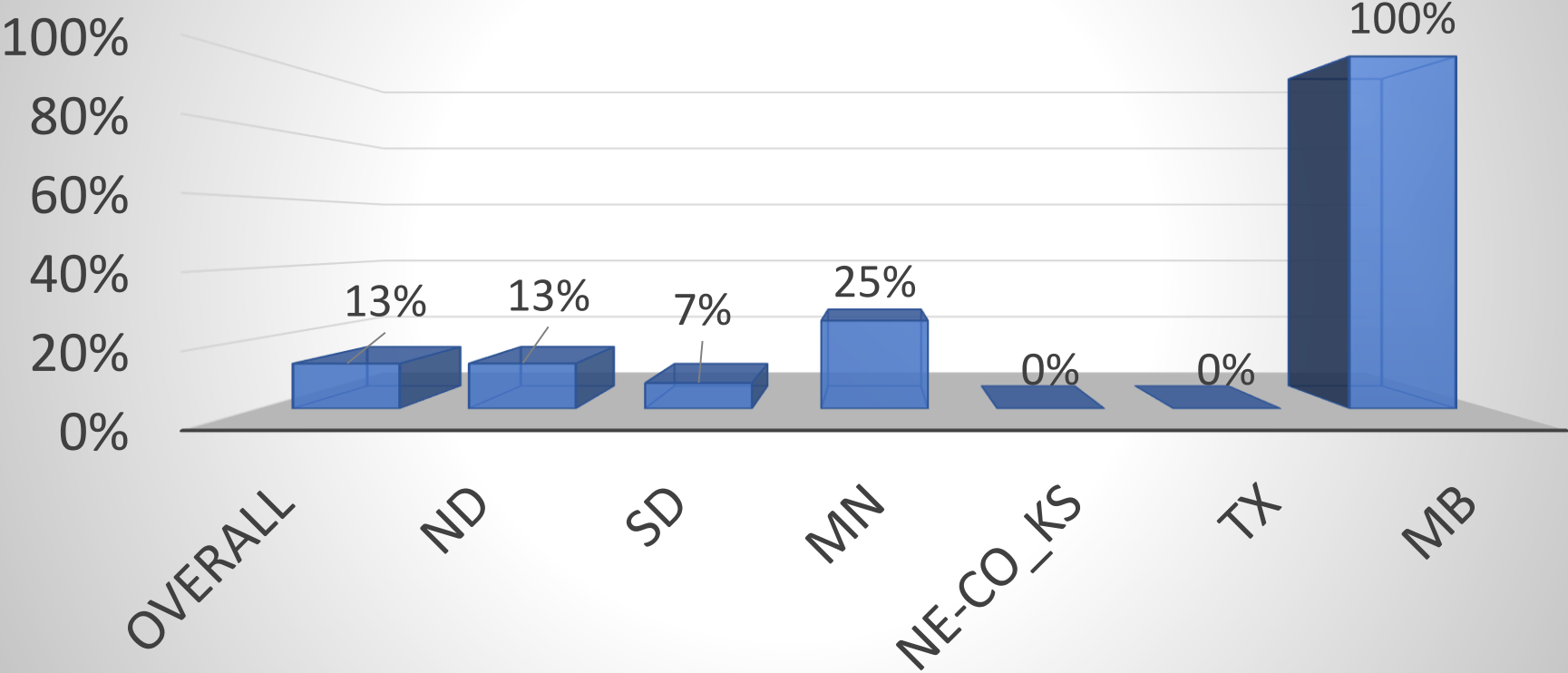
	2013	2015	2017	
Sclerotinia Wilt	12%	25%	13%	↓
Sclerotinia Mid Stem Rot	17%	21%	15%	↓
Sclerotinia Head Rot	20%	19%	22%	↑
Rhizopus Heat Rot	22%	39%	19%	↓↓
Rust	65%	62%	38%	↓↓
Phomopsis	52%	61%	15%	↓↓↓
Phoma	66%	80%	59%	↓↓
Downy Mildew	7%	16%	9%	↓
Verticillium	12%	11%	12%	~
Charcoal Rot	4%	1%	1%	~

	2017	2015	2013
Yield Limiting Factors	1st	1st	1st
<i>No Problem (0)</i>	9%	11%	11%
<i>Drought (3)</i>	31%	11%	15%
<i>Hail (5)</i>	3%	1%	1%
<i>Disease (2)</i>	11%	24%	17%
<i>Weeds (10)</i>	8%	8%	4%
<i>Birds (1)</i>	4%	7%	6%
<i>Insects (7)</i>	2%	4%	1%
<i>Plant Spacing (9)</i>	19%	13%	26%
<i>Lodging (8)</i>	3%	8%	10%
<i>Uneven Plant Growth (4)</i>	2%	4%	2%
<i>Herbicide Damage (6)</i>	0%	NC	NC
<i>Others (11)</i>	8%	9%	7%

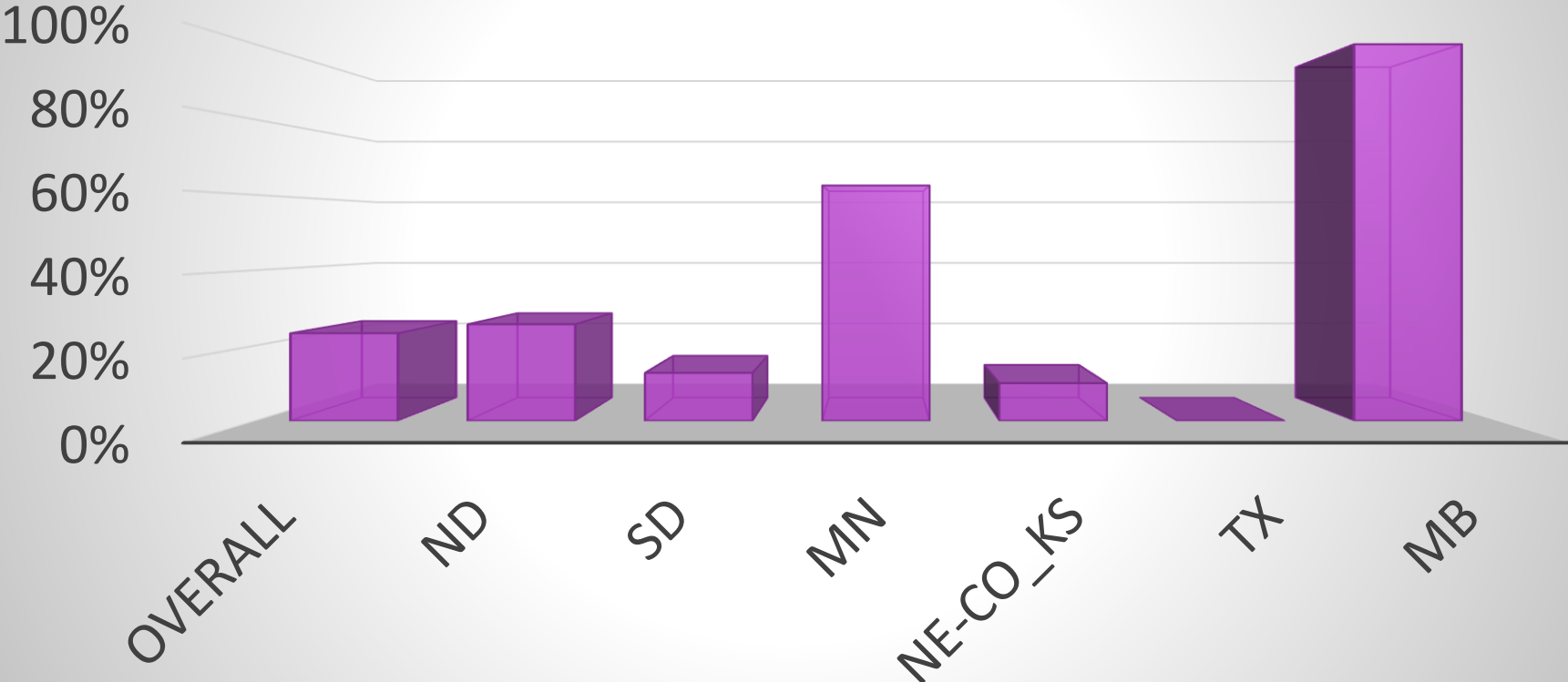
***INCIDENCE & GEOGRAPHIC TRENDS WITH
MAJOR SUNFLOWER DISEASES IN 2017***

The background is a dark blue gradient with a field of small, light blue stars. Overlaid on this are several faint, white circular patterns. One large pattern in the upper right quadrant features concentric circles and a scale with numerical markings from 0 to 210. Other smaller circular patterns are scattered in the lower left and bottom right areas.

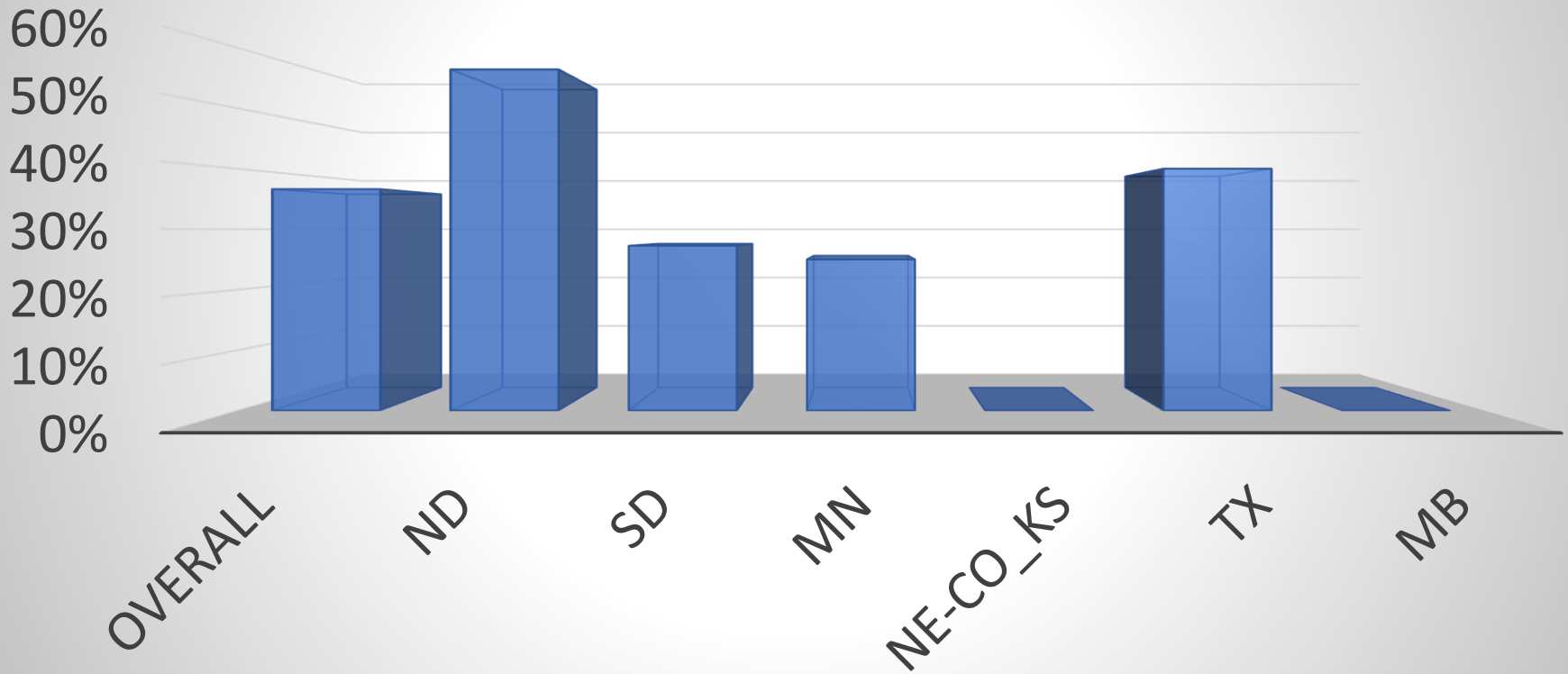
Sclerotinia Wilt



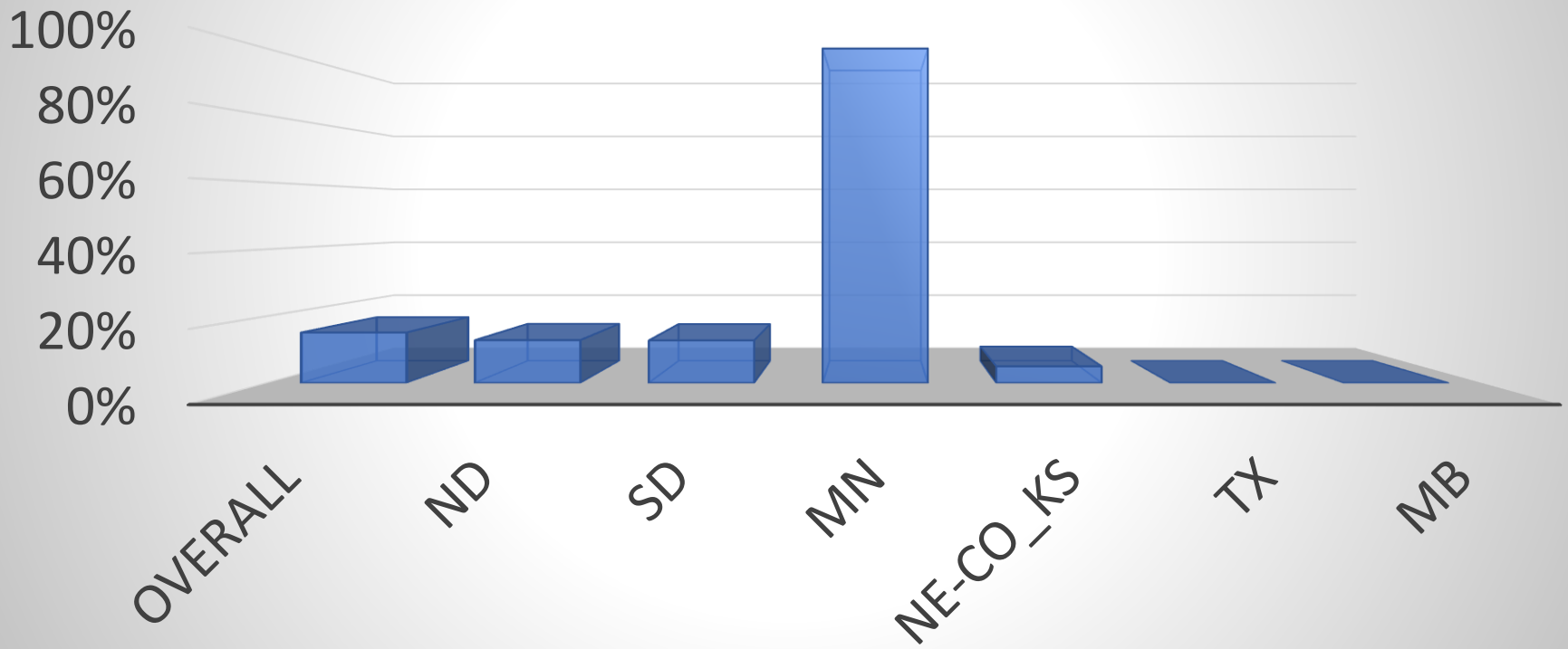
Sclerotinia Head Rot



Rust



Phomopsis



NEW CONCERN – MULTIPLE SPECIES OF PHOMOPSIS !

Phomopsis helianthi identified as cause of new stem canker in Yugoslavia in mid-1980s.

Two competing groups of pathologists in Yugoslavia: one claiming multiple species, other saying “**ONLY ONE.**”

With new molecular identification methods, 35 years later, two scientists in Australia (Sue Thompson) and the U.S. (Febina Mathew) have identified multiple NEW *Phomopsis* species causing disease on sunflower.

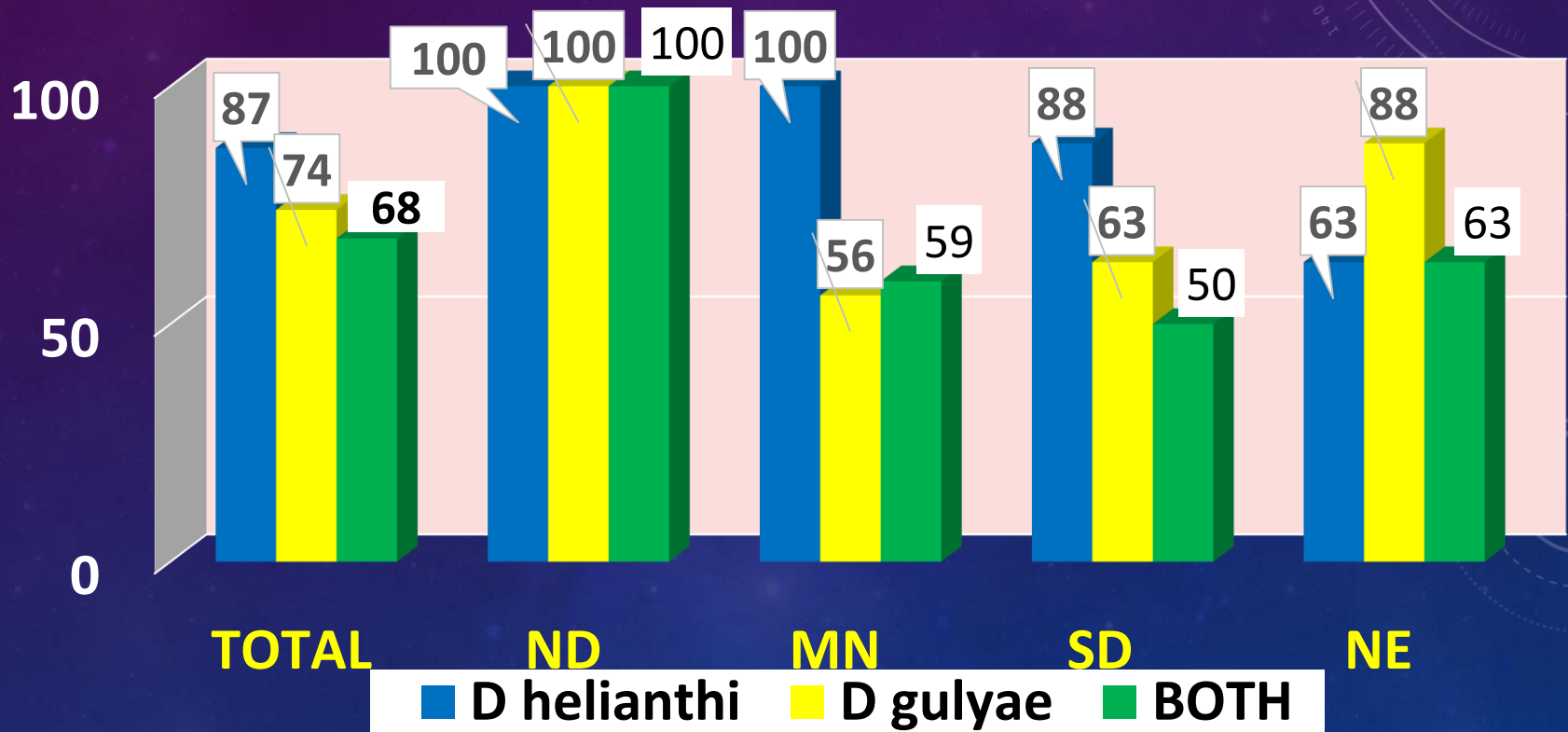
PHOMOPSIS/DIAPORTHE SPECIES NEWLY REPORTED ON SUNFLOWER

USA				AUSTRALIA			
	SF	Soy	Weeds		SF	Soy	Weeds
<i>D. helianthi</i>	XX		XX				
<i>D. gulyae</i>	XX	XX	XX	<i>D. gulyae</i>	XX	XX	XX
<i>D. stewartii</i>	XX			<i>D. kongii</i>	XX	XX	XX
				<i>D. kochmanii</i> (<i>sojae</i>)	XX	XX	XX
				<i>D. masirevici</i>	XX	XX	XX
				<i>D. mirici</i>	XX	XX	XX
				<i>D. goulteri</i>	XX	XX	
				<i>D. sackstoni</i>	XX		
				<i>D. serafiniae</i>	XX		
				Five more new species yet to be published	XX		

PHOMOPSIS SPECIES IDENTIFICATION VIA SURVEY-COLLECTED STALKS

- Funded by NSA Grant to Febina Mathew, SDSU
- PCR assays (developed by Taylor Olson) done by Marina Johnson and Brian Kontz – SDSU
- 100+ field samples hoped for, but with low Phomopsis in 2017, stalks from 31 fields received
- *Phomopsis helianthi* and *P. gulyae* recovered from FOUR states (ND, MN, SD, NE)

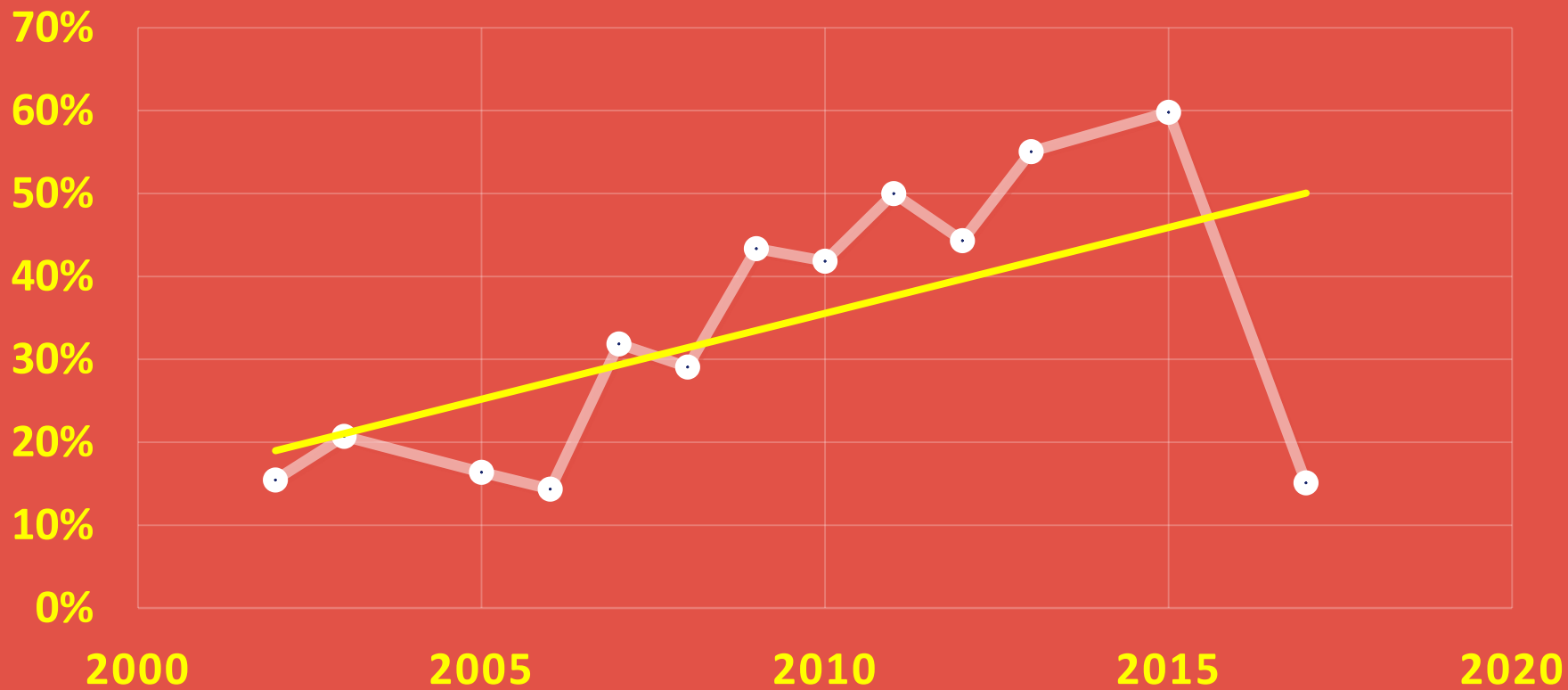
PHOMOPSIS SPECIES IDENTIFICATION VIA SURVEY-COLLECTED STALKS IN 2017 USING A PCR ASSAY



The background is a dark blue gradient with faint, light blue technical graphics. These include several circular gauges or dials with numerical scales (e.g., 0, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210) and arrows. There are also dashed lines and concentric circles, suggesting a technical or scientific theme.

HOW HAS PHOMOPSIS INCIDENCE CHANGED OVER TIME ? USING NSA SURVEY DATA FROM 2002 TO 2017

PHOMOPSIS - INCIDENCE



% Crop Affected by Phomopsis



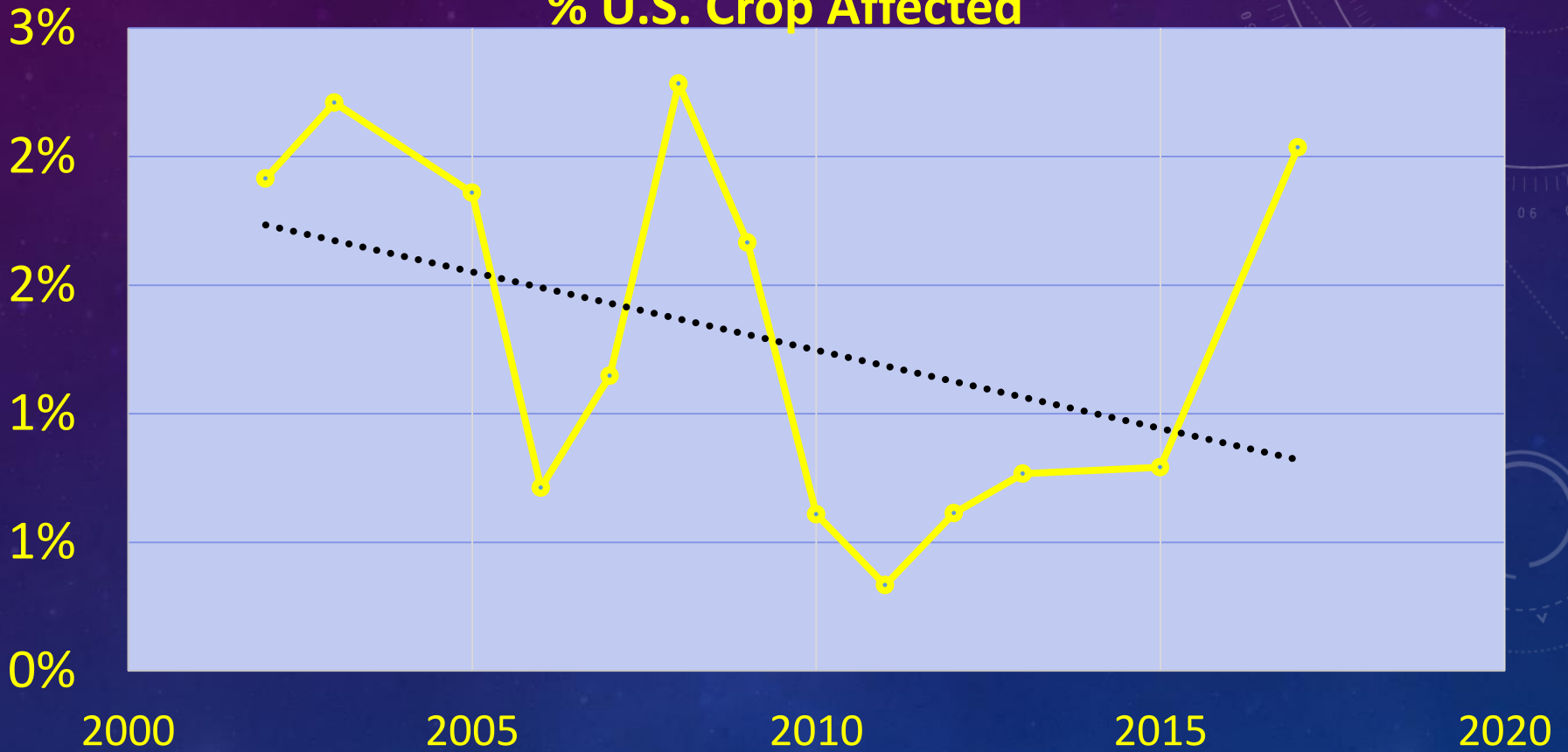
The background is a dark blue gradient with faint, light blue technical graphics. On the right side, there is a large circular gauge or dial with numerical markings from 0 to 210. Below it, there are several concentric circles and dashed lines, some with arrows indicating a clockwise direction. The overall aesthetic is that of a technical or scientific presentation.

**WHAT TRENDS OVER TIME DO WE SEE WITH
MAJOR DISEASES?**

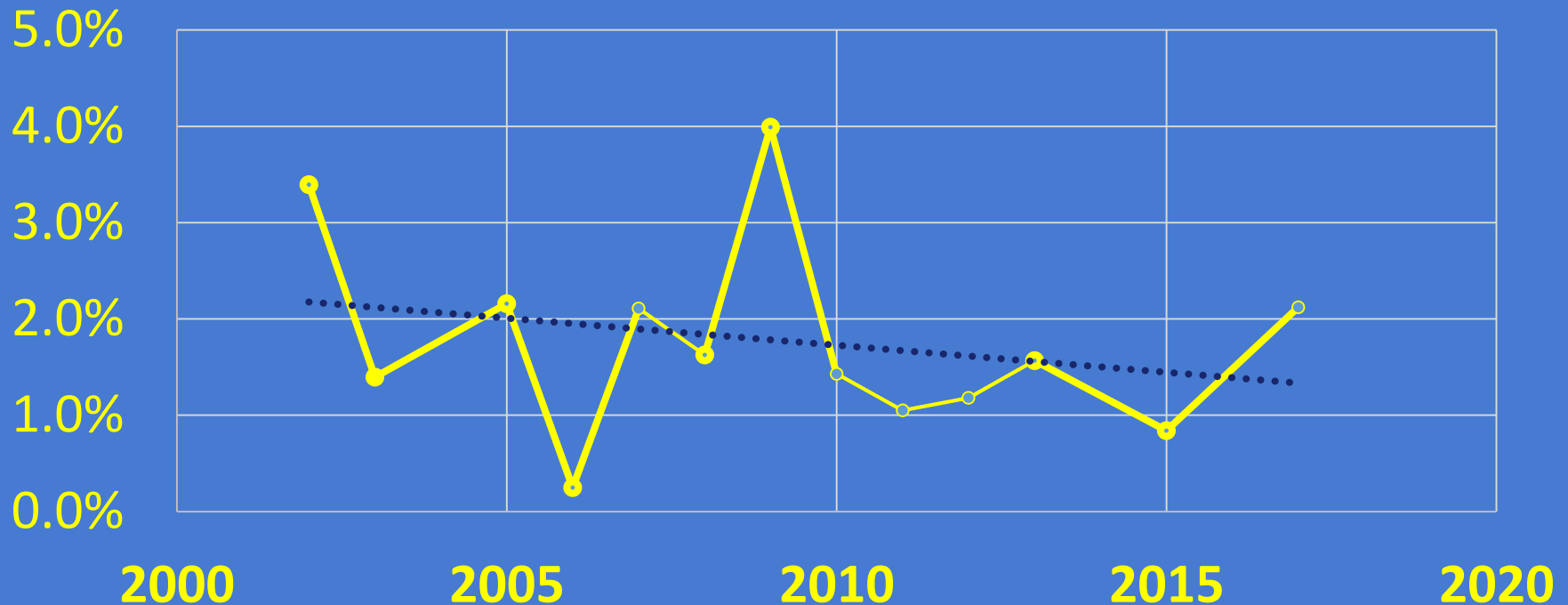
**SCLEROTINIA WILT - SCLEROTINIA HEAD ROT -
PHOMOPSIS**

SCLEROTINA WILT (BASAL STALK ROT)

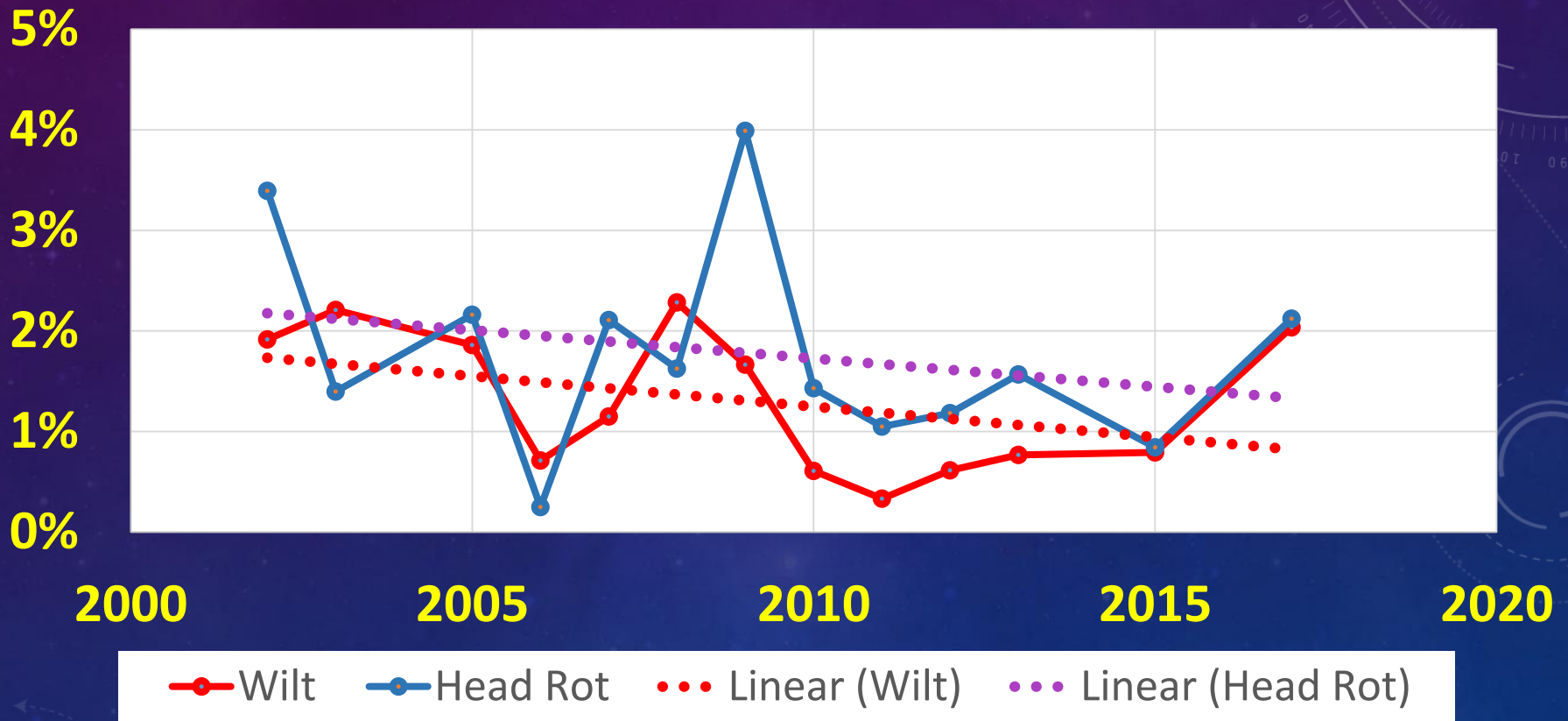
% U.S. Crop Affected



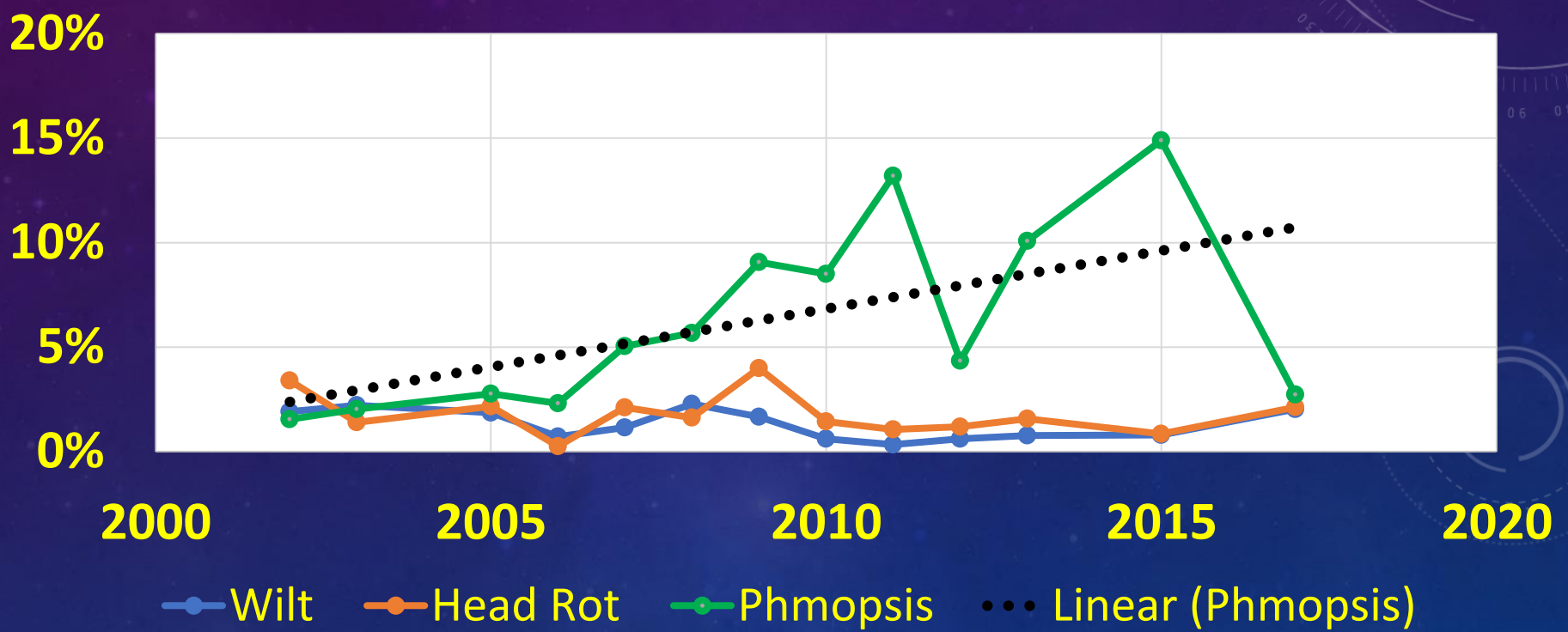
% U.S. Crop Affected by Sclerotinia Head Rot



COMPARISON OF SCLEROTINIA WILT & HEAD ROT % USA Sunflower Crop Affected



% U.S. Sunflower Crop Affected by Three Major Diseases



CONCLUSIONS –

- **The sunflower public and private research community is making progress in decreasing the impact of Sclerotinia wilt and head rot, through genetic resistance and grower education.**
- **Phomopsis “diseases” continue to increase, both in geographic distribution and % of the U.S. crop affected.**
- **Multiple *Phomopsis* species are already present in the U.S. (with more likely to be identified).**
- **Genetic resistance to one *Phomopsis* species may not confer resistance to other species.... Thus the development of resistant inbreds and hybrids will be more of a challenge.**

The background features a dark blue gradient with several circular gauges and a scale. The scale is a large arc on the left side, with numerical markings from 150 to 260 in increments of 10. There are also smaller circular gauges with arrows and dashed lines, suggesting a technical or scientific theme.

INSECT EVALUATIONS

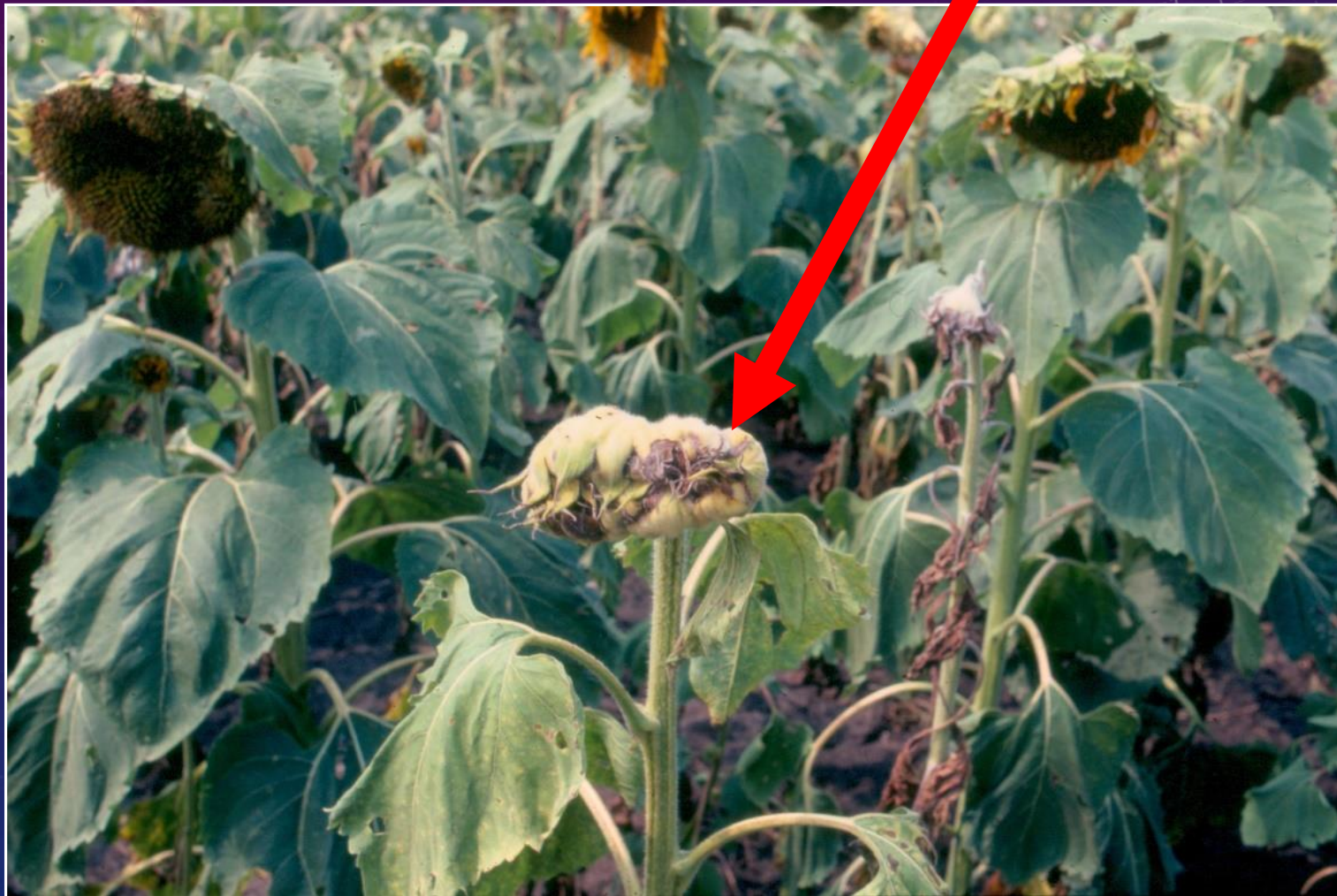
1 - IN-FIELD ASSESSMENTS

2 - SEED SAMPLES

IN-FIELD INSECT ASSESSMENTS

- Midge
- Bud moth
- Seed maggot
- Deform heads, can confuse w/ other causes
- Stem borer (*Dectes texanus*)
- Get presence and severity (%) each year

SUNFLOWER MIDGE DAMAGE



BUD MOTH DAMAGE IN SUNFLOWER

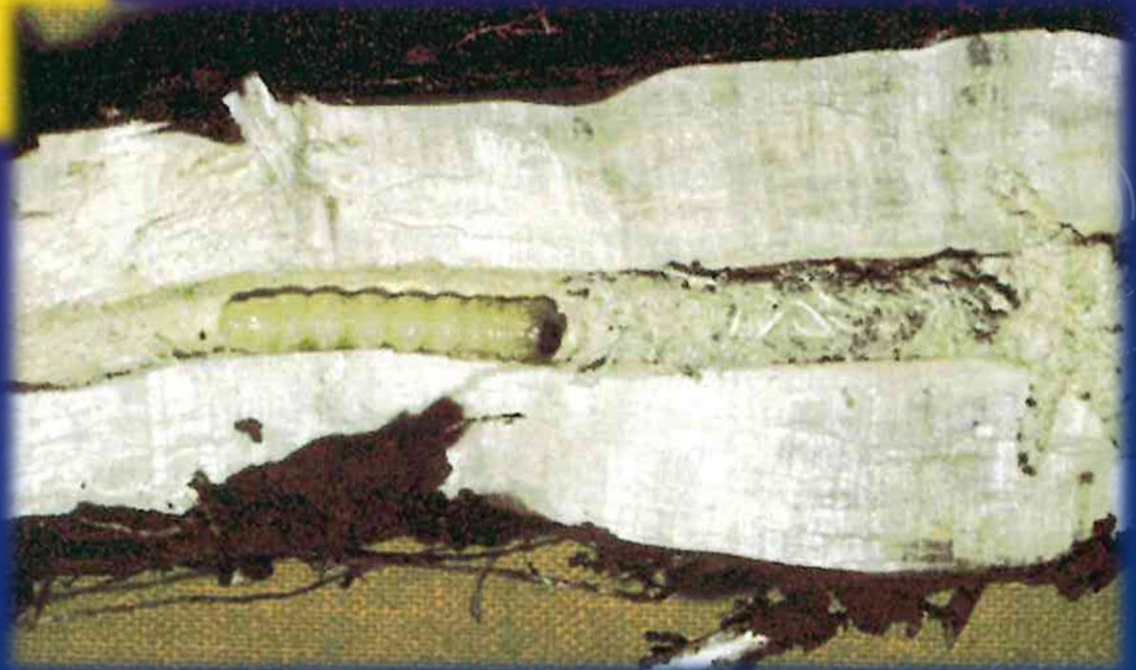


SUNFLOWER SEED MAGGOT DAMAGE



Photo: Dr. J. Knodel

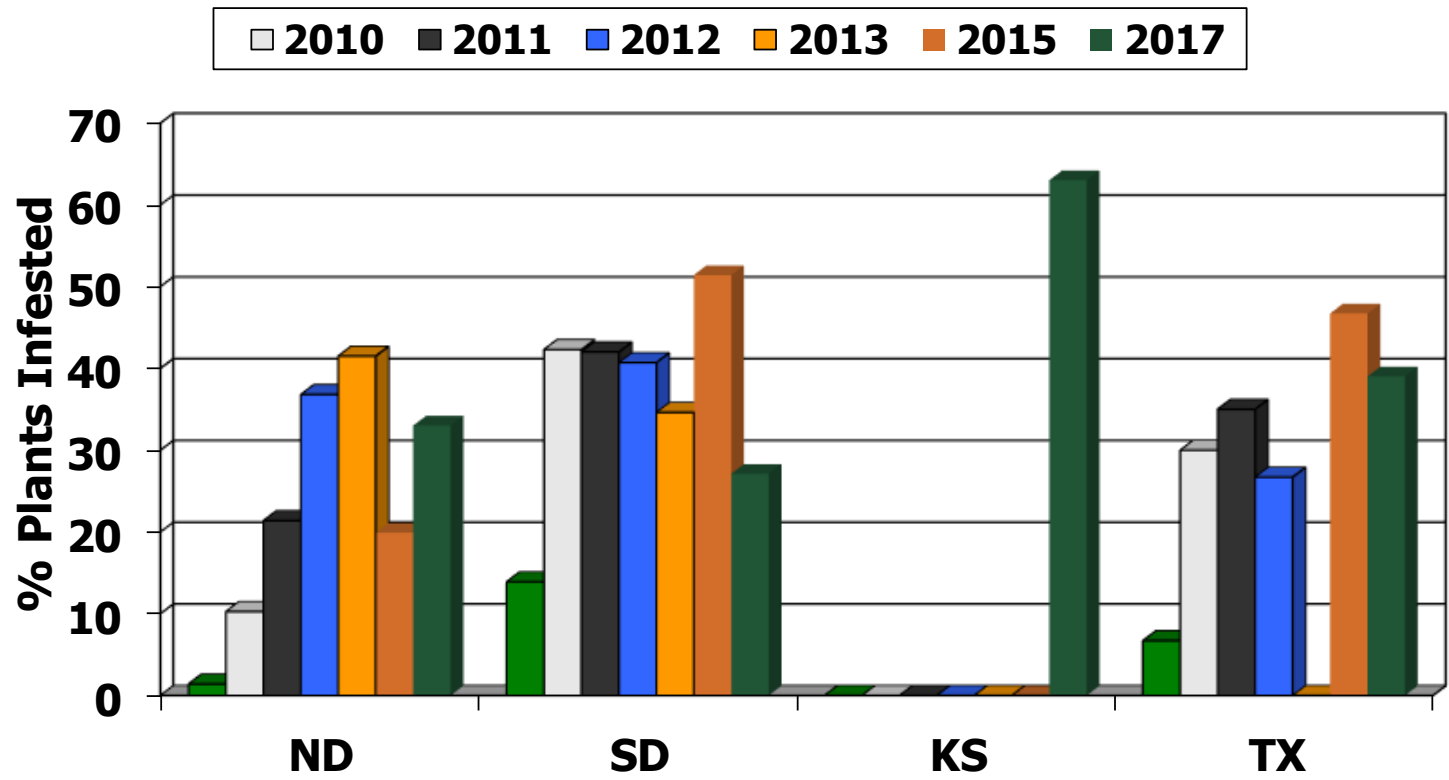
LONG-HORNED BEETLE (*Dectes texanus*)



IN-FIELD INSECT ASSESSMENTS

- **Midge, bud moth, seed maggot all**
 - **Uncommon (< 30% of fields), or**
 - **Low damage (< 5% plants with symptoms)**
- **Stem borer incidence up, severity same...**
- **For ND, SD borers found in more fields in 2015**
- **But % infested stalks similar to 2015**

DECTES BORER SEVERITY 2009-2017

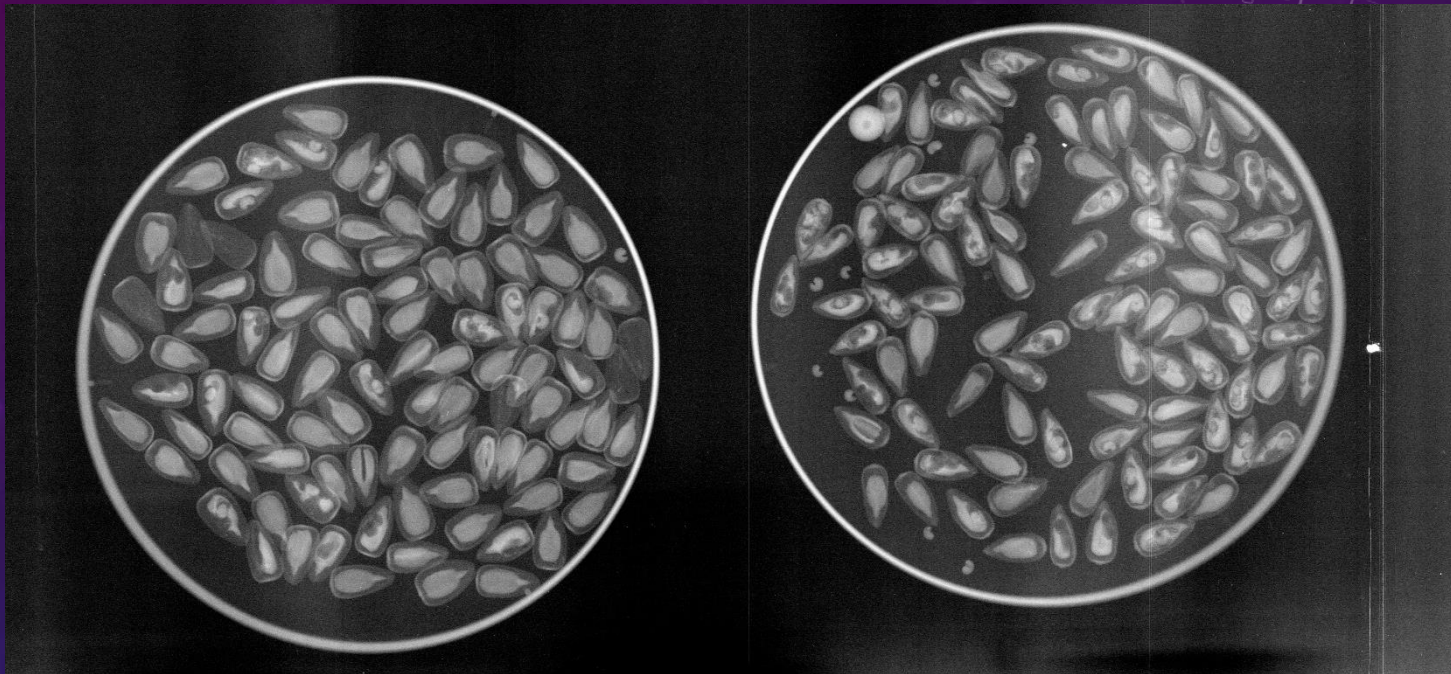


SEED SAMPLES (INSECTS)

- Wedges from 5 heads per field
- Samples X-rayed at USDA-ARS in Fargo, ND
- Scored for % damage of apparently good seed
- ID insect causing most damage in each sample

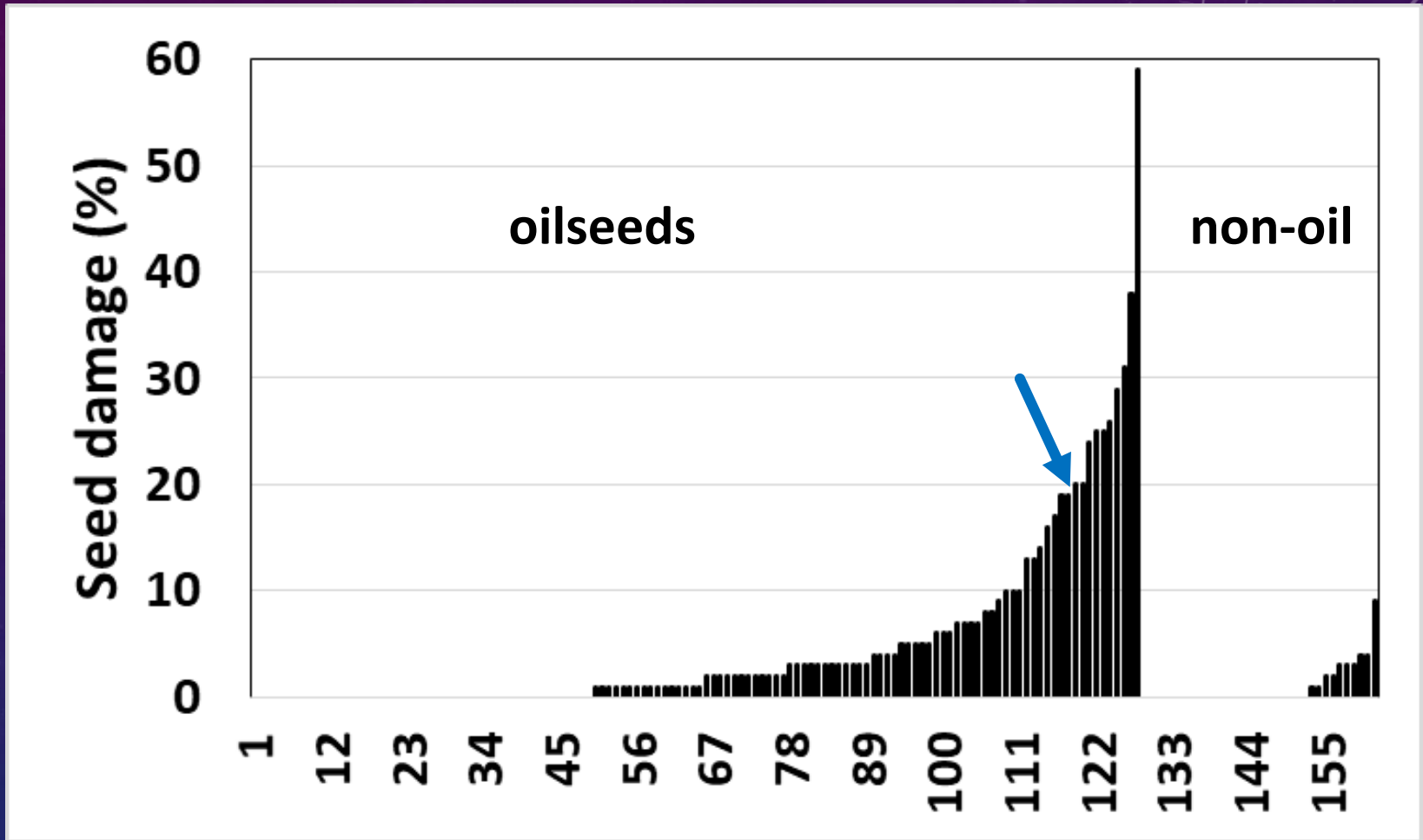


SEED SAMPLES RESULTS - 1



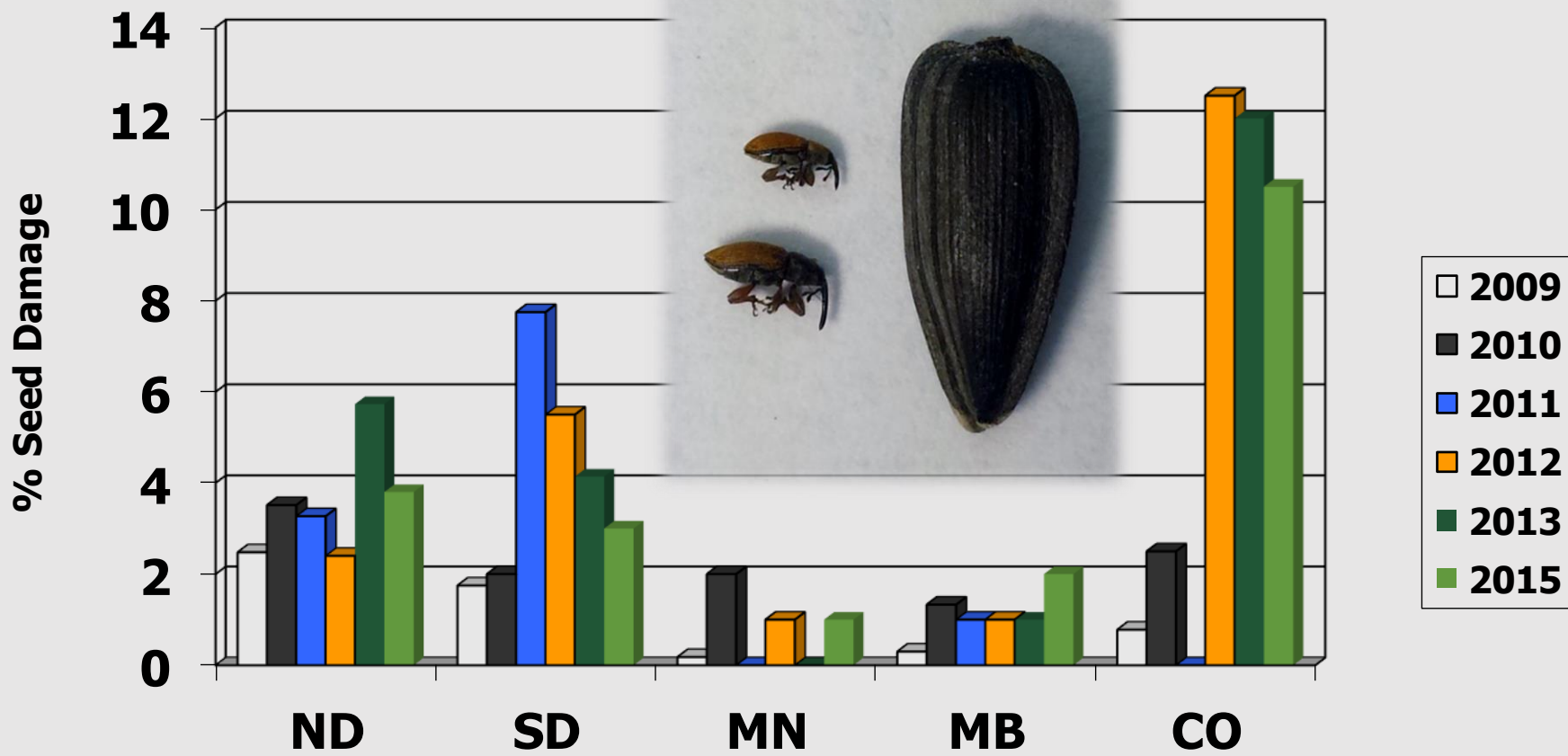
- Red seed weevil #1 (in 46% of 162 samples)
- Non-oil better managed (1% vs 5% damage)
- Few fields (n=12) account for 50+% of damage
- Lygus low in confections, 0–2% (n=34)

SEED SAMPLES RESULTS - 2



- 12 worst RSSW fields, 19-59% weevil damage

SEED DAMAGE – RED SEED WEEVIL 2009-2015

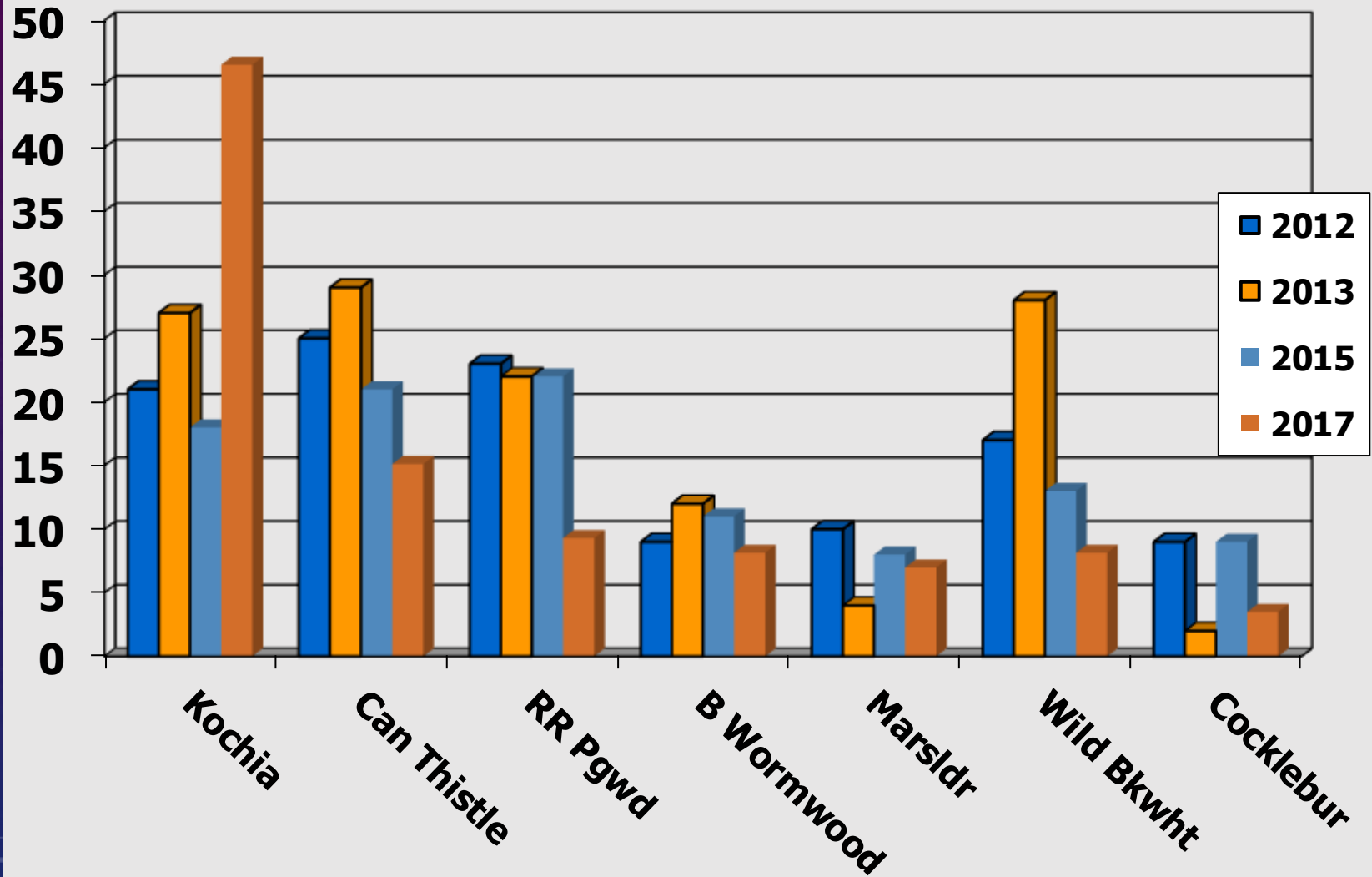


The background features a dark blue gradient with faint, light blue technical diagrams. On the left, a large circular scale is visible with numerical markings from 150 to 260. Several circular diagrams with arrows and dashed lines are scattered across the background, suggesting a process or cycle.

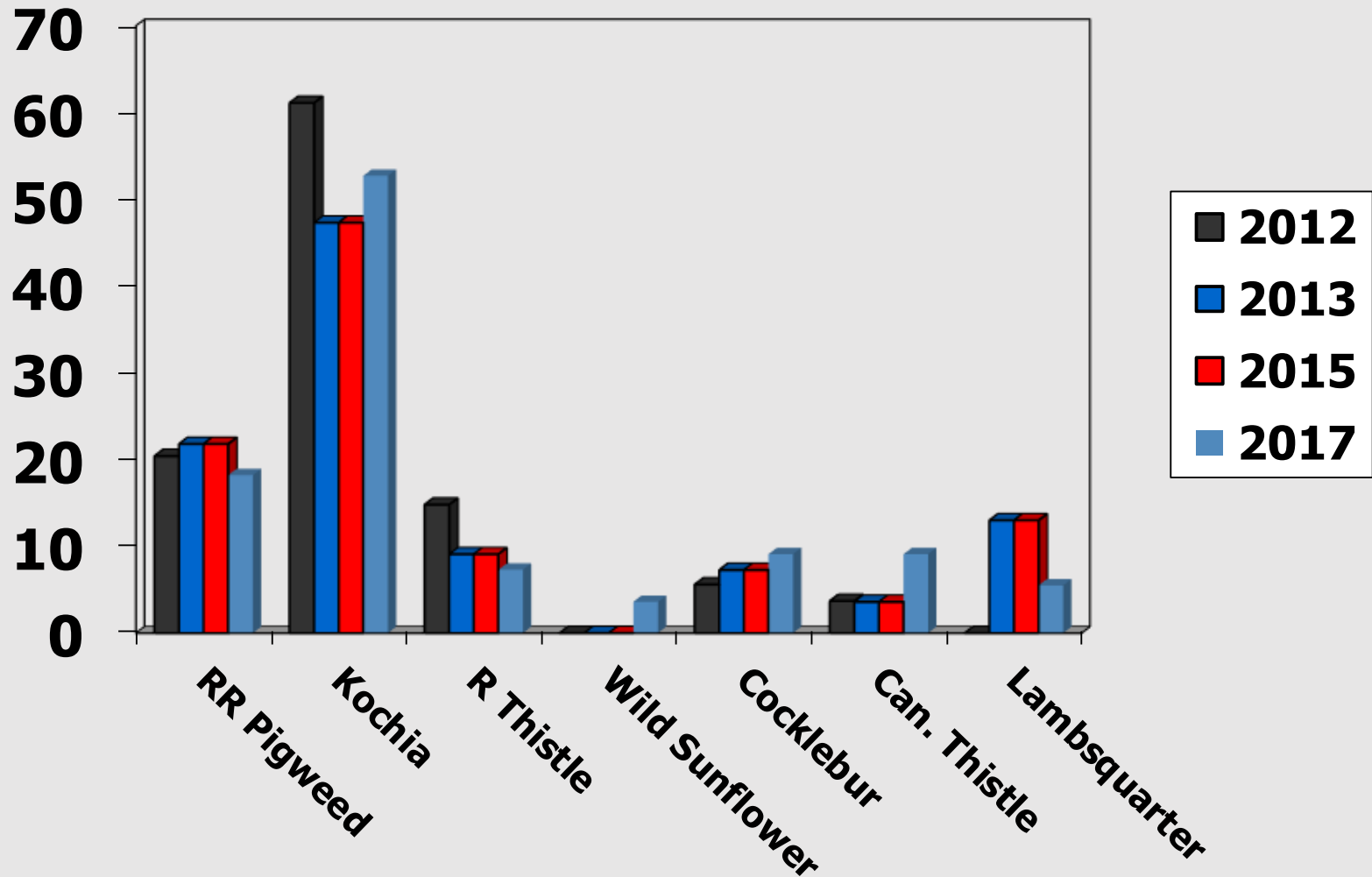
WEED ASSESSMENT

**30 WEEDS TO IDENTIFY AND RATE
INCIDENCE ON 1-3 SCALE**

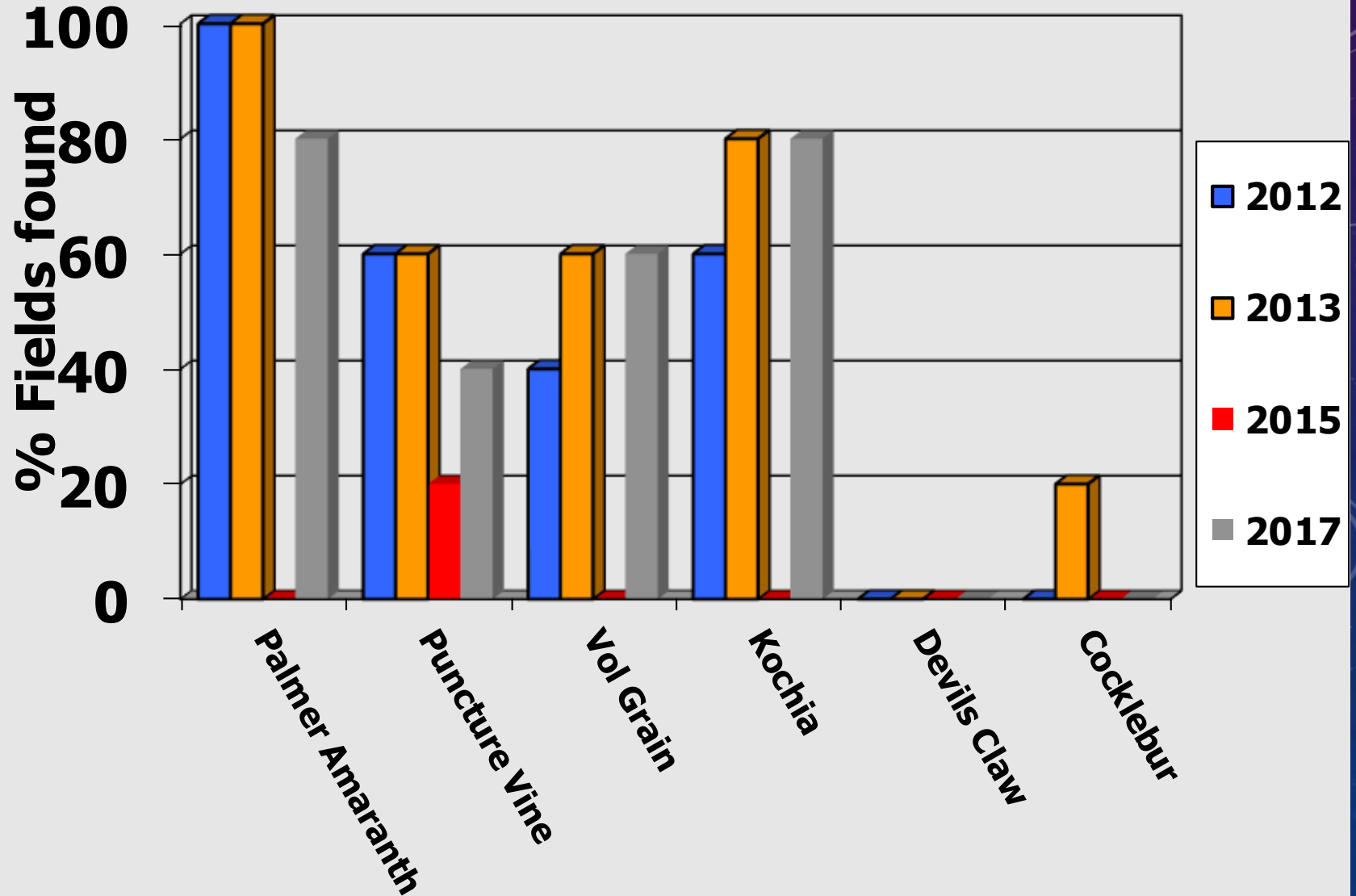
INCIDENCE OF WEEDS ND/MN 2012-2017



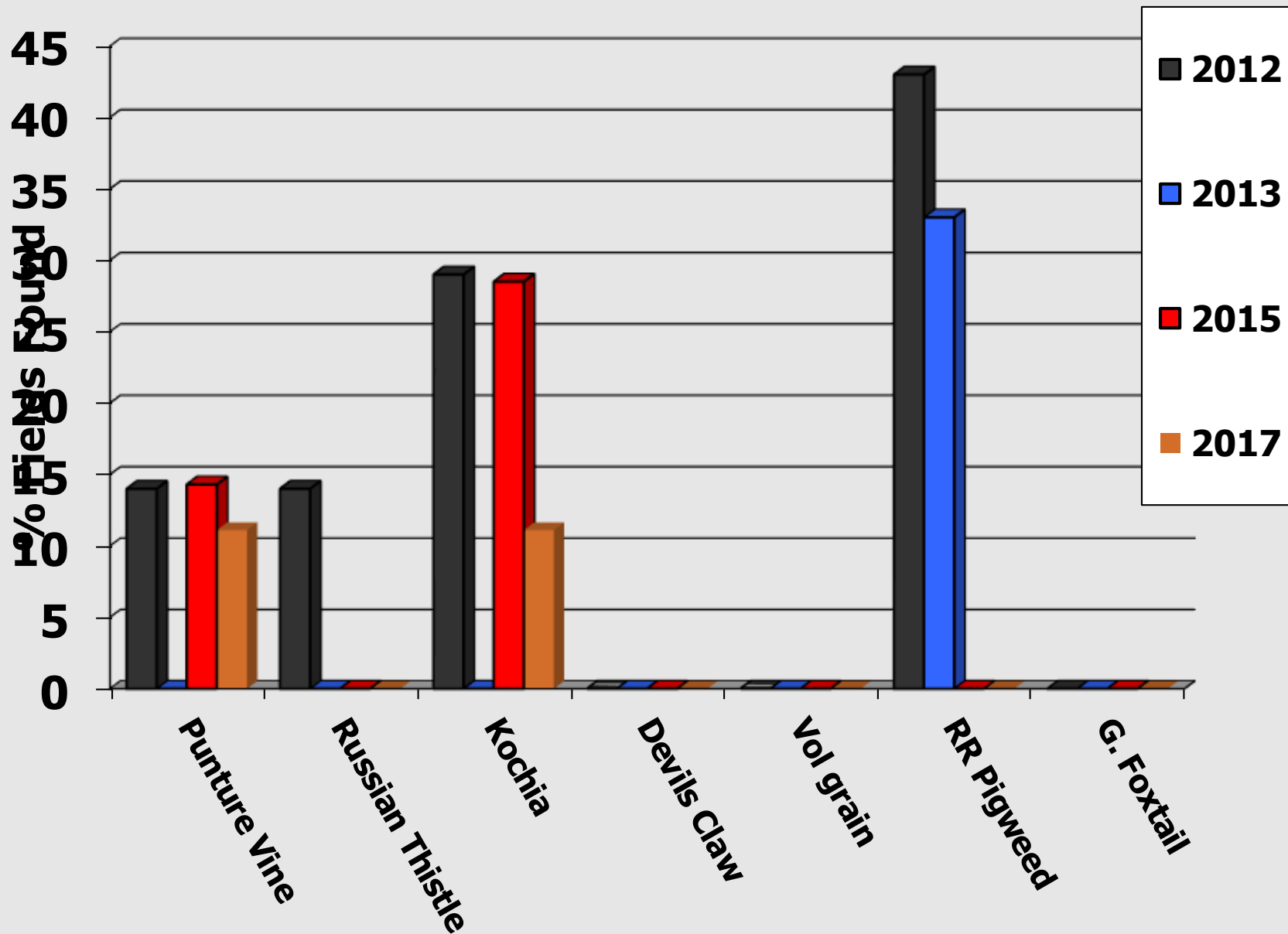
INCIDENCE OF WEEDS SOUTH DAKOTA 2012-2017



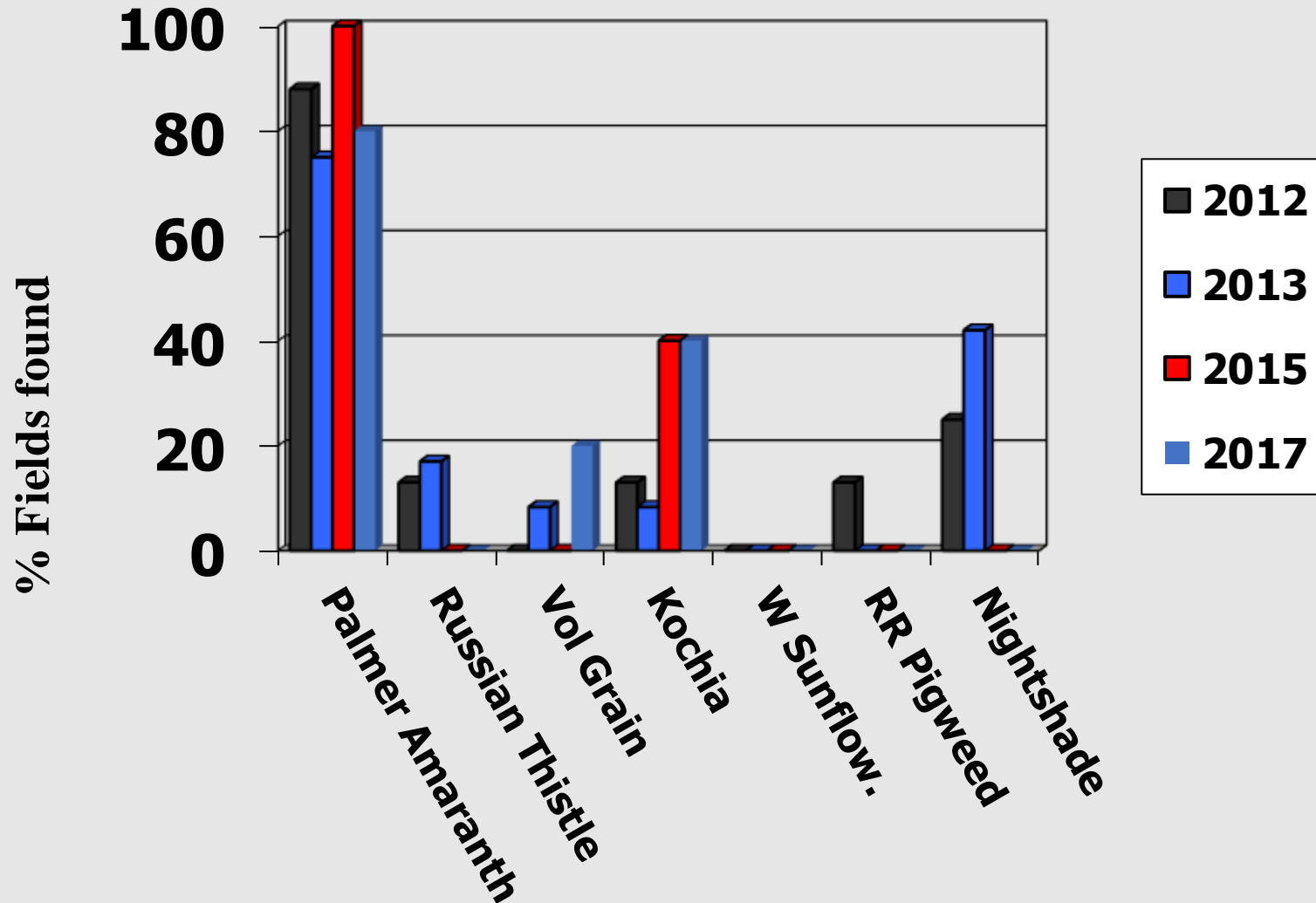
INCIDENCE OF WEEDS IN KANSAS 2012-2017



INCIDENCE OF WEEDS IN COLORADO 2012-2017



INCIDENCE OF WEEDS IN TEXAS 2012-2017



PERVASIVE WEEDS

Northern Area

- kochia
- redroot pigweed
- Canada thistle

Southern Area

- kochia
- Palmer amaranth
- redroot pigweed



USA
Sunflower Survey



Partnership of
University, USDA & Industry

PERVASIVE WEEDS

Northern Area

- kochia
- redroot pigweed
- Canada thistle

Southern Area

- kochia
- Palmer amaranth
- redroot pigweed
- volunteer grain

Options

Spartan ** (sulfentrazone)

Spartan ** (sulfentrazone)



PERVASIVE WEEDS

Northern Area

- kochia
- redroot pigweed
- Canada thistle

Southern Area

- kochia
- Palmer amaranth
- redroot pigweed
- volunteer grain

Options

Spartan ** (sulfentrazone)

Prowl, BroadAxe XC

Spartan ** (sulfentrazone)

Prowl, BroadAxe XC

Prowl, BroadAxe XC



PERVASIVE WEEDS

Northern Area

- kochia
- redroot pigweed
- Canada thistle

Southern Area

- kochia
- Palmer amaranth
- redroot pigweed
- volunteer grain

Options

Spartan ** (sulfentrazone)

Prowl, BroadAxe XC

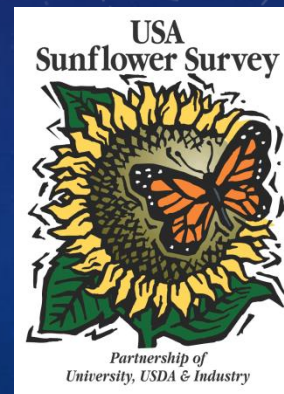
glyphosate previous fall

Spartan ** (sulfentrazone)

Prowl, BroadAxe XC

Prowl, BroadAxe XC

Group 1, ACCase



POSTEMERGENCE BROADLEAF CONTROL

Northern Area

- kochia
- redroot pigweed
- Canada thistle

Southern Area

- kochia
- Palmer amaranth
- redroot pigweed
- volunteer grain

Options

Broad resistance to group 2

Beyond, Express

Express, Beyond limits size

Broad resistance to group 2

Broad resistance to group 2

Beyond, Express

Group 1, ACCase

