Does Phomopsis Stem Canker Cause Yield Loss?

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OUTLINE

- *Phomopsis* prevalence (NSA survey)
  - 2002 vs. 2022

- Does *Phomopsis* affect yield?

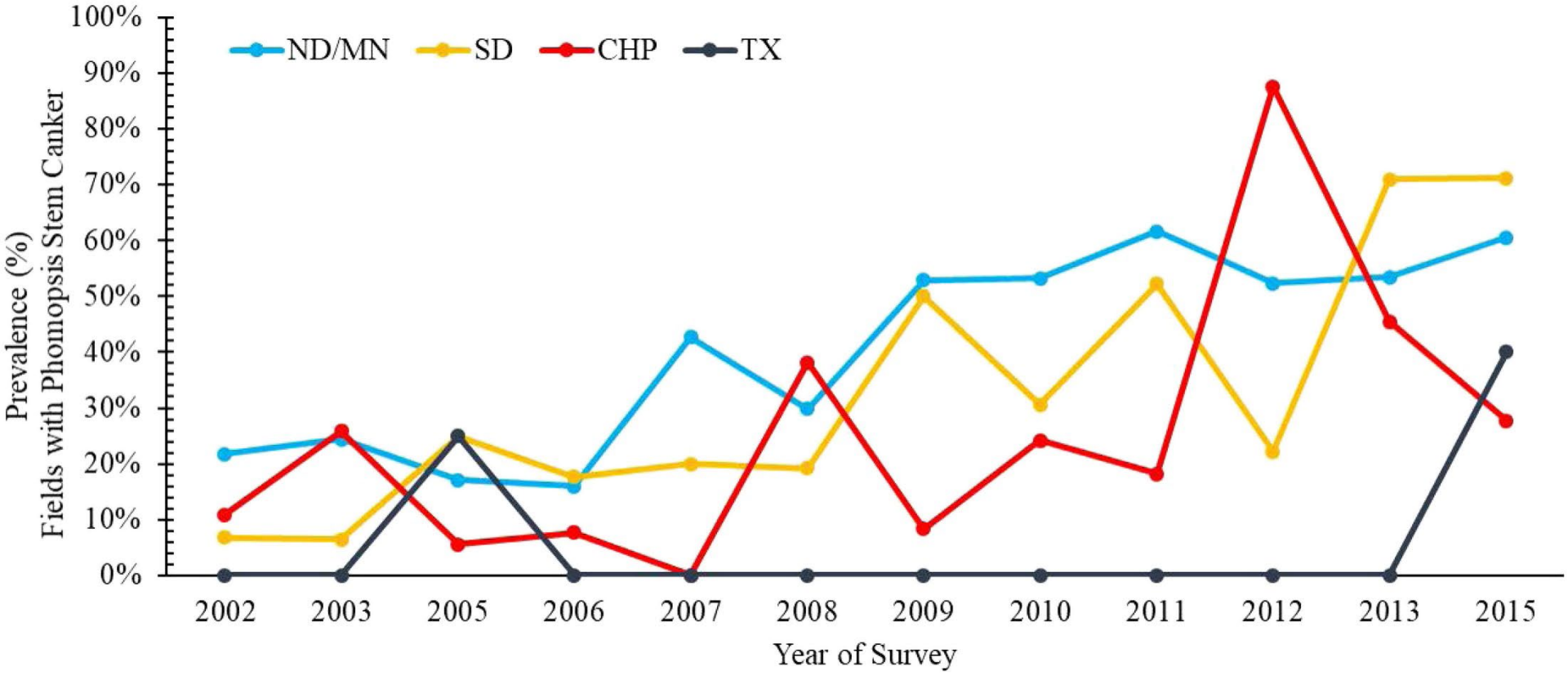
PHOMOPSIS STEM CANKER

R1 = bud initiation stage

R5 = flowering stage

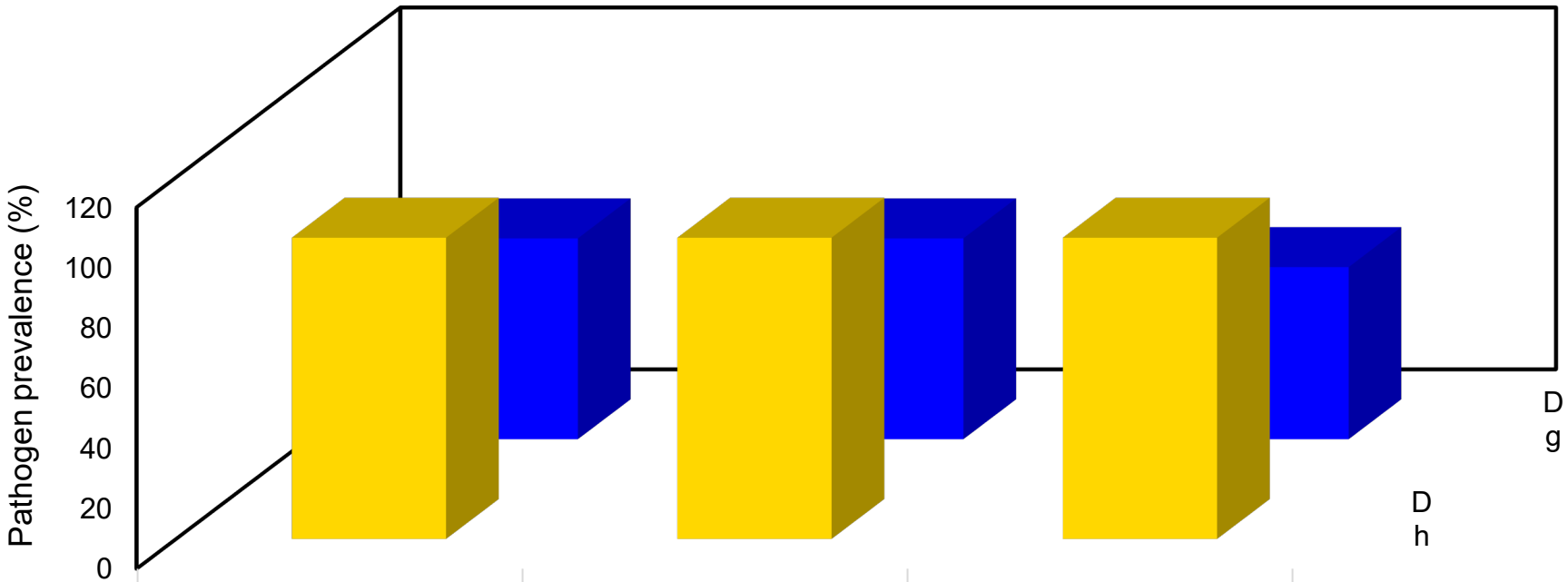
Pictures by Sam Markell, and Febina Mathew

PHOMOPSIS PREVALENCE



(Gulya et al. 2019)

2019 NSA Survey



	Minnesota	North Dakota	South Dakota
Dh	100	100	100
Dg	67	67	57

2021

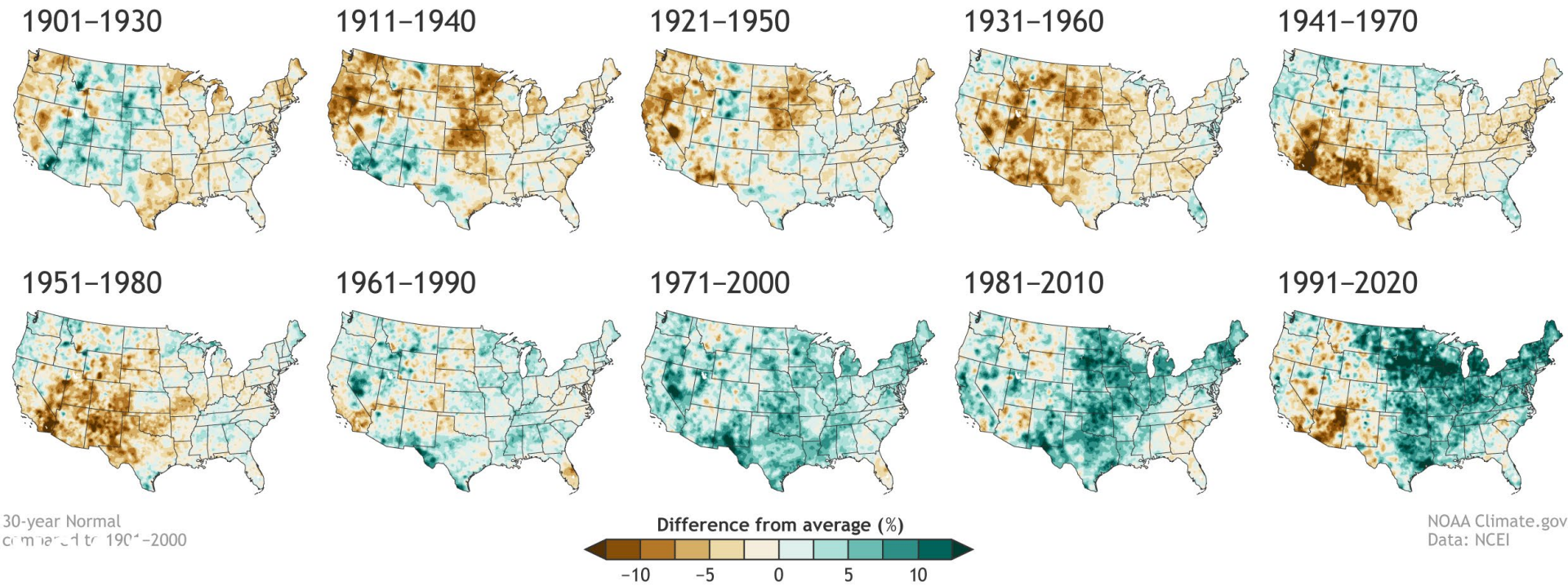
- Average disease prevalence = 11.2%

U.S. State	Average Disease prevalence	Notes
Colorado	0% (*n*=7)	No Phomopsis
Minnesota	8.2% (*n*=12)	Disease incidence ranged from 0 to 27%
North Dakota	13.4% (*n*=79)	Disease incidence ranged from 0 to 95%
South Dakota	56.3% (*n*=52)	Disease incidence ranged from 7.5 to 100%
Kansas	5% (*n*=5)	Disease incidence ranged from 0 to 22%
Nebraska	0% (*n*=5)	No Phomopsis
Texas	0% (*n*=4)	No Phomopsis

2021

- Four possibilities
  - Susceptible hybrid, or isolate by genotype interaction by using a partially resistant hybrid
  - Crop undergoing stress from drought and other factors
  - No use of foliar fungicide
  - Weather conditions in September and October

U.S. ANNUAL PRECIPITATION COMPARED TO 20th-CENTURY AVERAGE

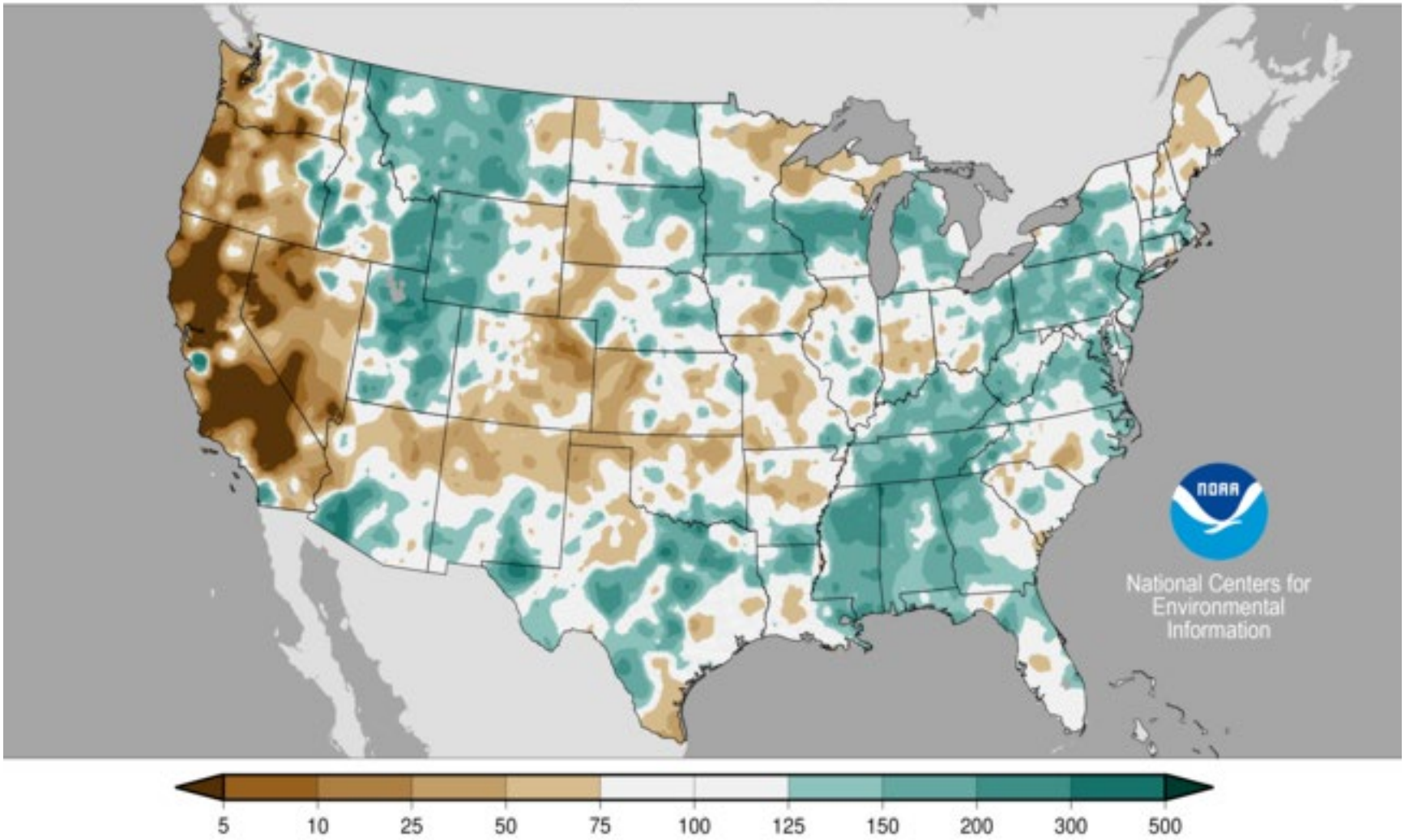


https://www.noaa.gov/news/new-us-climate-normals-are-here-what-do-they-tell-us-about-climate-change

Precipitation Percent of Average

August 2021

Average Period: 20th Century

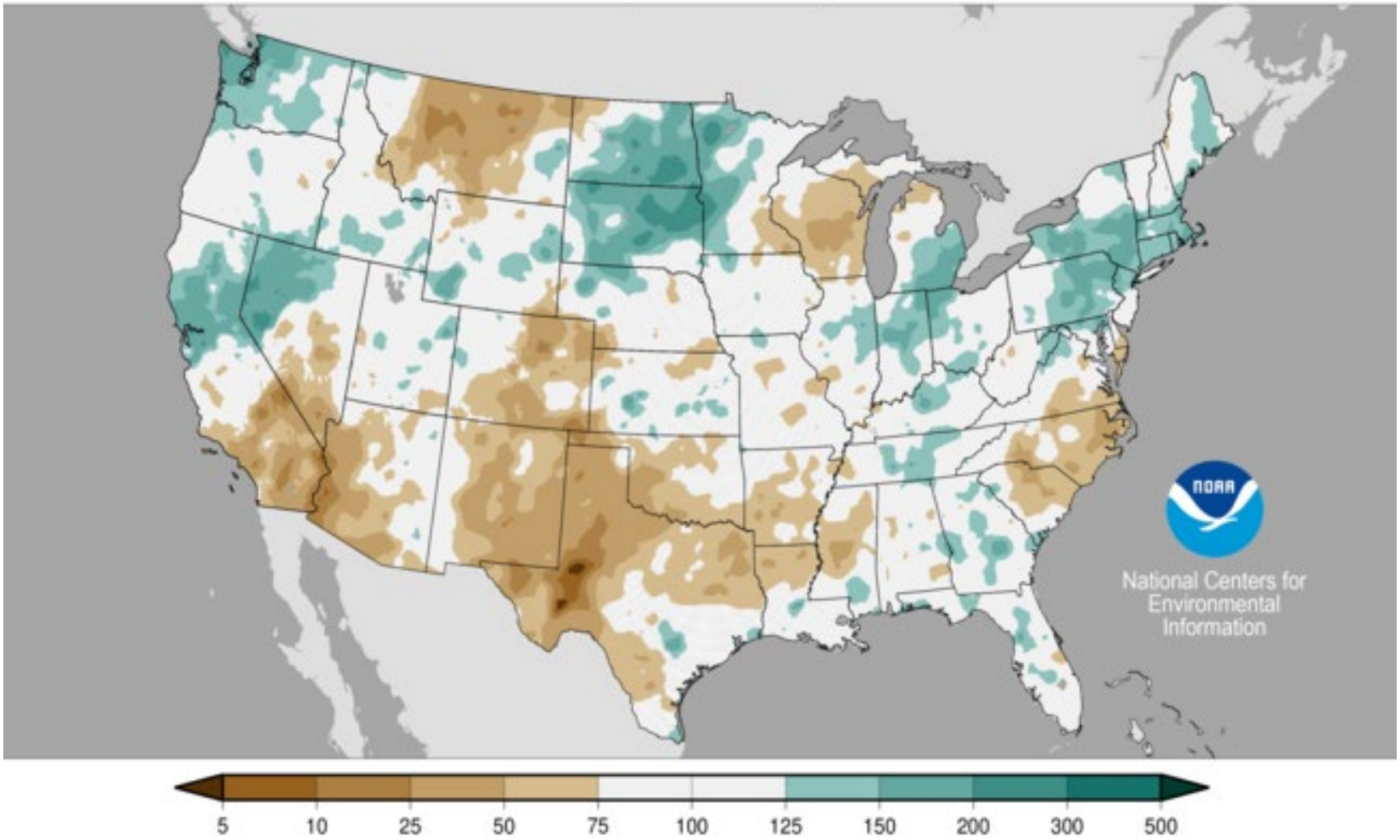


https://www.ncei.noaa.gov/sites/default/files/prcp-pon-202109-202111.png

Precipitation Percent of Average

September–November 2021

Average Period: 20th Century



https://www.ncei.noaa.gov/sites/default/files/prcp-pon-202109-202111.png

2021

- A total of 300+ stalks from 64 fields (5 to 6 stalks per field) received

- ✓ NSA surveyors
- ✓ Extension agents
- ✓ Farmers
- ✓ Students

6 counties in MN
17 counties in ND
12 counties in SD
3 counties in NE
2 counties in CO

PHOMOPSIS LESIONS

- Disease rating scale (0 to 5) (Mathew et al. 2015).

0: No discoloration

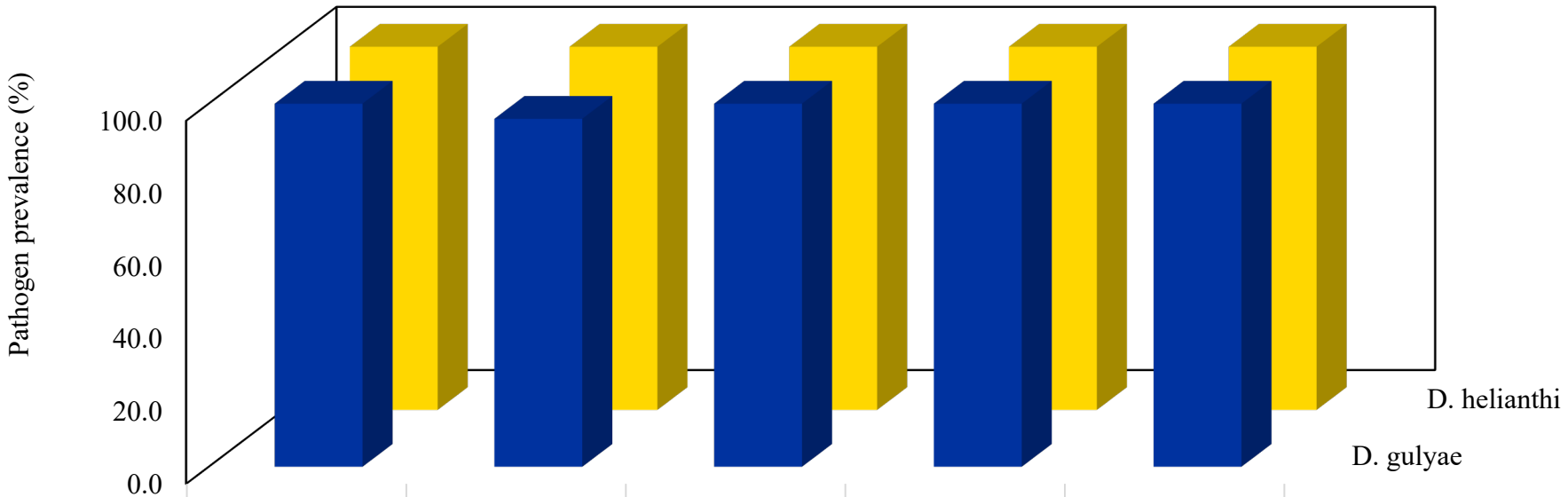
1: low level discoloration

3: necrotic lesions 2–5 mm, leaf wilting

5: very severe necrosis and lesions, or plant death

Pictures by Sam Markell, and Febina Mathew

2021 NSA Survey



	Minnesota	North Dakota	South Dakota	Nebraska	Colorado
D. gulyae	100.0	95.8	100.0	100.0	100.0
D. helianthi	100	100	100	100	100

Acknowledgement

- Thanks, Ryan Buetow, for coordinating the NSA survey

- Thank you, NSA surveyors, Extension agents, Farmers and Students and NSA for funding.

OUTLINE

- *Phomopsis* prevalence (NSA survey)
  - 2002 vs. 2022

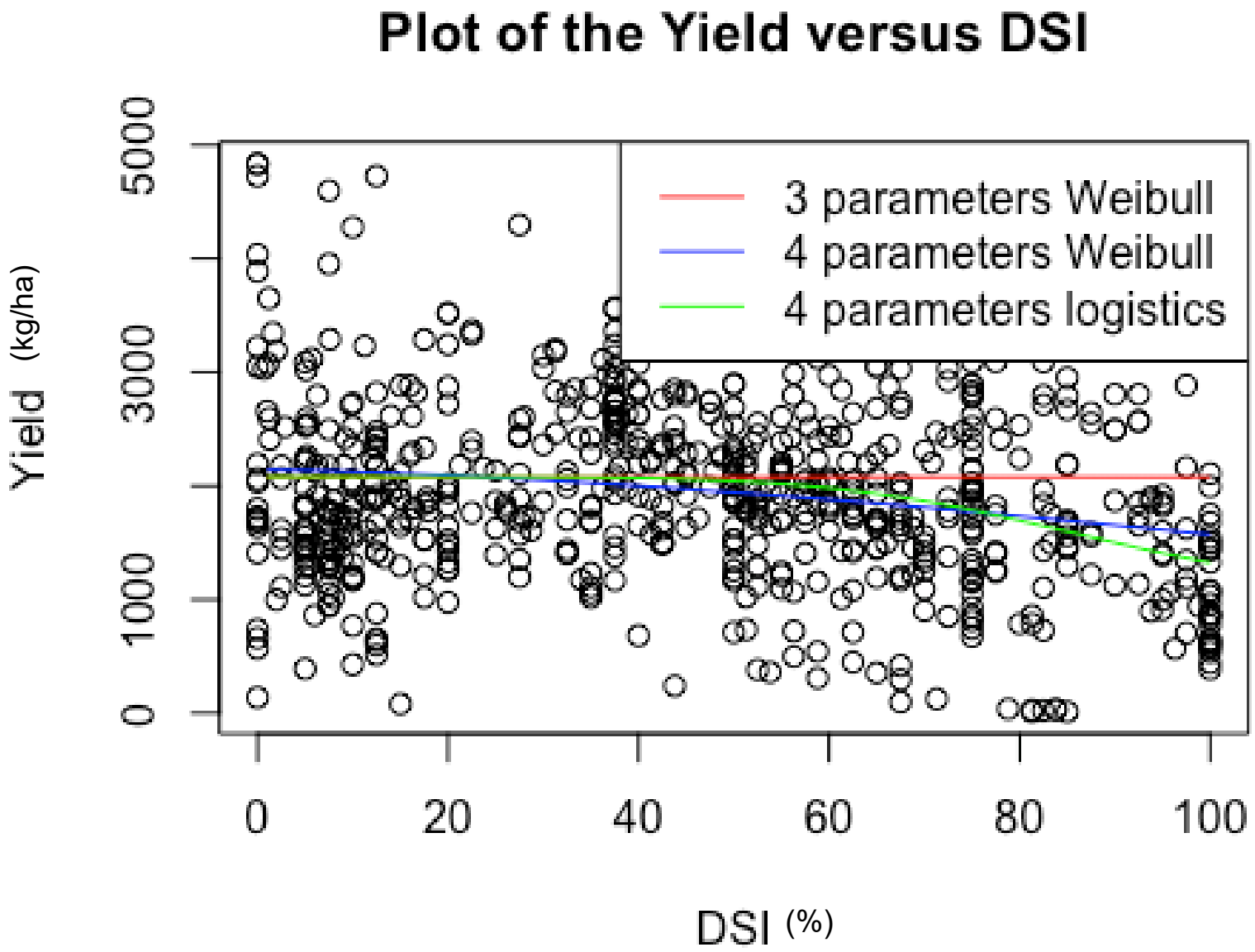
- Does *Phomopsis* affect yield?

PHOMOPSIS EFFECT ON YIELD

- Foliar fungicide trials conducted in MN, ND, NE and SD between 2009, 2013 and 2020 for a total of 73 location-years.
  - Natural disease pressure
  - Non-oils – susceptible, partially-resistant
  - Oils – susceptible, partially-resistant

PHOMOPSIS EFFECT ON YIELD

- Foliar fungicide trials conducted in MN, ND, NE and SD between 2009, 2013 and 2020 for a total of 73 location-years.
  - Disease severity evaluated after flowering
  - Yield
  - Non-linear regression analysis performed at the plot level (20 to 30 feet long by 10 feet wide)



R^2=0.07 (four parameter Logistic model)

PHOMOPSIS EFFECT ON YIELD

- Yield loss of <100 lb/A occurred between >0 to 45% DSI.

- For every ~10% increase in DSI, there is ~400 lb/A reduction in yield (≥$65/A for oils and ≥ $92/A for non-oils).

SUMMARY

- Prevalence of Phomopsis stem canker varies by location

- The disease is yield-limiting; for every ~10% increase in DSI, we see ~400 lb/A reduction in yield.

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