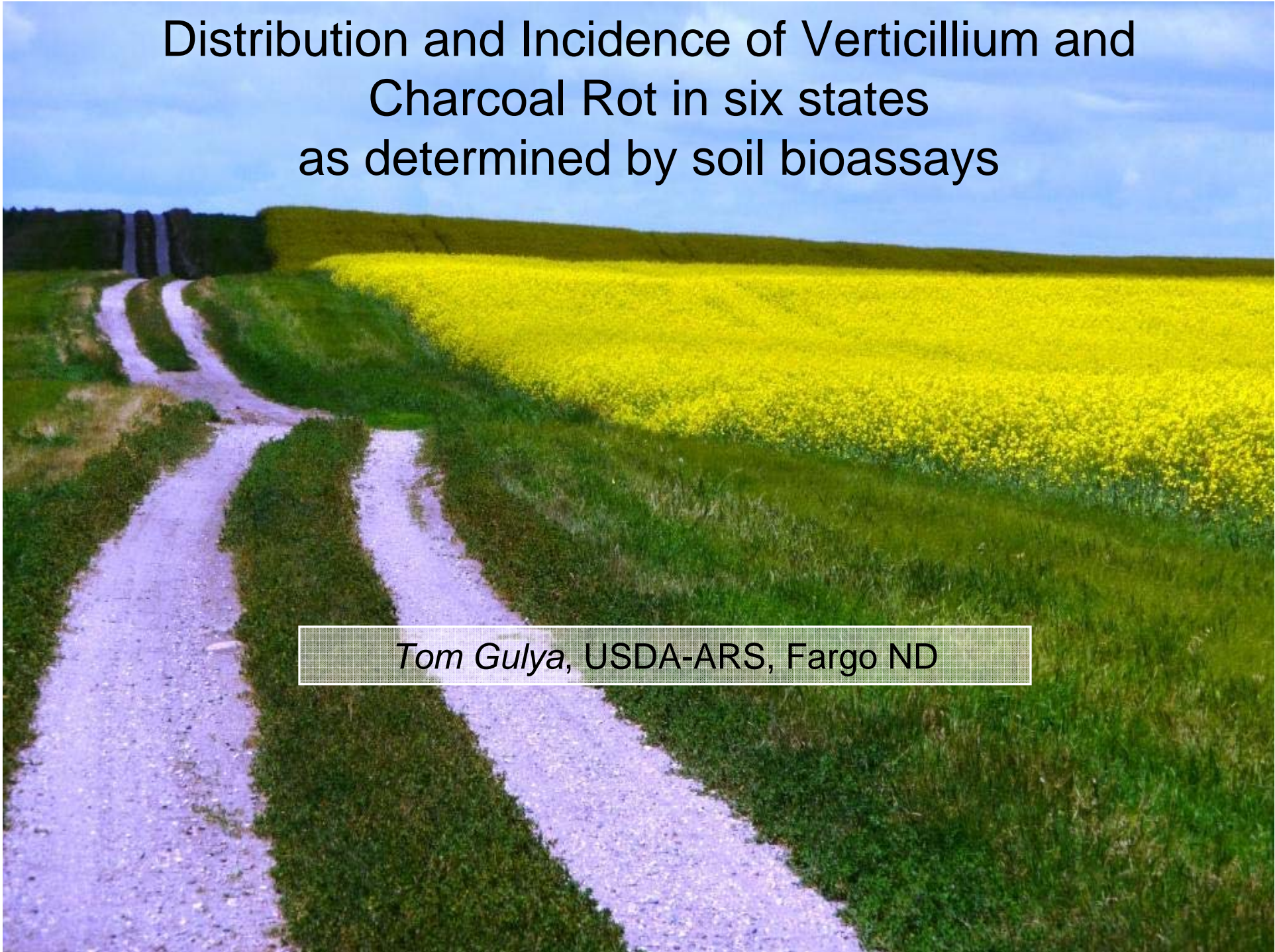


Distribution and Incidence of Verticillium and Charcoal Rot in six states as determined by soil bioassays

Tom Gulya, USDA-ARS, Fargo ND



Participants:

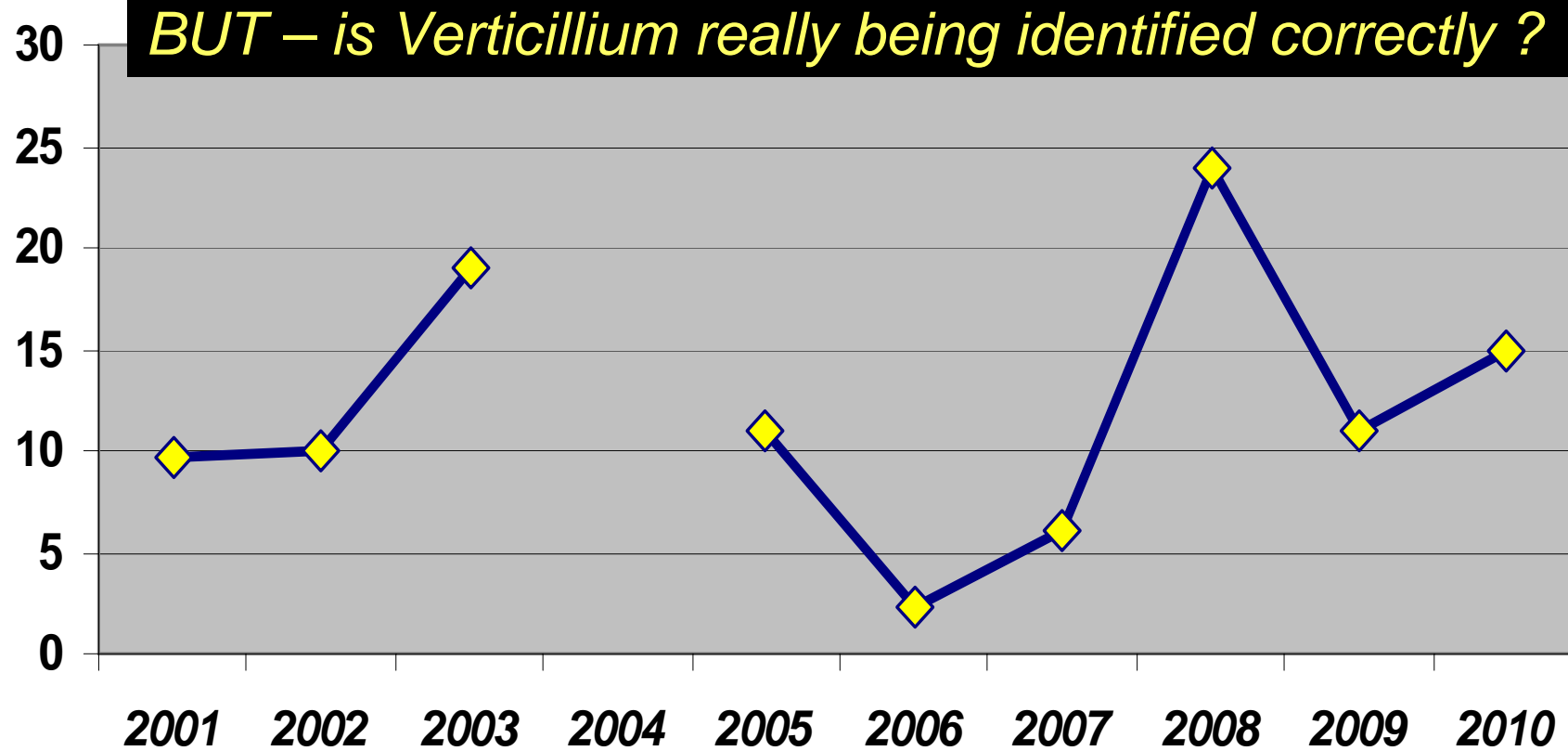
- NDSU – *Marcia McMullen, Sam Markell* & other extension personnel, supervising five IMP scouts
- SDSU – *Larry Osborne*, ext. pathologist
- U NEB – *Bob Harveson*, Scottsbluff, pathologist
- *Alemu Mengistu* - USDA-ARS soybean pathologist (charcoal rot expert)
- PestPros- commercial lab in Wisc specializing in potato pathogens

Question -

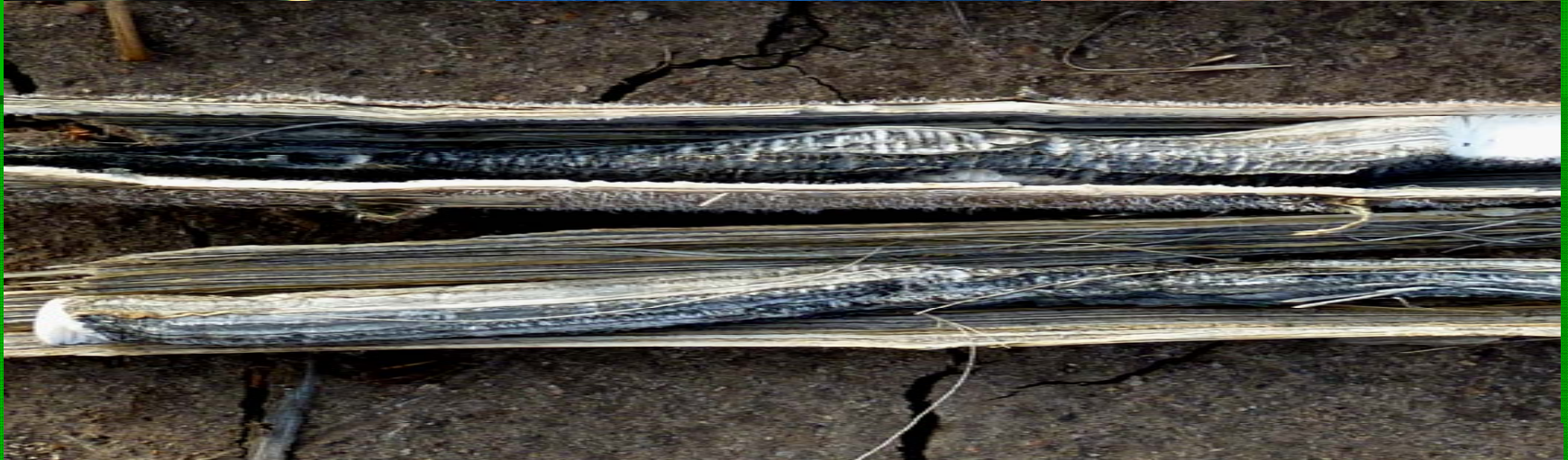
- What is the distribution of some soilborne fungal pathogens, based on soil bioassays?
- How accurately are some of the 'minor' diseases assessed by the NSA survey

What about Verticillium ?

Verticillium Wilt Incidence (% fields)



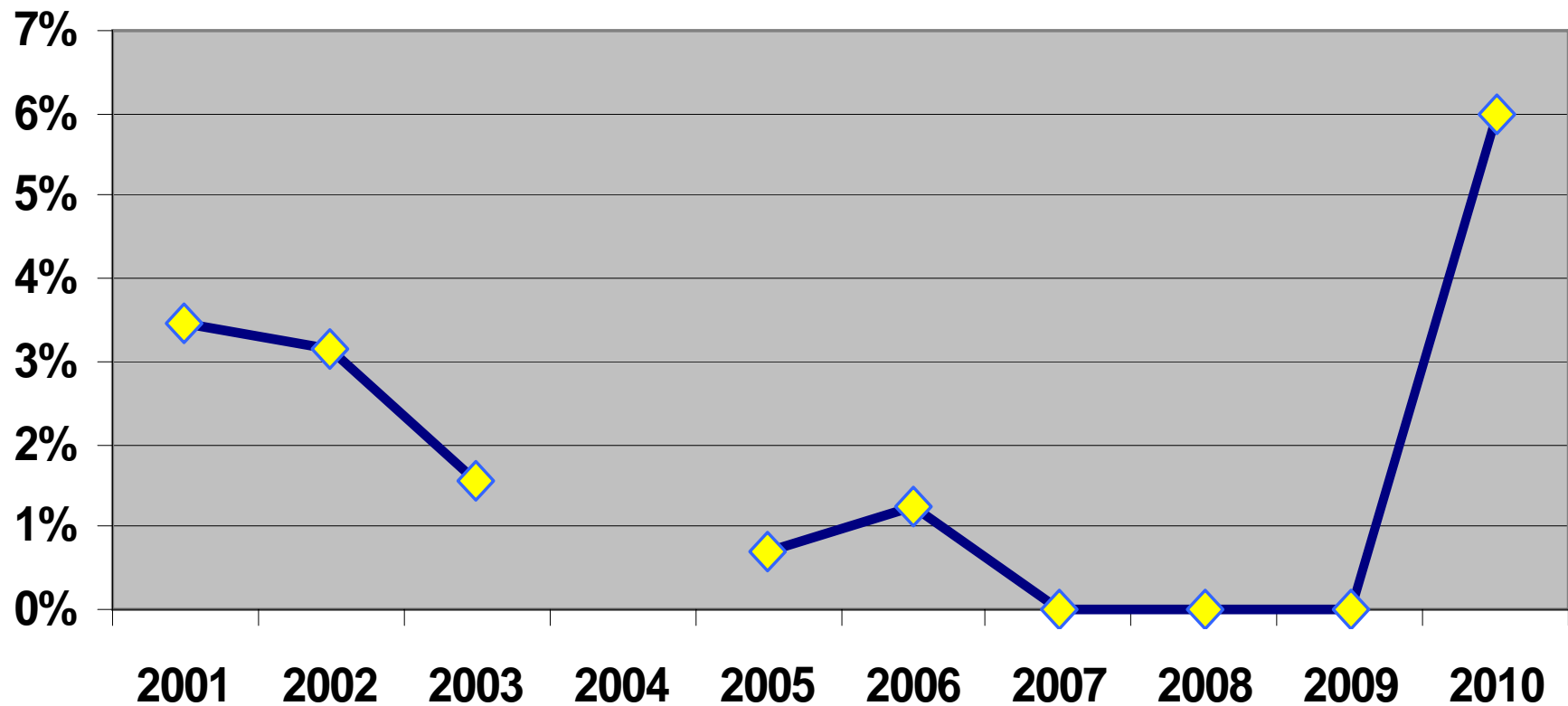
Verticillium symptoms



How prevalent is charcoal rot in sunflower?

Charcoal rot Incidence in U.S. Sunflower Crop

Data from annual NSA survey

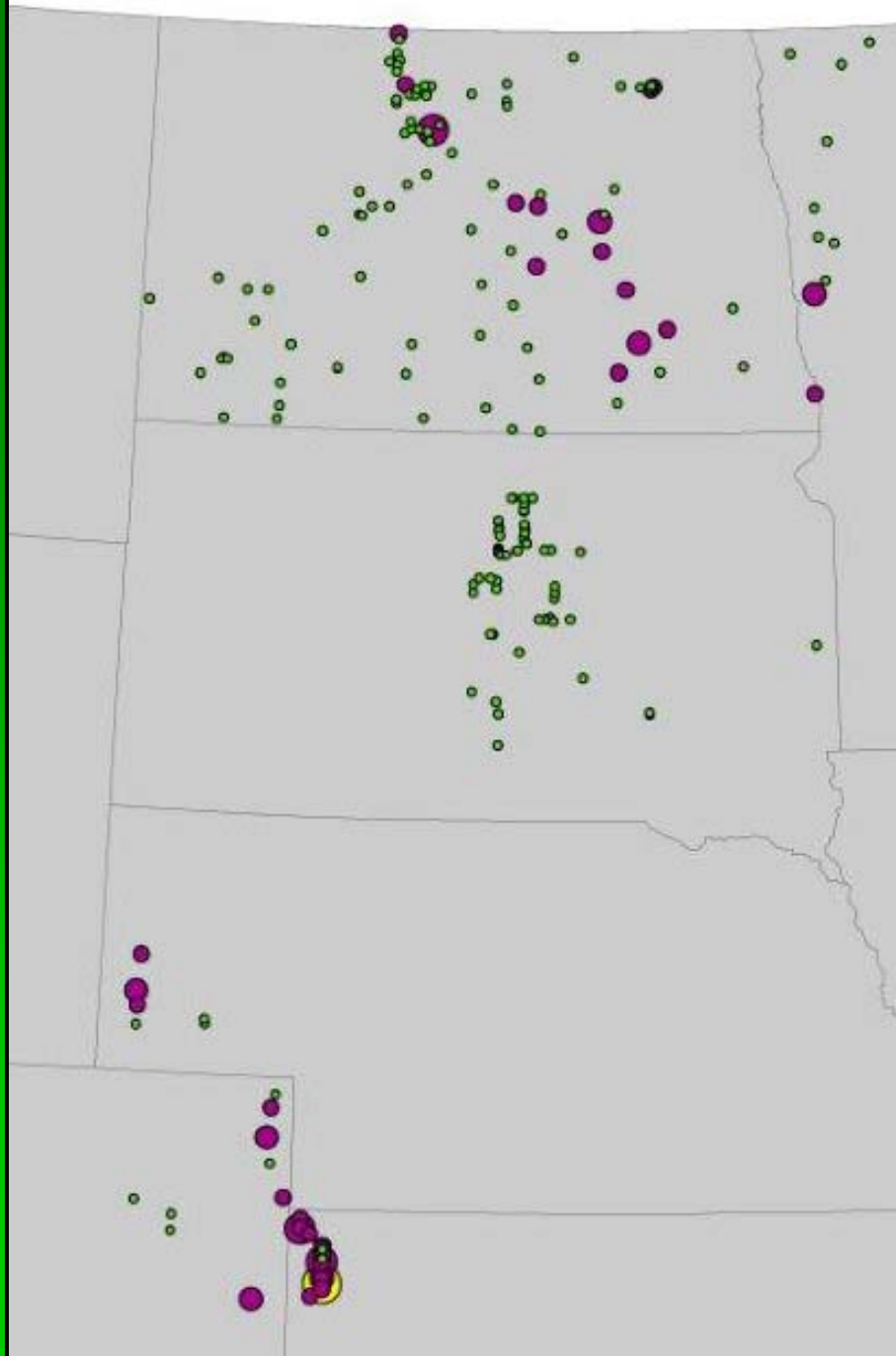


Charcoal rot



Objectives -

- Collect soil samples from six states (200 total)
- Have soil assayed in lab tests to positively identify & quantify Verticillium (commercial lab) and charcoal rot (USDA expert in TN)
- Visit 'positive' fields at season-end to verify disease.
- Compare disease incidence from NSA survey with soil bioassay results

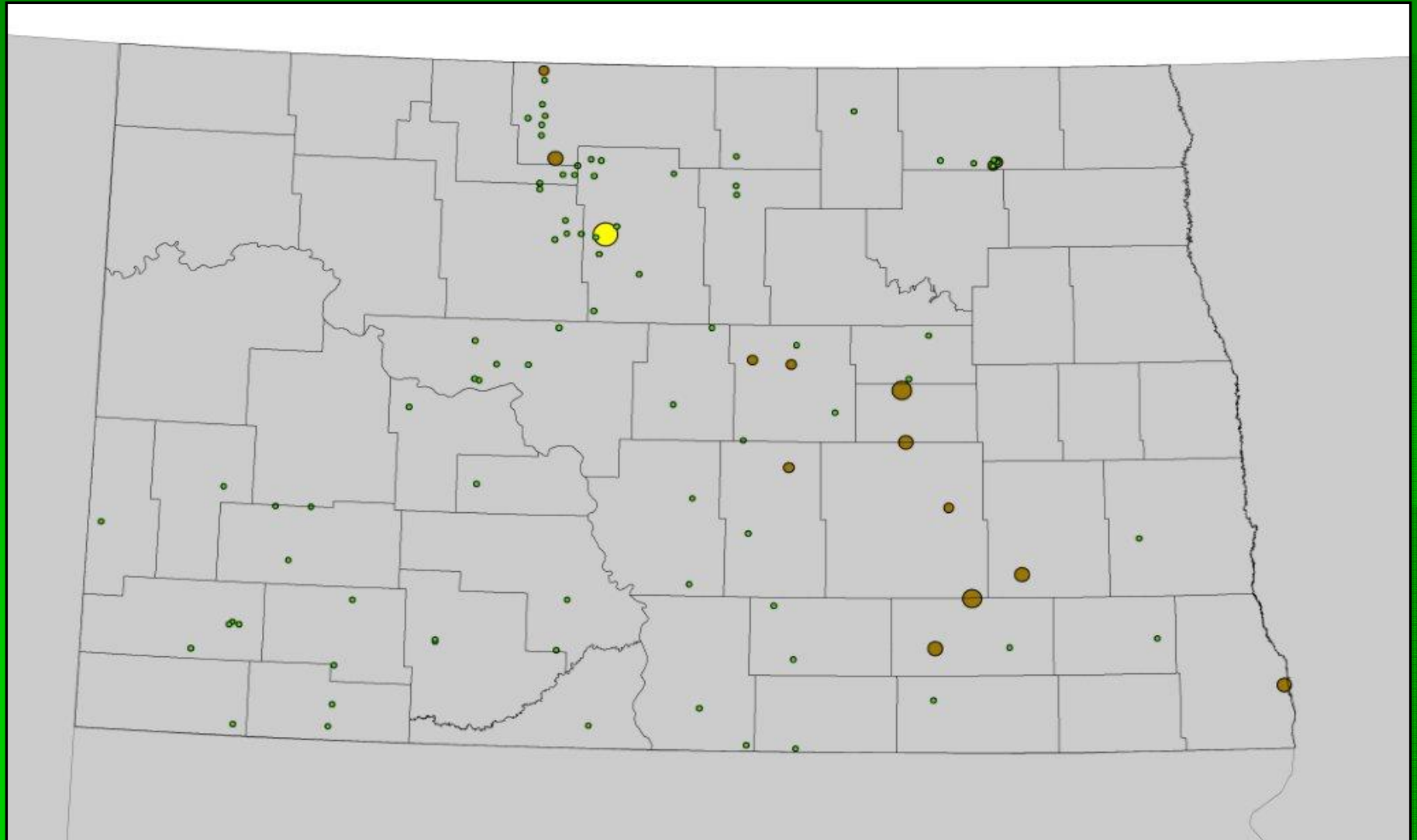


- 203 sampled fields from six states:
- ND – 101
- SD – 60
- MN – 8
- KS –
- NE –
- CO

Verticillium soil bioassay Results

State	# samples	# Vert positive	%	# propagules/ g soil
ND	101	16	16	0.7
SD	60	0	0	0
MN	9	1	11	0.9
KS	18	16	89	14.2
NE	6	3	50	2
CO	9	4	44	1.3
TOTAL	203		20	

Verticillium incidence from soil samples – determined by commercial bioassay



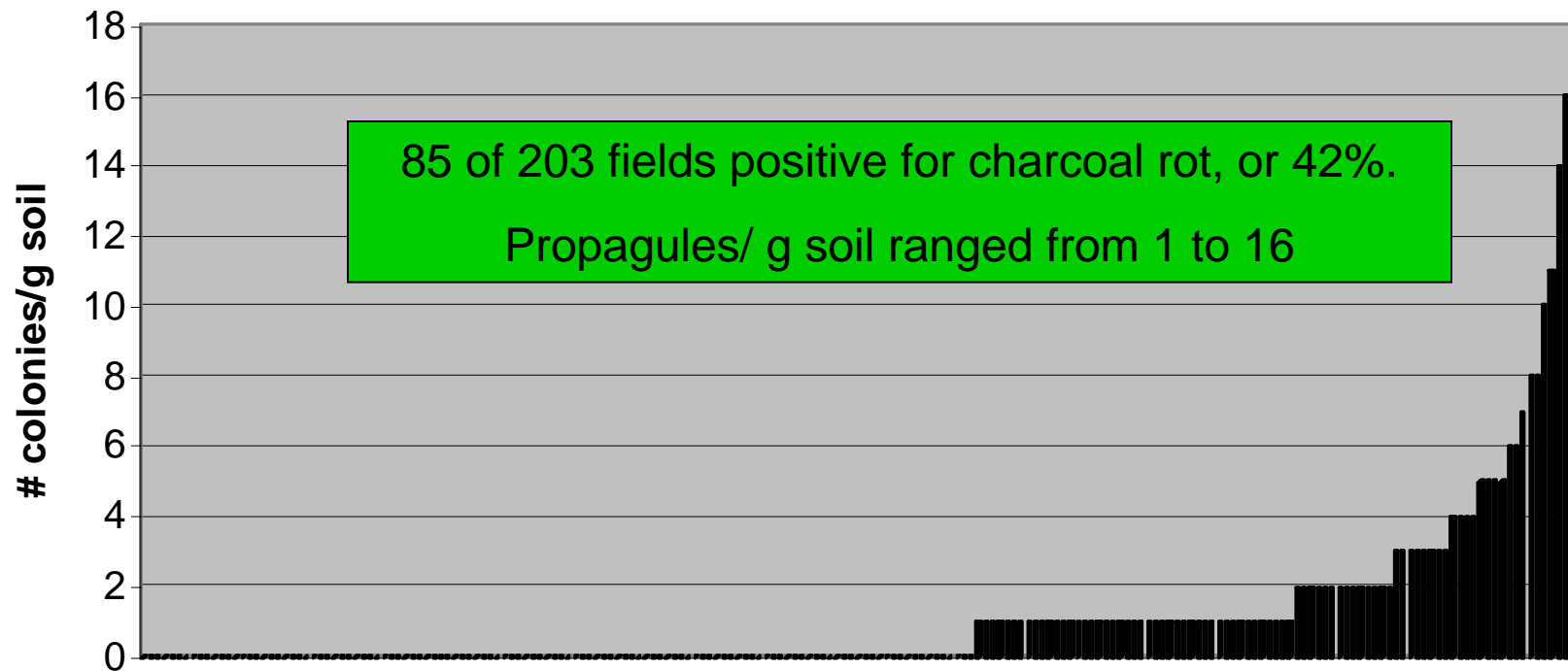
Field verification - Vert

- *Every field visited with a positive soil bioassay for Vert had Verticillium infected plants.* (50 -100 stalks split open to examine pith)
- End of season (late Sept – early Oct) best time to *positively* identify Verticillium

Black, shrunken pith best diagnosis for Verticillium



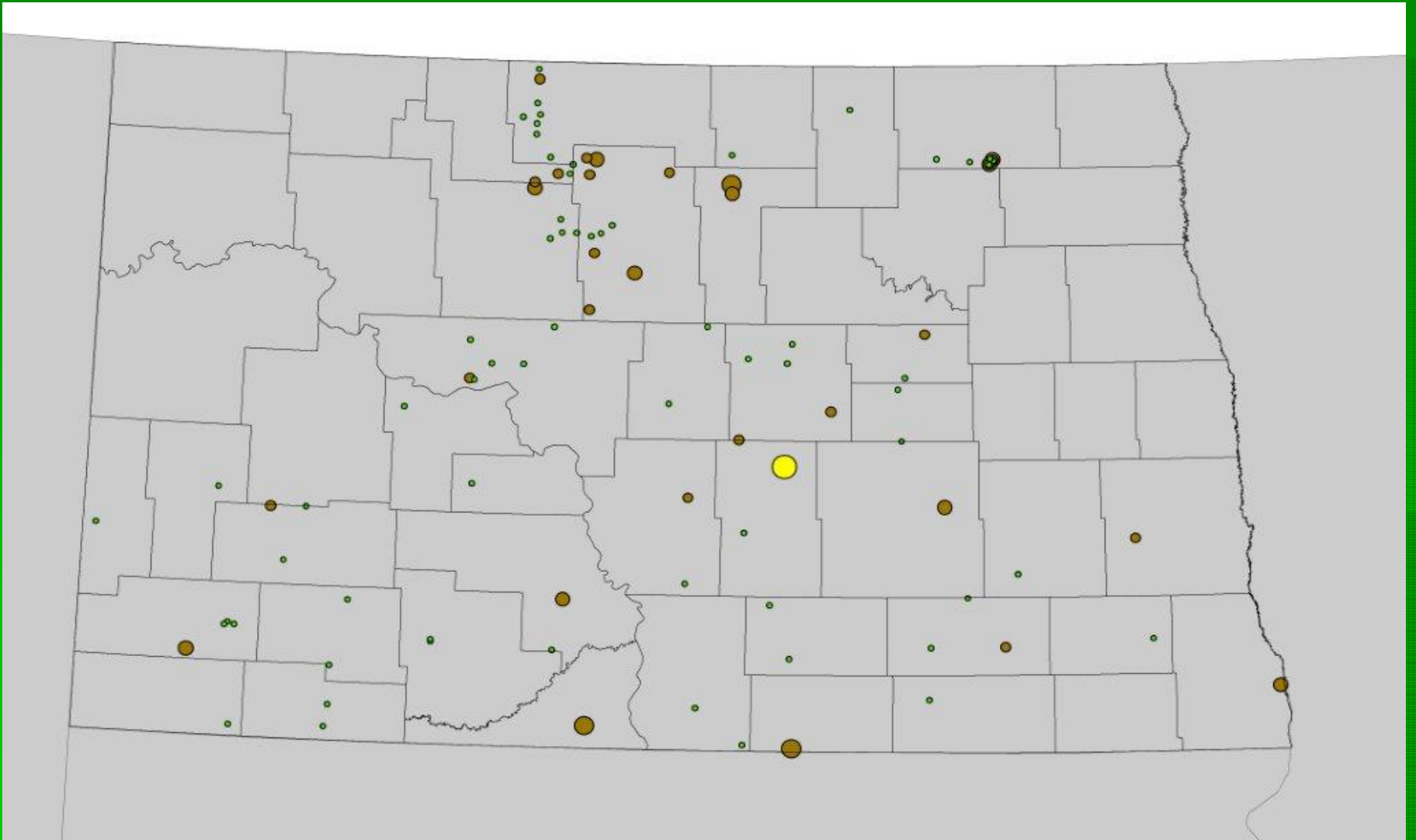
Charcoal Rot Soil Bioassay - 2010



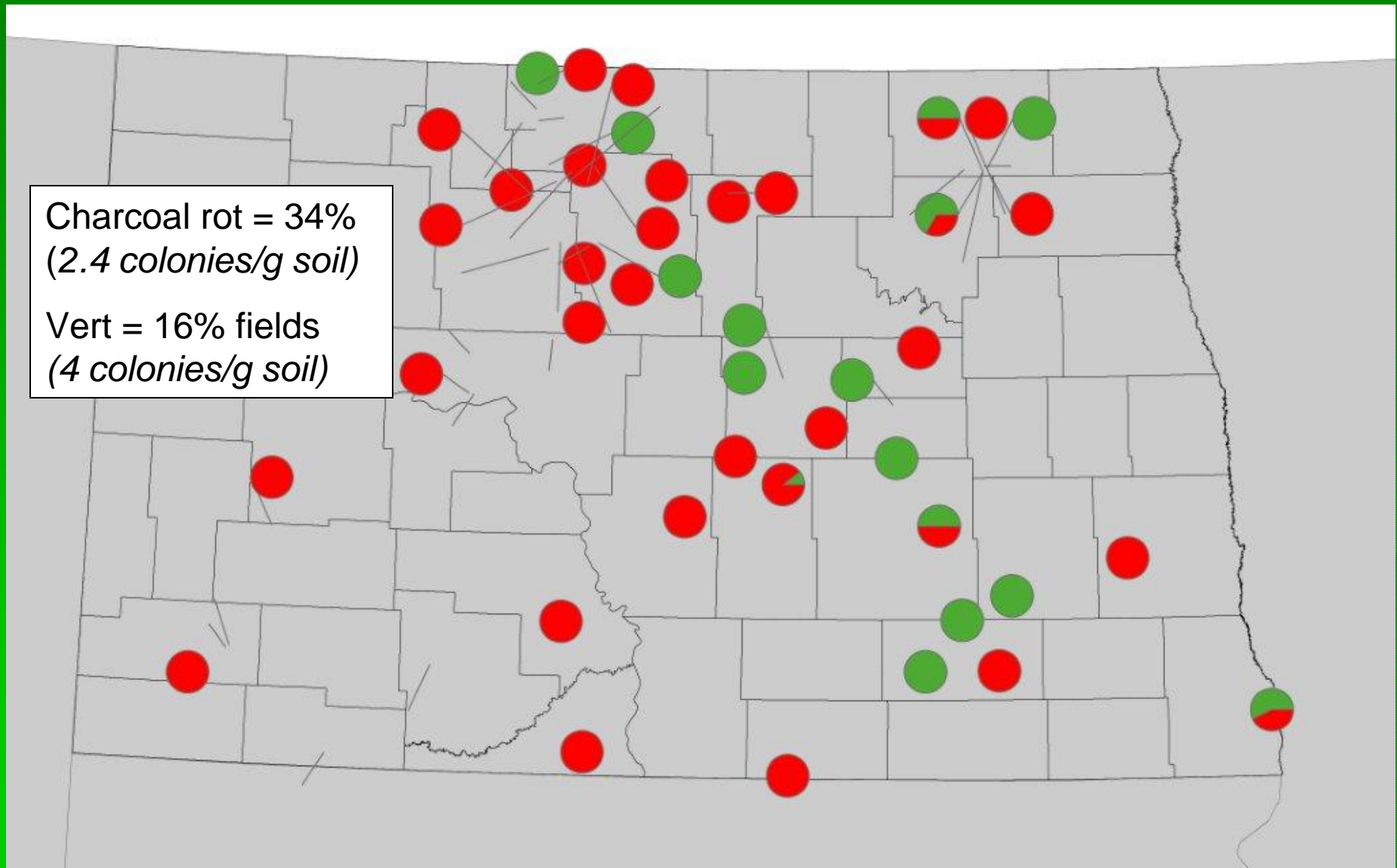
Charcoal rot soil bioassay Results

State	# samples	# Charcoal Rot positive	%	# propagules/ g soil
ND	101	34	34	0.8
SD	60	27	45	2.3
MN	9	5	56	0.7
KS	18	11	61	2
NE	6	3	50	1.3
CO	9	5	45	3.5
TOTAL	203		40	

Charcoal rot 'incidence' in ND via soil bioassay - 2010



Distribution of Charcoal rot (red) and Verticillium (green) positive fields in ND - 2010



Comparison of 2010 Survey & Soil Bioassay

	NSA Survey Results	Soil Bioassay	Colonies/ g soil & Average	Predictive Ability of Soil Test
Vert	30 of 197 = 15%**	40 of 203 = 20%	2 to 106 Av = 9	Good
Charcoal Rot	12 of 197 = 6%**	85 of 203 = 41%	1 to 17 Av = 2.8	Low soil counts. Poor prediction

** Many fields recorded as positive for Vert or charcoal rot were found to be misidentified.

Summary -

- Verticillium incidence ~ equal for NSA and soil bioassay.... But soil bioassay correctly predicts occurrence of disease.
- High levels of Vert soils of High Plains fields
- Surprising that no Vert found in any of 60 SD soil samples, but was recovered during a 5 day trip from plants.

Summary -

- Charcoal rot fungus present in 41% of fields... much more than observed in surveys
- Amount of charcoal rot fungus (*Macrophomina*) in soil may be < threshold to cause disease (or affected by excess soil moisture)
- Scant research on effect of charcoal rot on yield in U.S.
- Charcoal rot fungus found in every state in ~ equal amounts

Thank you -

