

Spore Trapping: Technologies and Results from 2007

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QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

APS, National Soybean Rust Symposium
Louisville, KY, Dec. 12-14, 2007

Outline

- ◆ Spore Traps
- ◆ Assays
- ◆ 2007 results
- ◆ “Iowa Event”
- ◆ Summary



Spore traps

- ◆ Rain traps
 - ◆ Passive (JB)
 - ◆ Wet deposition
 - ◆ Dry deposition



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 - ◆ Dry deposition
- ◆ Active (NADP)
 - ◆ Wet deposition



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- ◆ Passive (JB)
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 - ◆ Dry deposition
- ◆ Active (NADP)
 - ◆ Wet deposition



◆ Air traps

- ◆ Passive (Syngenta)



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- ◆ Passive (JB)
 - ◆ Wet deposition
 - ◆ Dry deposition
- ◆ Active (NADP)
 - ◆ Wet deposition



◆ Air traps

- ◆ Passive (Syngenta)
- ◆ Active (Burkhardt)



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Spore traps: Assay

- ◆ Rain traps (Passive & Active)



Spore traps: Assay

- ◆ Rain traps (Passive & Active)
 - ◆ Nested qPCR assay
 - ◆ *P. pachyrrhizi* specific
 - ◆ PCR primer and TaqMan probe
 - ◆ Sensitive (1-2 spores)



Spore traps: Assay

- ◆ Rain traps (Passive & Active)
 - ◆ Nested qPCR assay
 - ◆ *P. pachyrhizi* specific
 - ◆ PCR primer and TaqMan probe
 - ◆ Sensitive (1-2 spores)
- ◆ Air traps
 - ◆ Passive
 - ◆ Visual - Spore morphology
 - ◆ “Soybean rust-like”
 - ◆ Sensitive (1-2 spores)



Spore traps: Assay

- ◆ Rain traps (Passive & Active)
 - ◆ Nested qPCR assay
 - ◆ *P. pachyrhizi* specific
 - ◆ PCR primer and TaqMan probe
 - ◆ Sensitive (1-2 spores)
- ◆ Air traps
 - ◆ Passive
 - ◆ Visual - Spore morphology
 - ◆ “Soybean rust-like”
 - ◆ Sensitive (1-2 spores)
 - ◆ Active
 - ◆ qPCR or visual



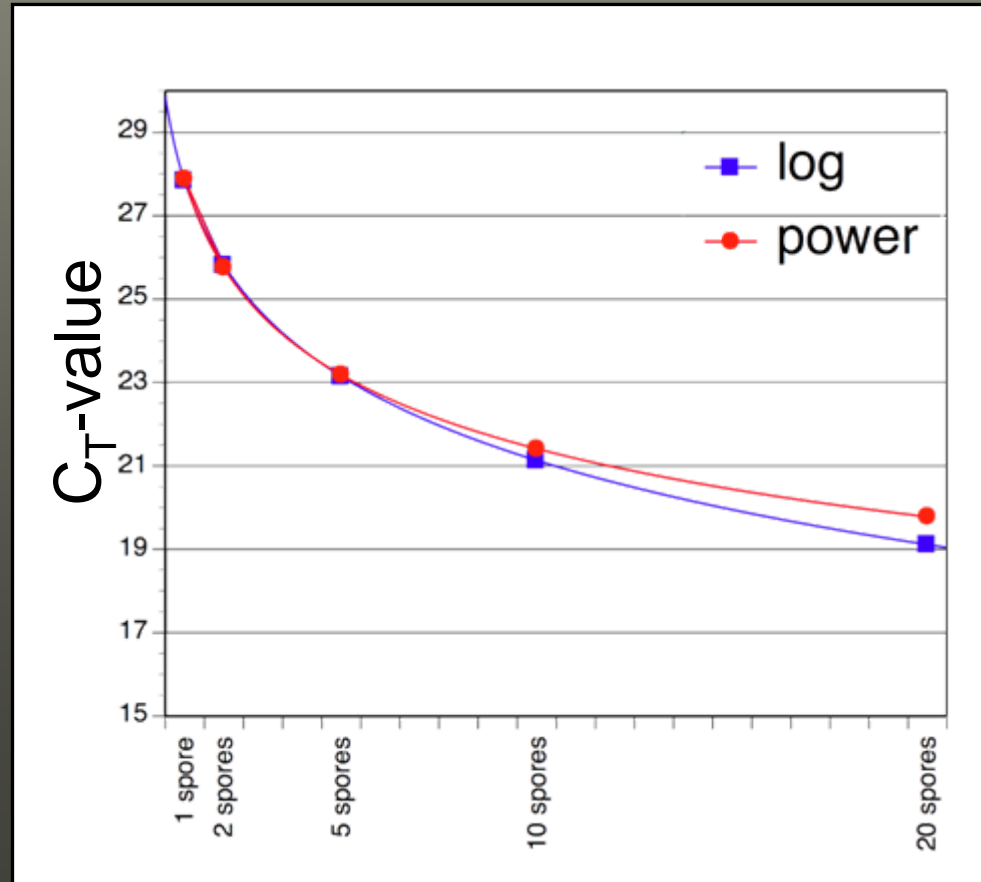
qPCR assay

- ◆ Calibration
 - ◆ Picked spores (dog hair)
 - ◆ 1, 2, 5, 10 & 20
 - ◆ Nested qPCR assay



qPCR assay

- ◆ Calibration
 - ◆ Picked spores (dog hair)
 - ◆ 1, 2, 5, 10 & 20
 - ◆ Nested qPCR assay
 - ◆ Models
 - ◆ log
 - ◆ power
 - ◆ Spores per m²



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Sites

◆ ~230 sites

◆ Rain traps

◆ Passive

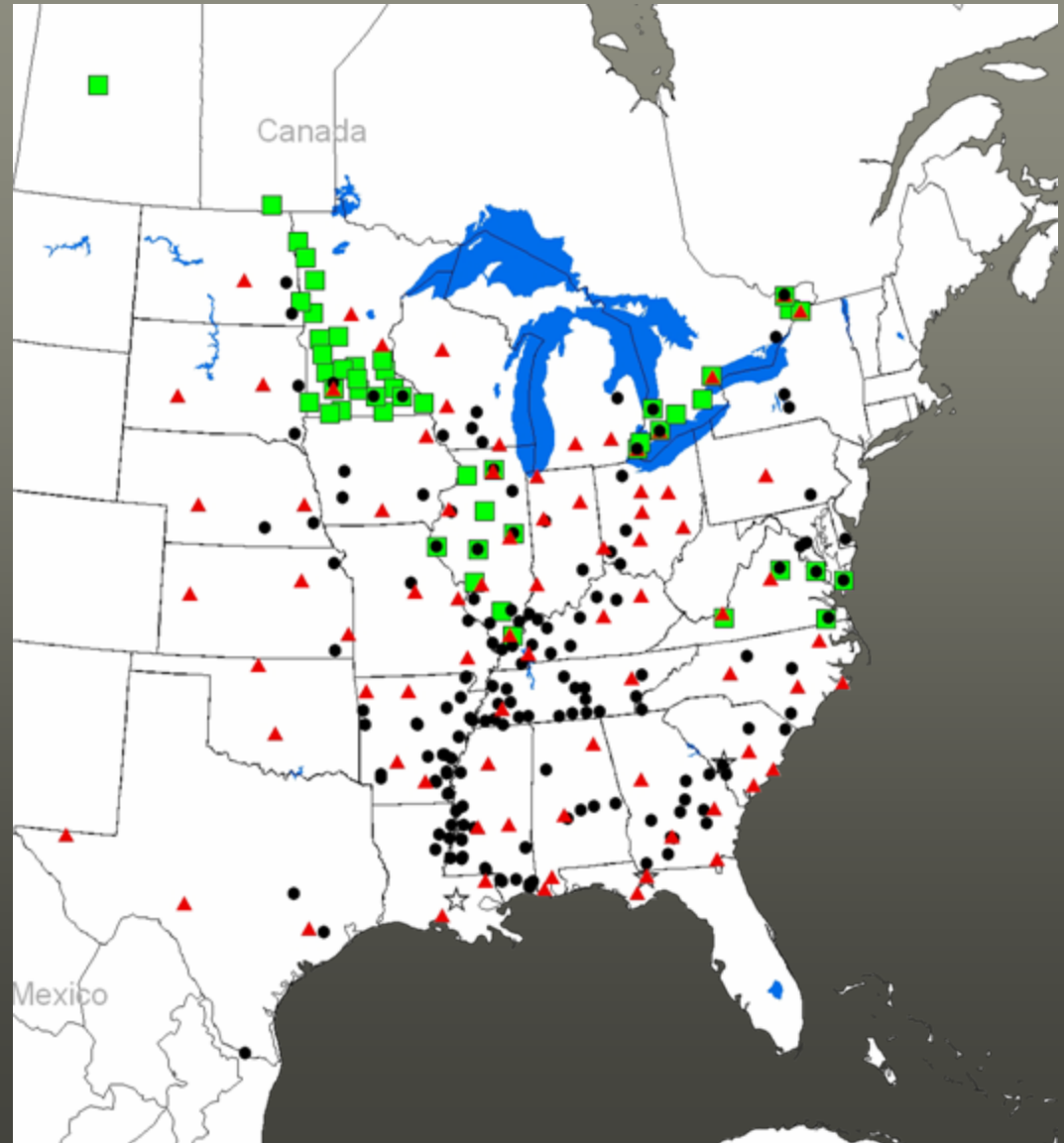


◆ Active

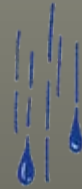


◆ Air traps

◆ Passive



Active Rain trap: NADP

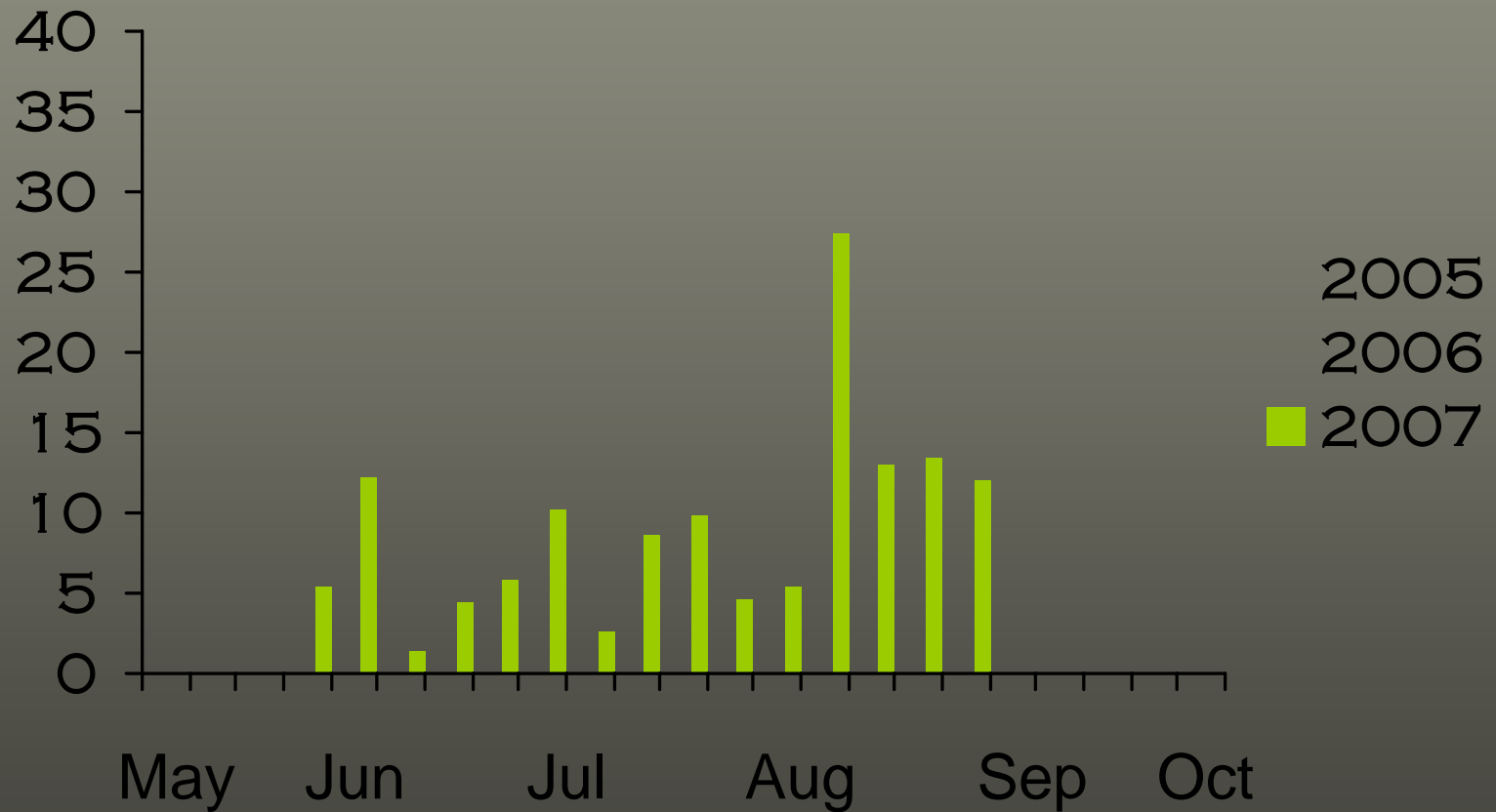


NADP sites

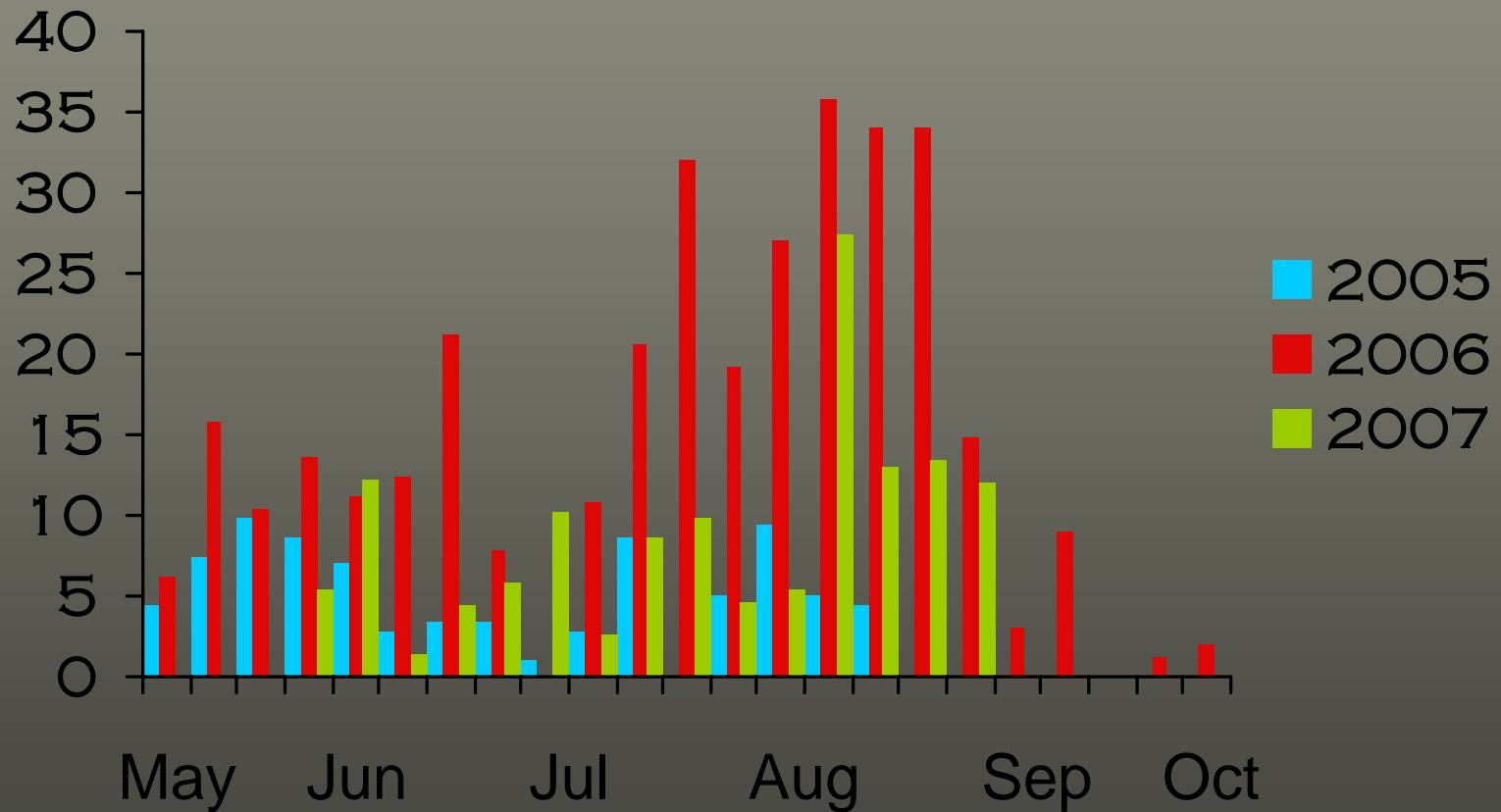
- ◆ 75 sites
- ◆ Sampling dates
 - ◆ May 29 - Sept. 25
 - ◆ Weekly
 - ◆ 17 weeks
- ◆ ~ 1,200 samples
- ◆ 89 positives



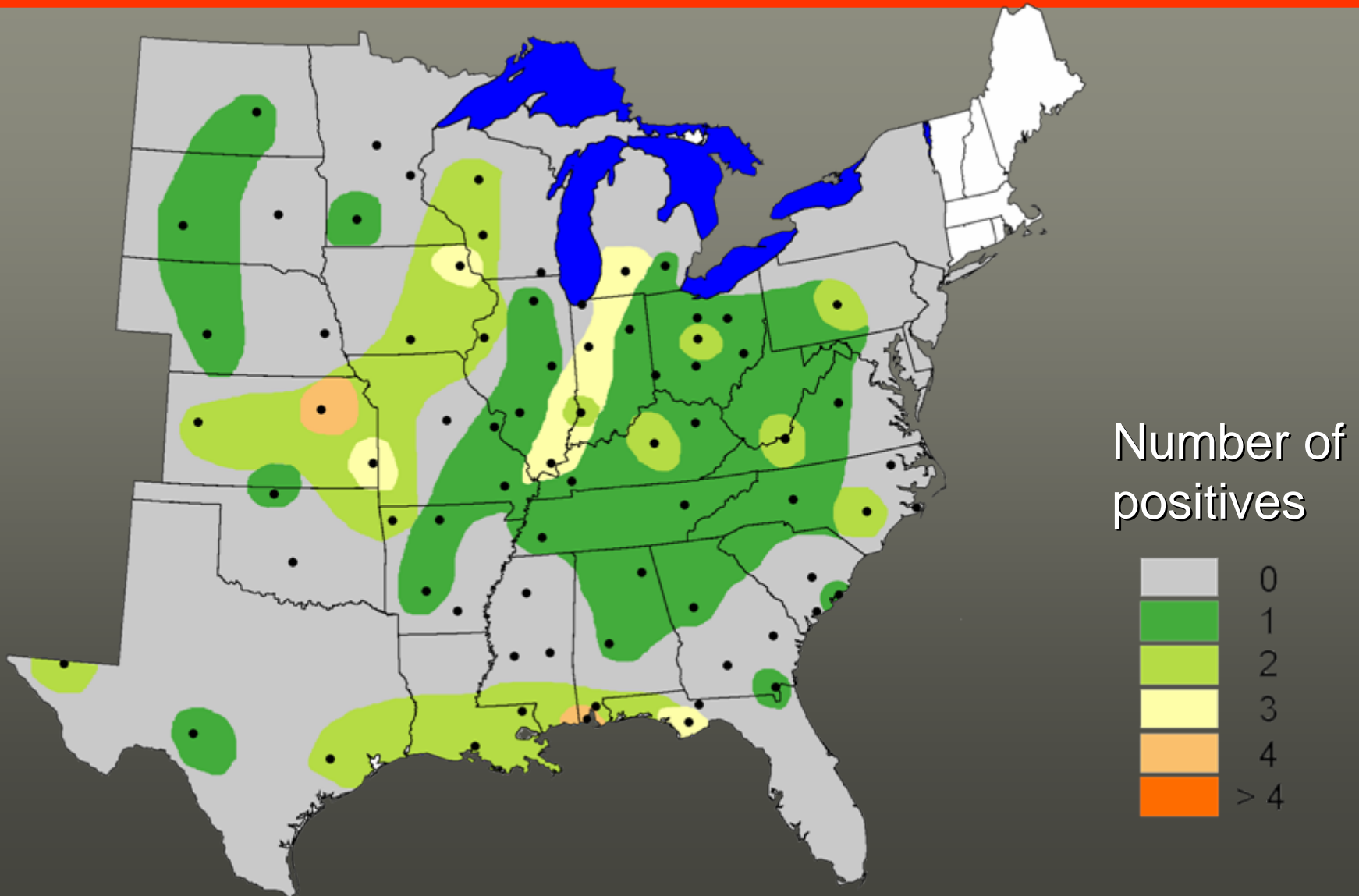
NADP: weekly trends



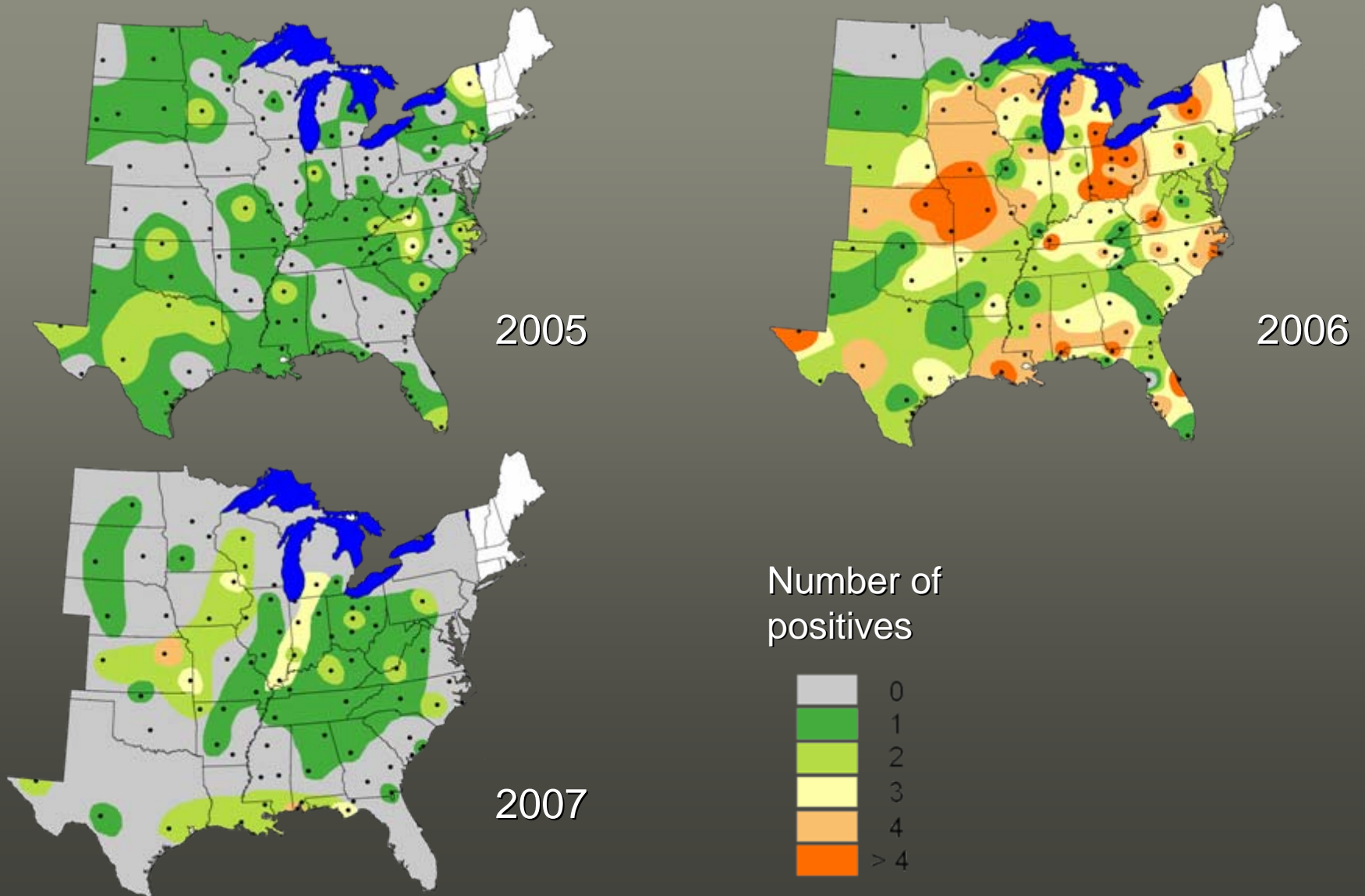
NADP: weekly trends



NADP: Geographical Trends



NADP: Geographical Trends

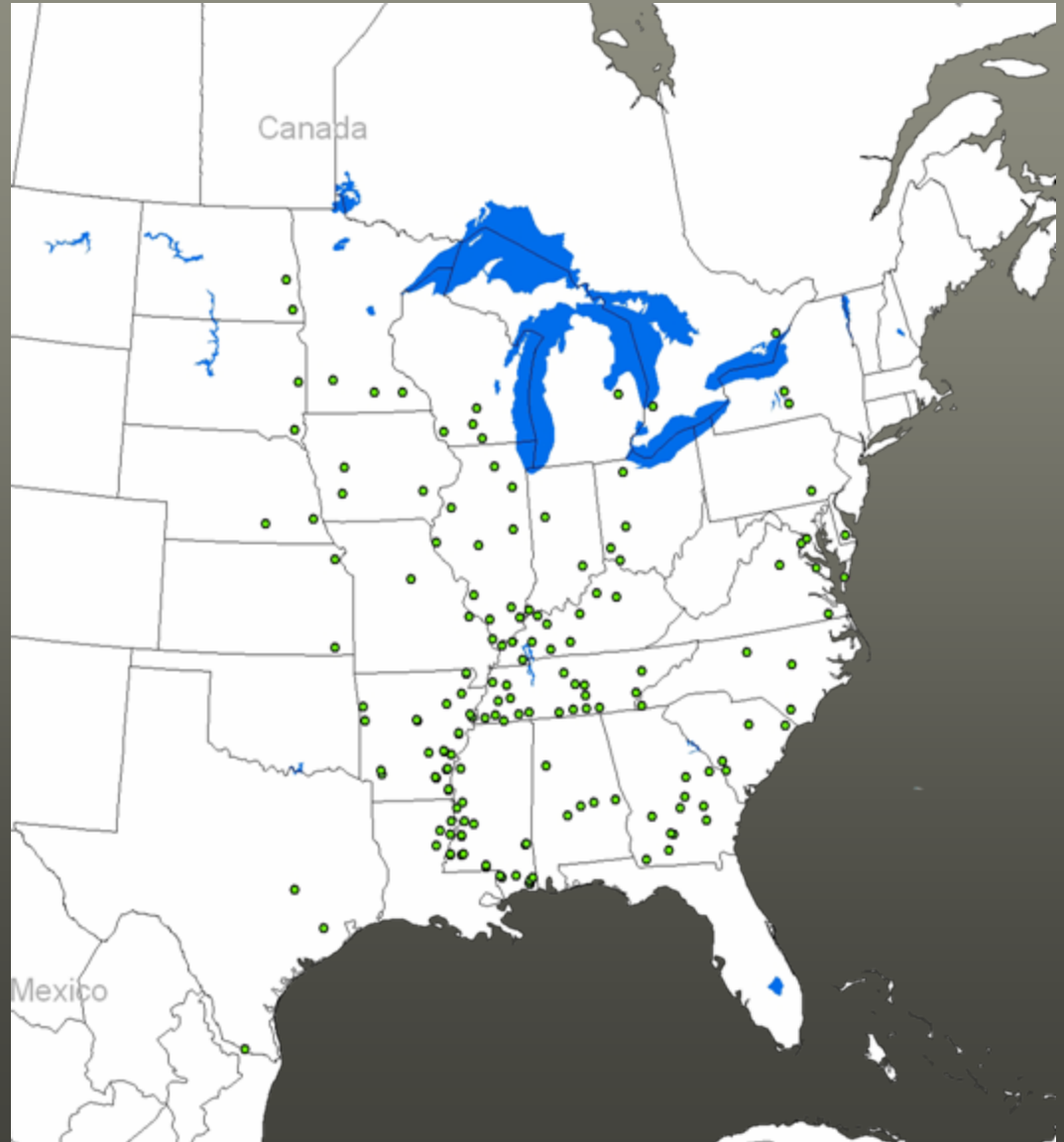


Passive air trap: Syngenta

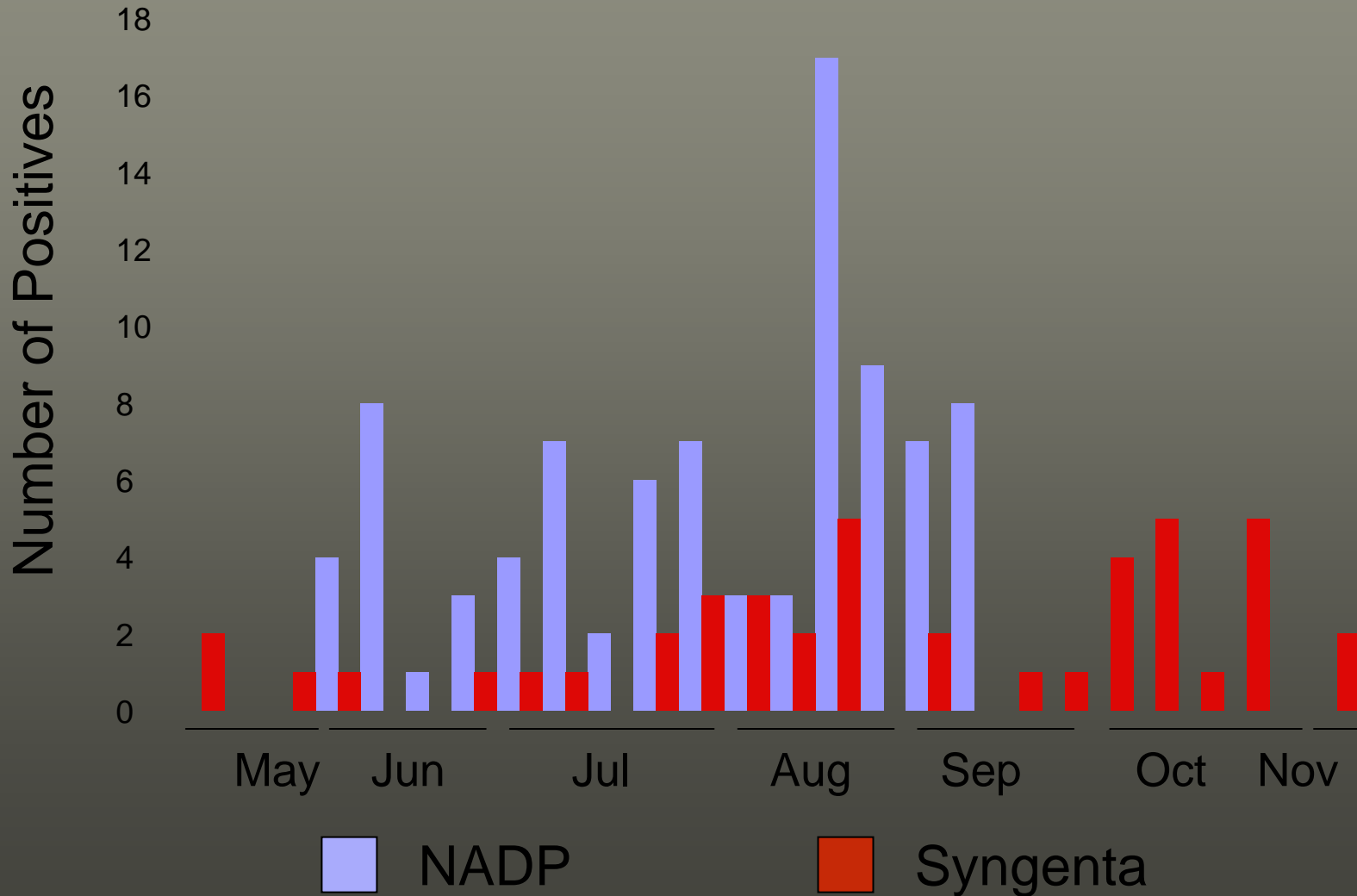


Syngenta sites

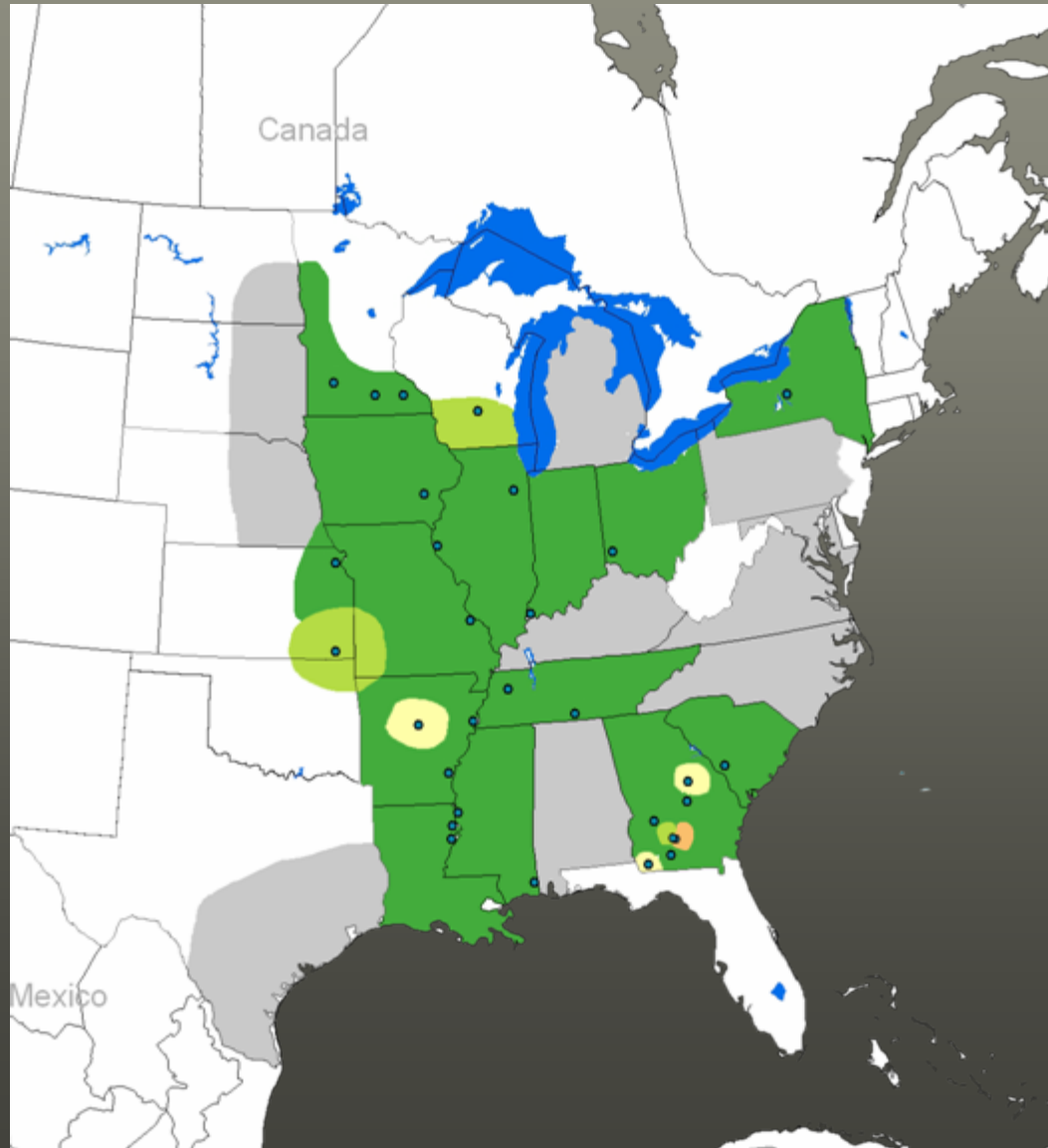
- ◆ 115 sites
- ◆ Sampling dates
 - ◆ May - November
- ◆ ~ 1,700 samples
- ◆ 43 positives



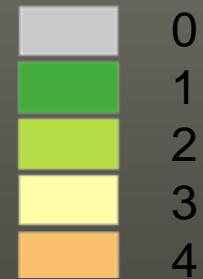
Weekly trends



Geographical trends



Number of positives

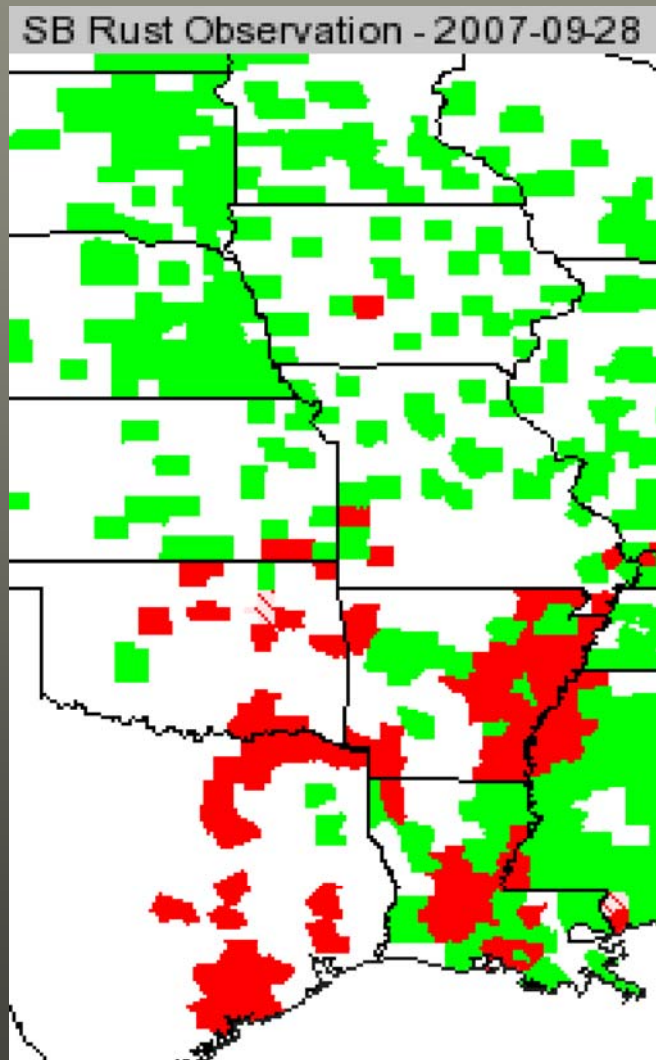


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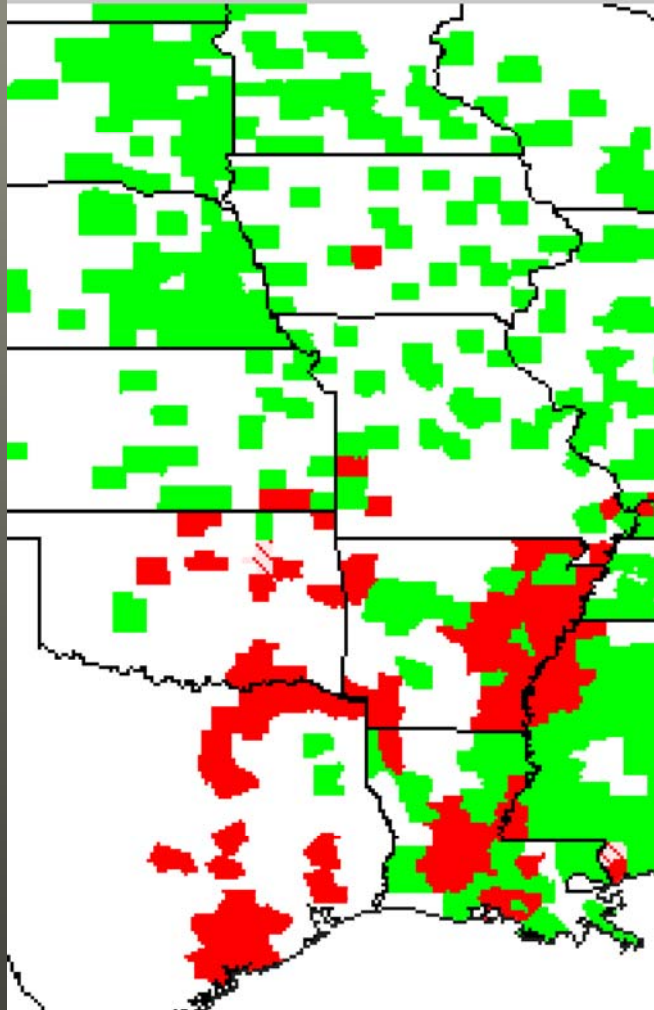


“Iowa Event”

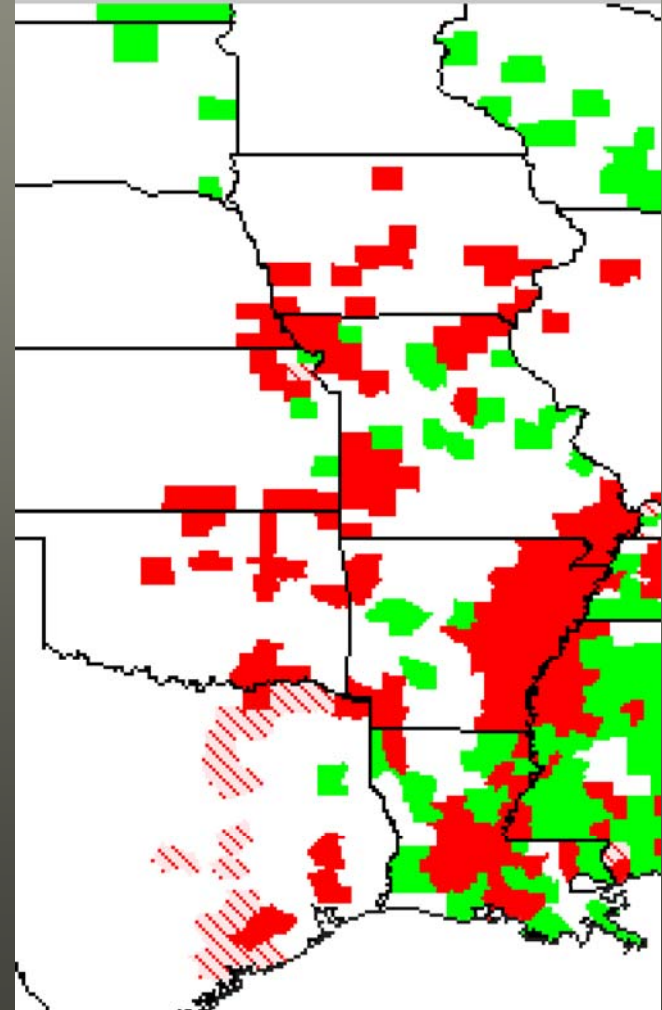


“Iowa Event”

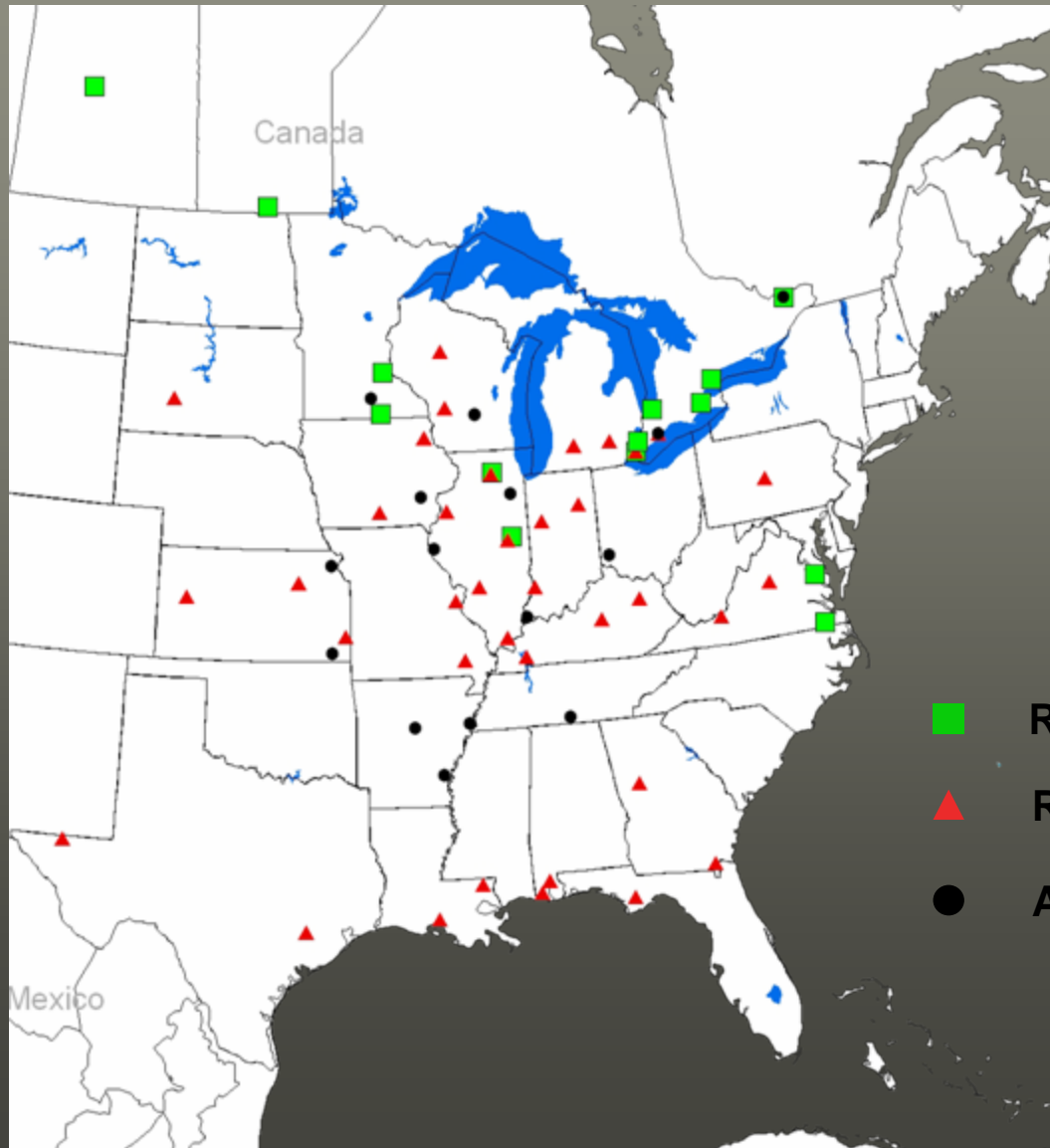
SB Rust Observation - 2007-09-28



SB Rust Observation - 2007-10-31



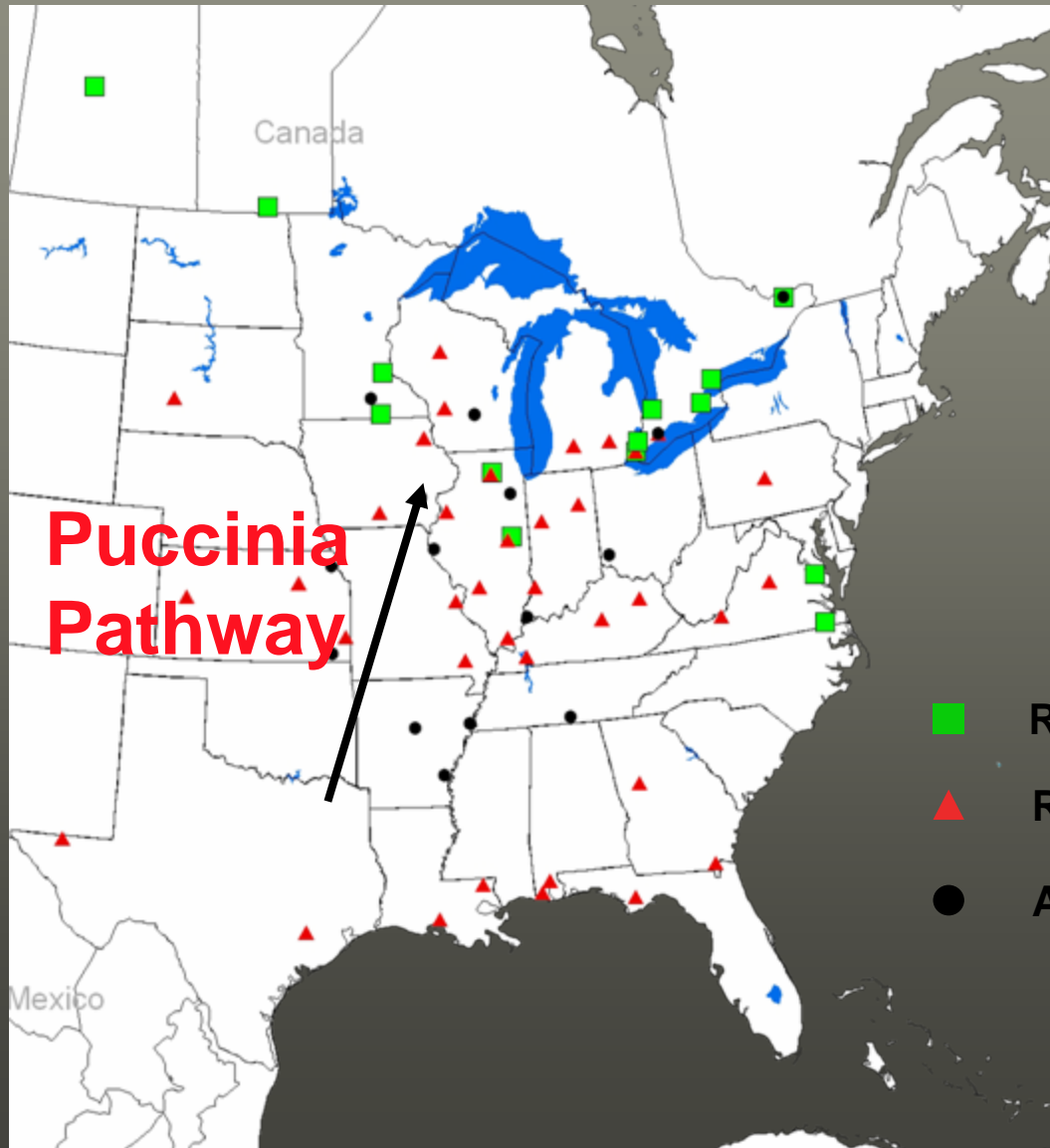
“Iowa Event”



- ◆ Positive events
- ◆ Aug 7 - Sept 25

- Rain Passive
- ▲ Rain Active
- Air Passive

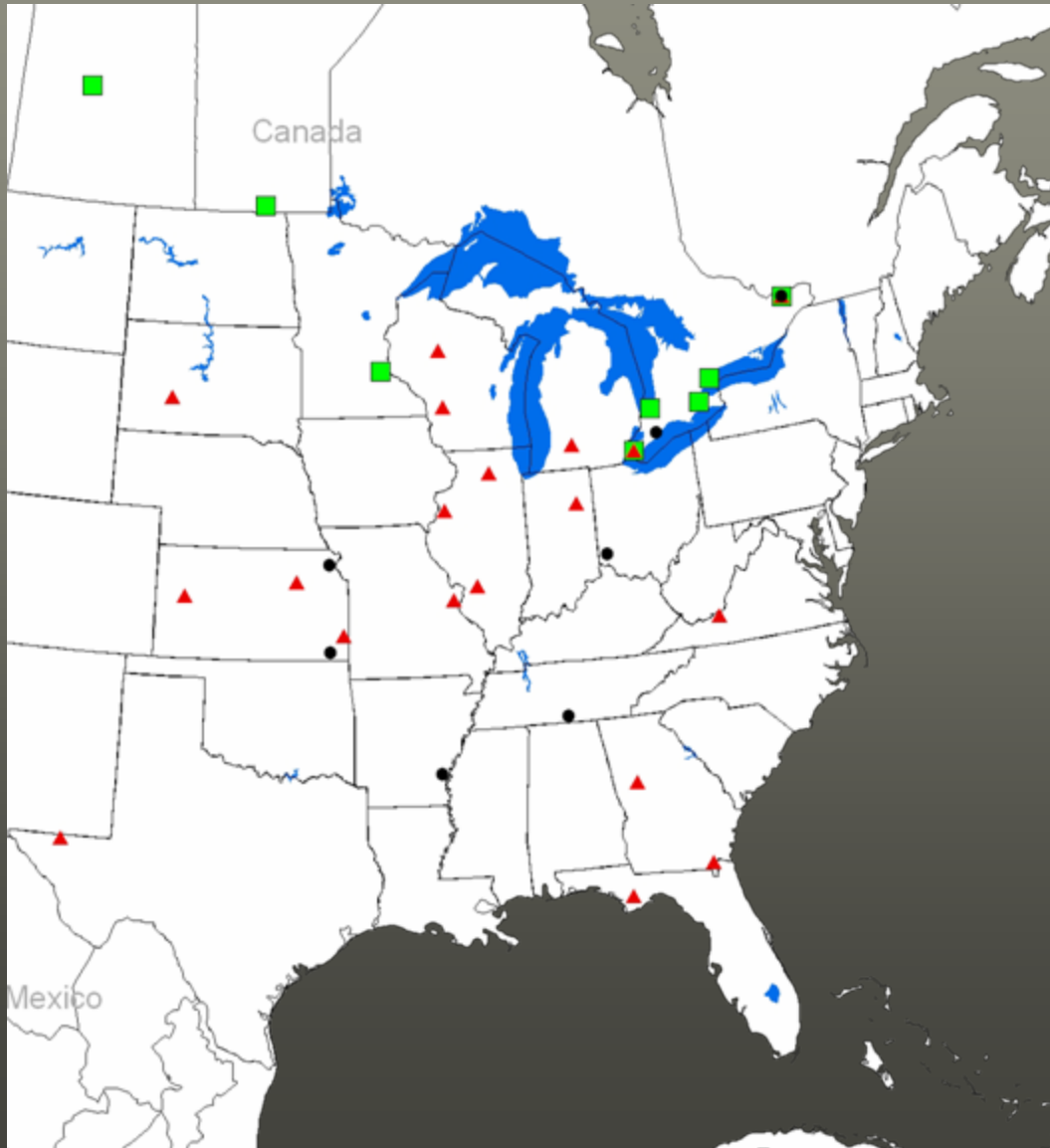
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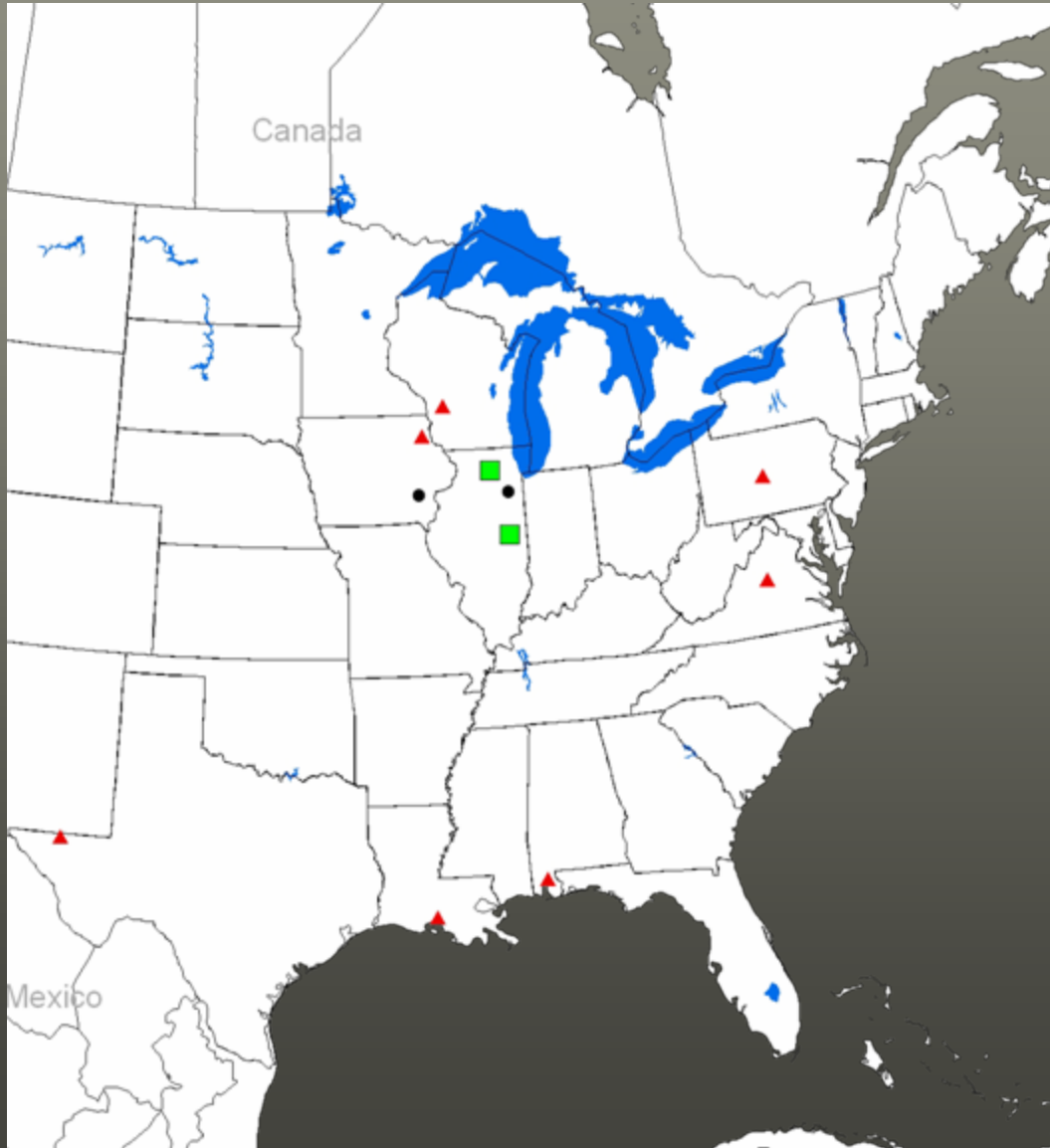
August 14 - 21



August 21 - 28



August 28 - September 4

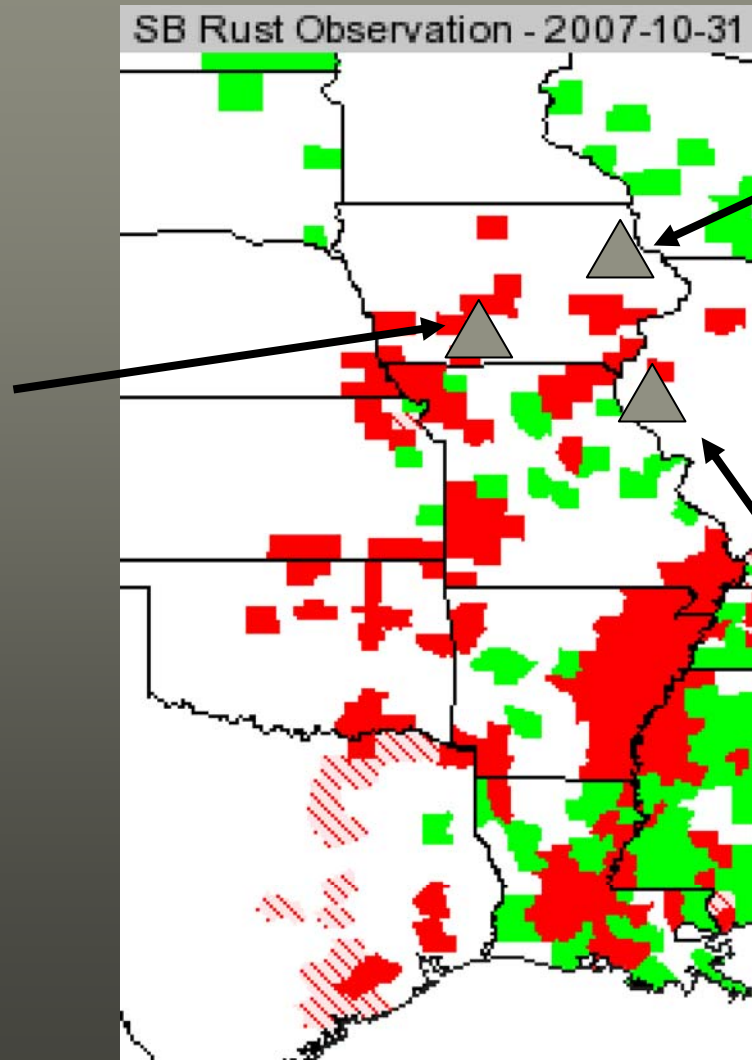


“Iowa Event” : Spore load

◆ IA23

◆ IA08

◆ IL63

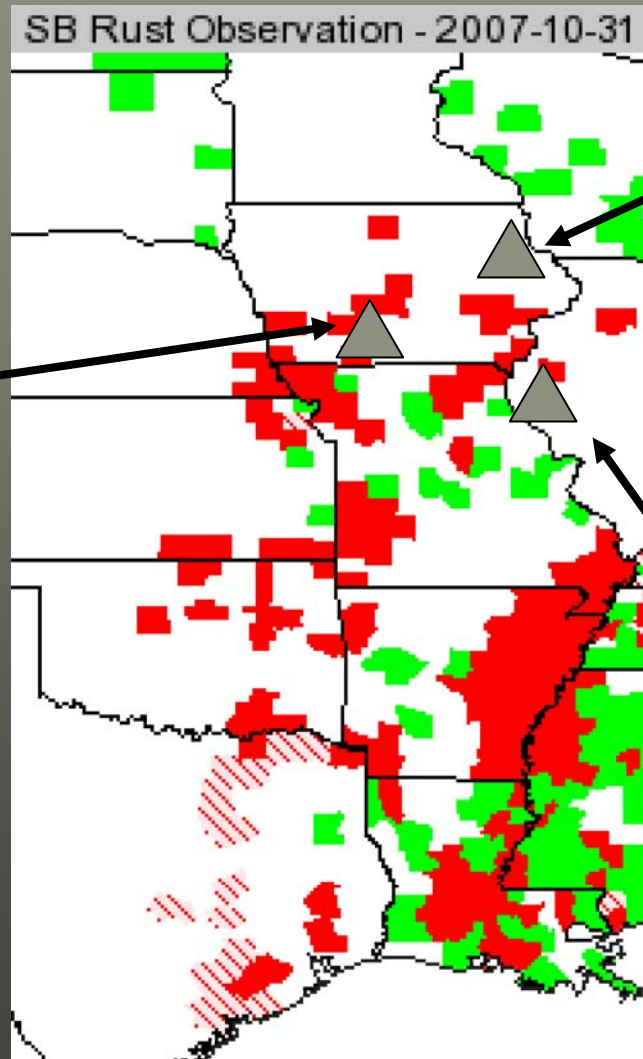


“Iowa Event” : Spore load

◆ IA23

◆ Aug 21-28

◆ 22 spores/m²



◆ IA08

◆ Aug 21-28

◆ 243 spores/m²

◆ IL63

◆ Aug 21-28

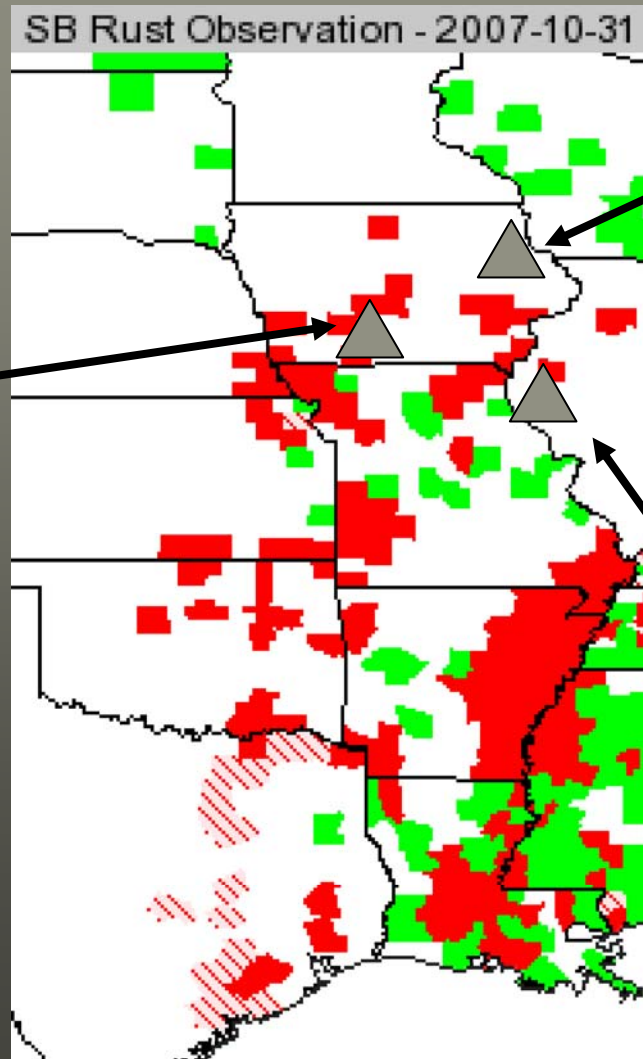
◆ 3 spores/m²

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◆ Aug 21-28

◆ 22 spores/m²



◆ IA08

◆ Aug 21-28

◆ 243 spores/m²

◆ Aug 28-Sept 4

◆ 2 spores/m²

◆ IL63

◆ Aug 21-28

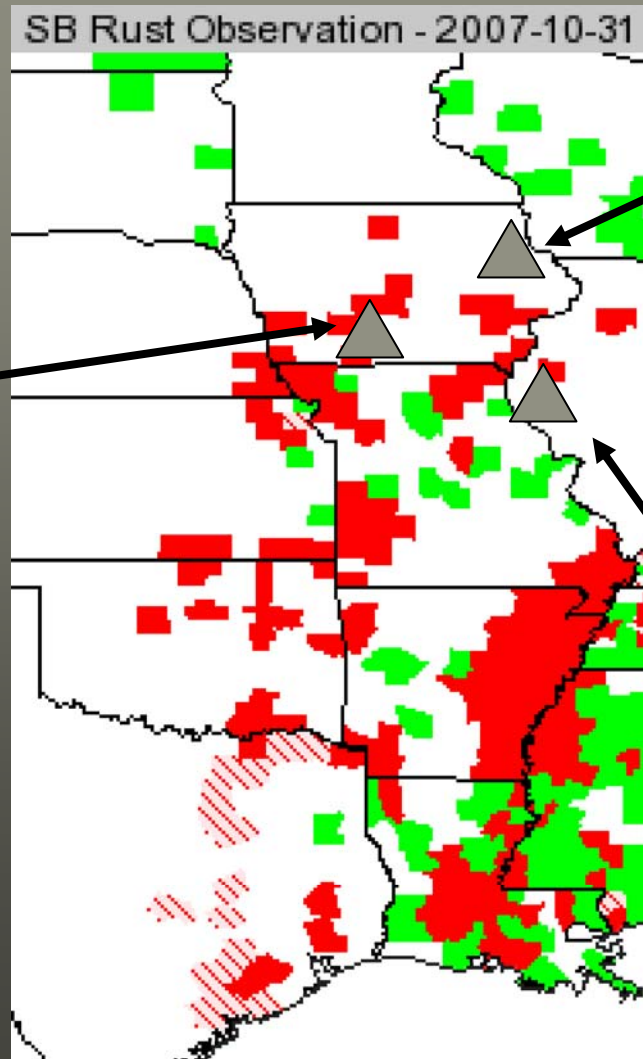
◆ 3 spores/m²

“Iowa Event”

◆ IA23

◆ Aug 21-28

◆ 22 spores/m²



◆ IA08

◆ Aug 21-28

◆ 243 spores/m²

◆ Aug 28-Sept 4

◆ 2 spores/m²

◆ Sept 4- 11

◆ 37 spores/m²

◆ IL63

◆ Aug 21-28

◆ 3 spores/m²

◆ Sept 4-11

◆ 29 spores/m²

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 - ◆ 4 types of spore collectors

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- ◆ qPCR assay has been calibrated to estimate spore load in wet deposition events (spores/m²)

Summary

- ◆ Spore monitoring effort has expanded in 2007
 - ◆ 5 groups, Eastern U.S. and Canada
 - ◆ 4 types of spore collectors
- ◆ qPCR assay has been calibrated to estimate spore load in wet deposition events (spores/m²)
- ◆ Number of positive events in 2007 were less than in 2006

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- ◆ Significant deposition of *P. pachyrhizi* spores occurred across the Upper Midwest the last two weeks of August and first week of September

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Summary

- ◆ Significant deposition of *P. pachyrhizi* spores occurred across the Upper Midwest the last two weeks of August and first week of September
- ◆ Rain spore deposition in Iowa during this period ranged from 2 - 243 spores/m² per monitoring period
- ◆ These deposition events likely provided the inoculum for the disease found across the Upper Midwest in late September and October

Thanks!!!

- ◆ USDA ARS Cereal Disease Lab
 - ◆ Charlie Barnes, Jerry Johnson, John Butler, Nathan Juergens, Yibai Li, Sara Wilke and Jacki Koch
 - ◆ NADP, Illinois Water Survey, University of Illinois
 - ◆ Van Bowersox, Christopher Lehmann and Brenda Riney
 - ◆ University of Arkansas
 - ◆ John Rupe and company
 - ◆ University of Minnesota
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 - ◆ Ontario Ministry of Agriculture
 - ◆ Albert Tenuta and Sarah Hambleton
 - ◆ Virginia Polytech Institute and State University
 - ◆ Erik Stromberg and Elizabeth Bush
- ◆ Funding
 - ◆ USDA ARS
 - ◆ USB