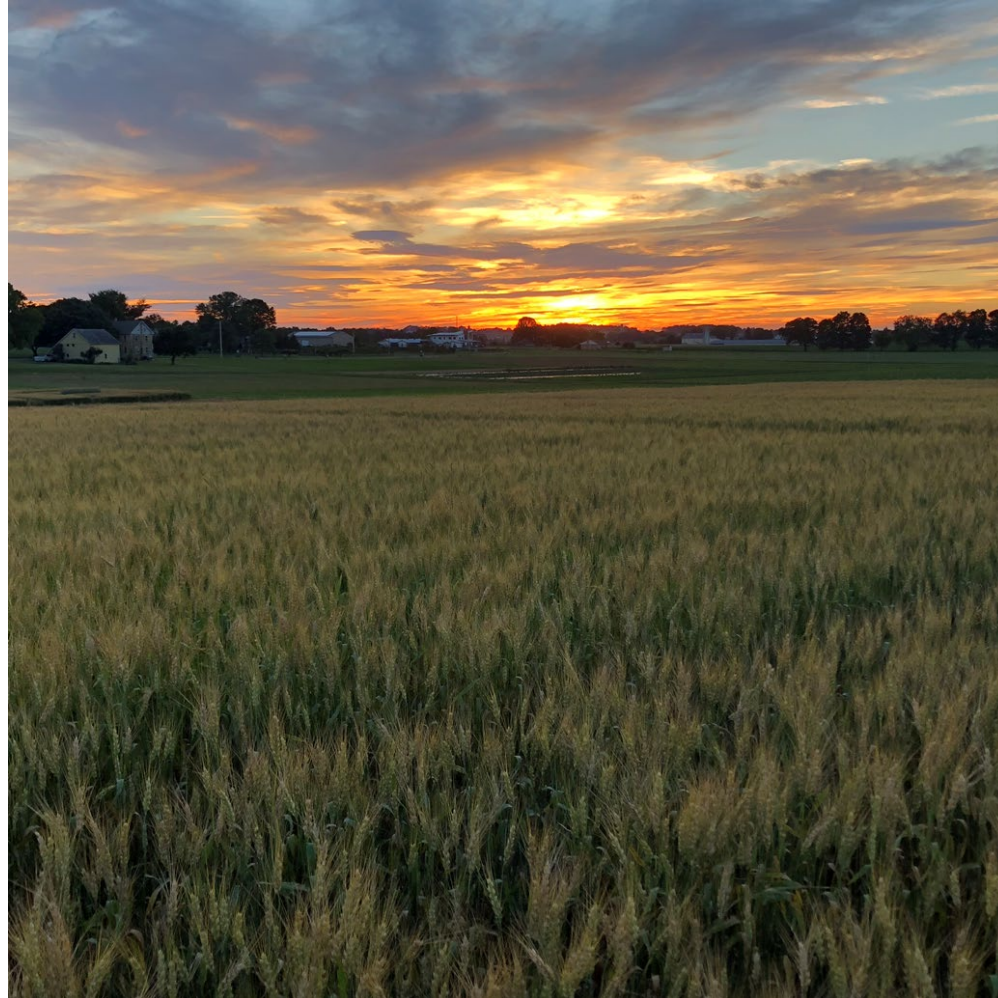


Understanding cultural impacts on scab management adoption in the East



PennState Extension

Dr. Alyssa Collins and Dr. Paul Esker

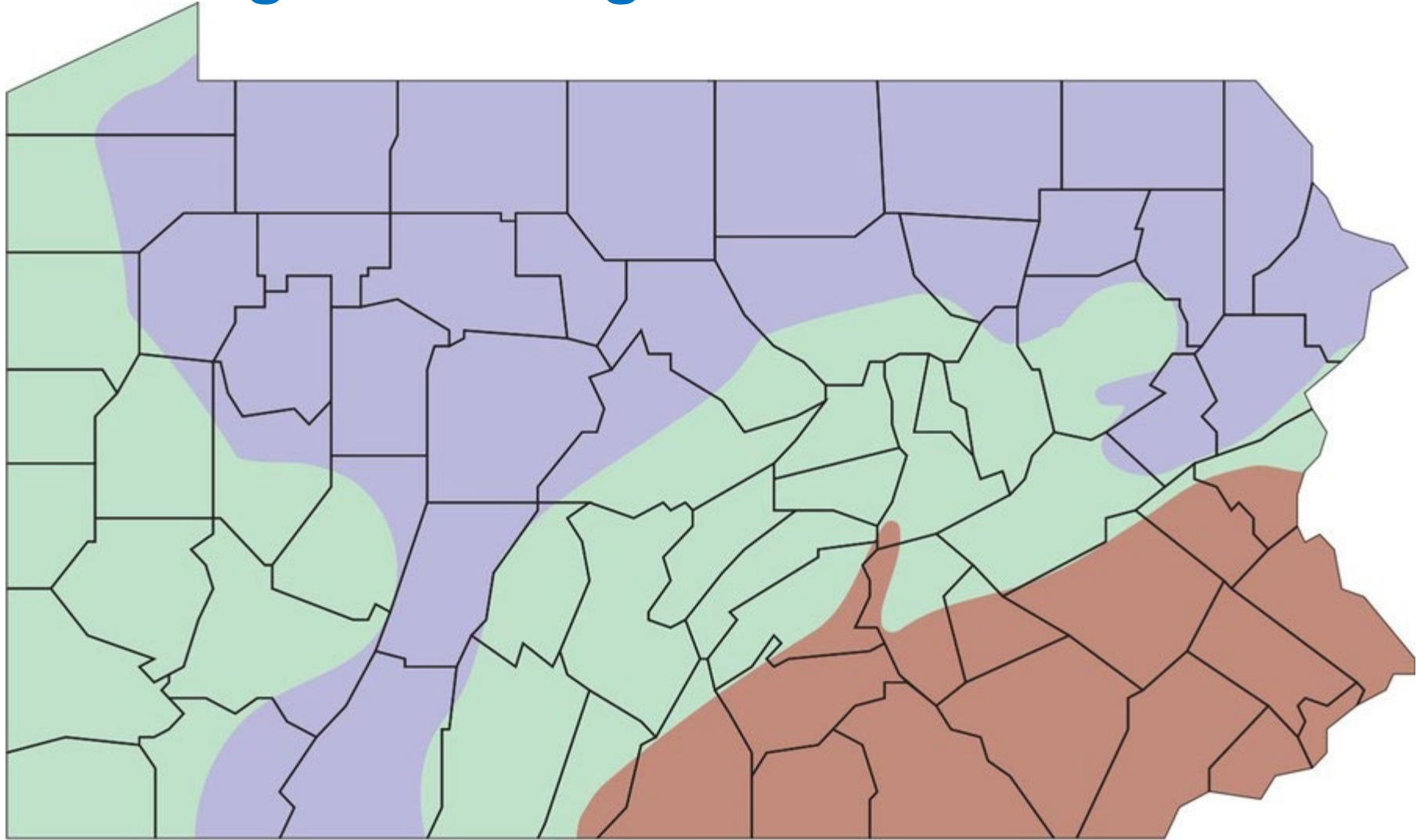
Department of Plant Pathology and Environmental Microbiology
Penn State University

Outline



- **Our goal: we are trying to understand the functional taxonomy of our stakeholders**
- Where do we start the discussions?
- What does small grain production look like in the NE?
- What did 2018 teach us?
- Who are our growers?
- Where do we need to go?

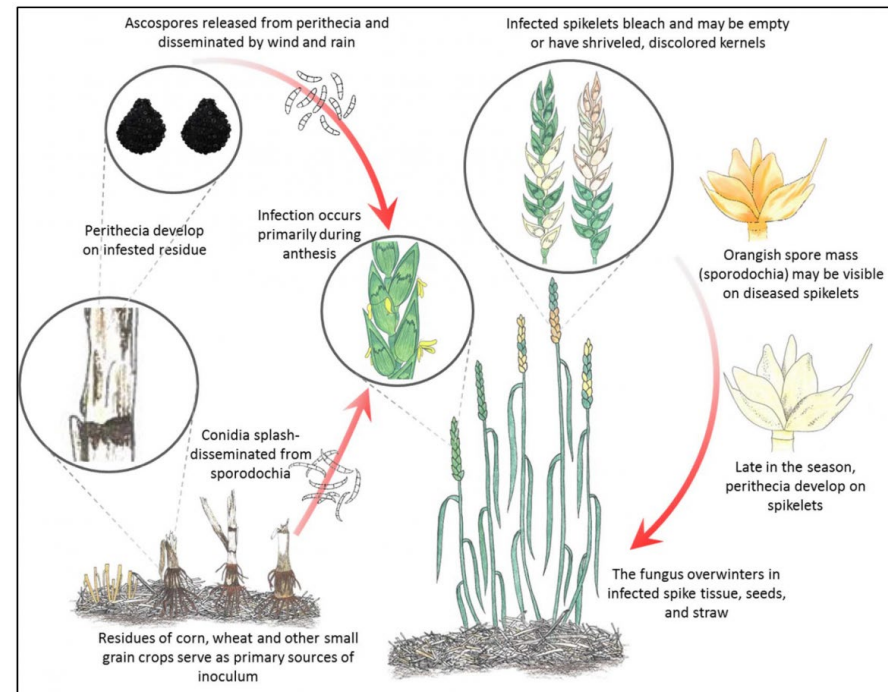
Small grain management zones: PA



<https://extension.psu.edu/malting-barley-in-pennsylvania>

Where do we start with the management discussion?

- Plant moderately resistant varieties
- Locate cereals as far away from corn fields with stalk residues
 - Rotate to a legume crop, if possible
- Understand the fungicide window and risk and know that best efficacy does not "eliminate" the disease



Fungicide(s)				Powdery mildew	Stagonospora leaf/ glume blotch	Septoria leaf blotch	Tan spot	Stripe rust	Leaf rust	Stem rust	Fusarium Head scab ¹	Harvest Restriction
Class	Active ingredient	Product	Rate/A (fl. oz)									
Strobilurin	Picoxystrobin 22.5%	Aproach SC	6.0 - 12.0	G ¹	VG	VG ²	VG	E ³	VG	VG	NL	Feekes 10.5
	Fluoxastrobin 40.3%	Evito 480 SC	2.0 - 4.0	G	--	--	VG	--	VG	--	NL	Feekes 10.5 and 40 days
	Pyraclostrobin 23.6%	Headline SC	6.0 - 9.0	G	VG	VG ²	E	E ³	E	G	NL	Feekes 10.5
Triazole	Metconazole 8.6%	Caramba 0.75 SL	10.0 - 17.0	VG	VG	--	VG	E	E	E	G	30 days
	Tebuconazole 38.7%	Folicur 3.6 F ⁴	4.0	NL	NL	NL	NL	E	E	E	F	30 days
	Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	--	VG	VG	VG	VG	VG	VG	G	30 days
	Prothioconazole19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	G	VG	VG	VG	E	E	E	G	30 days
	Propiconazole 41.8%	Tilt 3.6 EC ^{4*}	4.0	VG	VG	VG	VG	VG	VG	VG	P	Feekes 10.5.4
	Tebuconazole 22.6% Trifloxystrobin 22.6%	Absolute Maxx SC	5.0	G	VG	VG	VG	VG	E	VG	NL	35 days
	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima SC	3.4 - 6.8	VG	VG	VG	VG	E	VG	--	NR	45 days
	Prothioconazole 16.0% Trifloxystrobin 13.7%	Delaro 325 SC	8.0	G	VG	VG	VG	VG	VG	VG	NL	Feekes 10.5 35 days
	Fluxapyroxad 2.8% Pyraclostrobin 18.7% Propiconazole 11.7%	Nexicor EC	7.0 - 13.0	G	VG	VG	E	E	E	VG	NL	Feekes 10.5
	Fluoxastrobin 14.8% Flutriafol 19.3%	Preemptor SC	4.0 - 6.0	--	--	VG	VG	E	VG	--	NL	Feekes 10.5 and 40 days
	Fluxapyroxad 14.3% Pyraclostrobin 28.6%	Priaxor	4.0 - 8.0	G	VG	VG	E	VG	VG	G	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 13.5%	Quit Xcel 2.2 SE ⁴	10.5 - 14.0	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5.4
	Prothioconazole 10.8% Trifloxystrobin 32.3%	Stratego YLD	4.0	G	VG	VG	VG	VG	VG	VG	NL	Feekes 10.5 35 days
	Benzovindiflupyr 2.9% Propiconazole 11.9% Azoxystrobin 10.5%	Trivapro SE	9.4 - 13.7	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5.4 14 days

¹Efficacy categories: NL=Not Labeled; NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; -- = Insufficient data to make statement about efficacy of this product.

² Product efficacy may be reduced in areas with fungal populations that are resistant to strobilurin fungicides.

³ Efficacy may be significantly reduced if solo strobilurin products are applied after stripe rust infection has occurred.

⁴ Application of products containing strobilurin fungicides may result in elevated levels of the mycotoxin Deoxynivalenol (DON) in grain damaged by head scab.

^{4*} Multiple generic products containing the same active ingredients also may be labeled in some states.

⁵ Products with mixed modes of action generally combine triazole and strobilurin active ingredients. Nexicor, Priaxor and Trivapro include carboxamide active ingredients.



2018 Fusarium Head Blight Screening Nursery Factsheet

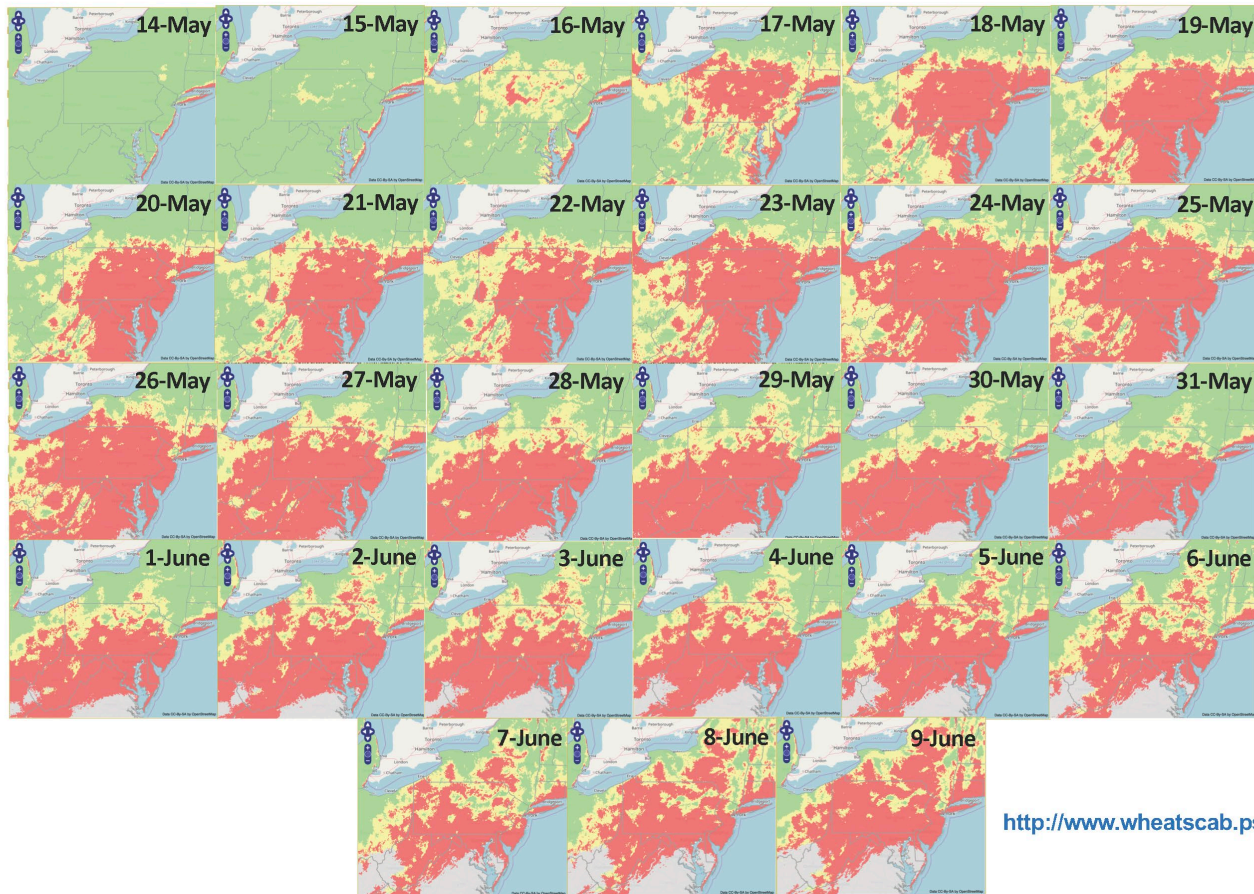
Nidhi Rawat, Ph.D. Small grain pathologist and Jason Wight, Ph.D. Field Trials coordinator
Department of Plant Science and Landscape Architecture, University of Maryland

Fusarium Head Blight (FHB) was the foremost challenge to wheat yields and quality in 2018 and should be an important consideration in making planting decisions for the coming seasons as well. Popular local varieties of wheat were evaluated for FHB reaction under heavy disease pressure in misted nursery conducted at the Beltsville research farm of University of Maryland. To provide the growers with consolidated information for making their planting decisions, we have combined data on statewide yield trials and FHB components: FHB index and DON content in the table below. The entries below have been sorted based on their average DON values. Green cells indicate moderate resistance/ tolerance to FHB, orange cells may be considered moderately susceptible, whereas those highlighted in blue depict highly susceptible varieties.

Entry	Brand	Statewide Yield Results			Fusarium Head Blight	
		Yield Rank	Yield	Test Wt	FHB Index	DON (ppm)
AgriMAXX 463	AgriMAXX	2	79.2	55.4	33.0	12.3
MBX18-A-237	Eddie Mercer Agnservices	57	64.3	56.3	34.6	12.6
MBX17-P-275	Eddie Mercer Agnservices	4	77.7	55.5	24.0	12.9
MAS67	Mid-Atlantic Seeds	9	74.2	55.2	21.3	13.4
AgriMAXX 480	AgriMAXX	39	67.7	57.4	44.9	14.5
DG 9772	Dyna-Gro	19	71.8	55.2	24.1	15.0
USG3228	UniSouth Genetics	3	78.0	55.3	28.0	15.8
FS878	Growmark	7	74.7	55.2	22.7	16.1
FS 875	Growmark	14	72.6	53.0	35.9	16.3
15MW315	University of Maryland	61	62.2	57.4	17.2	16.8
DG 9750	Dyna-Gro	13	73.2	54.8	22.1	17.0
TWS-2616	Tidewater	63	61.5	53.7	39.7	17.4
Momentum 106	Missouri Crop Improvement	34	68.8	56.5	36.1	17.6
USG 3197	UniSouth Genetics	30	69.5	54.5	23.7	18.4
MAS61	Mid-Atlantic Seeds	49	66.0	54.3	30.6	18.6
L11551	Limagrain Cereal Seeds	62	62.1	57.0	17.5	19.0
15MDX19	University of Maryland	58	63.8	56.0	31.8	19.1
USG3118	UniSouth Genetics	65	59.8	55.0	48.8	19.2
Ammo	Limagrain Cereal Seeds	46	66.4	55.4	33.5	19.3

Crop Protection Network
<https://cropprotectionnetwork.org/download/5672/>

2018: wet, wet, wet...

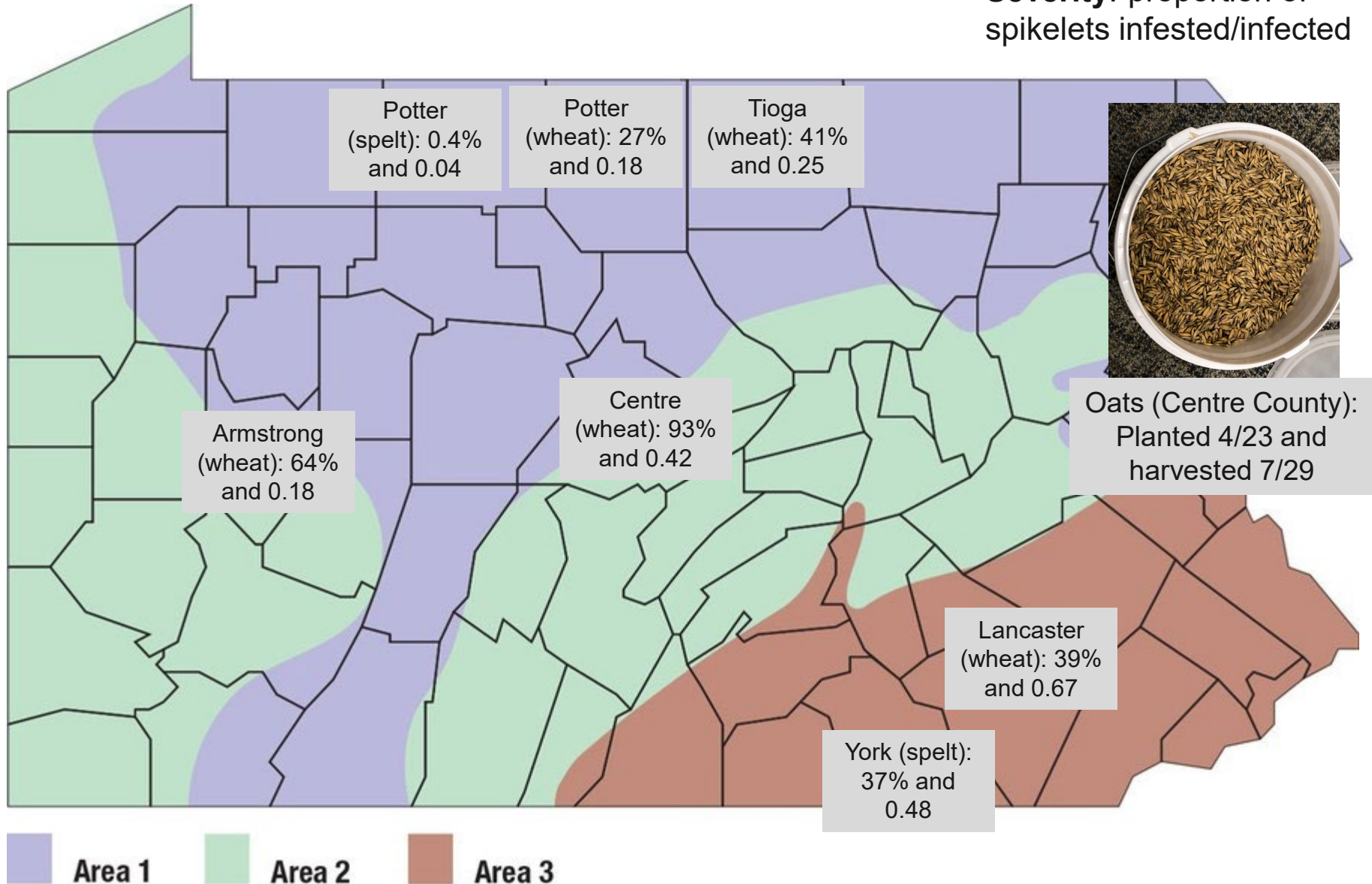


<http://www.wheatscab.psu.edu/>

PA Commentary, update 2018-05-14, Dr. Alyssa Collins, If you have wheat flowering this week or barley heading this week in DelMarVa or most of Pennsylvania, please consider spraying your crop for scab if you have not done so already. Persistent wet weather and warm temperatures are triggering Medium to High risk levels in many areas of the region. Time your application on fields that are at the beginning of flowering, up to about 5 days following the beginning of flowering. Remember, sprays applied PRIOR to flowering will NOT provide significant suppression of scab or toxin production. Caramba or Prostaro are effective on scab and give control of most leaf diseases and glume blotch. They do not need to be tank mixed with another product to control these diseases. If these products are unavailable, Proline and Folicur (which together provide the same chemicals as Prostaro) may be tank mixed at a rate of 3 + 3 fl oz/A. Spray nozzles should be angled at 30° down from horizontal, toward the grain heads, using forward- and backward mounted nozzles or nozzles with a two directional spray, such as Twinjet nozzles. Do NOT use any strobilurin-containing fungicides at heading or beyond.

Some observations from the field

- **Incidence:** percentage
- **Severity:** proportion of spikelets infested/infected



Reports for DON from 0 to 15+ ppm

Fungicide trials, PA 2018

- Two locations: Rock Springs and Manheim, PA
- Susceptible to moderately susceptible varieties
 - Seedway 63SR (Rock Springs) and MAS4 (Manheim)
- *Fusarium graminearum* = Natural infection
- Spray dates:
 - Rock Springs: 5/21 (F9), 5/25 (F10.3), 5/29 (F10.51)
 - Manheim: 5/21 (F9), 5/24 (F10.3), 5/31 (F10.51)

Treatment Code	Treatments	Fungicide	Timing
1	Untreated check	-	-
2	NIS + Prosaro 421 SC	6.5 fl oz/ac	Feekes 9
3	NIS + Delaro	8.0 fl oz/ac	Feekes 9
4	NIS + Prosaro 421 SC	6.5 fl oz/ac	Feekes 10.3
5	NIS + Miravis ACE	13.7 fl oz/ac	Feekes 10.3
6	NIS + Prosaro 421 SC	6.5 fl oz/ac	Feekes 10.51
7	NIS + Miravis ACE	13.7 fl oz/ac	Feekes 10.51
8	NIS + Delaro fb NIS + Prosaro 421 SC	6.0 fl oz/ac	Feekes 9
		6.5 fl oz/ac	Feekes 10.51


Rock Springs, PA

	Trt	Treatments	Incidence	Severity	FDK	Yield	DON
	1	Untreated check	95 a*	33 a	16.8 a	83.2 d	3.80 a
FGS 9	2	Prosaro 421 SC	90 ab	27 a	14.7 ab	85.6 d	4.63 a
	3	Delaro	93 ab	28 a	16.6 a	83.4 d	4.08 a
FGS 10.3	4	Prosaro 421 SC	79 b	14 b	12.4 bc	91.4 c	2.38 bc
	5	Miravis ACE	39 d	3 c	10.5 cd	103.3 a	1.83 bc
FGS 10.51	6	Prosaro 421 SC	53 cd	7 bc	11.0 cd	98.8 ab	0.95 c
	7	Miravis ACE	60 c	11 bc	10.9 cd	97.1 b	1.32 bc
FGS 9, fb 10.51	8	Delaro fb Prosaro 421 SC	55 c	9 bc	9.0 d	99.2 ab	1.17 c

* Means followed by the same letter are not significantly different at $P = 0.05$, based on LSD.



Scab severity on wheat 21 days post anthesis



Moody shot of wheat affected by scab and quality-impacting fungi

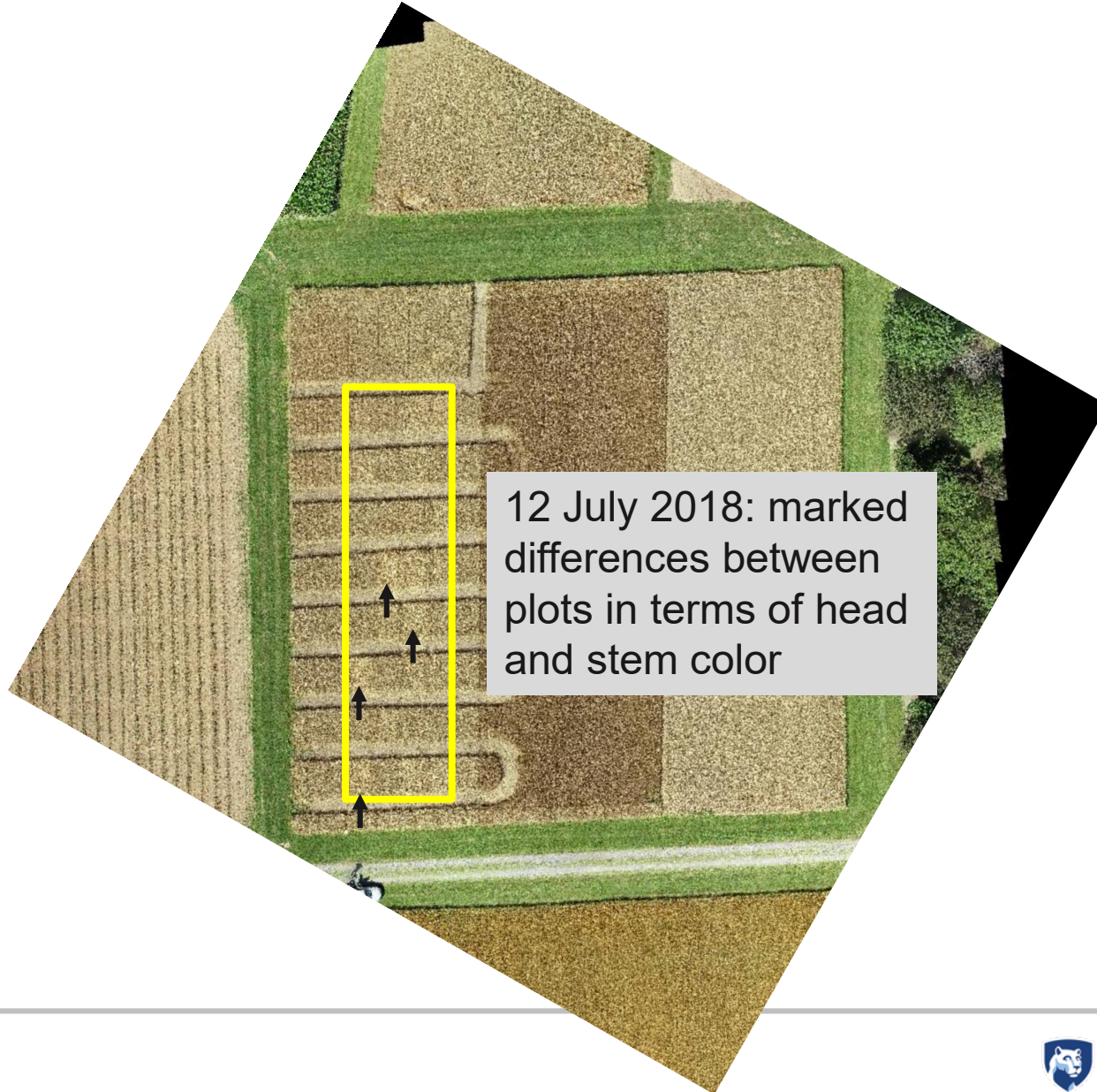


2018 and other years bring more than just scab.



Glume blotches and saprophytes also drag down quality

Rock Springs @ 44 days after flowering application



Visual differences in sprayed vs. unsprayed...

Fungicide

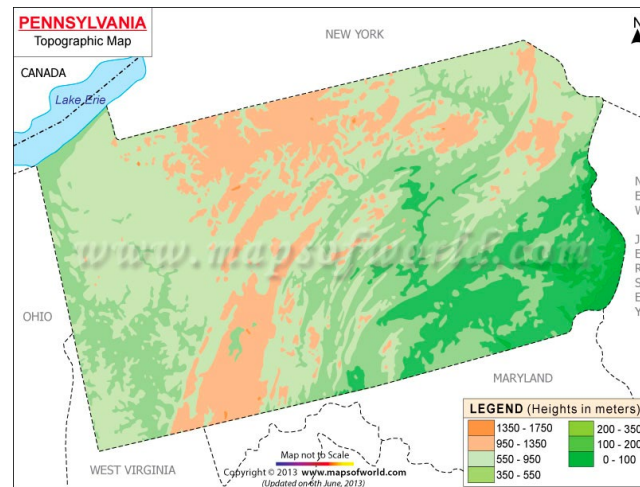


No
fungicide

**...remind us of other factors to
be considered**

What do our growers look like?

- Farm size, shape, and rotation often driven by the needs for the dairy
- Fields often smaller, irregular in shape
 - High microclimate variability
 - High terrain variability (river bottom to side hill to mountain top)
- Access to digital tools limited
- Diverse range of technology use adoption





Small, irregular fields. Corn and wheat as close neighbors in the Eastern US

What do our growers look like? –

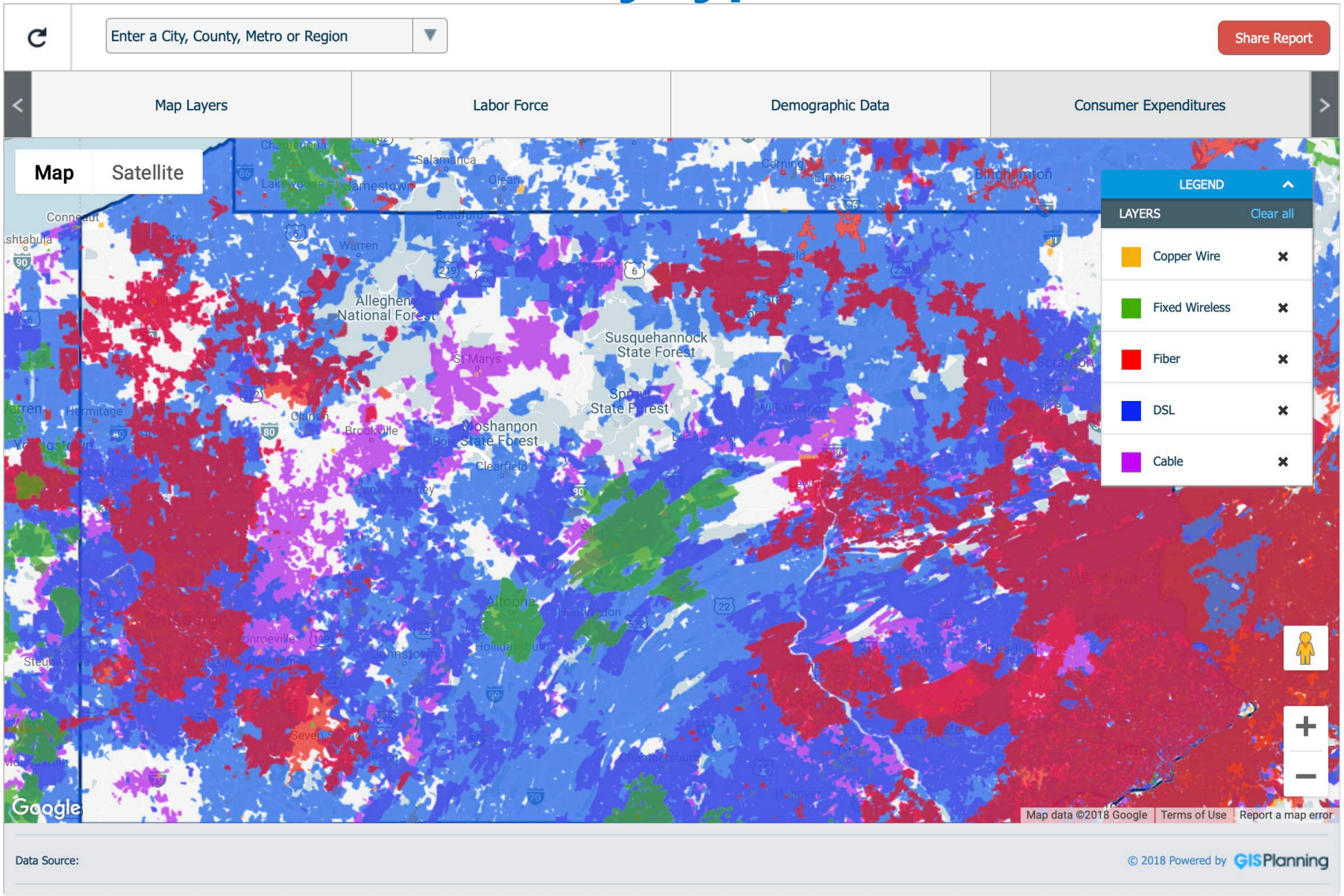
- Growers can arguably be classified into:
 - Low inputs:
 - Minimal inputs
 - “Avoid” FHB
 - Proactive with higher inputs
 - Integrated approach, heavily focused on scab control
- Most do not contract – they are spot sellers
 - Also can't necessarily anticipate what the buyer will do based on previous years



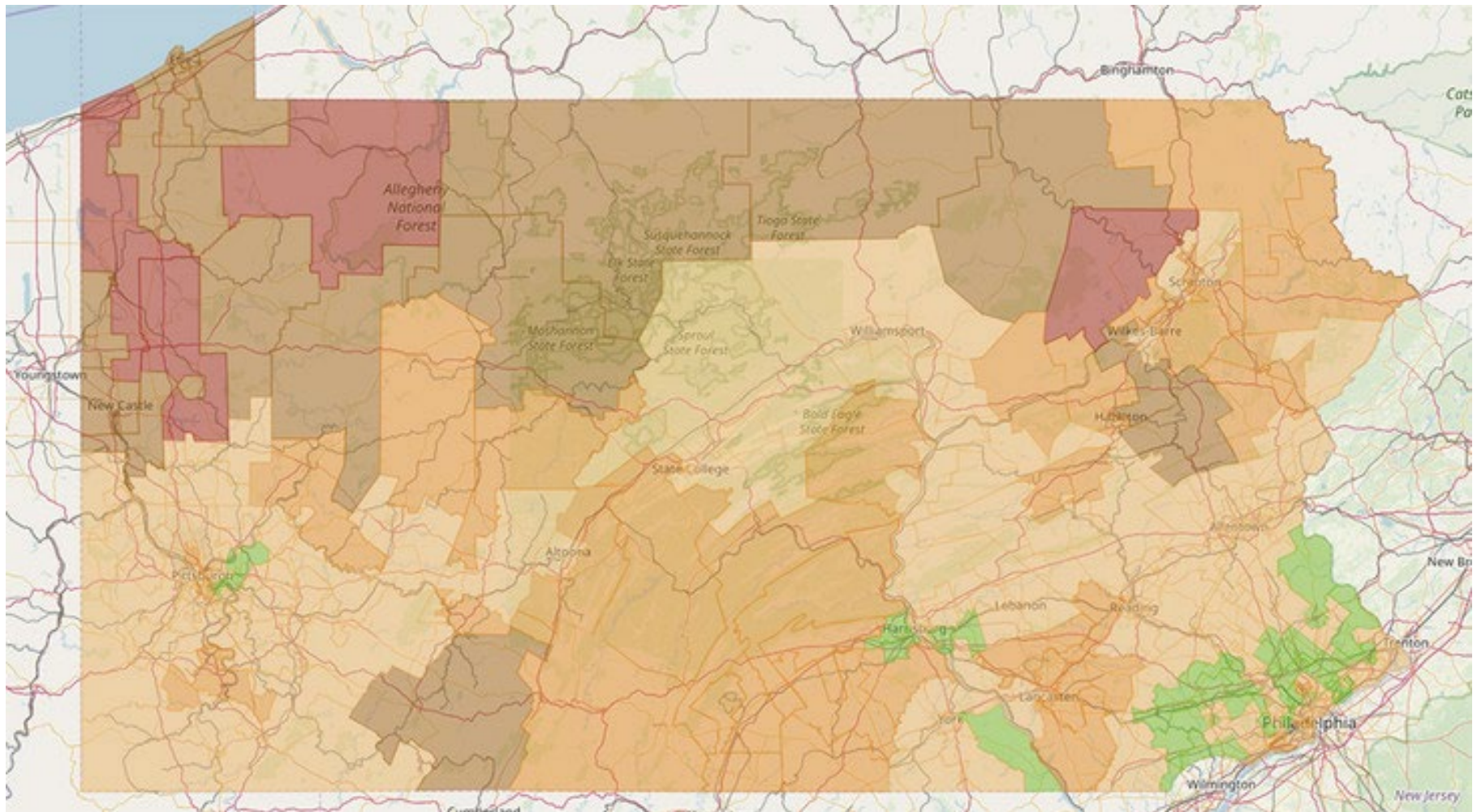
From Cowger et al. 2015.

- Use of MR: 15% (SRWW)
 - Mismatch between perception of use (35-70%) and acreage report (mostly <22%)
- Barriers to BMPs:
 - Weather
 - Logistical difficulties for timely applications
 - Information about resistant varieties
- NE region: high use of graminaceous crop prior to wheat
- Website use low

Access to internet by type of connection



<https://dced.pa.gov/broadband-resources/>
<https://broadbandnow.com/Pennsylvania>



According to more than 5 million tests, **only a small portion of Pennsylvania (those in green on the map) meet the FCC's minimum speed for broadband connectivity.** Sascha Meinrath, Penn State College of Communications, 2018.

The challenges (and opportunities)

Dr. Greg Roth (Emeritus Professor, PSU):

“Producing high quality grain has been a challenge. Actually, the ***supply chain is not working***. In years when barley production is good, some growers have no markets. When you have a bad year, then there is no good barley for maltsters. So, what we need is both a ***better supply chain*** and ***better, more intensive management by growers*** to be able to meet quality standards in a bad year. Another component would be strategies for dealing with grain that is not ideal but useable.”



Who are our growers becoming?

- Current trends...
 - Dairy prices driving farmers out
 - Soybean production growing but current economics may limit continued growth
 - Buyers drive quality expectations
- ...Dictate future needs
 - A divergent population of high intensity managers versus “side hustlers”
- Two different extension programs?



Craft brewery industry and demand for quality grains

- PA ranks #2 in craft beer consumption, nationally
- Brewers & maltsters tend not to have a farming background
- Want to source locally, but may not grasp the complexities of eastern production



Put another way from our industry stakeholders



*Alan Gaddish,
Double Eagle Malt*

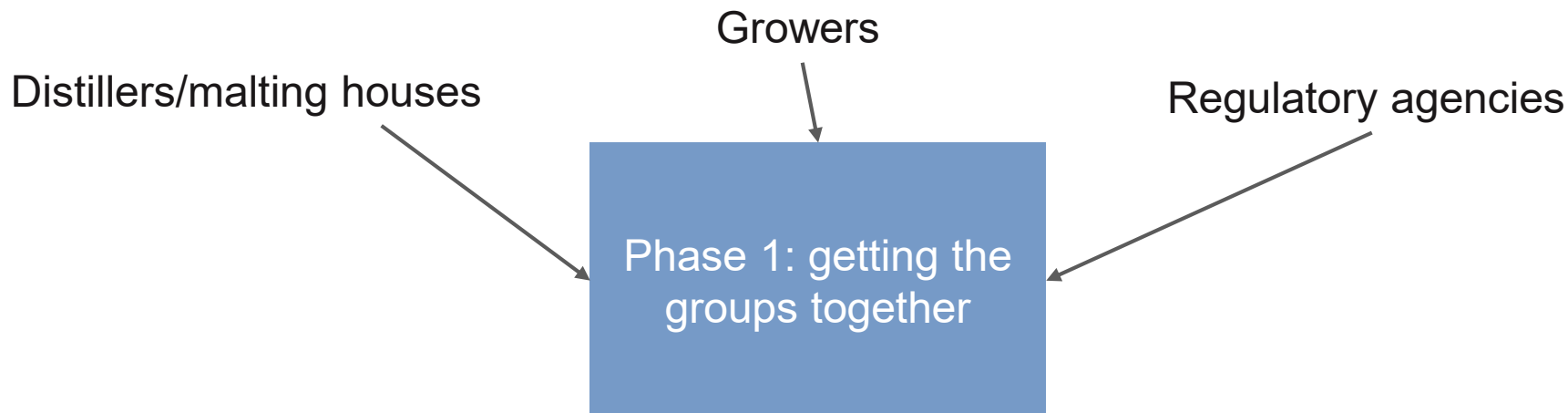
- Maltsters struggle with obtaining high quality local supply
- Most successful varieties come out of European programs for the east
- Point to investments made by malt industry, but farmers seem to not be keeping up with infrastructure and management
- Suggest change in farmer mindset is in order to shift to premium production

Moving forward...supplying the connective tissue

- A different approach to education is needed for the Eastern region
- Extension may need to do better to understand all stakeholder needs, then *translate* between growers and buyers



Our proposed approach for malting barley

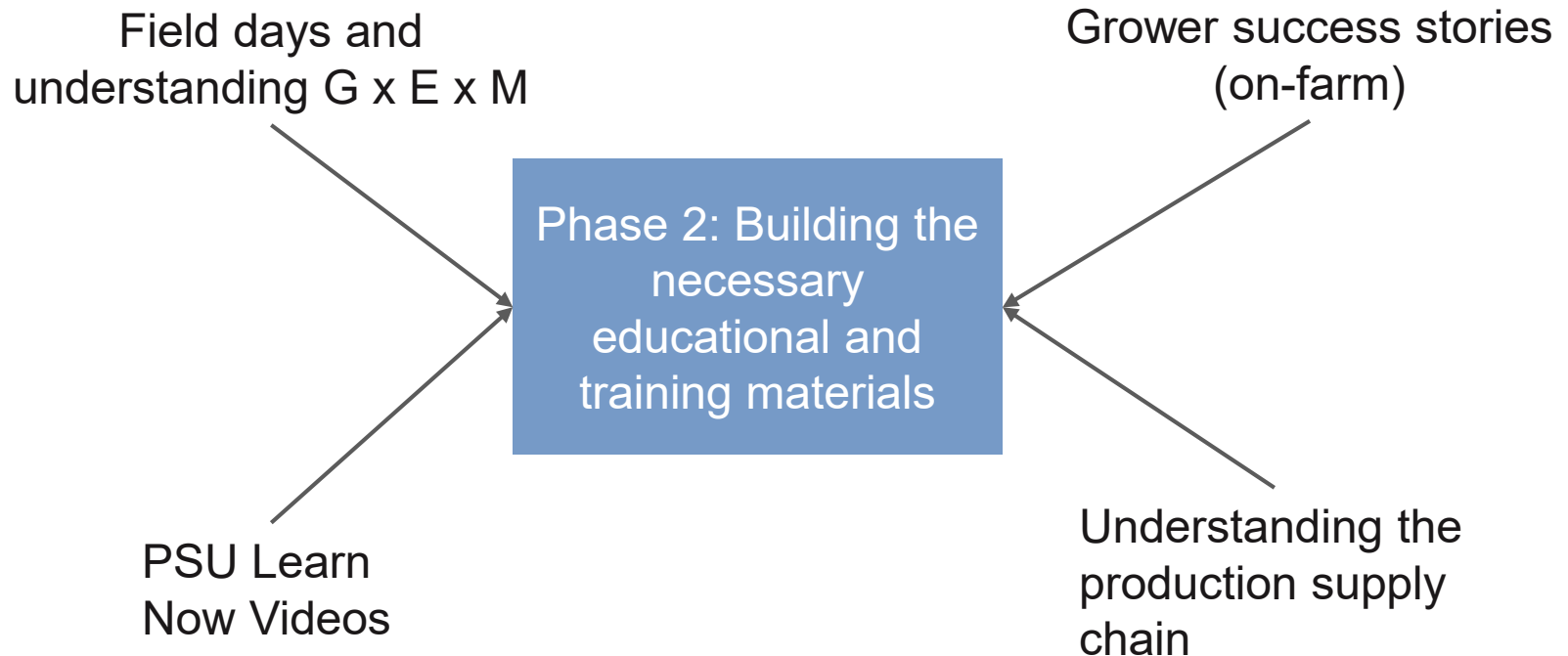


Approach: Meetings/workshops (listening sessions)

Types of questions:

- What is FAN?
- What is germination energy and why is that important?
- What are mycotoxin and why should I be concerned about them?
- How is malting barley quality affected by FHB?
- What is the uncertainty of a measurement in the DON analysis result and how is that interpreted?

Tailor the message to different backgrounds and knowledge levels



Expected outcomes:

- Raise awareness and understanding of the quality standards for producing malting barley that meets or exceeds the standards for the industry
- Facilitate discussions among the principle players (improved communication)
- Create educational platform for different/diverse audiences

Concluding thoughts

- Understanding the ***challenges, goals and needs*** unique to the farming, malting, and brewing/distilling populations in the East must come first
- Now, we ***tailor our extension to them***
- Ultimately, this should allow Extension to ***weave together these supply chains*** in a way that few other entities can

Field Crop, Small Grains and Forages Plant Pathology - PSU

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