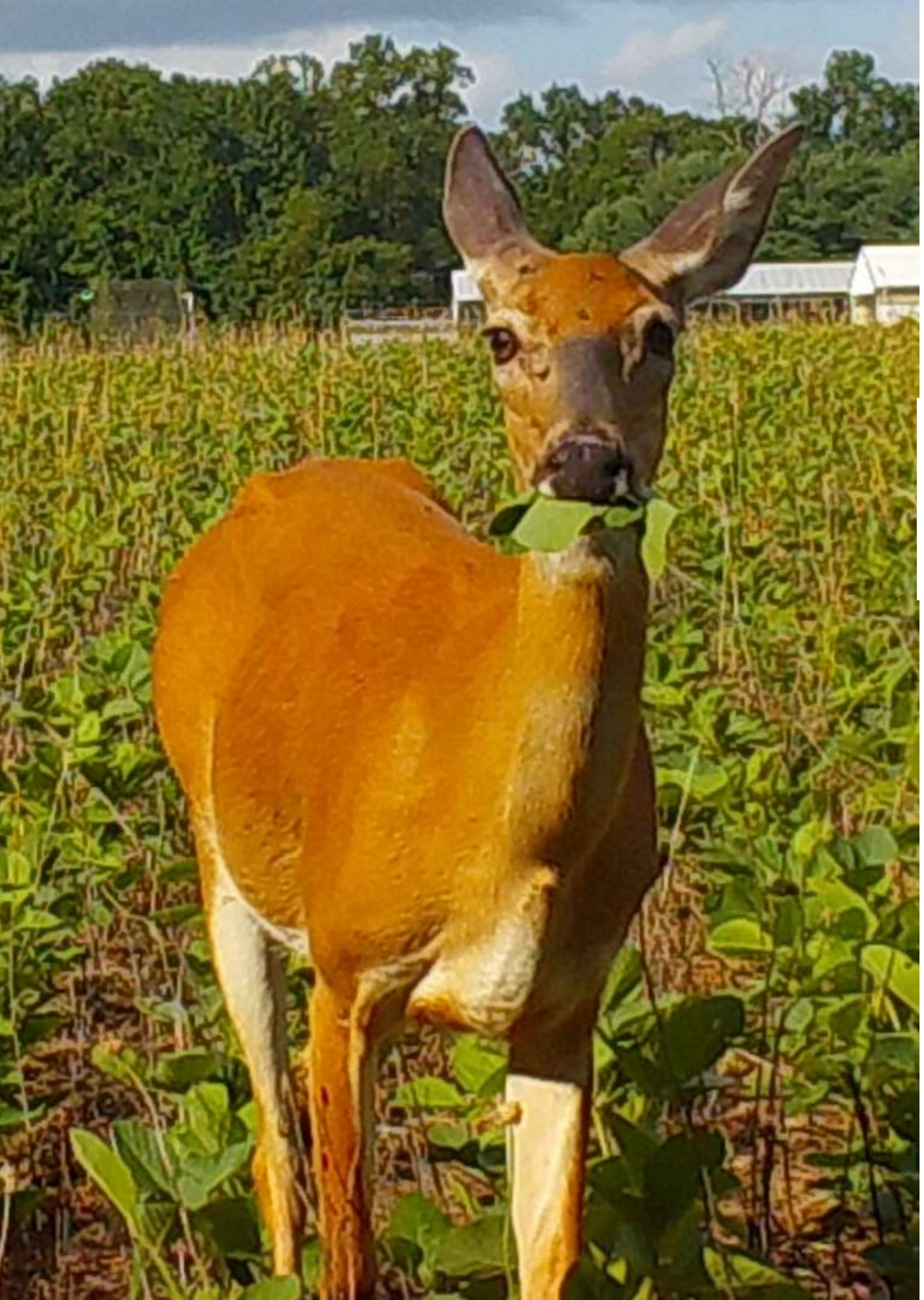


Evaluating forage soybeans as diversion crop for deer

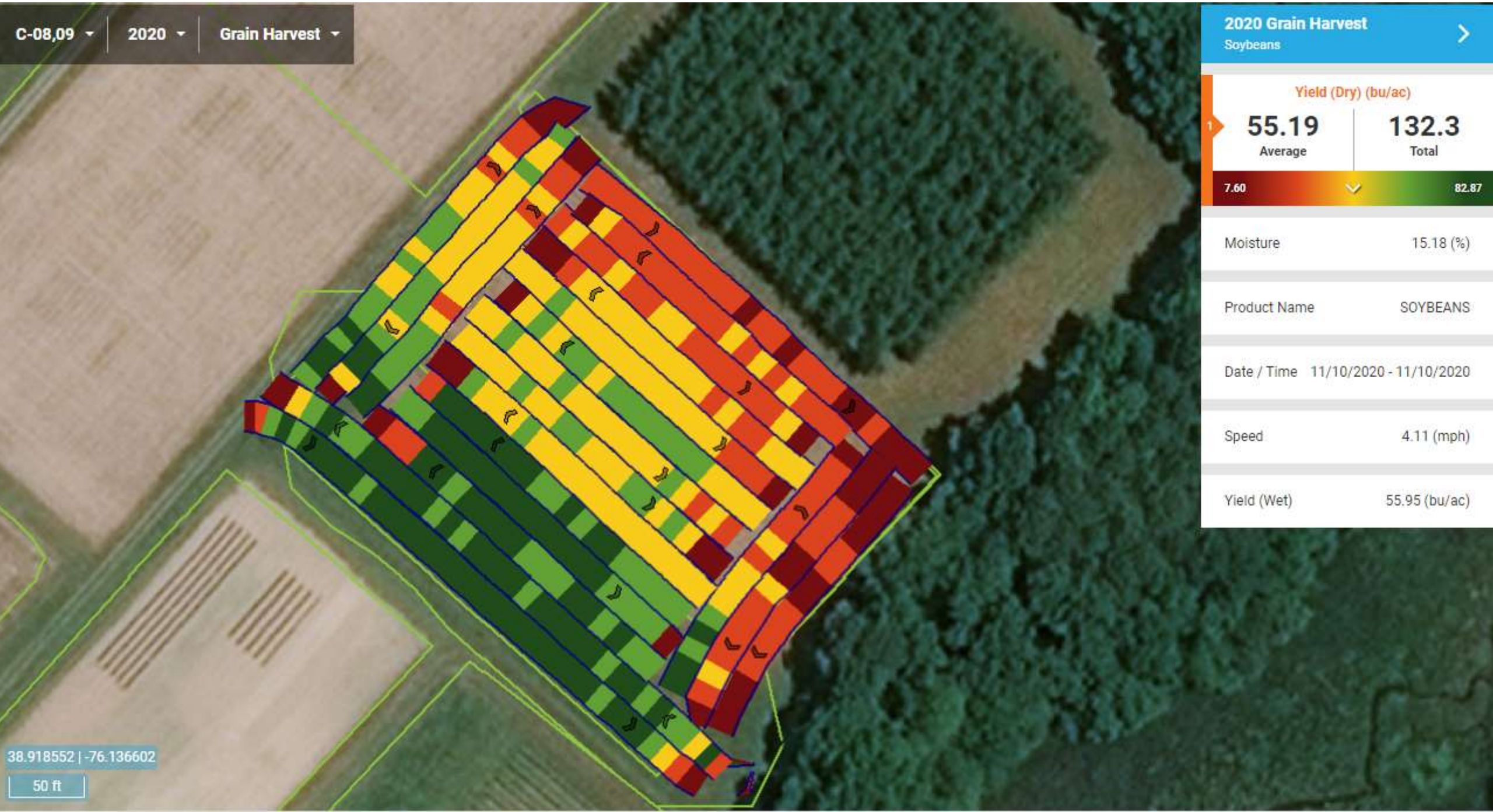
Luke Macaulay, Ph.D.
Wildlife Management Specialist

UNIVERSITY OF MARYLAND EXTENSION

Outline

- Introduction and problem
- Methods
- Results
- Next Steps

Wha


C-08,09
2020
Grain Harvest
2020 Grain Harvest
Soybeans
Yield (Dry) (bu/ac)
55.19
Average
132.3
Total
7.60
82.87
Moisture
15.18 (%)
Product Name
SOYBEANS
Date / Time
11/10/2020 - 11/10/2020
Speed
4.11 (mph)
Yield (Wet)
55.95 (bu/ac)
38.918552 | -76.136602
50 ft

What is the problem?

“Other than rainfall, deer are the single largest yield-limiting factor on our farm.”

–John Bruning, Eastern Shore Farmer

What are forage soybeans?

- In the 1870s … farmers began to plant soybeans as forage for livestock.
- ~1900, USDA was testing and encouraging farmers to plant them as animal feed
- Forage was predominant use of soybeans until WWII – production shifted to the beans and soybean meal.

Source: NC Soybean Producer's Association

- Late 1990s, 3 varieties of forage soybean, derry, donegal and tyrone, were developed and released by USDA ARS in Maryland.

Source: Michigan State University

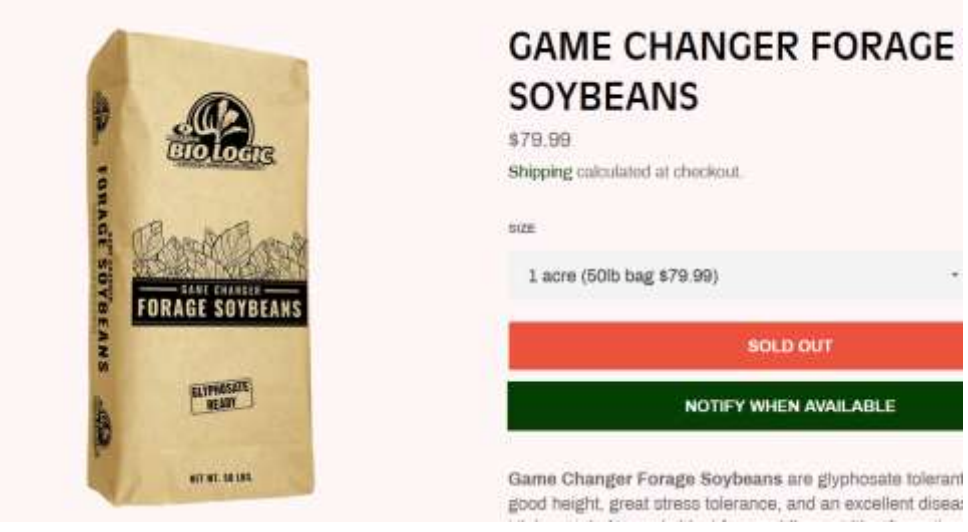
Forage soybeans

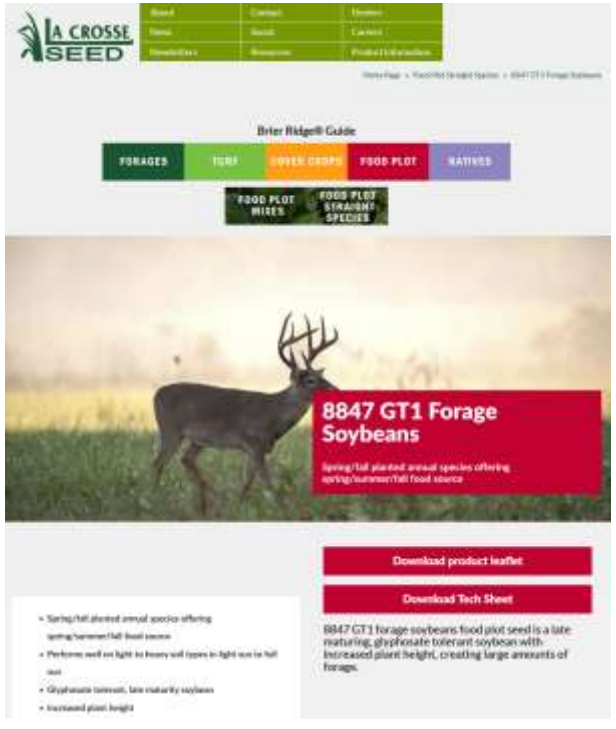
- Big Fellow Group 7 Forage
- GT1 Brier Ridge; Group 4.7 Forage; La Crosse Seed
- Biologic Group 6 Forage
- Eagle Seed “Multimax” Mix

BIG FELLOW ®

An extremely tall, large leafed, Glyphosate Ready forage variety. During its numerous university trials, it was found to be taller, provide more tonnage, more browse resistance, more protein, and more drought tolerance than other soybeans marketed for food plots, hay or silage.

It is also later than competitor's varieties giving you an advantage on body weight and antler size. When plants stay greener longer, you continue to feed the green leaves late in the fall, when deer are actively building mass. Deer simply prefer greener plants and Big Fellow® and Large Lad® can last 4-8 weeks longer. Big Fellow® is part of the blends GameKeeper® and Wildlife Manager's Mix®.





Goal of study

Evaluate:

- Deer preference for different soybean varieties
- Soybean plant response to grazing

Thanks to collaborators and funder

- Taylor Robinson
- John Draper
- Tom Eason
- Joe Streett
- Louis Thorne
- Joe Crank
- CJ Chansler

<u>Collaborating farmers</u>

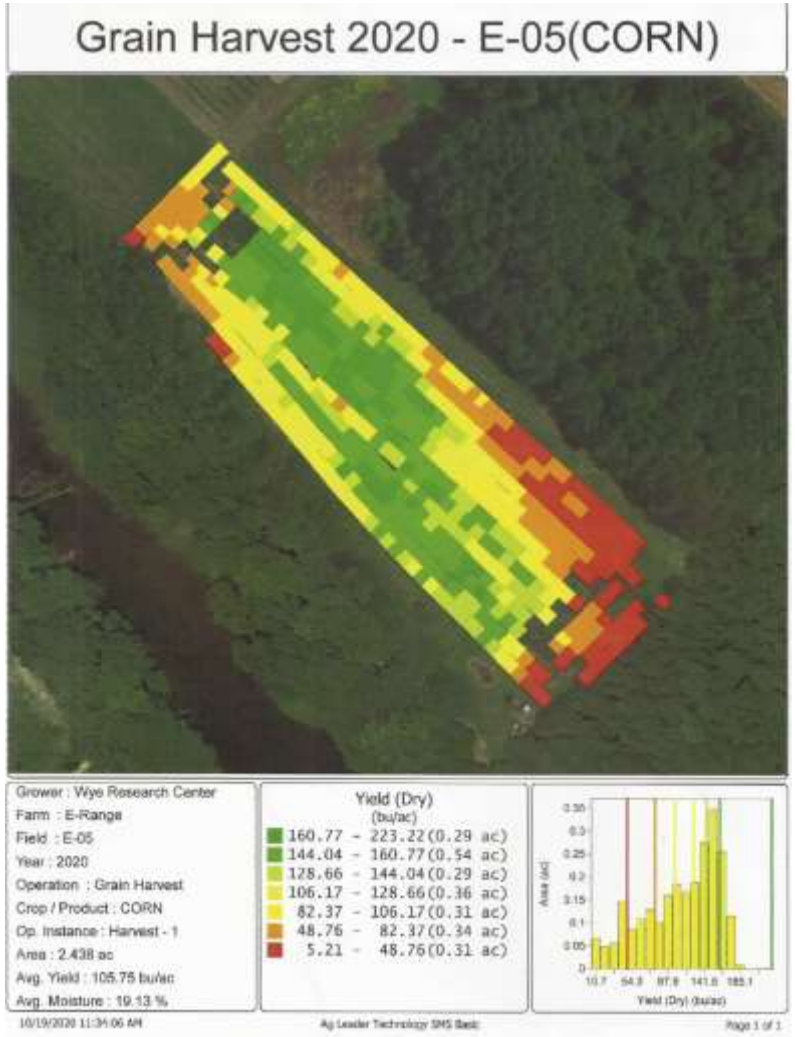
- Joe Streett
- Jim Lewis

<u>Co-PIs</u>

- Jim Lewis
- Nicole Fiorellino

Research sponsored by:

Field selection



Variety trial

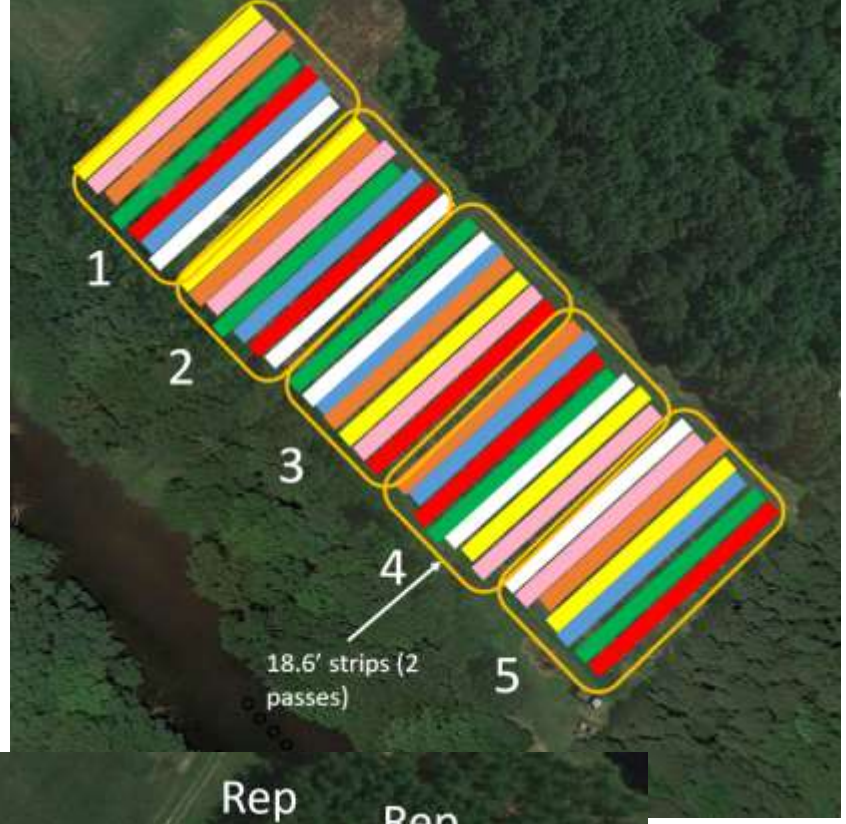
Planting date May 20, 2021

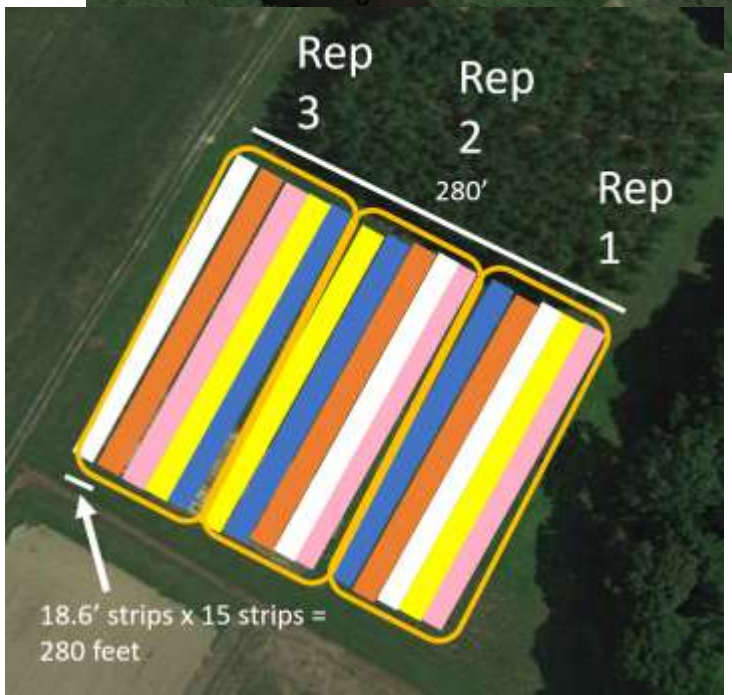
Forage soybeans:

- White: Big Fellow Group 7 Forage
- Blue: GT1 Brier Ridge; Group 4.7 Forage; La Crosse Seed
- Pink: Biologic Group 6 Forage (brown bag; R13-2423RR)
- Green: Eagle Seed Multimax Mix

Conventional soybeans:

- Yellow: Pioneer Group 3.1 (Brand P31T64E, Var. 86160724)
- Orange: Pioneer Group 5.3 (Brand P53T90E, Var. 5PQYD12)
- Red = Dynagrow Group 7.2 (Brand S72XT80, Var. 01073480)





Cameras to quantify deer activity and grazing


77°F
07/01/2021
05:35PM
CAMERA3


79°F
06/30/2021
04:22AM
CAMERA3


79°F
06/30/2021
04:22AM
CAMERA3


79°F
06/30/2021
04:22AM
CAMERA3

Not just deer

Gareth Rasberry

Drone imagery

7-14-21

7-20-21

8-23-21

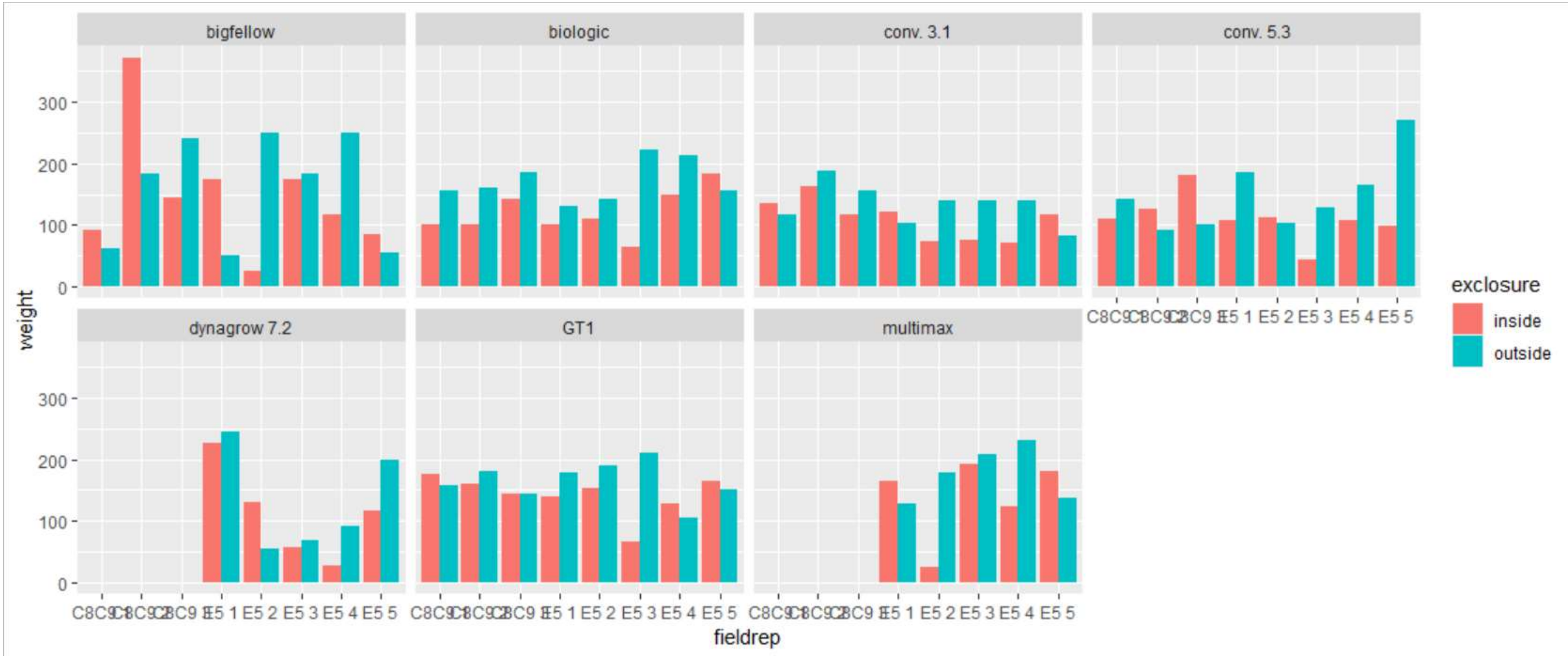
Harvest

Analysis and Results

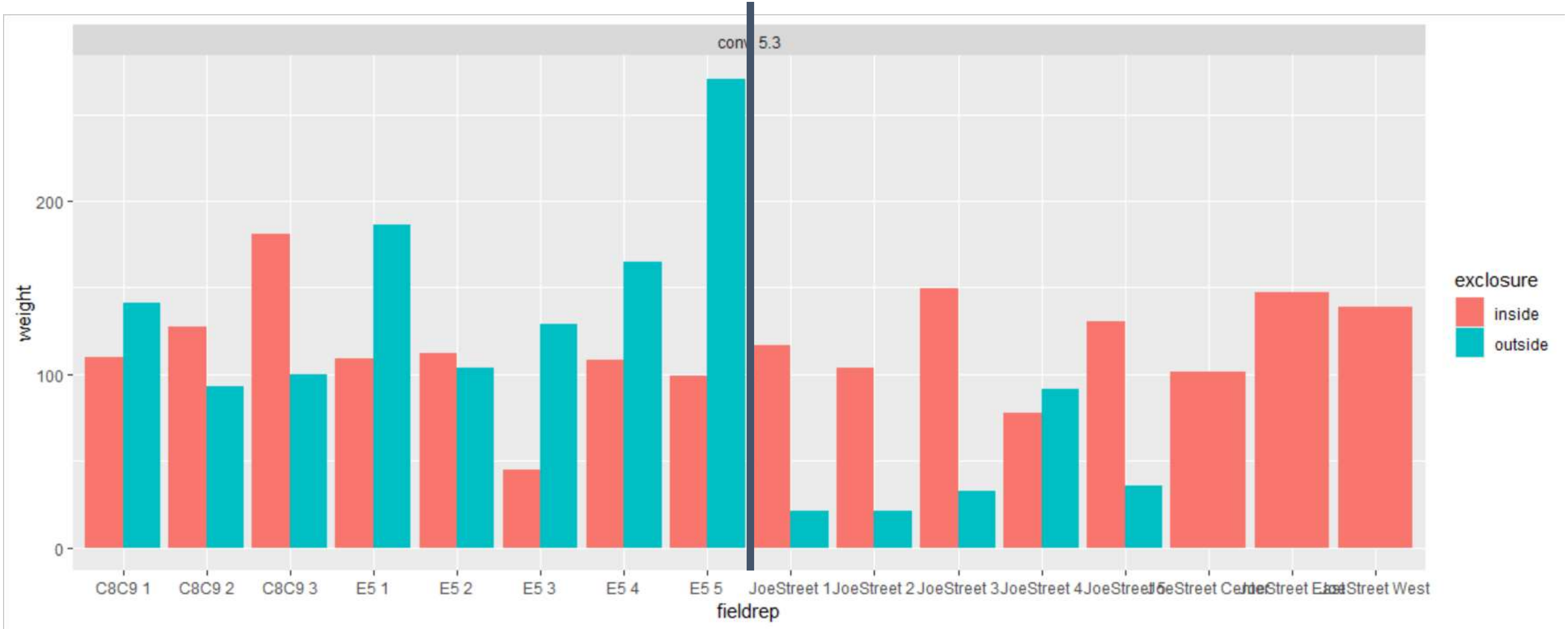
- Biomass
- Camera trap data
- Yield
- Economics

Results: Biomass

Biomass inside and outside exclosures – moderate grazing



Biomass results
moderate deer grazing (left), extreme grazing (right half)

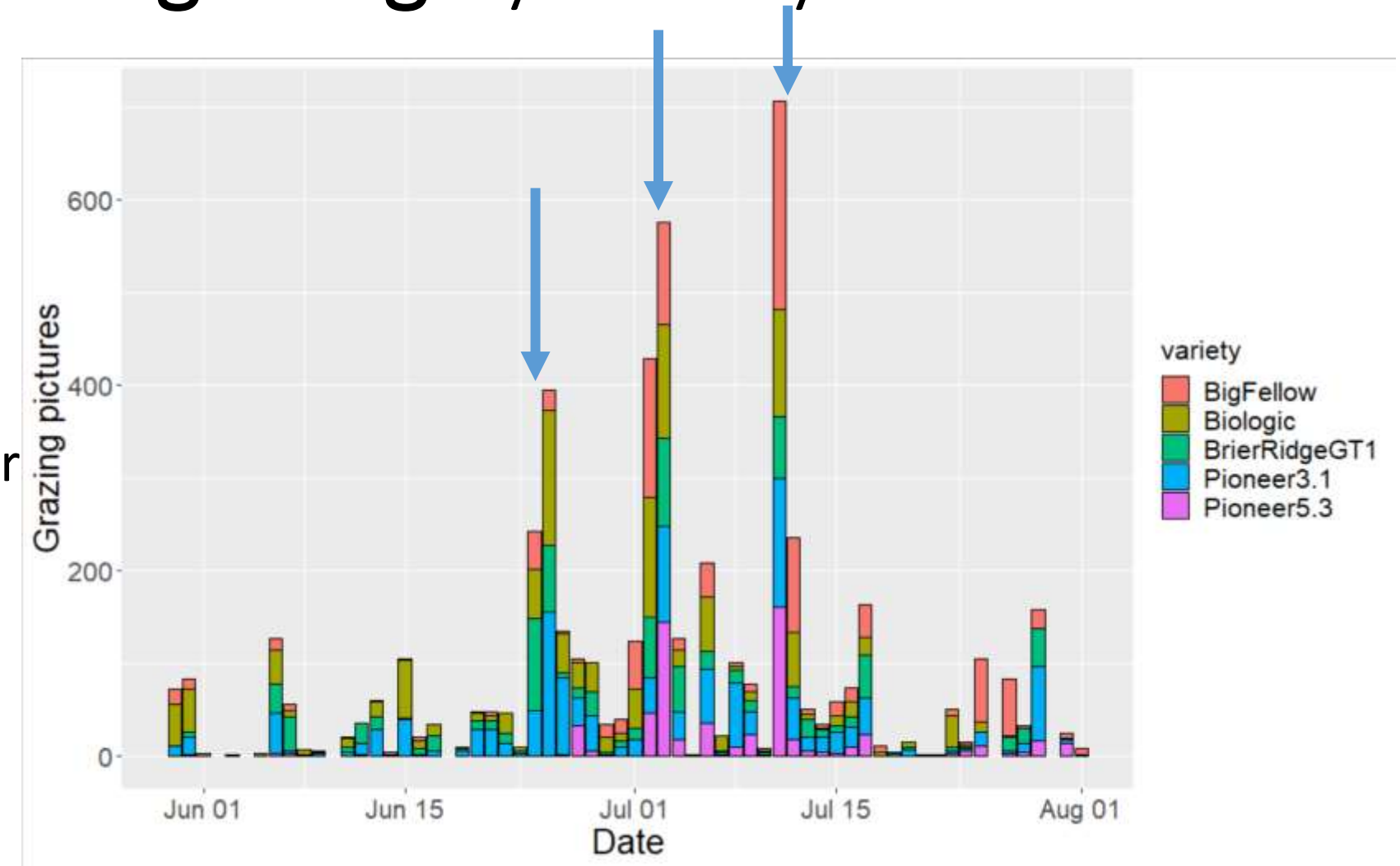


Results: Deer Activity & Grazing

Grazing…

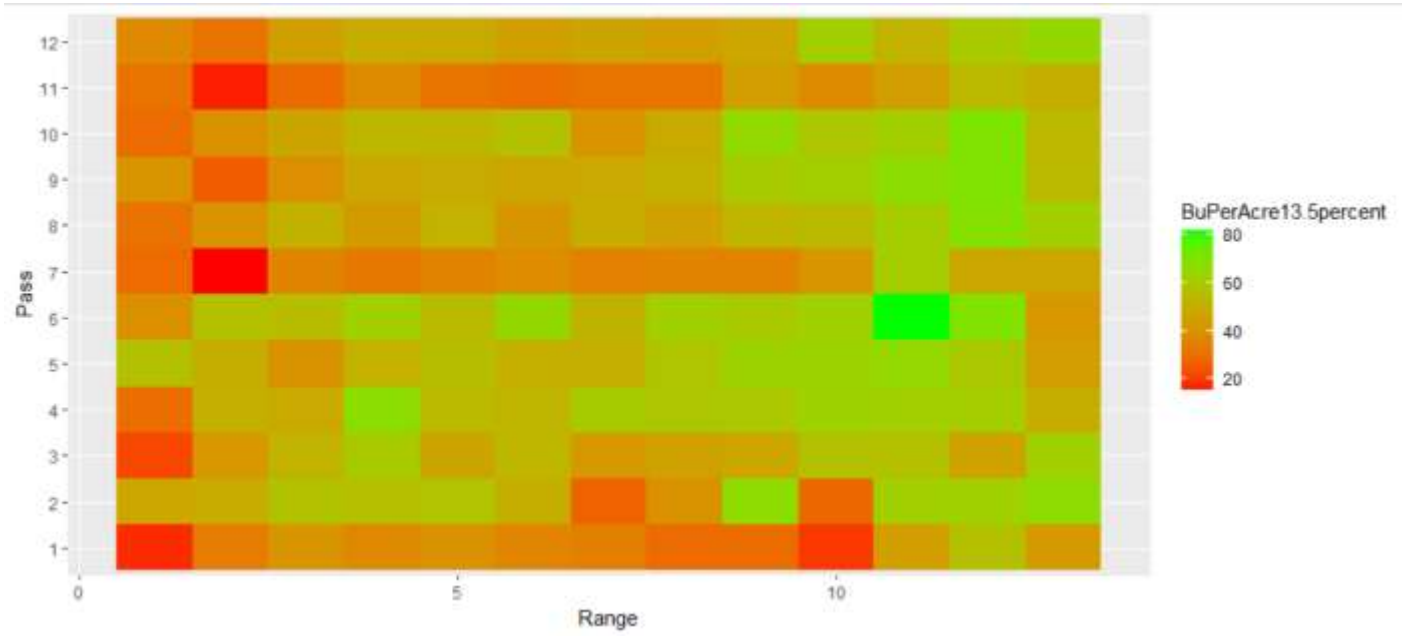
Photos of Deer **grazing** by variety

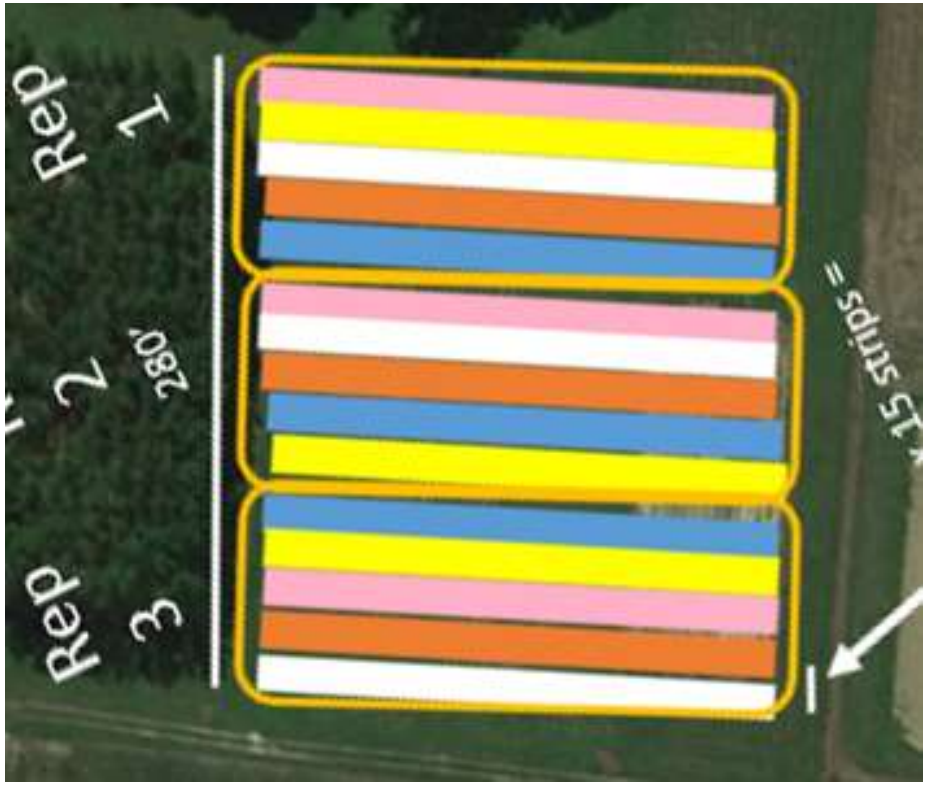
- 3 nights accounts for 48% of grazing activity
- Suggestive shifting preferences to later varieties later in season



Results: Yield

Yield map C8C9

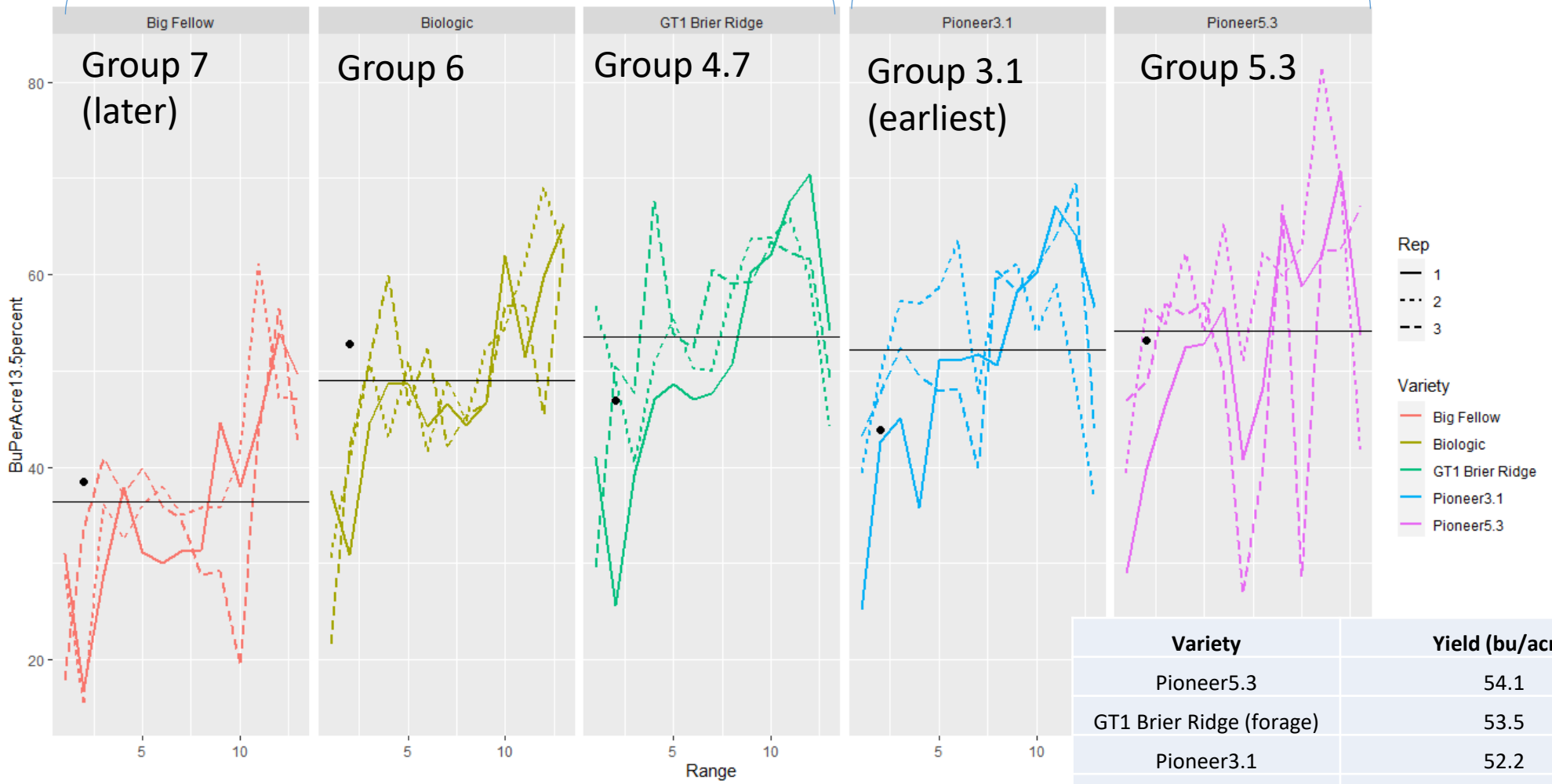




Yield data

Forage soybeans

Conventional



Variety	Yield (bu/acre)
Pioneer5.3	54.1
GT1 Brier Ridge (forage)	53.5
Pioneer3.1	52.2
Biologic (forage)	49.0
Big Fellow (forage)	36.4

Soybean herbivory and yield reductions

Yield Reduction from Defoliation of Irrigated and Non-Irrigated Soybeans[1]

C. E. Caviness and J. D. Thomas[2]

ABSTRACT

Hail adjusters, entomologists, and others frequently use defoliation percentages to estimate soybean [*Glycine max* (L.) Merr.] yield loss caused by hail, insects, or diseases. Little information is available on the percent yield loss from defoliation under drought stress and adequate moisture. Thus, the objective of this research was to measure yield response of a determinate soybean cultivar 'Lee 74' to different levels of defoliation under irrigated and non-irrigated conditions. Field experiments were conducted on a Crowley silt loam (fine, montmorillonitic, thermic Typic Albaqualfs) at Stuttgart, Ark., during a 3-year period to study effects of four levels of defoliation (0, 50, 75, and 100%) applied at three stages of development (V5, R2, and R4) in 1974 and 1975 and two stages (V3 and R5) in 1976 on yield of irrigated and nonirrigated soybeans.

Irrigation significantly increased yield 7% in 1974, 38% in 1975, and 51% in 1976. Mean squares for levels of defoliation, stages of treatment, and the defoliation × stage interaction were highly significant each year. The least reduction in yield occurred when plants were defoliated at vegetative stages, V3 and V5, and the most at reproductive stages, R4 (full pod) and R5 (beginning seed). Average yield reductions for 50, 75, and 100% defoliation were 11, 17, and 37%, respectively.

Percent yield reductions under irrigated and non-irrigated conditions were similar because all interactions with irrigation treatments were non-significant. This same pattern existed regardless of whether the season was extremely dry as in 1975 and 1976 or moderately dry as in 1974. Reduction in number of pods appeared to be the yield component primarily responsible for yield losses from defoliation. Results from these experiments indicated that percent reduction in yield from defoliation is similar for soybeans grown with adequate moisture or under drought stress.

Additional index words: Glycine max (L.) Merr., Stage of development, Drought stress, Leaf removal.

INFLUENCE of different levels of defoliation applied at various stages of development on soybean (*Glycine max* (L.) Merr.) yield has been studied extensively, but information is limited on the extent of losses under irrigated and non-irrigated conditions. Several researchers have reported that less than 50% defoliation before flowering usually did not reduce yields (1, 7, 11, 13). Yields generally have been reduced by 75 or 100% defoliation with the greatest reduction usually occurring during the reproductive stages (2, 3, 6, 12). Results reported by Fehr et al. (6) showed that indeterminate and determinate cultivars differed in their response to 100% defoliation with determinate cultivars sustaining greater yield losses than indeterminate types. Their data indicated that maximum loss for indeterminate cultivars occurred at R5 (beginning seed). Maximum losses for the determinate cultivars were about the same when defoliated at either R4 (full pod) or R5.

Studies have shown that yields from adequately watered soybeans were up to 55% greater than those where drought stress occurred during the flowering and pod-filling period (4, 8, 9, 10). Plant growth is often different under irrigated and non-irrigated conditions and this may affect response to defoliation. Hail adjusters, entomologists, and others often use

[1] Published with the approval of the Arkansas Agric. Exp. Stn. Director. This research was supported in part by the National Crop Insurance Assoc. and Crop Insurance Research Bureau, Inc. Received 16 July 1979.

[2] Professor of agronomy, Univ. of Arkansas, Fayetteville, AR 72701 and research assistant, Univ. of Arkansas, Rice Branch Exp. Stn., Stuttgart, AR 72160.

Soybean Yield Reductions Caused by Defoliation during Mid to Late Seed Filling

James E. Board,* Alan T. Wier, and David J. Boethel

ABSTRACT

Little is known about soybean [*Glycine max* (L.) Merr.] yield response to defoliation during the last half of the seed-filling period (R6.3 to R7) and how it is affected by source/sink ratio. Because defoliating insect pests in the southeastern USA frequently attack soybean during this period, greater knowledge of yield responses to defoliation at this time would aid in making management decisions. Therefore, the objectives of this field study were to (i) determine yield losses to total defoliation near the temporal midpoint (R6.3) and three-quarter point (R6.6) of the seed-filling period; (ii) determine if alterations in source/sink ratio affect this response; and (iii) determine yield component mechanisms responsible for the yield reduction. 'Centennial' soybean was planted in 1991 and 1992 near St. Gabriel, LA. Treatments were no defoliation (control), 100% defoliation at R6.3, and 100% defoliation at R6.6 arranged as split plots within high, normal, and low source/sink ratios during seed filling (main plots). Defoliation at R6.3 resulted in 40% yield reduction, whereas defoliation at R6.6 caused a 20% yield loss. Lower yield resulted from reduced seed size. Source/sink ratio did not affect this response. Smaller seed size in both defoliation treatments resulted partly from reduced seed-filling rate (28% less than control). Shorter effective filling period also contributed to smaller seed size, but this effect was influenced by treatments and years. In conclusion, 100% defoliation during R6.3 to R6.6 must be avoided to maintain optimum yield.

The most sensitive growth stage to defoliation is near R5. Fehr et al. (1981) demonstrated that in both determinate and indeterminate cultivars, R5 or R5.5 was the most sensitive stage, and that 100% defoliation resulted in an 80% yield loss. Goli and Weaver (1986) also reported greater yield reduction when 100% defoliation was applied at R4 or R5 compared with R6. However, even during the sensitive R4 to R5.5 period, defoliation must be substantial to achieve significant yield loss. Caviness and Thomas (1980) achieved only 13 to 17% yield reductions when 50% defoliation was applied during the R4 to R5 period. According to second-degree equations presented in Turnipseed and Kogan (1987), 55% leaf defoliation at R5 would result in a 20% yield loss.

Yield sensitivity to defoliation declines as the seed-filling period (R5 to R7) progresses. By R6, 70% defoliation was required to reduce yield 20% (Turnipseed and Kogan, 1987). Other studies have also reported yield reductions caused by defoliation at R6 (Thomas et al., 1974; Fehr et al., 1977). However, no yield effect was demonstrated when the same defoliation treatments were applied at R7. Defoliation between R6 to R7 was not conducted in these studies (Thomas et al., 1974; Fehr et al., 1977).

Yield summaries

Variety	C89	E5	Difference	Group
Pioneer5.3	54.1	52.1	2.0	5.3
GT1 Brier Ridge	53.5	47.7	5.8	4.7
Dynagrow7.2	NA	46.2		7.2
Pioneer3.1	52.2	44.8	7.4	3.1
Biologic	49.0	44.4	4.6	6.0
Multimax	NA	36.1		mix
Big Fellow	36.4	35.5	1.0	7.0

Variety	meanyield both fields	Group
Pioneer5.3	53.0	5.3
GT1 Brier Ridge	50.3	4.7
Pioneer3.1	48.1	3.1
Biologic	46.5	6.0
Dynagrow7.2	46.2	7.2
Multimax	36.1	mix
Big Fellow	35.9	7.0

Results: Economic case study

Economic case study

- Acres: 33.72
- Yield in 2021: 581 bushels
- Yield/Acre: 17.2

- Exclosure average yield: 51.1 bushels/acre
- Price/bushel: $12.5

- Gross income: $7,267
- Gross income based on deer exclosures: $21,550

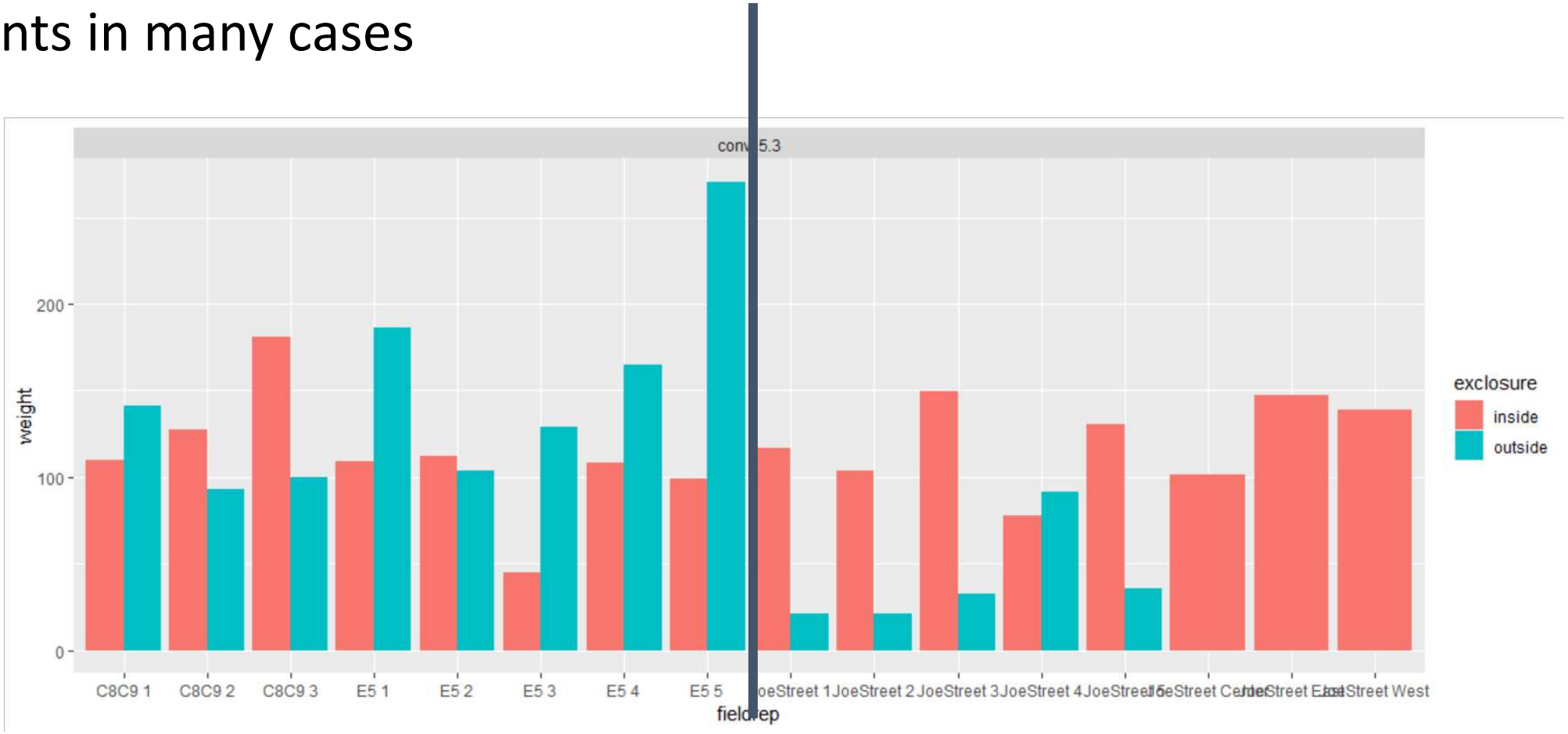
66% yield and income loss

However: may have reduced damage in neighboring farms.

Conclusions

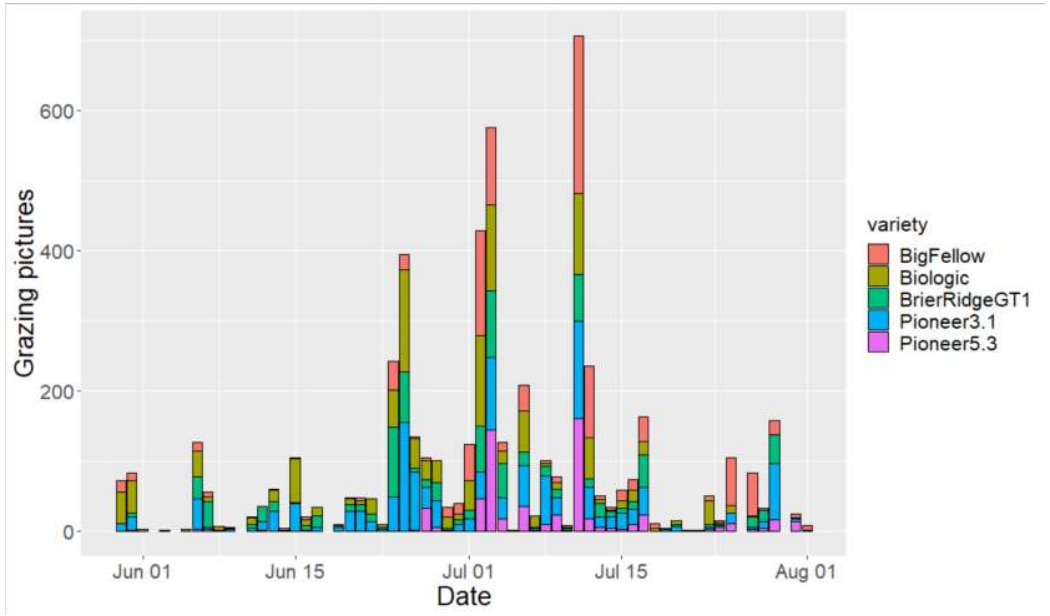
Conclusions & next steps

- Biomass: Moderate deer grazing seemed to increase biomass of plants in many cases



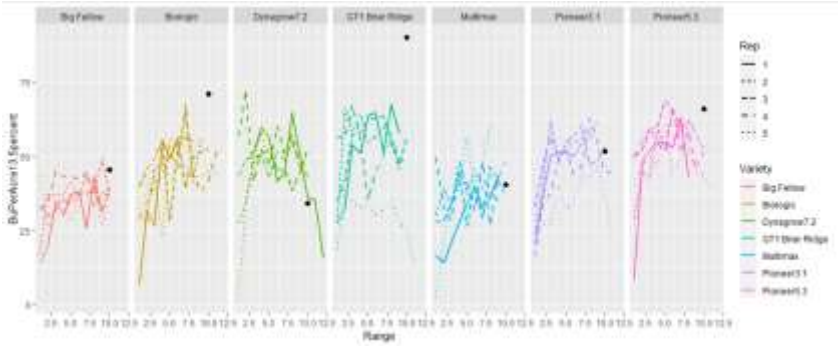
Conclusions & next steps

- Biomass: Moderate deer grazing actually increased biomass of plants in many cases
- Deer Activity & Variety Preference: Spikes in grazing. some initial evidence of shifting preferences for varieties based on their maturity date.



Conclusions & next steps

- Biomass: Moderate deer grazing actually increased biomass of plants in many cases
- Deer Activity & Variety Preference: Spikes in grazing. some initial evidence of shifting preferences for varieties based on their maturity date.
- Yield – Some forage varieties better than others, even offer better yields than conventional. However, later varieties may divert deer in key times.



Thanks again to collaborators and funder

- Taylor Robinson
- John Draper
- Tom Eason
- Joe Streett
- Louis Thorne
- Joe Crank
- CJ Chansler

<u>Collaborating farmers</u>

- Joe Streett
- Jim Lewis

<u>Co-PIs</u>

- Jim Lewis
- Nicole Fiorellino

Research sponsored by:

MSB
MARYLAND SOYBEAN BOARD

Contact: Luke Macaulay
lukemac@umd.edu

Future work

- Implement in context of field buffers. Need long history of yield data.
- Evaluate efficacy of planting into green cover crops to reduce seedling mortality in first few weeks of growth
- Also – better quantify landowner research and education needs related to wildlife

Seeking feedback on survey of landowners

- Last wildlife damage survey was in 2012

NEWS RELEASE

United States Department of Agriculture
NATIONAL AGRICULTURAL STATISTICS SERVICE
MARYLAND FIELD OFFICE
50 HARRY S. TRUMAN PARKWAY SUITE 202
ANNAPOLIS, MARYLAND 21401

FOR IMMEDIATE RELEASE
April 30, 2012

Contact: Barbara Rater
(410) 841-5740

Maryland Farmers Estimate $10.0 Million in 2011 Wildlife Related Crop Losses

The Maryland Field Office of USDA's National Agricultural Statistics Service recently reported that Maryland farmers lost an estimated $10.0 million in potential crop production income due to wildlife damage in 2011. The survey results were collected and tabulated from the agency's acreage and production survey, with nearly 400 reports tabulated. Damage statewide was attributed to the following wildlife species with the corresponding estimated percent loss due to each species: deer, 77 percent; groundhogs, 10 percent; migrant geese, 6 percent; and resident geese, 5 percent.

Estimated economic loss was greatest in North Central Maryland, with crop losses reported at $4.3 million, 43 percent of the state's total estimated losses. Most of these losses were due to deer damage (77 percent) followed by groundhogs. Regional losses in order of magnitude were as follows: Southern Maryland, $3.4 million; Northern Eastern Shore, $1.2 million; Southern Eastern Shore, $0.90 million; and Western Maryland, $0.20 million. Crop farmers across Maryland spent an estimated $0.410 million in 2011 on preventative measures such as fences, frightening devices, and repellents, with North Central Maryland growers spending the most, at $0.175 million.

Region	Estimated Economic Loss	Percent of Loss by Species						Amount Spent on Preventative Measures
		Deer	Resident Geese	Migrant Geese	Bear	Ground-hogs	Other Species[2]	
Maryland	10,000,000	77	5	6	[1]	10	[1]	410,000

Thank you.

How did I do?

Your feedback helps me improve my research and presentations.

- **https://go.umd.edu/ENRTEACH**

Contact: Luke Macaulay
lukemac@umd.edu

Forage analysis