WATERHEMP IMPACTS ON ESTABLISHED ALFALFA AND WHEN TO APPLY RESIDUAL HERBICIDES

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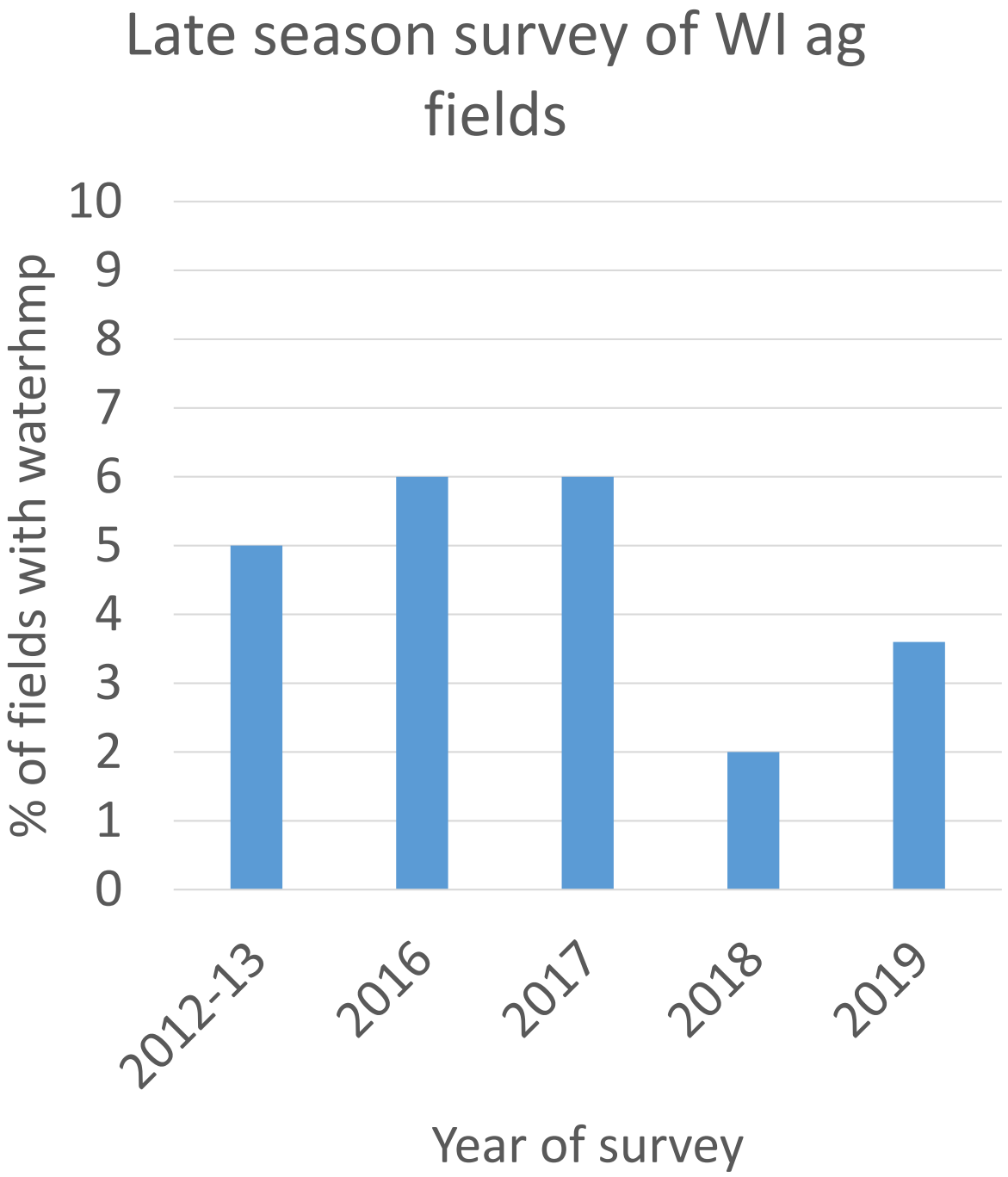
Waterhemp

- Native to WI
  - Present for 100 years
- Rapid expansion in some regions of WI
- Surveys suggest between 2-6% of fields infested



Why are we concerned about waterhemp?

1. Rapidly spreading throughout WI
2. Herbicide resistance
3. More competitive than common weeds
   - Grows faster
   - Emerges later in season

Tips on managing waterhemp in alfalfa

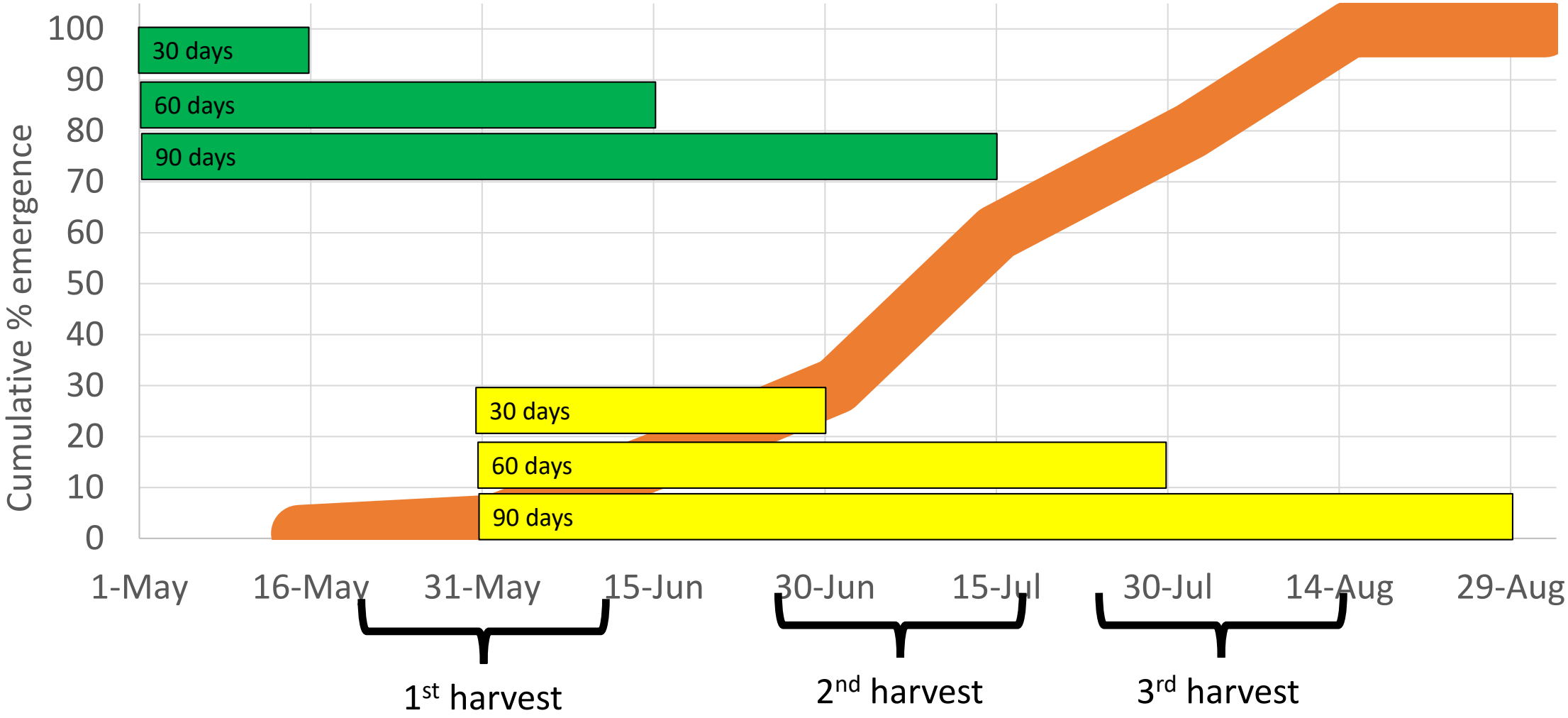
- Management in alfalfa will be different than corn/soybeans
- Optimize alfalfa plant health to minimize impact
  - Proper fertilization, cutting schedule, rotation, etc……
- Use herbicides efficiently to get desired results
  - Residual herbicides used will be similar to soybeans
  - Do not rely on POST herbicides to control waterhemp

PRE Herbicides we use in established alfalfa

applied either pre-greenup or in between cuttings#*

Herbicide	Active ingredient	Rate	Plantback restriction corn	Plantback restriction soy	Plantback restriction small grain
Chateau*,#	flumioxazin	4 oz/A	4 months	4 months	12 months
Metribuzin*	metribuzin	0.33-1.33 lbs/A	4 months	0 months	4-12 months
Prowl H20*,#	pendimethalin	1.1-4.2 qt/A	Following year	0 months	4 mo – following year
Velpar *,#	hexazinone	1-6 pt/A	12 months	2 years	2 years
Warrant*,#	acetochlor	1.25-2 qt/A	0 months	0 months	0- 4 months

If use residual herbicides, do we treat at green-up or wait until the first cutting?



2019 Research in established alfalfa

- NAFA grant: Evaluate waterhemp control in established alfalfa

- 4 states: Wisconsin, Minnesota, Michigan, Penn State

2019 Research Questions

QUESTIONS

1. impacts of waterhemp on alfalfa quality and productivity
2. effectiveness of residual herbicides applied after the first or second cut
3. Waterhemp emergence patterns in established alfalfa

RESEARCH ESTABLISHMENT

- WI: conducted
- MN, MI, PN: no waterhemp in fields

- Repeating in all four states in 2020

Treatments applied/Timing

TRT Nº	Active ingredient	Rate (kg ai ha^{-1})	Application timing
1	Untreated	-	-
2	acetochlor (359 g ai L^{-1})	1.70	After 1st cut (06/03)
3	flumioxazin (51%)	0.14	After 1st cut (06/03)
4	pendimethalin (455 g ai L^{-1})	2.13	After 1st cut (06/03)
5	acetochlor (359 g ai L^{-1})	1.70	After 2nd cut (07/07)
6	flumioxazin (51%)	0.14	After 2nd cut (07/07)
7	pendimethalin (455 g ai L^{-1})	2.13	After 2nd cut (07/07)
8	acetochlor +	1.7 +	After 1st cut
	flumioxazin	0.14	After 2nd cut

2) Material and Methods – Timeline of events

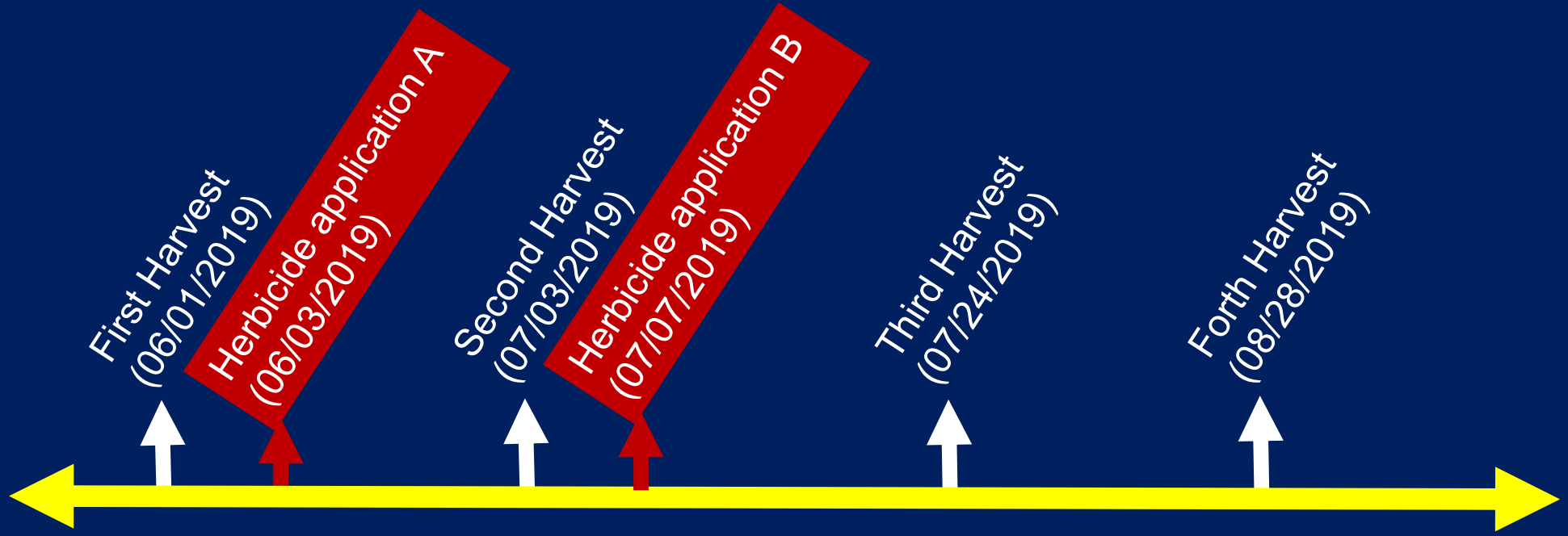
First Harvest (06/01/2019)

Second Harvest (07/03/2019)

Third Harvest (07/24/2019)

Forth Harvest (08/28/2019)

2) Material and Methods – Timeline of events



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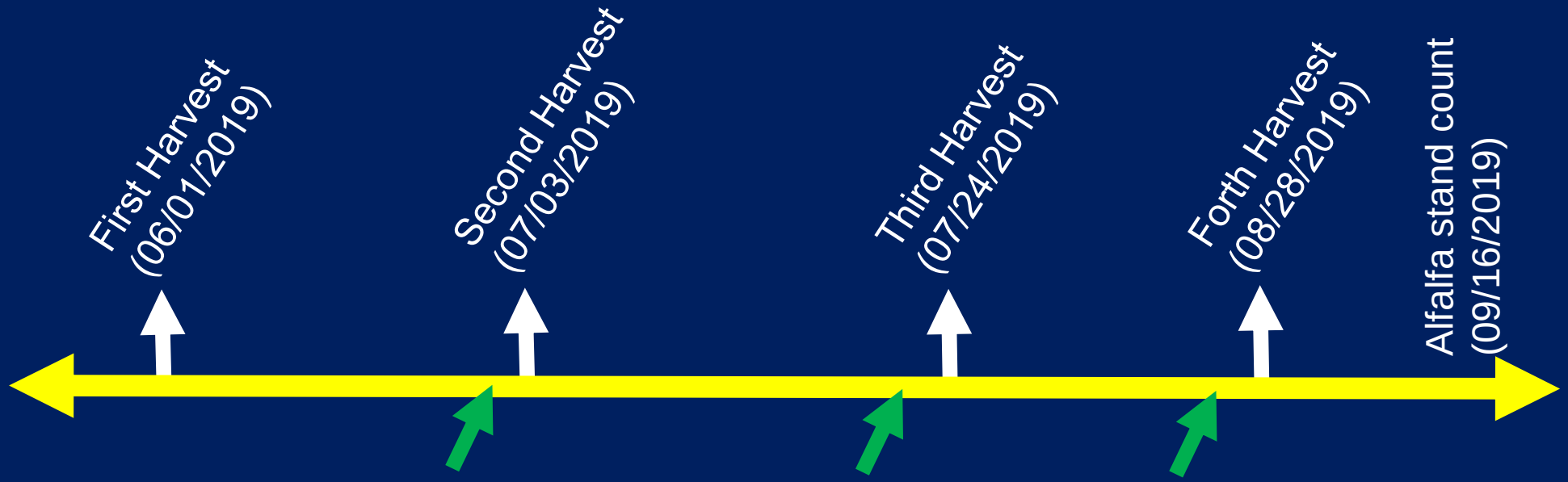
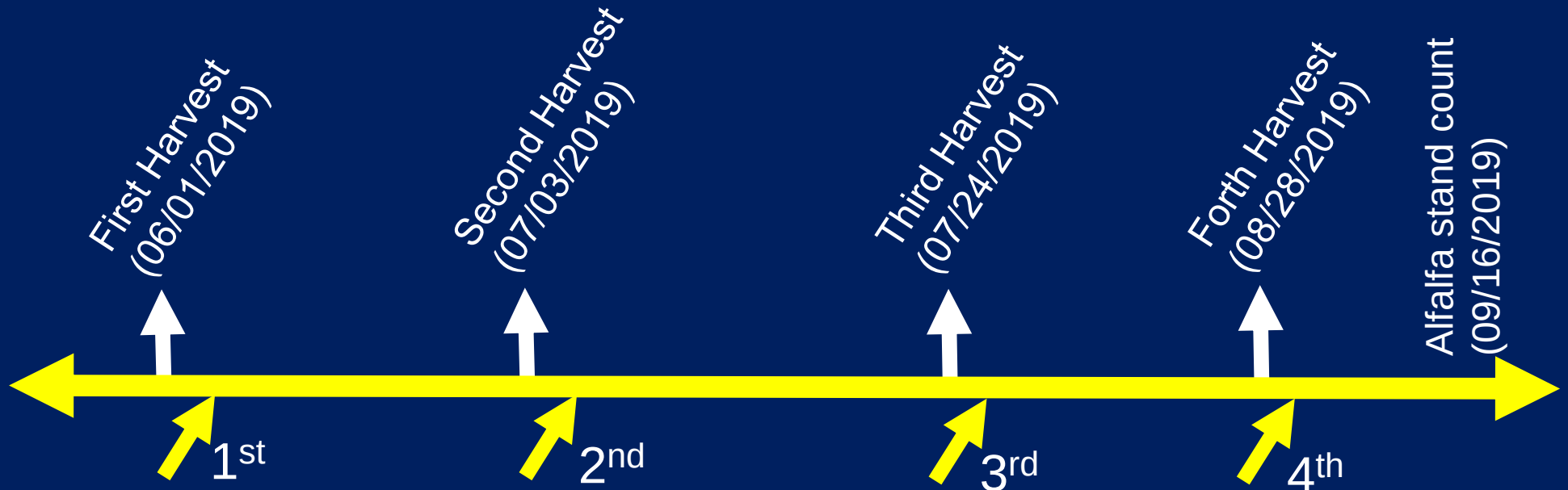


Legend

Biomass assessment

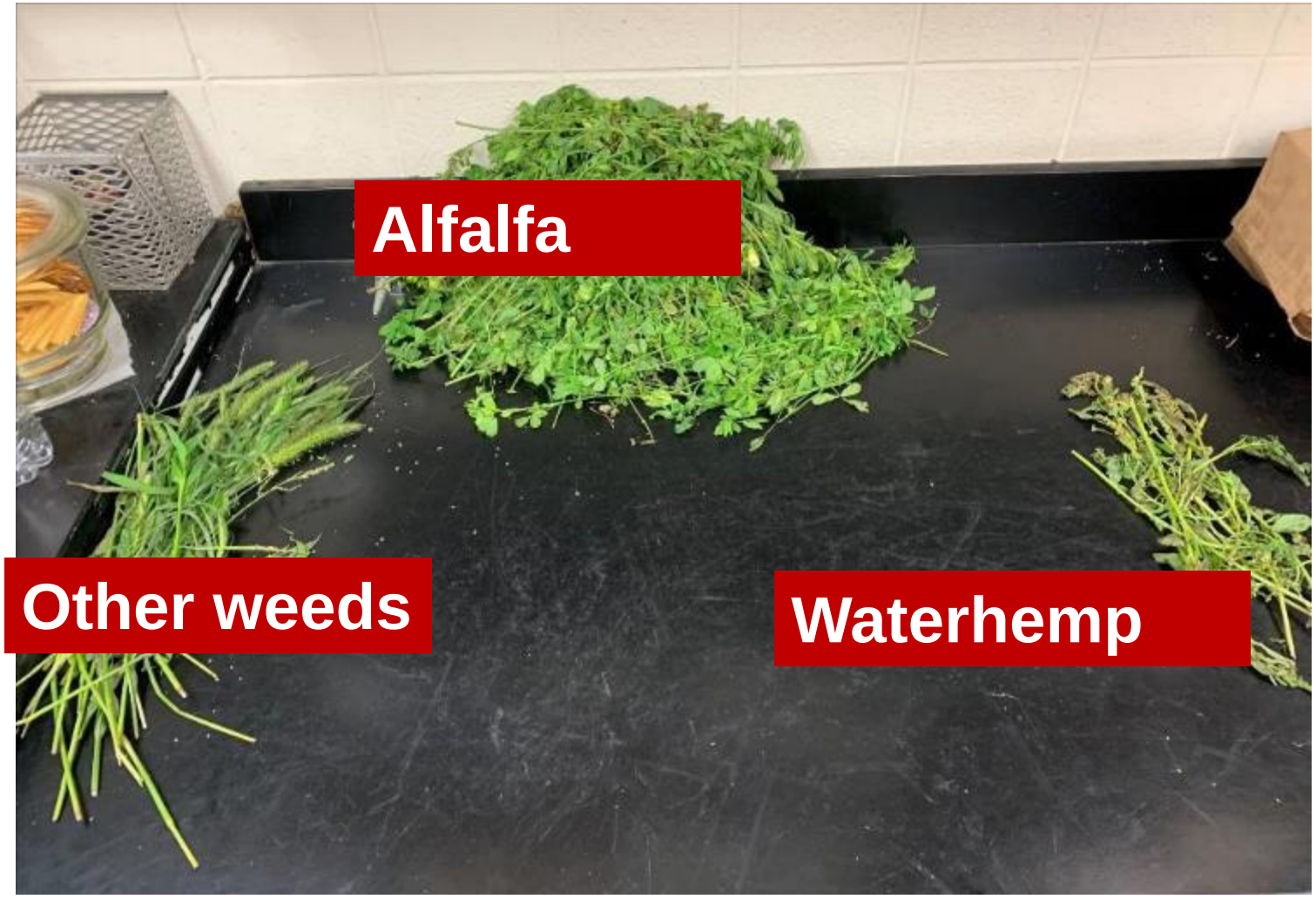
2) Material and Methods – Timeline of events



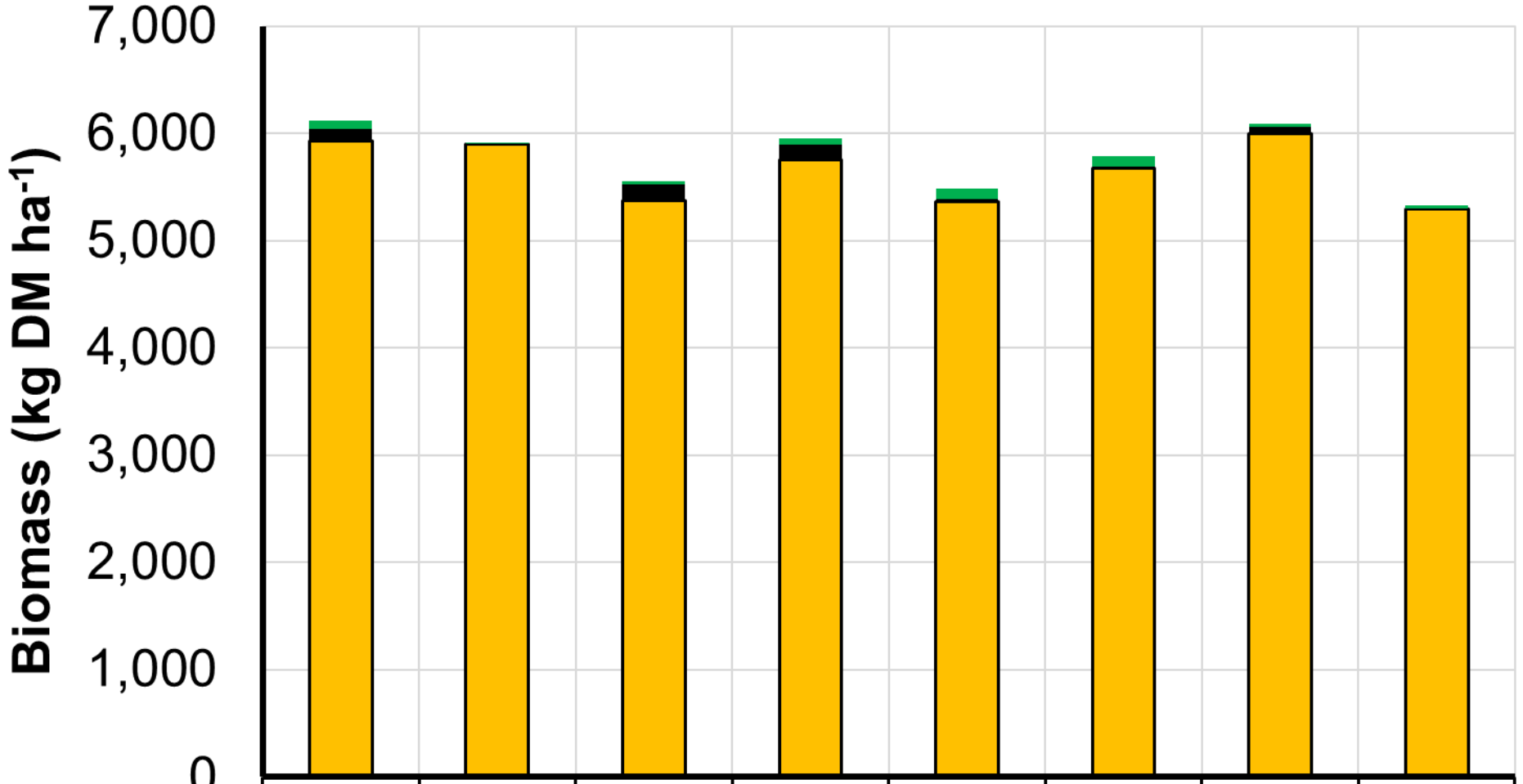
Legend

Waterhemp stand count

Results: Yield across 2nd, 3rd, and 4th harvest

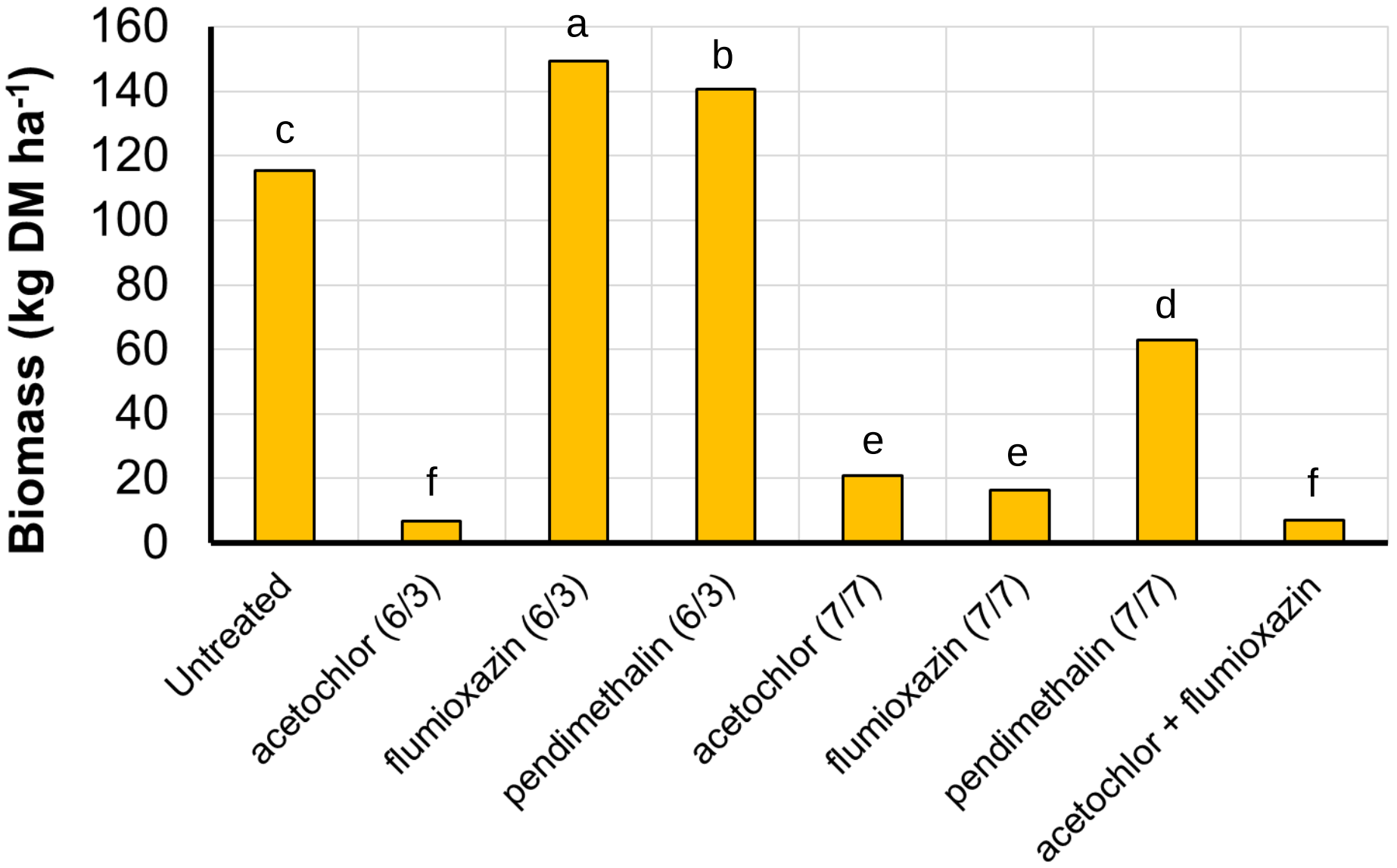


Combined yield (alfalfa, waterhemp, other weeds) (2nd, 3rd, 4th harvest)



	Untreated	aceto. (6/3)	flumi. (6/3)	pendim. (6/3)	aceto. (7/7)	flumi. (7/7)	pendim. (7/7)	aceto. + flumi.
Other weeds	79	1	30	61	100	96	33	28
Waterhemp	115	7	149	141	21	16	63	7
Alfalfa	5,928	5,904	5,378	5,753	5,368	5,680	6,000	5,299

Total season waterhemp biomass (2nd, 3rd, 4th harvest)



Yield and forage quality summary

- Waterhemp control:
  - Acetochlor after 1st cut or acetochlor (1st cut) + flumioxazin (2nd cut) provided best control (> 90% biomass reduction)
  - Flumioxazin control was variable (good after second cut, poor after 1st)
  - Pendamethalin control was poor
- Total and alfalfa yield: Neither differed among treatments
  - Waterhemp and weeds laways a low % of total forage biomass
- We do not expect Forage Quality to DIFFER (testing)

All plots had seed producing waterhemp by end of season

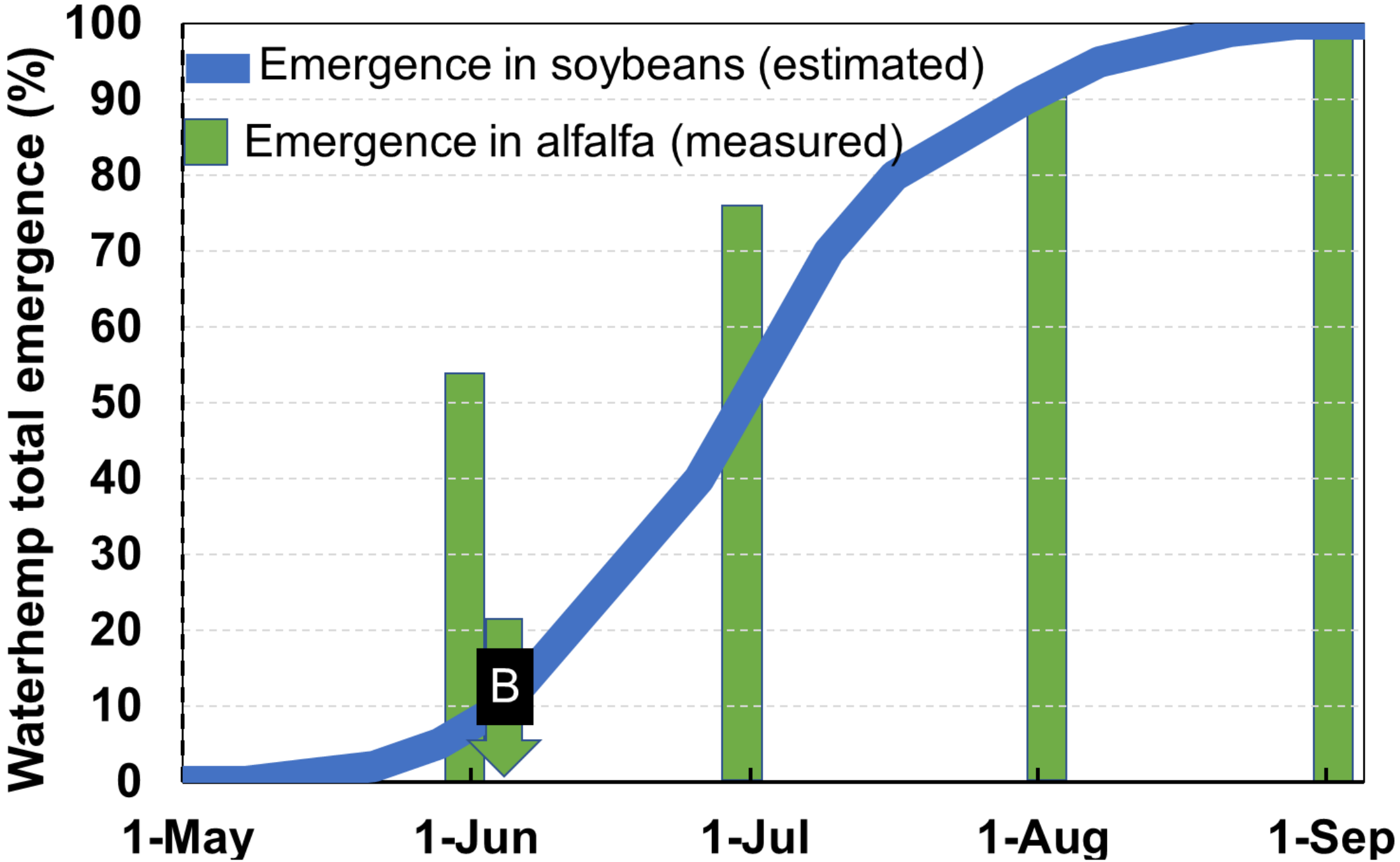
In Michigan, promoting Paraquat after 3 or 4 cut

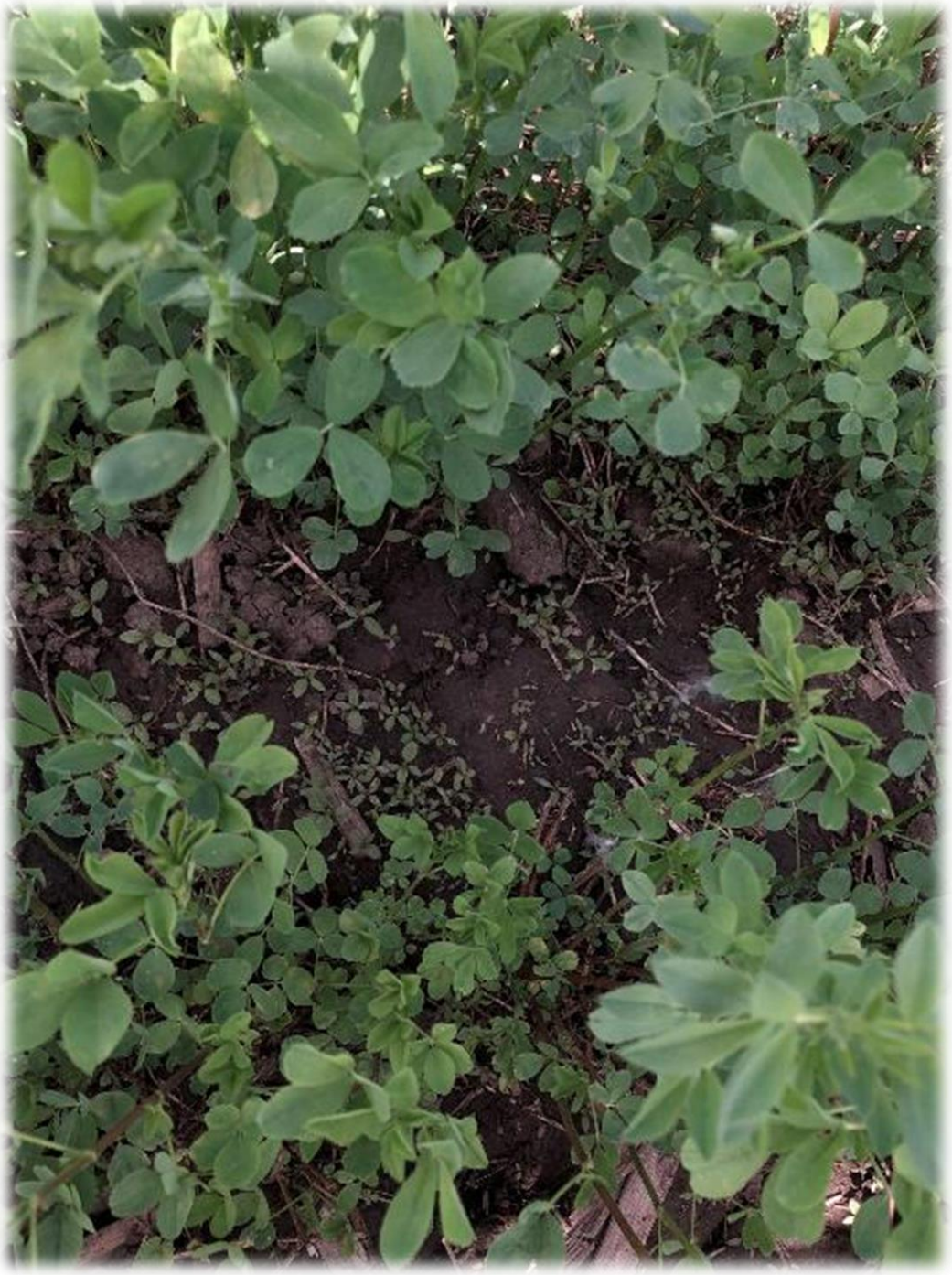
<u>May prevent seed production</u>

What was the emergence pattern in Alfalfa?

- Similar or delayed compared to annual crops?

- What was the survival pattern of emerged plants?

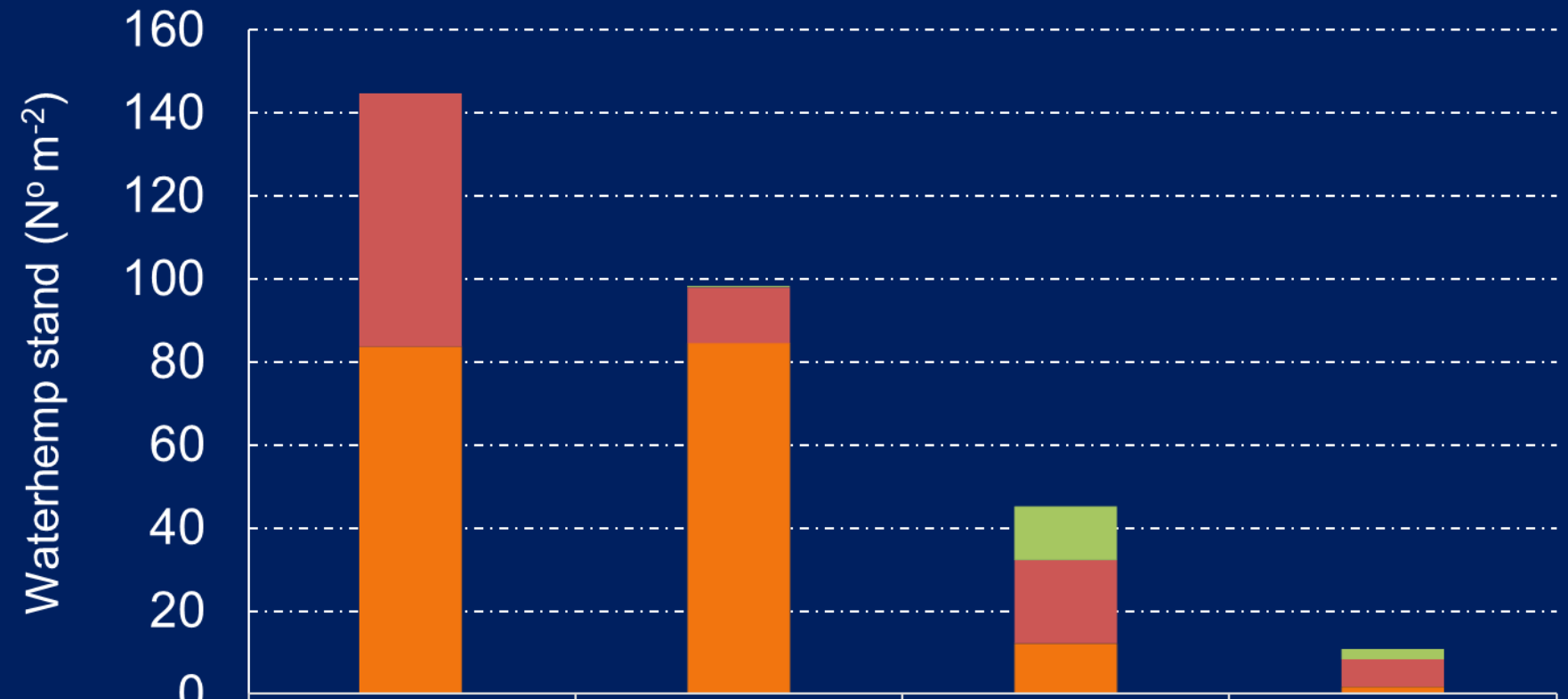

Waterhemp total emergence (%)
100
90
80
70
60
50
40
30
20
10
0
Emergence in soybeans (estimated)
Emergence in alfalfa (measured)
B
1-May
1-Jun
1-Jul
1-Aug
1-Sep



waterhemp germination around first cut

Survival of waterhemp seedlings

3) Results – Waterhemp stand through time



	June	July	August	September
Large	0	0	13	3
Medium	61	13	20	7
Small	84	85	13	2
Total:	144	98	45	11

Waterhemp emergence and survival summary

- >50% of waterhemp seedlings emerged near the first harvest (6/2/19)
- >75% of waterhemp seedlings emerged near the second harvest (7/3/19)
- >90% of waterhemp seedlings emerged by the third harvest (8/1/19)

- Mortality of waterhemp **seedlings** are high in established alfalfa fields
  - Early emerging plants (June) had >80% mortality
  - Mid emerging plants (July) had >60% mortality
  - Late emerging plants (Aug) had 23% mortality

Conclusions

- Elimination of waterhemp did not increase alfalfa yield.
- Impacts on forage quality not likely.
- Control with warrant was high when applied after the 1st or 2nd cut
  - Chateau control was better after second cut, poor after 1st
  - Prowl control poor
- Emergence patterns were different than annual crops
  - Large flush around first cut
- Seed production was observed in all treatments
  - other management approaches will be required to prevent waterhemp seed production.

Need to repeat in 2020 to confirm results…..