Updates on Invasive Species Research

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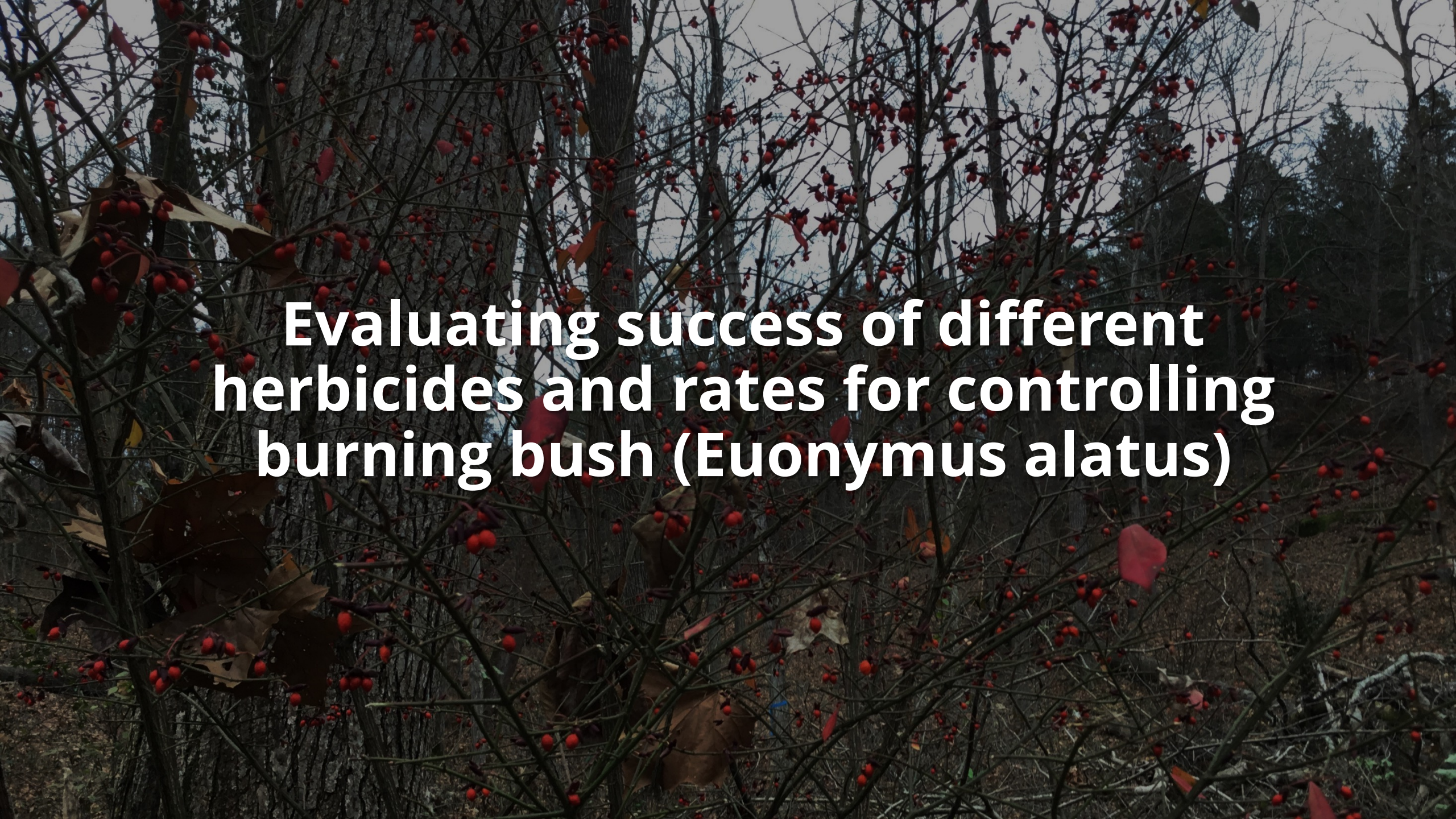
Invasive Species Projects

- Foliar treatments of burning bush
- Grass-specific herbicide and cover crop trial on Japanese stiltgrass
- Stem injection timing, method, herbicide, and rate trial on sugar maple

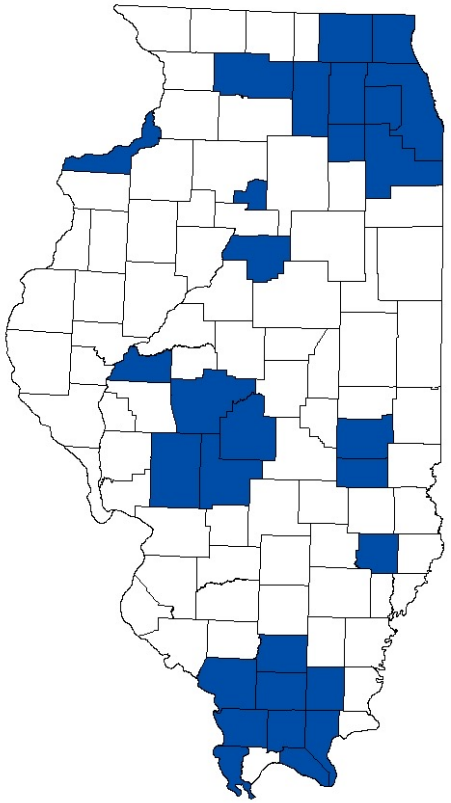


Evaluating success of different herbicides and rates for controlling burning bush (Euonymus alatus)

Study species

Winged burning bush (Euonymus alatus)

- Tardily deciduous shrub
- Aggressive invader in many locations
  - Shade tolerant
- Banned for sale in several states
- Very little experimental research on management techniques



Research Objectives

- Test effectiveness of different herbicides and rates as a foliar applied herbicide on winged burning bush
  - Defoliation
  - Mortality
    - 2 years after treatment

Study Design*

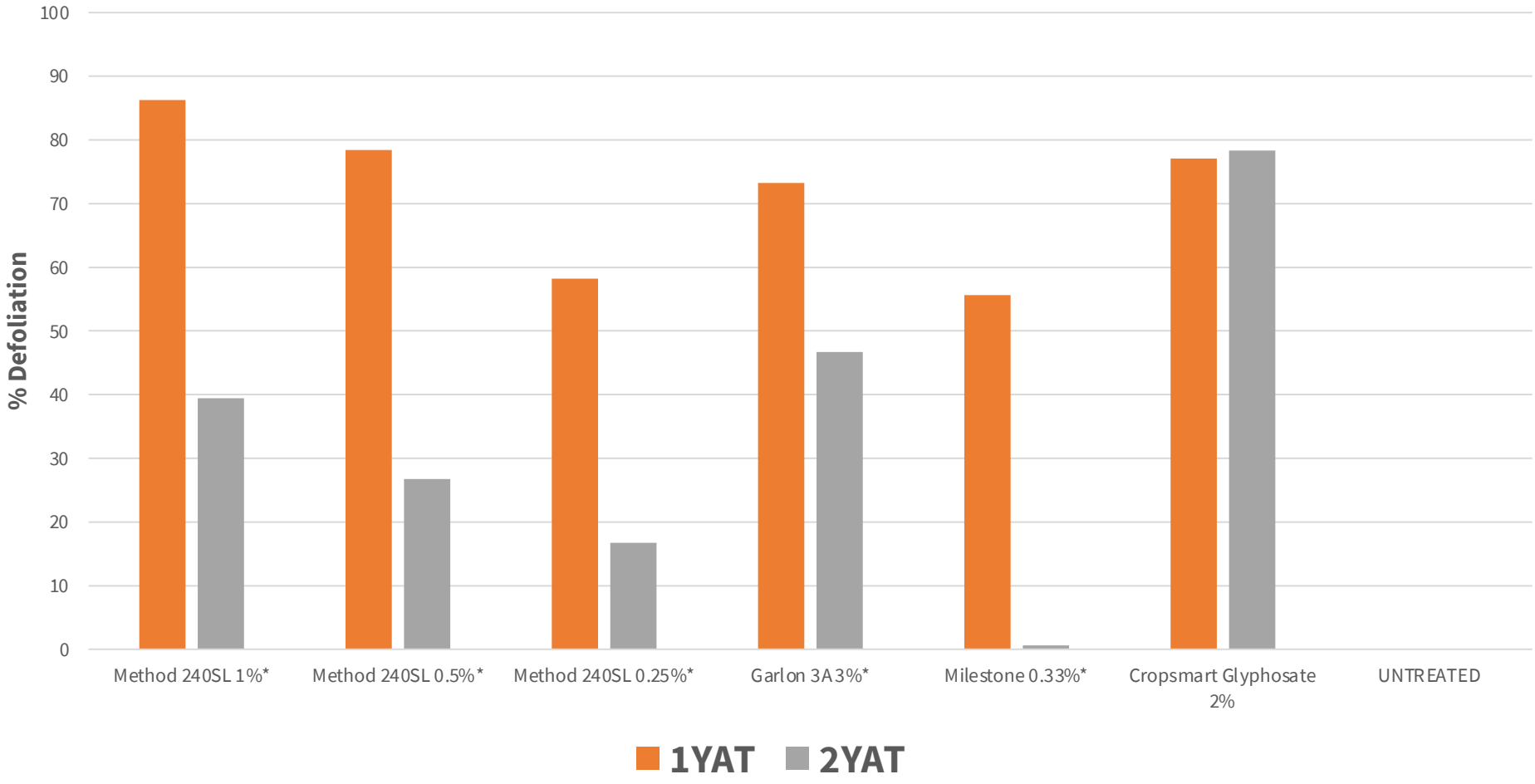
*In partnership with Bayer U.S.

- Individual Plant Treatment (9 replicates for each treatment type)
- Late summer of 2019 treatment
  - % Defoliation measured at 1 and 2 years after treatment (YAT)
  - Mortality calculated at end of study (Mortality = 100% defoliation at 2YAT)

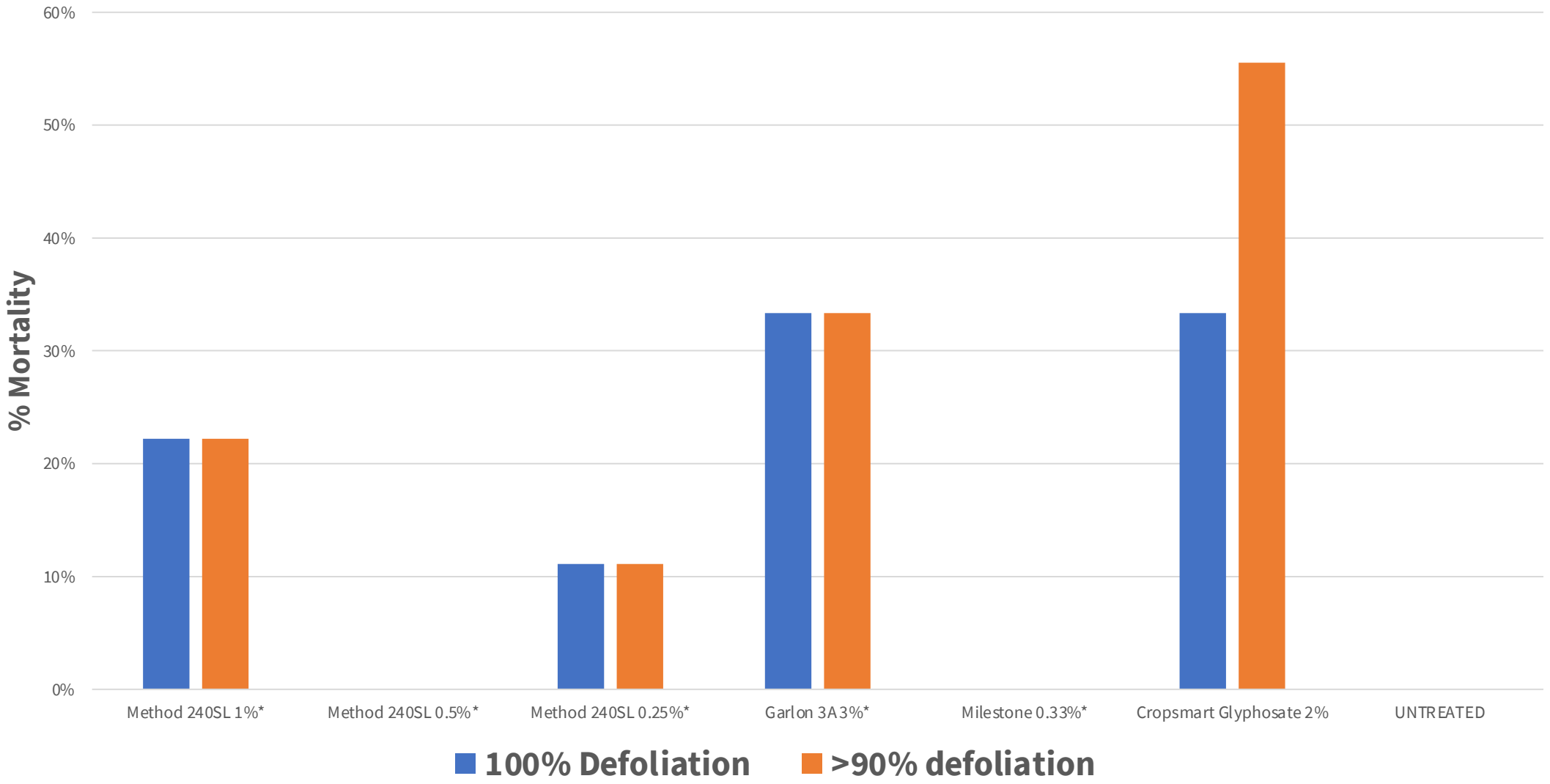
Treatments

- Cropsmart (Glyphosate)
  - 2%
- Garlon 3A (Triclopyr)
  - (3%)
- Method 240SL (Aminocyclopyrachlor)
  - (0.25%)
  - (0.5%)
  - (1%)
- Milestone (Aminopyralid)
  - (0.33%)
- Untreated Control

Burning Bush % Defoliation at 1- and 2- years after treatment



Burning Bush Mortality at 2-Years After Treatment (Using 100% and >90% defoliation to denote mortality)



Burning Bush Research Summary

- None of the foliar treatments tested were successful at controlling burning bush, measured at 2-years after treatment
- Strong initial defoliation and at 1-year after treatment but plants recovered for most treatments by 2-years after treatment

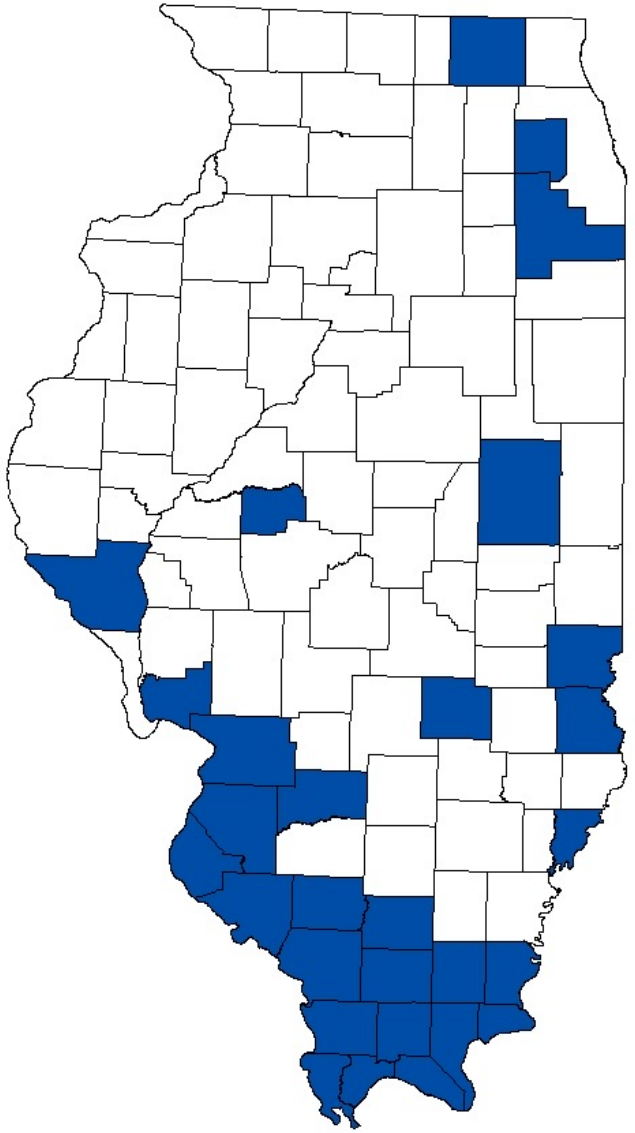
Management Implications

- Currently do not have a great recommended foliar treatment, but 2% glyphosate seems to wok best
- Observationally, both basal bark (with ester version of triclopyr) and cut stump (with triclopyr or glyphosate) are effective but still need to test them experimentally.


Can light rates of grass-specific herbicide effectively control stiltgrass?
Can the use of native cover crops in combination with herbicide reduce stiltgrass invasion following large-scale brush removal

Study Species

- Japanese stiltgrass
  - Microstegium vimineum
- Shade-tolerant, annual, warm-season grass
- Disturbance-driven colonization of new locations



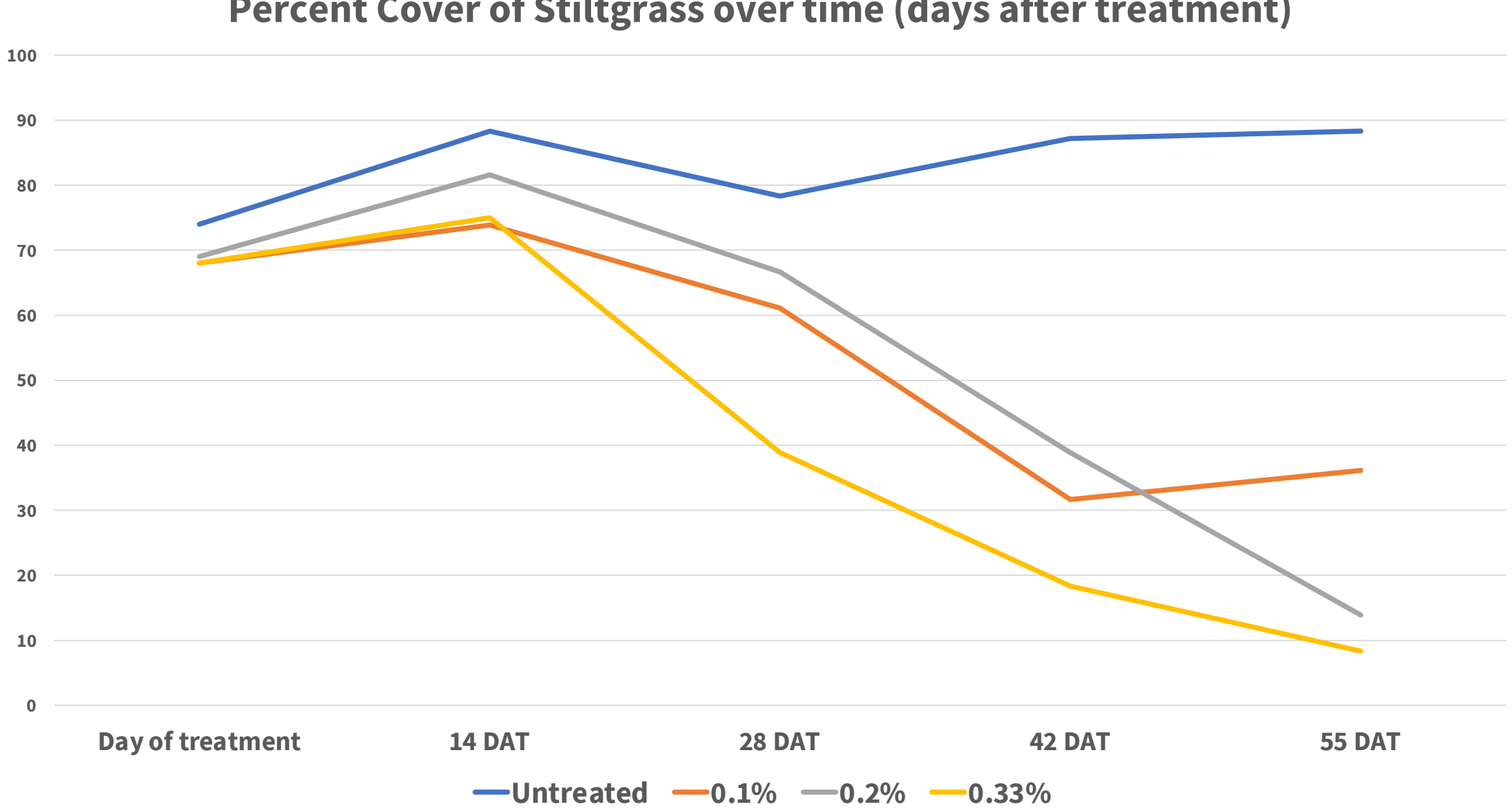
Conventional recommendations

- Grass-specific herbicides
  - Clethodim 2e @ 0.5-0.66% v/v spot spray rate
- Observational information that lower rates may still be effective
  - What about impacts to other vegetation?

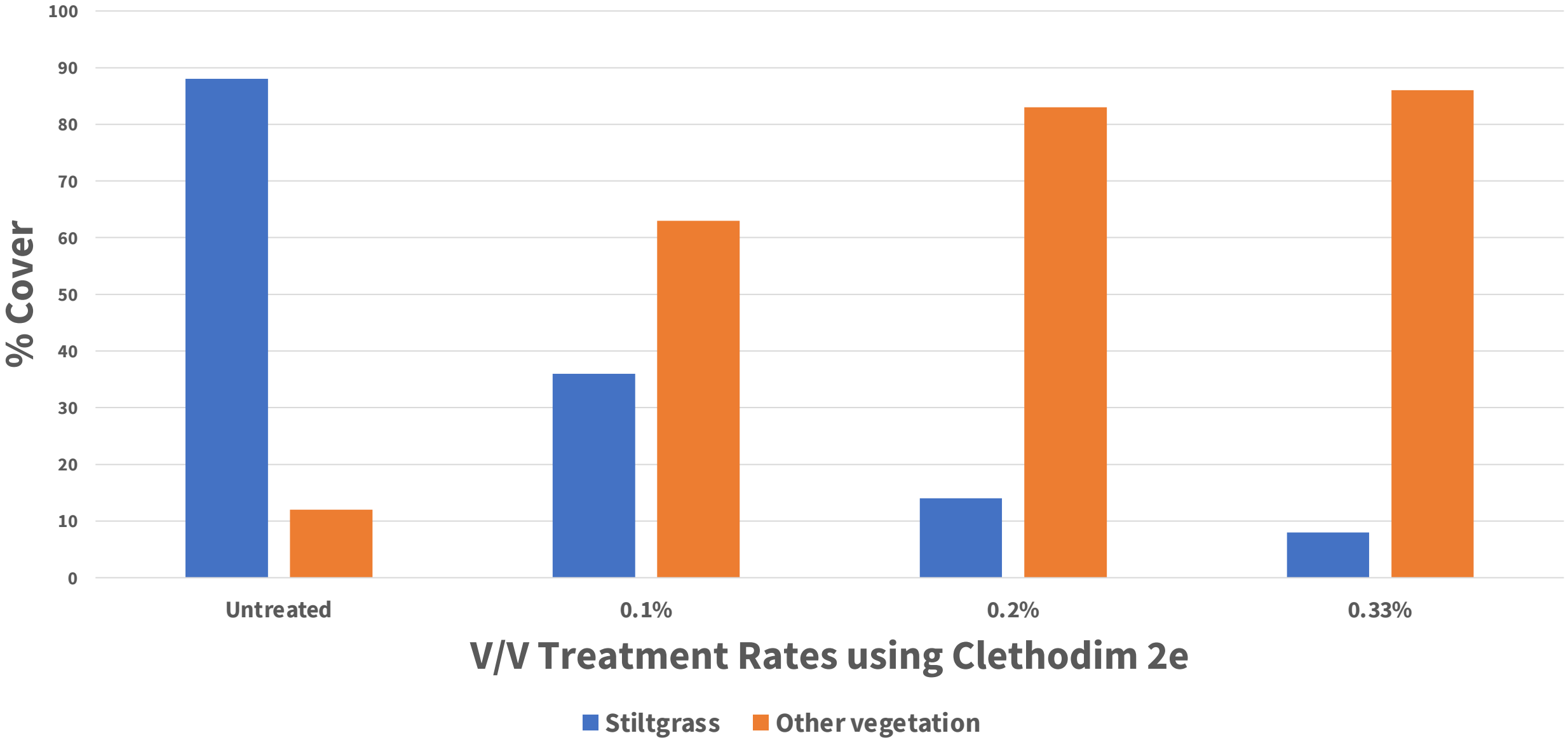
Study #1 – Herbicide rate trial

- 2m x 2m plots
  - Heavily invaded by stiltgrass
- Treated using 3 rates of Clethodim 2e with NIS (June 10, 2022)
  - Untreated
  - 0.1%
  - 0.2%
  - 0.33%
- 9 replicates per treatment
  - Recorded visual percent cover every two weeks for total of 55 days

42 DAT


Percent Cover of Stiltgrass over time (days after treatment)
100
90
80
70
60
50
40
30
20
10
0
Day of treatment
14 DAT
28 DAT
42 DAT
55 DAT
Untreated
0.1%
0.2%
0.33%

% Cover of Stiltgrass and other vegetation at 55 DAT under different treatments



Large-scale brush removal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Large-scale brush removal

- Heavy disturbance
- Often herbaceous invasive species rapidly invade

Can the use of native cover crops in combination with herbicide reduce stiltgrass invasion following large-scale brush removal

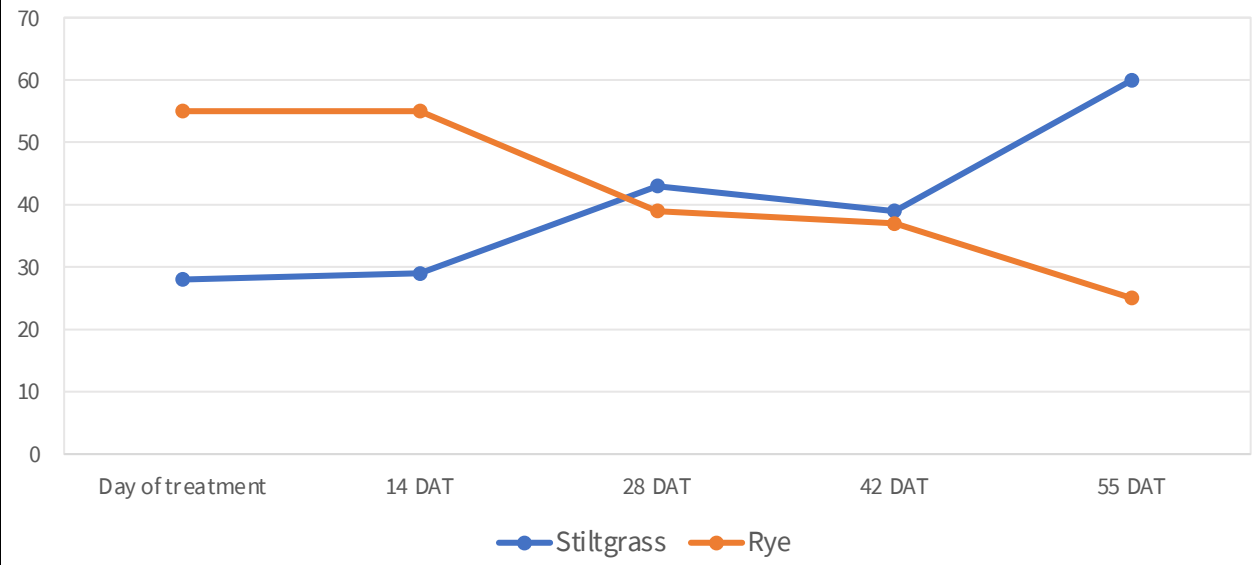
Study site

- Dixon Springs Agricultural Center
  - Pope County, IL
- 30-40 YO tree plantings heavily invaded by Autumn olive, bush honeysuckle, and tree seedlings
  - Stiltgrass present on site, but heavy infestations immediately adjacent as well
- Site was cleared in winter of 2020/2021 using a forestry mulcher
  - Stump sprouts of woody invaders treated using triclopyr herbicide in 2021 and 2022
- Mix of native shade-tolerant grass species was sown into area
  - Virginia wild rye primarily

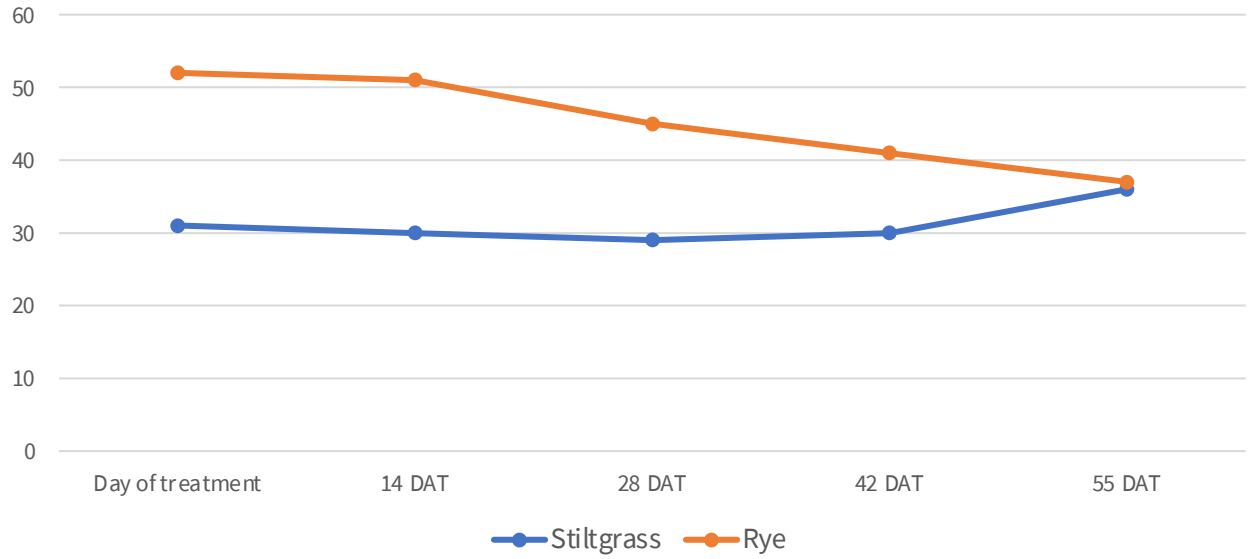
Study Design

- 2m x 2m plots within cleared area
- Mix of native rye and stiltgrass
- Treatments made in early June
  - Untreated
  - 0.1% Clethodim
  - 0.2% Clethodim
  - 0.33% Clethodim
- Visual estimates of % cover measured every two week for 55 days
  - Plans to follow up in year 2 to measure survivorship of native grasses

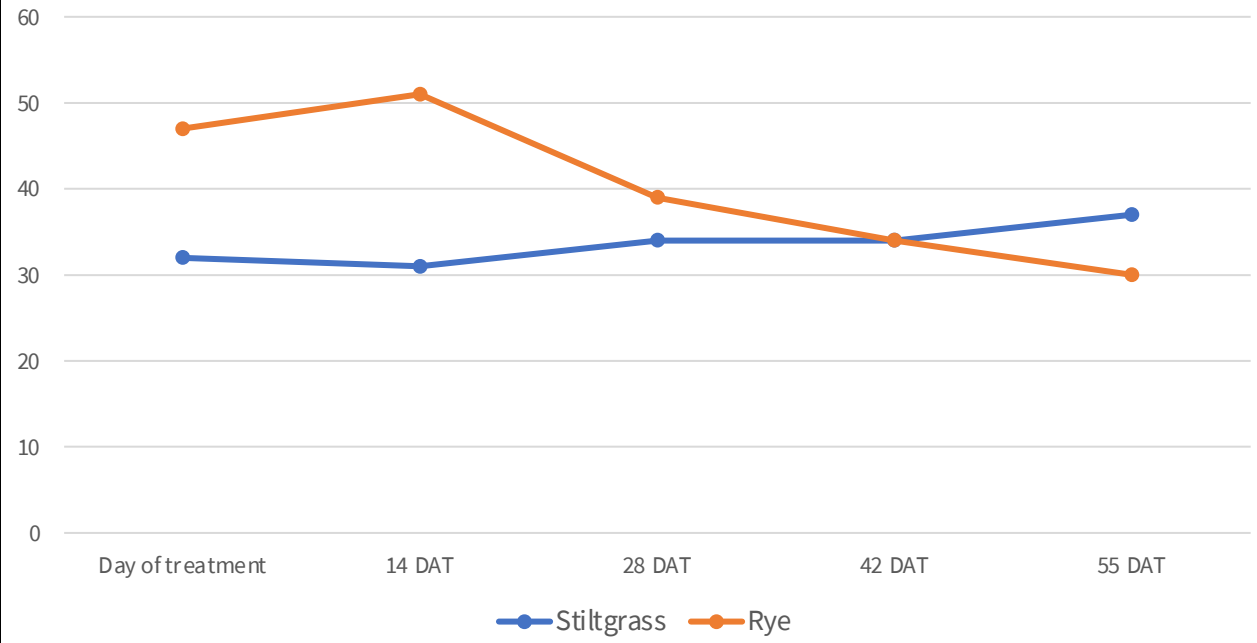
Untreated



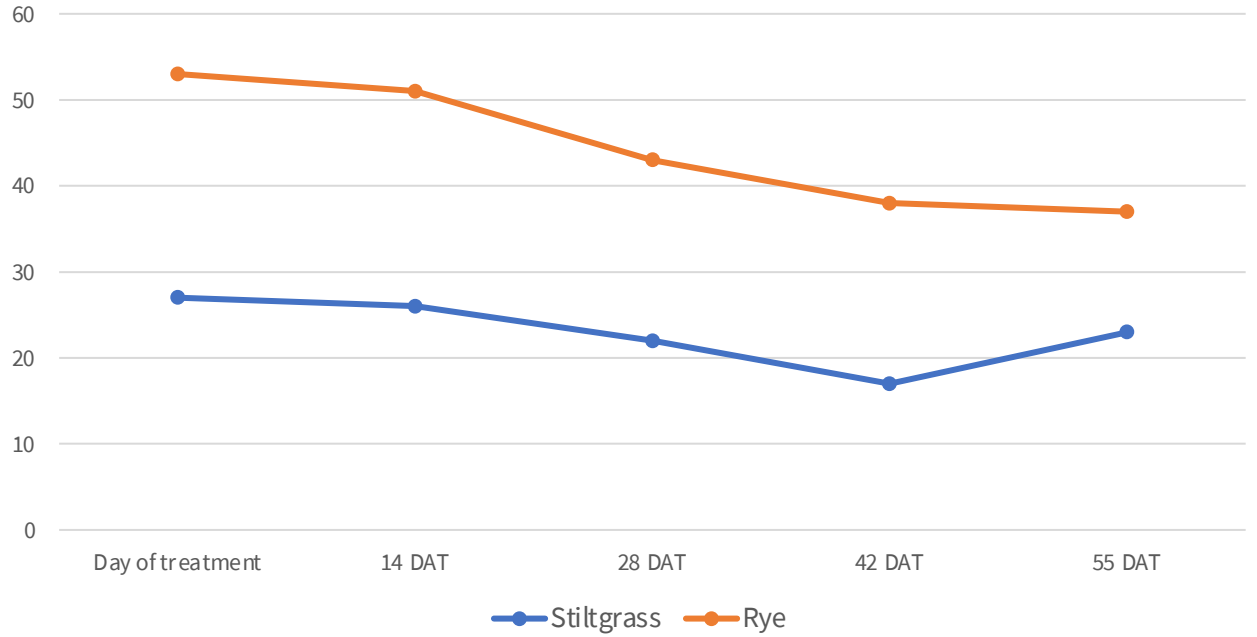
0.1% Clethodim 2e



0.2% Clethodim 2e



0.33% Clethodim 2e



Notes

- Native rye was impacted by treatment
  - Die-back of the tops of the plants noticeable
  - Did it lead to mortality, or will they bounce back?
    - Year 2 data will help determine ultimate utility of treatment
- Stiltgrass was clearly impacted by treatments but not as drastically as in the stiltgrass-only study
  - Taller native grasses intercepted herbicide, leading to less contact with stiltgrass?

Stiltgrass Research Discussion

- Very light rates of the grass-specific herbicide Clethodim 2e appear successful at treating dense stands of stiltgrass while maintaining other vegetation.
  - 0.2% and 0.33% rates are very effective
  - 0.1% rate was not as effective on stiltgrass
- Planting native wild ryes as a cover crop beneficial to reducing stiltgrass impact
  - Best used in combination with light rate grass-specific herbicide treatment.
  - Year 2 data collection will help determine long-term benefit of cover crop and herbicide treatments

How does herbicide, rate, and timing impact stem injection treatments for woody plants?

Stem Injection Applications

- Small site of damage to the stem of the woody plant
  - Direct application of concentrated herbicide at damage site
  - Reduces need for herbicide to be taken up through the bark
- Girdle or Frill
- Hack and Squirt
- Drill and Fill

Girdle or Frill

- Cut completely around stem deep enough to expose inner bark and sapwood
- Directed spray of herbicide into cut
- Girdle cuts should be within 2-feet of the ground and around 1” deep into wood past the bark
  - Works best on larger stems

Hack and Squirt

- Downward chops through bark to expose inner bark
- Direct application of herbicide into wound site
  - Leaving hatchet in cut and bending it down will help hold open cut and improve herbicide uptake
  - Downward angle of cut helps keep herbicide in

Figure 3. Hack-and-squirt application technique.
Credits: Stephen Enloe, UF/IFAS

Drill and Fill

- Similar to hack and squirt but use a large diameter drill bit instead (3/8”-1/2”) at a downward angle 1.5-2” deep into wood
- Apply approximately 1 ml of herbicide in each hole (# of holes depends upon diameter of stem)


Zep
Profe
Spra
32 Fl. Oz.

Stem Injection Considerations

- Very simple and portable methods
- Very little chance of non-target impacts
- Leaves plants standing (no slash issue)
- Calibrate hand-pump sprayers as they vary greatly in output

Study Objectives

Evaluate three different herbicides at different rates, different timing and different injection methods for effectiveness on treating small sugar maples in an oak forest

- Glyphosate, Triclopyr, and Aminocyclopyrachlor
- Hack ’n’ squirt and Drill ’n’ fill
- September and December treatment dates

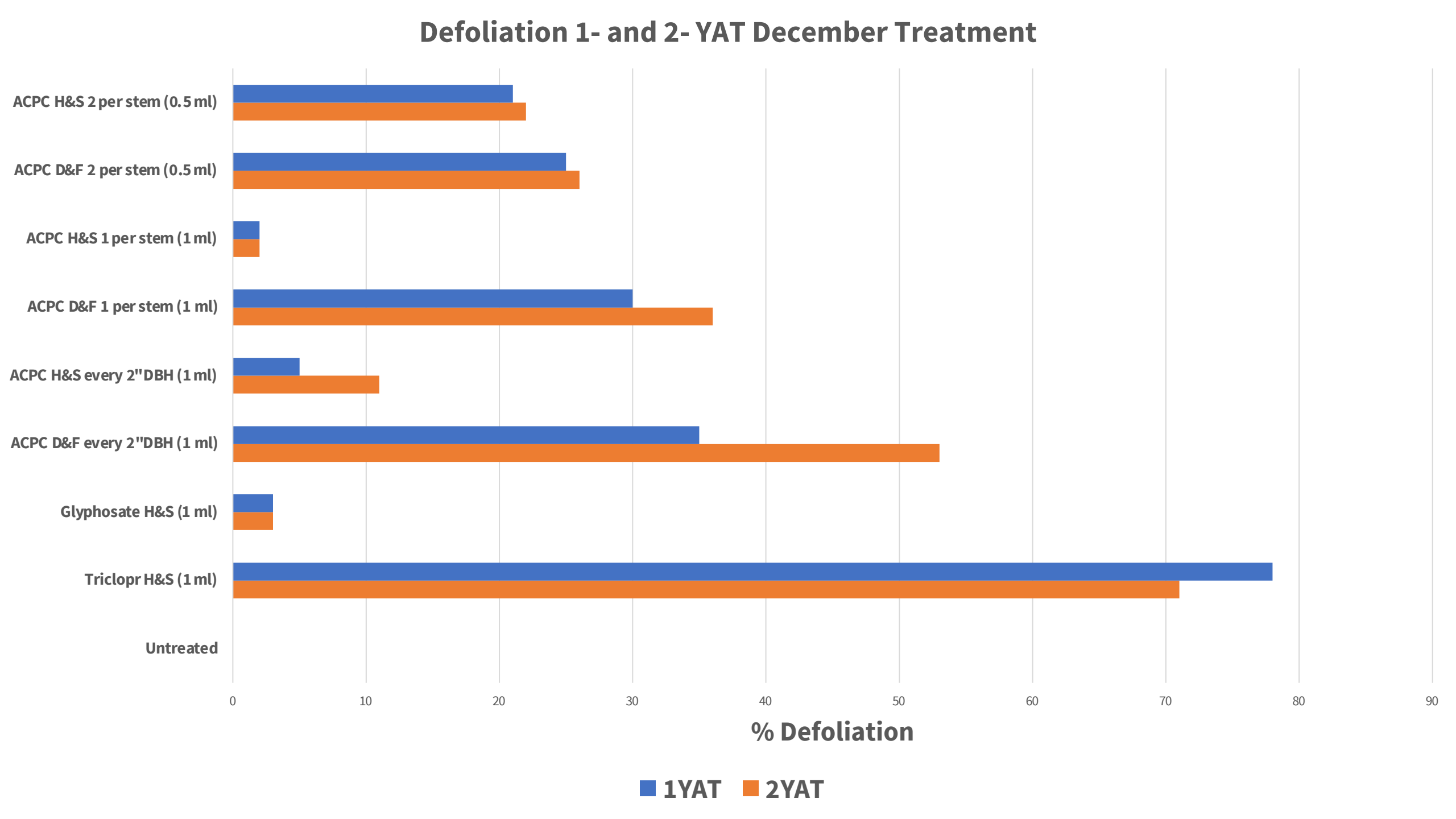
Study Design

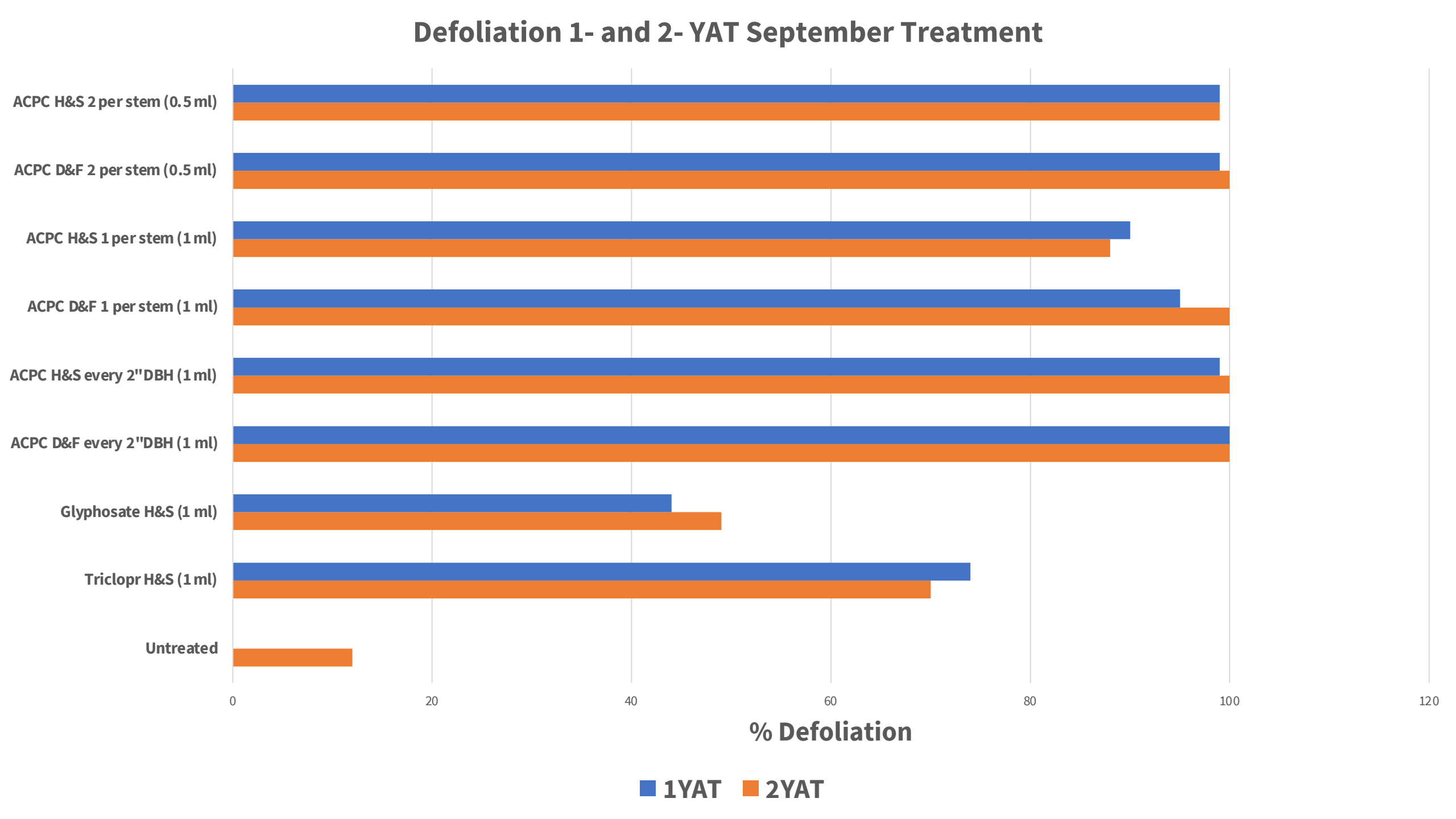
Individual plant treatments (9 replicates per treatment)

- Untreated
- Garlon 3A (triclopyr)
  - – H&S - 1/2 ml undiluted every 3-4” circumference (label instructions)
- Cropsmart (Glyphosate)
  - – H&S – 1ml every 2” DBH (label instructions)
- Method (Aminocyclopyrachlor)
  - – D&F (1 ml) every 2” DBH (D&F and H&S)
  - - 1 hole (1 ml) per stem (D&F and H&S)
  - – ½ ml, 2 per stem (D&F and H&S)

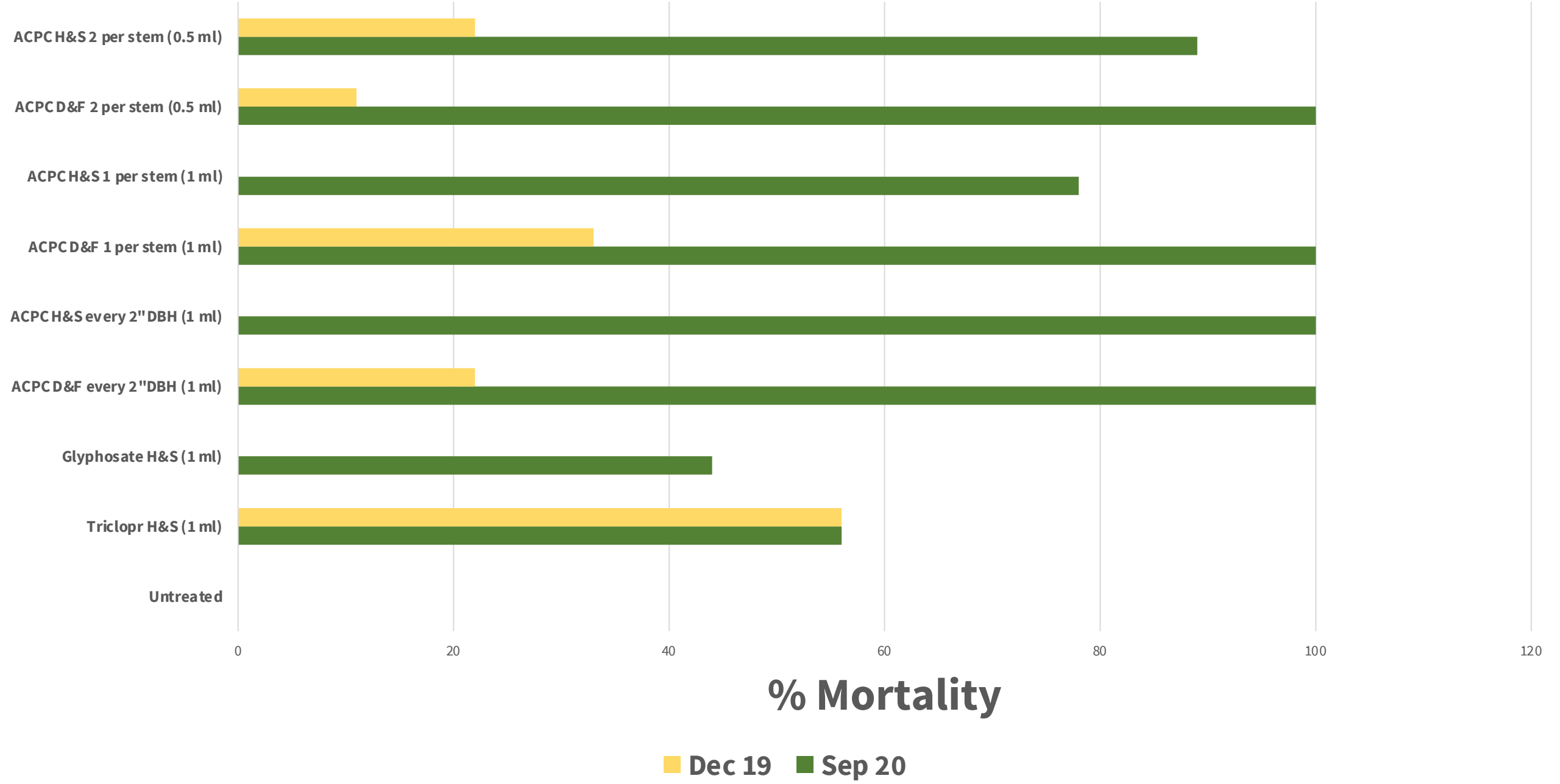
Study Design

- Initial treatment was December 2019
- Sap running excessively that day
- Potentially pushing herbicide out of the injection sites
- Decided to repeat the study the next year with earlier treatment date (September 2020)
- Measured % defoliation at 1- and 2- years after treatment
  - Rated mortality (100% defoliation 2-years after treatment)


Defoliation 1- and 2- YAT December Treatment
ACPC H&S 2 per stem (0.5 ml)
ACPC D&F 2 per stem (0.5 ml)
ACPC H&S 1 per stem (1 ml)
ACPC D&F 1 per stem (1 ml)
ACPC H&S every 2"DBH (1 ml)
ACPC D&F every 2"DBH (1 ml)
Glyphosate H&S (1 ml)
Triclopr H&S (1 ml)
Untreated
0
10
20
30
40
50
60
70
80
90
% Defoliation
1YAT
2YAT

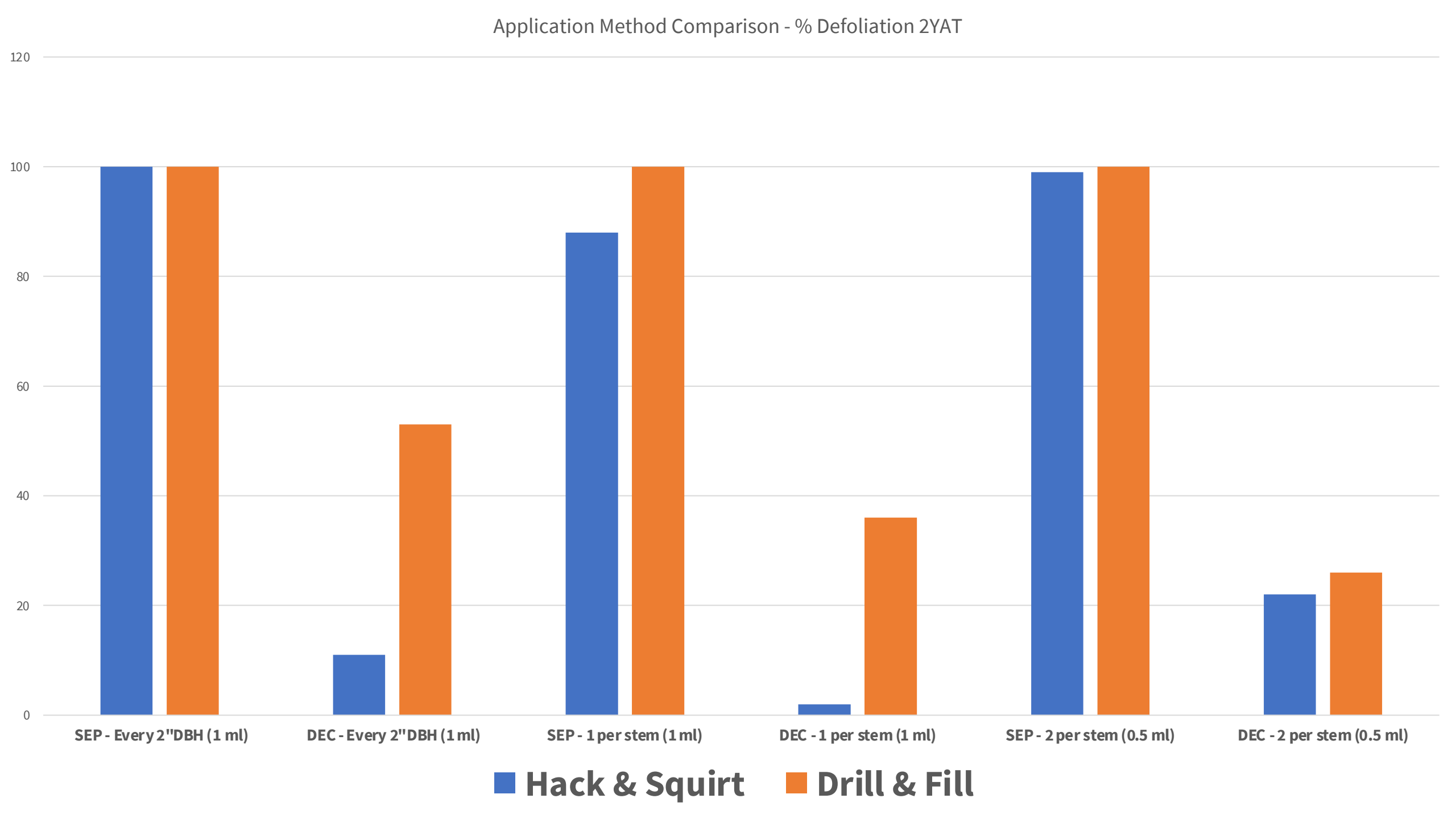

Defoliation 1- and 2- YAT September Treatment
ACPC H&S 2 per stem (0.5 ml)
ACPC D&F 2 per stem (0.5 ml)
ACPC H&S 1 per stem (1 ml)
ACPC D&F 1 per stem (1 ml)
ACPC H&S every 2"DBH (1 ml)
ACPC D&F every 2"DBH (1 ml)
Glyphosate H&S (1 ml)
Triclopr H&S (1 ml)
Untreated
0
20
40
60
80
100
120
% Defoliation
1YAT
2YAT

Mortality at 2-YAT for December ‘19 and September ‘20 Treatments



Timing Comparison

- % Defoliation and mortality was lower for every herbicide treatment except triclopyr H&S
- % Defoliation after 2 years across all herbicide treatments
  - 28% for December
  - 88% for September
- Mortality across all herbicide treatments
  - 18% for December
  - 83% for September.
- Mortality for all METHOD treatments
  - 15% for December
  - 95% for September


Application Method Comparison - % Defoliation 2YAT
120
100
80
60
40
20
0
SEP - Every 2"DBH (1 ml)
DEC - Every 2"DBH (1 ml)
SEP - 1 per stem (1 ml)
DEC - 1 per stem (1 ml)
SEP - 2 per stem (0.5 ml)
DEC - 2 per stem (0.5 ml)
Hack & Squirt
Drill & Fill

Take home message on stem injections

- Timing really matters for some species
  - Sap bleeders
- Drill & Fill equaled or exceeded Hack & Squirt for every treatment tested in both timings
  - Suitable (and potentially safer) application technique
- Method 240SL (Aminocyclopyrachlor) is very effective controlling maple via stem injections when the timing is right
  - Did see some level of non-target impacts to adjacent vegetation but it was minimal
    - Leaf curling, slight canopy dieback

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