Establishing Wildflower-enhanced Pastures through Herbicide Application

Summary: Adding native wildflowers to tall fescue pastures may help reverse declines in pollinator populations. Successful wildflower establishment into pastures can be hampered by weeds that emerge from the soil seed bank, however. Controlling weed competition using herbicides is a critical strategy to aid in the establishment of wildflower stands. We conducted field experiments in two Virginia locations and evaluated weed suppression and wildflower establishment in response to six herbicide treatments and tillage. Results from the experiment showed that intensive site preparation to control weeds was essential for good establishment of wildflowers. We found that Roundup/glyphosate herbicide or tillage can effectively suppress weeds and lead to better establishment success of native wildflowers. Another weed control option to consider is use of Plateau herbicide (Imazapic). Some wildflower species are resistant to Plateau, so it can be used to suppress weeds without harming wildflowers. Research from University of Tennessee found that low to moderate rates of Plateau (4oz/acre) can aid in the establishment of some wildflower species and we provide a recommended species list in this factsheet. It should be noted that Plateau applications should be used with caution, as native wildflowers have considerable genetic variation, and some individuals may be susceptible to herbicide injury.

Project Objectives:

- Evaluate how vegetation suppression using herbicides or tillage would influence wildflower establishment in Virginia, USA.
- Evaluate whether planting wildflowers in either fall or spring might influence the success of establishment under different herbicide and tillage treatments.
- Complementary work was also conducted at the University of Tennessee to test the effectiveness of Plateau herbicide (imazapic) on wildflower establishment.

Farmer Takeaways:

- We tested various herbicide options to increase the success of wildflower establishment and found that a full rate Roundup/glyphosate was most effective at suppressing vegetation for good wildflower stands.
- For farmers looking for non-chemical methods, we also found that tillage could be nearly as effective as Roundup especially for fall-planted wildflowers.
- Some wildflower species have shown resistance to Plateau/Imazapic herbicide, and low rates (4oz/acre) can be effective at helping to establish certain wildflower species.

Methods:

- We evaluated how a suite of seven site preparation treatments would affect wildflower establishment at two planting times (summer, fall). Two experiments were established at different locations in Virginia, representing either summer (June) or fall (November) planting times.
- Site preparation treatments included a control, tillage with no herbicide, and six herbicide treatments that included Pastora (Nicosulfuron + metsulfuron), Roundup (Glyphosate at low and full rates) Cimarron (Metsulfuron + chlorsulfuron), Select Plus (Clethodim), and Plateau (Imazapic).
- Several research projects conducted at the University of Tennessee also explored how native forbs and legumes can be integrated into forage management systems. Ten native wildflowers and nine legumes were selected for inclusion in these studies. Wildflower tolerance to Plateau herbicide (Imazapic) was measured in these trials.

VIRGINIA TECH

THE UNIVERSITY OF TENNESSEE KNOXVILLE

VIRGINIA WORKING LANDSCAPES

Smithsonian National Zoological Park Conservation Biology Institute

Results: Technical Findings

- For wildflowers that were planted in summer, plant density was almost 5x higher in the Roundup treated plots compared with the other treatments.
- For fall-planted wildflowers, tillage was more effective at helping establish stands compared to Roundup.
- For both planting times, the Roundup treatment was most effective at suppressing vegetation compared with other treatments (Figure 1).

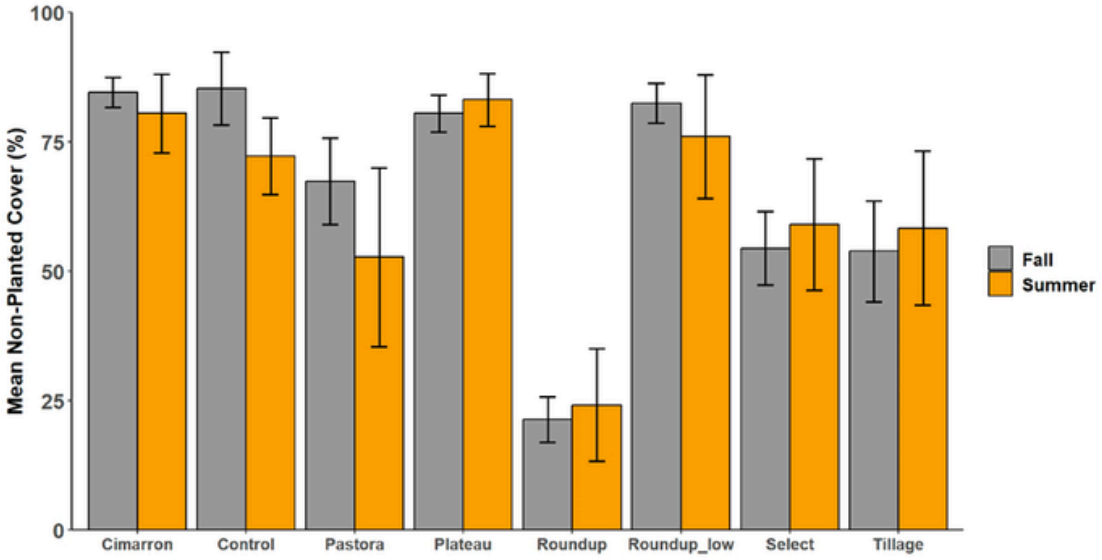

Figure 1. Overall vegetation suppression by the various treatments in our field experiments. Bars represent the average ground cover of non-wildflower vegetation at the different planting dates (fall or summer). Figure modified from Bellangue et al. 2024.

Table 1. A recommended wildflower mix, seeding rates and plateau herbicide application rates derived from work conducted at the University of Tennessee during this project.

Common Name	Latin Name	Seeding rate (lb/ac)	Plateau (per label) seedling	established
Black-eyed Susan	*Rudbeckia hirta*	0.25	4 oz	8 oz
Lanceleaf coreopsis	*Coreopsis lanceolata*	0.50	4 oz	
Ticktrefoil	*Desmodium* spp.	1.00	4 oz POST	
Purple coneflower	*Echinacea purpurea*	0.70	4 oz	8 oz
Oxeye sunflower	*Heliopsis helianthoides*	0.50	*none*[1]	
Upright prairie coneflower	*Ratibida columnifera*	0.50	4 oz	6 oz
Partridge pea	*Chamaecrista fasciculata*	1.00	4 oz	12 oz
Maximilian sunflower*	*Helianthus maximiliani*	0.25	*none*	
Cup plant*	*Silphium perfoliatum*	0.25	*none*	
Wild bergamot	*Monarda fistulosa*	0.25	4 oz POST	
Mountain mint	*Pycnanthemum tenuifolium*	0.25	none[2]	

[1] per guidance from commercial growers; also, not mentioned on label
[2] not mentioned on label
* These species can become quite large in pastures, and may be of concern to producers

- Some wildflower species are resistant to Plateau herbicide, and application can aid wildflower establishment by suppressing weeds. Several field experiments conducted through the University of Tennessee resulted in a wildflower mix that could be used with Plateau herbicide (Table 1). Recommended application rates for Plateau are listed on the table (modified from Keyser 2023).

References & More Information:

- Bellangue, D., J. Barney, M. Flessner, J. Kubesch, M. O'Rourke, B. Tracy and J.L. Reid. "Site preparation and planting strategies to improve native forb establishment in pasturelands." *Agronomy*, vol. 14, 2024, p. 2676. https://doi.org/10.3390/agronomy14112676
- Keyser, P. "Native grass forages for the Eastern U.S." *University of Tennessee Institute of Agriculture*, 2023.

Illustrations by Nick Garnhart / Smithsonian

Authors:
Dr. Benjamin Tracy, Virginia Tech
David Bellangue, M.S., Virginia Tech
Dr. Patrick Keyser, University of Tennessee

Lead Author Contact:
Benjamin Tracy, PhD | Professor
School of Plant and Environmental Sciences - Virginia Tech
bftracy@vt.edu