

2013

# Adding a Second Native Prairie Seed Addition to Improve Established Restorations

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## Recommended Citation

Martin, Leanne M. and Wilsey, Brian J., "Adding a Second Native Prairie Seed Addition to Improve Established Restorations" (2013). *Iowa State Research Farm Progress Reports*. 1991.

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# Adding a Second Native Prairie Seed Addition to Improve Established Restorations

## **Abstract**

Deciding when and how to plant prairie to simultaneously establish native prairie seedlings and prevent weed (non-prairie species) invasion can be challenging. Planting cover crops is an increasingly common management practice for prairie plantings. The idea is based on the assumption that the cover plant will act as a nurse plant to prairie seedlings and will have a positive effect on seedling recruitment by increasing weed suppression. This is predicted to lead to reduced weed biomass and increased prairie establishment in restoration plantings.

## **Keywords**

Ecology Evolution and Organismal Biology

## **Disciplines**

Agricultural Science | Agriculture | Ecology and Evolutionary Biology

# Adding a Second Native Prairie Seed Addition to Improve Established Restorations

## RFR-A1271

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Organismal Biology

### Introduction

Deciding when and how to plant prairie to simultaneously establish native prairie seedlings and prevent weed (non-prairie species) invasion can be challenging. Planting cover crops is an increasingly common management practice for prairie plantings. The idea is based on the assumption that the cover plant will act as a nurse plant to prairie seedlings and will have a positive effect on seedling recruitment by increasing weed suppression. This is predicted to lead to reduced weed biomass and increased prairie establishment in restoration plantings.

Planting native prairie at different times during the growing season may also affect how well it establishes or how weedy it becomes in the long term. Clearly, further scientific evidence is needed on the efficacy of cover plants, and what seeding times are best to establish prairie. As part of an ongoing project, we varied cover crop identity and timing of seeding to determine whether prairie establishment will be affected by treatments. We then added a second seed addition of prairie species to ash after a spring fire seven years after the initial seeding to determine if recruitment of native plants could be improved in established restorations.

### Materials and Methods

During the 2005 growing season, we established a restoration experiment at two separate sites (Horticulture Station and

Western Research Farm) that varied the timing of seeding and species arrival order. Here, we report on long-term results from these plots and results two years after a second seed addition was added in 2011.

Experimental plots were set up in a split-plot design. Seed mixes containing 30 prairie species were added to main plots that contain one of six cover crop treatments. Cover crop treatments include:

1. Canada wildrye (*Elymus canadensis*)
2. Partridge pea (*Chamaecrista fasciculata*)
3. Black-eyed susan (*Rudbeckia hirta*)
4. Side-oats grama (*Bouteloua curtipendula*)
5. No cover crop (control)
6. All four cover crop species combined

These species are all early emerging species that have the potential to reduce weed establishment and facilitate establishment of later emerging prairie species. Five replicate 5 × 5 m main plots were established for each treatment at each of the two sites, the Horticulture Station and the Western Research Farm. Plots were established on tilled areas that were formerly dominated by brome. Within each main plot, four sub-plots (2 × 2 m) received one of four seed timing treatments: 1) spring-seeded with prairie mix added at the same time that cover crops were established, 2) spring-seeded with prairie mix added the spring after cover crops were seeded, 3) summer-seeded with prairie mix added at the same time that cover crops were established, or 4) summer-seeded with prairie mix added the following spring.

After six years, plots seeded in the spring with the cover crop had the highest recruitment from the mix and lowest proportion of weeds. Here, we asked whether we could increase

establishment of prairie species with a second seed addition. To do this, we burned all plots at the Western Research Farm in spring 2011, the seventh year of establishment, and added the same 30-species prairie mix again to half of the plots. Biomass of prairie and weed species was estimated with point intercept sampling in July 2012, which involved counting plant contacts with metal pins dropped through the canopy in the middle of each plot. Biomass in subplots in 2012, a drought year, was 79 percent of biomass of the previous two years.

### Results and Discussion

After eight years of establishment, cover crops did not improve establishment of native prairie species or reduce weedy species invasion (both  $P > 0.20$ ), which suggests planting cover crops may not be as beneficial as predicted.

In the original treatments, prairie grass and forbs had much better establishment, and proportion of weeds was much lower when plots were seeded in spring with the cover crop than when they were seeded in the fall, or when they were seeded after a cover crop established (Figure 1, both  $P < 0.01$ ).

Adding the 30-species native prairie mixture a second time to established plots in 2011 did not change the abundance of prairie species after two years (Figure 1,  $P = 0.54$ ), nor did it change the proportion of exotic weeds (Figure 1,  $P = 0.87$ ).

In conclusion, we found that the most important factor for establishing native prairie species and reducing weeds is adding prairie seed as early in the process as possible. Our results suggest that it may be difficult to substantially improve established prairie restorations by adding a second seed addition. Focusing further efforts on establishing native species before weeds in the initial phases of

restoration will be crucial to restoration success in Western Iowa. More intensive management methods, such as soil disturbance or mowing, may need to be combined with seed additions to improve established restorations.

### Acknowledgements

Thanks to Wayne Roush and staff and Living Roadway Trust Fund for funding.

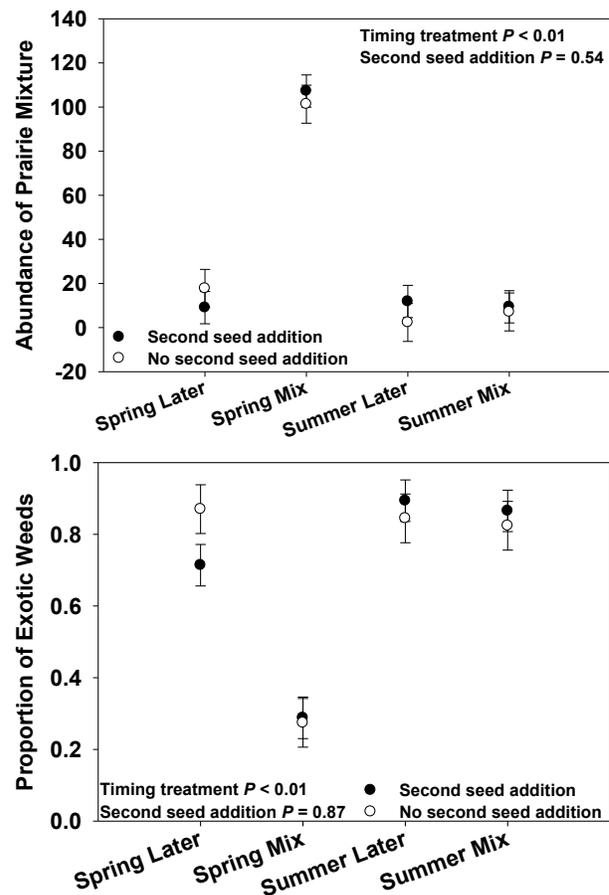


Figure 1. Changes in abundance of prairie species (top) and proportion of weeds (bottom) when timing of seed addition was altered, and comparisons between plots with a second seed addition (black circles) to no second seed addition (open circles) at Western Research Farm.