Enhancing CRP for Monarchs Using Mid-Contract Management

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Iowa's Monarch Recovery Plan relies heavily on increasing monarch habitat (milkweed stems and nectar plants) from Conservation Reserve Program (CRP) lands. However, there is a general tendency for many CRP plantings to become grass dominated and lose forb abundance over time, especially when seed mixes include high rates of large warm-season grasses. There is potential for mid-contract management to prevent or delay the process of warm-season grass dominance while improving monarch nectar and host plant abundance. The objective of this project was to evaluate the effectiveness of a mid-contract management option (grass-selective herbicide application) to increase monarch habitat quality in a variety of different types of CRP practices.

Materials and Methods

The experiment was applied to existing prairie research plots (established 2015) with varying seed mixes based on CRP program specifications. The original experiment consisted of 36 research plots using a split-plot design with two spatial blocks. Eighteen plots (20 × 28 ft. each) were established in each block. Within each block, the team randomly established three replicate plots of seed mixes in 40 × 28 ft. strips and a mowing treatment was applied to one randomly selected half of each strip. Seed mix treatments in the experiment varied in grass-to-forb ratio, and mimic NRCS-approved CRP mixes commonly planted in Iowa. Three seed mixes were established in 2015: the economy mix modeled the CP-25 Rare and Declining Habitat Practice (3:1 grass/forb by seeding density); the diversity mix modeled the CP-43 Prairie Strips Practice (1:1); and the pollinator mix modeled the CP-42 Pollinator Habitat Practice (1:3).

One herbicide treatment was applied to half of the experimental plots this year. Researchers used Clethodim, a grass selective herbicide commonly used to treat perennial grasses. Subplots were selected randomly to receive herbicides using a restricted randomization procedure that ensured herbicide was not applied to more of the mowed vs. unmowed plots. Three weeks prior to herbicide treatment, treatment plots were mowed at 5-in. height to create a uniform, actively growing stand of vegetation. The farm superintendent applied clethodim (Clethodim 2E) at 0.5 lb./acre along with adjuvant on August 30. The untreated plots served as a control group. Baseline monarch habitat measures (milkweed density, forb density, inflorescence density, and grass density) were collected before (July 2021) and after (July 2022) herbicide treatment. Change in each measure (post-treatment-pre-treatment) was calculated and ANOVA used to analyze change in habitat measures among herbicide and seed mix treatments.

Results and discussion

Forb and flower abundance generally increased in all plots from 2021 to 2022, but compared with controls, grass specific herbicide (Clethodim) application increased flower and forb abundance the year following treatment. Overall inflorescence density increased by 6.8 ± 1.6 SE inflorescences/ $ft.^2$ in herbicide treated plots compared with 1.3 ± 1.5 SE inflorescences/ $ft.^2$ in controls ($F = 6.57$, $df = 1,15$, $p < 0.05$). Herbicide effect on flower density appeared more prominent in the economy (CP-25) and diversity mixes (CP-43) (Figure 1), but post-hoc testing showed differences in seed mixes were not statistically significant. Forb density overall increased by 4.6 ± 1.3 SE stems/ $ft.^2$ in herbicide treated plots compared with 1.3 ± 0.6 SE stems/ ft2 in controls ($F = 6.15$, $df = 1,15$, $p < 0.05$). Similar to flower density, forb density in herbicide plots had the greatest increases in the economy (CP-25) and diversity mixes (CP-43) (Figure 2), but differences in seed mixes were not statistically significant. No impact of herbicide to grass or milkweed abundance was found. Seed mix generally did not affect changes in habitat measures, nor did it interact with herbicide treatment.

Using grass selective herbicide as a mid-contract management option resulted in modest improvements to monarch habitat. Only nectar plant density and flower density increased, while milkweed stem density remained unaffected. Forbs likely benefited during the window in which grasses were stunted (late summer-spring). It is unclear whether the effects observed will be temporary. Since grass composition had already rebounded to pre-treatment levels after one year, it is expected effects will become less prominent over time.

Acknowledgements

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Figure 1. Change in floral resource abundance one year after grass-selective herbicide application.

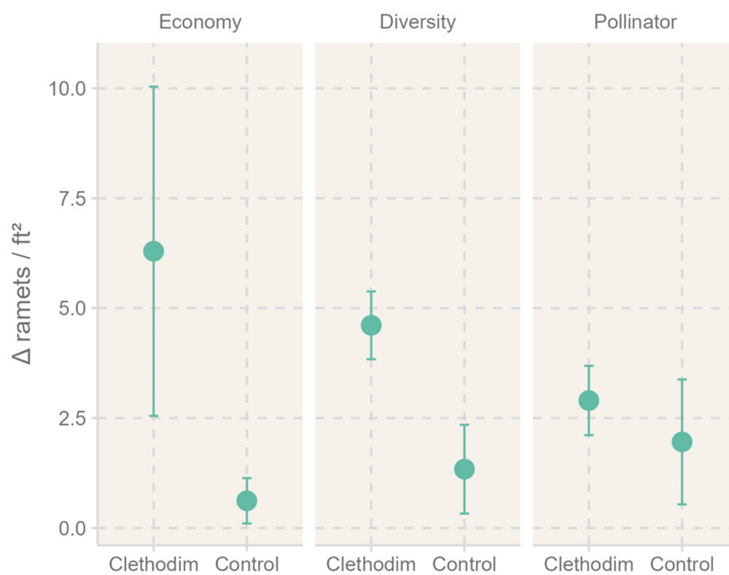

Figure 2. Change in forb abundance one year after grass-selective herbicide application.