Floral resource dynamics for pollinators in a central Iowa tallgrass prairie restoration

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Background

Recently, native and managed colonies of pollinators, including bees, butterflies, and other insects, have experienced large-scale declines. In an effort to restore habitat for pollinators, the United States Department of Agriculture’s Farm Service Agency (FSA) created the CP-42 Pollinator Habitat conservation project under the Conservation Reserve Program. This program pays private landowners to restore habitat for pollinator species with ecological and economic importance. To qualify for the program, CP-42 seed mixes must include:

- A minimum of 9 pollinator-friendly flowering plants.
- A minimum of three species in bloom during each of three seasonal periods (April-June 15, June 15-July, August-October), and
- no more than 25% native, non-sod forming grasses.

Since 2014, more than 200,000 acres have been enrolled in the CP-42 program in Iowa with virtually no post-planting monitoring or evaluation. To determine whether CP-42 sites are likely to meet the program’s floral resource targets, we analyzed a 5-year data set on flower phenology from an existing prairie restoration established with a similar seed mix.

Methods

- Data come from a long-term field experiment in prairie restoration at the Cedar River Ecological Research Site in Black Hawk County, Iowa. See Myers et al. (2016) for details on site establishment and management.
- We analyzed 5 years of flower phenology data from 22 species seed mix (P32) that included 20 forb and 12 graminoid species.
- The P32 forb seeding rate (26 pure live seeds/sq ft) was comparable to a typical CP-42 seed mix (~30 forb seeds/sq ft); however, the graminoid component greatly exceeded (55 pls/sq ft) CP-42 guidelines (~10 grass seeds/sq ft). Other studies have illustrated that diverse mixes with higher grass to forb seeding ratios perform as well or better than forb-heavy pollinator mixes in producing nectar plants (Meissen et al., 2017).

Research Questions

- Are there three P32 species in bloom during each of the CP-42 periods? Which species are most abundant?
- Does P32 habitat quality remain suitably high over 5 years? Is there an increase or decrease in flower abundance over time?

Table 1. Total # of species in bloom during CP-42 periods at various bloom abundance thresholds

<table>
<thead>
<tr>
<th>Year</th>
<th>Total # of species in bloom</th>
<th>Sown &gt; 1 flower per 10 m²</th>
<th>Sown &gt;1 flower per m²</th>
<th>Weeds (&gt;1 flower per m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>6</td>
<td>4</td>
<td>2 (hehe, phpi)</td>
<td>13 7 1 (deca)</td>
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<tr>
<td>2011</td>
<td>6</td>
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<td>2012</td>
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<td>2013</td>
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<td>4</td>
<td>2 (hehe)</td>
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</tr>
<tr>
<td>2014</td>
<td>6</td>
<td>4</td>
<td>2 (hehe)</td>
<td>*</td>
</tr>
</tbody>
</table>

Figure 1. Total mean abundance of sown flowers, weeds, and all flowers in P32 plots during 5 seasonal periods (1 = June 1 to June 20; 2 = June 21 to July 10; 3 = July 11 to July 31; 4 = August 1 to 31; 5 = Sept 1 to Sept 31) in a) 2010, b) 2011, c) 2012, d) 2013, and e) 2014.

Figure 2. P32 survey sessions 1-5 re-formatted to fit CP-42 bloom periods for: a) sown species, b) weeds, and c) total flowers. Dashed red line indicates a bloom threshold of 2 flowers per m².

Conclusions

- Floral resources were dominated by sown species, and flower abundance declined greatly after Year 2.
- Total and sown flower abundance was < 2 flowers per m² during Period 1 in 2012 and 2013 and during Period 2 in 2013 and 2014.
- The most abundant sown species were Phlox ptila, Zizia aurea, and Tradescantia bracteata in Period 1, Heliposis helenium in Period 2, and Heliposis helenium and Desmodium canadense in Period 3.
- After Year 1, weeds contributed only a minor portion of total flower abundance. Early season sweet clovers and late season frost aster and goldenrods were the most common weeds.
- With no density threshold, the P32 seed mix met the requirement of 3 species in bloom during each CP-42 seasonal period.
- With a bloom threshold of 1 flower per 10 m², the site did not meet the requirement of 3 species in bloom during Period 1 in 2012, 2013, or 2014.
- With a bloom threshold of 1 flower per m², the site did not meet the requirement of 3 species in bloom during any seasonal period in any year.
- While the P32 seed mix met the general requirements of the CP-42 program, the abundance and diversity of floral resources declined over time, particularly in the first seasonal period (April-June 15).

Acknowledgements

I would like to thank the Tallgrass Prairie Center for allowing me to contribute to this research project, Mark Myers for all of his time and support, and the Carver Foundation for the funding that made this poster possible.

References


Meyers, Justin; Williams, Dave; and Jackson, Laura. 2017. Cost-Effective Native Seed Mix Design and Fall Year Management. Farm Progress Reports 2016(3), Article 62. AVAILABLE ONLINE: http://www.farm-progress.com/2016/3/62
