

A DIFFERENT TYPE OF PRAIRIE WINGS:

Protecting Insect Pollinators in Tallgrass Prairies and Beyond

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If you are a baseball fan, I'm guessing that one of the highlights of your summer was Major League Baseball's "Field of Dreams" game, played on a baseball diamond surrounded by cornfields in tiny Dyersville, IA, just steps from where the iconic movie was filmed. For the uninitiated, the famous 1989 movie follows a farmer, played by Kevin Costner, who hears a mysterious voice whisper, "If you build it, they will come" while walking through his cornfield. Trusting the voice and his intuition, he plows the field and builds a baseball diamond—and lo and behold, Shoeless Joe Jackson and the infamous 1919 Chicago Black Sox emerge from the surrounding corn to play ball. I don't know how many conservation practitioners and enthusiasts are baseball fans, but I'm guessing this story resonates with many of us. As a graduate student studying the effects of prairie restoration on pollinators, I had many such "Field of Dreams" moments—standing in the middle of former crop fields in eastern Kansas that were now beautifully reconstructed prairies, wondering, "if we build it (and seed it and hay it and burn it and spot-spray the *Sericea!*), will the pollinators come?". And more broadly, what are our massive alterations to natural ecosystems doing to pollinators, and what can we do to help them?

Questions regarding the status, conservation and restoration of pollinators are not merely academic. Pollinators, most of which are insects, are critical to the functioning of Earth's ecosystems. About 90% of flowering plant species are animal pollinated, meaning that the biodiversity of plants and all other organisms that rely on plants depends on pollinators. Pollinators are integral to global food security because of the pollination services they provide to key food crops. In fact, a high-profile scholarly article published by ecologist David Kleijn and colleagues demonstrated that about 35% of global crop production, by volume, depends on animal pollination. We have pollinators to thank for some of our most delicious and nutrient-rich foods, including tomatoes, strawberries, peaches, blueberries and almonds.

So who are these insect pollinators? When I give outreach presentations about the importance of pollinators, I often ask the audience to close their eyes, think about the word "pollinator" and tell me the first thing that comes to mind. About 90% of the time, the first response I hear is "honeybees," which is not surprising at all. Honeybees are incredibly important to our industrialized agricultural systems, and commercial honeybee pollination services are a huge business (if you're interested in learning more about it, NPR's *Planet Money* has an excellent podcast episode called "The Bees Go to California"). Despite their current importance to American agriculture, honeybees (scientific name *Apis mellifera*)

are actually relative newcomers to North America, having been introduced to the US by European settlers. Most people are surprised to learn that there are at least 20,000 species of bees worldwide, including about 4000 species in the United States and perhaps 400 species in Kansas alone.

Compared to other flower visiting vertebrates and invertebrates, bees are widely considered to be the most important pollinator group.

Bees are highly efficient foragers, collecting pollen and nectar to provision their nests and unintentionally effecting pollination as they move from flower to flower across a landscape. Bees' bodies are very well-adapted for this task. If you ever get a chance to see a bee under a magnifying glass or stereomicroscope, you will notice that certain areas of their bodies are covered with thick, branched hairs, which are perfect for picking up and transporting pollen.

Aside from bees, many other insect groups perform the important work of pollination. Flies, especially hoverflies (Family Syrphidae) are important pollinators across many ecosystems and for many crops. Insects including beetles, ants, moths and butterflies, as well as vertebrates such as bats and birds, can also be important pollinators in a number of natural and agricultural contexts, and many non-bee pollinators are particularly important in tropical ecosystems. Indeed, a recent study by Australian ecologist Romina Rader and colleagues suggests that what these non-bee insect pollinators lack in individual efficiency of pollen transfer, they often make up for in sheer number of flower visits.

Despite their ecological and economic importance, pollinators worldwide are at serious risk of population decline and extinction. The threats to pollinators are largely human-induced, and include climate change, widespread pesticide use and the introduction of non-native diseases. By far, however, the greatest threats to pollinators are habitat degradation and destruction. The tallgrass prairie ecosystem, where I conducted my pollinator research, has been largely decimated by agricultural conversion, with some states retaining < 1% of the original, pre-EuroAmerican settlement tallgrass prairie. Today, the remaining tallgrass prairie largely exists as relatively small islands, isolated from one another by large expanses of monoculture crop fields which are largely unsuitable for pollinator foraging and nesting.



Syrphid fly hovering near yarrow (*Achillea millefolium*) in a remnant prairie near Lawrence, KS. Photo by Kathy R. Denning

The goal of my research was to investigate whether “reconstructing” tallgrass prairie on former croplands could reinstate diverse communities of native pollinators. To do this, I surveyed flowering plant (forb) and insect pollinator species at reconstructed tallgrass prairies in northeastern Kansas and compared those communities to communities of remnant, never plowed prairies in the same region. Over three summers, I recorded about 6700 individual insects as they were visiting flowers of 127 different forb species. About one-third of these flower-visiting insects were bees and another third were beetles. Most of the remainder were butterflies and flies. Not surprisingly, I found that forb communities greatly differed between remnant prairies and prairies reconstructed on former crop fields; anyone who has been involved in prairie restoration knows how difficult it is to reinstate the diversity of native forb species found on intact, never plowed prairies. I anticipated that the pollinator communities would mirror these differences, but surprisingly, my predictions were wrong.

I ended up finding quite a bit of site-to-site variability in the pollinator communities on these remnant and reconstructed prairies. In a follow-up study, I ultimately found that these communities of insect pollinators were likely being more strongly affected by what was going on in the landscapes surrounding these relatively small prairie “islands”. For example, the diversity of bee and hoverfly communities was higher on prairies that were surrounded by a greater extent of grasslands, regardless of whether the focal prairie itself was remnant or reconstructed. This highlights the need for scientists and practitioners to focus not just on focal remnant or restoration sites, but to consider the structure of the landscape more broadly when planning and implementing conservation and restoration projects targeted towards highly mobile species like insect pollinators.

Studies like mine are certainly important for protecting and restoring pollinator communities, but effective pollinator conservation will ultimately depend on the efforts of governmental bodies, non-governmental conservation organizations, corporations,

and private citizens. Although not explicitly centered on insect pollinator conservation, AOK’s commitment to establishing and maintaining wildlife sanctuaries will provide critical foraging resources and nesting habitats for insect pollinators. In addition, AOK’s multifaceted advocacy work in Kansas undoubtedly has helped insect pollinators survive in our highly human-modified landscapes. There are many things that individuals can do as well to promote pollinator health and conservation. Pollinator-friendly gardens, which are pesticide-free and are composed of native plant species, can function like mini oases in urban and suburban settings. My own small pollinator garden in suburban Lenexa has attracted a surprisingly large number of pollinator species, and it has also served as a great conversation starter for friends and neighbors.

Advocating and voting for pollinator-friendly laws in local and state elections is absolutely critical for the long-term protection of insect pollinators. For anyone who is interested in learning more about how they can help protect pollinators, I highly recommend checking out the website of The Xerces Society for Invertebrate Conservation (www.xerces.org). The Xerces Society has a wide range of resources centered on promoting pollinator conservation, education and advocacy. Ultimately, as human activities continue to place pressure on Earth’s ecosystems, the need to both understand and protect pollinator communities will become ever more important.