

Introduction to the Special Issue on Pollinators of the Great Plains

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*To make a prairie it takes a clover and one bee,
One clover, and a bee.
And revery.
The revery alone will do,
If bees are few.*
– Emily Dickinson

I can appreciate the sentiment of Ms. Dickinson, but the ecologist in me hopes we never need to rely on revery alone to make our prairies whole. Some 160 years after Emily Dickinson wrote “To Make a Prairie” we still know surprisingly little about the natural history, population trends, and habitat requirements of the 4,000 native bee and 750 butterfly species that live in the US. This lack of knowledge is striking considering the importance of insect pollinators in supporting ecosystem function and our own human well-being. Over 85% of flowering plants require, or directly benefit from insect pollinators (Ollerton et al. 2011). Plants and insect pollinators serve as the foundation of terrestrial food webs and animal-mediated pollination services have an estimated market value of \$235 billion to \$577 billion globally through pollination of agricultural crops (IPBES 2016). Although we are beginning to understand the considerable intrinsic and economic value of insect pollinators, much natural history research has yet to be done to determine what resources these valuable creatures need to support their lifecycles. This is troubling given the growing reports of native bee declines in the US and globally (Goulson et al. 2015). Although the scientific community does not have a firm grasp on population trends of most native pollinator species, there are well-documented declines of multiple bumble bee (*Bombus* spp.) species and iconic insects such as *Danaus plexippus* Linnaeus (Monarch Butterflies) in the US (Cameron et al. 2011, Thogmartin et al. 2017). Habitat loss and lack of floral resources are two of the primary threats to pollinators (Goulson et al. 2015).

There is much work to do in preventing pollinator declines and further loss of bee habitat. The Great Plains region of the US provides a textbook example of problems facing insect pollinators. Temperate grasslands are one of the most imperiled biomes on Earth, and in the US <30% of grasslands remain (Hoekstra et al. 2005, Samson et al. 2004). For example, less than <5% of the tall grass prairie ecosystem remains, the rest having been largely converted to cropland (Samson et al. 2004). Grasslands are important for native pollinators, not only for provisioning nutritional resources of pollen and nectar from flowering plants but also providing nesting habitat in soil, detritus, and hollow stems. However, we have little scientific information on how grassland conversion affects pollinator populations and possess only a cursory understanding of habitat needs of most grassland pollinator species.

Because of the close ties between pollinators and human health, there has been significant societal concern over declining insects. A US Presidential Memorandum, the first ever focused on insects, was released by President Obama in 2015 to address declining

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pollinators (Pollinator Health Task Force 2015). It established three national goals and a national research plan for promoting pollinator health and safeguarding their habitats. Furthermore, the American public recognizes their own role in creating habitat for bees in urban and rural areas alike. Landowners and agricultural producers are voluntarily enrolling marginally productive cropland into pollinator-specific conservation practices and initiatives that are administered through the US Department of Agriculture, and numerous non-governmental organizations have developed cost-share programs creating habitat on private land. In US cities, urban bee lawns are being created in place of turf grass monocultures (Burr et al. 2018, Ramer et al. 2019). Crop producers, homeowners and gardeners are beginning to recognize the harmful effects of pesticides on pollinators (Durant and Otto 2019), and people want to do their part to “save the bees”.

While saving the bees is a worthy cause, conservation efforts require a sound understanding of how bees interact with their local environment and the resources they use. This pollinator special issue was developed in response to growing societal concern over declining pollinators and the need to understand insect natural histories in the Great Plains region. The seven studies herein focus exclusively on grassland ecosystems, ranging from the tall-grass prairies in Minnesota to the short grass prairies in western North Dakota. Pollinators represent a taxonomically and functionally diverse group of organisms, and this special issue reflects this diversity. It includes large-scale surveys of native bee diversity (Evans et al. 2022, Pei et al. 2022), nesting ecology of leaf-cutter bees (Simanonok et al. 2022), and native bee surveys on restored prairie in Minnesota (Portman et al. 2022) and Nebraska (Lamke et al. 2022). Furthermore, this special issue includes investigations into pollinator habitat, including quantification of milkweed (Manzanares et al. 2022), the essential host plant of Monarch Butterflies, and flower visitations by bumble bees (Pei et al. 2022). The special issue opens with a study of the behavior and pollination ecology of insects visiting *Pulsatilla patens* (L.) Mill. (Pasqueflower) (Campbell et al. 2022), our indicator that spring has arrived on the prairie, so the cycle of one bee and a flower can begin anew.

I hope this special issue provides our readers with a better understanding of the hidden workforce that supports our prairie ecosystems and encourages others to conduct pollinator research in their region. I also hope natural resource managers will find the research we present valuable for creating better pollinator habitat on our managed grasslands. I thank Jane Austin, Editor in Chief of the Prairie Naturalist, for conceiving the idea of a pollinator special issue and Ian Pearse and John Mola from the US Geological Survey for serving as Guest Editors. Many thanks also to the reviewers for improving the manuscripts.

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