# THE ROLE OF RESOURCE AVAILABILITY AND HABITAT QUALITY IN STRUCTURING PRAIRIE BEE COMMUNITIES

by

Bethany S. Teeters

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# THE ROLE OF RESOURCE AVAILABILITY AND HABITAT QUALITY IN STRUCTURING PRAIRIE BEE COMMUNITIES

Bethany S. Teeters, Ph.D.

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Advisors: Craig R. Allen

Wild bees are a rich natural resource. They help maintain ecological structure and function through pollination services, which promote gene flow among plant communities. As prairie landscapes are converted to cropland, the distribution of forage and the nesting resources that sustain viable bee populations changes. Furthermore, resource availability differs by species' natural history traits, and few studies examine bees' trait-based responses to changes in resource distribution across landscapes. In this dissertation, I examine how prairie bee assemblages, and their functional composition, are structured by floral resource availability, habitat quality, connectivity, and landscape composition. Results suggest that well-connected grasslands may currently serve as reservoirs of diverse suites of wild bees and robust pollination services, but they may be restricted to this landscape. Blooming forb abundance and diversity were the best predictors of bee abundance and diversity, respectively. Woodland cover was a stronger predictor of social species' abundances than solitary, as well as of wood- and cavity-nesting species than ground-nesting species. Habitat connectivity, particularly the betweenness centrality of a foraging site, was an important predictor of solitary bee abundance, whereas flux, the ability to disperse to or from a forage patch, was a better measure for social species. Bee distributions were mapped across the landscape as a proxy of pollination services, and those provided by social species were the most

continuous. However, services decline when landscape composition exceeds 17% crop cover or has less than 37% grassland cover. These are important thresholds for bee conservation strategies. Overall, results indicate that high-quality, well-connected landscapes, in their current condition, may serve as an oasis for wild bees, where pollination still functions at a high level in an otherwise highly fragmented ecosystem.

# DEDICATION

For Grandma

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