The Hidden Benefits of Pollinator Diversity for the Rangelands of the Great Plains: Western Prairie Fringed Orchids as a Case Study

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The richest and most productive plant communities, including the grasslands typical of the Great Plains, are complex associations of different species dependent on the environment (nutrients and water), as well as ecological connections or relationships with other species. In particular, the mutual benefits of plant–pollinator relationships increase plant reproduction and population growth, increase genetic diversity of individual species, and allow more species to coexist in a plant community, all of which makes a prairie a prairie rather than an admixture of weeds. The diversity of plant species in a grassland is of more than passing interest to rangeland managers because there are clear management benefits to diversity, including increased forage production for livestock and wildlife grazing, improved soil structure, and community resilience to environmental disturbances. Yet, it is easy to overlook the complexity and diversity of pollination relationships of native prairie plants when evaluating long-term management options. Here we argue that the diversity of native grasslands depends on a diversity of pollinators. As a case study, we discuss the complex ecological interactions of pollinators, the Western Prairie Fringed Orchid (Platanthera praeclara), and other native prairie species. Our goal is to answer the following questions: How does pollination play a role in the maintenance of rare plant species? How do pollinators other than bees benefit grassland plant communities? And, how do these other pollinators differ from bee pollinators?

How Does Pollination Play a Role in the Maintenance of Rare Plant Species?
The sexual reproduction made possible by pollination increases genetic variation in offspring, with this then allowing for greater evolutionary potential. In plants there are many ways to reproduce. One is “tillering,” or asexual reproduction, which produces another individual that is genetically identical to the parent (e.g., ramets produced from stolons or rhizomes). Another is “selfing,” where pollen and ovules combine and produce a zygote, but both are from the same plant. Both of these mechanisms of producing a new generation of plants have problems associated with them. The biggest is that asexual reproduction and selfing yield little new genetic variation in the next generation of plants. Breeders of crops and livestock long ago revealed that the potential for new beneficial traits in new varieties depended directly on the amount of genetic variation in the population from which they were selecting. In the same way, genetic variation in future generations of native plants is beneficial because it translates into trait diversity, adaptability, and resilience of populations. Populations with these characteristics have an increased chance of surviving in changing environments.1

Outcross pollination is different and has several important benefits. Outcross pollination, where an animal (e.g., insect or bird) or the wind brings pollen from one individual to another, can create brand new combinations of genes in the seeds of the next generation. Pollination can combine genes from different populations adapted to very different local environments and create greater diversity within the gene pools of a species. Another benefit of outcross pollination is the masking or hiding of detrimental traits. Many genetic deficiencies in plants and animals that ultimately can lead to reduced performance or lethality are the product of recessive alleles that cause the most trouble when in the homozygous condition. Selfing and pollination between