**The nutritional ecology structuring bee-flower communities in the sierra and sagebrush and implications for conservation

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 **Abstract:**Understanding the nutritional drivers of bee-flower interactions is crucial to the conservation of native plants and pollinators. Pollen provides the primary source of protein and lipids necessary for bee development and reproduction. Yet, pollen nutrient composition differs widely among plant species, requiring diverse communities to provide a spectrum of nutrient rewards to support the bee community. Our previous research indicated that pollen protein:lipid ratios (P:L) shape bumble bee host-plant choice. Different bee species may have species-specific P:L nutritional needs driving their own foraging patterns. Therefore, pollen nutrition may shape bee-flower interactions and drive community stability. To understand how nutrition structures communities, we assessed pollen nutrient concentrations among co-flowering plant species in Sierra Nevada meadow and Great Basin sagebrush steppe habitats. We systematically sampled pollen-collecting bee species to create bee-flower visitation networks, and collected bees' pollen loads to analyze their nutritional foraging targets. We determined the relationship between plant species' pollen P:L and diversity of their bee visitors, and whether plants that shared bee visitors offered similar or dissimilar/complementary nutrition. Likewise, we asked if bees differ in P:L targets, and if species collecting similar pollen nutrients share host-plants. In the Sierra Nevada meadow (sagebrush steppe analysis in process), co-flowering plant species varied substantially in pollen nutrition, forming a wide spectrum of P:L values. Specialized plants, with the lowest diversity of visitors, offered the highest (and lowest) P:L values; and bee species diversity was highest on host-plants offering mid-range pollen P:L ratios. Correlating visitor and nutritional similarity, we found that plants with similar P:L ratios did not tend to share visitors, yet bees with similar nutritional targets overlapped in pollen host-plants. This offers new insight into how bees may achieve preferred nutrition by combining visits to plants offering complementary P:L ratios. For example, by collecting pollen from different host-plant species, related bee species within the genera Bombus and Calliopsis collect different pollen P:L ratios. This may indicate that bee species reduce competition by having different nutritional targets, collecting from different host-plant species at different frequencies, and emphasizing the need of diversity for sustainable populations. This study presents a novel approach to understanding fundamental nutritional factors that assemble bee-flower communities across varying environments. Our new framework can be used to identify key host-plants to enhance and complete deficient nutritional landscapes, providing quality forage for bee communities and facilitating their population stability.