

## Floral eDNA Rivals Traditional Surveys for Detecting Bumble Bee Species of Concern

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Recent pollinator declines emphasize a need for improved sampling approaches to facilitate efficient monitoring of species of concern. We assessed a new sampling framework consisting of flower collection, qPCR assays to detect environmental DNA (eDNA), and occupancy models suitable for evaluating drivers of species distributions. We tested the performance of this framework for two bumble bee species of conservation concern—*Bombus affinis* (rusty patched bumble bee) and *B. occidentalis* (western bumble bee)—compared to traditional survey methods. Each eDNA sample consisted of approximately 250 mL of flower heads placed in a bag and frozen; multiple eDNA samples were collected from each site. Surveys consisted of repeated 30-minute visual surveys for *B. affinis* and 45-minute netting surveys for *B. occidentalis*. For both species, detection and occupancy probabilities derived from eDNA sampling matched traditional 30–45-minute visual and netting surveys. A single eDNA sample had similar detection probability to a 45-minute netting survey for *B. occidentalis*; for *B. affinis*, detection via a single eDNA sample was only slightly lower. Detection probability via eDNA was more heavily influenced by bee activity during sampling than by weather variables that may degrade eDNA. Sampling flower species with higher eDNA detection rates and under conditions that heighten bee activity—such as warm temperatures and peak colony activity dates—increased eDNA detection probability. Success with these species shows promise for identifying cryptic pollinator species. Floral eDNA sampling can sometimes outperform traditional methods of bumble bee sampling by reducing fieldwork without compromising accuracy.