

Pollinators, Restoration, and Ungulate Research at the USDA Forest Service Starkey Experimental Forest and Range

Synopsis

- Land managers strive to balance multiple ecosystem services, including hunting, timber production, and livestock grazing.
- Recent interest in pollinators adds to the complexity of management decision-making.
- Our research program addresses basic gaps in knowledge about one group of pollinators – wild bees.
- Studies focus on 1) describing wild bee community dynamics in an environment free of pesticides; 2) quantifying the presence and abundance of species of concern, such as the western bumble bee, and 3) investigating how management actions (e.g., restoration, ungulate grazing, invasive plant removal) impact wild bee abundance and diversity.
- Results can be used to inform restoration and land management regionally and nationally in ways that improve pollinator habitat.

universities work together to monitor multiple responses including fish, aquatic habitat, plants, small mammals, and **wild bees**.



The Significance of Wild Bees as Pollinators

Bees pollinate >75% of flowering plant species, including 35% of agricultural crops. Hundreds of species of wild bees contribute significantly to crop production, pollinating over \$3 billion of crops in North America alone.

Goals of the Starkey Pollinator Program

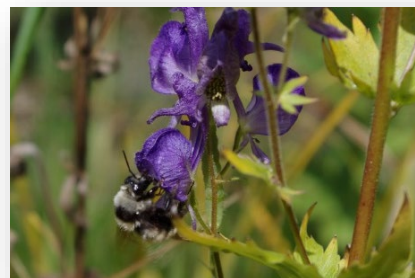
The pollinator program seeks to:

- Increase understanding of riparian bee communities and factors that influence them
- Monitor responses to riparian restoration
- Examine interactions of native ungulates, livestock, and native bees, partitioning out relationships across each



Riparian Restoration Research and Management at the Starkey Experimental Forest and Range

Starkey is the site of a multi-institutional, interdisciplinary research effort to understand the impacts of riparian restoration and ungulate grazing management on Meadow Creek, a significant salmonid-bearing stream in the Blue Mountains of eastern Oregon. A large restoration project involving in-stream improvements and planting >50,000 native trees and shrubs provided an ideal setting for studies of ecological restoration. An innovative grazing enclosure system allows investigators to partition out effects of livestock (cattle) and native ungulate (deer and elk) grazing. Collaborators from various federal and state agencies and several



Benefits

The Meadow Creek pollinator project provides key information on several topics for which information is scarce or lacking, including:

- Abundance and seasonal distribution of the imperiled western bumble bee in riparian systems
- Distribution and abundance of other native *Bombus* species, many of which are little studied

- Baseline data on bee communities in a system with no agricultural pesticides or other contaminants for comparison to altered natural systems
- Native bees and their resources in a riparian ecosystem common throughout the PNW – one that has undergone riparian restoration for the purpose of improving habitat for salmonids



- Flower morphology, rather than color, is key in explaining which species of bees visit particular species of plant ([Roof et al. 2018](#)).
- Some bee species rely heavily on early, mass-blooming shrubs commonly planted in riparian restoration, a win-win result ([Mitchell et al. 2021](#)).
- DNA metabarcoding of pollen revealed that many bee species are less specialized than previously thought ([Arstingstall et al. 2021](#)).

Current Status

- Six years of sampling native bees and flowers were completed, three with deer and elk herbivory and three with cattle, deer, and elk.
- Eight publications have been produced, in tandem with story maps and OSU extension publications. Additional publications are underway.

Key Findings to Date

- Bee communities of Meadow Creek are spatially and temporally dynamic and taxonomically diverse - more than **240 species of native bees** have been identified to date.
- Large shifts in abundance and species composition across seasons indicate that “snapshots” of bee communities at one time point will not adequately represent the full bee community.
- **Western bumble bee**, an imperiled species, was confirmed in each of the six years of sampling, but is rare. Of the 16 bumble bee species identified to date, *B. occidentalis* makes up only 1% of all individuals sampled.
- An extensive literature review indicated that, for flowers found along Meadow Creek, there is high overlap in diets of native bees and domestic and wild ungulates, especially bees and elk ([DeBano et al. 2016](#)).
- Over 90 flowering species of forbs and shrubs were evaluated for their attractiveness to bees. While many plants were not commonly visited by bees, dozens of others were identified as important resources for wild bees ([Roof et al. 2018](#)).



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