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Science You Can Use *(in 5 minutes)*
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# **What Do Bees Need?** Understanding Food and Nesting Sites in an Ecotone

*A digger bee (*Anthophora sp.*) inspecting flowers of Phacelia. Photo by Casey Delphia, Montana State University.*

We know that we need bees to maintain healthy ecosystems. Pollinators help plants reproduce and flourish, and these plants, in turn, maintain soils and provide cover and food for animals. But what do bees need to survive, to thrive?

For one, bees need access to both food and nesting sites. Ecotones, the space where two distinct habitats meet, offer potential sites that can provide these complementary resources. Lead scientist Will Glenny, along with Laura Burkle, both at Montana State University, and Rocky Mountain Research Station entomologist Justin Runyon studied bee habitats in a sagebrush-forest ecotone in the Beaverhead-Deerlodge National Forest in the Big Hole Valley of southwest Montana in hopes of understanding the effects that specific characteristics of this important habitat have on the number of bee species and the variety of their functions.

Climate change, fire exclusion, and intensive grazing are altering these ecotones. A key result of recent habitat changes is the encroachment of conifers, such as lodgepole and Douglas-fir, into the shrubland habitats. Previous studies have shown that trees compete for light and soil resources with the shrub and plant cover, which can result in more intense fires and even endanger sage grouse by providing perches for predators. What is less clear is how these changes affect key pollinators like bees. To understand the complex network of plants and insects in this ecotone better, the researchers examined the number of trees at each site, soil composition (some bees nest below ground), volume of coarse woody debris (CWD) (a favorite nesting site for some bees), bee/flower interactions, the number and variety of bee species, the number and variety of flowers, and the general traits of each kind of bee.

As expected, more flowers attracted more bees. However, if only a few kinds of flowers dominated the bloom, it attracted bees that specialized in that kind of plant and reduced the variety of bees and bee functions. Runyon explains that it is important to attract a wide variety of pollinators, even if the jobs they perform in the ecosystem overlap: “You want flowers visited by more than one species of bee because that provides a sort of buffer. If you lose a bee species, a plant won’t go without a pollinator.”

In sites with more trees, the researchers noted more CWD and more bees (especially in the early season)

and a wider variety of bees with a broader range of functions (especially in the late season). Overall, it seems, CWD might be an important factor in recruiting bees that nest above ground in dead wood.

If CWD is a key but limited nesting resource for bees, some management practices can potentially increase the volume of this resource. Runyon explained that land managers have choices when attempting to treat conifer encroachment, including prescribed burns, chip and burn, and lop and scatter. For Runyon, it is vital to keep the bee communities in mind when making these choices: “Lop and scatter maximizes CWD and nesting sites for bees. If managers chip or burn, they should consider not cutting all of the trees or leave some dead wood for above ground nesting bees.” Additional work is needed to better understand the connection between management practices, especially at the forest edge, and the survival of bees.

## Key Findings

- As land managers plan treatments to reduce conifer encroachment in key sagebrush-forest ecotones, the needs of bee communities, including readily available coarse woody debris for bee nesting, should be considered.
- Higher volumes of coarse woody debris seem to recruit both more bees and bees with a wider variety of functions.
- Maintaining a variety of flowering plants in forest-shrubland ecotones is important in order to maintain bee communities that are both abundant and include a diversity of bee species.

*Ecotone in the Big Hole Valley, Montana. The habitat transitions from forest to shrubland (left to right). USFS photo by Justin Runyon*

*Entrance of a bee nesting in coarse woody debris. USFS photo by Justin Runyon*

## Further Reading


Glenny, Will; Runyon, Justin B.; Burkle, Laura A. 2023. Habitat characteristics structuring bee communities in a forest-shrubland ecotone. Forest Ecology and Management. 534: 120883.

Runyon, Justin; Glenny, Will; Burkle, Laura; Salix, Jessie; DeLong, Don. 2023. Of bees and blooms: A new scorecard for selecting pollinator-friendly plants in restoration. Science You Can Use Bulletin, Issue 58. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 11 p.


## Lead Scientist


**Justin Runyon** is a Research Entomologist for the Rocky Mountain Research Station who focuses on plant-insect chemical ecology.

**Will Glenny** is a post-doctoral fellow at the German Centre for Integrative Biodiversity research (iDiv) in Leipzig, Germany where he focuses on pollinator health.

**Rebecca Jones** is the author of this Science You Can Use.