

onCampus GUIDE

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*Creating
some
BUZZ*

Bees just might be a solution
to rebuilding the Wilds



Creating some

Karen Goodell's research gives strip-mined land a chance to recuperate

Adam King onCampus staff |

Sure her first choice lived close by and smelled really good, but the fragrance of a new prospect was too much to refuse. It was a little further away, and getting there would definitely test her strength — when your wings beat 230 times a second it takes a lot more effort. But frankly, that extra 800 meters was worth the risk when there are so many more flowers — and nectar — to be had.

Road trip!

Karen Goodell takes the blame for tiring out the bee populations in southeastern Ohio. As part of her research, the associate professor in the Department of Evolution, Ecology and Organismal Biology at Ohio State Newark became a bee temptress — a Siren of buzz, if you will — planting wildly diverse prairies to see if she could lure bees into pollinating further from their nests.

Prairies, you see, can't thrive without bees. And the more bees that come to the party, the better for a prairie's growth and longevity.

The prairies are important where Goodell is doing her research: At the Wilds, a nearly 10,000-acre swath of rolling hills that American Electric Power subsidiary Central Ohio Coal Co. strip-mined for its resources. After AEP donated the land in 1984, the Wilds has been trying to restore native plants to the damaged ecosystem, and prairies are one of the few things that will grow in that soil.

"Without adequate bees, the plants won't produce enough seed to become self-sustaining populations," Goodell said. "We'd be sowing seed every year. That's not really economically feasible on 10,000 acres of reclaimed strip mine. We want to give the plants a start and have them continue on their own. I'm hoping that my research will contribute knowledge about how to approach these restorations in a smarter way from the pollinator perspective."

All told, Goodell, with the help of Ohio State graduate students Chia-Hua Lin and Sarah Cusser and several undergraduates including Howard Rogers and Stephany Chicaiza, has identified 95 different bee species

at the Wilds after collecting around 10,000 bee specimens over the past two years.

With approximately 20,000 different species of bees worldwide — 500 in Ohio alone — finding 95 might seem paltry, but Goodell said she was impressed to find so many on strip-mined land.

"This is a very vibrant and exciting community, and what we do to the habitat really impacts the bee communities in ways we don't completely understand," she said. "I think there's a lot of information that needs to be gathered as we as humans continue to have a very big influence on our natural surroundings."

Gathering information for Goodell's research means accepting repetitive, tedious work.

During one supremely hot July day, Goodell and her students waded through a plot of tall prairie plants — one of 48 Goodell has grown since the spring of 2009. They counted open flowers in randomly chosen sections of the plot using handheld clickers because the flowers can number in the thousands. After taking that sample, they used large nets just to snag a few bees on their nectar runs. Those they caught were preserved and identified later so Goodell could associate their abundance and diversity with the types of flowers growing in the plot and other features of the landscape.

At another site, the research team checked on a series of drilled wooden blocks, a sort of handmade apartment building that solitary bees could use for nesting. The team noted which chambers were occupied and if they were capped with mud, flowers or leaf parts (different species have different nesting tastes). Boxes were added if it looked like they were getting full.

The team netted bees near the nest blocks, being careful not to kill them because it might disrupt the bees nesting within the boxes. Instead, the netted bees were dropped into a jar and stunned with a shot of CO₂ gas, which slows their metabolism, allowing Goodell and her students to handle them



Associate Professor Karen Goodell helps Ohio State Newark student Stephany Chicaiza, left, identify a bee caught at one of Goodell's research plots at The Wilds. Below left, a bee stunned with CO₂ gas allows the research team time to examine the bee without harming it.



They're *not* out to get you

The hum of a bee's wings zips by your ear. What's your first reaction? Duck and run? Swat your hand in wide circles hoping to clear it from your head's vicinity?

Karen Goodell, an associate professor in the Department of Evolution, Ecology and Organismal Biology at Ohio State Newark, said it should be none of the above.

"Bees get a very bad rap, but they are not our enemies," said Goodell, who has been stung a few times but never took umbrage. "Most bees are completely uninterested in attacking humans. If you think about it, the consequence of stinging is often death for a bee. It's only when their lives are threatened that most would even consider stinging."

Goodell began her research pursuits in plant population genetics, but bees became her love as a new PhD student.

"When I realized that bees are really the organisms

that are moving genes around for plants in their role as pollinators, their behavior and their communities became extremely fascinating to me," she said.

"They're beautiful when you look at them up close. They can be green, purple, bronze-colored, metallic, shiny, striped or fuzzy. They're incredibly ecologically variable; some of them are incredibly tiny and some of them are huge."

"Most people look at a bee and they don't even know it's a bee. They think it's some other kind of an insect. I'd like the public to understand the great diversity we have in our native pollinators and the extent to which we rely on them for our food and for maintaining native plants. About 70 percent of flowering plants, including one in three bites of food we eat, require pollination by a bee."

BUZZ



Karen Goodell and her student researchers walk one of 48 prairie plots to see what types of bees might be making nectar runs. At left, wooden blocks with drilled holes in them, also known as "bee apartments," are an effort to give bees a chance to grow their populations by providing new nesting locations.

without being stung or damaging the bee. They made note of the species, then let them recover and return to their interrupted foraging.

More flower counting followed to learn what food resources the bees had nearby and how they might be using them.

Goodell's two projects use 72 different locations dispersed around the Wilds, and this not-so-glamorous process is repeated almost every day to collect data. Chicaiza, an Ohio State Newark research student who lives in one of the newly constructed cabins at the Wilds with the other students during the summer, can't get enough of it.

"Dr. Goodell and the others out here definitely prepared me for field work," said Chicaiza, a soon-to-be sophomore who is doing her own study to see how resource limitation affects seed production. "They said, 'Look, you're going to find yourself with a bunch of ticks on you and you're going to get dirty, so don't bring anything nice.' But it's definitely awesome. It's practically going back to when you were 5, playing in dirt, getting messy and not having to worry about it. It's a great experience."

In research terminology, bees are referred to as central-place foragers because they have homes to go back to, unlike flies and

butterflies. Some bee species may only fly about 200 meters from their nests to gather food and nest materials, and Goodell has found the diversity of bees is highest close to habitats such as untouched remnant forest. So understanding how far bees are willing to travel for their needs is key to rebuilding the Wilds' pollinator habitat and the pollinator community.

Goodell found that run-of-the-mill prairies planted further out from these forests don't do so well. The forests provide nesting and food resources for some species, and the prairie locations have few nesting sites and low flower variety. Planted 500, 800 and 1,000 meters away, the prairies didn't have enough oomph to attract those species tied to the forest habitat.

"But I've experimented with different seed mixtures for our prairie plantings, and what I find is if I boost the diversity as high as possible with the most attractive and highest diversity of flowers, I can push the envelope a little," Goodell said. "I can attract more bees out about a kilometer away from these good-quality forested habitats."

For some species of bee, however, even the richest patches of flowers amount to only partial habitat, lacking in woody vegetation good for nests. That's where the wooden-block nests come in — for the bees that just won't go that far no matter how Goodell tempts them florally. By adding nesting habitat for these leaf-cutter and other stem-nesting bees — those which need holes in wood to nest — Goodell hopes to help grow the bee populations.

"We're just at beginning of the project, so I don't have any conclusions yet," she said. "But I

can say our nests are being used quite actively, so I'm expecting that project will likely show that additional nest sites help population growth and promote high bee diversity."

The 75,000 people who annually visit the Wilds will only notice Goodell's work beyond the charismatic white rhinos, giraffes and water buffaloes if they embark on a horseback safari, which tours some of her large, circular prairie plantings, affectionately referred to by The Wilds staff as "crop circles." But the Wilds' staff understands cultivating such research is critical as the human race's need for more energy and minerals goes on unabated.

"When we approach a highly disturbed landscape, we're doing it to reconstruct that habitat into either the original ecosystem, or at the minimum, return it to a functional system able to support native wildlife," said Jenise Bauman, the Wilds' director of conservation science training. "It might not be the original, historic version of the landscape, but it will be an ecosystem designed with native plant material capable of supporting a diverse assemblage of, in Dr. Goodell's example, pollinators. Her work definitely complements our mission of advancing conservation through science, education and personal experience."

Defining the Wilds

So what exactly is the Wilds? Well, it depends on who you are as to how that question is answered.

If you're an Ohio State researcher or student, the Wilds is an opportunity. The largest conservation preserve in the United States welcomes regional universities to conduct research on its nearly 10,000 acres in Cumberland in southeastern Ohio. So in addition to Karen Goodell's work, Ohio State University has active studies on mollusks, switchgrass, biofuels and butterfly habitat and has done research on white rhino reproduction.

"In the long term what I hope to get out of this is good research methods and the discipline of field work; how to take notes," said Howard Rogers, a senior in forestry and wildlife management who worked with Goodell over the summer. "It's invaluable in that aspect, just learning to be a scientist, doing things properly and all the things that go along with that — teamwork and coordination. I've learned a ridiculous amount, and every time I go out I learn

something new."

If you're a Wilds staff member, the place represents keeping what we have now and potentially bringing back what we've lost for future generations.

"Everything is connected, and there's a real beauty when you realize that you're part of an ecological connection shared with organisms all around you," said Jenise Bauman, the Wilds' director of conservation science training. "With restoration ecology, we want to be the frontrunners and know exactly how we can aid in recovery after large-scale disturbances. In addition we hope to use our resources to train future professionals and provide venues for students and researchers to initiate long term projects here at the Wilds."

For the public, the Wilds is a place of wonder that houses exotic animals in a setting as close to their natural habitat as they can get. And now visitors have a new way to view the Wilds: Suspended above the ground via a 2-1/2 hour zipline safari tour.