

Threatened wild bees get help from researchers

Understanding the emerging perils

By **NICHOLAS TURNER**
Seattle Times

OKANOGAN-WENATCHEE NATIONAL FOREST, Wash. — Few creatures exist closer to the front lines of climate change than wild, native bees. And few are more important, or as irreplaceable.

They've always been subjected to a long list of existential threats: habitat loss through agriculture, construction and urban development; pesticides, insecticides and other harmful chemicals; and competition from domesticated honeybees.

Add to that list the growing impacts of a warming planet — wildfires, heat waves and drought — all of which are growing in frequency and intensity — and the gravity of the situation lurches into focus.

In Washington state, where the impacts of climate change become more apparent with each passing year, understanding the emerging perils faced by native bees could prove vital in their conservation and protection. Across the state, researchers and conservationists are doing just that.

At 10 different sites in the Okanogan-Wenatchee National Forest, Autumn Maust, a doctoral student from the University of Washington, is researching the impacts of wildfires on native bee communities. She strives to better understand how fires exacerbated by climate change are impacting the pollinators, and to eventually identify the plants they depend on so that forest managers can protect them.

For example, spreading the seeds of plants frequented by bees could both stabilize the ground after a prescribed burn and help reestablish bee communities.

"Ensuring we're conserving native pollinators is becoming more and more important," Maust said. "It's hard for a bee to outfly a fire."

Near Twenty-Five Mile Creek, a dozen miles northwest of Chelan, Maust is leading a rare if not pioneering look into how pollinators are adapting to the onset of bigger, more frequent fires. She began surveying the site soon after a massive blaze spanning 22,000 acres turned it into a wasteland, leaving behind an apocalyptic scene of charred black tree trunks and smoldering earth.

Now the rolling hills have been reclaimed by ponderosa pines, arrowleaf balsamroot, serviceberries and lupines.

At other sites, more time has passed since the last major fire — three years at some, six at others, more than a decade at the rest.

Initial observations suggest bees are healthiest at three-year post-burn sites, the window of time in which apparently the understory is just abundant enough to provide habitat and food, but the overstory isn't blocking the sun.

Three years could be the "sweet spot" for bee communities in recovering burn sites, according to Patrick Tobin, a researcher at the UW School of Environmental and Forest Sciences.

But that window could shift as the natural frequency of fires unique to any given forest ecosystem is increasingly disrupted.

Too many fires and plants don't get a chance to regrow, vegetation is lost, trees suffer long-term water deficits and the carbon stored inside them is released into the atmosphere — to say nothing of the physical dangers to people and wildlife.

Too few fires and undergrowth builds up, becoming a dangerous cache of fuel for the next fire. An overgrown tree canopy can block sunlight from the forest floor and soil can miss out on vital nutrients from burned detritus.

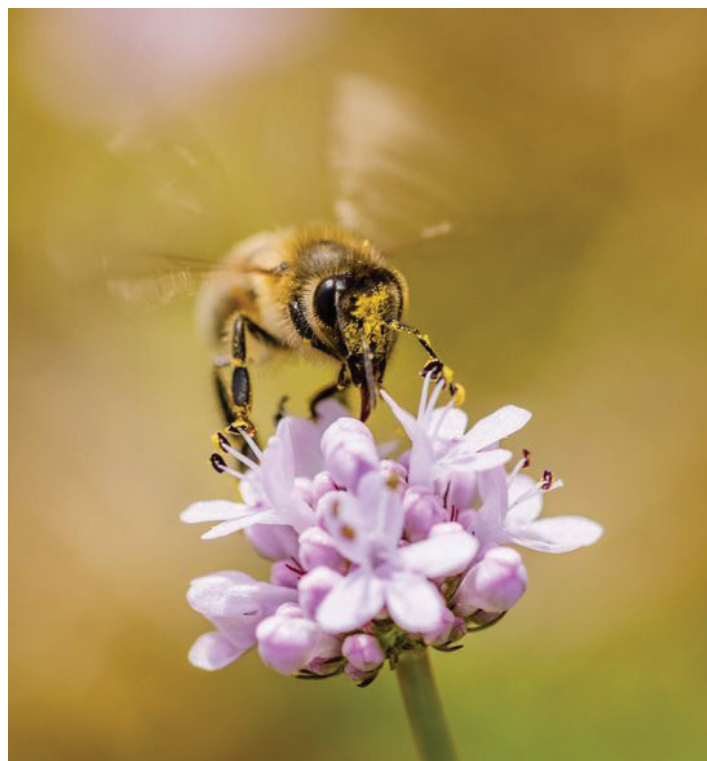
"Post-burn, there's a window where herbaceous plants can really thrive because of the opening in the light levels," Tobin said.

Altering nature's clockwork

The increasing use of prescribed fires in Washington state is a complicating factor. While the practice may help protect human life and property by diverting, reducing or preventing larger wildfires, they also influence the natural fire regime.

Climate change could also be altering nature's clockwork. The timing with which bears hibernate, birds migrate and trees change color is largely determined by environmental cues that often involve temperature or light.

But what may sound like a simple or straightforward pro-



Daniel Kim/Seattle Times

Bees live on the front lines of climate change.

cess of cause and effect is far more delicate than one might expect.

Disruption of that timing can alter an ecosystem's countless seasonal cycles, resulting in a so-called phenological mismatch.

Berri Brosi, a biology professor from the University of Washington, is studying how this phenomenon can impact both native bees and domesticated honeybees.

He's examining the rate of snowmelt on sites in the mountains of Colorado to observe the blooming time of flowers and how quickly pollinators return once the ice is gone.

A pessimist, he said, would believe these relationships are becoming increasingly disconnected, but an optimist would point out that most plants are visited by many pollinators and most pollinators visit many plants, hence the disappearance of one doesn't ensure that of another.

Still, Brosi found that plants in plots of accelerated snowmelt produced fewer seeds than those in the control plots.

"Every living thing uses cues from its environment to drive important activities, from microbes to huge trees to animals and everything in between," Brosi said. "One of the potentially insidious effects of climate change is the potential for climate change to throw off some of this timing."

But the causality between climate change and bee decline isn't always clear, according to Rich Hatfield, senior conservation biologist for the Xerces Society, an international nonprofit involved in the conservation of pollinators and invertebrates.

"Everybody looks for a smoking gun," he said. Models show that warmer temperatures cause shorter bloom times, which is pushing bees into higher elevations and higher altitudes. "But climate change isn't the only factor here."

Native bees continue to be endangered by habitat loss, toxic chemicals, competition with domesticated pollinators and other threats from agriculture and industry.

"Death by a thousand cuts," Hatfield said.

Deceptively simple countermeasure

Farther west, an artist is at work on the windswept shores of Whidbey Island in Washington.

Half a decade has passed since Eric Mader, co-director of the Xerces Society's Pollinator Program, bought 13 acres of parceled land on the island. Since then, he has transformed it into a bustling, fertile wildflower meadow.

What he's created could serve as a deceptively simple countermeasure to the growing plight of native pollinator communities.

The Xerces Society helped pioneer the wildflower meadow concept as a model for pollinator conservation around 2005 in California's Central Valley, a highly industrialized agricultural region.

Researchers sought to bring back wild pollinators to counteract a growing dependence on honeybees, which at

the time were suffering the height of colony collapse disorder, a phenomenon researchers now understand was possibly the result of a combination of toxic chemicals and disease.

At the edges of the valley, wild vegetation grew plentiful along mountain foothills and riparian corridors. Crops near these areas often didn't need any honeybees thanks to the presence of native pollinators.

Moving mountains was out of the question, so the society began planting trees and shrubs native to California in rows of hedges. Now, Mader said, hundreds of miles of pollinator hedgerows have been planted in the valley and the practice has influenced the agricultural industry and spurred policy nationwide.

All too often, Mader said, conservation efforts prioritize the health and survival of honeybees — which are neither native to this continent nor are they as effective as pollinators. The number of managed honeybee hives has halved since the 1950s, and they continue to become more expensive and in shorter supply.

Reports of honeybee decline often lead people to become honeybee keepers themselves, a practice that, for native bees, implies greater competition and the possibility of disease.

Soaring gas prices, supply chain issues and ongoing labor shortages also point to a precarious future for the honeybee industry. Hence, the wildflower meadow presents a promising solution — a template that can, in theory, be tailored and shipped as easily as it is to procure and plant a bag of seeds.

Mader's meadow on Whidbey Island is a living example.

Uncharacteristically wet, cloudy weather in May kept most bees away, the flowers hidden and his rain gear sopping, but that didn't bother Mader.

"Rain is good," he said as he stood among the panoply of serviceberry, white western yarrow, pink seablush, great camas, fool's onion, checker lily and Pacific crabapple. "This is my life's work."

A timeworn plot scarred by colonialism and displacement, the land used to be the home of several Native tribes before it was settled by white farmers who used it to grow cabbage and graze sheep on pasture grass.

As Mader undid nearly two centuries of nonnative vegetation, he stumbled upon what was hidden underneath — the seed pod of a camas plant, a surviving member of one of the region's historical, most culturally significant plants.

As he peeled back years of nonnative plants, more camas began to emerge.

The meadow almost instantly became a refuge for uncommon species like the Sitka bumblebee, which is predominantly found in cool, remote areas, as well as butterflies and other pollinators.

The land is threatened by heat waves, drought, wildflower smoke, seasonal storms and saltwater trickling in underground from the ocean across the street.

Extreme temperatures that consumed the Pacific Northwest in 2021 — the infamous "heat dome" — made the meadow "tinder dry," Mader said.

But native plants are often more resistant to extreme weather. The camas, for example, he boasted, has endured severe weather, colonization and even volcanic activity for more than 5,000 years.

When the time comes, Mader, his wife and their children will harvest the seeds together. They've made a business out of selling them to subsidize the property, and to help people build their own wildflower garden.

This method, he said, can be used in the backyards of people interested in helping native bees, especially in communities with poor access to green spaces.

At the Bill & Melinda Gates Foundation in Seattle, Mader has been helping build a wildflower meadow on a small plot of land nestled in the corner of the campus.

In the two or three years since it was installed, the meadow has become a haven for pollinators in an otherwise concrete jungle.

"To see wild pollinators that have traversed those conditions over miles to find these spaces and colonize them," Mader said. "It's really incredible."

Before him, riverbank lupine, western buttercups and dozens of other native plants were providing habitat and food for various bees, butterflies, grasshoppers, songbirds and even an owl. Just beyond a chain-link fence blared a cacophony from cars passing by on Mercer Street.

"This is essentially a model site for urban biodiversity conservation," Mader said, resting his hands on his hips as he admired the meadow. "This is the definition of restoration."

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