Mount Rainier's avalanche lilies could teach us about climate change

Trouble in Paradise? Researchers examine the relationship between flowers and their pollinators on Washington’s highest mountain — and the possible effects of climate change.

By Lynda V. Mapes
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PARADISE, Mount Rainier — University of Washington researcher Elinore Theobald is studying the relationship between flowers and their pollinators on Washington's highest mountain. And what she is finding so far — avalanche lilies at higher elevation set seed at one-third the rate of lilies elsewhere on the mountain — points to troubling questions.

Is it possible that the lilies are struggling because of a mismatch in their timing with their pollinators? And does that, in turn, point to trouble as the climate changes?

Theobald, a doctoral candidate, is working with field assistants Natasha Lozanoff and Margot Tsakonas to understand not just how a single species might be affected by even small changes in temperature, but how biological interactions between species respond to changing climates.

It is, if you will, a burning question: The average annual temperature in the Pacific Northwest has increased 1.5 degrees Fahrenheit since 1920, and is projected to increase an additional 3.6 to 7.2 degrees or more by the end of the century, according to the Climate Impacts Group at the University of Washington.

What might that mean for plant and animal communities? One way to find out is to head to the mountain, Theobald figured, where the range in elevation can be a proxy for the shifts in climate that are forecast.

She posits that understanding how plant and pollinator interactions are playing out at those different elevations today might be a clue to what will occur in the future. And if you love avalanche lilies, it might not be good.

_Erythronium montanum_ seems to be extremely diminished in its ability to set seed in some monitoring plots. The question is why. One theory Theobald is exploring is that the window of timing when the flower is ready for pollination and the presence of pollinators seeking food is quite precise.
And, as one of the first flowers to bloom in spring, there is reason to suspect avalanche lilies will be among the most sensitive to changing climate.

Change temperature, and it could alter the timing of snowmelt and flowering, putting them out of synchrony with the pollinators.

But the first step for Theobald is to understand exactly what role climate plays in determining the plant's range limits and the interaction between plants and their pollinators. Which is why, on a recent day, Theobald and Lozanoff were climbing up and down the south side of Mount Rainier, checking their five research sites at different elevations, from 5,249 feet to 5,905 feet — the limits of the plant's range today in the mountain's subalpine meadows.

The researchers have tied bags over some lilies to learn if they can self-pollinate. Answer: no. They have also, in pairs of flowers at similar elevation, hand-pollinated one flower while leaving the other alone, to see if the flowers would set seed.

So far, they have found that plants at the highest elevation were greatly limited in their ability to set fruit. Yet at lower ranges, fruit production (once seed was set) was lower than elsewhere. That suggested the problem at lower elevations wasn't pollination, but perhaps snacking by deer or even competition.

That could be bad news for the lily, too, if it's because trees, at lower elevations, are shading them out. Warming temperatures already are implicated in trees invading meadows on the mountain. Could the future be a lily squeezed at the top and the bottom of its range, limiting its survival to a narrower midrange of abundance?

It's too soon to know, but the team is gathering more data in an attempt to dissect a complex ecology, tracking snowmelt dates and temperature readings from sensors buried in the soil, and compiling, week-by-week, the life events in the plant's season — when it emerges, blooms and sets seed and fruit (or doesn't), and even counting and identifying actual pollinator visits to fill in the picture.

The observance of the plant's phenology — its seasonal events, from emergence from the snowpack to blooming and setting seed and fruit — provides visible evidence, through the power of simple observation, of how small shifts in temperature may be controlling survival.

"We don't have longterm data," Theobald said. "But we want to understand which plants are most sensitive to climate, and what resources there are for pollinators. We think there may be a link."

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