Research, Science & environment

Citizen scientists discover new, more virulent form of sudden oak death in Bay Area

Every year, volunteers with the UC Berkeley-led SOD Blitz Project survey tens of thousands of California trees for signs of the fungus-like pathogen.

By Kara Manke

Two citizen scientists participating in an SOD Blitz record the latitude and longitude of leaf samples.

Courtesy of Matteo Garbelotto.

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A UC Berkeley-led citizen science project has discovered at least four outbreaks of a new, potentially more aggressive form of the pathogen that causes sudden oak death (SOD) in the Bay Area.

Each year, volunteers with the SOD Blitz Project survey tens of thousands of California trees for signs of an aggressive plant pathogen, *Phytophthora ramorum,* that is lethal to oaks and tanoaks and damages the leaves and stems of several other plants. When a tree shows

signs of disease, volunteers sample the infected leaves and return them to Matteo Garbelotto's lab at Berkeley, where scientists use DNA testing to confirm the presence of the pathogen.

While multiple genetically distinct lineages of the pathogen have spread around the world, only one lineage, NA1, has been dominant in California. But this year, bay laurel leaves from four outbreaks — including two in San Mateo County, one in Alameda County and one in Contra Costa County — tested positive for NA2, a lineage that lab testing suggests is more infectious and more virulent than NA1.

"The big surprise was that not only did we find NA2 for the first time, but we found it in four different locations — it's creeping up in different spots at the same time," said Garbelotto, an adjunct professor of environmental science, policy and management at Berkeley. "We don't really know why this is happening, but we do know that these were independent introductions."

The pathogen that causes sudden oak death is often spread by infected bay laurels.

Courtesy of Matteo Garbelotto

Since it was first identified in California in the mid-1990s, *Phytophthora ramorum* has killed millions of trees and spread to at least 16 counties in the state, including all nine counties in the Bay Area. It is believed to have originated in Asia and spread throughout the world through the trade of infected ornamental plants, including rhododendrons and camellias. In California forests, the pathogen often spreads to oaks though bay laurel trees, whose leaves are highly infectious.

Three separate lineages of *Phytophthora ramorum* have been detected in ornamental plants in California nurseries. However, with the exception of one isolated outbreak of the EU1 lineage in Del Norte County in 2022, only NA1 has escaped to California forests. Garbelotto believes climate change may be contributing to the sudden emergence of NA2, which lab tests suggest is up to four times more infectious than NA1 and can survive under warmer conditions.

"The size of the outbreaks is significant — the largest one is about 1.5 miles in diameter. But considering that the NA1 lineage covers hundreds of miles, the NA2 lineage must have been introduced years or even decades after the original introduction of the NA1 lineage, presumed to have occurred in the late 1980s," Garbelotto said. "These NA2 infections have probably been out there for a few years, but now that we are facing warmer temperatures and fewer fog days, they may be more competitive than NA1 infections and we may be able to see them more easily."

First launched in 2008, the SOD Blitz Project is one of the oldest and largest citizen science projects in the country focused on the survey of exotic tree diseases. In 2024, a total 515 participants surveyed 23,644 trees at 28 separate locations extending from San Luis Obispo to Del Norte County on the Oregon border. They also collected 1,848 leaf samples for DNA testing by Garbelotto's team.

After finding bay laurel samples that had unexpectedly tested positive for NA2, Garbelotto and his team were able to use geolocation data provided by the volunteers to return to the infected trees and successfully retest them.

A tanoak tree that has been killed by sudden oak death.

Courtesy of Matteo Garbelotto.

“We were in awe that we could use the information provided by volunteers to identify the trees that they had sampled in order to resample them and confirm the results,” Garbelotto said. “This speaks about the power of well-designed citizen science programs.”

With early detection and management, including the removal of bay laurel trees infected by the NA2 lineage, it may be possible to prevent the pathogen from spreading to oak trees, Garbelotto said.

“We may not be able to get rid of the pathogen completely, but we would like to keep the population low so that it doesn’t start spreading and intermingling with NA1,” Garbelotto said. “Having two or three lineages spreading in a single area has the potential to be a lot more destructive to having a single one. Additionally, the NA2 lineage may be able to invade warmer inland woodlands, which so far have yet to be affected by the NA1 lineage of the SOD pathogen.”

Garbelotto’s team will share the news at a public meeting in Woodside on Tuesday, Nov. 12, at 6 p.m.; through a webinar on Nov. 19 and at an in-person meeting in Santa Rosa on Dec. 11 at 6 p.m. Details about the meetings, including a registration link for the webinar, are available on the SOD Blitz website. Questions will be answered in detail at the in-person meetings only.

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