

## OAK LORE / Preserving a heritage tree / Scientist takes holistic approach to sudden oak death

Deborah K. Rich, Special to The Chronicle  
 Published 4:00 am, Saturday, October 8, 2005

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Independent scientist Lee Klinger takes an unorthodox approach to saving trees infected with sudden oak death (SOD): rather than attacking the disease per se, he helps trees help themselves. His is a holistic approach that advocates identifying and correcting environmental factors that are causing California oaks to die from SOD. He believes soil acidification is foremost among the contributing

factors to the disease.

Soil acidification changes the mineral balance in the soil and reduces the availability of

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nutrients. When trees suffer from poor nutrition, they also become more susceptible to diseases of all sorts. More than 100,000 trees have succumbed to SOD in California over the past decade, and while Klinger doesn't dispute that *Phytophthora ramorum*, a fungi-like pathogen, is the infectious agent for SOD, he thinks that the prevalence of SOD is indicative of a greater disorder.

A preventive or cure is vitally important. Without intervention of any sort, 90 percent of black and coast live oaks that grow in woodlands alongside bay laurels -- a key host of *P. ramorum* -- and nearly all the tan oaks in Big Sur and in Santa Cruz, Marin, and Sonoma counties will succumb to SOD, according to Matteo Garbelotto of UC Berkeley's department of environmental science, policy and management.

Klinger's studies of mature forests in Congo, Canada, Brazil, China and Alaska have convinced him that soil acidification is among the primary causes of tree death in aging forests. Many factors contribute to soil acidification in older forest ecosystems, including the growth of acid-producing organisms like mosses, lichens and algae, the decomposition of large quantities of biomass and the transition from broadleaf trees to conifers whose needles produce more acid when decaying than leaves do. As soils acidify, some elements, like aluminum, reach levels toxic to plants, while many critical plant nutrients become less available, including potassium, magnesium and calcium.

In a paper he presented at the 2005 Sudden Oak Death Science Symposium in Monterey, Klinger said the deaths of California oaks attributed to SOD closely resemble the forest decline he associates with soil acidification. The fact that many oaks in the state are declining and dying even though apparently uninfected by SOD, the prevalence of affected trees in mature ecosystems and the presence of heavy moss and lichen covers in affected areas all hint at a cause larger than a single adventitious pathogen.

Perhaps the most telling correlation between oak decline and soil acidification is the fact that SOD rarely occurs in areas that have burned within the past 50 years. Until 100 to 150 years ago, California's oak forests and grasslands periodically burned in fires started by lightning, by accident or by people using fire for soil fertility and pasture management. By covering the soil in alkaline ash, the fires countered the tendency of soils to acidify. Today our ability to suppress fires has greatly reduced the frequency of forest burns.

In our densely populated state, intentionally setting forest fires will always be a political hot potato. But Klinger believes a simple regime of soil additives and trunk lime washes can hold soil acidification in check and increase nutrient availability without the use of fire.

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As a preventive treatment or when trees are only mildly stressed, Klinger applies a "soil sweetener" to the surface of the soil beneath the tree from the trunk out to the drip line (the perimeter of the tree's canopy). He prefers a product called Azomite, a mined natural crushed rock that contains potash, calcium and more than 50 trace minerals. For trees that have fungi and mosses growing on their trunks, that have bleeding cankers or whose

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canopy tops are dying back, Klinger also applies a lime wash to the trunk of the tree as well (from the root crown up to an extended arm's reach) using a mixture of lime, sea salt and volcanic ash. Klinger recommends applying the treatments once a year for the first two to three years. After that, he expects that the soil and trunk treatments will be necessary only once every several years. Labor and materials for the treatments generally cost \$50-\$100 per tree, depending upon its size.

Klinger is definitely out of the mainstream in regard to SOD. Since the identification in 2000 by Garbelotto and his fellow University of California researcher David Rizzo of *P. ramorum* as the pathogen that causes SOD, control efforts have focused on fungicide treatments or clear-cutting infected areas.

Klinger has so far been unable to secure a portion of the \$30 million in federal funds spent to date on SOD research to test his theory. He has submitted three proposals to the U.S. Forest Service in the past three years, all of which have been denied despite his academic qualifications.

Klinger has a doctorate in biogeography from the University of Colorado and has held scholarly appointments at the National Center for Atmospheric Research, the University of Colorado, University of Oxford in England, the University of East London, Naropa University in Boulder, Colo., and the Chinese Academy of Sciences, and has authored dozens of papers in ecology, geochemistry and earth system science.

While waiting for the funding to put academic rigor behind his theories, Klinger and others who believe in his ideas have already applied his suggested treatments to more than 5,000 trees infected with SOD and other diseases in the past three years. All but a handful of the trees have responded with a flush of healthy canopy growth. Klinger has assembled hundreds of before-and-after photos and is developing a following among property owners and managers. Scott Glough, who cares for the trees at the 1,000-acre Mountain of Attention retreat center in Lake County, says that the difference in his declining ancient oaks was "marked" after just one year of treatments. "When the trees leafed out, all of them, across the board, had at least 10 to 15 percent more leaves. Some had 20 percent and more."

Heather Lanier owns 170 acres in Big Sur (Monterey County) adjacent to the Post Ranch. In October 2004, she began working with Klinger on what she terms a "long-term research project" to create a healthier environment for her oaks, which have been dying in vast numbers over the past decade.

"What I like so much about Lee's method is that it is based upon a model to treat the whole system rather than just the disease. The way I live my life and the way I go about doing other things is to make the whole system healthy, to be strong and therefore less likely, when coming in contact with a disease, to become infected. Klinger's approach makes sense to me."

This past spring, Lanier saw good growth in the trees treated during the fall, but she says that more time is necessary before the long-term effects can be known.

But Garbelotto said lime wash and calcium treatments can have some beneficial effects, but are not enough. He refers to the treatments Klinger advocates as "wisdom treatments," meaning that they are something people have done for ages to treat an illness that have no proven scientific validity.

"Calcium, for example, is a kind of 'wisdom treatment' for Phytophthoras and if it's a wisdom treatment, there must be some good to it, and there is," Garbelotto said. "It's one of those things that generate health, like you need to drink orange juice and you need to rest. That's why it's a good practice if you have a problem to use it because it will



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ameliorate things. But, we haven't tested calcium yet (as a treatment of *P. ramorum*) because it's one of those things that if you have a serious problem, it won't solve the problem. You need to take antibiotics if you have an infection at some point, you can't just drink orange juice and rest."

It's too early to tell whether reducing soil alkalinity and providing ailing trees not only calcium but also the other trace minerals necessary for good tree health will allow trees to resist SOD in the long term.

## Resources

-- For soil mineral amendment: [www.azomite.com](http://www.azomite.com); 158 Pointe Royale Drive, Suite D, Branson, MO 65616; (877) 296-6483.

-- For lime wash preferred by Lee Klinger: [www.arborright.com](http://www.arborright.com); P.O. Box 150868, San Rafael CA, 94901; (707) 494-2130.

-- For more information on sudden oak death: Lee Klinger, Sudden Oak Life, P.O. Box 664, Big Sur, CA 93920; (831) 917-7070; [info@suddenoaklife.org](mailto:info@suddenoaklife.org).

-- California Oak Mortality Task Force, [www.cnr.berkeley.edu/comtf/index.html](http://www.cnr.berkeley.edu/comtf/index.html).

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