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Questions and Answers about "Sudden Oak Death" in California[1]

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Q What is Sudden Oak Death (SOD)?

A "Sudden Oak Death is a forest disease caused by the fungus-like pathogen ***Phytophthora ramorum***. This pathogen has caused widespread dieback of tanoak and several oak species in the central and northern coastal counties of California. It has also been found on numerous other species, including Douglas fir, rhododendron, California bay laurel, and camellia. While some of these species - coast live oak, black oak, Shreve oak and tanoak - sustain lethal trunk infections, other plants get more benign foliar and twig infections. Many of these species with foliar infections play a key role in spread of ***P. ramorum*** by acting as a reservoir of innoculum, which may then be spread aerially via wind blown rain. Sporangia and chlamydospores, the most likely propagules of dispersion, are commonly generated on foliage, whereas they have not as yet been found on infested oak bark. The two plants determined to be the greatest sinks for innoculum are California bay laurel/Oregon myrtle and *Rhododendron* spp. Mortality is most common where oaks and these foliar hosts are found growing together. At present, there are 38 species known to be susceptible to the ***Phytophthora ramorum***." (From *California Oak Mortality Task Force* website, Feb. 24, 2004, http://www.suddenoakdeath.org/)

Q What is the California Oak Mortality Task Force?

A "Created in August 2000, the California Oak Mortality Task Force (COMTF) is a nonprofit organization, under the California Forest Pest Council, that brings together public agencies, other nonprofit organizations and private interests to address the issue of elevated levels of oak mortality. The Task Force will implement a comprehensive and unified approach for research, management, education and public policy." (also) "**The Task Force focuses on the potentially devastating effects of a newly discovered pathogen called *Phytophthora ramorum*.** It has caused an outbreak of Sudden Oak Death†, which is killing large numbers of the native oaks and tanoaks in California's coastal regions." (http://www.suddenoakdeath.org/)

Q Are experts in agreement as to the cause and treatment of SOD?

A There are **a number of reputable scientists and experienced arborists** who **disagree with the COMTF** and who see the oak decline in California (and elsewhere) as an ecosystem-level problem associated with increased environmental acidification. The non-chemical treatment approaches they follow are directed at the whole forest rather than at a single species of pests or pathogens.

Q Is there evidence that the SOD pathogen is not the cause of oak decline?

A Leading SOD researchers admit that much of the decline seen in California oaks and other trees is not caused by the SOD pathogen. Indeed, studies in the oak forests on Mt. Tamalpais (a major epicenter for the disease) found that **more than half of the dying trees exhibited no sign of the SOD pathogen**. Alternative theories of oak decline have not been fully examined, and so cannot be ruled out. Most importantly, the **tests used to "prove" the pathogenicity of *P. ramorum* are now determined to be inconclusive** as researchers did not control for mosses, which are known to cause root mortality, soil acidification, and tree death (see Figure 1).

Figure 1. The effects of mosses on red spruce trees, the National Center for Atmospheric Research, Boulder, CO

[1] Contact Dr. L. Klinger for a complete list of the scientific studies upon which this document is based

† SOD, elsewhere called "phytophthora canker disease", has been renamed "sudden oak death" by the COMTF. This disease, by the way, is not sudden in its occurrence, nor is it restricted to oaks, and it usually does not result in death.

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Q What is the systemic acidification theory of tree decline?

A Backed by the insights of systems theory and a wealth of new findings, this "complex systems" approach to forest health points to the key role of the natural acidification and base nutrient loss in aging forests. Ecological studies have shown that as forests mature the vegetation takes on more evergreen forms, mosses and lichens increase in abundance, and surface soils become more acidic. **Mosses and lichens** are found to **degrade bark, kill roots, and leach the soils of nutrients**, thus hindering tree growth and health. This theory regards the *Phytophthora* pathogen, the *Ambrosia* beetle, and other pests as secondary agents which attack trees that are predisposed by the ill effects of systemic acidification. This theory accounts for the tree mortality that is widely known to be associated with acid rain around the world.

Q Can systemic acidification explain the decline of oaks and other trees in California?

A In California the decline of oaks (including SOD) and other trees tends to affect large canopy trees of mixed-oak forests in moist valleys and on hillsides, especially where fog is frequent and the moss cover is heavy. The entire region has been under strict fire control for more than 50 years. As a result, **increasingly strongly acidic soils have been noted in Sonoma, Marin, Mendocino, and Lake Counties**. This acidification is most likely due to the buildup of mosses and lichens that occurs in the absence of fire disturbance. Thus, forests that burned the longest time ago will be the first to show symptoms of decline (e.g., top dieback, reduced radial growth, fine root mortality). Soils in declining forests of northern California are found to be moderately (*p*H 5.5 - 6.5) to strongly (*p*H < 5.5) acidic, depleted in base cations, and enriched in soluble Fe and Al. The situation here in California is very similar to that of many other regions in the world where forests are experiencing decline.

Q Can systemic acidification be treated or prevented?

A Dozens of scientific studies have shown that buffering the acidification with calcium-rich minerals and stimulating the growth of roots will stop tree decline and improve forest health and productivity. **Success in treating forest decline has been widely achieved using methods such as liming and burning** that ameliorate soil acidity through the addition of base cations. Burning and liming also lower the level of organic acids in the environment through the reduction of moss cover. The common traditional practice of applying lime to the trunks of trees (i.e., limewashing) has long been known to improve tree health and reduce insect pests and mosses growing on the bark. In summary, studies in declining forests indicate that liming: 1) improves health of trees, 2) improves root and mycorrhizae growth, 3) improves soil fertility, 4) reduces the level of toxic metals in soil, and 5)reduces moss cover.

Q Is there evidence that reducing the acidity of the ecosystem through burning and liming will work to save California's trees?

A Recent findings in old-growth forests from across the state now indicate that **the many old trees alive today in California were kept free of disease for hundreds, if not thousands, of years due to the frequent burning and liming practices by Indians**. The profound ecological wisdom of our forebears is cleverly recorded in the peculiar fire scars on downhill sides of trunks, in the strange white coatings on the bark, and in the odd placement of sea shells around the largest and oldest trees. Indeed, as we begin to look carefully we see: that the many crooked trunks of the older oaks are bent by design, trained to grow sideways and into the hill; that archeologists are finding hundreds of stone mortars in the area, grinding sites littered with splintered bones and seashells from waters outside the bay; that there are many mysterious shell middens, heaps of broken shells, bones, chunks of limestone, and ashes, piled up to 40 feet high with no evidence of any significant habitation nearby; and that open slopes in and around oak forests are distinctly terraced. No longer a band of simple hunter-gatherers, legions of shaped and tended oaks, redwoods, and even the giant sequoias clearly reveal that **the California Indians** were sophisticated organic agriforesters who cultivated herbs, fruits and nuts in orchards and fields that extended to the horizon in all directions, and who, **using fire and lime,** eventually **grew the largest trees in the world!** (From *Luminous Project* website, Feb. 24, 2004, http://www.luminousproject.org/)

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