

Sudden Oak Death: *Phytophthora ramorum*

Introduction

Phytophthora ramorum is a pathogenic oomycete capable of infecting a wide range of trees and woody shrubs and is the causative agent of Sudden Oak Death (SOD). This pathogen was first observed in a population of tanoaks in California and was identified as *P. ramorum* in the late 1990's (1). Since then, the pathogen has been identified in 15 counties throughout Northern California as well as one county in Oregon, and has also been identified in multiple European regions, most notably the UK (1). Additionally, *P. ramorum* has over 100 identified hosts, which includes multiple oak and tanoak species, along with a variety of common nursery plants such as camellia and rhododendron (2).



Image of dead oaks on hillside, Joseph O'Brien, USDA Forest Service, Bugwood.org

This pathogen has had a devastating effect on coastal forests in California and threatens timber and nursery industries across the country (1, 3). Although *P. ramorum* is currently contained in California and Oregon, from 2001-2011 it was detected in 464 nurseries across 27 states (4). Due to its wide host range and ease of spread,

there is great concern *P. ramorum* could spread to states like New York, threatening both common ornamentals and natural oaks. It is critical to be aware of the symptoms of SOD and practice good preventative management in order to limit this devastating pathogen from spreading and establishing on the East coast.

Symptoms and Signs

In shrubs and herbaceous plants, symptoms include necrotic leaf margins, leaf spots, necrotic lesions on the petioles, and twig die-back (1). In woody tree hosts such as *Quercus* spp., *P. ramorum* infection may result in a trunk canker that seeps a dark ooze (1). Infected oaks and other trees may also show the same foliar symptoms as woody shrubs (1).



Appearance of canker on tree trunk, Joseph O'Brien, USDA Forest Service, Bugwood.org

It is important to note that since this pathogen has a wide range of potential hosts, symptoms can vary across different species. The full official host list is maintained by APHIS. It can be found

at: <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/phytophthora-ramorum> if you are interested in learning more about the signs and symptoms on a particular host.

Disease Cycle

Oomycetes such as *P. ramorum* are fungus-like organism that thrive in moist, cool conditions, and can persist or disperse in water. The pathogen primarily infects the foliar tissue of a susceptible host, where it then produces sporangia. These sporangia may be wind or splash dispersed to infect new plant tissue.

Phytophthora ramorum is a polycyclic pathogen and is therefore capable of reinfecting a host multiple times throughout the season (5). Oaks are known as “dead end” hosts, meaning that the pathogen is not capable of spreading from these species, ending the disease cycle. When infecting a “dead end” host such as *Quercus* spp., *P. ramorum* inoculum first infects foliar tissue and then moves downward. It spreads into the trunk sapwood, damaging the phloem below the bark surface, resulting in the characteristic oozing trunk cankers observed in infected trees (5). These cankers are often lethal (5).

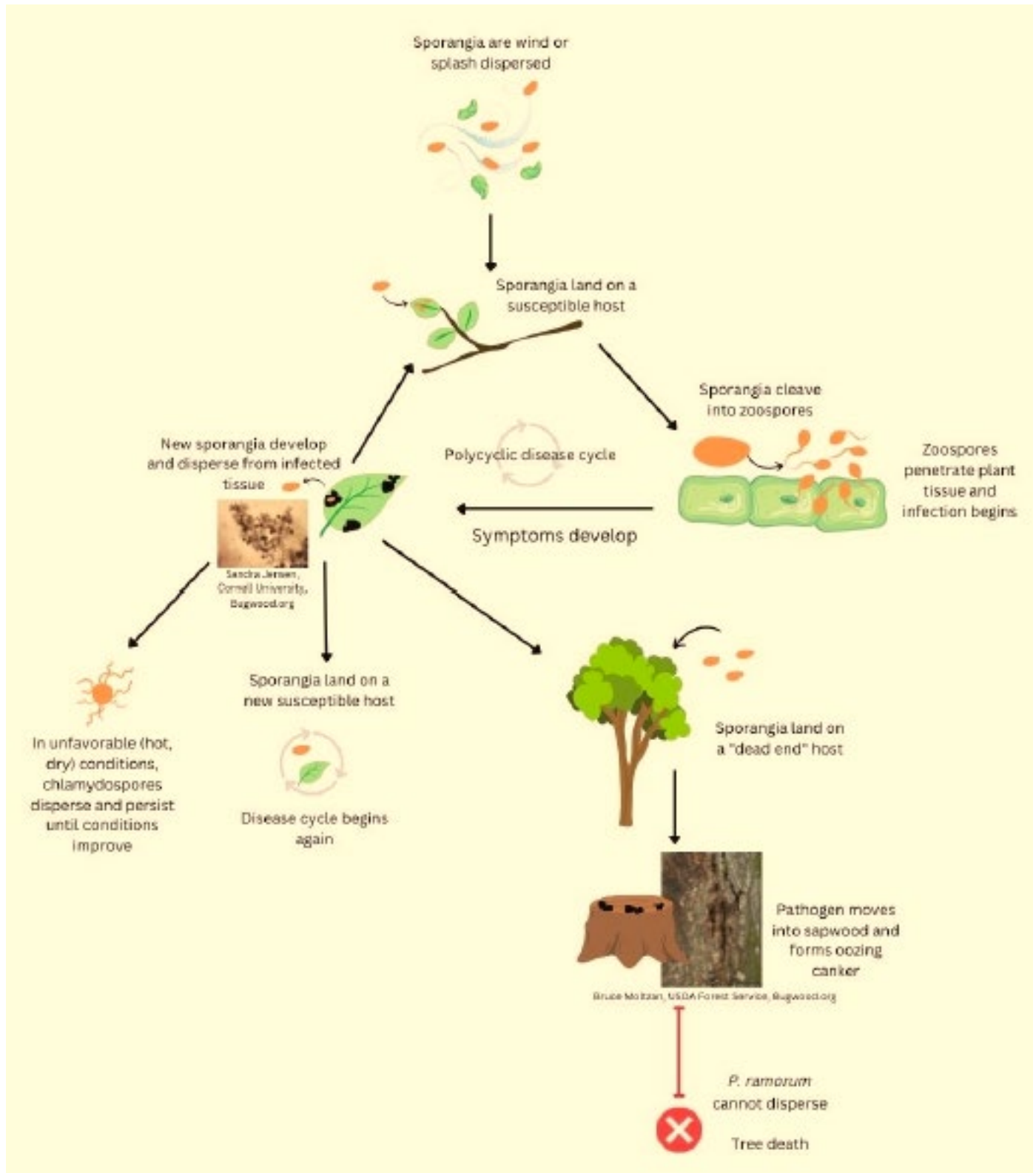
The pathogen does have distinct mating types, but these rarely coincide, and therefore only the asexual disease cycle of *P. ramorum* is known (5). The pathogen also produces chlamydospores, which allow infestations to persist during unfavorable, hot, or dry conditions (5). This is the general disease cycle in the natural environment, but in nursery settings, *P. ramorum* may also spread through contaminated irrigation water. Additionally, since identification of *P. ramorum* was relatively recent, there are still aspects of its life cycle that are unknown.

Management Strategies

To prevent the introduction and spread of *P. ramorum* in New York State, it is critical for homeowners, landscapers, arborists, nursery staff, and forestry service workers to all be aware of the symptoms of the pathogen on different hosts and to submit samples for diagnostics when necessary. For those living and working in New York, there are also many preventive management practices that will limit the spread of this disease. Refrain from purchasing or transporting wood and plant material from quarantined areas and ensure that plants from the West coast are certified pathogen free stock (6). Keep new nursery plants quarantined for at least 8 weeks to monitor for signs of disease, and avoid planting new nursery plants, especially known *P. ramorum* hosts, such as camellias and rhododendrons, near susceptible oak trees. Be aware that the pathogen can persist in mud on shoes, tires, and equipment, so it is important to wash or sanitize these items if travelling from a quarantined region.

If you are living in a region where *P. ramorum* is already established, it is important to practice good horticulture to keep your oaks healthy and resistant to disease (5). Do not over water your tree, since wet, muddy conditions will make it easier for the pathogen to establish (6). Clean pruning tools well and avoid excessive pruning as open bark wounds expose the tree to infection (6). Additionally, avoid infested areas during cool, moist conditions, when the transmission of *P. ramorum* is most likely (6). There is no known chemical or biological cure for Sudden Oak Death, but eradicating or sanitizing any known infected plant material will help prevent the spread of the disease to new plants.

Phytophthora ramorum life cycle, Melissa Martens 2022



References

1. COMF Partners. (2021). *Sudden Oak Death*. California Oak Mortality Force. Retrieved November 23, 2022, from <https://www.suddenoakdeath.org/>.
2. D. Shaw. (2007). *Sudden Oak Death Phytophthora ramorum*. Corvallis, Oregon; Oregon State University Extension Service.
3. Animal and Plant Health Inspection Service USDA. (2022, November 7). *Phytophthora ramorum*. USDA APHIS | Phytophthora ramorum. Retrieved November 23, 2022, from <https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/phytophthora-ramorum>.
4. USDA, Re-assessing Phytophthora ramorum Regulatory Framework – Impact of Pathogen Presence in Commercial Nurseries and Wild Land Environments 5–5 (2011). APHIS.
5. Parke, J. L., & Peterson, E. K. (2019). *Sudden oak death, sudden larch death, and ramorum blight*. APS. Retrieved November 23, 2022, from <https://www.apsnet.org/edcenter/disandpath/oomycete/pdlessons/Pages/SuddenOakDeath.aspx>
6. California Oak Mortality Force. (2021). *Sudden Oak Death Guidelines for California Landscapers and Gardeners*. California Oak Mortality Task Force.

Prepared by Melissa Martens, December 2022

READ THE LABEL BEFORE APPLYING ANY PESTICIDE! Changes in pesticide regulations occur constantly. All pesticides distributed, sold, and/or applied in New York State must be registered with the New York State Department of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional DEC office.

The Plant Disease Diagnostic Clinic

Phone: 607-255-7850

Fax: 607-255-4471

Email: Cornell-plantdiseaseclinic@cornell.edu

Web: plantclinic.cornell.edu