

## California Pest Rating Proposal for *Phytophthora multivora* P.M. Scott & T. Jung, 2009

**Current Pest Rating: Z**

**Proposed Pest Rating: C**

Kingdom: Chromista; Phylum: Pseudofungi;

Class: Oomycetes; Order: Peronosporales;

Family: Peronosporaceae

---

**Comment Period: 04/16/2020 through 05/31/2020**

---

### Initiating Event:

In 2007, *Phytophthora* isolates collected in Western Australia from *Eucalyptus* and other woody species were analyzed and compared to the ex-type isolate of *P. citricola* as described by Sawada in 1927. There were enough morphological and physiological characteristics differing from *P. citricola* in addition to variation in the ITS and *cox1* sequences to confirm that these isolates represented a new species later described as *P. multivora* (Scott et al., 2009). In May 2013, diseased rhododendrons from a *P. ramorum* research site were submitted to the CDFA's Meadowview Pest Diagnostics Center. CDFA plant pathologist Cheryl Blomquist isolated *Phytophthora* sp. and determined it was a match to *P. multivora*. Her results were confirmed by USDA's mycology laboratory in Beltsville, Maryland. The pathogen was initially given a temporary Q-rating. Over the next seven years, *P. multivora* was detected 55 additional times from 13 additional locations in coastal California and Sacramento and Solano counties, mostly in nursery stock sampled for *P. ramorum* compliance agreements. The rating was changed to a temporary Z. The risk to California from *P. multivora* is assessed herein and a permanent rating is proposed.

### History & Status:

**Background:** *Phytophthora multivora* is a significant pathogen with a wide host range and global distribution found in nurseries, the urban environment, and native plants (Jung et al., 2016; Rooney-Latham, 2019). It causes fine feeder root damage and stem girdling lesions often leading to the death of its hosts. Before 2009 when it was described by Scott et al., *P. multivora* isolates were identified as *P. citricola*. *Phytophthora citricola* is now recognized as a species complex and has been split out into

---

multiple species: *P. acerina*, *P. capensis*, *P. caryae*, *P. multivora*, *P. pachypleura*, *P. pini*, and *P. plurivora*. The name *P. citricola* is now used only for isolates from citrus in Asia (Bezuidenhout et al., 2010; Jung and Burgess, 2009). Some records of *P. citricola* from California and elsewhere prior to 2009 may be more consistent with *P. multivora*, thus its distribution is likely underestimated (Migliorini et al., 2019).

**Hosts:** More than 75 species of mostly woody plants, including trees and shrubs native to California, the Mediterranean, Australia, and South Africa, plus avocado, citrus, alfalfa, date palm, olive, and jujube (Farr and Rossman, 2020; Rodríguez-Padrón et al., 2018).

**Symptoms:** In general, *Phytophthora* isolates previously identified as *P. citricola* were seen to cause trunk cankers and crown rots that originate at or below ground level but could also cause branch cankers. Pathogen attack is more common if the trunks or lower limbs are wounded. Ground level symptoms are discrete cankers and gummosis. Cankers are often sunken, and tissue directly beneath the cankers can be blackened. Canker expansion results in girdling of the main stem, causing dieback and death of portions of the plant above the canker. The canker often exudes red resin or sap and cutting into the canker reveals an orange-tan to brown lesion in the cambium instead of the normal white or cream-colors. The lesion may have a fruity odor when exposed. The pathogen infects the inner bark and outer layer of wood, killing both the cambium and phloem. Discoloration rarely extends deeper than the outer woody layers. Some lesions may heal. Affected plants show a gradual loss of vigor and decline of the top canopy often with smaller than normal yellowish foliage, extensive loss of fine roots, and root lesions, and occasionally aerial cankers and shoot dieback. Occasionally, in advanced stages, trees will die suddenly, with leaves turning brown within a short period of time. (Dreistadt, 2012).

In Western Australia, Scott et al. (2009) observed severe dieback and mortality of a forest stand of *Eucalyptus gomphocephala*. The trees showed crown symptoms of decline, including thinning, clustering of leaves, and dieback of branches. *Phytophthora* was recovered from the rhizosphere and fine roots. Additionally, a collar rot of *Banksia attenuata* was described as a sudden wilting and death due to the girdling of the collar, with a tongue-shaped, orange-brown necrosis of the inner bark.

**Transmission:** The pathogen may be spread to non-infected sites through infected plants, nursery and planting stock, seedlings, soil, irrigation and rain water, and contaminated cultivation equipment and tools. *Phytophthora multivora* produces thick-walled oospores able to tolerate long dry summers (Scott et al., 2012).

**Damage Potential:** In southwestern Australia, *P. multivora* is responsible for significant eucalyptus forest decline (Scott et al., 2009). *Phytophthora multivora* is the dominant and often only species routinely isolated from dead and dying woody plants in the urban environment of the city of Perth in that country (Barber et al., 2013). *Phytophthora multivora* is known to be in the nursery trades in California, and can be isolated from dead and declining native plants in nurseries and at restoration sites (Rooney-Latham et al., 2019). In the Canary Islands, *P. multivora* was the *Phytophthora* species most frequently isolated from declining avocado orchards. Some, but not all, isolates caused root necrosis in pathogenicity experiments (Rodríguez-Padrón et al., 2018). *Phytophthora multivora* was

---

also found in avocado nurseries with propagated plants and in nursery irrigation water, soil used for substrate preparation, and soil samples collected in orchards that supply seeds for seedling propagation (Rodríguez-Padrón et al., 2019). In Argentina, Grijalba et al. (2013) describes how *P. multivora* causes damaging leafspots on *Rhododendron*.

**Worldwide Distribution:** Australia, Argentina, Croatia, Hungary, Italy, Japan, South Africa, Spain, Switzerland, United Kingdom, United States (California, Maryland, and Oregon).

**Official Control:** None

**California Distribution:** Alameda, Contra Costa, Marin, Monterey, Orange, Sacramento, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, and Ventura counties. Mainly detected in nursery stock during compliance agreement surveys for *P. ramorum* and from native plant restoration sites.

**California Interceptions:** None

The risk *Phytophthora multivora* would pose to California is evaluated below.

## Consequences of Introduction:

- 1) Climate/Host Interaction:** This pathogen has become established in several climates in California and is likely to become established anywhere in the state its hosts can grow.

Evaluate if the pest would have suitable hosts and climate to establish in California.

**Score: 3**

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- Medium (2) may be able to establish in a larger but limited part of California.
- **High (3) likely to establish a widespread distribution in California.**

- 2) Known Pest Host Range:** This pathogen was previously classified as *P. citricola*, which is now considered a species complex that has been divided up into seven new species. It is likely the host range of *P. multivora* exceeds the 75 plant species currently described and will expand as pathogenicity testing is ongoing.

Evaluate the host range of the pest.

**Score: 3**

- Low (1) has a very limited host range.
  - Medium (2) has a moderate host range.
  - **High (3) has a wide host range.**
-

- 3) Pest Reproductive Potential:** *Phytophthora multivora* reproduces with multiple types of spores and is moved with water, contaminated soil, and infested nursery stock.

Evaluate the natural and artificial dispersal potential of the pest.

**Score: 2**

- Low (1) does not have high reproductive or dispersal potential.
- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

- 4) Economic Impact:** *Phytophthora multivora* has caused large losses in native forests in Australia and is known to be affecting woody plants in the California nursery trades. There are few fungicide treatments and none are curative. Strict adherence to best management practices and sanitation are necessary to keep nursery stock free from *Phytophthora* spp. The host range also includes important fruit crops including citrus, avocado and olive

Evaluate the economic impact of the pest to California using the criteria below.

**Economic Impact: A, D, G**

**A. The pest could lower crop yield.**

- B. The pest could lower crop value (includes increasing crop production costs).
- C. The pest could trigger the loss of markets (includes quarantines).

**D. The pest could negatively change normal cultural practices.**

E. The pest can vector, or is vectored, by another pestiferous organism.

F. The organism is injurious or poisonous to agriculturally important animals.

**G. The organism can interfere with the delivery or supply of water for agricultural uses.**

**Economic Impact Score: 3**

- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
- **High (3) causes 3 or more of these impacts.**

- 5) Environmental Impact:** *Phytophthora multivora* has been very damaging to the native forests of Western Australia and could do similar damage in California forests and lanscapes.

**Environmental Impact: A, B, C**

**A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.**

B. **The pest could directly affect threatened or endangered species.**

C. **The pest could impact threatened or endangered species by disrupting critical habitats.**

D. The pest could trigger additional official or private treatment programs.

E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

**Environmental Impact Score: 3**

---

- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- **High (3) causes two or more of the above to occur.**

### Consequences of Introduction to California for *Phytophthora multivora*: High

Add up the total score and include it here. **14**

- Low = 5-8 points
- Medium = 9-12 points
- High = 13-15 points**

- 6) Post Entry Distribution and Survey Information:** Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included.

**Evaluation is 'high'**. Many detections in multiple counties on multiple hosts shows this pathogen is already widespread and moving in the nursery trades (Rooney-Latham et al., 2019). If detections previously classified as *P. citricola* were included in this measure, the distribution would be statewide.

**Score: -3**

- Not established (0) Pest never detected in California or known only from incursions.
- Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
- Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
- High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.**

- 7) The final score is the consequences of introduction score minus the post entry distribution and survey information score: (Score)**

**Final Score:** *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 11*

### Uncertainty:

*Phytophthora multivora* is a relatively new name. As it becomes more widely used or as diseases formerly classified as being caused by *P. citricola* transition to *P. multivora*, the host range and the damage estimates may expand.

---

## Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Phytophthora multivora* is C.**

## References:

- Bilodeau, G. J., Martin, F. N., Coffey, M. D., and Blomquist C. L. 2014. Development of a Multiplex Assay for Genus- and Species-Specific Detection of *Phytophthora* Based on Differences in Mitochondrial Gene Order. *Phytopathology* Vol. 104, No. 7.
- Barber, P. A., Paap, T., Burgess, T. I., Dunstan, W., Hardy, G. E. S. J., 2013. A diverse range of *Phytophthora* species are associated with dying urban trees. *Urban For. Urban Green*. 12, 569–575.
- Bezuidenhout, C.M., Denman, S., Kirk, S.A., Botha, W.J., Mostert, L., McLeod, A., 2010. *Phytophthora* taxa associated with cultivated *Agathosma*, with emphasis on the *P. citricola* complex and *P. capensis* sp. nov. *Persoonia Mol. Phylogeny Evol. Fungi* 25, 32–49.
- Dreistadt, S. 2012. Integrated Pest Management for Citrus—3rd Edition. UC ANR Publication Number: 3303, 270 pg
- Farr, D. F., and Rossman, A. Y. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved March 2, 2020, from <https://nt.ars-grin.gov/fungaldatabases/>
- Grijalba P.E., Palmucci, H.E., Guillin, E. and Herrera, C. 2013. *Phytophthora multivora* causing leaf spot on rhododendrons in Argentina. *New Disease Reports* 27, 20
- Jung, T., and Burgess, T. I. 2009. Re-evaluation of *Phytophthora citricola* isolates from multiple woody hosts in Europe and North America reveals a new species, *Phytophthora plurivora* sp nov. *Persoonia* 22:95-110.
- Jung, T., Orlikowski, L., Henricot, B., Abad-Campos, P., Aday, A. G., Aguin Casal, O., Bakonyi, J., Cacciola, S. O., Cech, T., Chavarriaga, D., Corcobado, T., Cravador, A., Decourcelle, T., Denton, G., Diamandis, S., Doğmuş - Lehtijärvi, H. T., Franceschini, A., Ginetti, B., Green, S., Glavendekić, M., Hantula, J., Hartmann, G., Herrero, M., Ivic, D., Horta Jung, M., Lilja, A., Keca, N., Kramarets, V., Lyubenova, A., Machado, H., Magnano di San Lio, G., Mansilla Vázquez, P. J., Marçais, B., Matsiakh, I., Milenkovic, I., Moricca, S., Nagy, Z., ÁNechwatal, J., Olsson, C., Oszako, T., Pane, A., Paplomatas, E. J., Pintos Varela, C., Prospero, S., Rial Martínez, C., Rigling, D., Robin, C., Rytönen, A., Sánchez, M. E., Sanz Ros, A. V., Scanu, B., Schlenzig, A., Schumacher, J., Slavov, S., Solla, A., Sousa, E., Stenlid, J., Talgø, V., Tomic, Z., Tsopeles, P., Vannini, A., Vettraino, A. M., Wenneker, M., Woodward, S., and Pérez - Sierra, A. 2016. Widespread *Phytophthora* infestations in European nurseries put forest, semi-natural and horticultural ecosystems at high risk of *Phytophthora* diseases. *Forest Pathology*. 46, 134–163.
- Migliorinia, D., Khdiara, M. Y., Rodríguez Padrón, C., Vivas, M., Barbera, P. A., St J. Hardy, G. E. and Burgess, T. I. 2019. Extending the host range of *Phytophthora multivora*, a pathogen of woody plants in
-

horticulture, nurseries, urban environments and natural ecosystems. Urban Forestry & Urban Greening  
46

Rodriguez-Padron, C., Siverio, F, Perez-Sierra, A., and Rodriguez, A. 2018. Isolation and pathogenicity of *Phytophthora* species and *Phytopythium vexans* recovered from avocado orchards in the Canary Islands, including *Phytophthora niederhauserii* as a new pathogen of Avocado. *Phytopathologia Mediterranea* 57, 1, 89-106

Rodríguez-Padrón, C., Rodríguez, A. and Siverio, F. 2018. Survey in Nurseries and Irrigation Water Reservoirs as Sources of Oomycetes Found in Avocado Orchards in the Canary Islands. *Plant Disease* Vol 103. No.6

Rooney-Latham, S., Blomquist, C. L., Kosta, K. L., Gou, Y. Y., and Woods, P. W. 2019. *Phytophthora* species are common on nursery stock grown for restoration and revegetation purposes in California. *Pl. Dis.* 103(3): 448-455.

Scott, P. M., Burgess, T. I., Barber, P. A., Shearer, B. L., Stukely, M. J. C., Hardy, G. E. St. J., and Jung, T. 2009. *Phytophthora multivora* sp. nov., a new species recovered from declining *Eucalyptus*, *Banksia*, *Agonis* and other plant species in Western Australia. *Persoonia* 22: 1-13.

Scott, P. M., Jung, T., Shearer, B. L., Barber, P. A., Calver, M., Hardy, G. E. S. J. 2012. Pathogenicity of *Phytophthora multivora* to *Eucalyptus gomphocephala* and *Eucalyptus marginata*. *For. Pathol.* 42, 289–298.

### Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, California Department of Food and Agriculture, 204 West Oak Ave, Lompoc, CA. Phone: 805-736-8050, [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

---

**\*Comment Period: 04/16/2020 through 05/31/2020**

### \*NOTE:

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

---

### Comment Format:

---

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

**Example Comment:**

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to “Climate/Host Interaction” here.]

- ❖ Posted comments will not be able to be viewed immediately.
- ❖ Comments may not be posted if they:
  - Contain inappropriate language which is not germane to the pest rating proposal;
  - Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;
  - Violates agency regulations prohibiting sexual harassment or other forms of discrimination;
  - Violates agency regulations prohibiting workplace violence, including threats.
- ❖ Comments may be edited prior to posting to ensure they are entirely germane.
- ❖ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

---

**Proposed Pest Rating: C**

---