

California Pest Rating Proposal for *Phytophthora asparagi* Saude & Hausbeck 2012

Root and spear rot

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Chromista, Phylum: Oomycota,
Class: Oomycetes, Order: Peronosporales,
Family: Peronosporaceae

Comment Period: **06/24/2025 through 08/08/2025**

Initiating Event:

In December 2017, a plant pathology researcher submitted samples of suspect *Phytophthora* species to CDFA's Plant Pest Diagnostics Center at Meadowview. Their collections were made by baiting water that had been in contact with the roots of various woody plants with immature pear fruits. The woody plants were growing in a park in Santa Clara County. From the baited pears, CDFA plant pathologist Suzanne Rooney-Latham isolated multiple *Phytophthora* species and confirmed them to species with PCR and DNA sequence analysis. One of the species found was a match to *Phytophthora asparagi*, which was the first detection record for California. The host of origin and the pathogenicity of this isolate was undetermined.

In March 2025, Sonoma County nursery inspectors collected samples from a woody plant nursery as part of certification for freedom from *Phytophthora ramorum*. These samples can be symptomatic or asymptomatic. Samples were sent to CDFA's Plant Pest Diagnostics Center at Meadowview and evaluated by Plant Pathologist Wei Belisle. Of 40 samples submitted, one sample of manzanita leaves was positive for *Phytophthora* by immunoassay. From that sample, *P. asparagi* was detected in culture, and its identity was confirmed by PCR and sequencing analysis. This pathogen was assigned a temporary Z-rating. The risk to California from *Phytophthora asparagi* is described herein, and a permanent rating is proposed.

History & Status:

Background:

Phytophthoras are filamentous, osmotrophic eukaryotes that resemble fungi morphologically but belong to the class Oomycota in the kingdom Stramenopila. The genus *Phytophthora* includes some of the most destructive plant pathogens of agricultural crops, ornamental plants, and forests. The majority of the described species of *Phytophthora* are soilborne and waterborne. They primarily cause root and collar rots and occasionally bleeding stem cankers. They infect through the release of biflagellate zoospores into soil or surface water. Airborne *Phytophthora* species produce almost exclusively caducous sporangia and primarily infect aerial parts of plants, causing leaf necroses, shoot blights, fruit rots, and bleeding bark cankers on stems and branches. Aerial infections can occur with some species through detached sporangia spread by wind and rain splash (Erwin et al., 1996; Brasier, 2009).

Phytophthora has over 150 described species and informally designated taxa. *Phytophthora* species can be highly invasive, and when they are introduced to new areas, they can affect the health and life span of trees drastically, sometimes destabilizing ecosystems. Several of the most destructive epidemics of trees and forests have been caused by *Phytophthora* species, including the extensive mortality of *Quercus* spp. and *Notholithocarpus densiflorus* in California by *P. ramorum* (Rizzo et al., 2002; Grunwald et al., 2012).

Phytophthora asparagi was described from isolates collected from symptomatic asparagus in Italy (Cacciola et al. 1996) and later in Michigan (Saude et al. 2008). It has also been reported from *Agave*, *Yucca*, *Furcraea*, and *Aloe* species in Australia (Cunnington et al. 2005) and from *Agave attenuata* in Italy (Cacciola et al. 2006). It has been isolated from the rhizosphere soil beneath declining *Asparagus albus*, *Juniperus phoenicea*, and *Pistacia lentiscus* in Italy (Scanu et al. 2015), and from *Aloe* sp. with basal leaf and root rot in Greece (Kalogeropoulou, 2024). *Phytophthora asparagi* is the only species in *Phytophthora* clade 6 subclade e. A clade is a taxonomic group of organisms classified together based on homologous features traced to a common ancestor. It is homothallic, and there are conflicting reports as to the presence (Kalogeropoulou, 2024) or absence (Abad et al., 2023a) of chlamydospores for various isolates within the species.

Crown and spear rot was first reported on asparagus in California in 1938. It was found by survey to be widespread in Northern California by the 1980s, and it was identified by morphology as *Phytophthora megasperma* var. *sojae* (Falloon et al., 1983). Although its occurrence is erratic, it is now present in all asparagus production areas of the state (Aegerter and Davis, 2009). *Phytophthora megasperma* var. *sojae* has a close taxonomic relationship to *P. asparagi*: they are both in clade 6, subclades b and e, respectively (Abad et al., 2023b). The standard identification method for *Phytophthora* today is to perform DNA sequencing to determine the species. The sequence data for *P. asparagi* was elucidated in 2012 by Granke et al., and its taxonomic relationship to other members of clade 6 was published in 2023 by Abad et al. There has not been any work on *Phytophthora* disease(s) of asparagus published in California since the description of *P. asparagi* nov. sp.

Hosts: Asparagus albus (white asparagus), *A. officinalis* (garden asparagus), *Juniperus phoenicea* (Phoenicean juniper), *Lomandra sonderi* (green mat rush), *Manzanita* sp., *Pistacia lentiscus* (mastic tree) (Farr and Rossman, 2025; CDFA PDR database, 2025).

Symptoms: Symptoms on asparagus include slightly sunken, water-soaked lesions on shoots at, slightly above, or below the soil line (spear rot). If conditions are wet, the lesions become slimy and smelly because of invasion by secondary bacteria. Under favorable conditions, lesions will rapidly elongate and turn light brown, and spears will develop a crooked appearance with lesions on the inside of the crook. This symptom alone is not diagnostic because insects, slugs, and mechanical injury can also result in crooked spears. If conditions are dry, the lesion may become light brown, and the spear may shrivel (Green et al., 2005).

Infected crowns develop yellow-brown colored tissue, which may appear water-soaked or fibrous. Infected newly formed storage roots appear white and slightly transparent, while fleshy storage roots appear reddish-brown and can be hollow. Root mass and vigor can be reduced. Internal tissues of the infected crowns may be yellow to brown (Saude et al., 2008)

Transmission: Soilborne *Phytophthora* species can survive as spores in soil or water with infected roots and organic debris. The movement of contaminated soil and water and infected plants for planting are the major pathways for *Phytophthora* movement on a regional, national, or international scale. *Phytophthora* infestations of nursery stock are well documented in Oregon (Parke et al., 2014) and California (Rooney-Latham et al., 2019). Nursery stock is seen as a major pathway of *Phytophthora* diseases into forests and semi-natural ecosystems within and between continents (Jung et al., 2016).

Asparagus is typically grown from crowns (one-year-old root systems with buds), rather than seeds. This method of crop production is a high risk for moving pathogens. In agricultural fields, it can be spread with soil through cultivation and with contaminated equipment or machinery. Propagules of the pathogen can also be moved with irrigation water.

Damage Potential: *Phytophthora* spear and root rot of asparagus is associated with crop loss; however, it varies among growing seasons and sites. The pathogen is highly favored by excessive rainfall and poor soil drainage. Disease development is most severe following heavy rains and with poorly draining soil. However, infection occurring during the winter when the plant tissue is dormant is thought to have less impact on yield compared with infection in spring, which can lead to substantial spear and crown rot (Green et al., 2005). Inoculated field trials with *P. megasperma* var. *sojae* conducted at UC Davis showed a 33% increase in yield when the disease was controlled with fungicides vs. an untreated control (Falloon et al., 1983).

In Greece, cultivated Aloe vera suffered a 10% loss due to this disease (Kalogeropoulou, 2024). *Phytophthora asparagi* was the most frequently isolated *Phytophthora* sp. (25% of all isolates) from declining Mediterranean maquis vegetation in Italy (Scanu et al., 2015). The potential damage from where it was found in California, on the foliage of manzanita, is unknown.

Worldwide Distribution: Australia, China, Greece, Italy, Japan, New Zealand, South Africa, United Kingdom, United States (Michigan) (Farr and Rossman, 2025; CABI, 2025).

Official Control: none

California Distribution: Santa Clara and Sonoma counties.

California Interceptions: none

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

Consequences of Introduction:

- 1) **Climate/Host Interaction:** *Phytophthora* disease on asparagus has been found in all production areas of California. *Phytophthora* disease on woody plants also occurs statewide.

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 be established in a larger but limited part of California.
- **High (3) likely to establish a widespread distribution in California.**

- 2) **Known Pest Host Range:** There are hosts in multiple plant families.

Evaluate the host range of the pest.

Score: 2

- 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:** This species produces sporangia and oogonia, and sometimes with chlamydospores. It is unknown if it has an aerial phase and if it can infect or sporulate on foliage.

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:** Crop losses on asparagus can be significant, especially when there are spear infections. Impacts have also been reported on aloes and agaves, and on woody plants in Europe. The pathogen can move with contaminated irrigation water.

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

Economic Impact: A, B, G

- A. The pest could lower crop yield.**
 - B. The pest could lower crop value (including increasing crop production costs).**
 - C. The pest could trigger the loss of markets (including 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:** As a relatively newly described species of *Phytophthora*, its host range is likely to expand. It has the potential to become invasive and to have a host range that includes California natives. It has been isolated from manzanita nursery stock and has been found associated with woody plant roots in a county park.

Evaluate the environmental impact of the pest on California using the criteria below.

Environmental Impact: A, B, E

- 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 asparagi*: High

Add up the total score and include it here. **13**

- 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.

Phytophthora asparagi was isolated from pears baited with water associated with the roots and soil of woody plants growing in Santa Clara County. Although not counted towards distribution, it was also found in a nursery in Sonoma County.

Evaluation is 'low'.

Score: -1

-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 the 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 = 12*

Uncertainty:

Crown and spear rot is a known problem of asparagus in California, attributed to *Phytophthora megasperma* var. *sojae*, and *Phytophthora* spp. by morphology (Falloon et al., 1983; Aegerter and Davis, 2009). Significant advances in our ability to make species identification of *Phytophthora* have occurred since earlier reports have been published. It is possible that *P. asparagi*, not *P. megasperma* var *sojae*, is the pathogen affecting asparagus in all growing regions of California (B. Aegerter, UCCE and S. Rooney-Latham, CDFA, Pers. Comm.). Additional surveys are needed.

Conclusion and Rating Justification:

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

References:

Abad, Z.G., Burgess, T.I., Redford, A.J., Bienapfl, J.C. 2023a. IDphy: An International online resource for molecular and morphological identification of *Phytophthora* based on type specimens. Plant Disease 107: 987–998.

Abad, Z.G., Burgess, T.I., Bourret, T., Bensch, K., Cacciola, S.O., Scanu, B., Mathew, R., Kasiborski, B., Srivastava, S., Kageyama, K. and Bienapf, J.C., 2023b. *Phytophthora*: taxonomic and phylogenetic revision of the genus. *Studies in Mycology*, 106(1), pp.259-348.

Aegerter, B. J. and Davis, R. M. 2009. UC IPM Pest Management Guidelines: Asparagus Crown and Spear Rot. UC ANR Publication 3435

Brasier, C., 2009. *Phytophthora* biodiversity: How many *Phytophthora* species are there. In: *Phytophthoras in forests and natural ecosystems*. Proceedings of the 4th IUFRO Working Party S07.02.09 Meeting. Ed. by Goheen, E. M.; Frankel, S. J. Albany, CA: USDA Forest Service, Pacific Southwest Research Station, Gen. Tech. Rep. PSW-GTR-221: pp. 101–115.

CABI Compendium. 2025. <https://doi.org/10.1079/cabicompendium.117973> accessed 5/18/25

Cacciola, S.O., Cavanni, P., Biocca, M. and Prisco, P. 1996. Variabilità del fenotipo elettroforetico di isolati italiani di *Phytophthora megasperma*. *Informatore Fitopatologico*, 7–8, 33–38.

Cacciola, S.O., Pane, A., Raudino, F., Chimento, A., Scibetta, S., Davino, S. and Magnano Di San Lio, G., 2006. Bud and heart rot of fox tail agave (*Agave attenuata*) caused by *Phytophthora asparagi*. *Journal of Plant Pathology*, 88, pp.S34-S34.

Cunnington, J.H., De Alwis, S., Pascoe, I.G. and Symes, P., 2005. The ‘asparagus’ *Phytophthora* infecting members of the Agavaceae at the Royal Botanic Gardens, Melbourne. *Australasian Plant Pathology*, 34(3), pp.413-414.

Erwin, D. C., and Ribeiro, O. K. 1996. *Phytophthora* Disease Worldwide. St Paul, MN: The American Phytopathological Society

EPPO Database. *Phytophthora asparagi*. 2025. <https://gd.eppo.int/taxon/PHYTAS> Accessed 5/16/2025

Falloon, P., Falloon, L., Mullen, R., Benson, B. and Grogan, R., 1983. Effect of *Phytophthora* spear rot on asparagus yield. *California Agriculture*, 37(7), pp.16-17.

Farr, D.F., and Rossman, A.Y. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved 5/16/2025, from <https://nt.ars-grin.gov/fungaldatabases/>

Granke, L.L., Saude, C., Windstam, S.T., Webster, B.J., and Hausbeck, M.K. 2012. *Phytophthora asparagi* Saude & Hausbeck, sp. nov. *Persoonia* 28: 146–147. In Crous et al. *Fungal Planet* description sheets: 107–127. *Persoonia* 28: 138–182

Green, K.R., Dyer, W., Falloon, P.G., Cooke, D.E.L. and Chimento, A., 2005, June. Management of *Phytophthora* rot on UK asparagus crops. In XI International Asparagus Symposium 776 (pp. 175-182).

Grunwald, N. J., Garbelotto, M., Goss, E. M., Heungens, K., Prospero, S., 2012: Emergence of the sudden oak death pathogen *Phytophthora ramorum*. Trends Microbiol. 20, 131–138.

Jung, T., Orlikowski, L., Henricot, B., Abad - Campos, P., Aday, A.G., Aguín Casal, O., Bakonyi, J., Cacciola, S.O., Cech, T., Chavarriaga, D. and Corcobado, T., 2016. Widespread *Phytophthora* infestations in European nurseries put forest, semi - natural and horticultural ecosystems at high risk of *Phytophthora* diseases. Forest Pathology, 46(2), pp.134-163.

Kalogeropoulou, E., 2024. First report of *Phytophthora asparagi* causing basal leaf and root rot of *Aloe vera* in Greece. Plant Disease, 108(3), p.822.

Parke, J.L., Knaus, B.J., Fieland, V.J., Lewis, C. and Grunwald, N.J., 2014. *Phytophthora* community structure analyses in Oregon nurseries inform systems approaches to disease management. Phytopathology, 104(10), pp.1052-1062.

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. Plant Disease, 103(3), pp.448-455.

Rizzo, D. M.; Garbelotto, M.; Davidson, J. M.; Slaughter, G. W.; Koike, S. T., 2002. *Phytophthora ramorum* as the cause of extensive mortality of *Quercus* spp. and *Lithocarpus densiflorus* in California. Plant Dis. 86, 205–214.

Saude, C., Hurtado-Gonzales, O.P., Lamour, K.H. and Hausbeck, M.K., 2008. Occurrence and characterization of a *Phytophthora* sp. pathogenic to asparagus (*Asparagus officinalis*) in Michigan. Phytopathology, 98(10), pp.1075-1083.

Scanu, B., Linaldeddu, B.T., Deidda, A. and Jung, T., 2015. Diversity of *Phytophthora* species from declining Mediterranean maquis vegetation, including two new species, *Phytophthora crassamura* and *P. ornamentata* sp. nov. PLoS One, 10(12), p.e0143234.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Phytophthora asparagi* Accessed 5/16/2025.

Responsible Party:

Heather J. Martin, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

***Comment Period: 06/24/2025 through 08/08/2025**

***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
