CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Profile for

Cryptostroma corticale (Ellis & Everhart) Gregory & Waller 1951
Sooty bark disease of sycamore and maple

Pest Rating: C

Kingdom: Fungi, Phylum: Ascomycota,
Subphylum: Pezizomycotina

Comment Period: 11/15/2024 through 12/30/2024

Initiating Event:

In June 2019, an arborist submitted a sample of red maple (*Acer rubrum*) from a residence in El Dorado County to CDFA's Plant Pest Diagnostics Center. He reported that the tree had shown symptoms of serious decline the previous fall and failed to leaf out in the spring. CDFA Plant Pathologist Suzanne Rooney-Latham cultured a fungus from the sample and diagnosed it as *Cryptostroma corticale*. In November 2022 and February 2023, Cal Fire tree health experts submitted samples to CDFA from four maples planted decades earlier at a residence in Sacramento County. The trees were silver maples (*Acer saccharinum*) and a Norway maple (*A. platanoides*). Extensive bark cankers were visible on the trees and Suzanne Rooney-Latham detected *C. corticale* in culture and confirmed her diagnosis with DNA sequencing. She assigned *C. corticale* a temporary Z rating. This pathogen has not been through the pest rating process. The risk to California from *Cryptostroma corticale* is described herein and a permanent rating is proposed.

History & Status:

Background: *Cryptostroma corticale* is presumed to be native to the Great Lakes Region of North America. It was first described from material collected in Ontario and later found in Wisconsin. It was accidentally introduced to the United Kingdom around 1945. Initially, it was thought to function as a saprophyte fruiting on dead wood a year or two after a tree had died (Gregory and Waller, 1951). It is now considered an invasive pathogen, and it causes widespread sooty bark disease on maples and sycamores across Europe (CABI, 2024). *Cryptostroma corticale* can grow as an endophyte or a pathogen. Spores (conidia) of the fungus can be spread over 300 km in the air (Muller et al., 2023). It is also a human pathogen infecting the respiratory system. Workers processing infected wood or taking down infected trees can develop hypersensitivity pneumonitis (maple bark strippers' lung) (Braun et al., 2021).

In western Washington, and British Columbia, Canada, *C. corticale* is becoming increasingly widespread, killing forest and urban maple trees (Brooks et al., 2023; Tanney et al., 2024). For California, it has the potential to impact native maples in forest settings, planted maples in urban areas (both native and non-native), and human health. Sooty bark disease has been previously shown to increase in severity and occurrence under drought and warm conditions (Kespohl et al., 2022).

Hosts: Acer campestre (field maple), *A. japonicum* (amur maple) *A. macrophyllum* (bigleaf maple), *A. negundo* (boxelder maple), *A. rubrum* (red maple), *A. palmatum* (Japanese maple), *A. platanoides* (Norway maple), *A. pseudoplatanus* (sycamore maple), *A. saccharum* (sugar maple), *Aesculus hippocastanum* (horse chestnut), *Cornus nuttallii* (pacific dogwood), *Fraxinus* sp. (ash) (Farr and Rossman, 2024; CABI, 2024; Worral 2020).

Symptoms: Symptoms consisted of bark blistering and shedding, with long and broad black stripes, resulting in thick layers of fungal spores forming blackish stains under the bark. The spores germinate on injured wood and the fungus spreads into the vascular system, moving from upper branches to the main stem. Once living wood is colonized, the pathogen can remain quiescent, as a latent endophyte and the tree can remain asymptomatic, sometimes for years (Kelnarová et al., 2017). When the tree experiences stress, often heat or drought but also flooding, the fungus becomes active and disease symptoms develop (Schlößer et al., 2023).

Internal symptoms are very similar to other vascular diseases like Verticillium wilt. There is wilting of foliage, dieback first of small branches but then progressively larger branches, with general tree decline. In the final stages of the disease, the bark blisters as the subcortical stromata are produced. These characteristic fruiting bodies are observed as dark, dry, sometimes powdery, and sooty-like patches sunken into the bark of the tree, which typically appear as bands or patches that run parallel to the stem (Gregory and Waller, 1951). The tree can release millions or even trillions of airborne conidia (Koukol et al., 2014). This is the stage that gives the disease the name of sooty canker. Tree mortality can be as fast as one year or take as long as seven years. (Brooks et al., 2022).

Transmission: The disease is spread by airborne asexual spores of the pathogen that enter wounds, especially broken branches (Gregory and Waller, 1951). Spores can be spread hundreds of kilometers in the air (Muller et al., 2022). Nursery stock is not considered a pathway as this is not a disease of young trees. It is not known to be seed-borne. Spreading by moving cut branches from infected trees is a possibility for long-distance transmission.

Damage Potential: Cryptostroma corticale is probably widespread as a latent endophyte in susceptible maples (Kelnarová et al., 2017). The actual outbreaks of sooty bark disease are likely to be triggered by climatical factors, especially drought and high temperatures (Burgdorf et al., 2022). On infected trees, the sapwood and heartwood are discolored, degraded, and visually decayed with significant branch dieback, reducing the ornamental value of trees (Ogris et al., 2021). Tree dieback has been reported in Washington by Brooks et al., 2022. Urban trees can provide tremendous value to neighborhoods and can result in huge costs to remove them safely to prevent workers from inhaling spores.

Maple bark strippers' disease is an uncommon condition caused by exposure to the spores of *C. corticale*. The disease has been found among workers in the paper industry employed to debark, cut, and chip maple logs. The symptoms include breathlessness, fever, night sweats, chills, and weight loss. Huge numbers of spores can be released even before the tree dies, and removing or harvesting dead-standing trees can endanger workers (Braun et al., 2021). Forest workers are advised to wear personal protective equipment when working around dead and diseased trees. It is advised to consult a certified arborist and to use machine felling rather than chainsaws. Working during wet weather helps to reduce the number of airborne spores. Diseased wood should not be used for firewood. It should be covered during transport and buried (https://forestpathology.org/canker/sooty-bark-maple/).

Worldwide Distribution: Austria, Belgium, Bulgaria, Canada, Czechia, France, Germany, Italy, Netherlands, Russia, Slovenia, Switzerland, United Kingdom, United States (*California, Michigan, North Carolina, Oregon, Tennessee*, *Wisconsin, Washington*) (CABI, 2024).

Official Control*: Cryptostroma corticale* is on the USDA PCIT's harmful organisms list for Colombia and The Republic of Korea (USDA PCIT 2024).

California Distribution: El Dorado and Sacramento counties

California Interceptions: none

The risk that *Cryptostroma corticale* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This disease is likely to establish wherever its hosts are grown.

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

   Score: **2**
   - 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:** The host range is mainly *Acer* spp. but has been reported on trees in other 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 pathogen produces huge numbers of conidia which are airborne.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 3

- 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:** This disease is causing economic damage in Europe and western Washington. Removing diseased trees safely also has an economic cost.

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

Economic Impact: A, B, C, D

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:** This pathogen is a threat to native *Acer* spp. and potentially others. It impacts cultural practices and ornamental plantings.

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

Environmental Impact: A, 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 *Cryptostroma corticale:* High

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

   There are records from El Dorado and Sacramento counties.

   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:

The spread of this disease in California will likely follow the trajectory seen in Europe and Washington State. It's unlikely that any intervention can prevent or control disease spread.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Cryptostroma corticale*** **is C.**

References:

Burgdorf, N., Härtl, L. and Hahn, W.A., 2022. Sooty Bark Disease in Sycamore: Seasonal and Vertical Variation in Spore Release of *Cryptostroma corticale*. Forests, 13(11), p.1956.

Braun, M., Klingelhöfer, D., and Groneberg, D.A., 2021. Sooty bark disease of maples: the risk for hypersensitivity pneumonitis by fungal spores not only for woodman. Journal of Occupational Medicine and Toxicology, 16, pp.1-7.

Brooks, R., Hulbert, J., Elliott, M., Omdal, D., and Chastagner, G. 2022. Sooty bark disease diagnostic guide. FS325E, WSU Extension. https://pubs.extension.wsu.edu/sooty-bark-disease-diagnostic-guide

Brooks, R.K., Omdal, D., Brown, S., Marshall, C.J., Hulbert, J.M., Elliott, M. and Chastagner, G., 2023. *Cryptostroma corticale*, the causal agent of sooty bark disease of maple, appears widespread in western Washington State, USA. Forest Pathology, 53(6), p.e12835.

CABI Compendium. 2024. *Cryptostroma corticale* (sooty bark disease of sycamore) https://doi.org/10.1079/cabicompendium.16449 Accessed 10/28/2024

EPPO Database. https://gd.eppo.int/taxon/CRPSCO Accessed 10/28/2024

Farr, D.F., and Rossman, A.Y. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved 10/28/2024, from https://nt.ars-grin.gov/fungaldatabases/

Gregory, P.H. and Waller, S., 1951. *Cryptostroma corticale* and sooty bark disease of sycamore (*Acer pseudoplatanus*). Transactions of the British Mycological Society, 34(4), pp.579-IN10.

Kelnarová, I., Černý, K., Zahradník, D. and Koukol, O., 2017. Widespread latent infection of *Cryptostroma corticale* in asymptomatic *Acer pseudoplatanus* as a risk for urban plantations. Forest Pathology, 47(4), p.e12344.

Kespohl, S., Riebesehl, J., Grüner, J. and Raulf, M., 2022. Impact of climate change on wood and woodworkers—*Cryptostroma corticale* (sooty bark disease): a risk factor for trees and exposed employees. Frontiers in Public Health, 10, p.973686.

Koukol, O., Kelnarová, I. and Černý, K., 2015. Recent observations of sooty bark disease of sycamore maple in Prague (Czech Republic) and the phylogenetic placement of *Cryptostroma corticale*. Forest Pathology, 45(1), pp.21-27.

Muller, E., Dvořák, M., Marçais, B., Caeiro, E., Clot, B., Desprez-Loustau, M.L., Gedda, B., Lundén, K., Migliorini, D., Oliver, G. and Ramos, A.P., 2023. Conditions of emergence of the Sooty Bark Disease and aerobiology of *Cryptostroma corticale* in Europe. NeoBiota, 84, pp.319-347.

Ogris, N., Brglez, A. and Piškur, B., 2021. Drought stress can induce the pathogenicity of *Cryptostroma corticale*, the causal agent of sooty bark disease of sycamore maple. Forests, 12(3), p.377.

Schlößer, R., Bien, S., Langer, G.J. and Langer, E.J., 2023. Fungi associated with woody tissues of *Acer pseudoplatanus* in forest stands with different health status concerning sooty bark disease (*Cryptostroma corticale*). Mycological Progress, 22(2), p.13.

Tanney, J.B., Feau, N., Shamoun, S.F., Kope, H.H., Dicaire, A., Drugmand, B., Walker, J., Burlakoti, P. and Joshi, V., 2024. *Cryptostroma corticale* (Ellis & Everh.) PH Greg. & S. Waller causing sooty bark disease in British Columbia, Canada. Canadian Journal of Plant Pathology, pp.1-15.

Worral, J. J. 2020. https://forestpathology.org/canker/sooty-bark-maple/ (accessed 25 October 2024).

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***Comment Period: 11/15/2024 through 12/30/2024**

***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.

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.

Pest Rating: C
