California Pest Rating Proposal for

Meloidogyne partityla Kleynhans, 1986
Pecan root-knot nematode

Current Pest Rating: none

Proposed Pest Rating: A

Kingdom: Animalia, Phylum: Nematoda,
Class: Secernentea, Order: Tylenchida,
Superfamily: Tylenchoidea,
Family: Heteroderidae, Subfamily: Meloidogyninae

Comment Period: 05/14/2026 through 06/28/2026

Initiating Event:

This pathogen has not been through the pest rating process. The risk to California from *Meloidogyne partityla* is described herein, and a permanent rating is proposed.

History & Status:

Background:

Meloidogyne spp. are obligate, sedentary endoparasites that feed within host plant roots. The effect of root-knot nematodes on plants can be dramatic. As a result of their feeding, large galls or “knots” are formed on the root systems, which impair the plant’s ability to take up water and nutrients from the soil (Chitambar et al., 2018). *Meloidogyne* is a name of Greek origin, meaning "apple-shaped female." Adult females, globose and sedentary, are found embedded in their host’s roots. They produce eggs in a gelatinous matrix either on the root surface or within root tissues. Many *Meloidogyne* spp. can reproduce by mitotic parthenogenesis, meaning that males are not necessary and viable eggs can be produced by females alone in the absence of fertilization. *Meloidogyne partityla* does have vermiform males, and it can be presumed that reproduction is at least partially by amphimixis (Kleynhans, 1986).

Eggs hatch in the soil, and vermiform juveniles swim to new roots (Mitkowski and Abawi, 2003). The first-stage juvenile develops within the egg and molts to develop into the second stage. The second-stage juveniles (J2) are the infective stage that hatch from eggs and migrate through the rhizosphere soil to host roots. The J2s penetrate the host roots and establish a specialized feeding site that is formed at the head end of the nematode in response to its feeding. They become sedentary while

feeding at the specialized site, increasing in size, and undergoing two more molts and non-feeding stages before developing into mature adult females or vermiform males and completing the life cycle.

A feeding site is a group of plant cells, known as "giant cells", created when the nematode injects secretory proteins that stimulate changes within the parasitized cells. The injected cells rapidly become multinucleate when division occurs without cell wall formation. Giant cells can be very large and act as significant nutrient sinks, producing large amounts of proteins that the nematodes can use. Increases in the production of plant growth regulators from nematode feeding also play a role in this increase in cell size and division. Root cells next to the giant cells enlarge and divide rapidly, resulting in gall formation. Once a female establishes a feeding site as a juvenile, she permanently remains within the plant root, extruding eggs into a gelatinous matrix on or just outside the root surface (Perry and Moens, 2013).

In California, pecans are grown as a specialty crop, with commercial production centered in the Central Valley, particularly in Kern, Tulare, and Fresno counties, totaling about 4,000 acres. In addition, California produces 99% of the U.S. commercial walnut supply and nearly two-thirds of the world's supply. The 2025 forecast estimated a production of 710,000 tons of walnuts from 365,000 bearing acres, representing an 18% increase from 2024. Walnuts are a top 20 commodity in California with over $1 billion in annual value (CDFA Ag Statistics, 2025).

Meloidogyne partityla was first described in 1986 by K.P.N. Kleynhans from specimens collected on pecan (*Carya illinoinensis*) roots in the Transvaal Lowveld region of South Africa. The first detection in the United States was by Starr et al. 1996 when they isolated it from declining pecan orchards in Texas. *Meloidogyne partityla* is thought to be native to the southern United States, and it was likely accidentally introduced to South Africa in the first half of the 20th century via imported pecan seedlings (Kleynhans, 1986). The species epithet *partityla* derives from the Latin *partitus* (divided) and Greek *tyla* (knot), alluding to the distinctive partially divided perineal pattern in adult females.

Meloidogyne partityla is notable for having a narrow host range, restricted primarily to Juglandaceae and some Fagaceae species. This specificity contrasts sharply with common polyphagous *Meloidogyne* species like *M. enterolobii, M. incognita,* and *M. javanica,* which have host ranges including members of multiple plant families (Starr et al., 1996).

Hosts: Carya ovata (shagbark hickory) *C. illinoinensis* (pecan), *Juglans regia* (English walnut), *J. hindsii* (California black walnut), *Quercus laurifolia* (laurel oak), *Q. nigra* (water oak), and *Q. stellata* (post oak) (Kleynhans et al.,1986; Brito et al., 2016; Khanal et al., 2016).

Symptoms: Above-ground symptoms of nematode feeding are general decline symptoms and are not diagnostic. Infected pecan seedling beds show patchy areas of stunted growth. Pecan trees infected with *M. partityla* exhibit leaf yellowing, stunted growth, and dead branches in the upper canopy. This type of canopy damage is commonly referred to as “mouse ear disorder” and has been associated with infection by *M. partityla* on pecans in Georgia (Nyczepir et al., 2006). Infected plants will exhibit root swellings and prominent galls as signs of root-knot nematode on major roots as well as younger roots (Brito et al., 2016).

Transmission: Meloidogyne partityla has a limited ability to move in the field. Only second-stage juveniles and males can swim within the soil, and their range is typically restricted to tens of centimeters per year at most. The most probable way for *M. partityla* to be introduced to a new area is through the transportation of infested or contaminated planting materials. Nematodes can easily be carried by infested seedlings. Additionally, the movement of non-host plants intended for planting, like seedling transplants or nursery stock, as well as non-host plant products such as bulbs, tubers, corms, and rhizomes, can contribute to the spread of *M. partityla* if they are contaminated with soil infested by the nematodes. Another potential pathway for its spread is through the movement of bulk soil. Contaminated irrigation water can also facilitate nematode movement (Chitambar et al., 2018).

Damage Potential: The nematodes invade young roots, transforming cells into specialized feeding sites that disrupt vascular function and inhibit fine root development, leading to reduced water and nutrient uptake. Trees lose vigor and yield. Dead wood accumulates, with branches failing to leaf out fully or losing foliage shortly after emergence, exacerbating overall canopy thinning. The economic impact can include significant yield reductions in pecan orchards, with infested trees showing gradual deterioration. If infected in the nursery, seedlings fail to thrive. Damage is particularly severe in sandy soils, where rapid nematode colonization occurs. *Meloidogyne partityla* exacerbates injury from drought, heavy nut production years, or co-occurring nematodes by further weakening root systems (Lujan et al., 2010; Nyczepir and Wood, 2012).

Worldwide Distribution: South Africa, United States (*Arkansas, Arizona, Florida, Georgia, New Mexico, Oklahoma, and Texas*) (Nemaplex, 2010; Khanal et al., 2016). There is a preliminary report from Argentina (Cap et al., 2024).

Official Control*: Meloidogyne partityla* is on the USDA PCIT's Harmful Organism List for Peru (USDA-PCIT, 2026).

California Distribution: none

California Interceptions: none

The risk that *Meloidogyne partityla* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This nematode is likely to be able to establish wherever its hosts can grow.

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 walnuts, pecans, and some species of oaks.

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:** *Meloidogyne partityla* has high potential for reproduction. A single female may produce several hundred eggs in an egg mass, similar to other *Meloidogyne* species. Dispersal is mainly passive through the movement of infected roots, planting stock, infested soil, and irrigation water.

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:** Orchards with populations of *M. partityla* suffer decreased tree growth and yields.

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

Economic Impact: A, B, C, 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 pathogen of native California black walnut, this pest could have significant impacts. The susceptibility of native oak species is unknown. It could also impact home orchards.

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 *Meloidogyne partityla:* 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.

Evaluation is 'Not Established'.

Score: 0
-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 is 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 consequence 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* ***= 13***

Uncertainty:

Expertise is required to distinguish *M. partityla* from common co-occurring species like *M. incognita* and *M. javanica* in mixed populations in nut orchards. Mixed populations increase the difficulty in assessing the relative damage from the different species.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for ***Meloidogyne partityla*** **is A.**

References:

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Responsible Party:

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***Comment Period: 05/14/2026 through 06/28/2026**

***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.

Proposed Pest Rating: A