

California Pest Rating Proposal for
***Amyntas agrestis* Goto & Hatai, 1899**
Jumping worm

Current Pest Rating: A

Proposed Pest Rating: A

Domain: Eukaryota, Kingdom: Metazoa,
Phylum: Annelida, Class: Oligochaeta,
Order: Haplotaxida

Comment Period: May 17, 2017 – July 1, 2017

Initiating Event:

On May 3, 2017, Nick Condos, then Director of Plant Health at CDFA, requested information on *Amyntas agrestis*, an invasive annelid, in California. The status and risk of this pest to California’s agricultural and natural environments was assessed by then Primary Plant Pathologist and Nematologist, John Chitambar. An “A” rating was proposed and finalized on May 17, 2017.

On November 11, 2021, CDFA’s Diversity, Equality, and Inclusion (DEI) steering committee received a request from Tunyalee Martin, Associate Director for Communications, University of California Statewide Integrated Pest Management Program, to officially use another common name for this worm other than the one that was used in 2017, specifically one that that doesn’t reference geography or use stigmatizing language. This pest rating proposal is revised to make that change, and to update the information with one California detection in containerized nursery stock.

History & Status:

Background: *Amyntas agrestis*, commonly known as jumping worm, crazy worm, wood eel, jumpers, wigglers, snake worm, and Alabama jumper, is an invasive earthworm that is native to East Asia (Japan and Korean Peninsula). These earthworms are extremely active, aggressive, and have voracious appetites. True to their name, they jump (known to jump off the ground or out of a bait can) and thrash immediately when handled behaving more like a threatened snake than a worm, sometimes even breaking and shedding their tail when caught (Williams, 2014). Jumping worms are considered aggressive as they out-compete common European earthworms (Tiddens, 2015). These worms are up

to 8 inches in length and are characteristically marked by a light (milky white to gray) band (clitellum) around a dark body. They breed en masse and constantly produce cocoons at the soil surface (Barncard, 2014; Williams, 2014; Tennesen, 2009). Hatchlings have been observed after air temperatures reached above 10°C and die when air temperatures reach below 5°C. Adults develop in about 60 days (or in lab studies, 77-93 days at 1000°C growing degree days accumulated from time of hatching). They can reproduce without mating or asexually (parthenogenetic). Cocoons can survive at soil temperatures below -20°C (Görres et al., 2016). Taxonomically, *Amyntas agrestis* are annelid ringed or segmented worms in the family Megascolecidae, and subclass Oligochaeta of the phylum Annelida.

Amyntas agrestis is not regulated by the State's Fish and Game Code or the California Code of Regulations. Bait regulations (section 4) would allow *A. agrestis* as bait: "Legally acquired and possessed invertebrates...may be used for bait". Subsections a-f of section 4 provide exceptions to this, none of which apply to *A. agrestis* (Personal communications: Martha Volkoff, Environmental Program Manager, Invasive Species Program, California Department of Fish and Wildlife).

Hosts: *Amyntas agrestis* has been found in deciduous and mixed deciduous-coniferous forests, hardwood forests, compost, mulched beds, ornamental beds amended with municipal leaf litter waste, plant containers and gardens (Görres, 2014).

Symptoms: *Amyntas agrestis* is a large pheretimoid earthworm that lives at the soil surface and constructs shallow, temporary burrows in upper topsoil layers. They voraciously consume leaf litter and associated microorganisms and produce large quantities of casting material that changes the physical, chemical, and biotic properties of the topsoil. They are highly active, exhibiting a unique thrashing behavior when disturbed and a serpentine style of locomotion that makes them conspicuous surface occupants. They are usually very successful colonizers and competitively dominate newly invaded environments, negatively impacting other earthworm species (Burtelow et al, 1998; Redmond et al., 2014).

Transmission: On their own, *Amyntas agrestis* can only move 5-10 meters in a year. Possible rapid means of long-distance spread to non-infested sites are, therefore, passive and through worm-contaminated soil and leaf debris adhering to off-road vehicles, municipal leaf litter waste, bait used by anglers, logging equipment, nursery field and container stock, compost, and mulch (Görres, 2014; Tennesen, 2009).

Earthworms purported to be *A. agrestis* can also be ordered online (Ziemba et al., 2016). Earth-moving activities (e.g., road building) have been shown to act as pathways of introduction and spread for other invasive earthworms, being a potential route of transport for *A. agrestis*.

Damage Potential: Unlike other earthworms that are considered friends of the ecosystem due to their ability to loosen and aerate soil, jumping worms pose a significant threat to forest health (Barncard, 2014). They are destructive and cause severe damage to hardwood forests, especially those consisting of maple, basswood, red oak, poplar or birch species that rely on thick layers of leaf litter that serve as rooting medium. Jumping worms are voracious feeders and can devour such a thick organic mat so to

deplete it completely in 2-5 years (Tennesen, 2009). Consequently, these earthworms disrupt the natural decomposition of leaf litter on forest floors turning the soil into grainy, dry worm castings that cannot support understory forest plants and alter forest soils from a fungal to a bacterial-dominated system, which speeds up the conversion of leaf debris to mineral compounds thereby robbing plants of organic nutrients. Also, by clearing the forest floors of understory plants and leaf debris, the worms encourage erosion and provide more accessible avenues for infection by other invasive species of organisms. Some northern hardwood forests that once had a lush understory are reported to now have only a single species of native herb and virtually no tree seedlings. They can also cause harm to ornamental plantings and turf. Demise of lawns due to abundant castings of this earthworm have been reported in Connecticut. Once established in environment, jumping worms are impossible to eradicate. Jumping worms have been found in abundance in nursery field and container stock, as well as in mulch and compost that may then be transported to residential and commercial gardens and parks thereby threatening production and resulting in significant losses in horticultural crop production (Görres, 2014; Tennesen, 2009).

Worldwide Distribution: These jumping worms were originally found in Japan and the Korean peninsula and are believed to have been introduced to the USA and Canada through landscape plants imported from those native Asian regions (Barncard, 2014). They have been reported in Alabama, Connecticut, Florida, Georgia, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia, and Wisconsin (Loria, 2014; Tiddens, 2015; Görres, 2014; Görres et al., 2016; CABI ISC, 2020).

A different species, *Amyntas gracilis*, apparently very similar to *A. agrestis*, was reported in 2016 from Oregon – including within Josephine County, which borders California. Some articles have reported the worm in Oregon as *A. agrestis*, but the lead agency in Oregon for this pest, Oregon Department of Agriculture, has record only of *A. gracilis* in the state and not of *A. agrestis* (Personal communications: Martha Volkoff, Environmental Program Manager, Invasive Species Program, California Department of Fish and Wildlife).

Official Control: Wisconsin Natural Resources Law Rule NR 40 lists *Amyntas agrestis* as a prohibited species (Görres, 2014).

California Distribution: There has been one detection associated with containerized plants at a nursery in Napa County in July 2021. The identification was made by Kevin Williams, CDFA Entomologist, using DNA sequencing, which confirmed this species with a CO-I match. Follow-up inspections did not yield any more specimens.

California Interceptions: None

The risk *Amyntas agrestis* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** It is likely that *Amyntas agrestis* will be able to establish a widespread distribution through California's forest habitat and ornamental production sites particularly in residential and commercial environments.

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:** *Amyntas agrestis* is not known to feed on living plants. However, the worms have been found in deciduous and mixed deciduous-coniferous forests, hardwood forests, compost, mulch, ornamental beds amended with municipal leaf litter waste, nursery field and container stock, and horticultural gardens. Because of its association with a large range of living plants and non-living plant growth-influencing media, the "host range" category is evaluated as high.

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:** All earthworms are hermaphrodites and many, including *A. agrestis*, have developed parthenogenesis. Unlike many earthworms, *A. agrestis* has an annual life cycle. On their own, they can move 12 meters in a year. Possible means of spread to non-infested sites are, therefore, passive and through contaminated soil and leaf debris adhering to off-road vehicles, municipal leaf litter waste, bait used by anglers, logging equipment, nursery field and container stock, compost, and mulch.

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:** *Amyntas agrestis* poses a serious threat primarily to California's forests. However, they may also be detrimental to commercial ornamental nurseries due to the presence of the pest in field and containerized plants that may be distributed to residential and commercial gardens and parks. In addition, contaminated mulches and compost used in private and commercial sites may
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result in economic losses of ornamental crop production. The worms can deplete thick layers of leaf litter that serve as rooting media thereby, disrupting the natural decomposition of leaf litter on forest floors and turning the soil into grainy, dry worm castings that cannot support understory forest plants. They can alter forest soils from a fungal to a bacterial-dominated system which speeds up the conversion of leaf debris to mineral compounds thereby robbing plants of organic nutrients. Similar effects may occur in residential and commercial plant production sites. Once they are established, they are impossible to eradicate.

Evaluate the economic impact of the pest to 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 (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:** The destruction of forest habitats could have significant environmental impact by lowering biodiversity, threatening natural communities and endangered/threatened species. Moreover, the pests may significantly impact ornamental plantings in home/urban gardens.

Evaluate the environmental impact of the pest to California using the criteria below

Environmental Impact: A, B, C, 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.
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- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Amyntas agrestis*:

Add up the total score and include it here. **15**

-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 has been a single detection at a nursery in Napa County. Follow up surveys did not find an established population.

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 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 = 15*

Uncertainty:

Amyntas agrestis has not been reported from California. The definitive presence of this pest in California is currently not known. Future in-state detections/reports may result in an alteration of the rating for *A. agrestis*.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Amyntas agrestis* is A.

References:

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Responsible Party:

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***Comment Period: May 17, 2017 – July 1, 2017**

*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.
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Proposed Pest Rating: A
