

A close-up photograph of a reddish-brown earthworm crawling on a dry, brown leaf. The leaf's intricate vein structure is clearly visible. The worm is positioned in the lower-left quadrant of the frame, moving towards the right. The background is a soft-focus view of the forest floor, showing more leaves and soil.

INVASIVE EARTHWORMS



Maryam Nouri-Aiin

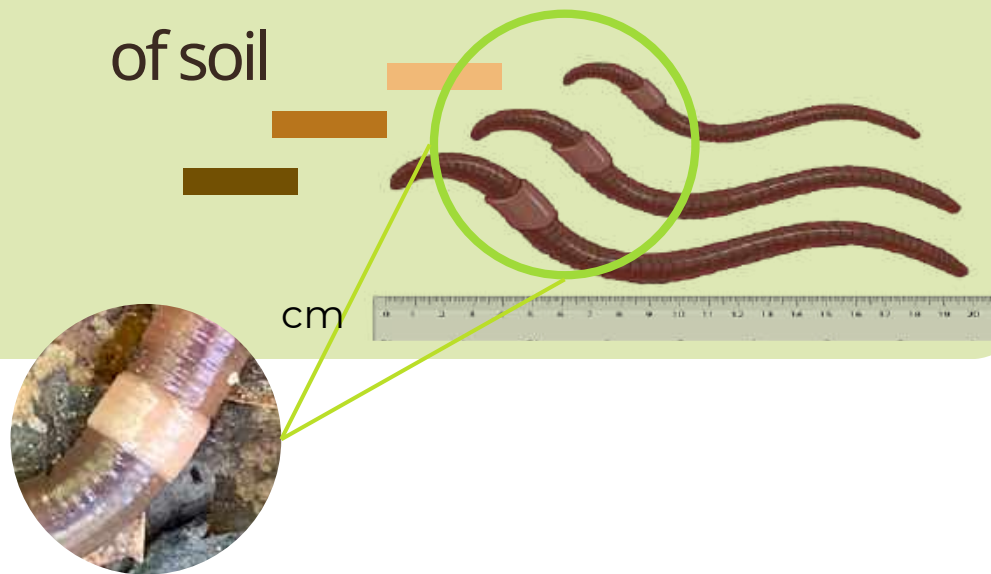
IDENTIFICATION

- How can we determine if worms we see are jumping worms for sure?
- Positive identification.
- How to identify jumping worms in the soil and what time of year are they mature?
- How to accurately identify them.
- How do I identify jumping worms in my garden?
- Identifying juveniles.
- Telling the difference in color/appearance between a JW and an earthworm in early spring.
- When they are just hatched in spring, how do you distinguish them from other worms?
- How do I identify jumping worms in my garden and if I do have them, how do I contain the problem?
- How to clearly explain how to identify them.
- Do adolescent worms have the sunken whitish rings like the adults do?
- What are the development stages and how to recognize them in all stages?
- When do the cocoons hatch in the summer?

JUMPING WORM LIFECYCLE

Adults

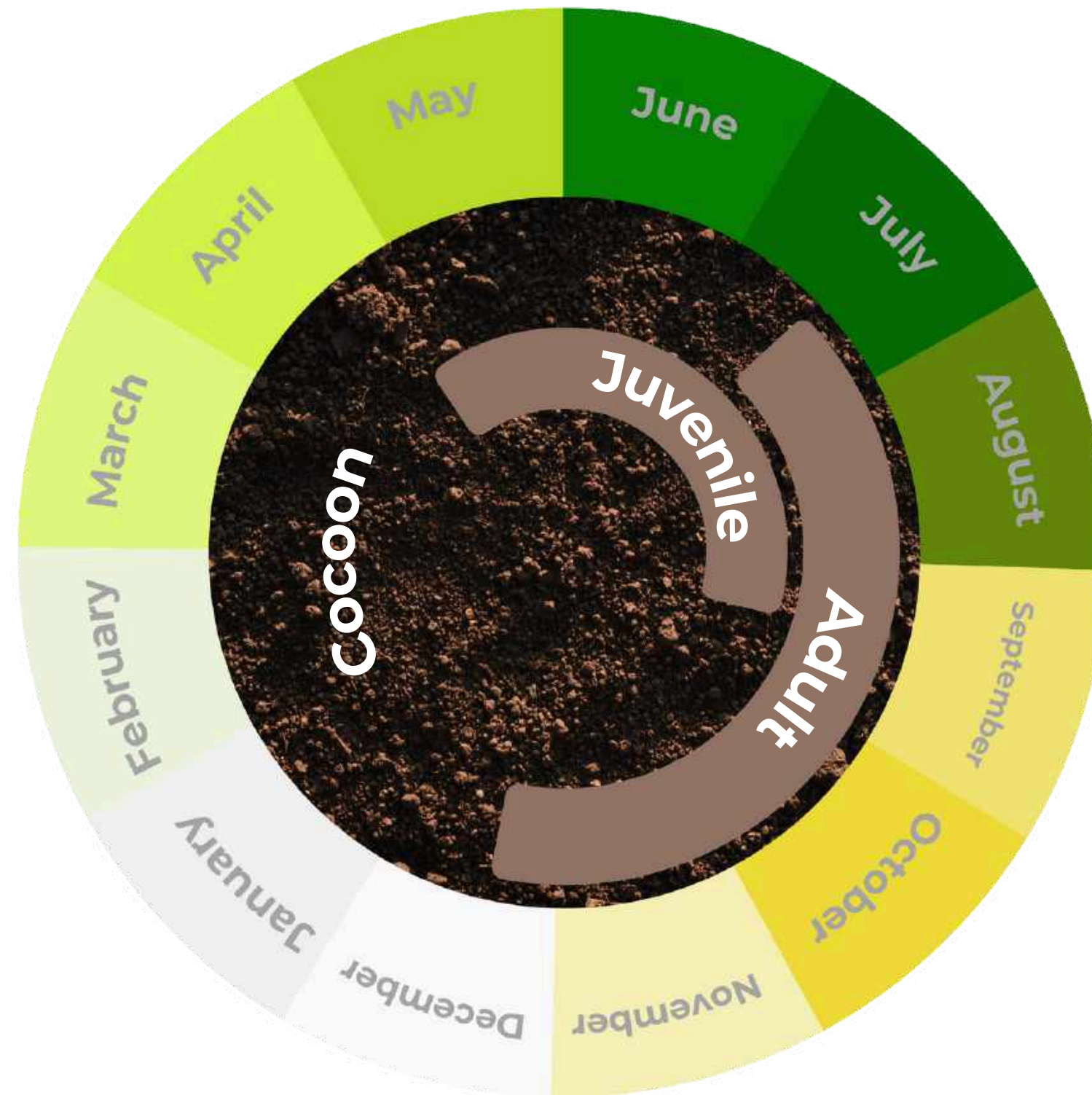
- First emerge by mid July
- Highest abundance = end of August/ early September
- Die at the end of the year
- Produce cocoons—up to 60 each year
- Mostly inhabit top 2-3 inches of soil



A. tokionesis

A. agrestis

M. hilgendorfi



Cocoons

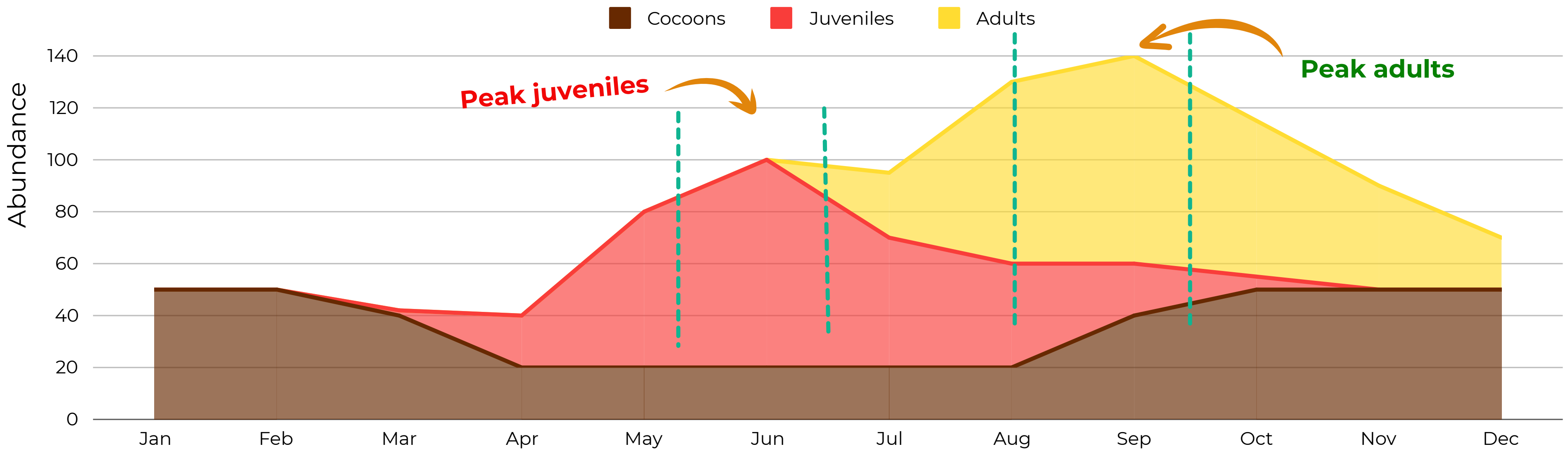
- All year round in soil
- Spherical, dark brown
- Require soil sieve washing to extract them from soil

Juveniles



- Impossible to identify to species by morphology
- Start to hatch in March
- Highest abundance = end of June/early July
- Inhabit the top 2-3 inches of soil

ABUNDANCE OF DIFFERENT LIFE STAGE

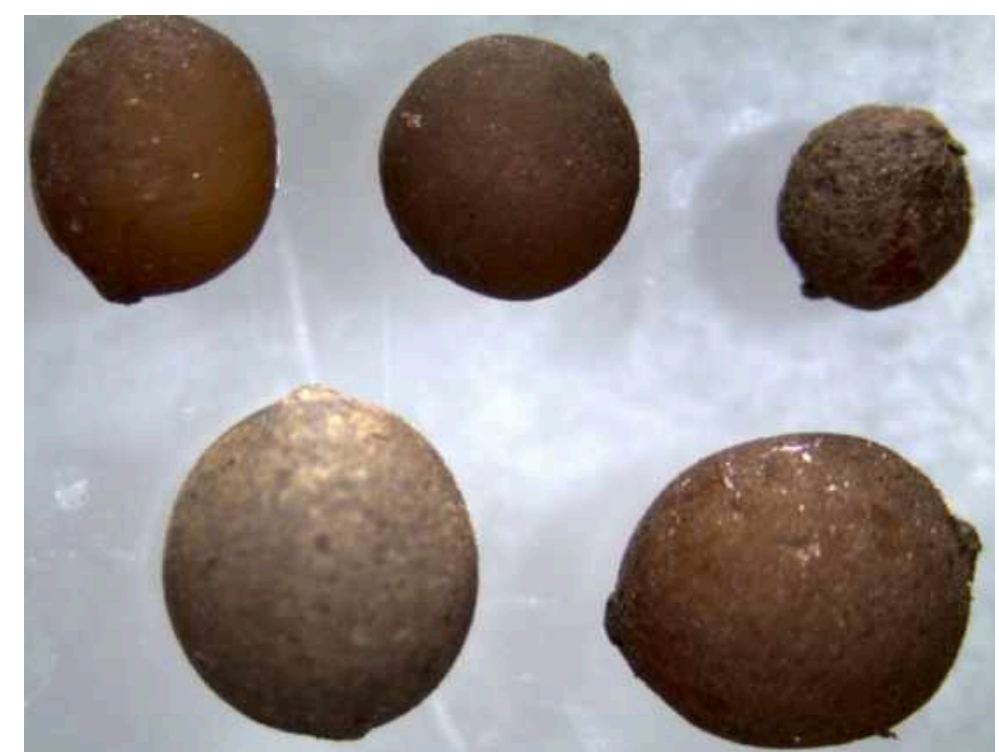




COCOONS

JUVENILES

ADULTS



JUVENILES

VS

HATCHLING



Gizzard

NOT clitellum



SPECIES IN VERMONT

A. tokioensis



Size 30–125 mm
(1.18-4.92 inch)

A. agrestis



Size 70–160 mm
(2.76 - 6.3 inch)

M. hilgendorfi



Size: 109–170 mm
(4.29 –6.69 inch)

Other species of earthworms (not JWs) ID key

Common earthworms

Videos of JWs and European earthworms by Penny Miller

Mucousy European Earthworm creeping

Sleek Adolescent JW wriggling

Jumping Worm - provoked

INATURALIST - JW PHOTOS

Credit: Penny Miller



CORRECT **INCORRECT**

*Early, **CORRECT** detection & reporting are critical to alert the Vermont Department of Agriculture and to protect our native Vermont ecosystems.*

JWS PEST STATUS

	Impact	Reported	Pest status
Garden	Changing soil physical properties	<input checked="" type="checkbox"/>	Not recognized as garden pests
Nursery	Changing soil physical properties; induce drought symptoms in potted plants	<input checked="" type="checkbox"/>	Not recognized as nursery pests
Farm	Changing soil physical properties	<input checked="" type="checkbox"/>	Not recognized as farm pests
Forest	Changing soil physical properties, increase soil erosion, fast consumption of leaf litter, negative impact on forest regeneration, micro/macro fauna	<input checked="" type="checkbox"/>	Recognized as forest pests

PREVENTION AND CONTROL

- Best natural methods for prevention.
- Methods to control.
- Avoidance and control.
- How to get rid of them in my garden and keep them from getting into the forest?
- What is the best way to get rid of them?
- How to prevent their spread?
- What measures can we take to limit their spread?
- Ways to slow growth and/or eradicate.
- How to manage them.
- What's the best way to manage jumping worms within a garden?
- What is the best way to mitigate them?
- Controlling their spread.
- Best practice if you get them.
- How to manage them.
- How to help the public protect their gardens from jumping worms?

PREVENTION AND CONTROL

- How to amend soil for plant health and not just feed the worms?
- What is the most important factor to address about jumping worms to minimize or control the situation
- What is the best way to flush the worms to the top of the soil so they can be destroyed?

Eradication

- Best eradication practices if any exist.
- Can other worms outcompete jumping worms in some soils and management practices?
- Is there a way to be sure that commercial bagged compost doesn't have them?
- What can be done to eradicate/control it?
- What is the long-term threat to gardeners and can effects be mitigated?

PREVENTION

- Refrain from transporting soil and horticultural media from infested areas
- Evaluate the risk of infestation before importing compost, wood chips, etc.
- If residing in an uninfested area, opt for worm-free purchases, bare root plants, or starting plants from seeds



PREVENTION

- Before planting on your property, inspect plant materials for adult and juvenile earthworms
- Note that cocoons are particularly challenging to detect



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PREVENTION

- Establish a cleaning station with water and boot brushes to prevent the spread of contamination from footwear
- Power-wash equipment if worms are present before moving to uninfested areas
- Once worms are at your nursery, offer customers options like bare root plants or plants grown in clean potting soil, along with information about potential issues
- Responsibly dispose of horticultural waste; avoid dumping in wooded areas and consult commercial composting companies for guidance
- Dispose of yard and horticultural waste responsibly by composting on-site or consulting compost facilities for proper disposal methods.



ADAPTATION

If your property is infested, it may not be practicable to eradicate JWs, but you can manage the ecosystem to reduce negative impacts.

- Monitor and manage the population
- Investigate plants that are less susceptible to JWs soil disturbance
- Planting species with varying root depths.

Adaptation does not address the root problem of invasion and may not be sufficient to prevent long-term ecological changes.

JW MANAGEMENT

Using clear plastic for soil solarization can raise soil temperatures above 104°F, effectively killing JW cocoons in the top few inches of soil. However, adult worms that burrow deeper may survive due to cooler temperatures below.

The best time for soil solarization is June, as April often has many viable cocoons but temperatures in Vermont may not reliably reach the necessary 104°F.

Collect leaf litter and the top 1 to 2 inches of soil from heavily infested areas, spread it evenly, and solarize it to ensure the temperature reaches at least 100°F for a minimum of 2 hours at every depth of the pile, effectively killing both cocoons and worms. Enhance the effectiveness of solarization by placing an insulating material underneath to prevent worms from escaping and to help maintain the necessary temperature throughout the material's depth. This method is a practical approach for heavily infested vegetable beds or gardens. This method is more effective when there is the highest abundance of juveniles (see below) since high proportion of them live in the leaf litter.

JW MANAGEMENT

Shallow tilling may be effective against juvenile and adult jumping worms, particularly when targeting them during peak abundance in late June/early July and late August/early September. However, this method is not effective against worm cocoons. Tillage might reduce earthworm abundance by disturbing their habitat.

Avoid adding mulch, organic residue, and organic fertilizers like seed meals and peanut shells. While this may help keep their numbers lower, complete eradication may not be achievable, and results may not be immediately noticeable. Use inorganic fertilizers (mineral-based) versus carbon-containing fertilizers (seed meals, animal by-products) to avoid feeding worms.

Mustard flush is being used to bring earthworm to the soil surface. However it does not expel all worms and it does not kill them. It requires handpicking. Also it does not effective on cocoons. CAUTION: be aware that some people suffer from severe mustard allergies.



JW MANAGEMENT

One effective way to manage jumping worms in gardens is to manually remove them during weeding or other gardening activities. Collect them along with the weeds in a bin with drainage holes the size of mustard seeds (2 mm). Allow the worms to help decompose the weeds, and later in the season, transfer them to a composting facility or place them in a plastic bag for solarization when temperatures are sufficiently high. The solarized material can then be used as fertilizer or processed to be compost tea, as the decomposed worm bodies are rich in nutrients and beneficial microbes for plants. Another option is to just collect them in water, they die within less than 24 hours in water.

Looking for JWs in garden

COMPASSIONATE CONTROL



Photo credit: Penny Miller

SOLARIZATION



COMPOST SOLARIZATION



CONSIDERATIONS

Unsuitable for Vermicomposting: JW species, being annual, are inactive for significant parts of the year, making them inappropriate for vermicomposting. They potentially could outcompete the efficient red wiggler worms and spread beyond compost piles.

Species-Specific Efficacy of Control Measures: Many control strategies are designed for general earthworm management, particularly in sports fields and may not be effective on JWs. However, direct research on JWs is scarce, there is uncertainty about how these methods affect different species and their effectiveness.

Holistic Management: Like many other invasives and pest species there is not a "magic bullet" for JWs infestations. Employing a variety of management techniques, customized for the specific local environment and JW behaviors, appears to be the most effective approach for controlling JW populations.

Continuous Evaluation: Regularly evaluate the success of control methods to adjust and enhance JW management tactics over time.

Life Stage Sensitivity: Be mindful that some control methods may only target specific life stages of JWs. Consequently, there might be a delay before you notice a reduction in their presence in treated areas.

Safety Reminder: Always read the label of any pesticide to ensure that the product is appropriate for your specific situation and to use it safely and effectively.

OTHER CONCERNS AND DEVELOPMENTS

- What concerns should home gardeners have about plants they are purchasing from retail/box stores?
- What is the best way to manage a garden with jumping worms?
- Interested in hearing about new developments.
- What do you suggest for people who experience crop production issues due to worms? More compost, fertilizer, or?
- Impact of treatment.
- How to cohabitate assuming they are here to stay, and how to care for soil health.
- What is the best way to buy potted trees to avoid jumping worms?
- Does anyone have a guess as to when there will be a solution to this problem and what it might be?

QUESTIONS?

