



## Plant Sale Best Practices to Stop the Spread of Jumping Worms

### Introduction

- This document was created to support organisations and gardeners involved in buying or selling plants, especially at local plant sales.
- Invasive Asian Jumping Worms (JWs) were confirmed in multiple locations in Ontario in the summer of 2021. (see page 7)
- Jumping Worms are a serious threat to our gardens and forests.
- **Note: All earthworms in Ontario are non-native, invasive and can negatively impact ecosystems, but Jumping Worms are a much more serious threat.**
- Once a garden is infested with JWs, there is currently no viable option for control, so it is crucial to prevention is key.
- Please **report sightings** of JWs to EDDMappS at <https://www.eddmaps.org/>.

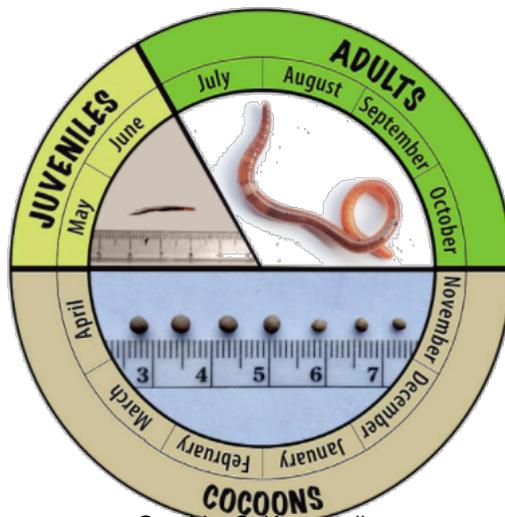
### Plant & Site Preparation

- Ensure ALL plant sale members are aware of Jumping Worms including what they look like and what contaminated soil looks like.
- **Timing of sales:** Plants sold in spring may not show evidence of JWs, but cocoons which are the size of soil particles may be present. One cocoon is enough to infest a garden. JWs mature in late summer and are more easily distinguishable from other earthworms at that time. This may help gardeners to screen their plants and gardens beforehand.
- DO NOT ACCEPT plants from gardeners with confirmed cases of JWs.
- **Bare-root plants:** Removing soil from plants removes both worms and their cocoons. Completely submerge plant roots in water and rinse away remaining soil. Since rinse water and soil may harbour JWs or cocoons, care should be taken with them. Strain soil using a cheese cloth or T-shirt then bag and solarize filtered material. (see below for info on solarizing) Allow rinse water to evaporate in the sun.
- If plants must be sold in soil, repot with clean potting soil using clean pots. Boiling water can be used to rinse containers and pots to kill cocoons as needed.
- Do not use mulch, leaves, backyard compost or other material to repot as they may harbor jumping worm eggs.
- Gather and transport plants/pots where they cannot pick-up contaminated materials like soil, leaves or mulch, e.g. on concrete, tarps or trays.
- **Arrive clean and leave clean.** Ensure volunteers clean shoes/boots/tools before arrival and brush off any soil before returning home.
- **Vehicles:** Be aware that vehicle tires may also transfer JW cocoons to and from the plant sale site. Where possible park vehicles on paved areas such as the street or parking lot.
- **Share information** about JWs at your plant sale.



## Introducing New Plants to Your Garden & Testing for Jumping Worms

- Isolate & inspect all new plants **before** adding them to your garden. If plants are acquired before July, you may want to hold the plant in its pot until JWs are more easily identified.
- Inspect the soil. Is it **intact** or **granular**? Intact soil is likely OK, granular soil may indicate the presence of JWs.
- If unsure, test for Jumping Worms:
  - **Note: This test is most useful later in the summer, when JWs are mature and can be distinguished from other earthworms.** It can be done in suspected garden areas, or with purchased potted plants.
  - Mix 1/3 cup ground mustard seed in one gallon of water.
  - In gardens, brush away any leaves or mulch that are on top of soil.
  - Slowly pour mustard solution onto the soil. The solution irritates worms and drives them to the surface. Note: All earthworms will react, but look for the white clitellum of the mature JWs and remove them as they appear. If unsure, it is safest to dispose of all earthworms.
  - Destroy all JWs. (see below)



Graphic: G. Kavassalis

Before August, Jumping Worms may be indistinguishable from other earthworms as they have not developed the white clitellum.

## Jumping Worm,

## Cocoon & Soil Treatment

- Destroy **JWs** using one of these options:
  - **Solarize** JWs by placing them in a plastic bag in the sun for at least 10 minutes (time will vary depending on temperatures).
  - **Soak** JWs in isopropyl (rubbing) alcohol or vinegar.
- Dispose of dead JWs in the garbage. Do not put them in a compost pile or garden.
- **Cocoons** have been known to survive temperatures of -40°F/C so winter temperatures are unlikely to kill them. They hatch when soil temperatures reach 10°C/50°F. Heat treatment is currently the only known method of killing cocoons. Temperatures of **40°C/ 104°F** will kill them.
- **Infested soil**



- **Isolated infestations in the garden:** Cover moistened soil with a sheet of transparent polyethylene for a minimum of two to three weeks. Time will vary according to conditions, but the soil temperature needs to exceed 40°C/104°F for at least three days.
- **Bagging soil:** Soil can be removed and placed in sealed plastic bags and set out in the sun. If thoroughly solarized in minimum of 40°C/104°F temperatures for at least 3 days, the soil should be safe to re-use in the garden. This method could also be used to treat purchased mulch or compost.
- **Disposal:** Many municipalities do not allow soil to be disposed of in the garbage and there is growing concern that disposing of infected soil in municipal waste may increase the spread.

## Controls for JWs

Once a garden is infested, there are currently no viable Jumping Worm control methods, however the following are being explored:

- **Abrasive materials** such as biochar (ground up charcoal) and diatomaceous earth (fossilized diatoms) show some promise in killing adult jumping worms. Diatomaceous earth is available in most stores selling garden products. Incorporate one of these products into the infested soil to a depth where the worms are located.
- **Saponins:** Saponins are plant derived chemicals which can act as pesticides. Some golf courses use fertilizers containing saponins to control earthworms in their turf grasses, e.g. Castaway 3-0-1 from [Planet Turf](#), contains saponin oil derived from *Camellia sinensis*. Saponin-based fertilizers work best when applied after rain or irrigation to expel the earthworms from the soil causing them to desiccate and die. There is a concern re potential negative impacts of saponins on other soil biota such as springtails. Alfalfa is another source of saponins. Saponin based fertilizers are not readily available for use.
- **Plant choices:** There is some anecdotal evidence that plant species with deeper roots and which are more drought tolerant tend to do better in invaded soils.
- **Grunting:** Grunting is a technique used by worm hunters to drive worms out of the ground using vibrations. A stake or branch is pushed into the ground 4 to 6 inches and a second rougher stick is used to rub back and forth against the first to cause vibrations. The vibrations cause worms to come to the surface where they can be removed and disposed of. Grunting may be useful later in the summer when JWs are mature to help control infestations. <https://www.facebook.com/sarah.gwozdz/videos/576329933608174>
- While the current advice is for "property owners to contact a pest control company", consider the following:
  - Because there are no known control options, companies may not be able to do much beyond "limiting" populations. The worms reproduce prolifically and a single egg is all that is needed for them to spread.
  - JWs can be spread through via vehicle tires or equipment used by any control company or landscaper.

## Purchasing Soil, Mulch & Compost



- When purchasing bulk mulch or compost, use a reputable producer that has heat-treated the material to a temperature of at least 40°C for at least three days to destroy the cocoons.
- It is possible for bagged mulch or soil to also be contaminated. Gardeners may opt to hold purchased soil or mulch and treat it with solarization before using.

## Jumping Worm ID

Become familiar with the appearance of JWs & affected soil by studying photos and videos of their movement.

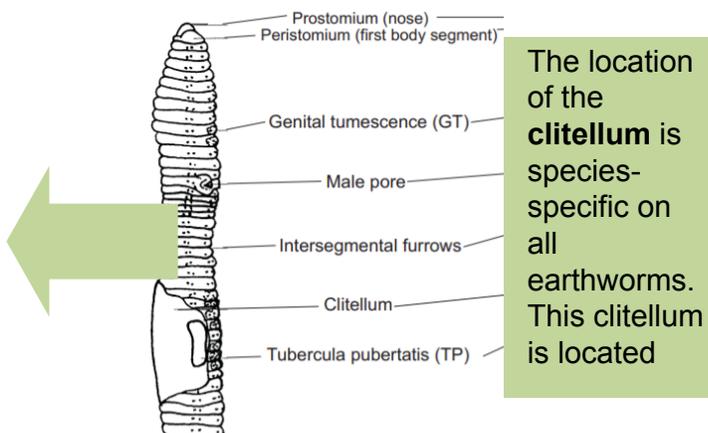
Comparison of Asian Jumping Worms and European Earthworms (Definitive JW ID in red)		
	Asian Jumping Worms	European worms
Mature worms	 <p><a href="https://extension.umn.edu/identify-invasive-species/jumping-worms">https://extension.umn.edu/identify-invasive-species/jumping-worms</a></p>	 <p><i>Lumbricus rubellus</i> (Common Red wiggler) <a href="https://www.purduelandscape.org/article/asian-jumping-worms-id-impact-and-prevention/">https://www.purduelandscape.org/article/asian-jumping-worms-id-impact-and-prevention/</a></p>
Scientific names	<ul style="list-style-type: none"> <li>• <i>Amyntas tokioensis</i></li> <li>• <i>Amyntas agrestis</i></li> <li>• <i>Metaphire hilgendorfi</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Lumbricus rubellus</i> (Common Red wiggler)</li> <li>• Other various species</li> </ul>



Life cycle	<ul style="list-style-type: none"> <li>• Annual species</li> <li>• Several generations per season</li> <li>• Overwinters as cocoon</li> <li>• Hatch when temperatures reach 10°C/50°F</li> <li>• Parthenogenic (asexual reproduction)</li> <li>• Takes about 70 days to grow to an identifiable size</li> <li>• Baby JWs are tiny, about 10 mm in length.</li> <li>• Large worms seen early in the year are not likely JWs</li> <li>• Small white worms seen in spring are “pot worms”, not JWs and not actually an earthworm at all</li> </ul>	<ul style="list-style-type: none"> <li>• Live more than one season</li> <li>• One generation per season</li> <li>• Adults burrow into soil during winter to re emerge in spring</li> <li>• Sexual reproduction</li> </ul>
Adult length	<ul style="list-style-type: none"> <li>• 7 - 20 cm depending on species</li> <li>• 12.5 cm/3 inches (<i>Amyntas tokioensis</i>)</li> <li>• 14 cm/ 5 inches (<i>A. agrestis</i>)</li> <li>• 10.9 – 17 cm/8 -12 inches (<i>Metaphire hilgendorfi</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• 3-10 cm (Common red wiggler)</li> <li>• Up to 30 cm</li> </ul>
Skin	<ul style="list-style-type: none"> <li>• 2-tone colour</li> <li>• Darker on their dorsal (back) than on their ventral side</li> </ul>	<ul style="list-style-type: none"> <li>• Reddish brown (Red wiggler)</li> <li>• Red-violet to dark brown (other earthworms)</li> </ul>
Body	<ul style="list-style-type: none"> <li>• "Rigid" body</li> </ul>	<ul style="list-style-type: none"> <li>• "Flaccid" body</li> <li>• Can wrap around your finger</li> </ul>



Clitellum	<ul style="list-style-type: none"> <li>• Milky white to grey in appearance</li> <li>• Whole, not split</li> <li>• <b>Goes all the way around the body</b></li> <li>• <b>Located on segments #14-16, nearer to the head</b></li> <li>• <b>"Smooth" clitellum that you can't feel with your finger</b></li> </ul>	<ul style="list-style-type: none"> <li>• Raised, pink/red</li> <li>• <b>Saddle shape, split down the back</b></li> <li>• <b>Does not wrap around completely</b> on the underside</li> <li>• Located on segments #26 – 32, further from the head</li> <li>• <b>"Raised" clitellum</b> that you can "feel" with your finger</li> </ul>
Behaviour	<ul style="list-style-type: none"> <li>• Very active, snake-like movements</li> <li>• A rigid body which can "bounce" and "flop" around</li> <li>• <b>Can shed tail when aggravated</b></li> <li>• Usually found in top layer of soil</li> </ul>	<ul style="list-style-type: none"> <li>• Less active, "wiggles"</li> <li>• Slightly limp</li> <li>• Will not shed tail</li> <li>• Borrows deeper into soil</li> </ul>
Soil signature (castings)	<ul style="list-style-type: none"> <li>• Soil appears to look like "coffee grounds"</li> <li>• Very loose</li> </ul>	<ul style="list-style-type: none"> <li>• Castings in "piles"</li> </ul>
Cocoons	<ul style="list-style-type: none"> <li>• Almost impossible to differentiate from soil particles</li> <li>• Hatch when soil temps reach</li> </ul>	





## Stop The Spread In Your Garden

- Produce your own compost or leaf mulch.
- Purchase plants and garden products from reputable sources. Ask nurseries, landscaping companies and soil, compost & mulch providers if they've had JW issues. If they know nothing about JWs, then be concerned.
- Grow your own plants from seed whenever possible.
- While compost that was properly heated up should not have worms or cocoons, they can become contaminated via backhoes, handling etc.
- When visiting private gardens, botanical gardens or trails, arrive clean (shoes, tires) and leave clean removing all soil, debris.

## Learn More

- [Jumping Worms](#) -Invasive Species Center
- [Jumping Worms](#) - University of Minnesota Extension
- [Plant Sales and Jumping Worms](#)
- [Heat kills invasive jumping worm cocoons, could help limit spread](#)
- University Place: [Invasive Jumping Worms](#) (Video)
- [Invasive Asian Jumping Earthworms](#)
- [NC State Extension Jumping Worms](#)
- [Stop the spread of jumping worms and other invasive species](#)
- [Jumping Worms](#) (MGOI Facebook post)
- [They are here!](#) (MGOI Facebook post)
- [Map of Jumping Worm Sightings](#) U.S.
- [Jumping Worm Sightings](#) – Ontario
- [Confirmed invasive jumping worm sightings along the Canada-USA border](#)
- [New Asian pheretimoid “jumping earthworm” records in Canada](#)
- Asian pheretimoid earthworms in North America north of Mexico: [An illustrated key to the genera Amyntas, Metaphire, Pithemera, and Polypheretima \(Clitellata: Megascolecidae\)](#)
- [Using Organic Products to Reduce Earthworm Castings](#)
- [General Earthworm Diagram](#) (Worm Watch)

## Locations of Jumping Worms in Ontario (Oct 2021)

