Jumping Worm Monitoring Protocol Handbook



Handbook adapted from the jumping worm project website and online training

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This guidebook is meant to give background information on the jumping worm to learn more about their keys to ID, their effects on our environment, and the next steps in controlling their spread.

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The Minnesota Jumping Worm Project

 This project is funded through the support of the University of Minnesota Invasive Terrestrial Plant and Pest Center and the Environment and Natural Trust Fund.



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Collaborators with the Minnesota Department of Natural Resources, Boulder Lake Environmental Learning Center, University of Minnesota Extension and the Minnesota Nursery and Landscape Association.











Program goals

The Minnesota Jumping Worms Project's long-term goal is to characterize the status of the jumping worm invasion in Minnesota.

- Investigate dispersal mechanisms; composting, horticulture, landscaping and bait
- Gather data this fall into the 2022 growing season
- Gather data across Minnesota (and beyond)
- Learn more about the current research taking place through this

grant: <u>https://mitppc.umn.edu/project/jumping-</u> worms-minnesota

As a citizen scientist, you bring the enthusiasm and skills to make this research possible. The Worm Rangers program aims to support citizen scientists so that together, we can reach these shared targets: Track the distribution of the worms throughout Minnesota



Photo by Erik Larson

Who are Worm Rangers?

People who are curious about the natural world. We can use YOUR help with this citizen science project tracking jumping worms across the state of Minnesota. Jumping worms are an invasive species that are documented having negative impacts on our natural (forests) and humandisturbed (gardens) ecosystems. They are being reported in gardens, compost, mulch, flowerpots, yards and forests. You can find jumping worms in high densities within the top 4-6" of the soil. Our goal is to work with citizens around Minnesota to track the spread of these earthworms. Knowing the location and extent of their presence will help researchers develop recommendations.



Glacial history impacts current forest ecosystems

About 18,000 years ago, almost all of Minnesota was under miles of dense ice known as glaciers. These glaciers carved out our landscape and killed off any native earthworms we may have had in our area. As the glaciers receded, our region went through a process of primary succession, from tundra to the forests we have today. As the climate warmed, southern Minnesota eventually gave way to prairies and deciduous forests.



Image by Evan Larson

Forest Succession

- This succession started from bedrock until mosses and lichens were able to decompose enough organic matter for early succession trees to take hold. Our forests were able to reach climax forests without earthworm interreference. They recycled their growth with fire and wind events that brought trees to the ground for the fungi to slowly breakdown over time. This process built up a layer of organic matter that played an important role in how our forests function.
- When earthworms were introduced to our region, they started eating all that organic matter that was built up over time. This rapid change in the soil profile has altered the way some of our forests regenerate their growth. From exposing seeds that hide in the organic matter to making it easier for fast growing plants to spread through the understory.



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Spread of earthworms

Observations of earthworms (like we are asking you to do!) tell us that European earthworms were the first ones to enter North America. They arrived as early as the 1600's with the European settlers. The Asian earthworms (jumping worms) have only been documented in North America over the last 100 years. Earthworms do not naturally travel long distance on their own. Their spread is largely aided by human behaviors and activities. Therefore, the best thing we can do to stop invasive jumping worms is to not introduce them in the first place.



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Natural Ecosystems

- Natural ecosystems are ones that have not been disturbed by humans. We see more European species than jumping worms in these ecosystems
- Native forests
- Prairie land
- Wilderness areas



Human-disturbed Ecosystems

- Human-disturbed areas are ones where humans have altered the landscape. This is where we are finding negative impacts from jumping worms.
- Landscaping
- Gardens
- Trails and some public parks



Meet the Jumping Worm

- The jumping worm or Latin name, Amynthas, is an earthworm that is called "jumping" because of their unusual behavior when disturbed. They move like a snake and sometimes appear to be jumping.
- Jumping worms live and feed in the leaf litter layer on the soil and in the top few inches of the soil, this makes them an epi-endogeic species of earthworm.
- Jumping worms are native to Asia.
- People spread jumping worms throughout North America by moving potted plants, soil, compost, mulch and fishing bait.



Photo by Josef Gorres

Habitat and Impacts

- Preferred habitats for jumping worms are in flowerbeds, mulch and compost piles. They can also be found under logs and in shady moist areas. Jumping worms spread by sharing infested compost, left over as fishing bait and buying horticulture/landscaping needs that have jumping worms hiding in the soil.
- Jumping worms impact our ecosystems by altering the soil profile and the nutrient cycling process.



Photo by Josef Gorres

Life Cycle

- Jumping worms have an annual life cycle: they produce cocoons in late summer and early autumn. They overwinter in the cocoon stage, cocoons hatch in early spring, and adults mature in summer.
- Jumping worms have cold-hardy cocoons and a short maturation time.
- They are asexual (parthenogenetic) and mature in just 60-90 days; high peak abundances during the summer exceeding 100 individuals per meters squared.
- Hatching may be triggered by temperatures exceeding 50° F



How you can help!

You can help gather the information needed to locate the spread of the jumping worms. Worm Ranger participants make observations of jumping worms and send their findings into us. Together we can create a detailed map documenting the spread of the jumping worms. After you send your observations to us, you can dispose of the worms. Best practices is to place the worms in a bag and throw them away in the garbage.



Photo by Doug Dirks

How are observations used

The Worm Rangers team will analyze your observations to confirm your identification. We will then put that information into a nationwide database that helps track the spread of jumping worms. In this way, the knowledge we create together will not only help Minnesota track this invasive species but will help the entire nation track the spread of these species.



Distribution map provided by EDDMaps

Data Collection

- To track the spread of the jumping worm, we are interested in the location that you find them. You can submit data using our form located on the "Jumping Worm Project" website.
- https://jwp.cfans.umn.edu/jumping-worms-project
- "Do you have data to submit?" Fill the data form out to the best of your knowledge. Even if you did not find jumping worms, the data is still useful in tracking the spread.
- Send in your pictures and short videos of suspected jumping worms. Experts can help ID the worms from across the state.



Photo by Beth Solie

Location

 The location is important when tracking the spread of the jumping worm. The data form has a section for latitude and longitude. If you do not have access to a GPS, you can write in the nearest town/county.
Additional information is for possible "how the worms got there" and for the physical place of the worms. (garden, compost pile, mulch bed, under logs, etc.)



Photo by Beth Solie

Taking pictures and videos

• To help us identify the worm from afar, we are requesting some pictures or short videos of the worms. To keep file size down, please no videos that are longer than 5-15 seconds. To get a good picture you will need a good background. We recommend clean, neutral-colored backgrounds. A tan or grey background works well. Make sure the photo is in focus before sending. Be aware of the lighting, glares and reflections can distort the photo.



Photo by Beth Solie

Sampling method

- The sampling method we are using for the jumping worm is called the "flip and strip". This method is hands-on and used to sample worms near the surface. To start the "flip" you can dig into the ground with your hands or use a utensil. Reach down 2-4 inches below the surface and pull up the soil. Once you have some soil pulled up you can roll it back over itself, this is the "strip" part. Roll the soil back about 12 inches and inspect the underside of the soil for jumping worms.
- Ist step: Visually inspect Look at your yard, garden and woods for signs that earthworms are active. Do you see earthworms? Does your soil look like coffee grounds?
- 2nd step: Physically inspect Flip logs & rocks, mulch, compost, soil, root around, under and through litter and see what you find.
- 3rd step: Found some Do the worms move like a snake or "unworm like". Are they jumping worms - Use the physical characteristics you learn in this handbook to distinguish the jumping worm from the European earthworms.
- 4th step: Submitting data Take a few pictures of the suspected jumping worms and submit your data into the requested section of the google form link.





Photos by Beth Solie

What if I don't see any jumping worms?

- Perfect! This is obviously preferable for our habitats, but this does not mean we do not need to document our data.
- All data is usable data. To track the spread of these worms it is important to know where they are, but also to know where they are not. Jumping worms thrive in warm climates, but they have made their way northward. We are in a unique position in the Midwest where we can track the northern most spread of these worms. Tracking the spread is the first step in controlling the species.
- By identifying locations where there are and aren't jumping worms, we can create a northern boundary with the data that will further help research into this invasive species.

EDD Maps

 This map show the counties with positive jumping worm IDs updated to June of 2021.



Explore the distribution data here: https://www.eddmaps.org/midwest/distribution/usc ounty.cfm?sub=58695

Distribution map provided by EDDMaps

- Pigmentation
- Clitellum
- Setae
- Movement
- Castings



Photo by Josef Gorres

The Jumping Worm

The jumping worm is a pigmented earthworm that lives and feeds near the surface. The jumping worm is streamlined with a dark coloration that is almost shiny or has a sheen to it. It has an annular clitellum 14-15 segments from the head. The clitellum is an opal white color. It has many setae that help it move more sporadic than other worms. This movement is what has given the "jumping" worm its name. The jumping worms' castings look and feel like coffee grounds. The jumping worm has a unique ability to create an enzyme that helps break down woody materials like wood chips and mulch.



Pigmentation: The pigmentation of the worms acts as protection against the sun. Worms that feed on or come to the surface are at risk of "sunburn" that can often be fatal. Worms will vary in pigmentation depending on their lifestyle. Jumping worms have a darker pigmentation with an almost shine to their body.



Photo by C Landstrom



Photo by L Lavrov



Photo by H Graf



Pigmented nightcrawler

Unpigmented

Pigmented jumping worm

Photo by J Anderson

- Clitellum: The clitellum is the earthworms' reproductive organ. This is a good indicator that a worm is an adult that has reached sexual maturity. The clitellum is located closer to the head of the worm (further from its rear).
- Jumping worms have an annular clitellum that is less swollen (see image on next page), and it wraps around the entire body. Their clitellum is roughly 14-15 segments from their head. The jumping worm clitellum has a pale opal color.
- Most European species have a saddle shaped clitellum that raises from the body and does not encompass the worm.



Jumping worm

Clitellum close to head start at segment 14 or 15 vs Further from head, start at segments 23-32, depending on species

Annular clitellum vs Raised clitellum

European earthworm *Lumbricus terrestris*



Setae: Setae are tiny hairs on each segment around the worm's body that help it move. They may be tough to see with just your eyes. You may want to use a hand lens or zoom in on a picture you take to identify the setae. Jumping worms have as many as 40 setae or more around each segment. The bristle-like setae of the jumping worm has no specific arrangement, they will encompass the entire segment.



- **Movement:** The European worms we are accustomed to move slowly. They inch their way forward using the setae on their body. Jumping worms have more setae which allow them to be in contact with more of the ground. They use these extra setae to move sporadically and "un-worm-like".
- When disturbed, they will secrete a yellow mucus as it tries to get away. Mild aggravation could even cause the worm to drop its tail to escape.
- Follow this link to see a short video showing the jumping worms movement. The first 20 seconds shows good examples of the jumping worms' movement and the tail breaking off.
 - https://www.youtube.com/watch?v=BrFDSYzqIUI

Castings: Castings are earthworm poo. Jumping worms do not offer the same support in the garden as European species. Their castings are left near the surface and often wash away or erode. Jumping worm castings look and feel like coffee grounds.



Photo by Beth Solie





Photos by Beth Solie

University of Minnesota Extension

- If you or someone you know has jumping worms on their property and would like to know more about what they can do to stop these worms, contact the University of Minnesota Extension to get into contact with other gardeners from around the state and learn what methods have worked for them.
- The University of Minnesota Extension has been working with gardeners and other public participants to learn more about what we can do at our own homes to stop the spread of these worms and keep them from damaging our gardens.

<u>https://extension.umn.edu/identify-invasive-species/jumping-worms</u>



Contact Information for the jumping worm project

 Reach out to <u>boulder@d.umn.edu</u> with photos of suspected worms or to learn more.



The Boulder Lake Environmental Learning Center strives to provide educational programs that contribute to increased understanding and appreciation of sustainable natural resources management practices through the Boulder Lake Management Area.

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