

Wormwood

Paul Hetzler

If you're tired of hearing about new invasive forest pests, I'm right there with you. Seems like they arrive at an ever-increasing pace, and the harm potential ratchets up with each newcomer. At this rate maybe we'll get some wood-boring beetle whose larvae explode inside tree trunks. As distasteful as it may be to learn who's next in the queue, we all realize it's better to know what we're up against.

If there's a bright side to spotted lanternfly, it's that it has an actual bright side – it stands out. At the other end of the Obvious Spectrum is a new and significant threat to forests, Asian earthworms, which have cleverly disguised themselves as earthworms. The fact that we are used to seeing worms in the landscape makes them a challenge to notice, but it is well worth the effort.

The new pests are three related species of earthworms from East Asia, *Amyntas agrestis*, *A. tokioensis*, and *Metaphire hilgendorfi*. While *A. agrestis* was the first to be identified, it has come to light that *A. tokioensis* is the more common. Known variously as Asian jumping worms, snake worms, crazy worms, and probably some choice expletives, these super-sized (20 cm when mature) annelid cousins look very similar to one another. In fact they can only be accurately separated by species through dissection, so I think it's fair to consider them as a group.

Asian worms can be identified by the smooth band called a clitellum, which in European earthworms is dark, close to their middle, and thicker than the rest of the body. In these worms it is milky-gray to white, and much closer to the head. It is generally flush with the body as well. Behaviour is another clue: when disturbed they scatter across the ground, snake-like, rather than disappear into the soil. If touched, they thrash wildly and may shed their tail. They feel drier than other worms, and more turgid. A woman who tried to fish with them told me they “exploded” when she put a hook in them. Incidentally she said fish will not touch Asian worms, which speaks to their toxicity.

One issue with Asian worms in the forest is that they have a high reproductive potential, with 2 or sometimes 3 generations per season compared to one for European worms. The latter are hermaphroditic, having both male and female organs, but still needing to find a mate. Invasive Asian worms are parthenogenic, all females who bypass the need to go out on a date, and spew out cocoons teeming with baby female worms. All it takes is one to start an infestation.

As with any recent pest, Asian worms have not been well-studied. Even the modest research which has been done can conflict at times. It is known that adult Asian worms die off in winter, but that their cocoons are cold-hardy. I have read figures which place the soil-temperature cutoff around minus-30, and other references to the limit being below -40. This puts much of southern Canada at risk. And based on research done by Josef Görres at the University of Vermont, cocoons can remain viable in the soil for at least 3 years, analogous to a soil seed bank.

By end of summer, Asian worm biomass is many times that of other species. This means they eat a lot, primarily on the surface and within the top 2.5 cm of soil. A September 2016 article in *Science Daily* cites work done by Jiangxiao Qiu, whose graduate research at the University of Wisconsin-Madison found that Asian worms reduced leaf litter in hardwood forests by 95%. I have seen an infested forest in Cortland County in south-central NY State, and can attest that it was almost entirely bare soil.

Not only do Asian worms leave soil bare, they leave it barren. Breaking down detritus incredibly fast leads to a big increase in plant-available nitrogen late in the season, when few plants can use it. Nearly all these nitrates leach out of the soil by spring. The soil also loses its healthy structure, becoming granular, and much more vulnerable to erosion and compaction.

In addition to their huge appetites for organic matter, Asian worms are known to vastly increase lignin-busting enzymes, according to a March 2015 article in *Applied Soil Ecology*. At this time it is unclear whether the worms secrete the enzyme itself, or a substance which induces white-rot fungi to ramp up production. As a result of this effect, wood breaks down at least 2.5 times faster in the presence of Asian worms. It is also not known what effect this has on tree seeds.

In the face of an Asian worm infestation, other changes in hardwood forest ecosystems occur. European earthworms disappear, although no one yet knows the mechanism by which this happens. Researchers in the USA have documented substantial reductions in juvenile and male salamanders at infested sites, as well as much lower populations of millipedes, and a general drop in invertebrate species richness.

These invaders have few predators. Raccoons, opossums, moles, and centipedes find them tasty. Many amphibians feel otherwise. Wisconsin Department of Natural Resources Invasive Species Specialist Bernadette Williams, who essentially broke the whole Asian worm story in the northern US, told me in a 2014 phone interview her team observed a salamander grab an Asian worm, then release it and spend several minutes wiping its mouth on the soil.

I doubt anyone needs convincing that Asian worms need to be taken seriously. Williams put it bluntly: “Their [Asian worm] introduction into our state poses a huge threat to the future of our forests.”

Although to-date there is only one confirmed Asian worm infestation in Canada, these pests are literally on our borders with the US States of Vermont, New York, and Michigan, and it's likely many more such sites already exist. Jean-David Moore, a researcher with the Ministère des Forêts, de la Faune et des Parcs in Québec City, believes the forests of southern Canada are vulnerable to Asian worm infestation. For more information, see the article “Exotic Asian pheretimoid earthworms (*Amyntas* spp., *Metaphire* spp.): Potential for colonisation of south-eastern Canada and effects on forest ecosystems” by Moore et al in the journal *Environmental Reviews*, 2018, 26(2): 113-120.

So where to from here? Asian worms are commonly spread through the horticulture trade, both in containerised plants, and especially mulch, which they love. Paw through bulk mulch before purchasing, and maybe think twice about getting fill delivered to your property. Where reforestation is concerned, it is safer to plant bare-root stock than plugs.

Equipment may pose the biggest threat to forest land, so be cautious. Before a logging crew shows up at your place, find out where their last job was. Skidders, forwarders and trucks coming from a known infested site may need to be steam-cleaned to protect your land.

If you're in an unfamiliar woodlot during the summer or fall to mark timber, bid on a sale, or just out for a walk, turn over a log or flat rock. Do the worms dive down, or scoot out in all directions? If the latter, be sure to notify the owners, as well as any crews working on that parcel. Asian worms are most likely to be found at log landings and along skid roads. Clean all dirt and debris off your boots, and preferably disinfect them as well, before getting in the vehicle to return. Worm cocoons are brown spheres about 2 mm. in diameter, and very easy to take home with you. A little prevention goes a long way in protecting our forest resources.

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