Invasive Earthworms in the Northeastern USA and the Horticulture Industry

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General Information. Earthworms are mostly exotic organisms in New England. There is a total of 31 species in 4 families and 15 genera known to occur in New England. Of these 10 species are confined to greenhouses and composting facilities. The two species thought of as originating from North America are *Bimastos parvus* and *Microscolex phosphoreus*, although only one of them may be native to the northern tier of North America. The other 29 species are exotic and some of them are invasive. There are three earthworm ecotypes: epigeic, endogeic and anecic. Epigeic earthworms tend to live at the soil surface in resource rich parts of an ecosystem, e.g. forest leaf litter, mulch, thatch, etc. These worms tend to be pigmented. Endogeic earthworms live underground and feed on microorganisms that grow in the mineral soil layer. These are unpigmented worms with transparent pink, green and grey hues. Finally, anecic earthworms are those that make very deep vertical burrows. The only one known in New England is the Nightcrawler (*Lumbricus terrestris*). Anecic earthworms tend to be pigmented.

The Problem with Invasive Earthworms. They have the ability to change native ecosystems. In northern North America the most studied negative effects are in forested ecosystems. Typically invasive earthworms change the structure of forest soil, mixing the organic horizons with the underlying mineral material creating a substrate which is no longer suitable as a seed bed and germination medium for most understory plants. This has several additional effects: the dense understory of typical New England

Figure 1: Forests not invaded by earthworms have a dense understory (left image). Invaded forests may have no significant understory and low regeneration rates (right image)

woodland thins out (Fig. 1); regeneration of canopy species is slowed exacerbated by browsing of deer and other wildlife; nests of bird species which build their nests on the ground become more vulnerable to predators. There are other effects on nutrient cycling in forests that may favor early phenology invasive plants such as *Berberis* species, *Rosa multiflora*, and *Lonicera* species.

The Crazy Snake Worm, a New Threat? A relatively new invader in our forests is the Crazy Snake Worm or Jumper Worm, *Amynthas agrestis*, which originated in Japan and the Korean Peninsula. However it has been reported from greenhouse operations in the Northeast for over 50 years. Did this earthworm escape from the greenhouses only recently? In Vermont it has been found in deciduous and mixed deciduous-coniferous forests, compost, mulched beds, ornamental beds amended with municipal leaf litter waste, plant containers and gardens. This earthworm is very invasive and considered a forest pest, although few states officially recognize it as an invasive. Part of the problem is that regulators are so focused on insect pests and invasive plants that earthworms simply fall through the cracks. However, Wisconsin Natural Resources Law lists it as a prohibited species together with other usual suspects such as the Emerald Ash Borer and the Asian Longhorn Beetle.

Why Should You Worry? There have been reports from nurseries that this earthworm is abundant in both field and container stock. Presumably it is transported to customers' gardens in this way. Why would the customer care? There are reports from home owners in Connecticut who blame the abundant castings of this earthworm for the demise of their lawns. In Vermont, some master gardeners associate the appearance of this species with the loss of ephemeral beds. *A. agrestis* has been linked with several reports of deleterious effects on horticultural crops. One case that made the press a few years ago is a Hosta producer in Pennsylvania who lost most of his crop to *A. agrestis*. In Vermont a producer has linked the high abundance of this earthworm and its prolific castings on the loss of much of his hallmark Lady Slippers. A picture of the root stock encased in the typical castings of this earthworm is shown in Figure 3. This worm also decomposes woody mulches rapidly by increasing the amount of lignin-decomposing enzymes, reducing the useful life span of mulch applications. You can identify this earthworm by its snake-like motion (see video at: http://digital.vpr.net/post/dark-side-earthworms) and the ring-like clitellum that is clearly offset from its body which completely encircles its body (an identifying feature that is not evident until late June or early July).

Figure 2: *Amynthas agrestis* and its castings in the mulch of a tree nursery

Figure 3: Lady Slipper roots with *A. agrestis* and its castings

What Can You Do? If you are sure you already have *A. agrestis*, investigate further to determine if unexplained crop losses could be associated with the infestation. Presently there are no pesticides registered for use against earthworms. There are also no proven biological control measures. Researchers in Kentucky have trialed an organic fertilizer called Early Bird (Ocean Organics, Waldboro, ME) on golf courses and the product seemed to also affect some earthworms species. It is marketed as a natural organic fertilizer, containing 3% nitrogen, and 1% soluble potash, is derived from oil seed meal, kelp extract and composted poultry litter. But it also has low concentrations of tea seed tree saponins (http://www.usga.org/news/2011/October/Course-Care--Controlling-Earthworm-Casts/). Little is known about the effect of these saponins on earthworms when applied in high concentration. Remember that these amendments are not approved against earthworm and that Tea Seed Tree saponins also affect fish if it reaches water bodies in high concentrations.

What If You Don't Have *A. agrestis*? Keep an eye out for them. One potential measure you can take to minimize the risk of getting them is to keep municipal mulches and composts out of your production. Keep in mind that Act 148 is coming on line in Vermont, which requires all organic wastes to be recycled. This may have serious ramifications for the spread of these worms with municipal and commercial compost and mulches. You may also check plant materials that you get from other nurseries for these worms. Encourage your professional organizations to support and lobby for research efforts on the biological control of these organisms.

Further Reading

http://www.duluthnewstribune.com/event/article/id/118862/
http://www.nytimes.com/2007/03/15/garden/15nature.html?pagewanted=print&_r=0
Cindy Hale. 2013. Earthworms of the Great Lakes. Kollath and Steensaas. Duluth, Mn.
https://www.naturewatch.ca/english/wormwatch/
http://www.nrri.umn.edu/worms/
http://www.harringtonsorganic.com/wp-content/uploads/2013/11/CT-Invasive-Worms-vers-10-4-11.pdf
http://www.vtinvasives.org/other-invasives/earthworms
http://uconnladybug.wordpress.com/tag/amynthas/
http://www.usga.org/news/2011/October/Course-Care--Controlling-Earthworm-Casts/