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Consequences of exotic Asian earthworm (*Amynthas agrestis*) invasion for Midwestern forest and prairie soils

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Background/Question/Methods

Invasion of non-native earthworms is a global phenomenon that has profoundly altered ecosystem structure and function. Prior research has well documented effects of invasive European earthworms (family Lumbricidae) in northern temperate forests, but the ecological consequences of earthworms from other origins remain poorly understood. Of particular concern is the recent invasion of Asian earthworms in the genus *Amynthas* (family Megascolecidae), which are increasingly reported in North America and expanding their range northward. Moreover, previous research has focused on forests; *Amynthas* are native to Asian grasslands and might thrive in midwestern prairies, with unknown effects. We conducted a mesocosm experiment and complementary field study from June to November 2014 in southern Wisconsin to study effects of a newly arrived (October 2013) invasive Asian earthworm (*Amynthas agrestis*). We asked what are the consequences of *Amynthas agrestis* invasion on soil and litter properties, and how do effects differ across forest and prairie ecosystems? We measured litter quantity and quality, and soil physical-chemical properties and nutrient pools at three depths (0-5cm, 5-10cm, and 10-25cm). We expected substantial litter declines and stronger effects on shallow soils, and we expected greater effects in forest than prairie ecosystems due to litter quality.

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Results/Conclusions

Initial results of the mesocosm experiment showed that, in both forest and prairie soils, foliage litter mass and depth declined substantially where *Amynthas agrestis* was present, as compared to no-worm controls ($P<0.001$). Litter mass declined more in forest than in prairie soils (70.8% vs. 48.3% loss, respectively), perhaps because deciduous forest leaf litter is easier to ingest relative to graminoid litter, which has higher lignin content. Field observations also showed that *Amynthas agrestis* accelerated loss of litter mass through time, with the strongest effect late in the growing season when *Amynthas* populations peak. In addition, total carbon and nitrogen in 0-5cm soils significantly increased from July to October in forests invaded by *Amynthas agrestis*, whereas total carbon and nitrogen remained constant or declined slightly in uninvaded forests. Furthermore, soil total C:N ratio increased from 13.0 to 13.8 in invaded areas but largely decreased from 15.1 to 12.9 in uninvaded areas over the experiment period. No differences through time were detected for deeper soils. Our study provided initial evidence that effects of this new invasive Asian earthworm can be significant and suggested the possibility of cascading effects on ecosystem processes that might rival those of European invaders.

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