

# Exotic earthworm abundance in west central Minnesota

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### Abstract

Native earthworms did not survive the Pleistocene glaciations in Minnesota. The earthworms currently found in the state are mostly Eurasian, and result from a biological invasion that followed European settlement in the 1800's. One of the main modes for the spread of earthworms is thought to be through sport fishing. Although many regions of the state are now infested, some areas are thought to remain worm-free. Recent studies have documented negative impacts of Eurasian earthworms on Minnesota forests. Data on worm distribution in Minnesota, however, are patchy. We surveyed for earthworms using the liquid extraction method in five forested study areas in west central Minnesota—the town of Morris, the University of Minnesota, Morris campus and three State Parks. Worm abundance is high in town and on campus, but much lower in the State Parks. Our three parks have low worm densities despite the presence of at least one fishing lake in each park. One of our study areas, Glacial Lake State Park, appears to be largely worm-free. Contrary to a published study suggesting a link between earthworms and invasive European buckthorn (*Rhamnus cathartica*), we see an inverse correlation between worm abundance and buckthorn abundance in the study plots at our State Park sites.

### Introduction

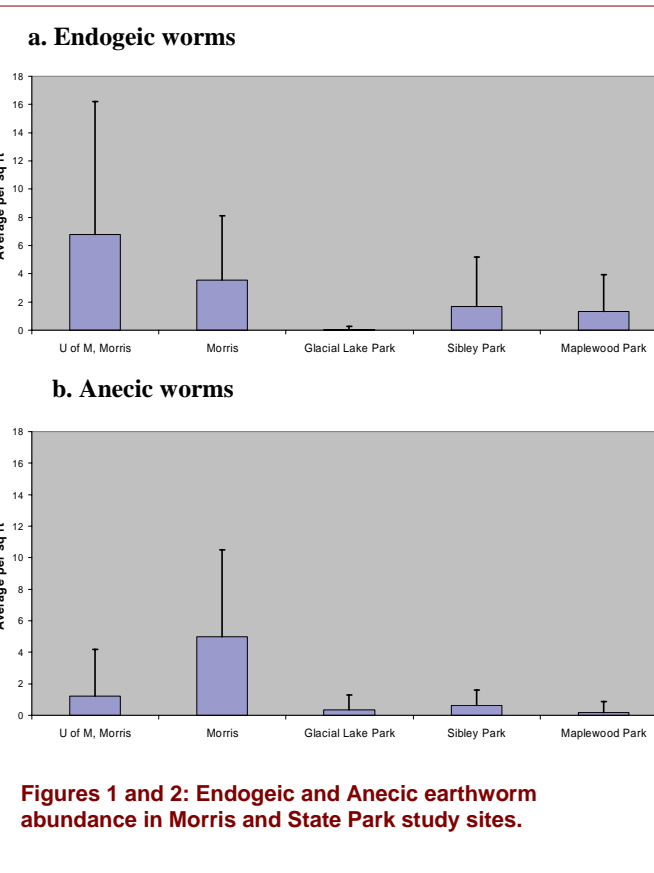
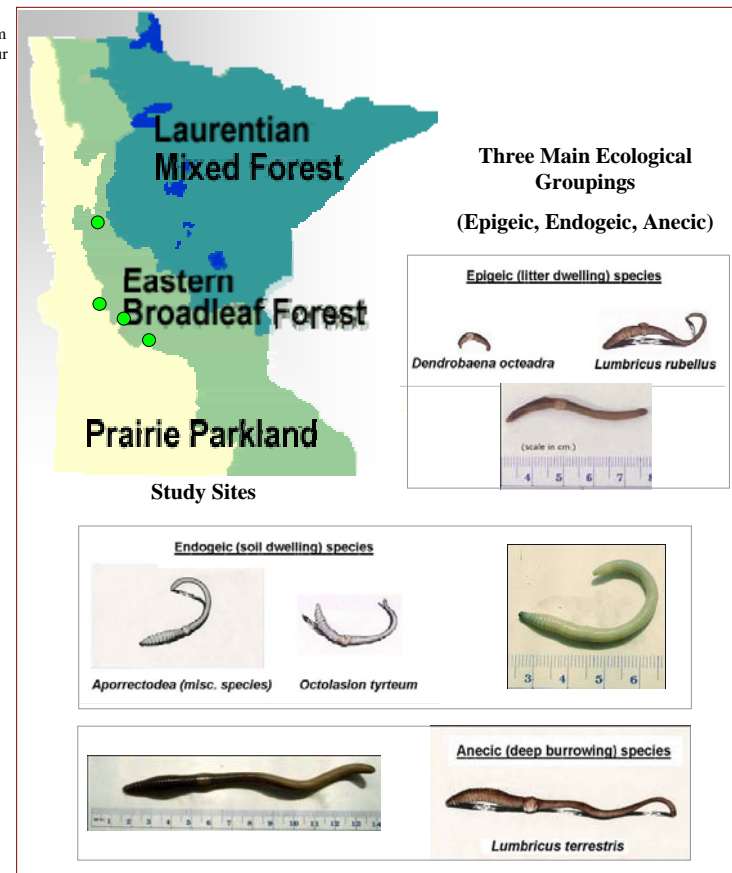
North American forests located within the southern limit of the Wisconsinian Glaciation contain no native earthworms. However, through various human activities, such as recreational fishing, exotic European earthworms are invading previously worm-free forests. This invasion of exotic earthworms leads to depletion of forest floor and organic soil layers, which may in turn affect soil nutrient availability, herbaceous populations and hardwood species abundance.

### Objective

Data concerning earthworm populations in Minnesota is not exhaustive. This survey looks at worm population abundance in the town of Morris, MN, and three state parks located on the prairie-forest border. It also compares worm populations to the abundance of the invasive shrub *Rhamnus cathartica*.

### Methods

- Earthworm population surveys taken in UofM:Morris campus, Morris, MN, Glacial Lakes State Park, Sibley State Park and Maplewood State Park.
- 33 sites, 77 plots sampled.
- Used 'hot' mustard (liquid) extraction to sample earthworms (Lawrence and Bowers, 2001)
- Earthworms were identified to ecological group (Epigeic, Endogeic, Anecic).
- Data were compared using one-way ANOVA (S plus)



Figures 1 and 2: Endogeic and Anecic earthworm abundance in Morris and State Park study sites.

### Results

- Endogeic and Anecic show significant difference in population abundance between city versus state parks (Figures 1 and 2)
- Earthworm abundance higher in areas of human activity (UofM:Morris campus and town of Morris, MN) (Figure 3)
- Earthworm and *Rhamnus cathartica* abundance show inverse correlation.

### Conclusion

- Worm abundance in our three State Parks is much lower than that of Morris (town and campus). Glacial Lakes state park appears to be largely worm-free, despite the presence of a public fishing dock.
- Contrary to a published study suggesting a link between earthworms and invasive European buckthorn (*Rhamnus cathartica*), we see an inverse correlation between worm abundance and buckthorn abundance in the study plots at our State Park sites.

### Acknowledgements

We thank Jess Nagel for help with fieldwork.  
 This work was funded through a U of MN Undergraduate Research Opportunities Program (UROP) grant and Morris Academic Partnership grant.

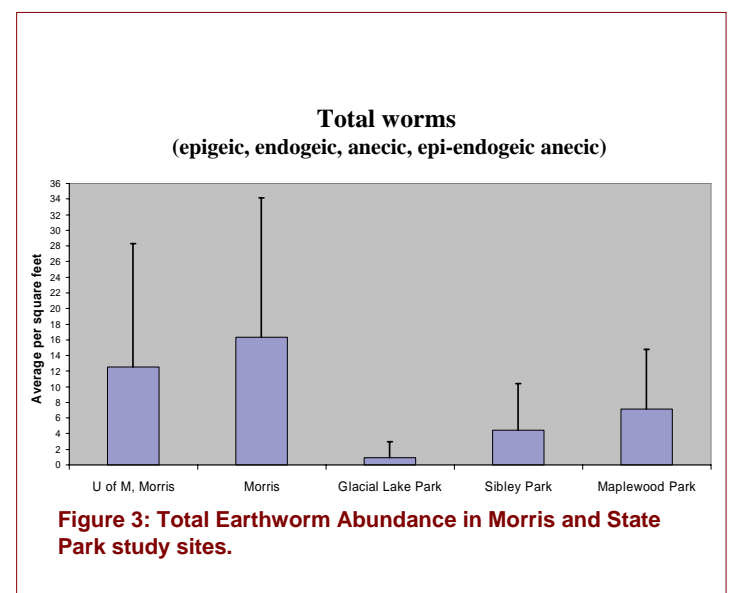


Figure 3: Total Earthworm Abundance in Morris and State Park study sites.

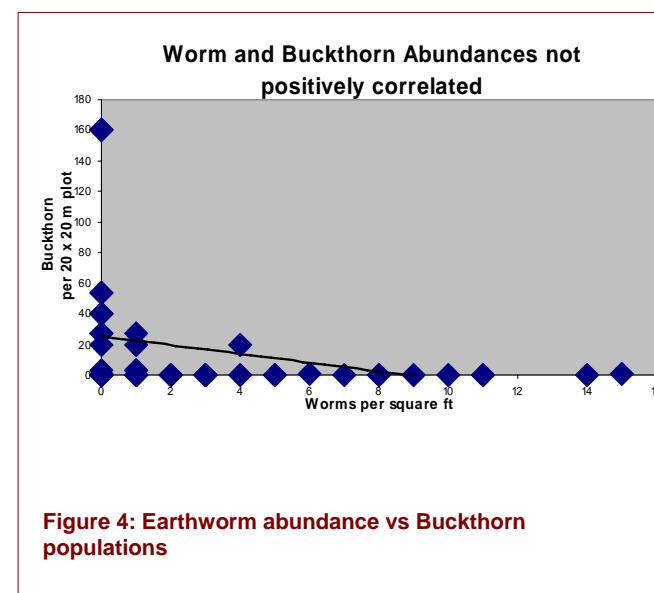


Figure 4: Earthworm abundance vs Buckthorn populations

### Literature cited

1. Lawrence, A. P., Bowers, M. A. 2002. A test of the 'hot' mustard extraction method of sampling earthworms. *Soil Biology and Biochemistry*. 34(4): 549-552.