Earthworms, Soils and N-Cycling in Remnant Forest Patches in the Baltimore Metropolitan Area

Katalin Szlávecz[1], Sarah Placella[1], Rich Pouyat[2], Vincent Giorgio[3], Peter Groffman[4], and Csaba Csuzdi[5]

[1]The Johns Hopkins University, Baltimore, MD; [2]USDA Forest Service, Northeast Station; [3]State University of New York, Syracuse NY; [4]Institute for Ecosystem Studies, Millbrook, NY; [5]Hungarian Museum of Natural History, Budapest

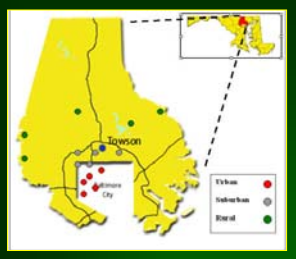
Introduction

Urbanization is the most prevalent land-use change today. It affects soil and soil fauna *via* habitat fragmentation, species introduction, changes in local climate, resource availability, and pollution. Earthworm invasion is one of the most visible change in soil invertebrate community structure.

Research Questions

- Are urban and rural forest soils different with respect to soil characteristics, and earthworm fauna?
- Does urbanization affect N mineralization and nitrification?

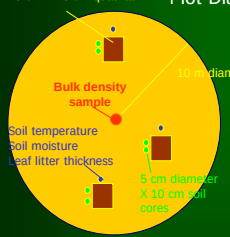
Methods



Earthworm burrows in Leakin Park, an urban site, in late summer.

Earthworm sample: 25 cm X 25 cm quadrat

Plot Diagram



Earthworm extraction: mild formaldehyde solution

Fixation: 4% formaldehyde solution

Potential N-mineralization and potential nitrification rates: Incubation at 17 °C, 21 days, colorimetry

Results

Soil data

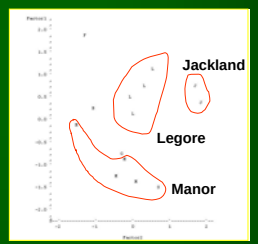
Summer 2001

	Bulk Density (g/cm³)	% Organic Matter	% Sand	% Silt	% Clay	Soil K (ppm)	Soil Ca (ppm)	Soil Mg (ppm)	Soil Na (ppm)	Leaf Litter K (ppm)	Leaf Litter Ca (ppm)	Leaf Litter Mg (ppm)	Earthworm Biomass (g/m²)
Urban	1.19	7.1	42.0	46.5	11.4	13.90	106.46	30.14	1.21	10.81	118.98	17.11	27.1
Suburban	1.03	9.1	51.9	35.7	12.4	19.66	93.85	18.83	1.49	12.14	118.84	15.25	21.3
Rural	.97	9.4	48.7	37.3	13.9	17.49	25.29	9.19	.96	13.22	75.86	20.47	29.4

Significant differences (ANOVA, Tukey's LSD, p<o.o5): bulk density, Ca, Mg, Na

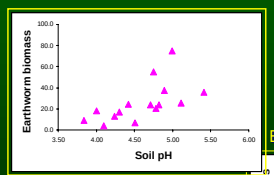
Fall 2002

	Soil Moisture (%)	pH	Conductivity (mV)	Leaf Litter Thickness (cm)
Urban	24.6	5.2	131	2.9
Rural	26.3	4.7	147	2.5



Sites are separated by soil type (parent material)

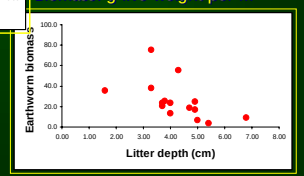
Earthworm data



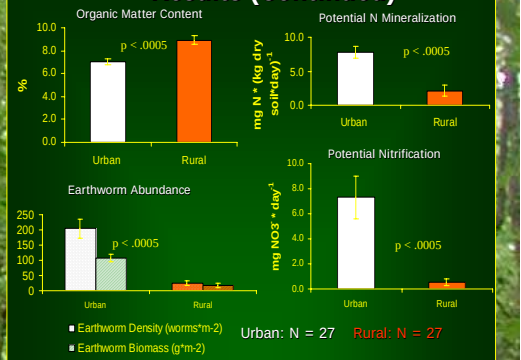
Species list:

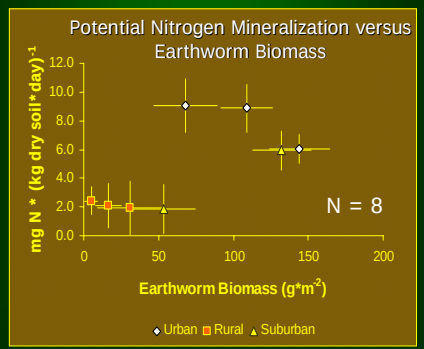
Aporrectodea caliginosa - Europe
Aporrectodea limicola - Europe
Lumbricus terrestris - Europe
Lumbricus friendi - Europe
Dendrobaena octaedra - Europe
Octolasion lacteum - Europe
Amynthas hilgendorfi - Asia
Diplocardia patuxentis – North America

Biomass: g live weight per m²



Results (Continued)





Conclusions

- Urban and rural forest soils form two distinct categories. Urban forest soils have greater
  - Potential N mineralization and potential nitrification
  - Earthworm density and earthworm biomass
- Differences in parent material confound the determination of urban effects

Acknowledgements

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