

ABSTRACT OF THE THESIS

Urbanization as a Multiple Stress Affecting
Forest Soil Arthropod Communities

by VICTOR AUGUSTINE RUDIS

Thesis director: Professor Richard T. T. Forman

Soil arthropods were collected at 15 upland oak forests along an 80-km urbanization gradient extending from New York City southwest toward rural New Jersey just north of Princeton. Four component stresses of urbanization were considered: forest isolation, biotic enrichment, air pollution, and microenvironmental alteration, along with site components indigenous to each forest stand. Environmental variables measured were: soil texture, moisture, and pH; tree diversity and numbers; distance to NYC; forest "island" area; percentage open, closed and forested land area within 1-km radius of each site; and atomic absorption analysis of fallen oak leaves.

Factor analysis and stepwise regression revealed that site components (oak leaf concentrations of Mn, S, P, K) and biotic enrichment (tree diversity) were significantly correlated with soil arthropod diversity; forest isolation, air pollution, and microenvironmental alteration were not. The urban pollutants Pb, Ni, and Na, were highly correlated, however, with aggregation (relative density/individual) and patchiness (relative frequency) of mite and collembola populations. Uropodina mites were more aggregated, collembola less aggregated, and oribatid

and other mites more patchily distributed at sites where one or more of these elements was in higher concentration. At many of the urban sites, an increase in diplopoda and saprovore coleoptera, and a decrease in thysanoptera and diptera were noted.

The major ecological implication of these findings suggests that urbanization, mainly as biotic enrichment and pollution, alters the soil ecosystem toward higher arthropod diversity and a higher decomposition rate, with more large, mobile saprovore taxa.