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Earthworms in the Non-glaciated Americas: Intentional Introductions, Invasions, Soil Quality Indicators, and Interactions with Native Species

MAC CALLAHAM¹, **GEORGE BROWN**², **CARLOS FRAGOSO**³, **BRUCE SNYDER**⁴, **SAMUEL JAMES**⁵

¹Center for Forest Disturbance Science, USDA Forest Service, Athens, GA, USA; ²Embrapa - Florestas, Colombo, PR, Brazil; ³Instituto de Ecologia, Xalapa, Ver., Mexico; ⁴Division of Biology, Kansas State University, Manhattan, KS, USA; ⁵Department of Biology, University of Iowa, Iowa City, IA, USA

The problem of introduction of, and subsequent invasion by, non-native earthworm species is global in scope, and is the subject of some recent debate. On one hand, earthworms are considered to be indicators of good soil quality due to their positive effects on water relations, nutrient availability, etc., but on the other hand, introduced earthworms do not always have strictly positive effects on the ecosystems they invade. There have been many intentional uses of non-native earthworms to realize benefits in agricultural, waste management, and bioremediation contexts. Large scale introductions of European earthworms have been used in Australia and New Zealand and these practices are still promoted as a way to improve pasture production and soil characteristics. Likewise, non-native earthworms are widely employed for managing organic wastes and subsequent production of vermicompost for horticultural or agricultural uses. Finally, non-native earthworms have been employed as agents of soil restoration in petroleum contaminated soils, and in soils that have otherwise been severely disturbed. In spite of this evidence that introduced earthworms can perform critical and useful functions in soil, there are still many situations where their presence is considered undesirable or even detrimental. For example, it has been demonstrated that the peregrine tropical species *Pontoscolex corethrurus* can negatively affect soil physical characteristics, particularly when there is insufficient organic matter in surface horizons of the soil. Additionally, there is growing evidence that non-native earthworms interact negatively with native litter and soil biota, and there have been suggestions that invasive earthworms can competitively exclude native species. Thus, one unresolved issue is how introduced earthworms influence soil processes when they invade soils that already support native earthworm species. Here we present examples from North, Central, and South American soils to examine relationships between land management and the composition of earthworm communities. A general pattern emerges suggesting that past disturbance and disturbance intensity can be a strong determinant of non-native earthworm representation in the total community, and this has implications for land managers focused on conservation and restoration objectives.