

CONTRIBUTION OF NEMATODES TO THE STRUCTURE AND FUNCTION OF THE SOIL FOOD WEB.

Ferris¹, Howard. ¹Department of Nematology, University of California, Davis, CA 95616. Carbon and energy flow through, and reticulate in, the soil food web, driving the metabolic processes of successive consumers. However, they are depleted rapidly by the metabolic and production functions of organisms. A “long” food web, with a large biomass at higher trophic levels, must receive a high rate of rhizodeposition or detrital subsidy, or be top-populated by organisms of slow growth and long life cycle, or both. Disturbed soil food webs tend to be bottom heavy and recalcitrant to restoration due to the slow growth of upper predator populations, physical and chemical constraints of the soil matrix, biological imbalances, and the relatively low mobility and invasion potential of soil organisms. Nematodes affect food web structure and function by: 1) channeling resources derived through herbivory; 2) predation on other organisms; 3) serving as prey for higher level predators; 4) redistributing organisms in the soil matrix; 5) sequestering minerals, C and energy; 6) mineralizing organic molecules to mineral forms available for uptake by plants and microbes; and 7) regulating opportunistic species. Subjectively, metabolic and behavioral functions of organisms in the soil food web may be categorized as ecosystem services, disservices or effect-neutral. Clearly, some of the functions through which nematodes affect food web structure are services; others are disservices. Among the disservices attributable to nematodes are overgrazing, which diminishes services of prey organisms, and plant-damaging herbivory, which reduces carbon fixation and availability for all organisms in the food web. However, not all plant-feeding is a disservice. Nematodes of the family Tylenchidae may be abundant around roots without causing measurable plant damage; their apparently non-damaging herbivory may be considered a service in providing resources for other functions of the food web. Opportunities for managing the service roles of nematodes in soil food webs include enhancement of mineralization by edaphic and environmental alteration, prolonging service effects through space and time by enhancing biodiversity and, consequently, functional complementarity and functional continuity. Further, managed increase of non-damaging prey of top predators provides an opportunity for enhancing predators in common of target prey species. In many instances, management to ameliorate potential disservices results in unintended but long-lasting diminution of services.