



Standard Guide for Conducting a Terrestrial Soil-Core Microcosm Test¹

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1. Scope

1.1 This guide defines the requirements and procedures for using soil-core microcosms to test the environmental fate, ecological effects, and environmental transport of chemicals that may enter terrestrial ecosystems. The approach and the materials suggested for use in the microcosm test are also described.

1.2 This guide details a procedure designed to supply site-specific or possibly regional information on the probable chemical fate and ecological effects in a soil system resulting from the release or spillage of chemicals into the environment in either liquid or solid form.

1.3 Experience has shown that microcosms are most helpful in the assessment process after preliminary knowledge about the chemical properties and biological activity have been obtained. Data generated from the test can then be used to compare the potential terrestrial environmental hazards of a chemical.

1.4 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 422 Test Method for Particle-Size Analysis of Soils²
- D 511 Test Methods for Calcium and Magnesium in Water³
- D 515 Test Methods for Phosphorus in Water³
- D 1426 Test Methods for Ammonia Nitrogen in Water³
- D 2167 Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method²
- D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures²
- D 2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)²
- D 3867 Test Method for Nitrite-Nitrate in Water³

2.2 U.S. Environmental Protection Agency:

Environmental Effects Test Guidelines, EPA 560/6-82-002, 1982⁴

Chemical Fate Test Guideline, EPA 560/6-82-003, 1982⁵

3. Terminology

3.1 Definition:

3.1.1 *soil-core terrestrial microcosm*—an intact soil-core containing the natural assemblages of biota surrounded by the boundary material. The system includes all equipment, facilities, and instrumentation necessary to maintain, monitor, and control the environment.

3.2 Description of Terms Specific to this Standard:

3.2.1 *terrestrial microcosm or micro-ecosystem*—a physical model of an interacting community of autotrophs, omnivores, herbivores, carnivores and decomposers within an intact soil profile. The forcing functions, for example, light intensity and duration, water quality and watering regime, temperature, and toxicant dose for the test system, are under the investigator's control. This test system is distinguished from test tube and single-species toxicity tests by the presence of a natural assemblage of organisms. This assemblage creates a higher order of ecological complexity and, thus, provides the capacity to evaluate chemical effects on component interactions and ecological processes. Certain features of this test system, however, set limits on the types of questions that can be addressed. Those limitations are related to scale and sampling, which in turn constrain both (a) the type of ecosystems and species assemblages on which one can gain information, and (b) the longevity of the test system.

3.2.2 *physical, chemical, and biological conditions of test system*—determined by the type of ecosystem from which the test system was extracted and by either the natural vegetation in the ecosystem or the crops selected for planting. Vegetation and crop selection are constrained and determined by the size (width and depth) of the soil core extracted.

3.2.3 *boundaries*—the boundaries of the test system are determined by the size of the soil-core and the space needed for vegetative growth.

¹ This guide is under the jurisdiction of ASTM Committee E-47 on Biological Effects and Environmental Fate and is the direct responsibility of Subcommittee E 47.08 on Biological Field Testing.

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² *Annual Book of ASTM Standards*, Vol 04.08.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ Available from the Office of Pesticides and Toxic Substances, Washington, DC. Also available as PB82 – 23992 from National Technical Information Service (NTIS), United States Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

⁵ Available from Office of Pesticides and Toxic Substances, Washington, DC. Also available as PB82 – 233008 from National Technical Information Service (NTIS), United States Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.