2 Quantitative Indicators of Soil Quality: A Minimum Data Set

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Interest in evaluating soil quality has been stimulated by increasing awareness that soil is a critically important component of the earth’s biosphere (Glanz, 1995). Soil functions in the production of food and fiber and also in the maintenance of the environment through acting as a filter and environmental buffer for water, air, nutrients, and chemicals. The quality and health of soils determine agricultural sustainability (Acton & Gregorich, 1995), environmental quality (Pierzynski et al., 1994), and, as a consequence of both—plant, animal, and human health (Haberern, 1992). Past management of nature to meet the food and fiber needs of increasing populations has taxed the resiliency of natural processes to maintain global balances of energy and matter (Doran et al., 1996). Within the last decade, inventories of the soil’s productive capacity indicate severe degradation on well more than 10% of the earth’s vegetated land as a result of soil erosion, atmospheric pollution, excessive tillage, over-grazing, land clearing, salinization, and desertification (Lal, 1994; Sanders, 1992). Findings from a project of the United Nations Environment Program on Global Assessment of Soil Degradation indicate that almost 40% of agricultural land has been adversely affected by human-induced soil degradation, and that more than 6% is degraded to such a degree that restoration of its original productive capacity is only possible through major capital investments (Oldeman, 1994). The quality of surface and subsurface water has been jeopardized in many parts of the world by intensive land management practices and the consequent imbalance in C, N, and water cycling in soil. At present, agriculture is considered the most widespread contributor to nonpoint source water pollution in the USA (CAST, 1992a; National Research Council, 1989). The present threat of global climate change and ozone depletion, through elevated levels of atmospheric gases and altered hydrological cycles, necessitates a better understanding of the effects of land management on soil processes. Soil management practices such as tillage, cropping patterns, and pesticide and fertilizer use are known to influence water quality. These manage-