Introduction to Coupling Soil Science and Hydrology with Ecology: Toward Integrating Landscape Processes

Ecosystem structure and its dynamic response to human-driven changes in climate and land use are complex by themselves and further complicated by the feedback mechanisms that interrelate soil processes, canopy dynamics, and climate. We propose that the scientific community needs to gain a fundamental understanding of these interactions to avoid a loss of biodiversity and irreversible shifts in vegetation. It is well recognized that the soil profile itself plays a vital role in moderating energy and mass fluxes; for example, partitioning energy into ground conduction, latent (evaporative), and sensible heat fluxes; and mediating the transport of soil water and nutrients. Plants are the drivers of these processes. We seek, in this special section, to focus on soil processes and their interactions with ecological services. The main objective of this special section is to focus on soil processes and their interactions with ecological services. The main objective of this special section is to focus on soil processes and their interactions with ecological services. The main objective of this special section is to focus on soil processes and their interactions with ecological services. The main objective of this special section is to focus on soil processes and their interactions with ecological services. The main objective of this special section is to focus on soil processes and their interactions with ecological services.

This special section is the product of a sequence of meetings aimed at interdisciplinary research and collaboration. The most recent symposium was held at the Ecological Society of America (ESA) meetings in Milwaukee, WI, in August 2008. "Soil, Water and Plants: Linking Physical Processes in Water Controlling Ecosystems" was jointly sponsored by the SSSA and was co-convened by Michael Young (Desert Research Institute), David Robinson (Centre for Ecology and Hydrology, Environment Centre Wales, Deiniol Rd, Bangor, Gwynedd, LL57 2UW, UK), and Ron Ryel (Department of Wildland Resources and the Ecology Center, Utah State University, Logan, UT 84322-5320). *Corresponding author.

The studies presented in this special section span a broad range of topics and linkages between climate, soil, and ecology. Kelleners et al. (2010) present a model to simulate snow dynamics, soil water storage, and soil temperature in a semiarid watershed. They showed that evapotranspiration still dominates the water budget even in areas where the dominant form of precipitation is snow (i.e., infiltration of snowmelt drives ecosystem productivity). Robinson et al. (2010) used electromagnetic induction to map heterogeneities in soil resources in a Mediterranean climate area. These heterogeneities affect the occurrence of grasses and trees across the landscape. Kelleners et al. (2010) presented an approach to simulate snow dynamics, soil water storage, and soil temperature in a complex, semiarid watershed. They showed that evapotranspiration still dominates the water budget even in areas where the dominant form of precipitation is snow (i.e., infiltration of snowmelt drives ecosystem productivity). Robinson et al. (2010) used electromagnetic induction to map heterogeneities in soil resources in a Mediterranean climate area. These heterogeneities affect the occurrence of grasses and trees across the landscape.