

ABSTRACT for symposium, "Ecological Foundations of Sustainability in a Constantly Changing World," 2007 Annual Meeting of the Ecological Society of America.

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Spatial pattern and temporal dynamics are fundamental attributes of ecological systems. Ecologists have long recognized patterns, but only recently has the understanding of spatial and temporal heterogeneity become an explicit research focus. I explore the implications of current understanding of spatial and temporal heterogeneity for the maintenance of ecosystem services. Spatial heterogeneity is significant for many ecological responses. For example, at broad scales, landscape heterogeneity and landscape context (the composition and configuration of areas surrounding a focal location) can affect species presence and abundance, genetic diversity, inter-specific interactions, and fluxes of matter and energy. At fine scales, spatial heterogeneity in soils affects biotic diversity, substrate availability and nutrient cycling rates. Thus, spatial patterns across a wide range of scales directly affect many ecosystem services. Natural and anthropogenic disturbances initiate trajectories of change in spatial patterns, thus linking heterogeneity in space and time. Ecosystem services that respond to spatial heterogeneity will be sensitive to temporal dynamics, and the legacy effects of disturbance can be remarkably persistent. Finally, spatial heterogeneity may lead to attenuation or amplification of ecological responses to multiple interacting drivers, particularly those that vary in scale. Such responses therefore may either enhance or hinder a given ecosystem service. The drivers of global change will produce new spatial patterns and novel trajectories of change. Maintenance of the provisioning, regulating, cultural and supporting ecosystem services upon which society depends is increasingly important in the context of global change and requires a careful consideration of spatial and temporal heterogeneity.