

ECOLOGICAL CLASSIFICATION SYSTEMS FOR THE WAYNE NATIONAL FOREST, SOUTHEASTERN OHIO¹

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Abstract: The importance of basing land management decisions upon an ecosystem perspective is becoming widely accepted. It is frequently regarded as insufficient to simply manage stands or forest cover types without considering the ecological relationships of the forest vegetation to the other components of the ecosystems, such as soils and physiography. In order to implement the policies of ecosystem management adopted by the USDA Forest Service, ecologically meaningful units of the landscape (ecosystems) must be recognized at various scales or levels. Given this justification, hierarchical ecological classification systems (ECSs) that characterize the range of local ecosystem types, have been developed for the Athens, Ironton, and Marietta Units of the Wayne National Forest. Each ECS was produced separately because of climatic, geologic, and land-use history differences among the three units. The Athens and Ironton Units lie principally within the Western Hocking Plateau Subsection. In contrast, the Marietta Unit is located within the Ohio Valley Lowland Subsection, and was settled first and more heavily farmed. Forest lands of the Athens Unit have experienced the most anthropogenic disturbance, including extensive clay and coal mining. The Ironton Unit was a center of 19th-century iron-ore production, resulting in a majority of the area consisting of even-aged mixed-oak forests.

A multifactor approach was utilized: characteristics of physiography, soils, and vegetation were integrated to identify and classify local forest ecosystems. Intensive field reconnaissance and sampling of a total of 380 sample plots were accomplished over several field seasons, followed by many iterations of multivariate analyses of the different data sets. The majority of the study area within unglaciated southeastern Ohio is comprised of moderately to steeply sloping terrain, however, ridgetops and ravine bottoms were easily distinguished by their level slopes (<16% slope). Canonical correspondence analysis (CCA) indicated that aspect was the environmental variable most highly correlated with different layers of the relatively undisturbed vegetation, for all three units. Therefore, the comparatively mesic northerly aspect ecosystems were separated from those of dry, southerly aspects. CCA was used to confirm which variables were the most important in delineating ecosystem types. Using the national hierarchical framework of ecological units, the most common Ecological Land Types (ELTs) and Ecological Land Type Phases (ELTPs) were defined primarily based upon reasonably stable ecosystem components including landform, slope position, depth to mottled soil, thickness of the A soil horizon, and soil fertility (Ironton only).

Ten major forest ecosystem types have been described for the Marietta Unit, 14 for the Athens Unit, and 8 for the Ironton Unit. The characteristic vegetation of each ecosystem type was specified by distinctive groups of mature canopy trees and of ground-flora species, both identified by two-way indicator species analysis (TWINSPAN). In general, oaks (*Quercus* L) typified the dry and dry-mesic slopes, while other species (e.g., *Acer saccharum* Marsh.) were more common on the mesic and wet-mesic sites. Cluster analysis confirmed the subjective classifications generated in the field, and multiple-response permutation procedures corroborated the differences in vegetation among ecosystem types. These ecosystem classification systems will be useful for managers as they formulate future forest plans, in making land management decisions, and as research frameworks.

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