

Ecological Systems as GAP Map Units in the Southeastern United States

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Through partnerships, the Gap Analysis Program (GAP) has played a major role in the evolution of vegetation classification systems for the United States (Jennings 1997; Grossman et al. 1998). The Ecological Systems Classification (Comer et al. 2003), developed by NatureServe for the Nature Conservancy, is a set of units that are reasonable mapping targets and also reasonable conservation targets at a variety of scales.

The Ecological Systems Classification is available for the lower 48 United States, and regional GAP efforts have generally adopted them as target map units. The developers of the Ecological Systems Classification were influenced by the recognition on the part of state GAP programs that in many cases, a consistent recombination of alliance and association units represented a more appropriate or practical set of map legend units than did individual alliances. The development of “Ecological Complexes” and “Compositional Groups” was an intermediate step in this process (Pearlstone et al. 1998; Menard and Lauver 2000). While GAP has moved away from mapping at the alliance level of the National Vegetation Classification System (NVCS), it is safe to say that without the association- and alliance-level descriptive work done for the NVCS, our understanding of the ecological systems would be far less complete.

Southwestern Regional GAP has recently completed a regional map for a five-state area with 109 of their 125 map units representing ecological systems (USGS-National Gap Analysis Program 2004). In the Southeast, we are targeting the systems and have added modifiers to accommodate variability within key systems. The Southeastern Regional GAP map legend will contain approximately 135 map units representing ecological systems and their modifiers. We are committed to mapping matrix, large-patch, and linear systems. Small-patch types will be mapped where possible on a case-by-case basis.

We have identified modifiers to the ecological systems in response to three different circumstances. First, there is structural variability within the system that may be important for improving the vertebrate models. Second, there is a successional expression of a community that dominates large areas. Third, there is variability in the underlying ecological processes that is expressed in the vegetation. In each case, the modifiers have only

been developed for systems where we expect spectral differences to correlate to the variability we need to recognize.

For example, the Southwest Florida Perched Barriers Salt Swamp and Lagoon, as described by NatureServe, can include patches of both mangrove forest and salt marsh. These structural variants should be spectrally distinct in the imagery, as well as important with respect to animal modeling. It would be desirable to recognize this within-system variation in the map legend.

In the Southeast, some plant communities have been reduced to mere remnants of their former distributions (Frost 1993; Noss et al. 1995). In these cases, identifying ecological systems in the field can be difficult because the reduced area or remnants occur within converted or managed landscapes. NatureServe in the Southeast has been developing spatial ranges for each of our target systems (Figure 1). These ranges are initially based on the Level III and IV Ecoregions of EPA Region 4 (EPA 2004) and refined with other environmental data and range data for dominant or characteristic plant species. The development of these spatially explicit range maps has been helpful in refining the concepts for some of these highly fragmented, but historically important, systems and in putting the existing vegetation in the context of the historic land-use patterns.

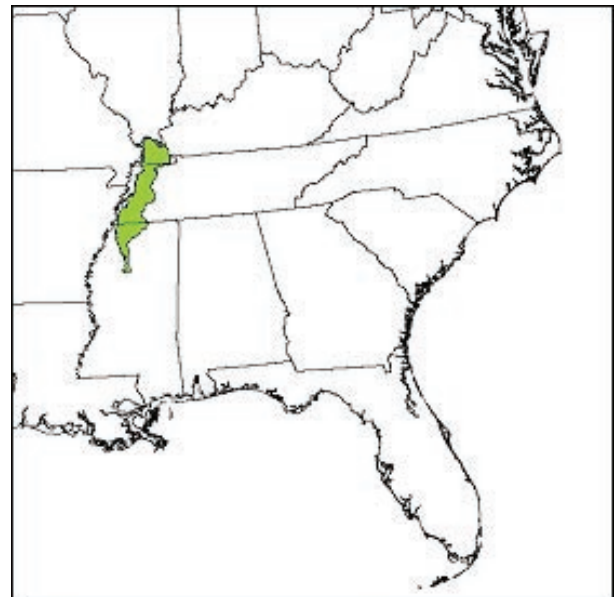


Figure 1. Preliminary range map for the East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482). This system is restricted to the Coastal Plain of Western Kentucky and Tennessee and northern Mississippi.

For disturbed systems, the development and application of the Ecological Systems Classification in the Southeast requires that we interpret the existing patterns that we currently see through the “lens” of historic patterns of land use and plant community succession. For the most highly disturbed conditions, such as pine plantations, we are not attempting to recognize the ecological system, but for the more moderately altered cases, we feel that recognizing the systems in their modified condition helps to place those sites in a clear context for conservation planning and restoration.

Natural low-elevation, dry-mesic forests in the Piedmont may be locally referred to as “oak-hickory” forests (e.g., Schafale and Weakley 1990; Wharton 1978), but most broader, regional treatments call these southeastern forests “oak-pine” forests (Braun 1950) or “oak-hickory-pine” forests (Küchler 1964; Skeen et al. 1993). In NatureServe’s classification, this is called “Southern Piedmont Dry Oak-(Pine) Forest.” This nomenclature attempts to recognize both that there is an increase in the amount of naturally occurring pine in this system as one moves from north to south, and that patterns of land clearing, regeneration, and succession have obscured much of the original patterns of natural vegetation (Braun 1950; Skeen et al. 1993). Today, much of the Piedmont supports loblolly pine-dominated stands that represent a long-term successional type that resulted from large-scale land clearing and subsequent abandonment of farmland (Schafale and Weakley 1990). Therefore we have recognized two expressions of the Southern Piedmont Dry Oak-(Pine) Forest: the loblolly pine modifier, representing the successional type, and the mixed/hardwood modifier, representing the mature expression of the type.

The Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest is another example in which a key ecological variable is well-correlated with a difference in vegetation that can be recognized in the satellite imagery. In this example, water level throughout the season varies enough to develop two phases of this system: the oak-dominated areas in the shallower water and the bald-cypress/gum portions in the deeper water. This variability in the composition and structure can be recognized in the imagery because the bald-cypress/gum variant is generally more open and should be spectrally separable and is also important for some animal models.

The weaknesses of the Ecological Systems Classification are those common to most detailed classification systems. The classification is evolving as knowledge is gained, the descriptions of the systems vary in completeness depending on our current understanding, and the classification describes ideal conditions within a plant community that may be more the exception than the rule, especially in the Southeastern landscape. This requires that we recognize some existing vegetation patterns through the use of modifiers.

The advantages, especially in the Southeast, include that this classification has evolved in parallel with GAP mapping efforts and therefore is more practical for mapping. In addition, it builds on the detailed framework of association- and alliance-level data, it has involved Heritage ecologists in its development, and the units are generally more recognizable to a broader audience than those of the U.S. National Vegetation Classification System.

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