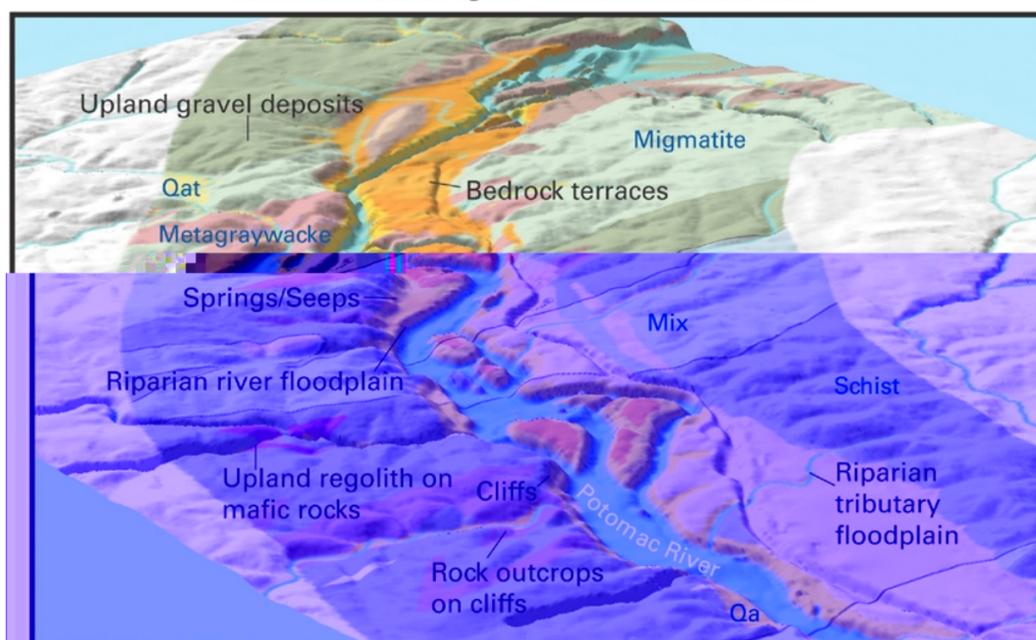


THE ROLE OF GEOLOGIC MAPS IN THE STUDY OF ECOLOGY OF THE APPALACHIAN REGION

Scott Southworth and others
United States Geological Survey

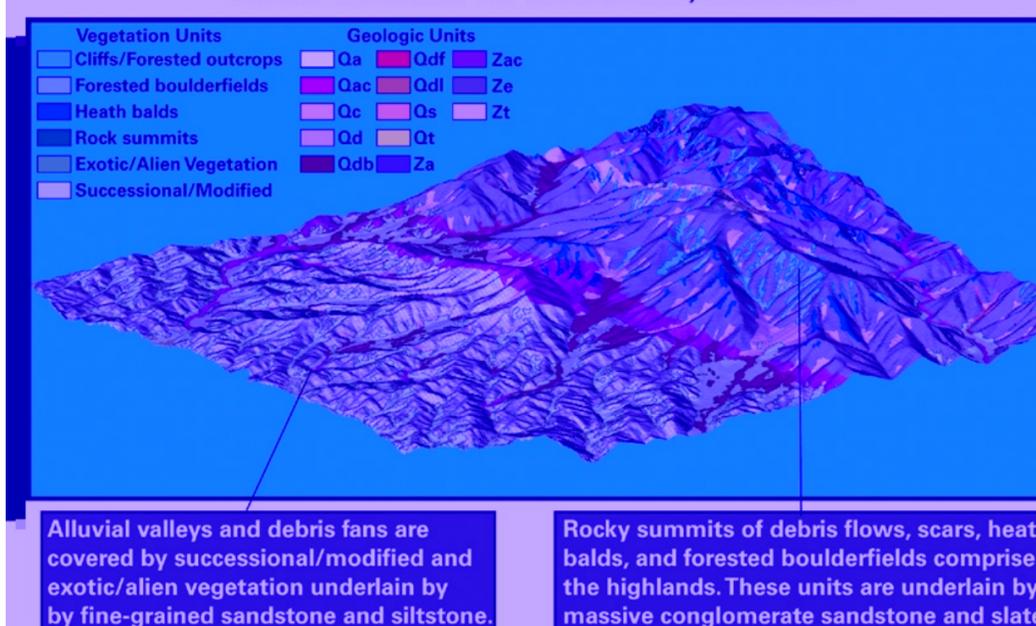
Problem: Conservation and management of public lands requires understanding of the natural resources and ecosystem. Geologic maps that portray bedrock and surficial deposits and topography provide the framework structure of the ecosystem. The All Taxa Biodiversity Inventory in the Great Smoky Mountains National Park, in the western Blue Ridge of Tennessee and North Carolina, and The Potomac Gorge Site Conservation Plan in the central Piedmont of Maryland and Virginia, are cooperative investigations with the National Park Service and The Nature Conservancy where geologic map data are providing an integral role. Both sites are globally renowned ecosystems that harbor great biodiversity rich in species. We are developing an integrated ecological landscape model here, as well as Shenandoah National Park, Va., by investigating the degree to which topographic, geomorphic, and biologic diversity is a function of bedrock lithologic units, structure, and types of regolith.

3-D Map of GeoEcological Landform Units
The Great Falls Region of the Potomac River



The Geologic Map: Geologic maps of parts of thirty two 7.5-minute quadrangles have been compiled and digitized as part of a geographic information system (GIS) of Great Smoky Mountains National Park, TN and NC. The park is situated in the westernmost part of the Blue Ridge of the Southern Appalachians. Bedrock is predominantly Neoproterozoic metasedimentary rocks of the Ocoee Supergroup with minor amounts of gneiss, igneous, and carbonate rocks. Quaternary surficial units are mostly colluvial slope deposits. Parts of six 7.5-minute quadrangles have been compiled and digitized as part of a GIS of Great Falls Park, C&O Canal National Historical Park, and George Washington Memorial Parkway, that constitute the Potomac Gorge Site. Centered on the Great Falls of the Potomac River, the bedrock is Neoproterozoic to Cambrian metasedimentary rocks with rare mafic and felsic meta-igneous rocks. Spectacular incised bedrock strath terraces, cliffs, islands, and associated potholes provide a unique setting.

3-D Map of GeoEcological Landform Units
Mount LeConte in the Great Smoky Mountains



Applying the geologic map: Traditional bedrock units are classified as lithochemical map units based on the acid neutralization capacity, based on the content of the minerals calcite, pyrite, and quartz. Surficial deposits are classified based on the composition of clasts and regolith, and topographic setting. Digital elevation model data processed for slope, aspect, and curvature of the landforms is combined with the bedrock and surficial units to create an Ecological Landscape Unit Map.

Discussion: The geologic framework shapes the topography, watersheds, and soils, that host the plant and animal communities as a function of climate, elevation, and the composition and chemistry of underlying materials. Vegetation communities independently mapped by The Nature Conservancy and NPS correspond to bedrock and surficial units. Rare plants and critical habitats correspond with unique geologic settings. Specifically exotic/alien, and successional/modified communities occur along alluvial valleys and fan deposits, and debris flows in the Great Smoky Mountains, and 15 globally-rare species and 100 species rare to the States are found in 30 different vegetation communities established on discrete geologic features within the 9700 acre area of the Potomac Gorge.