Torreya State Park (Liberty County) Photo by Gary Knight

Slope Forest

Description: Slope forest is a well-developed, closed canopy forest of upland hardwoods on steep slopes, bluffs, and in sheltered ravines within the Apalachicola River drainage. Slope forests have extremely high tree and shrub diversity (Platt and Schwartz 1990), largely because of their mixture of cold temperate and warm temperate elements (Greller 1980). Tree density is relatively high, inducing much competition for space, water, sunlight and nutrients. The mostly deciduous canopy commonly includes American beech (*Fagus grandifolia*), Florida maple (*Acer saccharum* ssp. *floridanum*), white oak (*Quercus alba*), tuliptree (*Liriodendron tulipifera*), Shumard's oak (*Q. shumardii*), white ash (*Fraxinus americana*), black oak (*Q. velutina*). Several evergreen species are common as well, including southern magnolia (*Magnolia grandiflora*), spruce pine (*Pinus glabra*), live oak (*Q. virginiana*), and laurel oak (*Q. hemisphaerica*).

The diverse understory can be moderately dense to sparse and includes smaller canopy species plus American witchhazel (*Hamamelis virginiana*), needle palm (*Rhapidophyllum hystrix*), American holly (*Ilex opaca*), eastern redbud (*Cercis canadensis*), mountain laurel (*Kalmia latifolia*), oakleaf hydrangea (*Hydrangea quercifolia*), basswood (*Tilia americana*), Florida anisetree (*Illicium floridanum*), sourwood (*Oxydendrum arboreum*), Gulf Sebastian bush (*Sebastiania fruticosa*), white fringe tree (*Chionanthus virginicus*), flowering dogwood (*Cornus florida*), horse sugar (*Symplocos tinctoria*), red buckeye (*Aesculus pavia*), silky camellia (*Stewartia malacodendron)*, Florida yew (*Taxus floridana*), Ashe's magnolia (*Magnolia ashei*), pyramid magnolia (*Magnolia pyramidata*), and the historically dominant but now declining Florida torreya (*Torreya taxifolia*; Schwartz and Hermann 1993). The herbaceous groundcover is often sparse and composed mainly of shade-tolerant species and spring ephemerals such as partridgeberry (*Mitchella repens*), Florida yam (*Dioscorea floridana*), woodland pinkroot (*Spigelia marilandica*), saw greenbrier (*Smilax bona-nox*), wild blue phlox (*Phlox divaricata*), sarsaparilla vine (*Smilax pumila*), prostrate blue violet (*Viola walteri*), heartleaf noseburn (*Tragia cordata*), switchcane (*Arundinaria gigantea*), trilliums (*Trillium* spp.), Christmas fern (*Polystichum acrostichoides*), and fringed campion (*Silene polypetala*).

The combination of densely shaded slopes and cool, moist microclimates produces conditions that are conducive for the growth of many plant species that are more typical of the Piedmont and Southern Appalachian Mountains (Schwartz and Hermann 1993). These include mountain laurel, black walnut (*Juglans nigra*), wild hydrangea (*Hydrangea arborescens*), sweet-shrub (*Calycanthus floridus*), burningbush (*Euonymus atropurpureus*), heartleaf (*Hexastylis arifolia*), common maidenhair fern (*Adiantum capillus-veneris*), smooth Solomon's seal (*Polygonatum biflorum*), liverleaf (*Hepatica nobilis*), white baneberry (*Actaea pachypoda*), perfoliate bellwort (*Uvularia perfoliata*), bloodroot (*Sanguinaria canadensis*), false hellebore (*Veratrum woodii*), Canadian lousewort (*Pedicularis canadensis*), wild comfrey (*Cynoglossum virginianum*), downy rattlesnake plantain (*Goodyera pubescens*), American bladdernut (*Staphylea trifolia*), and eastern leatherwood (*Dirca palustris*).

Slope forest occurs in areas with substantial topographic relief. Soils are generally composed of sands, sandy-clays, or clayey-sands with substantial organics and occasionally calcareous components. The Cody Scarp crosses the range of slope forest near its southern extent along the Big Sweetwater Creek (Schwartz and Hermann 1993). The soils above this divide are clayey Miocene soils while the soils to the south are Pleistocene sandy soils. Sandy soils are generally well drained, but clayey soils may shed much of the rainfall and exhibit significant surface water runoff. Thus, soil erosion is often a combination of seepage erosion, which occurs largely from the valley floors up (steepheads), and surface erosion, which occurs largely from the hilltops down (Whitney et al. 2004).

Slope forests along the Apalachicola River are included in one of the six biodiversity hotspots in the United States designated by The Nature Conservancy (Stein et al. 2000). These are relictual forests noted for their admixture of rare plants, coastalplain species, and species more common further north (Hubbell et al. 1956; Platt and Schwartz 1990). Ravines along the Apalachicola River north of the Cody Scarp remained above sea level

during the Pleistocene, providing a safe refuge for southward-moving northern species. Since the waters of the Apalachicola River originate in the Appalachian Mountains many northern species had a direct conduit to the south during interglacial periods. The cool microclimate created by the narrow, shaded ravines allowed for their persistence during warm periods.

Characteristic Set of Species: American beech, Florida torreya, Florida yew, Ashe's magnolia, croomia, fringed campion, eastern leatherwood, Shumard's oak, Florida maple

Rare Species: Slope forest is well known for its high diversity of rare plants (approximately 41 species) within a very restricted geographic location. Two Florida endemic tree species, Ashe's magnolia and Florida yew, are present in slope forest (James 1961; Platt and Schwartz 1990). Rare plants characteristic of slope forest include fringed campio, Florida torreya, Florida yew, croomia (*Croomia pauciflora*), burningbush, bay star-vine (*Schisandra glabra*), Baldwin's spiny-pod (*Matelea baldwyniana*), pyramid magnolia, Ashe's magnolia, eastern leatherwood, narrow-leaved trillium (*Trillium lancifolium*), liverleaf, wood spurge (*Euphorbia commutata*), Godfrey's privet (*Forestiera godfreyi*), American bladdernut, northern prickly ash (*Zanthoxylum americanum*), Florida flame azalea (*Rhododendron austrinum*), and green violet (*Hybanthus concolor*).

Rare animals that occupy slope forest are Apalachicola dusky salamander (*Desmognathus apalachicolae*), copperhead (*Agkistrodon contortrix*), hairy woodpecker (*Picoides villosus*), and worm-eating warbler (*Helmitheros vermivorum*). Several rare invertebrates are found in Florida slope forests including the Torreya pygmy grasshopper (*Tettigidea empedonepia*) and floodplain phanaeus scarab beetle (*Phanaeus triangularis*). The Apalachicola hydroptila caddisfly (*Hydroptila apalachicola*), is restricted to a single slope forest ravine.

Range: Slope forest is restricted to a 35 km stretch along the eastern side of the Apalachicola River in the northern Florida Panhandle and southern Georgia (Schwartz and Hermann 1993). In Florida, slope forest occurs south of Lake Seminole in Gadsden and Liberty counties, from the Georgia state line to just north of Bristol, Florida, roughly following the range of Florida torreya (Schwartz and Hermann 1993).

Natural Processes: Succession is generally restricted to single tree canopy gaps. Canopy damage on a larger scale can result from occasional hurricanes and strong storms (Batista and Platt 1997). Fire is rare in these protected mesic forests (Delcourt and Delcourt 1977).

Slope forest has undergone a drastic change since the 1950s, the near extinction of one of its dominant, understory species, the Florida torreya (Schwartz and Hermann 1993). The decline of the Florida torreya is thought to be caused by a fungal infection, although no specific pathogen has been identified to date (Schwartz and Hermann 1993). It is unclear and probably too early to tell what long-term effects the absence of this tree will have on the community.

Community Variations: Slope forest can vary with topographic location. Higher elevations with deep sandy soils and thinner leaf mantles may exhibit nearly xeric soil

conditions. Lower elevations on slopes near cool streams, or where seepage is prevalent, tend to be cooler, and soils may be nearly hydric. Slight changes in soil moisture along the slope gradient are often reflected by different plant species (Clewell 1986; Schwartz and Hermann 1993; Kwit et al. 1998). For example, Florida torreya, Florida anise, mountain laurel, and tuliptree tend to be associated with lower slopes in soils with higher moisture and organic content, while mockernut hickory, laurel oak, and live oak tend to be associated with upper slopes of better-drained, drier soils (Clewell 1986; Schwartz and Hermann 1993). The mid-slope is usually dominated by mesic forest species such as American beech, southern magnolia, and Florida maple.

Associated Communities: Apart from its narrow geographic range, slope forest may be distinguished from upland hardwood forest by steep slopes, a richer diversity of species, and a diversity of species more common to the Appalachian region further north. Two rare species, Florida torreya and Florida yew are endemic to this community type. Slope forest and upland hardwood forest are mesic communities that can occur in close proximity to one another. Slope forest is often associated with, and grades into, upland pine or sandhill at their upper elevations, and baygall or floodplain communities at their lower elevations. Seepage streams commonly occur along the valley floors of slope forest.

Management Considerations: Slope forests are sensitive to direct physical disturbances and to hydrological manipulations that affect seepage and surface water sources. Their steep slopes are highly susceptible to erosion when un-vegetated or damaged. Common disturbances include logging, development, foot or vehicular traffic, and feral hog rooting. Unsightly refuse dumps are frequently located in slope forest ravines and steepheads. This refuse can bury or damage vegetation and impact stream water quality. Impoundments of streams within ravines can also destroy slope forest on adjacent lower slopes.

The unique assemblage of slope forest plants and animals attracts many outdoor enthusiasts. Uncontrolled collecting by hobbyists and professionals could, however, significantly impact populations of some plants and animals. Slope forests are very rare, and should be protected diligently from human-related disturbances. It is also important that adjoining upland communities be maintained. Disturbances such as logging in these uplands can lead to accelerated erosion in the slope forest below (Stallins and Griggs 2004).

Invasive exotic species can be a problem even in the highest quality slope forest. Species that often invade these forests include coral ardisia (*Ardisia crenata*), Chinese privet (*Ligustrum sinense*), Japanese climbing fern (*Lygodium japonicum*), heavenly bamboo (*Nandina domestica*), and silverthorn (*Elaeagnus pungens*).

Exemplary Sites: Apalachicola Bluffs and Ravines Preserve (Liberty County), Torreya State Park (Liberty County)

Global and State Rank: G2?/S1

Crosswalk and Synonyms: The 1990 Natural Community Guide (FNAI and FDNR 1990) defined slope forest in a more general sense based primarily on topography. Many

forests in the Florida Panhandle and northern peninsula (e.g., Eglin Air Force Base in Okaloosa, Washington, and Santa Rosa counties, and Goldhead Branch State Park in Clay County) that were previously classified as slope forest would be classified as upland hardwood following this update.

Kuchler	112/southern mixed forest
	included in 113/southern floodplain forest
Davis	4/mixed hardwoods and pines
	12/hardwood forests
SCS	5/mixed hardwood and pine
	11/upland hardwood hammocks
Myers and Ewel	Temperate hardwood forests - relict forests
SAF	82/loblolly pine - hardwood
FLUCCS	431/beech - magnolia
	434/hardwood - conifer mixed
	438/mixed hardwoods
	439/other hardwoods

Other synonyms: ravine; steephead (Kwit et al. 1998); mesic hardwood hammock, magnolia beech climax forest (Delcourt and Delcourt 1977); torreya ravines, bluff and slope forests (Wharton 1978)

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