Apalachicola River Water Management Area (Liberty County) Photo by Ann F. Johnson

Alluvial Forest

Description: Alluvial forest is a hardwood forest found in river floodplains on low levees, ridges and terraces that are slightly elevated above floodplain swamp and are regularly flooded for a portion of the growing season. The physical environment is greatly influenced by ongoing disturbances created by a fluctuating river bed which is both eroding and depositing substrates (Sharitz and Mitsch 1993). Primary trees found include overcup oak (*Quercus lyrata*), swamp laurel oak (*Q. laurifolia*), water hickory (*Carya aquatica*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), water locust (*Gleditsia aquatica*), river birch (*Betula nigra*), and red maple (*Acer rubrum*). A great diversity of less flood-tolerant hardwoods or swamp species such as cypress (*Taxodium* spp.) and tupelo (*Nyssa* spp.) may also be present, but not dominant elements. Shrubs, small trees, and vines are usually sparse or moderate in abundance with green hawthorn (*Crataegus viridis*), swamp dogwood (*Cornus foemina*), eastern swampprivet (*Forestiera acuminata*), dwarf palmetto (*Sabal minor*), coastalplain willow (*Salix caroliniana*), black willow (*S. nigra*), American hornbeam (*Carpinus caroliniana*), *Hypericum* spp., possumhaw (*Ilex decidua*), and laurel greenbrier (*Smilax laurifolia*) common. Groundcover is variable in abundance with false nettle (*Boehmeria cylindrica*), butterweed (*Packera glabella*), netted chain fern (*Woodwardia areolata*), redtop panicum (*Panicum rigidulum*), and big carpetgrass (*Axonopus furcatus*) among the herbs most commonly encountered (species lists developed in part from Leitman et al. [1982], Darst [2008], and Darst [2002]). The ability of both adult plants and seedlings to

withstand specific flooding regimes throughout the "ridge and swale" topography of the floodplain often creates a mix of mesophytic and hydrophytic tree species.

Alluvial forest occurs in river floodplains and occupies low levees along channels, expansive flats located behind levees, low ridges alternating with swamps, and successional point bars. It is usually intermixed with lower areas of floodplain swamp and higher areas of bottomland forest, baygall, or upland hardwood forest. This forest develops along tertiary or higher order streams where deposition of alluvium becomes a significant factor in floodplain development (rather than simply erosional forces). Soils are variable mixtures of sand and alluvial sediments that have been deposited by the current drainage system and are often distinctly layered. Alluvial forest occupies an elevation within the broader floodplain that is inundated seasonally from river bank overflow for one to four months of the year during the growing season (Darst et al. 2002).

Characteristic Set of Species: water hickory, overcup oak, swamp laurel oak, green ash, American elm, water locust, river birch

Rare Species: Examples of rare plants found in alluvial forest include variable-leaved indian-plantain (*Arnoglossum diversifolium*), Canada honewort (*Cryptotaenia canadensis*), and Thorne's buckthorn (*Sideroxylon thornei*). Animal diversity is high, particularly in drier portions of the alluvial forest where forage is plentiful (Sharitz and Mitsch 1993). The long list of rare animals found (or historically found) in alluvial forest includes one-toed amphiuma (*Amphiuma pholeter*), American alligator (*Alligator mississippiensis*), Mississippi green water snake (*Nerodia cyclopion*), Barbour's map turtle (*Graptemys barbouri*), ivory-billed woodpecker (*Campephilus principalis*), swallow-tailed kite (*Elanoides forficatus*), yellow-crowned night-heron (*Nyctanassa violacea*), black-crowned night-heron (*Nycticorax nycticorax*), hairy woodpecker (*Picoides villosus*), Louisiana waterthrush (*Seiurus motacilla*), Bachman's warbler (*Vermivora bachmanii*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), big brown bat (*Eptesicus fuscus*), southeastern bat (*Myotis austroriparius*), gray bat (*M. grisescens*), northern long-eared myotis (*M. septentrionalis*), southeastern weasel (*Mustela frenata olivacea*), Florida long-tailed weasel (*M. frenata peninsulae*), and Florida black bear (*Ursus americanus floridanus*).

Range: Alluvial forest is most widespread in the Florida Panhandle where alluvial rivers, particularly the Apalachicola, create broad floodplains. Blackwater river systems may also contain alluvial forest; however, the deficiency of suspended inorganic alluvium and shorter flood duration is not as conducive to their development. In the peninsula south of the Suwannee River, alluvial forest is usually restricted to small areas around oxbows and riverbanks where deposition occurs on the inside curve of meander loops or in narrow strips bordering floodplain swamps. In these peninsular forests, overbank flooding does not contribute significant deposition to the remainder of the floodplain surface, and the majority of these systems are usually either hammocks or bottomland forest with shorter flood durations accompanying periods of heavy rainfall in the late summer and early fall. Alluvial forest is not found south of Lake Okeechobee where broad strand swamp systems replace the floodplains found further north.

Natural Processes: Hydroperiod is the primary physical feature of alluvial forest, which is inundated by flood waters nearly every year for at least a portion of the growing

season. This factor is critical to species composition, since many trees that can withstand frequent flooding are nonetheless sensitive to prolonged growing season inundation. Although flooding may be extensive, alluvial forest usually does not contain standing water during the dry season.

Seasonal inundation serves to flush the forest floor of leaf litter as accumulated organic material on the forest floor is picked up and redistributed in the floodplain or is washed downriver to provide a critical source of minerals and nutrients for downstream ecosystems, in particular estuarine systems. These floods also replenish soil minerals through deposition on the floodplain (Wharton et al. 1982). The unique topography of alluvial forest and floodplain swamp is a result of the seasonal flooding pattern which not only builds levees and point bars, but also creates scour channels and depressions. The changing meander of the river itself leaves behind old channels and levees that become part of the complex mosaic (Wharton et al. 1982). The formation of high levees along rivers may have a significant impact on alluvial forest and swamp located further from the river, as these levees block flow between the main channel and the rest of the floodplain, leading to ponding of floodwaters and an increase in anaerobic soil conditions (Leitman et al. 1982).

The advancement of alluvial forest onto point bars follows a successional pattern with pioneer, shade-intolerant species such as black willow and river birch initially stabilizing the soil and then gradually giving way to less disturbance tolerant species such as overcup oak. This pattern results in point bars with vegetation that is progressively younger toward the river channel.

Fire is very infrequent, often restricted to individual trees (Leitman et al. 1982). Stands that burn during drought conditions sustain heavy damage to the understory (Wharton et al. 1982). In addition to flooding regimes, variation in seedling establishment may be caused by individual tree death which creates canopy gaps necessary for the establishment of certain shade intolerant seedlings such as river birch (Sharitz and Mitsch 1993).

Community Variations: Alluvial forest is heavily influenced by seasonal river flooding. Each floodplain contains its own unique set of physical and chemical environments that lead to multiple species assemblages both across different floodplains and at different points within the same floodplain. The overcup oak/water hickory forests are the best examples of this community; however, other variations such as point bar thickets are common. Overcup oak and river birch are entirely absent from the narrower floodplains of the peninsula, reaching their southern limit just south of the Suwannee River. Peninsular alluvial forest usually contains a variable mixture of water hickory, water locust, American elm, swamp laurel oak, and/or green ash. Since peninsular rivers usually exhibit a stronger fall flooding pattern, these forests could only marginally be considered alluvial forest rather than bottomland forest.

Associated Communities: Alluvial forest is often positioned between high riverbank levees and the lower floodplain swamp. It may also occur as a terrace uphill from the floodplain swamp or immediately adjacent to rivers on aggrading point bars where recent deposition favors species particular to these conditions, particularly willows and river birch. Although many of the characteristic species of alluvial forest may be common in

floodplain swamp, cypress and/or tupelo are dominant in these swamps because of the longer hydroperiod. Bottomland forest often occupies slightly higher terraces, ridges, and levees in the floodplain and usually does not receive annual springtime flooding, whether due to higher elevation or differences in stream type. These forests sometimes have loblolly pine (*Pinus taeda*) and generally lack water hickory, overcup oak, and/or green ash as dominants. Baygall is dominated by evergreen bay species and lacks the diverse assemblage of deciduous trees found in alluvial forest. Both bottomland forest and baygall can line the courses of primary and secondary streams. The downstream transition to a broader floodplain where seasonal flooding shapes the course of the river (conditions conducive to the development of alluvial forest) is gradual. Hydric hammocks share many species of hydrophytic plants but are generally dominated by a mix of evergreen oaks, cabbage palm (*Sabal palmetto*), and red cedar (*Juniperus virginiana*).

Management Considerations: Alluvial forest must be managed as part of the whole of a riverine system. These communities provide important wildlife habitat and contribute to the overall water quality of streams and rivers. The maintenance of natural hydrologic regimes is critical to the health of forested floodplains and to the downstream systems with which they are connected. Species composition and the functional relationships throughout a river system are negatively impacted by hydrological alterations such as artificial impoundments, river diversion projects, pesticide use, forest clearcutting, or intensive agriculture. Upstream dam construction may severely limit the effects of seasonal flooding that maintain the health of these systems, including the stabilization of deposits and flushing of detritus (Wharton et al. 1982). Channelization of rivers also leads to a reduction of sedimentation in the floodplain by contributing to increased runoff (Hupp 2000). These artificial channels may also increase flooding downstream, decrease the filtering effects of floodplains, and amplify erosion because of the lack of stabilizing root masses (Wharton et al. 1977).

Exemplary Sites: Torreya State Park (Apalachicola River; Liberty County), Apalachicola Water Management Area (Florida River; Liberty County), Gum Landing in Choctawhatchee River Water Management Area (Washington County), Log Landing and Wannee Conservation Areas (Suwannee River; Dixie and Gilchrist counties)

Global and State Rank: G4/S3

Crosswalk and Synonyms:

Kuchler	113/Southern Floodplain Forest
Davis	8/Swamp Forests, mostly of Hardwoods
SCS	20/Bottomland Hardwoods
Myers and Ewel	Freshwater Swamp Forests - floodplain forests
SAF	61/River Birch - Sycamore
	95/Black Willow
	96/Overcup oak - Water Hickory
FLUCCS	615/Stream and Lake Swamps (Bottomland)
	617/Mixed Wetland Hardwoods
	630/Wetland Forested Mixed

Other synonyms: bottomland hardwoods, seasonally flooded basins of flats, oak-gum-cypress, elm-ash-cottonwoods, NWTC Zones III-IV, second bottom, levees, point bars, terraces, river terrace, river ridge, mixed bottomland hardwood

References:

Darst, M.R., and H.M. Light. 2008. Drier forest composition associated with hydrologic change in the Apalachicola River floodplain, Florida. Scientific Investigations Report 2008-5062. United States Geological Survey, Reston, Virginia. Available at: http://pubs.usgs.gov/sir/2008/5062/

Darst, M.R., H.M. Light, and L.P. Lewis. 2002. Ground-cover vegetation in wetland forests of the lower Suwannee River floodplain, Florida, and potential impacts of flow reductions. Water-Resources Investigations Report 02-4027. United States Geological Survey, Tallahassee, Florida.

Hupp, C.R. 2000. Hydrology, geomorphology and vegetation of Coastal Plain rivers in the south-eastern USA. Hydrological Processes 14:2991-3010.

Leitman, H.M., J.E. Sohm, and M.A. Franklin. 1982. Wetland hydrology and tree distribution of the Apalachicola River flood plain, Florida. 2196-A. United States Geological Survey Water Supply, Alexandria.

Sharitz, R.R., and W.J. Mitsch. 1993. Southern floodplain forests. Pages 311-372 in W.H. Martin, S.G. Boyce, and A.C. Echternacht, editors. Biodiversity of the Southeastern United States: Lowland Terrestrial Communities. John Wiley and Sons, Inc., New York.

Wharton, C.H., W.M. Kitchens, E.C. Pendleton, and T.W. Sipe. 1982. The ecology of bottomland hardwood swamps of the southeast: a community profile. FWS/OBS-81/37. United States Fish and Wildlife Service, Biological Service Program, Washington, D.C.

Wharton, C.H., H.T. Odum, K. Ewel, M. Duever, A. Lugo, R. Boyt, J. Bartholomew, E. DeBellevue, S. Brown, M. Brown, and L. Duever. 1977. Forested wetlands of Florida - Their management and use. Final Report to Florida Division of State Planning, DSP-BCP-19-77. Center for Wetlands, University of Florida, Gainesville, Florida.

Typical “ridge and swale” topography resulting from an aggrading point bar on the Ochlockonee River, Lake Talquin State Forest (Leon County) Photo by Ann Johnson