

Ecosystem Description

This ecosystem group includes the vegetated communities that occur on the floodplains of brownwater rivers. Brownwater rivers originate in the Piedmont or Mountains and flow into the Coastal Plain. In contrast to blackwater rivers, they carry heavy loads of mineral sediment, particularly clay and silt. The water is generally near neutral in pH and high in nutrients. The deposition of sediment in the floodplain provides a periodic nutrient input that keeps the soils rich. Depositional topographic features such as natural levees, point bars, ridge-and-swale systems, and sloughs are well developed, with their size depending on the size of the river.

There are six communities that occur in Coastal Plain brownwater floodplains: levee forest and bottomland hardwoods, small stream swamps, cypress-gum swamps, semipermanent impoundments, oxbow lakes, and sand and mud bars. Levee forest and bottomland hardwoods occur in the larger floodplains, usually dominated by high-diversity canopies and understory shrubs and vines.

Coastal Plain small stream swamps occur in small floodplains and occur only in the upper Coastal Plain and usually extend only a short distance. Cypress-gum swamps occur in the wettest forested parts of the floodplain, in sloughs and back swamps. They are dominated by the few tree species able to tolerate such long term flooding. These swamps usually harbor bald cypress, rather than pond cypress typically found in Blackwater river floodplains.

Coastal Plain semipermanent impoundments are primarily beaver ponds, sediment-blocked tributaries or, occasionally, old millponds. Cypress and gum trees may survive permanent flooding and provide a partial canopy. The wetland edges host a diversity of shrubs and herbs and a diverse community of aquatic plants develops in the water. Oxbow lakes are generally less diverse and occur along the large rivers in abandoned channel segments that are cut off and blocked so that they retain open water.

Sand and mud bars occur along the river on deposits that are too young or too frequently disturbed to support forest, but are vegetated by herbs or by alder, willow, river birch, or other early successional woody species.

The 2005 Wildlife Action Plan describes Mid-Atlantic Coastal Plain Floodplain Forest as a component of this community (see Chapter 5A) (NCWRC 2005). Floodplain forests along the Roanoke River may be the finest example remaining in the state, yet even there, flow regime has been greatly impacted by dams. Other large floodplain forests are associated with the Cape Fear River, Neuse River, Tar-Pamlico River, and Chowan River (NCWRC 2005).

Table 1 at the end of this report provides a summary of expected climate change impacts to these natural communities.

Predicted Effects to Wildlife Species

Tables 2 through 5 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

Brownwater floodplains are generally far apart on the landscape, are not connected, and few have north-south courses. Northward movement of plants and animals confined to brownwater floodplains may be difficult because these rivers are far apart and their tributaries are blackwater or Piedmont floodplains that may be unsuitable to these species.

Fragmentation of stands has contributed to the loss of intact large riparian corridors and the width of many riparian corridors has been greatly reduced. Breeding area-sensitive bottomland-hardwood birds have likely been impacted by the loss of intact woodland systems. Large patches of floodplain habitat are lacking in much of the Coastal Plain. Swallow-tailed kites are one such species that is area sensitive and are now suspected to breed within the state.

Two of the cane-feeding moths are endemic to the region but also occur in Blackwater Floodplains and Non-Riverine Swamp Forests. Another cane-feeding moth appears to be significantly disjunct within the lower Cape Fear floodplain. Two hawthorn-feeding moths also appear to have disjunct populations in the lower Roanoke floodplain, as does the Cerulean warbler. None of these species appear likely to be affected by climate change related impacts. High-grading of stands has changed plant species diversity and stand vegetative structure. Forestry activities (*e.g.*, logging) have reduced colonial waterbird and eagle nesting areas, but wading birds make more use of timber cleared wetlands for foraging.

Drainage of wetlands has exacerbated the problems in and adjacent to floodplain forest habitats. This habitat loss impacts all floodplain species, including furbearers, breeding amphibians, overwintering birds, and migrant species that use these areas as stopover sites. Water quality is also an issue in certain major river drainages that negatively affects many invertebrates, fish, amphibians and reptiles (NCWRC 2005)

Long-duration flooding has had impacts on all ground nesting bird species. Loss of old growth characteristics (canopy gaps, vine tangles, hollow trees, dead and downed woody material) and fragmentation of stands is a major concern. A lack of standing dead or older trees has impacted the availability of quality bat and chimney swift roosting and breeding sites and nesting productivity for species such as wood duck and hooded merganser. Lack of downed woody debris has impacted a variety of amphibians and reptiles (NCWRC 2005)

Climate Change Compared to Other Threats

Other than rising sea level, the effects of climate change are particularly uncertain in these systems. Changes in flood regimes and rising sea level are the most important climate effects. Climate change effects upstream of the tidal zone are likely to be limited and other existing threats are likely to be more significant.

Table compares climate change with other existing threats.

Table . Comparison Of Climate Change With Other Threats		
Threat	Rank Order	Comments
Logging/Exploitation	1	This is the most destructive recent force and may get worse if drought allows more access to wetter areas.
Climate Change	2	Temperature and rainfall averages are expected to increase. More important will be changes in frequency and magnitude of extreme rainfall events, which will affect flood regimes. An increase in droughts is also expected.
Invasive Species	2	Temperature increases create potential for invasion by exotic species that are already problematic farther south, such as Chinese tallow tree (<i>Triadica sebifera</i>). Invasive exotic species already spreading in these systems, such as tree-of-heaven (<i>Ailanthus altissima</i>), Asian dayflower (<i>Murdannia keisak</i>), and stilt grass (<i>Microstegium vimineum</i>) will continue to spread regardless of the climate, but any increased disturbance by flooding or wind storms may accelerate it.
Flood Regime Alteration	2	Alteration of hydrology due to dam creation and the draining of wetlands are one of the primary problems affecting this habitat type . Upstream dams are significant on some rivers but not others. Increased drought may lead to demand for more reservoirs upstream and to more water withdrawal and interbasin transfer in all large river systems.
Conversion to agriculture/silviculture	3	Very significant in the past but most feasible conversion is already done.

Summary and Recommendations

This ecosystem contains a moderate number of disjuncts and near endemics. While impacts are likely to occur near the mouths of the brownwater rivers, converting tidal swamp forests to marshes, the system as a whole will probably persist, along with the rare species it supports.

Recommended Actions

Surveys

- Surveys are needed to document the distribution, relative abundance and status of wildlife species associated with floodplain forest habitats. Priorities include swallow-tailed kite, cerulean warbler, wood stork, bats, and species believed to be declining, at risk, or mainly dependent on floodplain forest communities.
- Secondary priority for surveys should be for species for which current distribution information is already available or for species that are

considered common (NCWRC 2005).

- Monitoring
- Monitoring systems need to be expanded and/or targeted to be able to assess current population status and trend information for all wildlife species associated with floodplain forest habitats (NCWRC 2005).
- Research
- Research studies targeting birds need to be long-term and large-scale, replicated studies that have controlled experimental approaches and focus on population demographics and the response of species to habitat manipulations where appropriate as outlined by the National Partners in Flight Research working group (Donovan *et al.* 2002 in NCWRC 2005).
 - Similar research priorities are needed for other floodplain forest taxa including bats, small mammals, amphibians and reptiles (NCWRC 2005).
- Management Practices
- Efforts need to be made to retain old growth floodplain forest (*e.g.*, for chimney swifts, bats, and herpetofauna) (NCWRC 2005).
 - Floodplain buffers of 300 to 600 feet should be realized in as many areas as possible. This would benefit floodplain forest species such as northern parula, swallow-tailed kite, Mississippi kite, prothonotary warbler, wood thrush, Swainson's and cerulean warblers, and acadian flycatcher, as well as amphibians, canebrake rattlesnakes, and forest bats (NCWRC 2005).
 - Restore natural hydrology where dams have altered hydrology, such as on the Roanoke.
 - Work with partners to institute more natural water release regimes from dams.
- Land Protection
- Land acquisition and easements should be pursued through cooperation with land trusts with an effort to increase the width of riparian buffers and create larger patches of connected habitat. Priority should be given to brownwater bottomlands, as these are the most species-rich and are more susceptible to clearcutting and other timber harvest than are cypress-gum swamps (*i.e.*, wetter sites) (NCWRC 2005).
 - Wherever possible, maintenance or restoration of floodplain forest connectivity should be pursued; floodplain forest are important distribution and dispersal corridors for many species (Bailey *et al.* 2004 in NCWRC 2005).

[CLICK HERE TO SUBMIT COMMENTS](#)

A comment form will open in a new window

References

Bailey, M. A., J. N. Holmes, and K. A. Buhlmann. 2004. Habitat management guidelines for amphibians and reptiles of the southeastern United States (DRAFT). Partners in Amphibian and Reptile Conservation.

DeWan, A., N. Dubois, K. Theoharides, and J. Boshoven. 2010. Understanding the impacts of climate change on fish and wildlife in North Carolina. Defenders of Wildlife, Washington, DC.

Donovan, T.M., C.J. Beardmore, D.N. Bonter, J.D. Brawn, R.J. Cooper, J.A. Fitzgerald, R. Ford, S.A. Gauthreaux, T. L. George, W.C. Hunter, T.E. Martin, J. Price, K.V. Rosenberg, P.D. Vickery and T.B. Wigley. 2002. Priority research needs for the conservation of neotropical migrant landbirds. *J. Field Ornithol.* 73(4): 329-339.

Doyle, T.W.; O'Neil, C.P.; Melder, P.V.; From, A.S.; and Palta, M.M. 2007. Tidal freshwater swamps of the Southeastern United States: effects of land use, sea-level rise and climate change. In: W.H. Conner, T.W. Doyle, and K.W. Krauss (eds) *Forested Wetlands of the Southeastern United States*. Springer; Dordrecht.

Gaff, H., DeAngelis, D.L., Gross, L.J., Salinas, R., and M. Shorrash. 2000. *Ecological Modeling* 127:3352.

Hupp, C.R.; Pierce, A.R.; and Noe, G.B. 2009. Floodplain geomorphic processes and environmental impacts of human alteration along coastal plain rivers, USA. *Wetlands* 29:413–429

Krauss, K.W.; Duberstein, J.A.; Doyle, T.W.; Conner, W.H.; Day, R.H.; Inabinette, L.W.; and Whitbeck, J.L. 2009. Site condition, structure, and growth of baldcypress along tidal/non-tidal salinity gradients. *Wetlands* 29:505–519.

Leigh, D.S. 2008. Late Quaternary climates and river channels of the Atlantic Coastal Plain, Southeastern USA. *Geomorphology* 101: 90-108.

Leigh, D.S., P. Srivastava, and G.A. Brook. 2004. Late Pleistocene braided rivers of the Atlantic Coastal Plain, USA. *Quaternary Science Reviews* 23: 65-84.

Maurer, E.P, L.Brekke, T.Pruitt, and P.B. Duffy. 2007. Fine-resolution climate projections enhance regional climate change impact studies. *Eos Trans. AGU*, 88(47), 504.

NC Natural Heritage Program (NCNHP). 2001. Descriptions of the biological themes of North Carolina, 2nd edition. N.C. Department of Environment and Natural Resources, Natural Heritage Program, Raleigh, NC.

NC Wildlife Resources Commission (NCWRC). 2005. North Carolina Wildlife Action Plan. Raleigh, NC.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina, third approximation. N.C. Department of Environment and Natural Resources, Natural Heritage Program, Raleigh, NC.

Table 1. Predicted Impacts of Climate Change

Climate Change Factor	Comments
Sea Level Rise – Inundation	Will create wholesale change to a tidal system in the downstream portions. Large expanses in these areas will shift to tidal swamps.
Wind Damage	Increased wind damage would decrease average canopy age and increase the proportion of gaps. Increased tree growth rates may offset the structural effect to some degree. Bottomland Hardwoods likely will be most affected by structural and compositional changes from increased wind storms.
Mild Winters	Increased temperatures/decreased winter kills may allow southern species to move farther north.
Flooding	Possible increased frequency and/or severity. Possible mix of positive and negative influences. Changes in rainfall regime may also induce water management that produces more floods of unnatural, destructive long duration. If floods become more extreme, channels may begin to migrate more. Increased scouring by more severe floods would create more early successional bar communities at the expense of mature communities on the banks. Increased magnitude of floods could affect higher terraces that now see little flooding.
Drought	Given the water availability in floodplains, drought is unlikely to stress floodplain ecosystems. The effect will be mostly in the form of allowing upland species to invade.
Sea Level Rise -- Salt Intrusion	Significant adverse effects on lower reaches. Salt water intrusion would likely affect long-term survivability of canopy species in the lower floodplain reaches. Saltwater intrusion could occur further upstream during floods or high storm surge.
Exotic Species Invasion	Increases in amounts of non-native plants (<i>e.g.</i> , Privet, Japanese grass, Japanese honeysuckle). Climate change likely will bring additional invasive species such as Chinese tallow tree.
Compositional Change	Increased wind disturbance may cause some shifts in species composition, such as favoring sweetgum and loblolly pine over oaks in bottomland hardwoods. These will be relatively small compared to the past and ongoing similar effects of logging, but will exacerbate them.
Structural Change	Leigh (2008) and Leigh <i>et al.</i> , (2004) suggest that Coastal Plain rivers may be near a threshold for switching to a braided channel morphology. More large floods might mean increased area but reduced stability of sand and mud bars.
Acreage Change	No significant inland migration is possible for this community so there will be a net loss of acreage, mostly caused by inundation from rising sea level. Some coastal plain species may be able to expand into the piedmont as the climate warms, but many of the differences between brownwater and piedmont floodplains are the result of geology rather than climate.
Temperature Increases/ Hot Spells	An average of climate model predictions for the Roanoke River area predicts annual average temperatures to rise 4 degrees by 2050, with a range of 2.4 to 5.5 degrees (Maurer <i>et al.</i> , 2007). At Wilmington, the expected increase in annual average temperature is 3.4 degrees, with a range of 2.4 to 5.2.

Table 2. Bird Species Utilizing Brownwater Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/ NC/ WAP*	Comments
BIRDS							
<i>Aix sponsa</i>	Wood Duck						
<i>Anhinga anhinga</i>	Anhinga	G5/S3B				/W2/P	
<i>Chaetura pelagica</i>	Chimney Swift					/ /P	
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo					/ /P	
<i>Contopus virens</i>	Eastern Wood-pewee					/ /P	
<i>Dendroica cerulea</i>	Cerulean warbler	G4/S2B		YES		FSC/SR/P	Disjunct population in Lower Roanoke Floodplain.
<i>Dendroica virens waynei</i>	Wayne's Black-throated Green Warbler					/ /P	
<i>Elanoides forficatus</i>	Swallow-tailed Kite					/ /P	
<i>Haliaeetus leucocephalus</i>	Bald Eagle					BGPA/T/P	
<i>Hylocichla mustelina</i>	Wood Thrush					/ /P	
<i>Ictinia mississippiensis</i>	Mississippi Kite					/SR/P	
<i>Limnothlypis swainsonii</i>	Swainson's warbler	G4/S3B				/W2, W5/P	
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker					/ /P	
<i>Nyctanassa violacea</i>	Yellow-crowned Night-heron					/ /P	
<i>Oporornis formosus</i>	Kentucky warbler	G5/S4B				/ /P	
<i>Picoides villosus</i>	Hairy Woodpecker					/ /P	
<i>Scolopax minor</i>	American Woodcock					/ /P	
<i>Wilsonia citrina</i>	Hooded Warbler					/ /P	

Table 3. Mammal Species Utilizing Brownwater Floodplains

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
MAMMALS							
<i>Condylura cristata</i>	Star-nosed Mole					/SC/P	
<i>Corynorhinus rafinesquii macrotis</i>	Rafinesque's big-eared bat, CP subspecies	G3G4TNR/S3				FSC/T/P	
<i>Lasiurus intermedius</i>	Northern Yellow Bat					/SR/P	
<i>Lasiurus seminolus</i>	Seminole Bat					//P	
<i>Myotis austroriparius</i>	Southeastern myotis	G3G4/S3				FSC/SC/P	
<i>Neotoma floridana</i>	Eastern Woodrat					/T/P	
<i>Peromyscus gossypinus</i>	Cotton Mouse					//P	
<i>Sorex hoyi winnemana</i>	Southern Pygmy Shrew					//P	
<i>Sylvilagus palustris</i>	Marsh Rabbit					//P	

Table 4. Reptile Species Utilizing

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
REPTILES							
<i>Clemmys guttata</i>	Spotted Turtle					//P	
<i>Crotalus horridus</i>	Timber (Canebrake) Rattlesnake					/SC/P	
<i>Eumeces laticeps</i>	Broad-headed Skink					//P	
<i>Lampropeltis getula getula</i>	Eastern Kingsnake					//P	
<i>Terrapene carolina</i>	Eastern Box Turtle					//P	
<i>Thamnophis sauritus sauritus</i>	Common Ribbonsnake					//P	

Table 5. Amphibian Species Utilizing Brownwater Floodplains

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
AMPHIBIANS							
<i>Ambystoma mabeei</i>	Mabee's Salamander					/SR/P	
<i>Ambystoma maculatum</i>	Spotted Salamander					//P	
<i>Ambystoma opacum</i>	Marbled Salamander					//P	
<i>Desmognathus auriculatus</i>	Southern Dusky Salamander					//P	
<i>Eurycea guttolineata</i>	Three-lined Salamander					//P	
<i>Eurycea quadridigitata</i>	Dwarf Salamander					/SC/P	
<i>Eurycea sp 1</i>	Sandhills Salamander					//P	
<i>Hemidactylium scutatum</i>	Four-toed salamander	G5/S3				/SC/P	
<i>Scaphiopus holbrookii</i>	Eastern Spadefoot					//P	

Table 6. Invertebrate Species Utilizing Brownwater Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
INVERTEBRATES							
<i>Acrapex relictus</i>	A canebrake moth	G4/S3				/W3/	
<i>Acronicta perblanda</i>	Cypress daggermoth	G3G4/S1S2				/SR/	
<i>Anacamptodes cypressaria</i>	An inchworm moth	G2G4/SU				/SR/	
<i>Apameine, New Genus 2, Species 1</i>	A canebrake moth	GNR/ S2S3		YES		/W3/	Single specimen from the Coastal Plain from Greenbank Bluff.
<i>Apameine, New Genus 2, Species 3</i>	A canebrake moth	GNR/ S2S3	YES			/SR/	Only known from the NC Coastal Plain and the Dismal Swamp in VA.
<i>Apameine, New Genus 4, Species 1</i>	A canebrake moth	GNR/ S2S3	YES			/SR/	Recently described as <i>Lascopia roblei</i> . Only known from the NC Coastal Plain and an adjoining area of the Great Dismal Swamp in VA.
<i>Argillophora furcilla</i>	A cane moth	G3G4/S2S3				/W3/	
<i>Catocala blandula, Southeastern form</i>	Southern charming underwing (moth)	G5T3/S1S3		YES		/W3/	Known in the Coastal Plain only from Devil's Gut; also in the mountains.
<i>Catocala lincolnana</i>	Lincoln underwing (moth)	G3/S2S3				/SR/	NC specimens all from brownwater floodplains and Rocky Point Marl Forest

Table 6. Invertebrate Species Utilizing Brownwater Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
INVERTEBRATES							
<i>Catocala marmorata</i>	Marbled underwing (moth)	G3G4/S1S3				/SR/	Associated with swamp cottonwood but also occurs, at least as a stray, well outside the Coastal Plain.
<i>Catocala orba</i>	Orba underwing (moth)	G4/S2S3		YES		/SR/	Only NC specimen is from Devil's Gut
<i>Cerma cora</i>	A bird-dropping moth	G3G4/S2S3				/SR/	
<i>Cisthene kentuckiensis</i>	Kentucky lichen moth	G4/SU				/W3/	
<i>Dasychira atrivenosa</i>	A tussock moth	G4/S3?				/W3/	
<i>Franclmontia interrogans</i>	A noctuid moth	G3G4/S3?				/SR/	
<i>Hypomecis longipectinaria</i>	A wave (moth)	G2G4/S3S4				/W3/	
<i>Papaipema sp. 3</i>	Southeastern cane borer moth	G4/S3S4				/W3/	

*** US/ NC/ WAP Abbreviations (species are subject to reclassification by USFWS, NHP, or WRC).**

E	Endangered	SC	Special Concern	P	WAP Priority Species
T	Threatened	SR	Significantly Rare		
FSC	Federal Species of Concern	W	Watch Category		
T(S/A)	Threatened due to Similarity of Appearance				
BGPA	Bald and Golden Eagle Protection Act				

NatureServe Element Rank: <http://www.natureserve.org/explorer/ranking.htm>

USFWS Endangered Species Listing Status: http://www.fws.gov/raleigh/es_tes.html

NC Natural Heritage Program Status:
<http://www.ncnhp.org/Images/2010%20Rare%20Animal%20List.pdf>

[CLICK HERE TO SUBMIT COMMENTS](#)

A comment form will open in a new window