

Ecosystem Description

Blackwater Floodplains include the vegetated communities that occur on the floodplains of blackwater rivers. Blackwater rivers originate in the Coastal Plain ecoregion, and contrary to brownwater rivers, they carry little mineral sediment such as clay and silt. The water chemistry is dominated by dissolved organic matter leached from decomposing vegetation and is generally very acidic and low in nutrients. The water is tea colored but is not cloudy.

The soils of blackwater floodplains are usually sandy or mucky and are acidic and infertile. Many floodplains, particularly the larger ones, have at least some development of depositional features such as natural levees, point bars, and ridge-and-swale systems, but these are not as large or prominent as on brownwater rivers. Many smaller blackwater floodplains are filled with muck and are flat and featureless.

Communities that occur in Blackwater Coastal Plain floodplains include: Coastal Plain Levee Forest and Bottomland Hardwoods on the larger floodplains; Cypress-Gum Swamps in the wettest and forested parts of the floodplain; Coastal Plain Small Stream Swamps, Coastal Plain Semi-permanent Impoundments (primarily beaver ponds), Oxbow Lakes along the large rivers in abandoned channel segments; and Sand and Mud Bars along the rivers.

The 2005 Wildlife Action Plan describes Floodplain Forest, Riverine Aquatic Communities, and Tidal Swamp Forest and Wetlands, components of this ecosystem, as priority habitats (see Chapter 5A) (NCWRC 2005).

Table 1 at the end of this report summarizes the predicted effects of climate change.

Predicted Effects to Wildlife Species

Tables 2 through 6 at the end of this report identify the species of greatest conservation need (priority species) that use habitats in this ecosystem

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. Removing woody debris from streams after storms has influenced in-stream habitat structure and food webs. Lack of downed woody debris has impacted a variety of amphibians and reptiles.

Fragmentation of floodplain forest 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 although are not presently known to breed within the state, do breed just across the South Carolina border. High-grading logging practices have changed plant species diversity and stand vegetative structure. Logging has reduced colonial waterbird and eagle nesting areas.

Alteration of hydrology due to dam creation and the draining of wetlands are one of the primary problems affecting species in this habitat type. The impacts of development adjacent to rivers and streams includes potential problems associated with direct input of contaminants and sediment, alteration of hydrologic patterns and processes, temperature regimes, and loss of critical habitat adjacent to aquatic habitat that may be of equal importance to species that only spend a portion of their lives in the water, like some amphibians. 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.

This ecosystem contains some extremely rare disjunct and near endemic plant species. Their rarity makes them vulnerable to changes in habitat. Random events in specific locations can have major impacts on the expected viability of whole species. Two cane-feeding moths are endemic (or nearly so) to the North Carolina Coastal Plain. Habitat for these species, as well as another one in this group, is divided between blackwater and brownwater floodplains, as well as peatlands. All of these species, plus the larger guild of cane-feeding insects, is likely to benefit from increased canopy gaps and other disturbances associated with climate change.

One species of cypress-feeding moth, *Acronicta perblanda*, is currently known in North Carolina from only a single blackwater site. However, this species is likely to be found at more sites with more early spring season sampling. The one existing location, however, is located close to Core Sound and is likely to be affected by sea level rise and saltwater intrusion.

Diversity of "native" species may potentially increase due to movement of more southerly species to move northward into this habitat type (e.g., wood storks, swallowtail kites, water elm, water locust). More substantial changes may occur in floodplains north of North Carolina, beyond the current range of widespread southern floodplain species.

Climate Change Compared to Other Threats

Changes in flood regimes and rising sea level are the most important climate effects. Coastal plain wetlands may be moderately vulnerable to climate change, depending on importance of precipitation and riverine flooding for hydrologic inputs, so direct loss of wetlands due to sea level rise is expected to be the greatest threat in coastal landscapes (DeWan *et al.* 2010). However, these systems will remain common.

Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	Rank Order	Comments
Flood Regime Alteration	1	Effects of changed flooding regime are very uncertain. If floods become more extreme, channels may begin to migrate more. Levee communities, where present, are the most likely forested floodplain community to be affected by changes in flooding regime and channel stability. Increased canopy gaps may result from increased storm wind damage and from flood scouring.
Logging/Exploitation	1	Logging will remain a larger source of altered canopy age and structure. This might benefit species that depend on canopy openings.
Pollution/siltation	2	Chicken processing facilities are leading to a large increase in chicken farms. The waste from these poultry farms are currently regulated like within the hog farm industry. Untreated stormwater runoff from large cities and towns is a major problem that impacts both aquatic life and terrestrial wildlife associated with floodplain forests.
Groundwater Depletion	2	Increased drought may lead to demand for more water withdrawal.
Invasive Species	2	<i>Ligustrum sinense</i> , <i>Microstegium vimineum</i> , <i>Lonicera japonica</i> , and <i>Murdannia keisak</i> are already a problem and are expected to increase with climate change. If not controlled, these species will greatly expand the acreage severely affected, regardless of climate. Canopy gaps could allow invasive species to become established, especially <i>Microstegium vimineum</i> .
Climate Change	4	The effects of rising sea level would be felt only in the lower reaches of the rivers. Large expanses in these areas would shift to tidal swamps. Saltwater intrusion could occur during floods or high storm surge.

Summary and Recommendations

Surveys are needed to document the distribution, relative abundance and status of many wildlife species associated with these habitats. Priorities for conducting surveys need to focus on species believed to be declining, at risk or mainly dependent on these communities (like rails). Secondary priority for surveys should be for species for which current distribution information is already available or for species that are considered common. Many bird species associated with these community types are not sampled well or at all by BBS.

Recommended Actions

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| Surveys | <ul style="list-style-type: none"> • Determine the status and distribution of priority species in this habitat. • Document bald eagle nesting sites. |
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- Determine the breeding and roosting status and distribution of chimney swift in natural conditions along major floodplains with appropriate habitat conditions (*e.g.* older, hollow trees).
 - Design specific surveys to determine status and distribution of birds not adequately picked up by the Breeding Bird Survey in floodplain forests (*e.g.*, cerulean warbler, Swainson's warbler, Kentucky warbler, worm-eating warbler, hooded warbler, prothonotary warbler).
- Monitoring
- Establish long-term monitoring programs for priority species in this habitat type.
 - Continue nest monitoring for colonial waterbirds.
 - Continue long-term monitoring of active bald eagle territories, successful breeding pairs, and fledged eagles.
 - Establish MAPS and migration banding stations, as well as specialized long-term monitoring for hard to sample species such as cerulean and Swainson's warbler (Graves 2001).
- Research
- Explore techniques for restoration of tidal swamp forest and wetlands.
 - Investigate the past, current and potential future impact of nutria on both floral and faunal communities and individual species.
 - Research the genetic makeup of the coastal population of the black-throated green warbler.
 - Research the genetic relationships among floodplain salamanders.
 - Examine demographics and habitat-use of priority species using this habitat.
 - Determine the conservation and restoration efforts needed for priority species in this habitat.
- Management Practices
- 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). This would benefit floodplain forest species such as northern parula, yellow-throated warbler, prothonotary warbler, wood thrush, Swainson's warbler, and acadian flycatcher, as well as amphibians, canebrake rattlesnakes and forest bats. An attempt should be made to protect waterbird nesting colonies.
 - Partnerships to begin cane restoration projects and research should be initiated with the Natural Resources Conservation Service.
 - The Forest Landbird Legacy Program (a cooperative effort between the Commission, the US Fish and Wildlife Service, and the Natural Resources Conservation Service) should be further expanded to influence habitat for birds and other wildlife in mature floodplain forest through canopy gap management and other options.
 - The cooperative efforts with colonial waterbird (wading bird) working groups

should continue and future management recommendations from the North American Waterbird Management Plan should be followed (Kushlan *et al.* 2002).

- Land Protection
- Efforts need to be made to retain old growth floodplain forest (e.g., for chimney swifts, bats, wood ducks, hooded mergansers, and herpetofauna).
 - The South Atlantic Coastal Plain Partners In Flight Bird Conservation Plan calls for protection of eight patches of forested wetlands of at least 10,000 acres in size throughout the South Atlantic Coastal Plain (Hunter *et al.* 2000).
 - Floodplain buffers of 300 to 600 feet should be realized in as many areas as possible. Where possible forest patches should be connected along river systems to provide connectivity. This would benefit floodplain forest species such as northern parula, yellow-throated warbler, prothonotary warbler, wood thrush, Swainson's warbler, and acadian flycatcher, as well as amphibians, canebrake rattlesnakes and forest bats. An attempt should be made to protect waterbird nesting colonies.
 - Priorities for protection include colonial waterbird nesting sites, eagle nesting sites, wood stork foraging areas, and important black rail habitat once it is better identified. Adjacent nesting habitat for snakes and turtles should also be protected.

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Table 1. Predicted Impacts of Climate Change

Climate Change Factor	Comments
Wind Damage	Increased hurricane intensity will increase blow down, especially near the coast. Bottomland hardwoods are more likely to be affected by windthrow than other floodplain communities.
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.
Sea Level Rise – Inundation	Significant adverse effects on lower reaches
Mild Winters	Increased temperatures and decreased winter kills will allow southern species to move farther north (e.g., <i>Murdannia</i> , <i>Lygodium japonicum</i> , <i>Triadica</i>). Potentially longer growing season and earlier bloom time for plants and earlier breeding periods for reptiles and amphibians.
Increased Temperature	Most species in this habitat type have a southeastern distribution and are fairly well adapted to higher temperatures per se.
Flooding	Increased severity of flooding may destabilize channels, alter sediment load and deposition, and increase erosion. Increased frequency may have beneficial effects but increased duration may not. More large floods might mean increased river area with increased instability of bars. This would come at the expense of forests along the river banks, which are often the least altered forests in the floodplains. If flood frequency increases it might also cause the boundaries between Bottomland Hardwoods and Cypress-Gum Swamp to shift.
Drought	Invasion of upland species (e.g., red maples and beech).
Channel Hydrodynamics	Increased channel migration will have strong effects on bar communities. Communities that depend on ephemeral habitats may prosper.
Exotic species invasion	Some more southern species may migrate into these communities. Conversion of lower river areas to tidal marsh will allow <i>Phragmites communis</i> to invade.
Structural Change	Increased canopy gaps may result from increased storm wind damage and from flood scouring. Flooding could benefit canebrakes and their associated species, but both the magnitude and direction of the effects are uncertain.
Compositional Change	Likely limited, except where systems become tidal. Downstream reaches will transform into tidal marshes which could beneficially replace these communities lost to inundation from sea level rise. Mast producing species such as water-tupelo may increase while others may be lost.
Acreage Change	No expansion is possible upstream and expansion into the Piedmont is not possible for this ecosystem. Consequently, the net effect will be an overall loss of acreage. Because there is not substantial potential for the floodplain systems to expand inland, there will be a net loss in area.

Table 2. Bird Species Utilizing Coastal Plain Depression Communities

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
BIRDS							
<i>Aix sponsa</i>	Wood Duck						Consider including due to economic importance
<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>Dendroica cerulea</i>	Cerulean warbler					/SR/P	
<i>Dendroica virens waynei</i>	Black-throated green warbler					/ /P	
<i>Elanoides forficatus</i>	Swallow-tailed kite					/ /P	
<i>Haliaeetus leucocephalus</i>	Bald eagle					T/T/P	
<i>Helminthorus vermicivorus</i>	Worm-eating warbler					/ /P	
<i>Hylocichla mustelina</i>	Wood thrush					/ /P	
<i>Ictinia mississippiensis</i>	Mississippi kite					/SR/P	
<i>Limnothlypis swainsonii</i>	Swainson's warbler					/ /P	
<i>Melanerpes erythrocephalus</i>	Red-headed woodpecker					/ /P	
<i>Mycteria americana</i>	Wood Stork					E/E/	Down-listing to Threatened is proposed and in the midst of review by USFWS.
<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	

Table 2. Bird Species Utilizing Coastal Plain Depression Communities

BIRDS							
Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
<i>Scolopax minor</i>	American woodcock					/P	Significant declines since the mid 60's. 20.8 million new acres of habitat needed to return woodcock to former densities (American Woodcock Conservation Plan, 2008)
<i>Wilsonia citrina</i>	Hooded warbler					/P	

Table 3. Mammal Species Utilizing Coastal Plain Depression Communities

MAMMALS							
Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
<i>Condylura cristata</i>	Star-nosed mole					/SC/P	
<i>Corynorhinus rafinesquii macrotis</i>	Rafinesque's big-eared bats	G3G4TNR / S3				FSC/T/P	
<i>Lasiusurus intermedius</i>	Northern yellow bat					/SR/P	
<i>Lasiusurus 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>	Pygmy shrew					/ /P	
<i>Sylvilagus palustris</i>	Marsh rabbit					/ /P	

Table 4. Reptile Species Utilizing Coastal Plain Depression Communities

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
REPTILES							
<i>Alligator mississippiensis</i>	American alligator					T/T-SA/P	
<i>Apalone spinifera aspera</i>	Gulf Coast spiny softshell					/ /P	
<i>Clemmys guttata</i>	Spotted turtle					/ /P	
<i>Crotalus horridus</i>	Timber rattlesnake					/ /P	
<i>Deirochelys reticularia</i>	Chicken turtle					/SR/P	
<i>Elaphe guttata</i>	Corn snake					/ /P	
<i>Eumeces laticeps</i>	Broad-headed skink					/ /P	
<i>Farancia abacura abacura</i>	Mud snake					/ /P	
<i>Farancia erytrogramma erytrogramma</i>	Rainbow snake					/ /P	
<i>Kinosternon baurii</i>	Three-striped mud turtle					/ /P	
<i>Lampropeltis getula getula</i>	Eastern kingsnake					/ /P	
<i>Regina rigida</i>	Glossy crayfish snake					/SR/P	
<i>Seminatrix pygaea</i>	Black swamp snake					/SR/P	
<i>Terrapene carolina</i>	Box turtle					/ /P	

Table 5. Amphibian Species Utilizing Coastal Plain Depression Communities

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
AMPHIBIANS							
<i>Ambystoma mabeee</i>	Mabee's salamander	G4/S3				/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>Hemidactylum scutatum</i>	Four-toed salamander	G5/S3				/SC/P	
<i>Plethodon glutinosus sensustricto</i>	Slimy salamander					/ /P	
<i>Scaphiopus holbrookii</i>	Eastern spadefoot					/ /P	

Table 6. Invertebrate Species Utilizing Coastal Plain Depression Communities

INVERTEBRATES							
Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
<i>Acronicta perblanda</i>	Cypress daggermoth	G3G4/S1S2		YES		/SR/	Currently known from only one site in NC, located in Craven County. The next nearest populations are in SC.
<i>Anacamptodes cypriaria</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 canebrake moth	G3G4/S2S3				/W3/	
<i>Cisthene kentuckiensis</i>	Kentucky lichen moth	G4/SU				/W3/	
<i>Dasychira atrivenosa</i>	a tussock moth	G4/S3?				/W3/	
<i>Franclemontia interrogans</i>	a noctuid moth	G3G4/S3?				/SR/	
<i>Hypomecis longipectinaria</i>	a wave	G2G4/S3S4				/W3/	
<i>Papaipema sp. 3</i>	Southeastern cane borer moth	G4/S3S4				/W3/	
<i>Tolype minta</i>	Southern tolype	G4/S2S3				/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				

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>

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