

DRAFT - Piedmont and Mountain Floodplains

Ecosystem Description

Natural communities of Piedmont and Mountain ecoregion floodplains are influenced by slight elevation differences created by different sediment deposition patterns. Where there are relatively steep gradients, few floodplains contain significant elevation differences and well-developed floodplain landforms are often lacking. A number of variants determined by different geologic conditions can be recognized within the community types in this theme: Piedmont/Low Mountain Alluvial Forest, Levee Forest Communities, Piedmont/Mountain Semipermanent Impoundments, Floodplain Pools, and Sand and Mud Bar and Rocky Bar and Shore Communities.

The Wildlife Action Plan (2005) identified Piedmont and Southern Blue Ridge Mountain ecoregion Floodplain Forests as a priority habitat (see Chapter 5A) (NCWRC 2005). Examples of large floodplain communities can be found at New Hope Creek Bottomland in Durham County and Pee Dee National Wildlife Refuge in Anson and Richmond Counties. The Pee Dee and Dan River basins contain some of the larger tracts of intact floodplain forest left in the Piedmont. The few examples of functional floodplain forest remaining in the mountains are found along major rivers on private lands. The more generalized riparian forest, a community associated with smaller mountain streams, exists on protected or conservation lands such as those owned by state and federal government agencies (NCWRC 2005).

Table 1 at the end of this report provides of summary of predicted climate change impacts.

Predicted Effects to Wildlife Species

Tables 2 through 6 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

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Many of the wildlife species associated with mountain floodplain forest are not restricted to floodplains, but will utilize them and a variety of other mountain habitats. Historically, many floodplains were maintained in switch cane (*Arundinaria gigantea*) and herbaceous plants through fire and other periodic disturbance (NCWRC 2005). Two cane-feeding moths are endemic to the Southern Appalachians and two others represent major disjunct populations from west of the Appalachian Mountains. Cane breaks benefit several species, such as hooded warbler, Kentucky warbler and Swainson's warbler, wood thrush, American woodcock, and timber rattlesnake, and are used for breeding sites by migratory land birds (NCWRC 2005).

Floodplain forests, are particularly important habitats for breeding amphibians in the region, mainly due to the inclusion of floodplain pools and semi-permanent impoundments (*i.e.* beaver ponds). Beaver activity and the creation of beaver ponds in floodplain forest can have substantial impacts on trapping sediment and associated pollutants. Several moth species associated with marshy habitats in floodplains are found only at widely disjunct sites in the Piedmont and mountains, possibly representing beaver-ecosystem relicts (NCWRC 2005).

Beavers are a native species returning to presumed former abundance and can have severe impacts on local populations of rare species. Increasing beaver populations will provide more open water for wildlife species but at the same time reduce closed-canopy forest for shade-loving species of bottomlands. For at least several species of marsh, sedge-mire, and other species associated with open wetlands, on the other hand, the return of beavers is likely to have a strongly positive effect.

Floodplain pools that occur in small depressions and are flooded for a portion of the year generally have few or no trees and are especially important sites for breeding amphibians such as spotted salamander, marbled salamander, four-toed salamander and many frogs. Pools that seldom dry out (or less frequently) can develop permanent aquatic communities (with fish) that are often unsuitable for breeding amphibians.

Contiguous, unfragmented gradients between floodplain forest and adjacent upland sites provide essential foraging habitat, hibernation sites, and refugia during high water events for amphibian and reptile species (Bailey *et al.* 2004). Piedmont floodplains are also important as movement corridors for mammals, reptiles, and amphibians. The high stream density in the Piedmont and short distances between streams in different watersheds should facilitate migration of species that can live in small floodplains. Larger floodplains are farther apart, and species confined to them will have more difficulty migrating.

Birds use riparian corridors at all times of the year and these areas are especially important to neotropical migrants during the migration periods. Indeed, floodplain forests generally have the highest nesting bird concentrations in the state and they are arguably the most important habitats for birds (NCWRC 2005).

Stream snagging (clearing woody debris within stream channels) after storms can reduce habitat structure, particularly for reptiles and amphibians among terrestrial creatures. Snags play a very important role in providing nesting, foraging, and roosting areas for many cavity nesting birds, bats, arboreal mammals, reptiles and amphibians. Lack of snags and den trees is often a limiting factor for several species of wildlife, especially secondary cavity users (McComb *et al.* 1986). Younger riparian forests can also lack dead wood on the ground, which is important for some songbirds (*e.g.*, Kentucky warbler), many reptiles, amphibians, and some small mammals. Habitat disturbance can be important for creating canopy gaps which create small pockets of dense, low growth (valuable for nesting for Swainson's warbler, hooded warbler, Kentucky warbler and wood thrush), provide cover for American woodcock, and are valuable foraging areas for many juvenile birds.

Climate Change Compared to Other Threats

This Ecosystem Group may be one of the least susceptible to ecosystem change in response to climate change. Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	Rank Order	Comments
Logging/Exploitation	1	Extensive ongoing logging alters structure and composition of vegetation. "High grade" logging operations removes the larger trees that provide important habitat structure for wildlife, while the low-quality trees that are left can often hamper the regeneration of more wildlife-favorable trees (NCWRC 2005).
Development	2	Construction of reservoirs and interbasin transfers of water are likely to be spurred by climate change. Drier, seldom flooded portions of floodplain are often subject to development and utility easements (e.g., sewer lines).
Land Use Conversion	3	Construction of reservoirs creates significant loss of floodplain habitats, resulting in severe fragmentation of entire river basins.
Habitat Fragmentation	3	Floodplains are often the only remaining forested landscape connections. The loss of these connections creates major barriers to movements. Shoreline development around impoundments can obliterate upland habitats adjoining the reservoirs.
Invasive Species	3	This Ecosystem Group currently suffers the most impact from invasive plants of any in the state and the increased disturbance related to climate change is only likely to exacerbate it.
Flood Regime Alteration	4	Building ditches and canals in floodplains dramatically alters hydrology and is often done to prepare a floodplain for agriculture, forestry, or development. Even in abandoned sites, ditches will continue to alter the hydrology for many decades. Controlled flows downstream of dams and the construction of levees can reduce overbank flood events which are important for recharging ephemeral wetlands and spreading nutrients in the floodplain.
Groundwater Depletion	5	
Climate Change	6	The direct effects are comparatively minor compared to other types of impacts. However, climate change is also likely to increase the severity of all other factors, with the possible exception of development, whose rate of increase may or may not be affected by climate change.

Summary and Recommendations

Maintaining and restoring connections between habitat blocks is also critical, not only for allowing adjustments in range in response to climate change, but to maintain population resilience and adaptability more generally. A high priority should be given to protecting movement corridors that allow dispersal between habitat blocks, especially as development and roadways fragment the few remaining large tracts of habitat. Over the state as a whole, a high priority should be given to restoring connections that are lost due to construction of four-lane highways and other roads that create near-impassible barriers for all animals except those capable of flight.

Recommended Actions

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| Surveys | <ul style="list-style-type: none">• Status surveys are needed to gather current baseline information on all species, though priority should be given to species that are considered rare, or thought to be declining (<i>e.g.</i>, Indiana bat, mole salamander, seepage salamander, Junaluska salamander, longtail salamander, four-toed salamander, mountain chorus frog, bog turtle, timber rattlesnake) (NCWRC 2005).• Secondary priority for surveys should be concentrated upon species for which we have little current information about status and distribution, though they are thought to be more common (<i>e.g.</i>, Swainson's warbler, Kentucky warbler, hooded warbler, Louisiana waterthrush, Baltimore oriole, warbling vireo, smoky shrew, spotted salamander, marbled salamander, three-lined salamander, slimy salamander, eastern hognose snake, eastern kingsnake) (NCWRC 2005). |
| Monitoring | <ul style="list-style-type: none">• Collect information about population trends for all priority species associated with floodplain forests (considering new techniques for those that are not adequately sampled through existing methods) (NCWRC 2005).• Monitor amphibian populations to detect incidence of fungal and viral infections (<i>e.g.</i>, iridoviruses, chytridiomycosis). |
| Research | <ul style="list-style-type: none">• For most of the priority species we do not have a clear understanding of species/habitat relationships to determine how critical maintenance of floodplain forest habitat or its management is to population or species sustainability (NCWRC 2005).• Investigations of the impacts and effects of beaver ponds on various floodplain forest species (NCWRC 2005).• For species ascribed to floodplain forest habitats, investigate the degree of isolation of populations (<i>e.g.</i>, longtail salamanders, mountain chorus frogs, mole and four-toed salamanders) (NCWRC 2005). |

- Investigate minimum hydroperiods needed by priority amphibian species that utilize ephemeral pools and wetlands. Results can be used to determine when supplemental or interventive measures are needed to support breeding periods and metamorphosis during drought periods.

Management Practices

- Maintaining and restoring connections between habitat blocks is also critical, not only for allowing adjustments in range in response to climate change, but to maintain population resilience and adaptability more generally.
- Where periodic land disturbance is absent, artificial disturbance may be needed to create snags and canopy gaps to support dense undergrowth in some areas.
- Control Invasive Species
- Maintaining strips of undeveloped lands bordering reservoirs will benefit water quality for human uses and maintain landscape connectivity across broad areas of the state.
- Control beaver populations or their impounding or foraging activities in areas where there are species of major conservation concern.
- Examine ways to effectively restore canebrake communities, and determine the response of birds, mammals, amphibians and reptiles to the reestablishment of switch cane stands (NCWRC 2005).
- Study the effects of various river flow regimes on ephemeral pool habitat in floodplains, to help develop management recommendations for dam releases. This research will be particularly critical to help guide management recommendations in the Federal Energy Regulatory Commission relicensing process for dams along the Yadkin, Pee Dee, and Catawba rivers (NCWRC 2005).

Land Protection

- A high priority should be given to protecting movement corridors that allow dispersal between habitat blocks, especially as development and roadways fragment the few remaining large tracts of habitat.
- A high priority should be given to restoring connections that are lost due to construction of four-lane highways and other roads that create near-impassable barriers for all animals except those capable of flight.
- Transportation facilities that utilize longer bridges at streams and wetlands not only minimize impacts (and thereby reduce mitigation requirements) but also provide crossing options for wildlife that often travel riparian corridors.
- Protect upland buffers around all new reservoirs and acquire undeveloped areas for conservation buffers around existing reservoirs.
- Priority protection measures include, but are not limited to, acquisition of floodplains (through purchase, easement, or other legal means such as management contracts), restoration of floodplain systems, or other legal measures (*e.g.*, buffer rules) (NCWRC 2005).

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Table 1. Predicted Impacts of Climate Change

Climate Change Factor	Comments
Drought	Droughts are expected to increase, which may cause floodplains to be drier than usual between storm events. Invasion by upland species is a possibility.
Mild Winters	Mild winters may allow some southern species to expand northward. May increase exotic or pest species invasion.
Flooding	Increased frequency and magnitude of floods will increase scouring and bank erosion. Channel incision may increase, causing reduced flooding and drying in some floodplains; more floodplains could become isolated from their creeks resulting in reduced flooding. Chinese and Japanese privet, Japanese honeysuckle, <i>Microstegium</i> , and Japanese knotweed, etc., are already locally abundant
Invasive/Exotic Species	<i>Murdannia</i> , <i>Microstegium</i> , <i>Lonicera</i> , <i>Ligustrum</i> , and <i>Reynoutria</i> are already a severe problem. Warmer temperatures may allow the invasion of additional species (perhaps <i>Triadica</i>).
Impoundments	Droughts and population growth may necessitate creation of more water supply reservoirs. Increased severity of flooding will increase the demand for flood control structures. Increased development of non-carbon-based energy is likely to include construction of new hydro-power dams. Large reservoirs present on many rivers may be significant barriers to migration.
Structural Change	Reservoirs permanently destroy vast amounts of riverine and riparian habitats due to the direct effects of inundation. They can also severely alter the flood regimes downstream, particularly where used for hydropower generation. Such alterations, in turn, can have major effects on the structure and composition of floodplain ecosystems.
Compositional Change	
Acreage Change	Small increases in floodplain extent may occur with deeper floods.
Increased Storm Activity	Increased wind storm events would decrease average tree age and increase number of gaps.

Table 2. Bird Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
BIRDS							
<i>Aix sponsa</i>	Wood Duck						
<i>Caprimulgus vociferus</i>	Whip-poor-will					/ /P	
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo					/ /P	
<i>Colaptes auratus</i>	Northern Flicker					/ /P	
<i>Contopus virens</i>	Eastern Wood-pewee					/ /P	
<i>Dendroica cerulea</i>	Cerulean warbler	G4/S2B				FSC/SR/P	
<i>Haliaeetus leucocephalus</i>	Bald Eagle					BGPA/T/P	
<i>Helmitheros vermivorous</i>	Worm-eating Warbler					/ /P	
<i>Hylocichla mustelina</i>	Wood Thrush					/ /P	
<i>Ixobrychus exilis</i>	Least bittern	G5/S3B		YES		/SR/P	Probably once widespread in the Piedmont, but now very scarce as a breeding species.
<i>Limnothlypis swainsonii</i>	Swainson's Warbler					/ /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	

Table 2. Bird Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
BIRDS							
<i>Rallus elegans</i>	King rail	G4/S3B, S3N		YES		/W1, W3/P	Probably more widespread in the Piedmont once but now extremely rare as a nesting species in this region.
<i>Scolopax minor</i>	American Woodcock					/ /P	
<i>Wilsonia citrina</i>	Hooded Warbler					/ /P	

Table 3. Mammal Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
MAMMALS							
<i>Corynorhinus rafinesquii rafinesquii</i>	Rafinesque's big-eared bat	G3G4TNR / S2				FSC/T/	Mountain subspecies
<i>Lasiurus seminolus</i>	Seminole Bat					/ /P	
<i>Myotis austroriparius</i>	Southeastern Bat					/SC/P	
<i>Myotis sodalis</i>	Indiana Bat					E/E/P	
<i>Sorex fumeus</i>	Smoky Shrew					/ /P	

Table 4. Reptile Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
REPTILES							
<i>Clemmys guttata</i>	Spotted Turtle					/ /P	
<i>Glyptemys muhlenbergii</i>	Bog Turtle	G3/S2				T(SA)/T/P	
<i>Crotalus horridus</i>	Timber Rattlesnake	G4/S3				/SC/P	
<i>Elaphe guttata</i>	Corn Snake					/ /P	
<i>Eumeces laticeps</i>	Broad-headed Skink					/ /P	
<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake					/ /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 Piedmont and Mountain Floodplains

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
AMPHIBIANS							
<i>Ambystoma maculatum</i>	Spotted salamander	G5/S5				/ /P	
<i>Ambystoma opacum</i>	Marbled salamander	G5/S5				/ /P	
<i>Ambystoma talpoideum</i>	Mole salamander	G5/S2		YES		/SC/P	Populations in the NC Piedmont are all widely disjunct.
<i>Desmognathus aeneus</i>	Seepage Salamander	G3G4/S3				FSC/SR /P	
<i>Eurycea guttolineata</i>	Three-lined salamander	G5/S5				//P	
<i>Eurycea junaluska</i>	Junaluska Salamander	G3/S2				FSC/T/ P	
<i>Eurycea longicauda</i>	Longtail Salamander	G5/S1S2				/SC/P	
<i>Hemidactylium scutatum</i>	Four-toed salamander	G5/S3				/SC/P	
<i>Hyla versicolor</i>	Northern Gray Treefrog	G5/S2?				/SR/P	
<i>Plethodon glutinosus</i>	Northern Slimy Salamander	G5/SU?				/W4/P	
<i>Pseudacris brachyphona</i>	Mountain Chorus Frog	G5/S2				/SC/P	

Table 6. Invertebrate Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
INVERTEBRATES							
<i>Amblyscirtes reversa</i>	Reversed roadside skipper	G3G4/S3				/SR/	
<i>Apameine</i> , <i>New Genus 1</i> , <i>Species 2</i>	A cane borer moth	GNR/SH		YES		/SR	Only a single, historic record exists for NC from Highlands. Other populations are located west of the Appalachians.
<i>Apameine</i> , <i>New Genus 2</i> , <i>Species 4</i>	A cane borer moth	GU/S2S3	YES			/W2/	Appears to be endemic to the Southern Appalachians.
<i>Apameine</i> , <i>New Genus 2</i> , <i>Species 5</i>	A moth	GU/S1S2		YES		/W2/	Only NC records is from the Dan River at Hanging Rock State Park. Known primarily from midwest US.
<i>Apameine</i> , <i>New Genus nr. Oligia</i>	A moth	GNR/S2S3	YES			/W2/	Recently discovered species known only from the NC side of the Great Smoky Mountains National Park and possibly also from Highlands
<i>Argillophora furcilla</i>	A cane moth	G3G4/S2S3				/W3/	
<i>Autochton cellus</i>	Golden banded-skipper	G4/S2				/SR/	
<i>Catocala marmorata</i>	Marbled underwing	G3G4/S1S3				/SR/	
<i>Cisthene kentuckiensis</i>	Kentucky lichen moth	G4/SU				/W3/	

Table 6. Invertebrate Species Utilizing Piedmont and Mountain Floodplains

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
INVERTEBRATES							
<i>Cordulegaster erronea</i>	Tiger spiketail	G4/S3?				/W2/	
<i>Dasychira atrivenosa</i>	A tussock moth	G4/S3?				/W3/	
<i>Hypomecis longipectinaria</i>	A wave (moth)	G2G4/S3S4				/W3/	
<i>Papaipema sp. 3</i>	Southeastern cane borer moth	G4/S3S4				/W3/	Known in the Piedmont only from one Wake County specimen but is fairly common in the Outer Coastal Plain and Sandhills
<i>Poanes viator zizaniae</i>	Broad-winged skipper	G5/S5		YES		//	Sole Piedmont population is located near the Deep and Haw River m confluence.

*** 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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