DRAFT - Mesic Forests

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Ecosystem Description

Mesic forests occur on sites that are moist but not wet. In the Piedmont these are generally northfacing slopes, sheltered ravines, or high terraces on the edges of floodplains. In the Coastal Plain, mesic forests occur in similar sites and also on moist portions of broad upland flats and on small island ridges surrounded by swamps. These sites are naturally sheltered from the fires that are a major natural shaper of vegetation in the Coastal Plain. The 2005 Wildlife Action Plan describes the Piedmont ecoregion and Mid-Atlantic Coastal Plain ecoregion Mesic Forest as a priority habitat (see Chapter 5A) (NCWRC 2005).

The Coastal Plain and Piedmont subtypes cannot be separated by any particular species, but differ in their overall flora. In the Piedmont, mesic mixed hardwood forest communities occur on mesic sites that have typically acidic soils. Good examples can be found at Umstead State Park, Duke Forest, Hill Demonstration Forest, Raven Rock State Park and at Eno River State Park in the central piedmont and also examples in parts of Uwharrie National Forest.

The much rarer basic mesic forests occur on soils that are neutral to slightly basic in pH. They are more diverse than the mesic mixed hardwood forests and they have species that require high pH. The basic mesic forest subtype often has rare and disjunct plant species and both variants of basic mesic forest (marl outcrop and terrace slope) are rare because of the rarity of basic substrates on the Coastal Plain (Schafale and Weakley 1990).

Several distinctive variants of these subtypes are recognized in the Coastal Plain, including the swamp island, mesic flat, and bluff/slope variants of mesic mixed hardwood forest, and the terrace slope and marl outcrop variants of basic mesic forests. Examples of the mesic mixed hardwood forest bluff/slope variant are found in Croatan National Forest, Merchant's Millpond State Park and Cliffs of the Neuse State Park. Examples of the swamp island variant are found in the Dismal Swamp National Wildlife Refuge and along the Waccamaw River in Columbus County and examples of the upland flat variant are found in Perquimans and Bertie County.

Mesic sites are among the most favorable environments for plant growth. They tend to support dense forests dominated by moisture-loving non-wetland trees such as beech, tulip poplar, and red oak. They usually have well-developed understory, shrub, and herb layers. They often contain species that are common in the mountain parts of the state or farther north but are rare in the southern Piedmont and Coastal Plain. Some species may be disjunct long distances from cooler areas. At least some of these disjuncts are remnants of wider distributions in the past, such as during the cooler, moister climate of the Ice Age.

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

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.

Fragmentation of mesic forests into smaller or narrower contiguous blocks is a concern for forest interior birds (like wood thrush, Cooper's hawk, and worm-eating warbler), which may occur in lower densities or suffer lower productivity or survival in small habitat patches. Fragmentation by roads and development can be problematic for reptiles (especially timber rattlesnake and box turtle), amphibians, and small mammals (particularly eastern mole) that suffer high mortality on roads when traveling between forest patches or between mesic forest and other habitats (NCWRC 2005).

A lack of canopy gaps in this habitat type has probably lead to a reduced number of some avifauna such as the eastern wood-pewee, red-headed woodpecker, northern flicker, hooded warbler, and Kentucky warbler. This reduction in canopy gaps has also caused a decline in midstory and understory vegetation, which has impacted species such as the Swainson's warbler, Kentucky warbler, hooded warbler, and wood thrush. The reduction in standing snags negatively impacts primary and secondary cavity nesting species and the lack of dead wood on the forest floor impacts herpetofauna and small mammals (NCWRC 2005).

Climate Change Compared to Other Threats

The greatest threats to Piedmont and Coastal Plain Mesic Forests are those from development and logging which are ongoing land uses. Climate change is less of a threat than ongoing concerns, but will exacerbate some of them. Although expected threats associated with climate change are the least significant to these forests, increased wind damage, droughts, and warmer temperatures may alter their structure and size.

Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats

Threat	Rank Order	Comments
Development	1	Destruction and indirect effects such as fragmentation and edge effect result from land development in suburban areas and even in many rural areas.
Logging/Exploitation	1	Logging severely alters canopy structure and composition, and is a threat to all but the steepest unprotected examples. Invasive plants are a present and increasing threat. Both development of nearby areas and logging increase the potential for invasion.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	**Rank Order**	**Comments**
Invasive Species	2	Plants such as autumn olive, Japanese grass, Japanese honeysuckle, princess tree, tree-of-heaven, and privet have taken resources from native vegetation and altered habitat structure and species composition. The extent of negative (and positive) impacts of exotic species on populations of native fauna is largely unknown.
Climate Change	3	The severity of climate change effects on these sheltered sites is uncertain. It is expected that the boundary with drier communities will shift, so that peripheral portions are lost, smaller or more marginal examples may be lost, and the total acreage will shrink. These communities often support species disjunct from cooler areas, and some of these species may be lost.
Fire Suppression	4	Fires that would have naturally swept through these sites (relatively infrequently in the Piedmont, perhaps more frequently in the Coastal Plain) have been suppressed, likely affecting the community composition of mesic plant species and exotics.

Summary and Recommendations

These communities occur in specialized microsites and are unlikely to migrate. To reduce the possible impacts from climate change, protection or restoration of landscape connections to allow migration is most important. These sites often occur in riparian areas and floodplains, and protection of these sites which will be dually beneficial to nearby streams.

Recommended Actions

Surveys

- Initial efforts need to be directed towards surveys to determine the current baseline distribution and status of species mainly associated with mesic forests (especially those that are state-listed or believed to be declining) for which that information is lacking. (NCWRC 2005).
- Secondary efforts need to focus on conducting surveys to understand current status from which we can then measure future population changes over time (NCWRC 2005).
- Protocols and procedures developed from baseline surveys should then provide a means to convert from a baseline survey mode to a long-term population monitoring mode (NCWRC 2005).

Monitoring

- Current monitoring systems and protocols (*e.g*. MAPS and BBS) may need to be enhanced to better cover certain species not well covered by current monitoring efforts (NCWRC 2005).
- Establish long-term monitoring for small mammals and bats following initial

surveys (NCWRC 2005).

- Conduct general long-term herpetofauna monitoring to track the effects of the loss of old growth characteristics in this habitat type (NCWRC 2005).

Research

- Collect demographic information on all bat species; investigate specific habitat needs and conduct life history studies (NCWRC 2005).

Management Practices

- Maintaining connections between habitat blocks is critical, not only for allowing adjustments in range in response to climate change, but to maintain population resilience and adaptability more generally.
- 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 and disperse to upland communities.
- For protected and unprotected sites, control of exotic plants that are present or may potentially invade is very important.
- Cooperative programs with non-industrial foresters to promote and increase silvicultural practices (*e.g*., promote canopy gap management, longer rotations, introduction of fire) could benefit birds of conservation concern as well as small mammals, bats, reptiles, and amphibians (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.
- 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.
- Conservation actions will need to include land acquisition, easements, and protection to promote remaining large, unfragmented tracts as well as management to maintain and re-establish mesic forest. This is a relatively rare forest type and great effort should be made to protect mesic forest and their species assemblages. Protection of larger natural areas that include adjacent communities will lead to greater viability for all communities present.

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Table 1. Predicted Impacts of Climate Change	
Climate Change Factor	**Comments**
Increased Temperature/ Hot Spells	Although we are not aware of any identified problems from phenological disruption, there may be higher potential for it in these communities than others, because they have many spring ephemeral plants.
Drought	The importance of drought and hot spells in mesic sites is unclear. Most of these sites are mesic because of topographic sheltering such as north-facing slopes or deep ravines. These sites are buffered from extremes of weather. However, because they contain many species that are not adapted to hot and dry conditions, they may suffer stress from even slightly drier conditions.
Fire	There may be an increase in natural fires (due to increased drought and higher average temperatures), but landscape fragmentation and fire suppression practices likely will continue to prevent most fires from spreading very far in the Piedmont and in the dissected lands in the Coastal Plain where mesic forests occur. Mesic forests occur in sites sheltered from most fires, but wild fire during drought may increase the likelihood or severity of fires in them.
Storms	An increase in hurricanes or other severe storms likely would increase wind damage in forests. Increased storm disturbance will increase the potential for exotic plant invasion, especially if a seed source is present in nearby developed or disturbed areas, or has already entered the community. Wind damage is often more severe in forests if there are adjacent openings such as logged or developed areas. If more intense storms increase flood heights, this will affect lower lying mesic forests. If wind throw stimulates salvage logging, this will further increase the damage to natural areas.

Table 2. Bird Species Utilizing Piedmont and Coastal Plain Mesic Forests							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
BIRDS							
Accipiter cooperii	Cooper's Hawk					/SC/P	
Accipiter striatus	Sharp-shinned Hawk					/SR/P	
Coccyzus americanus	Yellow-billed Cuckoo					/ /P	
Colaptes auratus	Northern Flicker					/ /P	
Contopus virens	Eastern Wood-pewee					/ /P	
Helmitheros vermivorous	Worm-eating Warbler					/ /P	
Hylocichla mustelina	Wood Thrush					/ /P	
Limnothlypis swainsonii	Swainson's Warbler					/ /P	
Melanerpes erythrocephalus	Red-headed Woodpecker					/ /P	
Oporornis formosus	Kentucky Warbler					/ /P	
Picoides villosus	Hairy Woodpecker					/ /P	
Wilsonia citrina	Hooded Warbler					/ /P	

Table 3. Mammal Species Utilizing Piedmont and Coastal Plain Mesic Forests							
Species	**Common Name**	**Element Rank:**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
MAMMALS							
Lasionycteris noctivagans	Silver-haired Bat					/SR/P	
Lasiurus intermedius	Northern Yellow Bat					/SR/P	
Mustela frenata	Long-tailed Weasel					/ /P	
Peromyscus gossypinus	Cotton Mouse					/ /P	
Scalopus aquaticus	Eastern Mole					/ /P	

Table 4. Reptile Species Utilizing Piedmont and Coastal Plain Mesic Forests							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
REPTILES							
Clemmys guttata	Spotted Turtle					/ /P	
Crotalus horridus	Timber Rattlesnake	SC				/SC/P	
Crotalus horridus	Canebrake Rattlesnake	SC				/SC/P	
Elaphe guttata	Corn Snake					/ /P	
Eumeces laticeps	Broadhead Skink					/ /P	
Lampropeltis calligaster rhombomaculata	Mole Kingsnake					/ /P	
Rhadinaea flavilata	Pine Woods Littersnake					/ /P	
Terrapene carolina	Eastern Box Turtle					/ /P	
Virginia valeriae valeriae	Eastern Smooth Earthsnake					/ /P	

Table 5. Amphibian Species Utilizing Piedmont and Coastal Plain Mesic Forests							
Species	**Common Name**	**Element Rank:**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
AMPHIBIANS							
Ambystoma mabeei	Mabee's Salamander					/SR/P	
Ambystoma maculatum	Spotted Salamander					/ /P	
Ambystoma maculatum	Spotted Salamander					/ /P	
Ambystoma opacum	Marbled Salamander					/ /P	
Ambystoma opacum	Marbled Salamander					/ /P	
Ambystoma talpoideum	Mole Salamander					/SC/P	
Eurycea guttolineata	Three-lined salamander	G5/S5				//P	
Hemidactylium scutatum	Four-toed salamander	G5/S3				/SC/P	
Hemidactylium scutatum	Four-toed Salamander					/SC/P	
Hyla gratiosa	Barking Treefrog					/ /P	
Hyla versicolor	Northern Gray Treefrog					/SR/P	
Plethodon glutinosus sensustricto	Northern Slimy Salamander					/ /P	
Pseudacris brimleyi	Brimley's Chorus Frog					/ /P	
Pseudacris nigrita nigrita	Striped Southern Chorus Frog					/ /P	
Pseudacris ornate	Ornate Chorus Frog					/SR/P	
Rana capito	Carolina Gopher Frog					/T/P	
Scaphiopus holbrookii	Eastern Spadefoot					/ /P	

Table 6. Invertebrate Species Utilizing Piedmont and Coastal Plain Mesic Forests							
Species	**Common Name**	**Element Rank**	**Endemic**	**Major Disjunct**	**Extinction/ Extirpation Prone**	**US/ NC/ WAP***	**Comments**
INVERTEBRATES							
Autochton cellus	Golden banded-skipper	G4/S2				/SR/	
Cordulegaster erronea	Tiger spiketail	G4/S3?				/W2/	
Hypomecis longipectinaria	A wave (moth)	G2G4/S3S4				/W3/	
Papaipema rutila	Mayapple borer moth	G4/S1S3		YES		/W2/	
Pyreferra ceromatica	Anointed sallow moth	GU/S1S3				FSC/SR/	
Scopula ordinata	A wave (moth)	G5/S2S3		YES		/W3/	Trillium feeder. Known in the Coastal Plain only from Greenbank Bluff. Occurs more widely in the mountains.

*** 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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