

DRAFT –Dry Coniferous Woodlands

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Ecosystem Description

The vast majority of land in the Piedmont and Mountain regions is dominated by hardwood forests. Less common are dry coniferous forests, which occur at mid to lower elevations in several kinds of specialized sites that are drier than most environments. They occur primarily in the mountains and are found in a few mountain-like sites in the Piedmont. Piedmont longleaf pine forests, although dominated by coniferous trees and sometimes dry, are included with the more closely related dry longleaf pine forests ecosystem group rather than here. There are four community types associated with this ecosystem: pine-oak/heath, Carolina hemlock bluffs, white pine forests, and montane red cedar hardwood woodlands.

The pine-oak/heath community occurs on sharp ridgetops and spur ridges, where shallow soils and exposure to drying winds and lightning prevent development of a closed hardwood forest. Extremely acidic soils, created by leaching and by the acidity of plant leaf litter, may also be a factor. The canopy is generally open with a dense, tall shrub layer dominated by mountain laurel or rhododendron occurs beneath the canopy. Herbs are few and sparse, but characteristic acid-loving species often occur in openings among the shrubs.

Carolina hemlock bluffs occur in settings similar to pine-oak/heath, but usually more on steep bluff-like side slopes. Carolina hemlock dominates the canopy with a shrub and herb layer similar to pine-oak/heath but may be more open.

White pine forests are poorly understood communities. While white pine is a common successional tree in mountain hardwood forests, natural forests of it most typically occur on the walls of steep gorges.

Montane red cedar-hardwood woodland occurs on shallow soils on gentle slopes. Smooth rock outcrops are usually found in association with it. These woodlands have an open canopy with an understory grassy with patchy shrubs. A number of the species suggest that the soils are less acidic than typical mountain soils.

These communities occur through the lower to middle elevations in the mountains and in the foothills. They are particularly abundant in the escarpment. Pilot Mountain, Hanging Rock and Crowders Mountain State Parks all have examples of the pine-oak/heath community. Owing to the relatively low elevations occupied by dry coniferous forests in the region, significant ownership of this habitat occurs in western North Carolina upon state owned lands (Thurmond-Chatham, South Mountains, and Green River Game Lands; South Mountains State Park; Dupont State Forest). Most of the dry coniferous woodland habitat occurs in the foothills region or in the far western counties (*e.g.*, Cherokee and Clay counties).

Piedmont ecoregion and Southern Blue Ridge Mountain ecoregion Dry Coniferous Woodlands are described as priority habitats in the 2005 Wildlife Action Plan (see Chapter 5A) (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 6 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

The two species of moths that feed on bear oak have a highly confined distribution in North Carolina (as does their host plant). While climate change may create conditions such as increased fire that may favor the oak, the moths are likely to be highly vulnerable to extirpation if fires completely consume all available habitat in the few areas where the moth currently exists.

While red-cockaded woodpeckers are almost exclusively associated with longleaf pine systems, most animals that are associated with pines and other dry conifers also occur in mixed stands of hardwoods and conifers. Brown-headed nuthatch and chuck-wills-widow are also associated with dry woodlands and/or heathlands more generally.

Additional problems faced by individual species associated with dry coniferous forest include the lack of early successional habitat of this type or conversion of this habitat to other pine habitat (*i.e.*, white pine) for species such as prairie warblers, woodpeckers, and nuthatches. Timber rattlesnake persecution in these habitats also remains a significant problem. Lack of management of the stands decreases the quality of habitat for woodland hawks by decreasing prey abundance and limiting their ability to hunt in dense understory growth (NCWRC 2005).

Climate Change Compared to Other Threats

The most significant threats vary among the different community types. Piedmont and mountain dry coniferous forests will likely be resilient to the effects of climate change and may actually benefit from increased fire frequency and drought. Lack of fire is the greatest threat to the majority of remaining pine--oak/heath. Not only will these forests not be able to reproduce themselves without fire, but those stands at higher elevations which are not regularly burned often develop dense mountain laurel/rhododendron understories that shade out other shrubs and herbaceous plants, thus lowering the habitat quality and diversity of wildlife which could utilize the area (NCWRC 2005). Management efforts by multiple agencies to increase prescribed fire in fire adapted communities, including dry coniferous forests, is already positioning these communities for greater resiliency.

Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	Rank Order	Comments
Fire	1	With the suppression of fire, many examples have disappeared or have become degraded by a lack of pine regeneration and invasion by hardwoods and shrubs. Suppression of fire has caused severe alteration and loss in Pine-Oak/Heath.
Development	2	Development can lead to fragmentation and disrupts connectivity between patches for most wildlife except birds. Road crossings can lead to mortalities, especially for reptiles and amphibians. Development in or adjacent to this habitat often leads to a significant problems using prescribed fire as a management tool due to the proximity of residential or other development. Construction activities, clear cutting, and other extensive removal of plant cover can make steep slopes prone to mud and/or rock slides, causing loss of topsoil and potentially causing property damage and threatening human safety (NCWRC 2005).
Logging/Exploitation	2	Logging is a threat to unprotected examples, particularly on pine--oak/heath and white pine forest.
Invasive Species	3	A major factor in loss of pine dominance is southern pine beetle outbreaks, which are often triggered by droughts. There are numerous native and exotic pests that can impact coniferous trees in this habitat (e.g., southern pine beetle, tip moths, pine webworm, Schweinitzii root and bud disease, and red heart of pine disease). Localized and non-lethal infestations can be beneficial for wildlife by creating snags, a food source, and habitat diversity. However, extensive lethal outbreaks can dramatically shift the composition of the tree community, with implications for conifer-specialists like brown-headed nuthatch (NCWRC 2005). Control of the hemlock woolly adelgid is crucial for the Carolina hemlock bluff communities. Without control, most or all of these communities may be lost in the near future.
Climate Change	4	Climate change will act somewhat counter to existing threats rather than exacerbating them. However, these benefits are far from certain.

Summary and Recommendations

Protection of good examples of all community types remains important. Because of the widespread loss of pine--oak/heath and the likely loss of Carolina hemlock bluff, restoration of degraded examples is also important. As in all communities, protection of surrounding communities and protection or restoration of landscape connections will improve the viability of communities and allow native species to migrate to adjust to the changing climate.

Conducting prescribed burns and controlling invasive species are the most important conservation actions to take in order to restore degraded sites and allow these communities to be more stable and resilient in the face of climate change.

Recommended Actions

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|----------------------|---|
| Surveys | <ul style="list-style-type: none">• Determine the current baseline distribution and status of species mainly associated with dry coniferous forest (especially those that are state-listed or believed to be declining). Data is most severely lacking for reptiles, small mammals, and nocturnal birds (NCWRC 2005).• Secondary efforts for conducting surveys to understand current status from which we can then measure future population changes over time (NCWRC 2005).• Protocols and procedures should be developed using baseline surveys to convert from a baseline survey mode to a long-term population monitoring mode (NCWRC 2005). |
| Monitoring | <ul style="list-style-type: none">• Current monitoring systems and protocols (e.g., MAPS and BBS) may need to be enhanced to better cover species not well covered by current monitoring efforts (NCWRC 2005).• Establish long-term monitoring efforts for small mammals and reptiles in the habitat (NCWRC 2005). Monitoring protocols and procedures need to be developed or refined that will allow us to measure population trends of the priority wildlife species, as well as the health and distribution of this relatively rare habitat through time (NCWRC 2005). |
| Research | <ul style="list-style-type: none">• Research needs to continue on topics including efficient and effective means to manage and improve the quality and quantity of dry coniferous forest, with a particular eye towards techniques that are applicable in our developing landscape (e.g., in the absence of fire, either as a natural event or as a management tool, what other means might be available to sustain this habitat across the landscape?) (NCWRC 2005).• Research how the loss of hemlock affects salamander habitat use and microclimate. |
| Management Practices | <ul style="list-style-type: none">• Determine impacts of prescribed fire on these communities and the resulting effects on wildlife communities. (NCWRC 2005).• Develop logistically and economically effective control strategies for controlling outbreaks of the most damaging insect pests and diseases. (NCWRC 2005).• Continue to support partnerships like the Southern Blue Ridge Fire Learning Network and the North Carolina Prescribed Fire Council to expand efforts at |

restoring disturbance regimes.

- Regulation of human activities on steep slopes that may cause excessive erosion or mud slides and the development and implementation of best management practices to mitigate erosion is needed.

Land Protection

- Identify the best remaining examples of this habitat in the western Piedmont and then to pursue easements or acquisition. The efforts of land trusts and government agencies should be coordinated to target the highest priority sites.
- Land use planning is needed to minimize development within large, unfragmented tracts of all woodland types in the western Piedmont.

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Table 1. Predicted Impacts of Climate Change

Climate Change Factor	Comments
Wind Damage	Increased wind damage may increase loss of mature pines and contribute to ongoing encroachment of hardwoods.
Fire	The occurrences of most dry coniferous woodlands depends on a combination of fire behavior and dry soils, both driven by topography. However, an increase in extreme fires may be detrimental. Increased drought may increase southern pine beetle outbreaks, a major threat to the pine canopy.
Drought	Because the characteristic plants are drought-tolerant as well as fire tolerant, an increase in drought may help them retain or regain dominance. In addition, if drought contributes to an increase in wild fire, this may benefit these communities.
Structural Change	The structural effects caused by fire suppression and southern pine beetles much exceed any effect likely from climate change. Restoration of the structure, composition, and, most importantly, disturbance regimes of these communities will increase their resiliency to environmental stressors.
Elevation Change	Warmer temperatures should allow spreading to higher elevation, but the acreage gain is likely to be limited. It may not occur if fires are suppressed.
Compositional Change	Without fire to promote pine regeneration, increased pine beetle mortality could hasten the shift from pines to hardwoods.
Acreage Change	Fire suppression has caused these habitats to shrink in recent decades. Increased drought may favor pines over hardwoods and allow them to regain some of their lost area even without fire. Increased drought and fire may allow expansion. These communities occur in the driest mountain and foothill sites, and increasingly dry climate may allow them to expand into a broader range of topography and to higher elevations.

Table 2. Bird Species Utilizing Piedmont and Mountain Dry Coniferous Woodlands

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
BIRDS							
<i>Accipiter cooperii</i>	Cooper's Hawk					/SC/P	
<i>Accipiter striatus</i>	Sharp-shinned Hawk					/SR/P	
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	G5/S5B				/ /P	
<i>Caprimulgus vociferus</i>	Whip-poor-will					/ /P	
<i>Colaptes auratus</i>	Northern Flicker					/ /P	
<i>Contopus virens</i>	Eastern Wood-pewee					/ /P	
<i>Setophaga discolor</i>	Prairie Warbler					/ /P	
<i>Falco sparverius</i>	American Kestrel					/ /P	
<i>Helmitheros vermivorous</i>	Worm-eating Warbler					/ /P	
<i>Loxia curvirostra</i>	Red Crossbill					/SC/P	
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker					/ /P	
<i>Picoides villosus</i>	Hairy Woodpecker					/ /P	
<i>Sitta pusilla</i>	Brown-headed Nuthatch					/ /P	

Table 3. Mammal Species Utilizing Piedmont and Mountain Dry Coniferous Woodlands

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
MAMMALS							
<i>Lasiurus seminolus</i>	Seminole Bat					/ /P	
<i>Neotoma floridana</i>	Eastern Woodrat	G5/S3S4				/SC/P	Mountain population
<i>Neotoma magister</i>	Allegheny Woodrat	G3G4/S2				/SC/P	

Table 4. Reptile Species Utilizing Piedmont and Mountain Dry Coniferous Woodlands

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
REPTILES							
<i>Cemophora coccinea</i>	Scarlet snake	G5/S3				/W1, W5/P	
<i>Crotalus horridus</i>	Timber Rattlesnake	G4/S3				/SC/P	
<i>Eumeces anthracinus</i>	Coal Skink	G5/S2S3				/SR/P	
<i>Pituophis melanoleucus melanoleucus</i>	Northern pine snake	G4T4/S3				FSC/SC/P	Non-Sandhills populations
<i>Sistrurus miliarius</i>	Pigmy Rattlesnake					/SC/P	
<i>Tantilla coronata</i>	Southeastern crowned snake	G5/S3S4				/ /P	

Table 5. Amphibian Species Utilizing Piedmont and Mountain Dry Coniferous Woodlands

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/ Extirpation Prone	US/ NC/ WAP*	Comments
AMPHIBIANS							
<i>Aneides aeneus</i>	Green salamander	G3G4/S2				/E/P	
<i>Plethodon meridianus</i>	South Mountains Gray-cheeked Salamander	G3/S1S2				/ /P	
<i>Plethodon amplus</i>	Blue Ridge Gray-cheeked Salamander	G1G2/S1S2				/ /P	
<i>Plethodon wehrlei</i>	Wehrle's Salamander	G5/S1				/T/P	

Table 6. Invertebrate Species Utilizing Piedmont and Mountain Dry Coniferous Woodlands

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
INVERTEBRATES							
<i>Acronicta albarufa</i>	Barrens daggermoth	G3G4/S1S2		YES		/SR/	Currently known in NC only from a couple of records from the Sandhills. However, it is likely to occur in the Piedmont, if not the Mountains.
<i>Catocala herodias gerhardi</i>	Herodias underwing (moth)	G3T3/SU		YES	YES	/SR/	Bear Oak feeder, known in NC only from Hanging Rock.
<i>Chlosyne gorgone</i>	Gorgone checkerspot	G5/S1		YES		/SR/	Recorded in NC only from Buck Creek and the vicinity of Jones Knob.
<i>Erastria coloraria</i>	Broad-lined catopyrrha (moth)	G4/SU		YES		/W3/	Known in NC only from Sandhills records but likely to occur in the Piedmont.
<i>Erynnis martialis</i>	Mottled duskywing	G3G4/S3				/SR/	
<i>Eucrotopcnemis dapsilis</i>	An owlet moth	G4/S2S3				/W3/	
<i>Faronta rubripennis</i>	Pink streak (moth)	G3G4/S2S3				/W3/	
<i>Feltia manifesta</i>	A noctuid moth	G4/S2S3				/SR/	
<i>Helimata infulata</i>	Rare spring moth	G2G4/S2S3				/SR/	
<i>Hemeroplanis n sp</i>	A noctuid moth	GNR/ S2S3				/SR/	
<i>Idaea eremiata</i>	A wave (moth)	G4/S3S4				/W3/	
<i>Lobocleta peralbata</i>	An inchworm moth	GNR/SU				/W3/	

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Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
INVERTEBRATES							
<i>Megathymus yuccae</i>	Yucca giant-skipper	G5/S3S4				/W2/	
<i>Phyciodes batesii maconensis</i>	Tawny crescent	G4T2T3/S2	YES		YES	FSC/SR/	Recorded at only a few sites in the Southern Mountains
<i>Phyciodes incognitus</i>	Mimic crescent	G2G4Q/S3?				/W3/	
<i>Ptichodis bistrigata</i>	Southern ptichodis (moth)	G3/S2S3				/SR/	
<i>Satyrium edwardsii</i>	Edwards' hairstreak	G4/S2?				/SR/	
<i>Stenoporpia polygrammaria</i>	Faded gray geometer	GU/S1		YES	YES	/W2/	Bear oak feeder known in NC only from Hanging Rock

*** 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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