

**Oak Forest (Including Mixed Hardwoods And Pine)**  
**Southern Blue Ridge Mountains**

Oak dominated forest is the most widespread and heterogeneous habitat of the mountain region of North Carolina, and throughout the Southern Blue Ridge ecoregion on relatively dry slopes and ridges. This habitat is a complex mix of numerous ecological community types including: high elevation red oak, montane white oak, chestnut oak, montane oak-hickory, dry oak-hickory, dry-mesic oak-hickory, basic oak-hickory, pine-oak heath, and mesic mixed hardwood (Schafale and Weakley 1990). Other classification systems differentiate this habitat into categories such as oak-dominated forests and mixed pine-hardwood forests (Hunter et al. 1999).

This habitat includes a range of moisture and topographic gradients, from dry to mesic, and from the piedmont to some of the highest mountain ranges. The driest sites are dominated by chestnut oak and/or scarlet oak, often with an understory of sourwood, black gum, and red maple. Montane oak-hickory forests, one of the most abundant ecological community types of this habitat, contain a mixture of oak species (often white oak dominates). Hickories may be present, and the understory/ shrub layer vegetation is often quite diverse, supporting species such as flowering dogwood, flame azalea, and huckleberries. Red oak forests may dominate at medium to high elevations (most common community on high mountains) and on ridgetops where spruce-fir and northern hardwoods are absent or adjacent (NCNHP 2001).

The importance of oak forest to wildlife of the region cannot be overstated, due to the overwhelming predominance of the habitat across the landscape, the variety of conditions encompassed, and the mast production capacity of this habitat. By virtue of the production of vast quantities of acorns, hickory nuts, and a wide variety of soft mast associates, the wildlife food production capacity of oak forests is immense. Coupled with the sheer amount of this habitat available, these factors make oak forests one of the most important habitats of the region to a significant variety wildlife species. A list of priority species associated with oak forests (including mixed hardwoods and pine) and for which there is conservation concern is provided in Table 1.

**Table 1. Priority species associated with montane oak & mixed hardwoods/pine forest.**

<b>Group</b>	<b>Scientific name</b>	<b>Common name</b>	<b>State status* (Federal status)</b>
Birds	<i>Accipiter cooperii</i>	Cooper's Hawk	SC
	<i>Accipiter striatus</i>	Sharp-shinned Hawk	SR
	<i>Caprimulgus vociferus</i>	Whip-poor-will	
	<i>Certhia americana</i>	Brown Creeper	SC
	<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	
	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	SR
	<i>Colaptes auratus</i>	Northern Flicker	
	<i>Contopus virens</i>	Eastern Wood-pewee	
	<i>Dendroica cerulea</i>	Cerulean Warbler	SR
	<i>Helmitheros vermivorous</i>	Worm-eating Warbler	

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<b>Group</b>	<b>Scientific name</b>	<b>Common name</b>	<b>State status* (Federal status)</b>
	<i>Hylocichla mustelina</i>	Wood Thrush	
	<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	
	<i>Oporornis formosus</i>	Kentucky Warbler	
	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	
	<i>Picoides villosus</i>	Hairy Woodpecker	
	<i>Poecile atricapilla</i>	Black-capped Chickadee	SC
	<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	SC
	<i>Vermivora chrysoptera</i>	Golden-winged Warbler	SR
	<i>Wilsonia canadensis</i>	Canada Warbler	
	<i>Wilsonia citrina</i>	Hooded Warbler	
Mammals	<i>Mustela frenata</i>	Long-tailed Weasel	
	<i>Mustela nivalis</i>	Least Weasel	SR
	<i>Parascalops breweri</i>	Hairy-tailed Mole	
	<i>Scalopus aquaticus</i>	Eastern Mole	
	<i>Sciurus niger</i>	Eastern Fox Squirrel	SR
	<i>Sorex cinereus</i>	Masked Shrew	
	<i>Sorex fumeus</i>	Smoky Shrew	
	<i>Sorex hoyi winnemana</i>	Southern Pygmy Shrew	
Amphibians	<i>Ambystoma maculatum</i>	Spotted Salamander	
	<i>Ambystoma opacum</i>	Marbled Salamander	
	<i>Aneides aeneus</i>	Green Salamander	E
	<i>Desmognathus aeneus</i>	Seepage Salamander	SR
	<i>Hemidactylium scutatum</i>	Four-toed Salamander	SC
	<i>Plethodon aureolus</i>	Tellico Salamander	SR
	<i>Plethodon chattahoochee</i>	Chattahoochee Slimy Salamander	
	<i>Plethodon glutinosus sensu stricto</i>	Northern Slimy Salamander	
	<i>Plethodon longicrus</i>	Crevice Salamander	SC
	<i>Plethodon richmondi</i>	Southern Ravine Salamander	SC
	<i>Plethodon ventralis</i>	Southern Zigzag Salamander	E
	<i>Plethodon wehrlei</i>	Wehrle's Salamander	T
	<i>Pseudacris brachyphona</i>	Mountain Chorus Frog	SC
Reptiles	<i>Crotalus horridus</i>	Timber Rattlesnake	SC
	<i>Lampropeltis calligaster rhombomaculata</i>	Mole Kingsnake	
	<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard	
	<i>Pituophis melanoleucus melanoleucus</i>	Northern Pinesnake	SC

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Group	Scientific name	Common name	State status* (Federal status)
	<i>Terrapene carolina</i>	Eastern Box Turtle	
	<i>Virginia valeriae valeriae</i>	Eastern Smooth Earthsnake	
*Abbreviations T Threatened E Endangered SC Special Concern SR Significantly Rare			

**Location and condition of habitat (see Map 5A.6):**

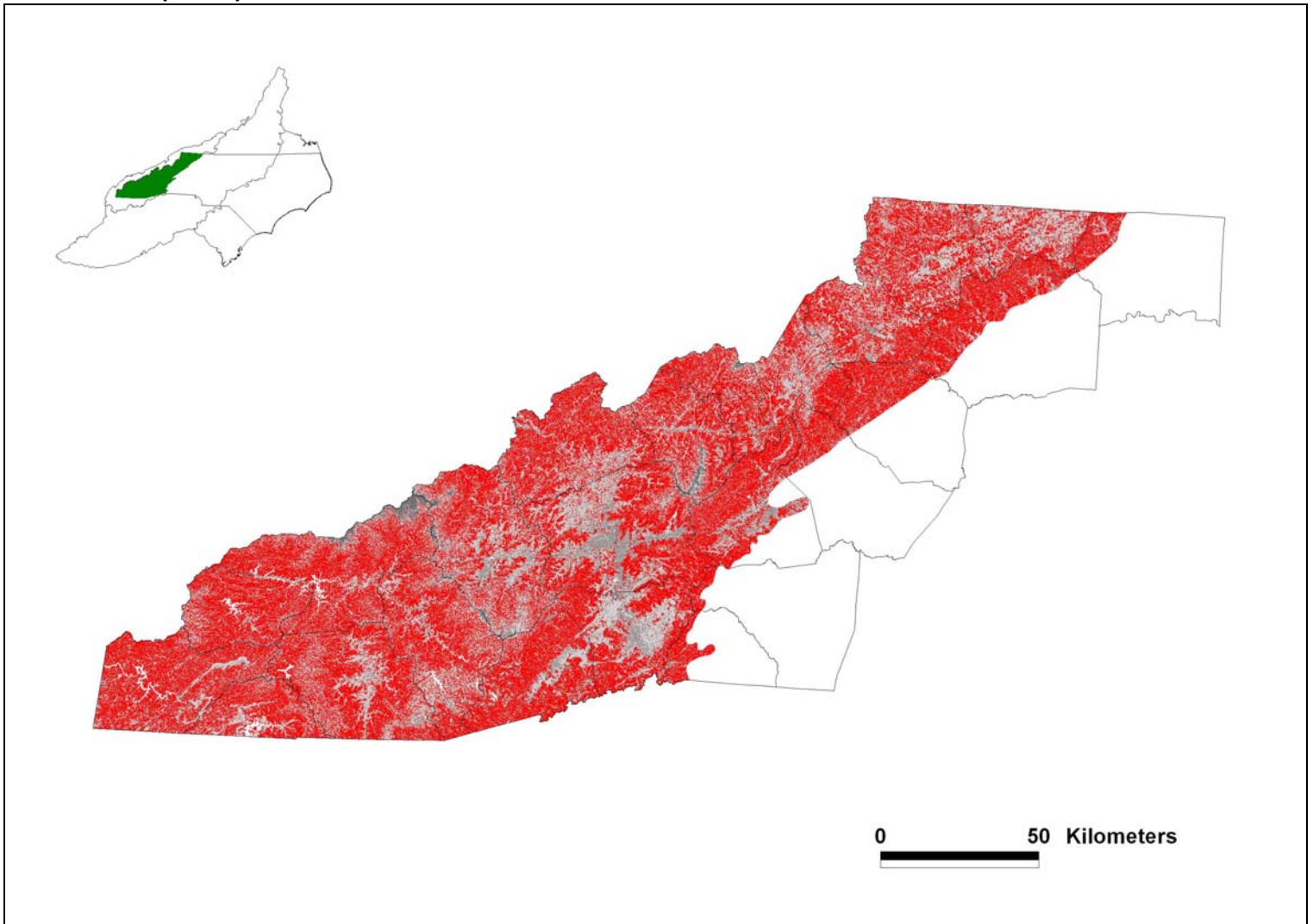
As a result of the variety of ecological classifications of this habitat, it is difficult to accurately assess the availability of this habitat in the state or region. The Southern Appalachian Assessment ascribed over 17.5 million acres in the seven states covered by their assessment (VA, KY, TN, NC, SC, GA, AL) to oak or mixed oak-pine categories (SAMAB 1996). Hunter et al. (1999) went further in classifying over 5 million acres of the Southern Blue Ridge physiographic province (including parts of VA, TN, NC, and GA, though the majority in NC) as the combination of oak dominated forests and oak-pine mixed forests. Map 1 depicts locations of oak forest (mixed hardwoods and pine) in the Southern Blue Ridge ecoregion.

The US Forest Service has utilized several classification systems and techniques to assess availability of a variety of forest types on their holdings within western North Carolina. Out of approximately 1 million acres in Forest Service holdings on the Pisgah and Nantahala National Forests, utilizing Continuous Inventory of Stand Condition data, they have estimated over 500,000 acres of upland hardwood and mixed pine-hardwood habitat; and ecological modeling conducted by the Forest Service estimated over 600,000 acres of various oak and mixed oak-pine habitats on the same two national forests (USFS 2001). Regardless of the specific classification system or boundaries employed, it is clear that oak dominated forests are the predominant forest habitat of the mid- and lower elevation mountains of western North Carolina.

Information regarding the condition of oak forest in the region is less readily available. Because oak forest is so common on both public and private lands, coupled with a variety of other factors (geographic, topographic, micro-climatic, etc.), this habitat has been subjected to a wide variety of natural and anthropogenic stresses which have shaped its current distribution and condition. The loss of American chestnut as a component of the landscape, development patterns, historic demands for timber products, fire suppression and a variety of other conditions have brought us to the current condition of oak forests today. Hunter et al. (1999) indicate that over half of the available oak forest habitat is currently in mid-late successional stages, with a very small proportion in early successional stages. The US Forest Service estimates that on the Pisgah and Nantahala National Forests, over 89% of upland hardwood and mixed pine-oak stands are more than 60 years old (USFS 2001). Extrapolating from these

figures, the vast majority of oak forest on public lands of western North Carolina is currently in older age classes, though the percentage of older age classes on private lands in the region is smaller due to more active timber management strategies on private lands, but remains a majority nonetheless.

**Map 1. Oak forest (mixed hardwoods and pine) habitats in the Southern Blue Ridge ecoregion of North Carolina (in red).**



Data source: NC GAP, 1992.

### **Problems Affecting Species And Habitats**

With regard to oak forest habitat, three main categories of problems currently recognized include habitat loss, insects and/or diseases, and inappropriate management. Specifically, these include the following historic and ongoing problems:

- Loss or conversion of habitats (e.g., due to human development, agriculture).
- Increased development leading to greater degrees of habitat fragmentation.
- Amphibian species impacted by loss of embedded ephemeral pool habitats.
- Chestnut blight, oak decline, gypsy moths, and other diseases/pests may significantly affect the composition and diversity of hardwood stands throughout the Southern Appalachians.
- Fire suppression is a major factor affecting species diversity and richness, also affecting the composition, structure and diversity of hardwood stands throughout the Southern Appalachians.
- Homogeneity of stand age has resulted in decreasing habitat for bird species that rely on diverse understory development (lack of understory development).

Individual species associated with oak forest habitats may be experiencing problems other than those listed above that are not necessarily associated with oak forest habitat. Timber rattlesnakes and other snake species are subjected to persecution. Many species (e.g. cerulean warbler, black-capped chickadee, green salamander, seepage salamander, crevice salamander, Wehrle's salamander, northern pine snake) have such a small range or clumped distribution within North Carolina that they are more susceptible to stochastic or genetic population declines or local extirpations. Many neotropical migrant birds may also be experiencing winter range habitat loss. And finally, since there is such abundance and diversity of species associated with oak forests, we may not know the exact habitat or life history requirements of individual species that are limiting factors to their population stability.

### **Species And Habitat Conservation Actions and Priorities For Implementation**

Because oak forest habitat remains abundant and widespread, the most critical conservation activities revolve around gathering information about the wildlife species that utilize it and the habitat itself. We do not face the imminent threat of loss of the habitat as a whole, and therefore we must learn as much as possible about the species, the habitat, and their inter-relationships in order to develop concentrated strategies to both protect the most critical areas, and properly manage those under conservation protection. We cannot protect all oak forest in western North Carolina from loss or perturbation. We must understand what the most critical components are both ecologically and with respect to wildlife groups or species, and develop strategies to conserve and manage them. We must also recognize opportunities to act as soon as possible to protect landscape scale oak forests through both acquisition and other protection measures (voluntary incentives, cooperative agreements, easement programs) focused upon large tracts that will preclude future fragmentation or promote connectivity between existing conservation ownerships.

Within the land management realm, we must foster efforts to understand and implement appropriate management techniques (e.g., prescribed fire or thinning) for the benefit of the broadest array of oak forest dependent wildlife, while taking into account specific needs of wildlife with more restrictive requirements (Artman and Downhower 2003, Ford et al. 2000).

We must encourage both study and dissemination of information about the impacts (both positive and negative) of various management strategies upon oak forest wildlife species. We must continue to pursue appropriate management of existing conservation lands including the use of prescribed burning to diversify structure and composition of forest understory, and other silvicultural techniques to promote regeneration, provide an array of age class and structural composition, and promote long-term economic sustainability of Appalachian oak forests. Changes in the Southern Appalachian landscape have reduced populations of some early successional birds that require disturbance and proper management in largely forested areas may be required to meet the needs of the wide array of wildlife (Marzluff et al. 2000, Klaus and Buehler 2001).

### **Priority Research, Survey, And Monitoring**

Because the list of species associated with oak forest habitat is so broad, the potential research topics are innumerable. However, examples of priority efforts include:

- **Surveys**

- Priority goes to gathering baseline information regarding the current distribution and status of oak forest associated species that are rare or declining (e.g. sharp-shinned hawk, cerulean warbler, black-capped chickadee, black-billed cuckoo, golden-winged warbler, eastern fox squirrel, green salamander, seepage salamander, four-toed salamander, Tellico salamander, crevice salamander, southern zigzag salamander, Wehrle's salamander, mountain chorus frog, timber rattlesnake, northern pine snake).
- Next, expand surveys to include species for which we know very little about current status and distribution (e.g. whip-poor-will, Cooper's hawk, weasels, moles, shrews, bats, certain salamanders, and reptile species such as the box turtle).
- Finally, compile, store and synthesize information about the status and distribution of more common species, developed through those approaches or other efforts.

- **Monitoring**

- Monitoring efforts need to be established for numerous species groups for which no current framework exists. For many species groups (e.g. amphibians, reptiles, mammals), no current efforts are focused upon determination of population trends.
- Procedures and protocols must be developed that will allow us to determine whether populations of all of these animal groups are increasing or decreasing as a result of habitat changes through time.
- In addition to establishment or expansion of monitoring efforts at all times of the year for wildlife species associated with oak forest, we must work towards a consistent, comprehensive approach to monitoring the health, distribution, and availability of oak forests themselves. Knowing what the trends are for the habitat will be critical to understanding the dynamics of wildlife populations which depend upon them.
- Expand monitoring frameworks to account for species that are not suited to traditional long-term monitoring protocols (e.g. hawks, goatsuckers, owls), or for species missed

- Track oak habitat trends (e.g., rate of loss or conversion of the habitat and disease or pest affects) and consider trends in the development of long-term monitoring strategies for oak forests of the region.

- **Research**

*Genetics*

- Initiate genetic and morphological studies to clarify taxonomic status of numerous birds and amphibians (e.g. high elevation birds, plethodontid salamanders)

*Habitat*

- Conduct life history and habitat use research on northern pinesnake.
- Conduct habitat use studies of neotropical migrants (e.g. cerulean warbler, black-capped chickadee, many others) using telemetry.
- Conduct habitat use and life history studies for bat species that may potentially use this habitat (e.g. hoary, silver-haired, eastern small-footed, northern bats)
- Study population responses of plant and wildlife species to habitat manipulations (e.g. large scale prescribed burning, oak savannah creation, canopy gap creation, etc.)
- Conduct green salamander movement studies either around embedded rock outcrops or between rock outcrops

*Other*

- Establish studies to determine both direct and indirect impacts of pest control measures upon oak forest dependent species (*e.g. what is the impact of gypsy moth control strategies upon local and landscape scale wildlife populations? Upon invertebrates that serve as food for vertebrates?*)

## **Supporting References**

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