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Neotropical Migratory Birds of the Southern Appalachians

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Cover Photo: Golden-Winged Warbler, Ricky A. Phillips

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Introduction

Neotropical migratory birds nest in North America and winter in Mexico, the Caribbean, Central America, and South America. Almost half of the bird species that breed in the United States and Canada migrate to the Neotropics where they spend 6 to 9 months before returning North. About 143 species are considered true migrants; examples are the broad-winged hawk, yellow-billed cuckoo, red-eyed vireo, cerulean warbler, summer tanager, and rose-breasted grosbeak. Another 72 species are considered short-distance migrants and have varied behavior, with some individuals migrating to the Southern United States and beyond and others remaining on the breeding grounds; examples include the American robin, cedar waxwing, and American goldfinch.

The purpose of this publication is to describe Neotropical migratory birds in the Southern Appalachians, their general ecology and habitat associations, population status, possible reasons for declines, and management needs. This paper concentrates on migratory landbirds, thus it does not include waterfowl or shorebirds.

Costs versus Benefits of Migration

Bird migration by all measures is a remarkable feat. Physiologically, the cost of migrating is enormous as shown by the substantial body weight loss, as much as 50 percent, that migrating individuals experience. In contrast to short-distance migrants and resident species, which have two and even three broods per year, long distance migrants have a single clutch, a condition that can have dramatic consequences unless the nest is lost very early in the season allowing the pair to re-nest. Many short-distance migrants arrive on the breeding grounds earlier than the Neotropical migrants and begin fall migration later, allowing more time to reproduce. Moreover, the permanent residents such as the pileated woodpecker, northern cardinal, and blue jay are often bigger and can more easily defend their nests against predators. The result is that Neotropical migrant birds may be disadvantaged on three fronts:

* They frequently build an open cup nest, often on the ground, increasing susceptibility to detection and predation.
* Many produce only one brood annually.
* Most have limited defense mechanisms against nest predators and nest parasites.

Yellow-Throated Warbler

If migration is so physically taxing, why do these birds undertake such arduous travels? By abandoning the North in the fall, they avoid nights that are harsh and cold. Spring migration from the tropical areas allows those birds nesting in the far North to escape hot, humid conditions for cooler climates. It also reduces the amount of intra- and interspecific competition for food, thought to be a limiting resource in winter, that otherwise would have occurred on the breeding grounds had all the birds remained there. Likewise, food availability on the wintering grounds during the breeding season may be insufficient to support rearing the young of additional individuals (those that now migrate). Migration also allows some species to take advantage of periodic insect outbreaks. For those breeding in the far North, the extended daylight hours provide more opportunity to forage for food. In response to the short northern summer, all the young hatch during a relatively brief period of time. Hence, the impacts of predators can be minimized as the proportion of the young or eggs lost is reduced by this compressed period of vulnerability. From an evolutionary perspective, migratory behavior fosters mixing of genes from individuals in populations that reside in different geographical areas. Such mixing may convey survival advantages.

Breeding Habitat

Mechanisms of Habitat Selection

How does a bird decide where to establish its territory? Why are certain birds found in some areas and not others, even in situations where the areas are in close proximity? For almost all species, the male arrives first on the breeding grounds and establishes a territory with the expectation of attracting a mate. A territory is an area that the bird will defend against others of its own species, and in some situations, other species as well.

Each species has its own set of habitat affinities (see Appendix) that influence its distributional patterns. To understand habitat affinities, think of the bird as having a template or mental image of what constitutes acceptable habitat. Depending on the species this image will be either genetically determined or **environmentally** induced through learning. The bird assesses the characteristics of a potential territory to judge its suitability, such as the structural configurations (horizontal and vertical complexity, amount of canopy, proportion of open ground), vegetative community composition, edge area, proportion of undisturbed forest, microclimate, availability of nest sites, quality and quantity of food resources, and presence of potential competitors or predators.

Nesting

Mature deciduous forests contain several layers of vegetation, each layer providing nesting habitat for particular bird species. Nests are at ground level for ovenbirds and Kentucky warblers; at 1 to 3 yards for gray catbirds; at 3 to 6 yards for acadian flycatchers and wood thrushes; from 6 to 11 yards for scarlet tanagers and red-eyed vireos; and at the tops of the canopy for eastern wood-pewees and yellow-throated vireos. If a vegetative layer disappears, any species normally associated with it is not likely to occur, thus reducing the density of that species and the diversity of the avian community. Hence, habitat structure and composition can greatly influence the a&n community.

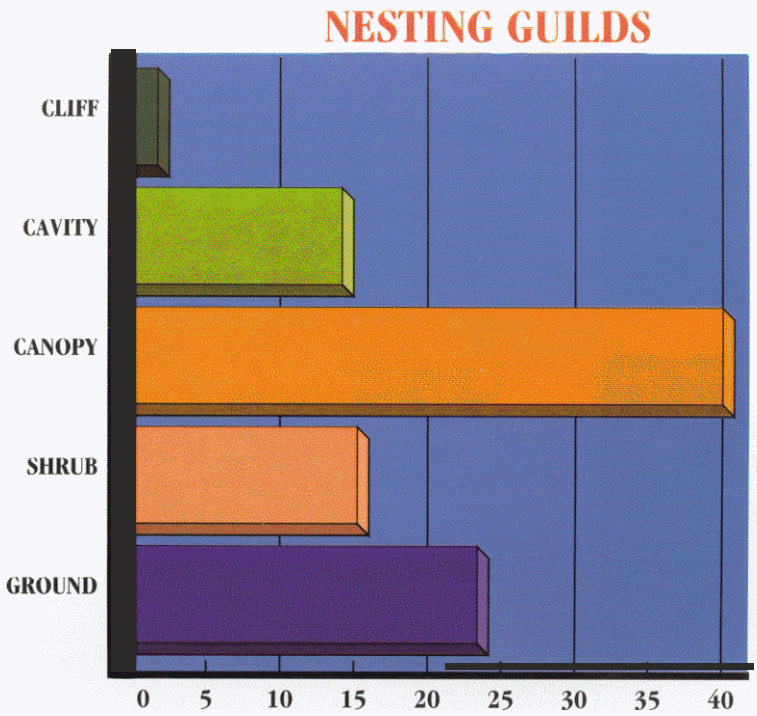
Many species require cavities for nesting. Woodpeckers are examples of **primary** cavity nesters, or those species that construct their own cavities. Secondary cavity nesters use cavities that have been constructed by other species; they include chickadees, titmice, and bluebirds. Because many cavities are constructed in snags (dead trees), nesting opportunities will improve if snags are allowed to remain during harvesting operations.

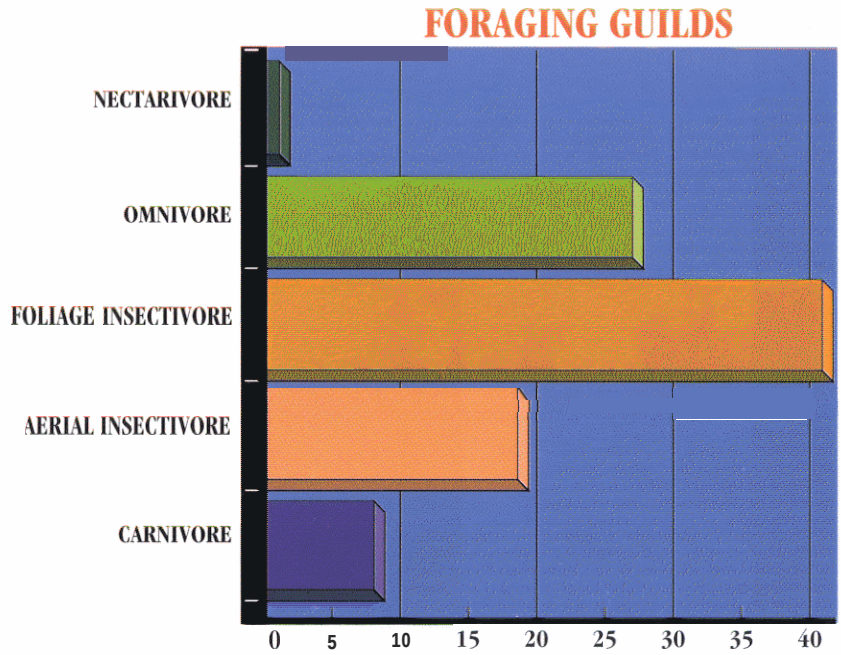
Veery

Effects of Fragmentation

In North America, forest structure, composition, configuration, and appearance have changed drastically. In many areas large blocks of forest habitat have shrunken into much smaller blocks or patches compared to the pre-development vegetation. The resulting fragmentation of landscapes can affect the distribution and numbers of certain birds. Because area sensitive species and forest interior species, such as the black-throated blue warbler and Blackburnian warbler, are particularly susceptible to forest fragmentation on the breeding grounds, their densities are highest in unfragmented forests.

Compared to pre-development times, many of today's forests have substantially different plant species composition and age structure. When forests are altered by logging, agricultural conversion, urban development, or other means, the effects on Neotropical migratory birds are difficult to predict and sometimes difficult to recognize. Avery and Leslie (1990) concluded that too little is known about the consequences of forest management techniques to judge the effectiveness of potential bird conservation prescriptions.





Influence of Edge and Forest Area

Some species prefer areas with edges, such as the boundary that forms when a pasture abuts a forest, because edges offer the beneficial attributes of several vegetation types. Edge species include the least flycatcher, chestnut-sided warbler, and indigo bunting. In contrast, forest interior species primarily nest away from edges in the deep forest. Many Neotropical migrants are forest interior species and disappear from forest lands that are harvested or converted into small tracts. These include the veery, black-throated blue warbler, black-and-white warbler, and cerulean warbler. As the proportion of edge to forest interior increases, the likelihood of predation and brood parasitism by brown-headed cowbirds increases (see section on brood parasitism). Nests along forest edges and in small forest tracts are reported to experience higher rates of loss from foxes, raccoons, skunks, coyotes, cats, dogs, blue jays, and other predators. In fact, nest predation and cowbird brood parasitism are more common near the forest edge than elsewhere in the forest. Susceptibility to nest loss is particularly acute within the area less than 100 yards from the forest edge.

Certain species are more common in larger rather than smaller wooded areas, suggesting that they prefer forested tracts of a certain minimum area. Territories of most forest songbirds generally range in size from 1 to 10 acres. Area-sensitive forest species tend to be mostly warblers, flycatchers, vireos, thrushes, and tanagers. Example species include the Acadian flycatcher, yellow-throated vireo, and northern parula. About 75 percent of forest interior or area-sensitive species in eastern forests are Neotropical migrants. Bird populations in otherwise similar forest fragments of different sizes have been compared to understand area requirements. For example, few forest-interior species were found in small forest stands, especially those less than 25 acres (Freemark and Collins 1992). The Acadian flycatcher, yellow-throated vireo, and northern parula appear mainly or exclusively in large tracts of continuous forest. Area insensitive species are those species that may be found even in small woodlots; examples include the eastern wood-pewee, yellow-breasted chat, gray catbird, and indigo bunting.

Why would a species need a forest tract many times larger than its average territory? One possible reason is that tracts near the edge of the forest offer access to species associated with cropland or other open country. The birds choosing large tracts would be less subject to encroachment, predation, parasitism, and potential competition for nest sites and food.

Area requirements vary from species to species and depend, in part, on the characteristics of the regional landscape. Examples of influencing characteristics include the extent to which a tract is isolated, its elevation, structure, vegetative composition, and the overall amount of forested habitat in the vicinity. Robbins and others (1989a) developed the following predictions of a 50 percent probability that some common species would occur in different sized woodlots during the nesting season in Maryland: wood thrush (2.5 acres), red-eyed vireo (6.2 acres), summer tanager (99 acres), and worm-eating warbler (371 acres). This means that to have a 50 percent chance of finding a wood thrush, the woodlot would have to be at least 2.5 acres, but that the size of the woodlot would have to increase to 371 acres for the same probability of finding a worm-eating warbler. Research has shown that the two most important factors in determining species-richness (defined as the number of species present) are forest area for forest interior species and habitat heterogeneity (complexity and variation) for edge species (Askins and others 1987, Blake and Karr 1987, Ambuel and Temple 1983). Robbins and others (1989a) suggest that 7,410 acres is a minimum forest size that can be expected to retain forest-interior species in eastern North America.

Forest size influences the role that predation and brood parasitism (see following sections) play in the distribution and abundance of Neotropical migratory birds on the breeding grounds. Migrants are susceptible to interspecific competition with edge species for food, nest sites, and space. And lastly, large-scale habitat modifications affect the availability of habitat, reduce habitat quality, and cause mortality in adults and young birds; examples are extensive fires, severe storms, and infestations of pests such as the damage caused by balsam wooly adelgid in spruce-fir forests and the southern pine beetle throughout the South.

WinterHabitat

From 1850 to 1980, deforestation reduced the size of Latin American forests by about 20 percent (Hartshorn 1992). In Central America, the annual loss has been nearly a million acres or 2 percent per year. Costa Rica, for example, has lost more than half of its tropical forests since 1950. During the vast deforestation that took place in the 1970's and 1980's, little consideration was given to site quality, erosion potential, and sustainability. The result was large-scale erosion, landslides, and stream sedimentation, all of which have negative environmental consequences for the ecosystem (Hartshorn 1992).

The primary motive for deforestation is conversion to pasture for cattle; this is usually a more permanent threat to migrant populations than allowing stands to regenerate, because the land is likely to remain in agricultural use. A study comparing migratory and permanent resident bird species in Belize showed that migrants were common in mature moist forests and more abundant in early successional stages (Kricher and Davis 1992). However, most (57 percent) of the species using successional areas were edge or forest-border species, thereby highlighting the need to have nearby mature forest. Kricher and Davis (1992) stress that the availability of mature forest is essential to preserving avian species richness of disturbed sites.

Habitat Preferences

About a third of Neotropical migratory birds winter in forests or woodlands (Rappole and others 1983). Tropical forests are well-documented as being far more diverse than their northern counterparts, thus providing a wider range of habitat types. Some species, such as the yellow warbler and yellow-breasted chat, seem to concentrate on second-growth forests and abandoned fields. Some use pastures and agricultural fields on the wintering grounds and may achieve their highest densities there; these include the common yellowthroat, yellow-throated warbler, and indigo bunting. While some Neotropical migrants, such as the black-throated blue and black-and- white warblers, may take advantage of the wider assortment of habitats available on the wintering grounds, others may be more restricted; an example is the cerulean warbler, which winters strictly in primary, humid evergreen forests along a narrow elevation zone at the base of the Andes (Robbins and others 1992b). Other migrants and permanent residents use highly modified or successional vegetation, although certain species, such as the wood thrush, hooded warbler, and Kentucky warbler, avoid disturbed sites (Petit and others 1992).

Common Nighthawk

Population Densities

A few migrant species have unusually extensive winter distributions; examples are the black-and-white warbler and Louisiana waterthrush — their wintering areas include most of Mexico, all of Central America, the Antilles, and a large part of South America. However, most other terrestrial migrants generally have rather limited distributions during the winter. There are about 4 million acres below the tree line in North America. When compared to the half-million acres in Mexico, the Bahamas, and Cuba that support the majority of all migrants, it is easy to see how wintering populations can be 5 to 8 times more dense than breeding populations. Acre for acre, loss of habitat often affects more individuals in the tropics than on the breeding grounds, especially in the Caribbean. Highly compressed populations may experience severe intraspecific and interspecific competition for food, territories, and other limiting resources.

Age and Gender Distributions

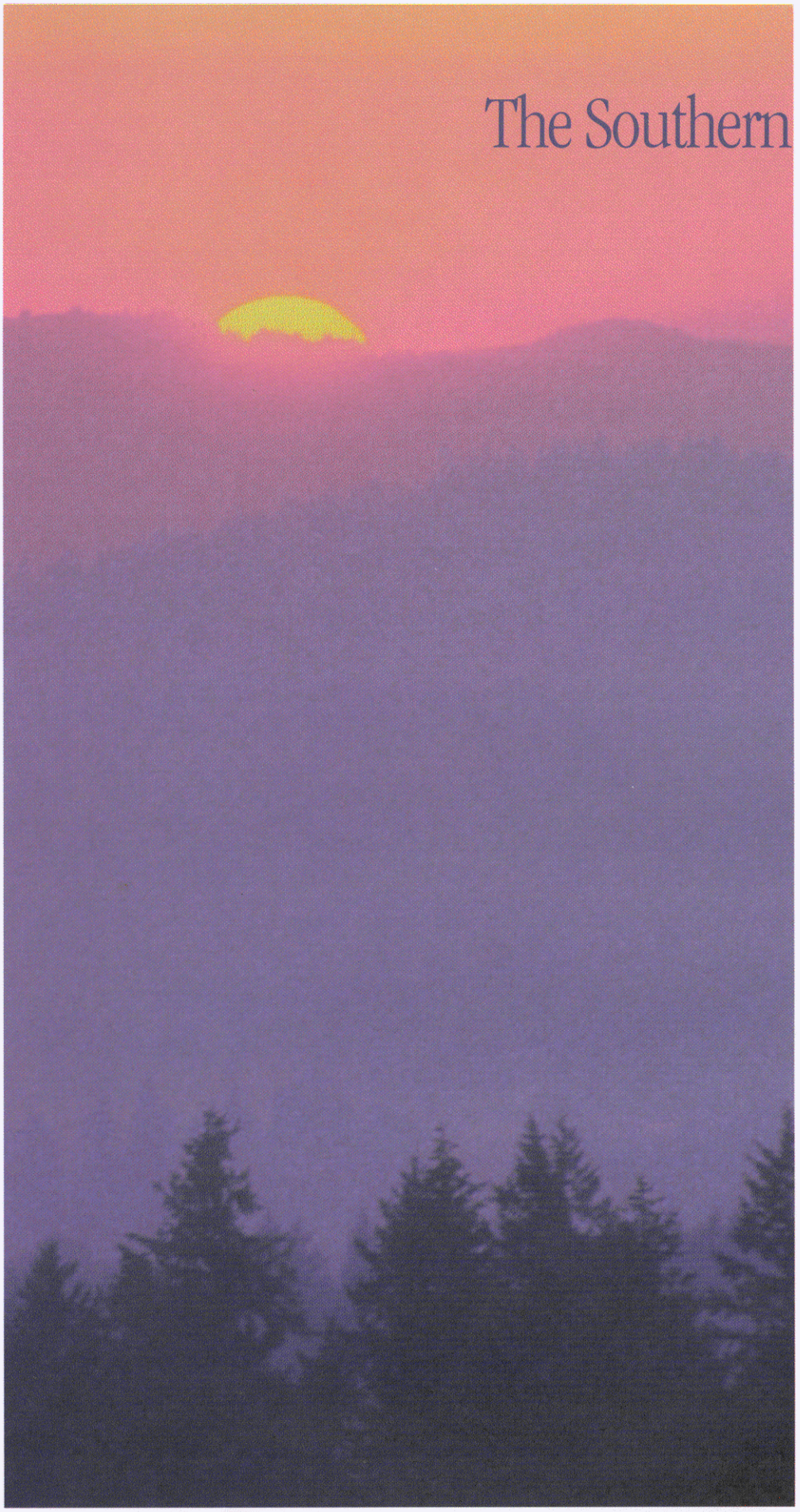
Although many migrants nest and winter in structurally similar habitats, this is not true for all species. Also, some species are segregated by age class and sex on the wintering grounds. For example, female black-throated blue warblers select younger, shrub-sapling stages of high altitude forests in the winter, while the males choose older, taller forests at the lower elevations (Wunderle 1988). In winter, hooded warbler females are more common along the edges and in early successional stages of forests, but the males primarily inhabit mature forests (Lynch and others 1985). In contrast to these examples, breeding ranges must be geographically fixed to ensure that males and females are able to locate each other.

Deforestation

Logging of tropical forests has produced losses that are particularly pronounced in Southern Mexico, Central America, and the West Indies. How may this change in habitat availability in winter be reflected on the breeding grounds? Wilcove (1988) in 1982 and 1983 revisited 10 plots—9 of which were in virgin stands—in the Great Smoky Mountains National Park, one of the largest and least disturbed eastern forests. The plots had originally been surveyed by Fawver in 1947 and 1948 (Fawver 1950, Kendeigh and Fawver 1981). Wilcove found little difference in grand totals between the two surveys, although some migrants declined at some sites. However, several species—the rose-breasted grosbeak, northern parula, and indigo bunting—were more common in the later surveys; these species, associated with second-growth tropical forests, thrive in areas that have been logged and are regenerating. In contrast, the chestnut-sided warbler showed a statistically significant decline and three other species—the wood thrush, Blackburnian warbler, and hooded warbler—showed apparent declines. These four species winter mainly in primary (uncut) tropical forests, although Powell and others (1992) and Blake and Loiselle (1992) found chestnut-sided warblers using second-growth as well as primary forests in Costa Rica. Because of sampling bias, Wilcove suggests that these data be regarded as preliminary.

Pesticides

Pesticides (insecticides, fungicides, herbicides) may affect Neotropical migratory birds. Many pesticides are widely applied in the tropics, including some like DDT that are prohibited for use in the United States. During the winter, many migrants use agricultural habitat, either by choice or as a substitute for their preferred habitat. Little is known about the direct or indirect effects of pesticides on migrant birds (Robbins and others 1992a).



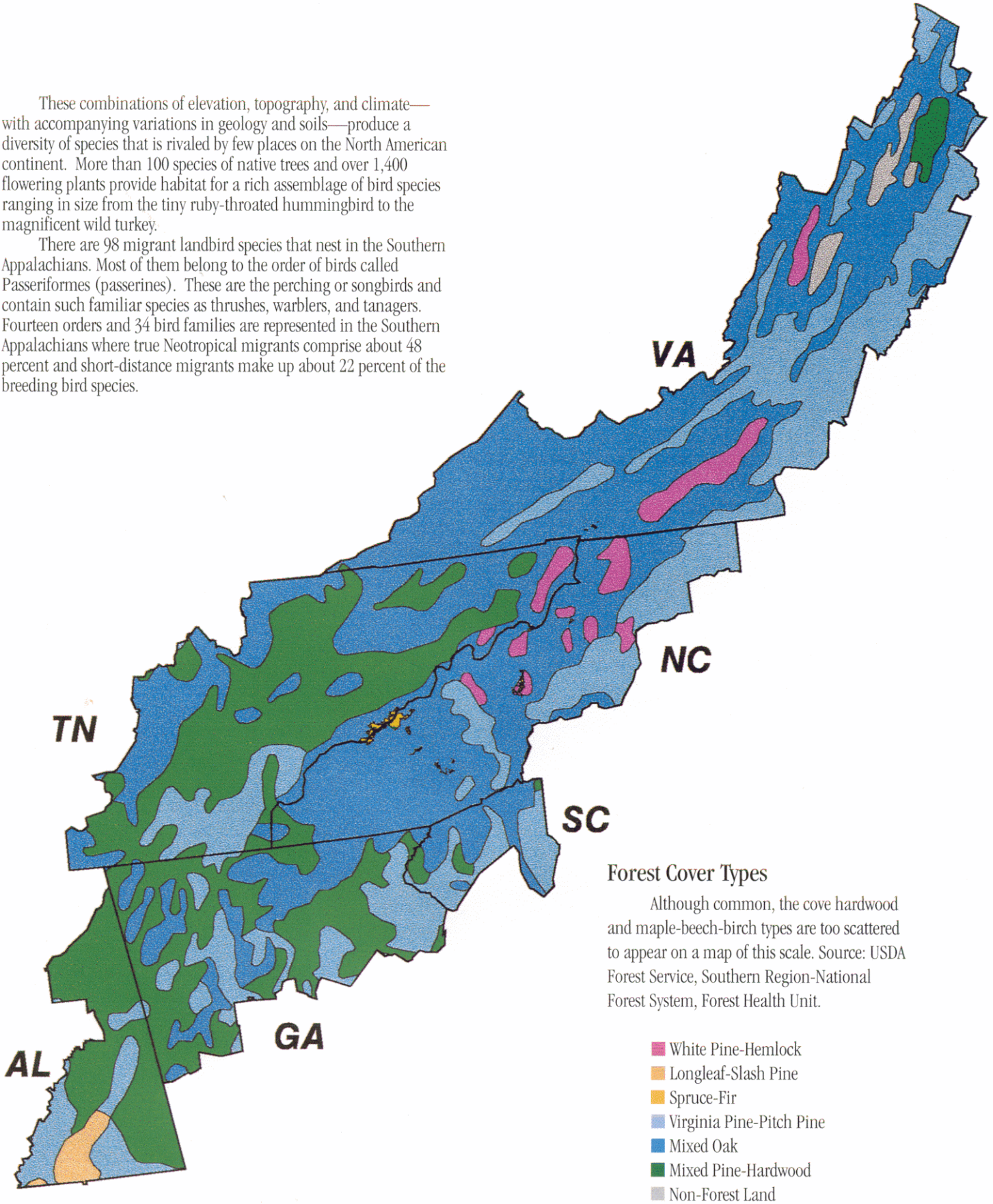
The Southern Appalachians

The Southern Appalachians contain the largest area of contiguous, mature forested habitat in the Eastern United States. They form the lower section of the Blue Ridge Physiographic Province, an area covering almost 600 miles from the Susquehanna River in Pennsylvania to Mt. Oglethorpe in northern Georgia. Unlike the upper section, a single well-defined range averaging about 3,000 feet in elevation, this lower sub-province greatly varies in topography and elevation (Braun 1967). It begins near the Roanoke River Gap in Virginia as a broad, undulating plateau with elevations ranging from 1,200 to 3,000 feet; then at the New River Gap near the North Carolina border, it rises to rugged mountain ranges and cross ranges with many peaks exceeding 6,000 feet.

Extremes in elevation and topography contribute to a wide range of climatic conditions. For example, average July temperatures can range from 75 °F in Gatlinburg, TN (1,460 feet) to 59 °F at Mount Mitchell, NC (6,684 feet). These lofty peaks of the southernmost mountains intercept warm, moist air masses from the Gulf Coast and produce relatively high average annual precipitation levels: Clingman's Dome (6,642 feet) gets 85 inches, whereas Asheville (2,100 feet) gets only 40 inches even though it is less than 50 miles away (Stupka 1963).

These combinations of elevation, topography, and climate—with accompanying variations in geology and soils—produce a diversity of species that is rivaled by few places on the North American continent. More than 100 species of native trees and over 1,400 flowering plants provide habitat for a rich assemblage of bird species ranging in size from the tiny ruby-throated hummingbird to the magnificent wild turkey.

There are 98 migrant landbird species that nest in the Southern Appalachians. Most of them belong to the order of birds called Passeriformes (passerines). These are the perching or songbirds and contain such familiar species as thrushes, warblers, and tanagers. Fourteen orders and 34 bird families are represented in the Southern Appalachians where true Neotropical migrants comprise about 48 percent and short-distance migrants make up about 22 percent of the breeding bird species.

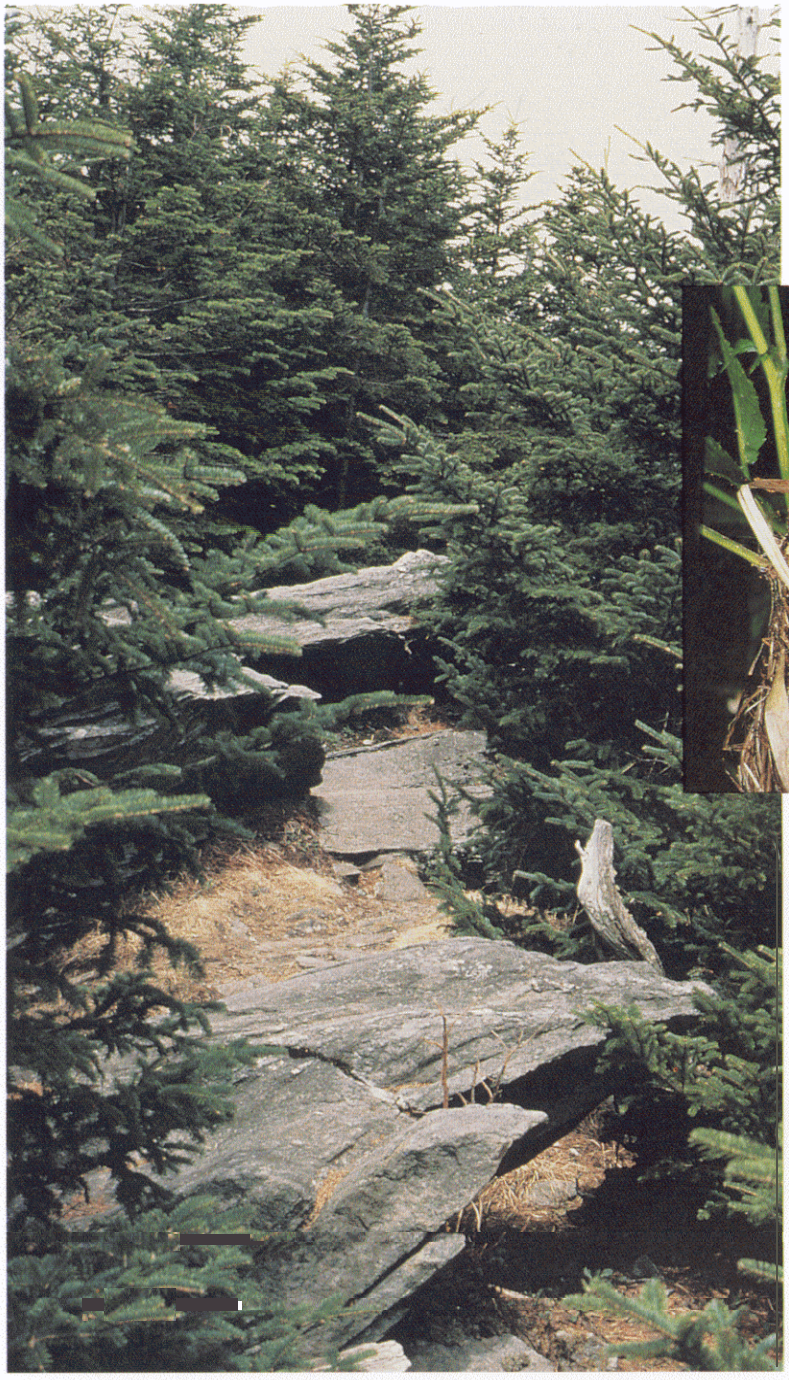


Forest Cover Types

Although common, the cove hardwood and maple-beech-birch types are too scattered to appear on a map of this scale. Source: USDA Forest Service, Southern Region-National Forest System, Forest Health Unit.

- White Pine-Hemlock
- Longleaf-Slash Pine
- Spruce-Fir
- Virginia Pine-Pitch Pine
- Mixed Oak
- Mixed Pine-Hardwood
- Non-Forest Land

Forest Types and Bird Associations



Chestnut-Sided Warbler

Spruce-Fir

Red spruce and Fraser fir once covered the highest peaks of the Southern Appalachians, where the interaction of cool temperatures and warm, moist air masses from the Gulf Coast forms an almost perpetual mist and creates a dark, damp environment. Fraser fir, the dominant species above 6,000 feet, has fallen prey to an infestation by the balsam wooly adelgid, an introduced pest. Stands of red spruce, extending down to 4,500 feet, are also declining. The understory is generally sparse, but may be quite dense. Representative shrubs are hobblebush, mountain winterberry, and thornless blackberry, with catawba rhododendron covering the more-exposed sites. The ground layer is often dense with mountain wood-sorrel, southern lady fern, and mountain woodfern.

Because they are a continuation of the great Canadian boreal forests, the highest elevations of the Southern Appalachians represent the southern limit of the breeding range for many species—such as the yellow-rumped warbler and magnolia warbler—that live near sea-level in Maine and Nova Scotia. Representative species are the red-breasted nuthatch, brown creeper, winter wren, golden-crowned kinglet, solitary vireo, and dark-eyed junco (common throughout the spruce-fir community); and the black-capped chickadee, black-throated green warbler, and Blackburnian warbler (common throughout the community with the exception of Roan and Unaka Mountains along the North Carolina-Tennessee border). The species that are restricted to this type during the breeding season are the olive-sided flycatcher, yellow-bellied flycatcher, hermit thrush, Swainson's thrush, magnolia warbler, yellow-rumped warbler, purple finch, red crossbill, and pine siskin.

Grassy balds are the other high elevation community in the spruce-fir habitat type of the Southern Appalachians. Of unknown origins, they are usually composed of mountain oat grass (dominant) and a variety of sedges and herbs; and are surrounded by spruce-fir, heath balds, or northern hardwoods. On Roan Mountain, green alder is an important invading shrub. These broad, open meadows support a few species of birds, but are not as diverse as the surrounding habitats. Breeding birds characteristic of this habitat are the alder flycatcher, horned lark, vesper sparrow, common yellowthroat, song sparrow, and dark-eyed junco. Of these species, none are restricted to this habitat.

Approximately 31 percent (30 species) of Southern Appalachian migrant landbirds use this habitat during the breeding season.

Maple-Beech-Birch

The northern hardwood forest is a mixture of species—dominated by maple, beech, and birch—that occupy mesic sites. Its range begins at about 4,300 feet and can continue to the highest elevations in the absence of the spruce-fir community (Whittaker 1956). Where spruce-fir is present, northern hardwoods will continue to about 4,500 feet and then intermingle in an irregular transition zone.

Stands are dominated by a mixture of sugar maple, American beech, and yellow birch, with northern red oak, fire cherry, Carolina silverbell, and yellow buckeye forming minor components. The understory contains serviceberry, alternate-leaved dogwood, and rosebay rhododendron. The ground layer is a rich mixture of ferns and herbs.

Typical bird species include the barred owl, black-billed cuckoo, yellow-bellied sapsucker, veery, solitary vireo, black-throated blue warbler, chestnut-sided warbler, Canada warbler, rose-breasted grosbeak, and dark-eyed junco; along with species typically associated with the spruce-fir community if the two types are adjacent or interdigitate. No species are restricted to this habitat.

Approximately 51 percent (50 species) of Southern Appalachian migrant landbirds use this habitat during the breeding season.

Veery

Hooded Warbler

Cove Hardwood

The cove hardwood forests of the Southern Appalachians are among the most beautiful deciduous forests in the world. These rich communities occur in moist coves, ravines, and valleys at low to middle elevations, occasionally reaching 4,500 feet. A great diversity of species in this community is exemplified by the common codominance of yellow-poplar, American basswood, white ash, black cherry, American beech and—in some areas—Carolina silverbell. Areas of high precipitation and mild climate have many trees of world record size. The understory, often open, features flowering dogwood, ironwood, striped maple, and Fraser magnolia. The herb layer is lush and diverse with black cohosh, red trillium, orange jewelweed, and wood-nettle.

Bird species typically associated with this forest type include the Acadian flycatcher, solitary vireo, red-eyed vireo, northern parula, black-throated blue warbler, black-throated green warbler, Blackburnian warbler, black-and-white warbler, Swainson's warbler, ovenbird, hooded warbler, scarlet tanager, rose-breasted grosbeak, and dark-eyed junco. No species are restricted to this type.

Approximately 62 percent (61 species) of Southern Appalachian migrant landbirds use this habitat during the breeding season.

Black -Throated Green Warbler

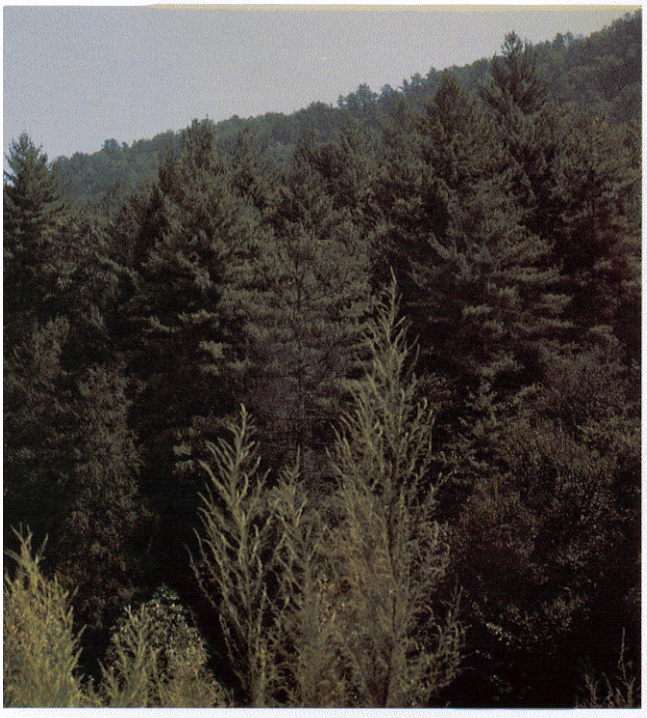
White Pine-Hemlock

Mesic to dry-mesic, acidic sites between 1,000 feet and 5,500 feet have almost pure stands of eastern hemlock (rarely Carolina hemlock), white pine, and combinations of the two species. Hemlock stands tend to occur on mesic sites including open valley flats, slopes above cove forests, sheltered low ridges, narrow ravines, and open north-facing slopes at fairly high elevations. White pine stands are more likely on dry-mesic sites such as walls of gorges and other steep, exposed slopes. The shrub layer is often dense with blueberries, rhododendron, huckleberries, and other acid-loving shrubs.

Typical bird species in this community are the barred owl, brown creeper, solitary vireo, northern parula, black-throated green warbler, Blackburnian warbler, Canada warbler, and dark-eyed junco. No species are restricted to this habitat.

Approximately 33 percent (32 species) of Southern Appalachian migrant landbirds use this habitat during the nesting season.

Prairie Warbler



Mixed Pine-Hardwood

The mixed pine-hardwood type is most often encountered on slopes at the lower and middle elevations. These stands are characterized by a mixture of hardwoods and conifers, each making up at least 25 percent of the stocking and primarily combining various species of oaks, hickories, and pines.

This combination gives rise to a bird community that mixes the species from both types of forest. Some representative species are the Chuck-will's-widow, whip poor-will, great crested flycatcher, eastern wood-pewee, yellow-throated warbler, and summer tanager. Permanent residents include the Carolina chickadee, tufted titmouse, white-breasted nuthatch, and pine warbler. No species are restricted to this habitat.

About 58 percent (57 species) of Southern Appalachian migrant landbirds use this habitat during the breeding season.

Mixed Oak

Extending from the lowest elevations up to about 5,500 feet on more xeric slopes, the mixed oak forest is a mixture of codominants including white oak, scarlet oak, chestnut oak, northern red oak, and black oak. Minor components include hickories, red maple, black locust, and a mixture of Virginia pine, pitch pine, table mountain pine, and other pine species. This was called the oak-chestnut forest until the chestnut blight altered the composition of the canopy species. Now most often referred to as the mixed oak or oak-hickory forest, it is the most extensive forest type of the Southern Appalachians, occurring in two forms—the closed-oak and the open-oak.

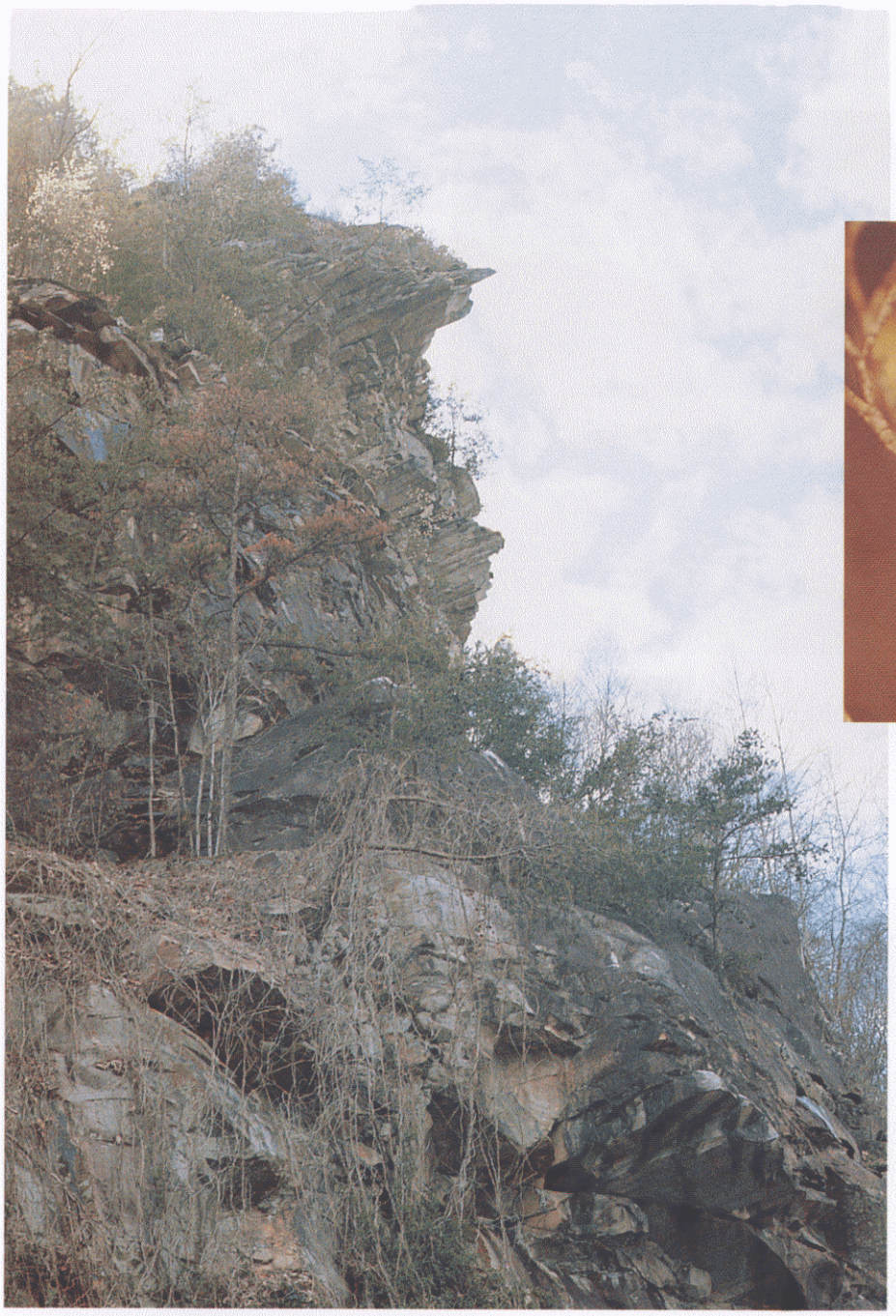
The closed-oak form occupies submesic slopes. It is characterized by a high and continuous canopy dominated by white oak, chestnut oak, northern red and black oaks, and pignut or mockernut hickories. The shrub layer is generally discontinuous and dominated by mountain laurel and other acid-loving shrubs.

The open-oak form is found on dry, exposed, often rocky slopes and is dominated by white, scarlet, chestnut, and black oaks along with table mountain, Virginia, pitch, or white pine. The trees are short and scattered with an open canopy. Some localities call them "oak orchards" because of their resemblance to orchards of fruit trees. Dominating the almost continuous high-shrub layer is the mountain laurel, which can form dense thickets and heath balds on exposed, rocky peaks.

Ovenbird

The bird community of this forest type varies greatly in response to this wide range of elevations and environments. Some representative species are the red-bellied woodpecker, hairy woodpecker, downy woodpecker, Carolina chickadee, tufted titmouse, wood thrush, red-eyed vireo, yellow-throated vireo, black-and-white warbler, yellow-throated warbler, pine warbler, hooded warbler, yellow-breasted chat, and scarlet tanager. Of these species, none are restricted to this habitat.

Approximately 84 percent (82 species) of Southern Appalachian migrant landbirds can be found in this forest type during the breeding season.



Yellow-Throated Warbler

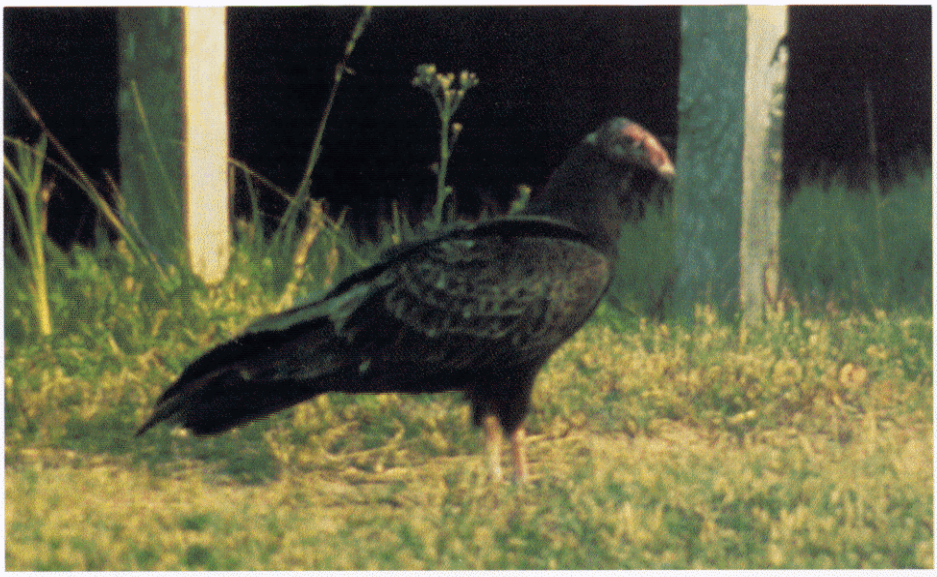
Virginia Pine-Pitch Pine

The xeric conditions of steep, rocky, generally south facing slopes produce stands that are a mixture of several pine species—Virginia pine, pitch pine, table mountain pine, shortleaf pine—with Virginia pine and pitch pine encountered most frequently. The shrub layer, generally dense, is dominated by acid-loving species such as mountain laurel and black huckleberry. Greenbriar species are often present. Although most stands of this type are at low to middle elevations, the type occurs occasionally as high as 5,500 feet (Unaka Mountain). The southwestern portion of the Great Smoky Mountains National Park contains old stands of Virginia pine-pitch pine; their size and age make them one of the few habitats for red-cockaded woodpeckers (an endangered species) in the Southern Appalachians.

The bird species characteristic of this type are sharp-shinned hawk, downy woodpecker, hairy woodpecker, eastern phoebe, blue jay, Carolina chickadee, tufted titmouse, wood thrush, yellow-throated vireo, red-eyed vireo, yellow-throated warbler, black-and-white warbler, northern cardinal, indigo bunting, and rufous-sided towhee. Of these species, the red-cockaded woodpecker probably is restricted to this habitat.

Approximately 26 percent (25 species) of Southern Appalachian migrant landbirds can be found in this forest type during the breeding season.

SouthernAppalachianMigrants



New World Vultures

Order Falconiformes
Family Cathartidae
Turkey Vulture *(Cathartes aura)*
Vultures are rather large, heavy bodied birds with small, naked heads, slightly hooked beaks, and small weak talons. The turkey vulture is widespread and fairly common in the Southern Appalachians—often nesting on open cliffs, under hollow logs, upturned tree roots, or abandoned buildings. They forage by soaring on long, broad wings and searching the forests, fields, and roadsides for carrion. This species has recently been expanding its range northward in the East. (1 species)

Kites, Hawks, and Eagles

Order Falconiformes
Family Accipitridae
Broad-Winged Hawk *(Buteo platypterus)*
A large, diverse family collectively known as "birds of prey", they are hunters equipped with hooked beaks and strong talons. Most have long, rounded wings and broad, banded tails and are often observed soaring on thermals or updrafts. The broad-winged hawk is one of the most common breeding raptors of the Southern Appalachians and can be found nesting throughout these mountain ranges in woodland habitats at all elevations. They are medium-sized birds with broad, slightly pointed wings and broad tail with alternating white and dark bands of about the same width. They feed primarily on small mammals, snakes, frogs, and occasionally small birds. They build a bulky nest of sticks, usually in the forks of large trees. In autumn, hundreds to thousands may be seen in a single day, moving along ridgetops (such as Roan Mountain and Unaka Mountain) and lofty peaks to wintering areas primarily in Central and South America. (4 species)

Falcons

Order Falconiformes
Family Falconidae
Peregrine Falcon *(Falco peregrinus)*
This family includes mostly swift, aerial hunters, distinguished from the hawks by their long, pointed wings bent back at the wrist. Sexes are distinguishable in some species by plumage, and males are usually smaller than females. The peregrine falcon is one of the most majestic birds of prey. Inhabitating high cliffs overlooking forested valleys, these birds can attack prey—primarily other birds in flight—at speeds exceeding 200 miles per hour. The eastern breeding population of this falcon was entirely extirpated by pesticides in the 1930's and 1940's; only through a rigorous program of controlling the use of these pesticides and of reintroducing captive-bred young birds have they recently been reported nesting once again in the wild. (2 species)

Cuckoos

Order Cuculiformes
Family Cuculidae
Yellow-Billed Cuckoo *(Coccyzus americanus)*
Cuckoos are slender, long-tailed, robin-sized birds found in open woodlands, thickets, and orchards, often near water. The two Southern Appalachian species—the yellow-billed and black-billed—are separated to a large extent by altitudinal preferences, with the yellow-billed cuckoo preferring lower elevations (under 3,500 feet), riparian areas, and edge (versus forest interior) habitat. It is one of the few birds that specialize in eating a variety of caterpillar species. One observer recorded consumption of 41 gypsy moth caterpillars in a 15-minute period, a potentially important feat in light of the recent southward movement of the gypsy moth infestation. (2 species)

Nightjars

Order Caprimulgiformes
Family Caprimulgidae
Chuck-Will's-Widow *(Caprimulgus carolinensis)*
Nightjars are a group of primarily nocturnal, ground-nesting species, well camouflaged in drab, intricately patterned plumages. The three Southern Appalachian species are readily distinguished by their distinctive calls. The chuck-will's-widow is the least common of the three nightjar species nesting in the Southern Appalachians. It is found in open woodlands at lower elevations. One can sometimes catch a glimpse of this elusive species by driving along little-traveled dirt or graveled backroads and watching for the ruby-red reflections of the birds' eyes shining in the headlights as they sit incessantly chanting their name "chuck-will's-wid-ow, chuck-will's-widow...". These birds feed on flying insects which they catch in flight in their gaping mouths. They build no nest, laying one or two white eggs directly on the ground. They are one of the few species documented to move the eggs from one location to another if disturbed. (3 species)

Swifts

Order Apodiformes
Family Apodidae
Chimney Swift *(Chaetura pelagica)*
The swift resembles a swallow with its stiff, narrow wings, flat head, tiny feet with four toes forward-pointing, and small, spined tail. They are masters of the air, spending most of their waking hours taking flying insects on the wing. The chimney swift is the single representative of this family in the Southern Appalachians. It is a small, dark brown, chattering bird that nests in chimneys or in hollow trees in woodlands. The nest is constructed of small twigs held together and attached by a resin in the bird's saliva. (1 species)

Southern Appalachian Migrants

Hummingbirds

Order Apodiformes
Family Trochillidae
Ruby-Throated Hummingbird *(Archilochus colubris)*
This New World family has many species in the Neotropics, a few breeding in the Southwestern United States, and only one breeding regularly in the East. Hummingbirds are tiny, brilliantly colored species that spend most of their time on the wing in search of food. They feed on nectar or sometimes small insects and other arthropods associated with flowers. The ruby-throated hummingbird is a green bird, whose intensity of color and shade does not depend on pigmentation but on the amount of light absorbed or reflected through its feathers. Males have a glowing, metallic-red throat. This species builds a tiny, compact nest of lichens held together with spider web. They are common at all elevations, feeding on flowering plants along roadsides or in openings near wooded areas. (1 species)

Woodpeckers

Order Piciformes
Family Picidae
Yellow-Bellied Sapsucker *(Sphyrapicus varius)*
A family of essentially arboreal species that spend most of their time dissecting bark and decayed wood from trees in search of grubs and other insects, these birds also excavate cavities in trunks and branches in which to lay their eggs and rear young. Their characteristics include short, stout legs; a stiff tail with small spines; a sharp and chisel-pointed bill; and a long tongue featuring small barbs at the sides of the up. Yellow-bellied sapsuckers inhabit mid to high elevations in hardwood or mixed hardwood-conifer forests, where they feed on sap and cambium after drilling evenly spaced holes (sapwells) through the outer bark. Sapsuckers also consume a variety of insects and other arthropods that are attracted to the sapwells. They excavate nesting cavities in the rotten heartwood of living or dead trees, often yellow birch or black cherry in the Southern Appalachians. (2 species)

Flycatchers

Order Passeriformes
Family Tyrannidae
Least Flycatcher *(Empidonax minimus)*
All but one of the many species that comprise this exclusively New World family are Neotropical migrants. Their general characteristics are a large head on a short neck, a flattened bill that gradually tapers to a sharp point, and a large cape with bristles at the corners. Most species feed primarily by taking small insects on the wing. Several Southern Appalachian species inhabit woodlands, usually near water. The least flycatcher, belonging to the similarly marked Empidonax genus, is the smallest and least green of the group. It usually inhabits open areas (orchards, gardens, and woodland edges) at elevations between 2,500 and 5,000 feet. Its local nickname, "Chebec," comes from a monotonous, unmusical song that it repeats throughout the day. (10 species)

Swallows

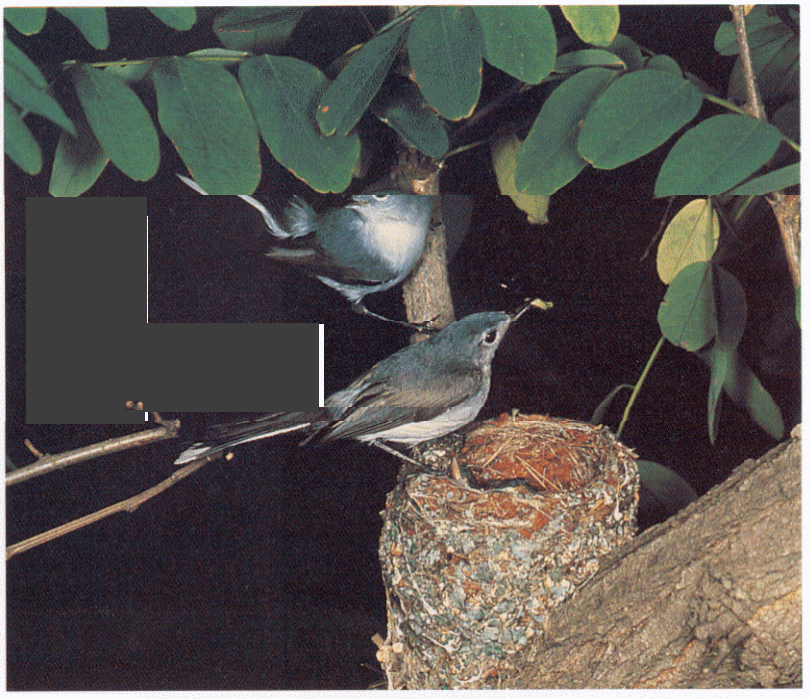
Order Passeriformes
Family Hirundinidae
Barn Swallow *(Hirundo rustica)*

Swallows are a group of slender-bodied, swift-like, aerial foragers, often observed feeding on insects in large groups. The characteristics that distinguish them from swifts are wings that bend more sharply at the wrist and flight that is more graceful and fluid. Plumages are usually iridescent blues or greens and the tail is notched or forked. All species in the Southern Appalachians are Neotropical migrants. The barn swallow is occasionally seen foraging or heard overhead in Southern Appalachian woodlands, but is most common around bridges, barns, and other outbuildings in rural or agricultural areas. Its mud nest is plastered into place on a barn rafter or some other surface beneath an overhang. This species seems to be expanding its range in the Southeast. (5 species)

Creepers

Order Passeriformes
Family Certhiidae
Brown Creeper *(Certhia americana)*

This family is represented by a single species in North America. The brown creeper is a small, brown-backed bird with a thin decurved bill. Its stiff tail feathers serve as a prop while the bird moves in a spiral up tree trunks in search of insects and their larvae. The creeper builds its nest of dead leaves and shredded bark beneath a loose piece of bark on a tree. Formerly restricted to higher elevation forests, it has in the past decade extended its breeding range to all elevations in the Southern Appalachians, especially in areas near standing water. (1 species)



Thrushes, Gnatcatchers, and Kinglets

Order Passeriformes
Family Musicapidae
Blue-Gray Gnatcatcher *(Polioptila caerulea)*

The Musicapids are a relatively diverse group of birds, many of which are accomplished singers. The blue-gray gnatcatcher is a tiny bird, with a long, narrow tail and white outer tail feathers. Its song is a thin wiry series of jumbled warbles. Gnatcatchers spend most of their day flitting about the treetops searching the foliage for insects. They build compact, sturdy nests of lichens and spider webs lined with fine grasses or animal fur. They inhabitat hardwood and mixed hardwood-conifer forests at low to middle elevations. (7 species)

Southern Appalachian Migrants

Mimic Thrushes

Order Passeriformes
Family Mimidae
Gray Catbird *(Dumetella carolinensis)*

The mimic thrushes are widely known for their rich and varied songs. Some species mimic the songs of other birds. Most have rather drab plumages with unstriking patterns and long curved bills. They are found in many different habitats throughout their wide range. The gray catbird is a common breeding bird in early successional habitats at all elevations in the Southern Appalachians. It is a plain dark gray bird with a slate-black cap and a long black tail, which is often cocked to reveal its chestnut-brown undertail coverts. Its song is a series of jumbled, nasal warbles and squeaky notes interspersed with the catlike "mew" calls. Catbirds usually raise their young in thick cover near the ground, building substantial nests of dry leaves, twigs, and grasses lined with fine rootlets. Their diet is mostly insects, but they may consume considerable quantities of fruit. (2 species)

Vireos

Order Passeriformes
Family Vireonidae
Solitary Vireo *(Vireo solitarius)*

The Latin word "vireo" (meaning "I am green") aptly describes the members of this widely distributed family. They are small, chunky birds whose wings are longer than their tails and whose short, sturdy bills are slightly hooked at the tip. Their insect-rich diet comes from the foliage of shrubs and trees. The solitary vireo is fairly common in the cool, moist forests at mid to high elevations in the Southern Appalachians. It is among the earliest of the Neotropical migrants to return to the breeding ground in the spring, usually appearing by mid to late March. It is an attractive bird with slate-blue head, white eye-ring, and wing bars. Its sweet, but monotonous song consists of a series of phrases rising and falling in pitch with short pauses between. This species moves about in a deliberate manner searching the foliage of trees and shrubs for insects. It builds a pendant nest in the terminal forks of horizontal branches usually within 10 feet of the ground. (5 species)

Wood Warblers

Order Passeriformes
Family Emberizidae
Subfamily Parulinae
Black-Throated Blue Warbler *(Dendroica caerulescens)*

This large, diverse family includes the wood warblers, grosbeaks, buntings, sparrows, blackbirds, orioles, and tanagers. The wood warblers are small, strikingly patterned birds that spend most of their waking hours actively moving from place to place in search of food. Most feed and nest in trees, but a few are terrestrial spending their lives close to the ground. The black-throated blue warbler is a beautiful example of its subfamily's striking patterns. The male is distinctive with his blue-gray back, black throat and sides, and brilliant white underneath. The female is a nondescript brown backed bird, sometimes embellished with a tiny white wing-spot. These birds prefer cool, dark woodlands in the Southern Appalachians and often show a preference for dense stands of rhododendron. They range from the mid to higher elevations in hardwoods and mixed hardwood-conifer forests. (26 species)

Tanagers

Order Passeriformes
Family Emberizidae
Subfamily Thraupinae
Scarlet Tanager *(Piranga olivacea)*

The tanagers are primarily a Neotropical family with only a few species migrating to North America for the summer. They are usually brightly colored with reds and yellows, and have a somewhat conical bill topped with a distinct ridge and hooked at the tip. The tail is shorter than the wing and sometimes slightly forked at the tip. In females the brilliant reds are replaced with shades of green and yellow. The scarlet tanager is one of the most brilliantly colored breeding species of the Southern Appalachian forest interior. The male is a uniform intense scarlet with black wings, shoulders, and tail. The female is olive-green with darker tail and wings. Their movement through the treetops is deliberate, punctuated by many stops to study their surroundings. Their song is a series of hoarse notes reminiscent of the American robin. They generally build nests on a horizontal limb of low-hanging branches, but sometimes as high as 50 or 60 feet. Their nests are loosely assembled, composed of stems, roots, and bark strips and lined with finer rootlets. (2 species)

Grosbeaks and Buntings

Order Passeriformes
Family Emberizidae
Subfamily Cardinalinae
Rose-Breasted Grosbeak *(Pheucticus ludovicianus)*

This subfamily includes all the grosbeaks and buntings, including some of the most colorful species in the Southern Appalachians. Their distribution is widespread, and some species are nonmigratory. The rose-breasted grosbeak male has a black head and back that contrasts sharply with his white underparts and a splash of rose-red across his upper breast. The female is a brown bird with streaked breast. Their song is a pleasant, lively warble sometimes described as a more rapid, sweeter version of the familiar American robin song. In the Southern Appalachians these birds nest at mid to high elevations, primarily in open, second-growth hardwood forests. They build their nests low in shrubs or small trees. (3 species)

Blackbirds and Orioles

Order Passeriformes
Family Emberizidae
Subfamily Emberizinae
Northern Oriole *(Icterus galbula)*

This large and diverse subfamily includes many familiar species of blackbirds and orioles. Their common characteristics are strong, direct flight and pointed bills. Their habitats range from grasslands to forest interiors. The northern oriole inhabits orchards and open woodlands in the Southern Appalachians. They are restricted to lower elevations where they seem to favor areas along streams and rivers. The male, a glowing orange and black, is usually heard or seen foraging in the treetops. Nests are deep, pendant baskets suspended by the rim from twigs and constructed of interwoven plant fibers, milkweed stalks, bark strips, horsehair, or cord. These birds consume a variety of insects and occasionally wild or cultivated fruits. (6 species)

Population Trends

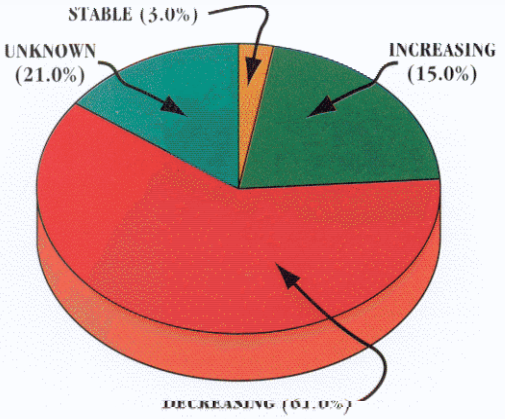
BBS Results

Recent information on the status of Neotropical migrants has caused concern that populations may be declining throughout much of North America. Since 1966 the Fish and Wildlife Service of the U.S. Department of the Interior has coordinated the North American Breeding Bird Survey (BBS), which is an annual roadside bird survey or count during the breeding season. Although BBS data have limitations because of sampling bias (for example, they are based on a relatively small number of routes and are roadside counts), they are the only relatively long-term data set covering a wide range of habitats in the United States. BBS data for the East indicate that 75 percent of the forest Neotropical migrants declined between 1978 and 1987 (Robbins and others 1989a). Some species have persistent declines. For example, the number of cerulean warblers declined an average of 3.4 percent from 1966 to 1987 (Robbins and others 1992b). In contrast, other species appear to be stable or increasing.

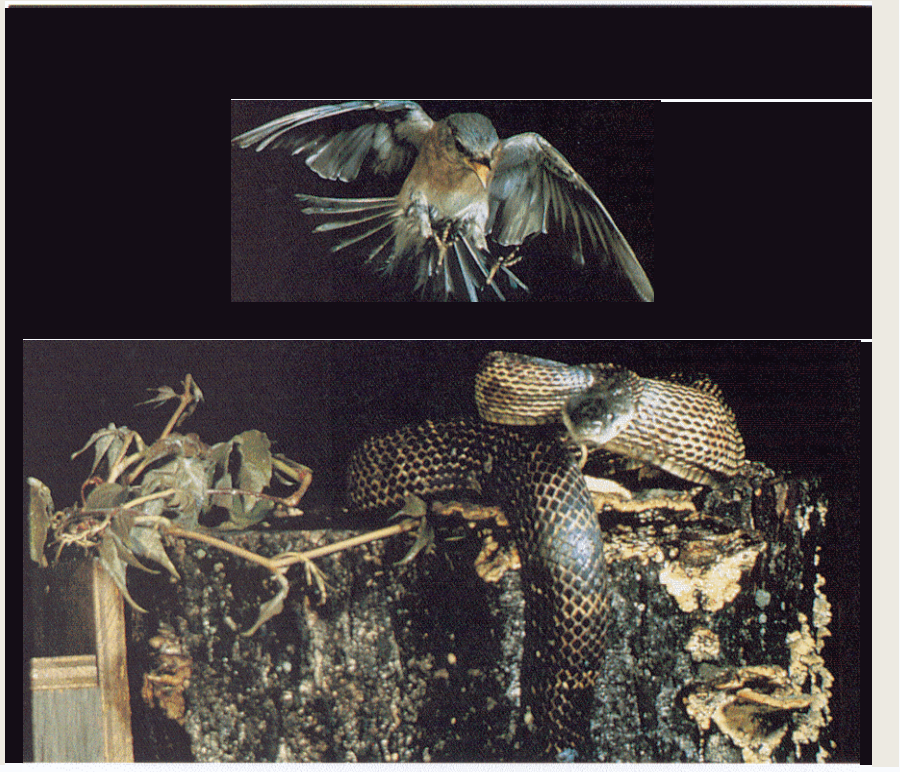
Little information is available on long-term population trends of Neotropical migrants on the wintering grounds. By mist-netting birds annually from 1973 to 1988 in the Guanica Forest, a protected area in Puerto Rico, Faaborg and Arendt (1992) noted a decrease in the capture frequency of several wintering migrants including the northern parula and prairie warblers. Yet populations of other species, such as the black-and-white warbler and American redstart, seemed to be relatively stable.

Is the Problem on the Wintering Grounds or Breeding Grounds?

Determining if numbers of Neotropical migrants are declining requires an evaluation of the situation on the breeding as well as the wintering grounds. What factors may contribute to the change in avian numbers? Two hypotheses have been postulated to account for the reductions in Neotropical migratory birds: the loss of habitat on the wintering grounds in Mexico, the Caribbean, Central and South America; and the loss and fragmentation of nesting habitat in the United States and Canada. Extensive areas of native forest in the Neotropics are being converted to agricultural use and ranching through "slash and burn" technology. In North America, extensive areas of native forested habitat have been converted to other uses or modified in various ways. Additional considerations include factors related to reproductive biology, competition, predation, brood parasitism and other nonbiological factors.



What evidence is available to determine if Neotropical migrants are declining and, if so, whether the primary cause is loss of habitat on wintering grounds or fragmentation and habitat loss of the nesting habitat in North America? Part of the answer can be found by comparing the population responses of species using different migratory strategies. During the same period (1978-1987) that BBS data revealed a 75 percent decline in migrant forest species, there was no consistent pattern in the status of permanent residents or short-distance migrants (Robbins and others 1989b). This suggests that the condition of migrants on the wintering grounds plays a somewhat larger role in migrant declines, at least in some species. Further studies probably will show that migrant declines are the result of a constellation of factors, perhaps with unique combinations of factors for each species, including the condition of both the breeding and wintering grounds. Several authors have expressed the view that Neotropical migrants are responding to the cumulative effects of multiple land use actions (Askins and others 1990, Morton and Greenberg 1989).



Eastern Bluebird

Brown-Headed Cowbird

Competition and Predation

There is no evidence that competition among avian species is causing the decline in Neotropical migrants. While some species—such as warblers, vireos, and flycatchers—are declining, catbirds and some non-Neotropical migrants (doves, grackles, and blue jays) are among those that seem to be increasing. Comparisons of declining and increasing species reveal that differences in behavior and morphometric characteristics (size and shape of body parts) usually limit opportunities for competition.

Vulnerability to nest predation varies, depending partly on nest type, location (ground, shrub, or canopy), and site (edge or interior). According to early studies, many Neotropical migrants that build open cup nests near the ground are more vulnerable to nest loss than resident or short-distance migrants (Ricklefs 1969, Whitcomb and others 1981, Terborgh 1989); however, new data suggest that ground-nesting species may have higher nesting success than either canopy or shrub nesting species (Martin 1992). Cavity nesters have larger clutch sizes (numbers of eggs) and suffer less nest loss than do open-nesting birds. Shrub-nesting birds in forest habitats were found to have the highest nest predation. Wilcove (1985b) found nearly 100 percent loss to terrestrial and arboreal predators in smaller suburban woodlots (with a high proportion of edge), compared to 2 percent in the Great Smoky Mountains National Park. Nesting away from the forest edge may be an effective strategy in reducing losses, but it is no guarantee against predation. Minimizing losses from predators will depend on managing habitat to discourage use by predators. For example, logging operations that leave dead trees and snags minimize disturbance to cavity-building bird populations.

Brood Parasites

Brood parasitism may reduce nesting success of species at forest or agricultural edges. Brown-headed cowbirds (*Molothrus ater*) are considered brood parasites because they lay their eggs in the nests of other species, virtually always to the detriment of the hosts' own young. Cowbirds were once uncommon in forests, preferring open country that allowed room for social displays and ground foraging. Conversion of eastern forests to extensive agricultural areas increased the range of suitable habitat for cowbirds. The number of cowbird host species has increased from about 50 in pre-colonial times to 200 or more today, at least partly because of increases in the amount of exposed edge. Female cowbirds concentrate on finding host nests along forest edges; forest fragmentation has increased edge area, allowing cowbird access to the nests of some interior species. Although usually less numerous more than several hundred yards into the forest interior, cowbirds were found in spot-map censuses of Maryland in woodlots of all sizes up to 1,000 acres (Wilcove 1985a).

Although cowbirds were not noted in 1982-83 survey work by Wilcove (1985a) in the Great Smoky Mountains National Park or recent surveys in the nearby Pisgah and Nantahala National Forests, they have been found in the Monongahela National Forest in West Virginia and in limited numbers in the Cherokee National Forest in Tennessee. Even though cowbirds do not yet appear to be a problem in much of the Southern Appalachians, as forested habitat continues to experience disturbances (agricultural conversion, urban growth, certain logging practices) and becomes more fragmented, the potential for adverse effects on host species becomes more likely. Certain forest management practices that leave snags for cavity nesters are a boon to female cowbirds, providing places to perch while waiting to follow females of other species back to their nest sites.[1]

[1] Personal Communication. 1993. David Buehler, Assistant Professor, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, Knoxville, TN 37901-1071.

The Southern Appalachians—Are Populations Declining?

Neotropical migratory birds comprise about 48 percent of breeding bird species in the Southern Appalachians. Although the Great Smoky Mountains National Park (Wilcove 1988) and a few other land management units appear to have relatively stable populations of a number of species, recent BBS surveys suggest declines in more than half of all Neotropical migrant species. Data for 22 selected mature-forest species grouped by habitat use showed definite declines in 12 (or 55 percent), and possible declines in another 5 (or 23 percent). Representative species that have been identified as needing management or monitoring attention are the black-billed cuckoo, yellow-throated vireo, Acadian flycatcher, Blackburnian warbler, black-throated blue warbler, cerulean warbler, Swainson's warbler, and Canada warbler.

Although much attention has been focused on forest-interior birds, some species occurring primarily or exclusively in early successional habitats also need monitoring or management. Of a selected sample of 6 species in the Southern Appalachians using early successional (shrub-scrub) habitats (but also occurring across a wide variety of physiographic areas), 4 (or 67 percent) are showing declining population trends. Species that have been indicated as needing monitoring/management attention include the prairie warbler, golden-winged warbler, chestnut-sided warbler, and orchard oriole.

BBS data collected for forest breeding species from 1966 to 1988 show that over some physiographic strata or provinces, Neotropical migrants increased in numbers. However, this was not the case for the Southern Appalachian Mountains. Further, for most physiographic strata, the data from 1978 to 1988 indicate that more species declined than increased. For some species the population declines were particularly striking as in the case of the cerulean warbler. This species experienced the greatest reduction of any North American warbler, declining at a rate of 3.4 percent annually from 1966 through 1987 (Robbins and others 1992b).

Conservation of Resources

Even though there is evidence that some Neotropical migrants in forested habitats in the Southern Appalachians have declined, questions remain about the significance and extent of these declines. Nevertheless in the face of conflicting information, it is important to conserve this valuable component of the ecosystem.

Synthesis of existing data into a cohesive framework and additional research are needed to clarify the roles of breeding and wintering grounds in population declines and to provide necessary management tools. Although Neotropical migrants spend a good portion of the annual cycle on the wintering grounds, limited information on their behavior during the winter and their habitat requirements hampers conservation efforts.

Partners in Flight

In 1990 the National Fish and Wildlife Foundation launched the conservation program known as Partners in Flight/Aves de las Americas, a cooperative of government agencies, philanthropic foundations, professional organizations, industry, conservation groups, the academic community, and private citizens in North and Latin America. It encompasses approximately 150 species of birds that breed, migrate through, or winter in more than a dozen countries. Of these, 98 species are found during the breeding season in the Southern Appalachians.

The focus of Partners in Flight is on improving monitoring, research, management, and education as well as fostering international cooperation to manage and conserve Neotropical migrants and their habitats. Its primary goal is to determine which species and habitats are of greatest concern and to develop a framework for long-term ecosystem protection.

The Partners in Flight program consists of five main components: monitoring, management, research, education/outreach, and international partnerships. Each component has a working group charged with developing and implementing its specific part of the program. The Southeast Management Working Group of Partners in Flight has developed a prioritization scheme based on numerical scoring to identify species of special concern (Hunter and others 1993a), and has formed monitoring units in each of the region's 24 physiographic areas (ecologically classified land units used in the Breeding Bird Survey). One unit is responsible for monitoring species in the Southern Appalachians (Southern Blue Ridge Physiographic Province). Opportunities for involvement by biologists interested in the Southern Appalachians include membership in the Working Group's Southeastern Subgroup and Blue Ridge Physiographic Province Subgroup and in the Southern Appalachian Man and the Biosphere (SAMAB) program.

Research Needs

To determine whether populations are actually declining, long-term data are needed on avian population trends in different habitat types, under different management strategies, and with varying landscape patterns and conditions. A number of research questions have been framed to provide that data:

* Verify the nature and extent of reported population declines by analyzing existing and new information and by comparing population responses to forest size, land use activities, and migratory status

* Determine what habitat, biotic, and behavioral factors limit populations and distributions of migrants on the breeding and wintering grounds

* Determine what migrant species and habitats are vulnerable to forest fragmentation and tropical deforestation, identify processes that impact these species, and propose conservation solutions

* Determine population trends, survival rates, habitat use, reproductive requirements, and viable population levels in relation to different landscape patterns, silvicultural treatments, and other land use activities

* Develop guidelines, and innovative habitat relationship models, and landscape designs to sustain migrant habitats, populations, and bird communities

* Evaluate the social and economic impacts of management for Neotropical migrants including public acceptance, economic costs, and alternative silviculture

Appendix

Southern Appalachian Migratory Landbirds (98 species)

This Appendix provides ecological information and population trends for Southern Appalachian migratory landbirds during the breeding season. Although no positive breeding records have been published for the hermit thrush, Swainson's thrush, magnolia warbler, or mourning warbler, there is evidence of occasional, local nesting. The following will serve as a key to the symbols used in the table.

PIF List= Inclusion in list A (Neotropical migrants) or list B (other migrants) of the Research Working Group of the Partners in Flight Program,

POPULATION TRENDS:
from BBS Data 1966 to 1991
+ = increasing
— = decreasing
S = stable
ND = sample size too small for meaningful analysis

(statistical significance associated with trend) :
* = $p < .10$
** = $p < .05$
*** = $p < .01$

ELEVATIONAL DISTRIBUTION:
L = less than 2500feet
M = 2500 feet to 4500 feet
H = greater than 4500 feet

SUCCESSIONAL STAGES:
from Hamel (1992)
1 = grass-forb
2 = shrub-seedling
3 = sapling-poletimber
4 = sawtimber

HABITAT ASSOCIATION:
from Hamel (1992)
V = Virginia Pine-Pitch Pine
P = Mixed Pine-Hardwood
O = Mixed Oak or Oak Hickory
C = Cove Hardwood
W = White Pine-Hemlock
M = Maple-Beech-Birch or Northern Hardwoods
S = Spruce-Fir

BREEDING HABITAT SUITABILITY:
from Hamel (1992)
O = optimal
S = satisfactory
M = marginal

AREA SENSITIVITY:
from Robbins and others (1989)
S = sensitive
I = insensitive
U= unknown

HABITAT DISTRIBUTION:
from Blake and Karr (1987)
I = interior
I/E = interior/edge
E = edge

NEST LOCATION
from Erhlich and others (1988)

SPECIES (NEST TYPE, FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
CATHARTIDAE:									
TURKEY VULTURE	B	+	L,M	V,C,M	2,3,4	M	U	I/E	Cliff, Ground
(none, carnivore)				P,O	2	M			
				P,O	3,4	O			
ACCIPITRIDAE:									
SHARP-SHINNED HAWK	B	+***	ALL	V,W	3,4	M	U	I/E	Tree
(platform, carnivore)				P,O,C,M	3	M			
				P,O	4	O			
				C,M	4	S			
COOPER'S HAWK	B	_	L,M	V,W	3,4	M	U	I	Tree
(platform, carnivore)				P,O,C,M	3	M			
				P,O	4	O			
				C,M	4	S			
BROAD-WINGED HAWK	A	_	L,M	O	4	O	S	I	Tree
(platform, carnivore)				S, M	4	M			
				C, P	4	S			
RED-TAILED HAWK	B	S	L,M	P,O	4	O	U	I/E	Tree
(platform, carnivore)				C,M	4	M			
FALCONIDAE:									
PEREGRINE FALCON	A	ND	M,H	M,S	1,2	M	U	E	Cliff, Snag
(scrape, carnivore)									
AMERICAN KESTREL	B	+*	L	O,P	1	S	U	E	Snag, Cliff, Building
(cavity, carnivore)				V	1	M			
CHARADRIIDAE:									
KILLDEER	B	_*	L	O	1	M	I	E	Ground
(scrape, ground insectivore)									
COLUMBIDAE:									
MOURNING DOVE	B	+	L	V,M	2,3,4	M	I	E	Tree
(platform, omnivore)				P,O	2,3	O			
				P	1,4	S			
				O	4	S			
				C	2	M			
CUCULIDAE:									
BLACK-BILLED CUCKOO	A	_***	M,H	C,O	4	S	S	I/E	Deciduous Tree, Shrub
(platform, foliage insectivore)				M	3,4	O			
YELLOW-BILLED CUCKOO	A	+*	L,M	O	3,4	S	S	I/E	Deciduous Tree, Shrub
(platform, foliage insectivore)				C,P	3,4	M			
CAPRIMULGIDAE:									
COMMON NIGHTHAWK	A	ND	I	V	3,4	M	I	E	Ground, Graveled Roof
(none. aerial insectivore)									
CHUCK-WILL'S-WIDOW	A	SD	I	P	4	O	U	E	Ground
(none, aerial insectivore)				P	3	S			
				O	3,4	M			
WHIP-POOR-WILL	A		M	P	4	O	S	E	Ground
(none, aerial insectivore)				P	3	S			
				O,V	3,4	S			
				C	3,4	M			
APODIDAE:									
CHIMNEY SWIFT	A		ALL	C,M,O,S,W	4	M	I	I/E	Chimney, Cave, Snag
(saucer, aerial insectivore)									
TROCHILIDAE:									
RUBY-THROATED									
HUMMINGBIRD	A		ALL	C,O	3 4	S		E	111.1.
(cup, nectarivore)				C,O	2	M			
				M,P	2,3,4	M			

SPECIES (NEST TYPE, FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
ALCEDINIDAE:									
BELTED KINGFISHER (cavity, carnivore)	B	_	L	O,W	3,4	M	I	I/E	Bank, Snag
PICIDAE:									
YELLOW-BELLIED SAPSUCKER (cavity, omnivore)	B	ND	M,H	O,C M M	3,4 3 4	M M O	U	I/E	Deciduous Tree, Snag
NORTHERN FLICKER (cavity, omnivore)	B	_*	L,M	V,W P,O,C P,O,C	3,4 3 4	M M S	I	I/E	Snag
TYRANNIDAE:									
OLIVE-SIDED FLYCATCHER (cup, aerial insectivore)	A	ND	H	S W	4 4	S M	U	I	Conifer Tree
EASTERN WOOD-PEWEE (cup, aerial insectivore)	A	_*	L,M	P, O C C,P,O M,V	4 4 3 3,4	O S M M	I	I/E	Deciduous Tree
ACADIAN FLYCATCHER (cup, aerial insectivore)	A	_**	L,M	C C O,W O,W P	4 3 4 3 3,4	O S S M M	S	I	Tree
ALDER FLYCATCHER (cup, aerial insectivore)	A	ND	M,H	S M	2,3 2	S M	U	E	Shrub
WILLOW FLYCATCHER (cup, aerial insectivore)	A	+	L,M	O	2	M	U	E	Shrub, Deciduous Tree
YELLOW-BELLIED FLYCATCHER (cup, aerial insectivore)	A	ND	H	S	4	M	U	I/E	Ground
LEAST FLYCATCHER (cup, aerial insectivore)	A	+***	L,M	O,M O,M C,W,V	1 3,4 1,3,4	S M M	S	E	Deciduous Tree
EASTERN PHOEBE (cup, aerial insectivore)	B	_	L,M	O,W,C,M	3,4	M	U	I/E	Shelf
GREAT CRESTED FLYCATCHER (cavity, aerial insectivore)	A	+	L,M	P, O C C,P, O V	4 4 3 3,4	O S M M	S	I/E	Snag
EASTERN KINGBIRD (cup, aerial insectivore)	A	_***	L	O, P	1	M	I	E	Deciduous Tree, Stub, or Fence Post
ALUDIDAE:									
HORNED LARK (cup, omnivore)	B	_	ALL	ALL	1	M	I	E	Ground
HIRUNDINIDAE:									
PURPLE MARTIN (cavity, aerial insectivore)	A	_	L	C,M,P,O,V,W	1	M	I	E	Birdhouse, Snag, Cliff
N. ROUGH-WINGED SWALLOW (cavity, aerial insectivore)	A	_*	ALL	C,M,P,O,V,W	1	S	I	E	Bank, Cliff, Culvert
BARN SWALLOW (cup, aerial insectivore)	A	_**	L,M	C,M,P,O,V,W	1	M	I	E	Building, Bridge, Cliff
TREE SWALLOW (cavity, aerial insectivore)	B	ND	L,M	O	1	S	I	E	Snag, Nestbox
BANK SWALLOW (cavity, aerial insectivore)	A	ND	L,M	P, O	1	M	I	E	Bank

SPECIES (NEST TYPE, FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
CERTHIIDAE:									
BROWN CREEPER	B	ND	M,H	W,M,S	3	M	U	I/E	Under loose bark
(cup, omnivore)				W	4	S			
				M	4	M			
				S	4	O			
TROGLODYTIDAE:									
HOUSE WREN	A	+**	ALL	O, P	2	M	I	E	Snag, Deciduous Tree
(cavity, foliage insectivore)									
MUSICAPIDAE:									
BLUE-GRAY	A	_	L,M	P,O	4	S	S	I/E	Tree
GNATCATCHER				P,O	3	M			
(cup, foliage insectivore)				C	3, 4	M			
EASTERN BLUEBIRD	B	ND	L	P,O	1,3,4	M	I	E	Snag, Birdhouse
(cavity, omnivore)									
VEERY	A	+	M,H	O	3,4	M	S	I	Shrub, Ground
(cup, foliage insectivore)				W,C,S	3,4	M			
				M	2,3	S			
				M	4	O			
HERMIT THRUSH	B	ND	H	S	3	S	S	I	Ground, Shrub
(cup, foliage insectivore)				S	4	O			
SWAINSON'S THRUSH	A	ND	H	S	3	S	U	I	Conifer Tree
(cup, foliage insectivore)				S	4	O			
WOOD THRUSH	A	_***	L,M	O	4	O	S	I/E	Tree, Shrub
(cup, foliage insectivore)				O	3	S			
				C,P,W	4	S			
				C,P,W	3	M			
				M	3, 4	M			
AMERICAN ROBIN	B	S	ALL	P,V,O,W	2,3,4	M	I	I/E	Tree, Shrub,
(cup, omnivore)				M	2	M			Shelf
				M	3,4	S			
				S	2	S			
				S	3,4	O			
MIMIDAE:									
GRAY CATBIRD	A	_***	ALL	M	2, 3	O	I	I/E	Shrub, Tree
(cup, foliage insectivore)				M	4	S			
				C	2,3,4	S			
				S	3,4	M			
				S	2	S			
				P,O,W	2,3,4	M			
NORTHERN	B	_*	L	O,M	1,2	M	I	E	Shrub, Deciduous Tree
MOCKINGBIRD (cup, omnivore)									
BOMBYCILLIDAE:									
CEDAR WAXWING	B	_	ALL	O,C,M	3,4	M	I	I/E	Tree
(cup, omnivore)				W	3	S			
				W	4	O			
				S	3	M			
				S	4	S			
VIREONIDAE:									
WHITE-EYED VIREO	A	_	L,M	O	2	M	I	I/E	Shrub, Deciduous Tree
(cup, foliage insectivore)									
SOLITARY VIREO	A	_	M,H	C,M,S,W	4	O	S	I/E	Tree, Shrub
(cup, foliage insectivore)				C,M,S,W	3	S			
				P	4	S			
				P	3	M			
				O,V	3	M			
YELLOW-THROATED	A	_	L,M	O	4	S	S	I/E	Deciduous Tree
VIREO (cup, foliage insectivore)				C,P	4	M			

SPECIES (NEST TYPE, FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
RED-EYED VIREO (cup, foliage insectivore)	A	+	L,M	C,O C,O P P M	4 3 4 3 3,4	O S S M M	S	I/E	Tree, Shrub
WARBLING VIREO (cup, foliage insectivore)	A	_	L	O	4	M	U	E	Deciduous Tree
EMBERIZIDAE:									
BLUE-WINGED WARBLER (cup, foliage insectivore)	A	+	L	P,C O	2 2	M O	U	E	Ground
GOLDEN-WINGED WARBLER (cup, foliage insectivore)	A	_	M,H	P O,C O,C,M	2,3 2 3	M S M	I	E	Ground
NORTHERN PARULA (cup, foliage insectivore)	A	_**	L,M	a C,M,P P O	4 4 3 4	O S M M	S	I/E	Tree
YELLOW WARBLER (cup, foliage insectivore)	A	_***	ALL	C,M O	2 2,3	M M	I	E	Deciduous Tree, Shrub
CHESTNUT-SIDED WARBLER (cup, foliage insectivore)	A	_***	M,H	P P,O,C,S O,M W C,S M M	2 3,4 2 2,3,4 2 3 4	S M O M S S M	I	E	Ground, Shrub
BLACK-THROATED BLUE WARBLER (cup, foliage insectivore)	A	_	M,H	O W C,M,S C,M S	3,4 3,4 3 4 4	M S S O S	S	I	Ground, Tree, Shrub
YELLOW-RUMPED WARBLER (cup, foliage insectivore)	B	ND	H	S	4	M	U	I/E	Conifer Tree
BLACK-THROATED GREEN WARBLER (cup, foliage insectivore)	A	_**	M,H	O,W,C,M,V O,V W,S C,M	3 4 4 4	M M O S	I	I	Tree
PROTHONOTARY WARBLER (cavity, foliage insectivore)	A	ND	L	O	3,4	M	I	I/E	Snag, Nestbox
BLACKBURNIAN WARBLER (cup, foliage insectivore)	A	_	M,H	O,C W,S M	4 4 4	M O S	S	I	Tree
YELLOW-THROATED WARBLER (cup, foliage insectivore)	A	_	L	P P O,V,W	4 3 3,4	S M M	S	I	Tree
PRAIRIE WARBLER (cup, foliage insectivore)	A	_***	L	P,O C	2 2	O M	I	E	Tree, Shrub
CERULEAN WARBLER (cup, foliage insectivore)	A	_	L,M	C O M	4 4 4	O S M	S	I	Deciduous Tree

SPECIES (NEST TYPE; FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
BLACK-AND-WHITE WARBLER (cup, foliage insectivore)	A	***	ALL	C,O	4	O	S	I	Ground
				M	4	S			
				C,M,O	3	M			
				P	3,4	M			
MAGNOLIA WARBLER (cup, foliage insectivore)	A	ND	H	W	2,3,4	M	I	I/E	Conifer Tree
				S	2	S			
				S	3,4	O			
AMERICAN REDSTART (cup, foliage insectivore)	A		L,M	C,O	4	S	S	I	Deciduous Tree
				C,O	3	M			
WORM-EATING WARBLER (cup, foliage insectivore)	A		L,M	C	4	O	S	I	Ground
				O	4	S			
				P,W	3,4	M			
				O	3	M			
SWAINSON'S WARBLER (cup, foliage insectivore)	A	***	L	C	4	O	S	I	Shrubs
				C	3	S			
				W	4	S			
				W	3	M			
OVENBIRD (cup, foliage insectivore)	A	***	ALL	C,O	4	O	S	I	Ground
				C,P,O	3	S			
				M	4	S			
				M	3	M			
LOUISIANA WATERTHRUSH (cup, foliage insectivore)	A	*	L,M	C,O	4	S	S	I	Bank
				P,W	4	M			
KENTUCKY WARBLER (cup, foliage insectivore)	A	**	L,M	O	4	S	S	I	Ground
				C,P	4	M			
MOURNING WARBLER (cup, foliage insectivore)	A	ND	H	M,S	2	S	S	E	Ground
				C	2	M			
COMMON YELLOWTHROAT (cup, foliage insectivore)	A	***	ALL	P,O	1,2	S	I	I/E	Ground
				C,M,S	2	M			
HOODED WARBLER (cup, foliage insectivore)	A	**	L,M	C,O	4	O	I	I	Shrub, Deciduous Tree
				M,P	4	S			
				C,M,P,O	3	M			
CANADA WARBLER (cup, foliage insectivore)	A		H	W,C,M,S	3	S	S	I	Ground
				C,S	2	M			
YELLOW-BREASTED CHAT (cup, foliage insectivore)	A	***	L,M	O	2	O	I	E	Shrub
				P	2	S			
				C,M	2	M			
				P,O	1	M			
SUMMER TANAGER (cup, foliage insectivore)	A	***	L	P,O	4	O	S	I/E	Tree
				C	3,4	M			
				P,O	3	M			
SCARLET TANAGER (cup, foliage insectivore)	A		ALL	C,O	4	O	S	I	Tree
				M,P	4	S			
ROSE-BREASTED GROSBEAK (cup, omnivore)	A		M,H	O,W,C,M,S	3	M	S	I/E	Deciduous Tree, Shrub
				C,O	4	S			
				S,W	4	M			
				M	4	O			
BLUE GROSBEAK (cup, omnivore)	A		L	O	2	O	I	E	Shrub, Deciduous Tree
				P,O	1	M			
INDIGO BUNTING (cup, omnivore)	A	_	ALL	P,O	2	S	I	E	Shrub
				C,M	2,3,4	M			
				P,O	1,4	M			

SPECIES (NEST TYPE, FOOD HABITS)	PIF LIST	POPULATION TREND	ELEVATIONAL DISTRIBUTION	HABITAT ASSOCIATION	SUCCESSIONAL STAGES	BREEDING HABITAT SUITABILITY	AREA SENSITIVITY	HABITAT DISTRIBUTION	NEST LOCATION
RUFOUS-SIDED TOWHEE (cup, omnivore)	B	ALL		M,V	2,3,4	M	I	I/E	Ground, Shrub
				O,P	2,3	O			
				O,P	4	S			
				C	2,3	S			
				C	4	M			
				S	2	M			
CHIPPING SPARROW (cup, omnivore)	A	ALL		P	1,2,3,4	M	I	E	Shrub, Tree
				O	3,4	M			
GRASSHOPPER SPARROW (cup, omnivore)	A	L,M		P,O	1	O	I	E	Ground
				V	1	M			
VESPER SPARROW (cup, omnivore)	B	H		V,P,O,S	1	M	I	E	Ground
				M	1	S			
SONG SPARROW (cup, omnivore)	B	ALL		P,O,C	2	M	I	E	Ground
				M,S	2	S			
DARK-EYED JUNCO (cup, omnivore)	B	M,H		O	3,4	M	I	I/E	Ground
				W	2	M			
				W	3,4	S			
				C	3	M			
				C	4	S			
				M,S	2	M			
				M,S	3	S			
				M,S	4	O			
BOBOLINK (cup, foliage insectivore)	A	L,M		P	1	M	I	E	Ground
				O	1	S			
RED-WINGED BLACKBIRD (cup, omnivore)	B	L,M		V	1	M	I	E	Ground, Cattail, Shrub
				P,O	1	S			
EASTERN MEADOWLARK (cup, omnivore)	B	L,M		O	1	O	I	E	Ground
				O	2	M			
				V	1	S			
				V	2	M			
				P	1	O			
				P	2	M			
BROWN-HEADED COWBIRD (none, omnivore)	B	L,M		V,C,M	1,2,3,4	M	I	E	Brood Parasite (uses other birds' nests)
				P,O	1	M			
				P	2,3,4	S			
				O	2,3,4	O			
ORCHARD ORIOLE (cup, omnivore)	A	L		O	1,3,4	M	I	E	Deciduous Tree, Shrub
NORTHERN ORIOLE (cup, omnivore)	A	L,M		O	1,3,4	M		E	Deciduous Tree
FRINGILLIDAE:									
PURPLE FINCH (cup, omnivore)	B	H		S	3	S	I	I/E	Conifer Tree
				S	4	O			
PINE SISKIN (cup, omnivore)	B	H		S	2,3	S	I	I/E	Conifer Tree
				S	4	O			
AMERICAN GOLDFINCH (cup, omnivore)	B	L,M		O	2	S	I	E	Sapling, Tree
				C,M,P	2	M			

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This publication describes Neotropical migratory birds in the Southern Appalachians, their general ecology and habitat associations, population status, possible reasons for declines, and management needs. This paper concentrates on migratory landbirds, thus it does not include waterfowl or shorebirds.

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What You Can Do

The next time you take a walk in the rich, cool woods of a Southern Appalachian mountain forest, stop a minute to listen to the great diversity of songs coming from the many lively bird species. Things wouldn't be quite the same without them, would they?

The magnitude of implementing the Partners in Flight/Aves de las Americas program requires the involvement of many people, both professionals and amateurs. You can make a significant contribution by participating in local efforts to increase Neotropical migrant bird populations. One way is to work on Breeding Bird Surveys and Breeding Bird Censuses. Another is to help government agencies develop and practice sound land management practices, and support national and international efforts to conserve biodiversity.

Anyone who has an interest in these species can participate in the Partners in Flight program. For additional information, please contact:

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