BIRD LIFE OF NORTH CAROLINA'S SHINING ROCK WILDERNESS

Marcus B. Simpson Jr.

Occasional Papers of the
North Carolina Biological Survey
and the North Carolina State Museum
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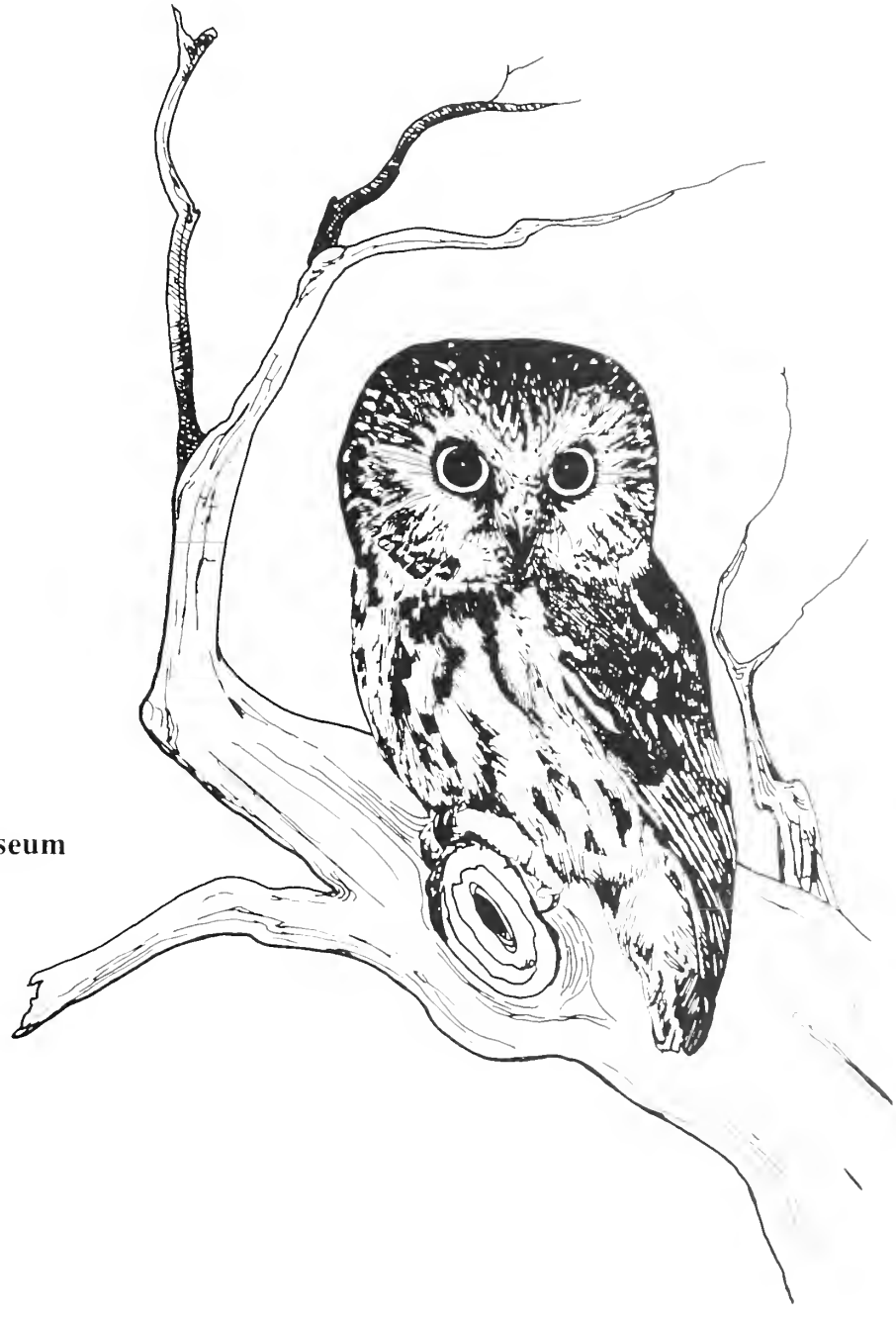

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ABOUT THE AUTHOR

Marcus B. Simpson Jr., an immunohematologist, is chief of the blood bank at the George Washington University Medical Center, Washington, D.C., and an associate professor in the George Washington Medical School. Dr. Simpson is in great demand as a lecturer on matters related to the operation of blood banks and as a consultant to agencies such as the Red Cross and the Department of Defense. He also teaches an ornithology course at the university.

Simpson grew up in Statesville, N.C., and is a graduate of Davidson College and the Medical School of the University of North Carolina at Chapel Hill. He did postdoctoral work in pathology at the Yale University School of Medicine and in laboratory medicine at Johns Hopkins Hospital. Upon completion of his work at Johns Hopkins, he entered the U.S. Army and was assigned as director of the blood bank at Walter Reed Army Hospital in Washington, D.C. Following his discharge from military service, Simpson joined the staff of the Medical School of Duke University and remained there for five years.

Mark's boyhood interest in natural history was encouraged by family vacations in the mountains of North Carolina and by his high-school biology teacher, Lois T. Goforth. As a freshman at Davidson College, Mark met a kindred spirit, H. Douglas Pratt, who was destined to become a distinguished artist/ornithologist and the illustrator for *Birds of the Blue Ridge Mountains* (University of North Carolina Press, 1992), which Mark dedicated to Mrs. Goforth.

During the first 10 years after Mark graduated from Davidson, he contributed 40 papers and notes to *The Chat*, the quarterly journal of the Carolina Bird Club. Nearly all of them pertained to the birds of the southern Appalachians. Five more articles followed in the next two years. By that time Mark and his wife Sallie had begun writing a series of papers for the *North Carolina Historical Review*. One of these, on whaling, received the Historical Society's Connor Award in 1986 and was reprinted as a booklet. However, most subjects of Mark's historical writings are people who have some connection with ornithology in the Carolinas: Alexander Wilson, John Cairns, William Brewster, Moses Ashely Curtis, and Elliott Coues. His research on Coues led to the aforementioned paper on whaling and to a yet-to-be published book on the history of whaling in North Carolina.

BIRD LIFE OF NORTH CAROLINA'S SHINING ROCK WILDERNESS

Table of Contents

FIGURES

Shining Rock Wilderness is managed as a part of Pisgah National Forest by the United States Forest Service, an agency of the U.S. Department of Agriculture. In the view at left, a heath barren within the Wilderness frames mountains outside its boundaries. (Photo courtesy of the USDA Forest Service)

SHINING ROCK

Shining Rock (above center) is one of many rocky ledges and outcroppings (right) that characterize the high country of Shining Rock Wilderness. (Photos by Barry Nehr, above center, and Bill Duyck, right, courtesy of USDA Forest Service)

SHINING ROCK WILDERNESS

Shining Rock Wilderness encompasses some of the most attractive and ecologically diverse terrain in the southern Appalachian Mountains. Established as a wilderness tract in 1964, Shining Rock contains a complex mosaic of habitats, a result of logging and wildfires that ravaged the area during the early decades of the 20th century. This disruption of the original northern and boreal forests in the high elevations at Shining Rock has produced conspicuous changes in the avifauna of the area. Bird species associated with Canadian Zone forests elsewhere in the southern Appalachians have been reduced in number or extirpated altogether, while species usually considered to be typical of low elevations and of open or shrubby deciduous habitats have increased in number or have become established for the first time. The present study reviews the status of the bird species that inhabit the Wilderness area and provides notes on the effects of deforestation and plant succession on the distribution of birds within the region.

GEOMORPHOLOGY

Located in the southeast corner of Haywood County, N.C., at 35°22' N and 82°52' W, the 18,500-acre Wilderness tract lies along the crest of Shining Rock Ledge. This lofty mountain range, 17 km (10.5 miles) long, forms most of the headwaters of the Pigeon River, a major tributary of the Tennessee and Mississippi river systems. The southern terminus of Shining Rock Ledge lies just south of the Wilderness boundary between Devil's Courthouse and Beech Gap, linking the range with Pisgah Ridge, the southern Great Balsam Mountains, and Tanasee Ridge, three of the major transverse ranges of the southern Blue Ridge Mountain Province (Fenneman 1938, Stuckey 1965, Thornbury 1965).

Elevations within the Wilderness area range from 975 m (3200 feet) on the West Fork Pigeon River to a maximum of 1841 m (6040 feet) at the peak of Grassy Cove Top. The main crest of Shining Rock Ledge runs on a north-south axis, generally above 1700 m (5600 feet) through most of its length, with major topographic features including Cold Mountain (1838 m/6030 feet) at the northern end of the range, followed southward by Deep Gap (1524 m/5000 feet), Stairs Mountain (1792 m/5880 feet), Shining Rock (1832 m/6010 feet), Flower Top (1792 m/5880 feet), Grassy Cove Top (1841 m/6040 feet), and Ivestor Gap (1737 m/5700 feet).

Despite the high elevation, much of the region consists of undulating and relatively gentle topography, particularly along the main crest in the southern portion of the Wilderness. Major lateral ridges extend from the main ridge system and form an extensive mass of high-elevation terrain, including Dog Looser Ridge, Old Butt Ridge, and Fork Mountain. The eastern and western slopes of the range are drained by the East Fork and the West Fork of the Pigeon River. Access to the Wilderness is provided by a paved road originating at mile 420.2 of the Blue Ridge Parkway and by a network of trails from valley roads and Parkway overlooks. U.S. Geological Survey topographic maps and Forest Service maps include detailed information on geographic features and trails of the Wilderness (USGS Quadrangles: Cruso, Sam Knob, Shining Rock, Waynesville). Major geographic features are illustrated in Figure 3.

CLIMATE

No climate records have been published from Shining Rock, but data from neighboring areas reveal patterns that are relevant to the Wilderness area. Data from Hardy and Hardy (1971), Ramseur (1960), and Simpson (1992) illustrate the basic features at various stations in the southern Appalachians. Mean July temperatures from selected sites are: 75°F at Gatlinburg, Tenn. (445 m/1460 feet), 70°F at Highlands, N.C. (1175 m/3850 feet), 62°F on Grandfather Mountain (1610 m/5280 feet), and 59°F on Mount Mitchell, the highest elevation in the Appalachian Mountains (2037 m/6684 feet). Annual rainfall data from selected sites are: 203 cm (80 inches) at Highlands, 216 cm (85 inches) on Clingmans Dome in the Great Smokies (2025 m/6642 feet), 178 cm (70 inches) on Mount Mitchell, and 102 cm (40 inches) at Asheville (640 m/2100 feet).

As a general rule, with increasing elevation there is a decrease in average temperature and an increase in average precipitation. For each 300-m gain in elevation, the mean temperature decreases about

2° to 3°F, which is approximately equivalent to a change of 350 to 400 km in latitude. Thus, climatic conditions in the higher elevations at Shining Rock resemble those found around Mount Mitchell, with cool temperatures, frequent rain, and fog during the summer months, and with subfreezing temperatures and significant accumulations of snow and ice common during the winter. No specific data are available from Shining Rock, but elevations along the crest are about 200 m lower than in the Black Mountains, which suggests that weather conditions are milder than in the Mount Mitchell area.

Although the relation between temperature and elevation is fairly consistent throughout the southern Appalachians, the relationship between precipitation and elevation is more complex, owing in part to the so-called "rain shadow" effect. The rain shadow phenomenon occurs when moisture-laden winds are cooled and thus lose much of their water content in passing across a mountain range, resulting in relatively heavy precipitation on the windward side and low rainfall on the leeward slopes. The heaviest rainfall in North Carolina occurs at Highlands, where the prevailing southwesterly winds first encounter the Blue Ridge Mountains, rising abruptly as a steep escarpment some 900 m (3000 feet) above the piedmont plateau to the south. Asheville, which lies 87 km (54 miles) NE of Highlands, has the lowest annual precipitation in North Carolina, because of the rain shadow initiated by heavy moisture loss in the Blue Ridge and the Unaka mountain ranges to the southwest and west. Lying between the obstructing escarpments of the western ranges and the Asheville basin, Shining Rock and the nearby southern Great Balsam Mountains might not only be affected by the rain shadow but also contribute further to the low precipitation at Asheville. Meteorological studies are thus needed at Shining Rock to evaluate the details of local climate and the potential effects of airborne pollutants on vegetation in the Wilderness area.

VEGETATION

No study has dealt exclusively with the vegetation of Shining Rock Wilderness. The following broad classification of plant communities is based on data provided from the region by Ruff (1938), Ramseur (1960), Lord (1969), Pittillo and Govus (1978), J. Dan Pittillo (pers. comm.), D. R. McLeod (pers. comm.), W. D. Zeedyk (pers. comm.), Charles Moore (pers. comm.), and M. B. Simpson (pers. obs.). The present study is the first to characterize the plants and plant communities of Shining Rock Wilderness. Nomenclature follows Radford, Ahles, and Bell (1968).

Spruce-Fir Forests

Formerly covering much of the terrain above 1370 m (4500 feet), the spruce-fir forests have been severely damaged at Shining Rock by logging and repeated wildfires, leaving only scattered stands on the high peaks and the immediately subjacent slopes. Remnant tracts are potentially threatened by the balsam wooly adelgid (*Adelges piceae*) and by other factors, perhaps airborne pollutants, which may be the cause of extensive losses in nearby sections of the southern Great Balsam Mountains.

Canopy trees include Fraser fir (*Abies fraseri*), red spruce (*Picea rubens*), mountain ash (*Sorbus americana*), fire cherry (*Prunus pensylvanica*), mountain maple (*Acer spicatum*), striped maple (*A. pensylvanicum*), and yellow birch (*Betula lutea*). Beech (*Fagus grandifolia*) and serviceberry (*Amelanchier laevis*) are often present along the lower edge of the forests. The understory shrubs form a rather uneven layer containing blackberry (*Rubus canadensis*), elderberry (*Sambucus pubens*), bearberry (*Vaccinium erythrocarpum*), hobblebush (*Viburnum alnifolium*), and the seedlings of canopy species.

Northern Hardwood Forests

Extensively damaged by wildfires and logging, northern hardwood forests formerly occurred along the lower border of the spruce-fir community at elevations above 1370 m (4500 feet), usually infiltrating the adjacent boreal forests in an irregular transition zone. Northern hardwood communities often occur as a successional stage following disruption of the spruce-fir forest, and stands dominated by beech or buckeye (*Aesculus octandra*) may occupy gaps along major ridges. The dominant canopy species are beech and yellow birch. Other common canopy trees include sugar maple (*Acer saccharum*), red maple (*A. rubrum*), buckeye, striped maple, fire cherry, and serviceberry. The shrub layer includes the seedlings of canopy species, along with rosebay rhododendron (*Rhododendron maximum*), purple rhododendron (*R. catawbiense*), dog-hobble (*Leucothoe editorum*), hydrangea (*Hydrangea arborescens*), hobblebush, and blackberry.

Oak Forests

Communities dominated by oak species cover many of the intermediate slopes and ridges at elevations up to 1370 m (4500 feet). The canopy composition and dominant species vary with the slope, exposure, soil, and moisture.

On dry, exposed, steep, or rocky slopes, a community of open oak and pine predominates, often giving way to heath balds on xeric sites above and blending gradually into the more mesic, closed oak

forests below. The canopy is generally open; but the shrub layer is virtually continuous, fairly tall, and usually dominated by *Kalmia*. Common canopy species include red maple, white oak (*Quercus alba*), scarlet oak (*Q. coccinea*), chestnut oak (*Q. prinus*), black oak (*Q. velutina*), sourwood (*Oxydendrum arboreum*), Table Mountain pine (*Pinus pungens*), pitch pine (*P. rigida*), white pine (*P. strobus*), serviceberry, and black gum (*Nyssa sylvatica*). Prominent shrubs include mountain laurel (*Kalmia latifolia*), pepperbush (*Clethra acuminata*), flame azalea (*R. calendulaceum*), rosebay rhododendron, blueberry (*Vaccinium constablaei*), and squaw-huckleberry (*V. stamineum*).

On intermediate slopes of less xeric character, a closed oak forest occurs, with a high, continuous canopy and a typically discontinuous shrub layer. Dominant trees include white oak, chestnut oak, red oak (*Q. rubra*), black oak, red maple, silverbell (*Halesia carolina*), sourwood, tulip tree (*Liriodendron tulipifera*), cherry birch (*B. lenta*), and various hickories (*Carya* sp.). Common shrubs include flowering dogwood (*Cornus florida*), mountain laurel, rosebay rhododendron, blueberry, sweet-shrub (*Calycanthus floridus*), pepperbush, huckleberry (*Gaylussacia ursina*), and hydrangea.

On south-facing slopes and high ridge tops up to 1675 m (5500 feet), a distinctive "oak orchard" community may occur locally. Dominated by oaks, the canopy is generally open and noncontinuous; the open understory consists of grasses and sedges with occasional clumps of rhododendron, laurel, and azalea.

Cove Hardwood Forests

Cove hardwood forests, or mixed mesophytic forests, occur in moist coves and sheltered ravines up to 1220 m (4000 feet) and rarely up to 1370 m (4500 feet), where they may merge with northern hardwood stands. The cove hardwood community is not well represented in the Wilderness area because of the generally high elevation of most of the terrain. Common canopy trees include sugar maple, buckeye, yellow birch, beech, silverbell, tulip tree, red oak, eastern hemlock (*Tsuga canadensis*), red maple, white oak, basswood (*Tilia heterophylla*), and white ash (*Fraxinus americana*). The irregular shrub layer contains such species as rosebay rhododendron, mountain laurel, dog-hobble, flowering dogwood, hydrangea, and sweet-shrub.

Grass Balds

On some peaks and exposed slopes above 1525 m (5000 feet), the forest and shrub communities give way to open expanses typically dominated by mountain oat grass (*Danthonia compressa*) and various sedges. Occasionally a peripheral margin of ericaceous species, shrubs, and small trees infiltrates the edges of the balds. Based on historical evidence, grass balds in Shining Rock Wilderness and on nearby peaks to the south, such as Black Balsam Knob, are a result of logging and fires, the area formerly having been entirely covered by spruce, fir, northern hardwoods, and occasional heath balds. Shrubs that commonly occur along the edge or margin of the balds include blueberries (*Vaccinium* sp.), rhododendrons, serviceberry, blackberry, flame azalea, fire cherry, minniebush (*Menziesia pilosa*), and occasionally the seedlings of canopy species from spruce-fir and northern hardwood communities.

Heath Balds

Many steep, rocky, exposed slopes and ridges above 1220 m (4000 feet) are covered by a dense community dominated by ericaceous species, most of which form the shrub or understory layer of the adjacent open oak communities. These heath balds, or "slicks," usually form an almost impenetrable tangle of growth with a virtually unbroken canopy. In the Shining Rock area, a considerable portion of the high terrain is covered by such communities, often intermixed irregularly with balds, secondary successional communities, and remnants of climax forests. Mountain laurel and rhododendrons are the dominant species in the low elevations, and piedmont rhododendron (*R. minus*) and purple rhododendron dominate at the high elevations. Other shrubs include pepperbush, fetterbush (*Pieris floribunda*), blueberry, gooseberry, and mountain winterberry (*Ilex montana*).

Shrubby Tree Balds

In several localities above 1525 m (5000 feet) on Cold Mountain, the dominant vegetation is an open forest of low, shrubby, attenuated trees that are typically found at lower elevations. This distinctive and uncommon community, described by Ramseur (1960), is dominated by beech, yellow birch, red oak, serviceberry, purple rhododendron, American chestnut (*Castanea dentata*), pitch pine, and alternate-leaf dogwood (*Cornus alternifolia*).

Secondary Successional Communities

In regions where the climax forests have been destroyed by fires and logging, reforestation progresses through a complex series of secondary successional communities. Dominated by fire cherry, the species composition of this series of communities varies with such factors as elevation, slope, exposure, proximity to streams, original vegetation type, proximity to surviving forest types, extent and severity of past fires and

logging, extent of soil damage, and the time interval since the last disruption of a particular area. In many localities these successional communities appear to be progressing toward the type of forest cover originally present, but in other areas that trend is not readily apparent. In the early stages, fire cherry is the dominant tree, and much of the ground is covered by grasses. Subsequently, fire cherry becomes progressively less important as various shrubs, ericaceous species, and the saplings of forest canopy species invade the area. In addition to fire cherry, the common and important species in secondary successional communities include blackberry, elderberry, bush honeysuckle (*Diervilla sessilifolia*), blueberries (*Vaccinium* sp.), gooseberries (*Ribes* sp.), hobblebush, alternate-leaf dogwood, willows (*Salix* sp.), serviceberry, minnie-bush, red maple, Fraser fir, mountain ash, red spruce, yellow birch, and purple rhododendron. A detailed account of the various stages and dominant species in these communities has been presented by Ramseur (1960).

Disclimax Communities

Prior to the establishment of the Wilderness, continual human activities resulted in the perpetuation of artifically stable communities in many areas of Shining Rock. With the present restrictions on cutting and clearing of trails and camping areas, many disclimax communities have disappeared, giving rise to typical secondary successional communities. The few areas remaining as disclimax types include the campsite complex on the south slope of Shining Rock and the primary trail system in the Wilderness.

VEGETATION PATTERNS, PAST AND PRESENT

During the Pleistocene glacial period, the polar ice cap extended as far south as Ohio, pushing the Canadian Zone boreal forests deep into the southeastern United States. As the glaciers retreated at the close of the last ice age, the slowly warming temperatures forced the spruce-fir forests and associated hardwood species northward and into the cool climates of the southern Appalachians, where they survived into modern times as isolated stands on the high peaks and ridges of major mountain ranges at elevations above 1280 m (4200 feet) (Oosting and Billings 1951). At present, the southern limit of spruce-fir forests in the eastern United States occurs at Tanasee Bald, 8 km (5 miles) southwest of Shining Rock Wilderness, at the junction of Shining Rock Ledge, Tanasee Ridge, and the southern Great Balsam Mountains (Simpson 1972a).

At the beginning of the present century, this vast plateau-like region, marking the convergence of the Great Balsams, Tanasee Ridge, Pisgah Ridge, and Shining Rock Ledge, was covered by the most extensive stand of spruce-fir forest in the southern Appalachians (Holmes 1911). Earlier, in 1858, Samuel Botsford Buckley (1858, 1859) visited the region and reported that the spruce trees in the Shining Rock Ledge area were the largest he had observed in his extensive exploration of the southern Appalachians.

Between 1913 and 1926, that magnificent forest was virtually destroyed by the activities of the Suncrest Lumber Company of Waynesville (J. Seniard, pers. comm.; Lord 1969). Using its network of logging railroads through the high elevations, the company stripped the region of millions of board feet of marketable timber, principally red spruce, leaving dense piles of slash and brush. On Thanksgiving Day 1925, following a prolonged drought, fire sparked by a logging train swept over the high elevations of the region, destroying 25,000 acres of virgin spruce-fir forest and severely damaging the soil and secondary growth in previously cutover areas. The dry soil, which continued to smolder and burn for several weeks, was essentially destroyed, making reforestation extremely slow through much of the affected region. Less severe wildfires occurred in subsequent years, causing additional damage to the vegetation and soil.

In recent decades, the spruce-fir forests in many areas of the southern Appalachians have suffered extensive damage from what may prove to be the effects of airborne pollutants. Despite the dramatic loss of spruce-fir forests in the nearby Great Balsam Mountains during the 1980s, there was little evidence of such problems in the Shining Rock area as late as 1992 (Simpson, pers. obs.).

As a result of logging and repeated wildfires, the present distribution of plant communities in the Shining Rock area is quite complicated. Most of the high elevations are covered by a complex mosaic of heath balds, grass balds, various stages and types of secondary successional communities, and scattered stands of deciduous and coniferous forests of varying degrees of maturity. Just south of the Wilderness boundary, the picture is further complicated by U.S. Forest Service activities in replanting conifers and conducting controlled burnovers to encourage use of the region by certain bird and mammal species.

Although similar to environmental damage found throughout the southern Appalachians, where over 90% of the original spruce-fir forests have been destroyed (Korstian 1937), the changes in vegetation at Shining Rock represent the most severe and extensive alteration of high-elevation habitat in the southern Blue Ridge Province. The influence of habitat alteration on the

distribution of bird species in the Shining Rock area has been significant and representative of changes found on a smaller scale elsewhere in disturbed high-elevation forests (Burleigh 1941, Simpson 1972c).

ORNITHOLOGICAL EXPLORATION

The earliest ornithological observations in the Shining Rock area were made by the botanist Samuel Botsford Buckley, who briefly described his 1858 exploration of the region without providing details sufficient to assign specific records within the present boundaries of the Wilderness (Buckley 1859). Twentieth-century records on the bird life of the area date back to the 1940s and 1950s, when Don R. McLeod (pers. comm.) and Charles Moore (pers. comm.) compiled extensive data from the region. During the period from 1960 to 1990, further notes were gathered by Charles Hutchinson (pers. comm.), James E. Davidson (pers. comm.), James Fleetwood (pers. comm.), James Walters (pers. comm.), Walter Spofford (pers. comm.), William D. Zeedyk (pers. comm.), Jerry and Ruth Young (pers. comm.), William and Norma Siebenheller (pers. comm.), Lauren Hillman (pers. comm.), Mike Tove (1977), H. E. LeGrand Jr. (1979), S. F. Knickerbocker (undated ms.), Nora Murdock (pers. comm.), and D. B. McNair (1987). Records by other visitors have been compiled at the Blue Ridge Parkway offices at Oteen and Balsam, N.C. The aggregate total hours of field work provided by the aforementioned workers is difficult to verify, but it probably exceeds 4000 hours.

My studies at Shining Rock began in June 1963 and continued at irregular intervals through June 1992, representing more than 1800 hours of field work, some of which has been previously reported (Simpson 1974, 1976a, 1976c, 1978a, 1992). Intensive field work was conducted during June, July, and August 1963 and in July and August 1965, when I was in the region almost daily throughout the 5 months and often for uninterrupted periods of up to a week. Regular, but somewhat less intense, work was done in June and July 1964, May and June 1969, September and October 1969, May through July 1970, and June 1986, 1988, 1989, 1990, and 1992. In addition, many visits and overnight trips were made during the 28-year period, with a total of at least 8 days during each of the months from November through April.

At least three breeding-season strip censuses, measuring 200 by 40 m, were conducted in each major type of plant community in June 1969, 1970, and 1986; at least one such census was conducted in each community during spring and fall migration (late April and early October) and in midwinter. Unfortunately the extreme density of heath balds and secondary successional communities often precluded a reliable quantitative analysis of bird abundance data from these communities. Furthermore, few individual tracts of any community type in the high elevations are large enough to permit valid population sampling for density of breeding birds. The complex mosaic and patchwork of small communities essentially invalidates conclusions based solely on quantitative description of bird population densities, owing to unavoidable sampling errors and the edge, or ecotone, effect. Therefore, the descriptive accounts rely on relative abundance terminology and direct observation of habitat selection.

TERMINOLOGY

The status of each species recorded at Shining Rock is defined in terms of seasonal occurrence, relative abundance, habitat preference, and elevation range. Breeding evidence is described when specific documentation is available. The seasonal occurrence and relative abundance terminology are a modification of that used by Mengel (1965). Nomenclature is based on the A.O.U. Check-list (1983). Dates of occurrence reflect general or typical patterns based on dividing the month into thirds. Thus "early," "mid-" and "late" refer to approximately 10-day intervals within each month. Extreme dates of occurrence are often misleading and have, therefore, been excluded. Occurrence data refer only to the Wilderness area; the status of a species may be considerably different at nearby localities in the southern Appalachians.

Seasonal Occurrence

Resident. Species that occur throughout the entire year, regardless of seasonal fluctuations in relative abundance or dispersal and migratory movements by individuals within the Wilderness.

Summer resident. Species absent during the winter season, usually arriving during spring migration, remaining through summer, and departing during fall migration.

Winter resident. Species absent during summer, usually arriving in fall migration, remaining through winter, and departing during spring migration.

Transient. Species present only during part of a season, usually during spring and fall migration.

Postbreeding wanderer. Species that occur as summer or permanent residents at elevations or localities outside the Wilderness boundaries and sub-

sequently disperse into the region in late summer, after the end of their breeding season.

Erratic. Species whose presence and abundance vary markedly and usually unpredictably over any given period of time.

Relative Abundance

Abundant. Very many individuals are recorded per unit of available habitat, including marginal and suboptimal habitats.

Common. Large numbers are recorded per unit of available habitat, often including marginal and suboptimal habitats.

Fairly common. Small to moderate numbers are recorded per unit of available optimal habitat.

Uncommon. Small numbers are recorded per unit of available habitat, with considerable amounts of apparently suitable habitat unoccupied.

Rare. Very small numbers per unit of available habitat, with extensive field work required for observation of any individual during a given year.

ANNOTATED SPECIES LIST

BLACK VULTURE
Coragyps atratus

This species is a rare and erratic summer resident from March to October at all elevations within the Wilderness. The species' breeding status in the southern Appalachians is uncertain, and there is no evidence of nesting at Shining Rock.

TURKEY VULTURE
Cathartes aura

This permanent resident is observed at all elevations at Shining Rock. Although uncommon, individuals are regularly seen from late March to mid-October; the bird is rare to absent from early November to early March.

OSPREY
Pandion haliaetus

Although probably a rare spring and fall transient, the only record of the Osprey from the Wilderness is of four birds at Shining Rock on 11 March 1978 (Chat 42:86, 1978). W. and N. Siebenheller (pers. comm.) noted a single bird just south of the Wilderness on 9 September 1987.

BALD EAGLE
Haliaeetus leucocephalus

The status of this species is uncertain in the Wilderness, but it was reported by Knickerbocker (undated ms.) and has been observed there occasionally during February by L. Hillman (staff wildlife biologist, U.S. Forest Service, pers. comm.)

NORTHERN HARRIER
Circus cyaneus

This fall and spring transient and winter resident prefers open grassy terrain at all elevations. The bird is uncommon from mid-August to late December and again in April; rare from November through March.

SHARP-SHINNED HAWK
Accipiter striatus

This species is probably a permanent resident in the Wilderness. Records are from all elevations, mostly in fairly mature deciduous forests. The bird is rare from April to October and rare to absent from November to March. Individuals are most often seen as fall migrants during September and October.

COOPER'S HAWK
Accipiter cooperii

Probably a permanent resident, this species occurs mostly at low and intermediate elevations in mature deciduous forests. The bird is rare from March to October; rare and usually absent, November through February. Less common than the Sharp-shinned, Cooper's Hawks are most frequently observed during fall migration in September and October.

NORTHERN GOSHAWK
Accipiter gentilis

Although the Northern Goshawk may be a rare permanent resident in the North Carolina mountains (Lee 1985), the only record from the Wilderness is a single bird noted at Shining Rock on 3 April 1976 by Tove (1977). This species appears to have expanded its range southward down the Appalachian chain in recent years (Simpson 1992).

RED-SHOULDERED HAWK
Buteo lineatus

A winter resident in mature forests at low and middle elevations of Shining Rock Wilderness, the Red-shouldered Hawk is uncommon to rare from November to March.

BROAD-WINGED HAWK
Buteo platypterus

This summer resident occurs at all elevations from April to October. The species prefers mature deciduous forests, where it is fairly common to uncommon from April to October. A slight to moderate increase in numbers occurs during fall migration in September and October.

RED-TAILED HAWK
Buteo jamaicensis

A permanent resident at all elevations at Shining Rock, the Red-tailed Hawk is fairly common to uncommon from March to November and is uncommon to rare from December to February. The bird prefers mature deciduous and coniferous forests.

GOLDEN EAGLE
Aquila chrysaetos

The Golden Eagle is a rare, but apparently regular, winter resident from September to March, primarily in the high elevations, where it prefers grass balds and open disturbed areas of early secondary successional growth. From about 1981 through 1985, two to six Golden Eagles were released annually as part of a government-sponsored hacking program at Tennant and Black Balsam mountains, just south of the Wilderness, to attempt an introduction of the species as a breeding bird in the Shining Rock area (Chat 45:70, 1981), where it was rumored to nest as late as the 1950s (Knickerbocker, undated ms.; Hillman, pers. comm.; L. W. Zeedyk, pers. comm.). Numerous sightings in the spring of 1994, including one on 20 May (Simpson, pers. obs.), suggest that the Golden Eagle might become an esbablished resident in the Shining Rock area.

AMERICAN KESTREL
Falco sparverius

Although apparently a permanent resident in the region, the kestrel is rare and erratic at Shining Rock, where the species prefers open clearings, disturbed areas, and secondary successional communities at all elevations.

PEREGRINE FALCON
Falco peregrinus

Peregrine Falcons were rumored to nest in the Shining Rock Ledge area prior to the 1950s, but sightings in the Wilderness during the period from 1963 to 1988 have been during September and October and presumably represent migrants. In recent years a hacking project has been under way just south of the Wilderness boundary, with four birds dispersed at Sam's Knob in 1986 and four on Tennant Mountain in 1987 (L. Hillman, pers. comm.). Subsequently, Peregrines have nested successfully at nearby Looking-glass Rock (Allen Boynton, pers. comm.; Simpson 1992).

RUFFED GROUSE
Bonasa umbellus

Grouse are shy, but fairly common, permanent residents at all elevations. They prefer mature deciduous and spruce-fir forests. Breeding evidence includes my record of a hen with six chicks at Shining Rock (1828 m/6000 feet) on 21 June 1963.

WILD TURKEY
Meleagris gallopavo

Turkeys are uncommon to rare residents in the Wilderness, mostly in deciduous forests at elevations up to 1525 m (5000 feet). Local release and restocking programs appear largely responsible for the return of the species in this area.

NORTHERN BOBWHITE
Colinus virginianus

An uncommon permanent resident at all elevations, the Northern Bobwhite prefers forest edge and disturbed areas with early successional communities. Although found at all elevations from May to late August, these birds become less numerous at successively higher elevations. They abandon the high mountains during winter and are usually found below 1200 m (4000 feet) from September to April.

KILLDEER
Charadrius vociferus

The Killdeer is a rare and erratic resident in open grassy areas at Shining Rock Wilderness. Although individuals have been noted at all elevations, the species is quite scarce above 1500 m (5000 feet) and is usually absent in the high elevations from November to March.

COMMON SNIPE
Gallinago gallinago

This species is a rare and erratic winter resident, from September to April, in open grassy areas below 1500 m (5000 feet).

AMERICAN WOODCOCK
Scolopax minor

The American Woodcock is an uncommon summer resident, March through November, at all elevations in disturbed, open, grassy areas with light to moderate growth of secondary successional species, such as the area near Ivestor Gap. The birds are rare and usually absent from the Wilderness from mid-December to

late February. The occurrence of this species in the high elevations of the southern Appalachians is apparently associated with the removal of forest canopy and the subsequent long-term presence of suitable open areas resulting from fire damage, bald formation, and disclimax zones such as those associated with the Blue Ridge Parkway (Simpson 1971).

MOURNING DOVE
Zenaida macroura

From March to November, this species is a rare summer resident in open areas of Shining Rock Wilderness below 1150 m (3800 feet). The bird is a common permanent resident at low elevations outside the Wilderness boundaries.

BLACK-BILLED CUCKOO
Coccyzus erythropthalmus

This uncommon to rare summer resident occurs in medium to mature deciduous forests at elevations up to 1675 m (5500 feet) from early May to mid-October. Although usually rather erratic, the species has been noted most consistently in the mature woods at Deep Gap and Grassy Cove Ridge.

YELLOW-BILLED CUCKOO
Coccyzus americanus

This species is a summer resident in medium to mature deciduous forests up to 1370 m (4500 feet), where it is uncommon to fairly common from late April to late October.

EASTERN SCREECH-OWL
Otus asio

A permanent resident in mature deciduous forests up to 1200 m (4000 feet), this owl is uncommon to rare from July to March and rare from April to June.

GREAT HORNED OWL
Bubo virginianus

This species is a rare permanent resident in mature deciduous forests below 1370 m (4500 feet).

BARRED OWL
Strix varia

The most conspicuous of the owls at Shining Rock, this species is a permanent resident at all elevations in medium to mature deciduous and coniferous forests. The population density decreases at progressively higher elevations, particularly during the winter months. The species is fairly common in the Wilderness from late March to mid-October and uncommon from late October to mid-March.

NORTHERN SAW-WHET OWL
Aegolius acadicus

Although this owl is probably a permanent resident at Shining Rock, there are only two records within the Wilderness. I observed a single bird calling from a mixture of spruce-fir forest and northern hardwoods on the northwest slope of Flower Knob, at 1600 m (5200 feet) on 13 June 1986, and N. Murdock (pers. comm.) noted one at Ivestor Gap on 8 October 1989. This species was of regular occurrence in similar habitat in the Great Balsam Mountains to the south and southwest of the Wilderness area from the late 1960s through the 1980s. The recent destruction of spruce-fir forests in that region may adversely affect the population there. The calling season is mostly from April through June (Simpson 1968, 1972a). Based on data from other areas in the southern Blue Ridge, it is reasonable to suppose that the Saw-whet may undergo a vertical migration in the Shining Rock area, perhaps abandoning the high elevations during the winter months.

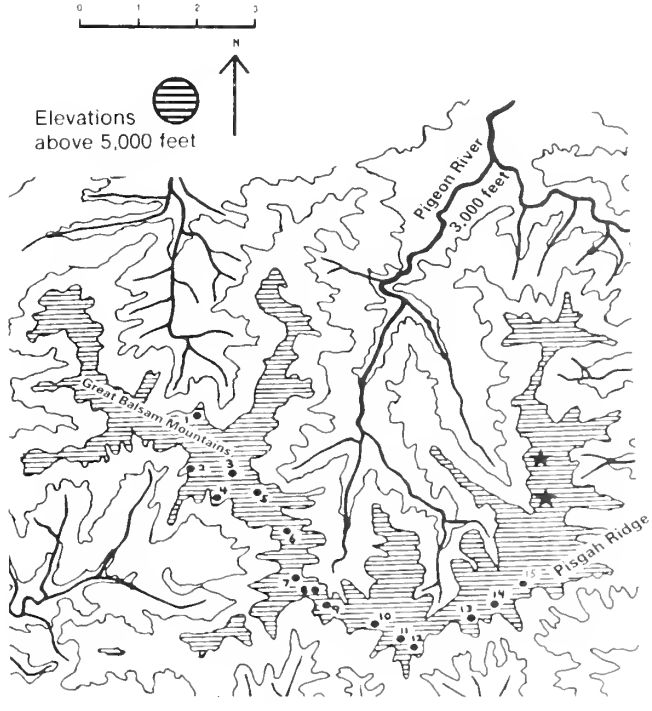


Fig. 1. Distribution of the Saw-whet Owl in the Great Balsam Mountains and on Pisgah Ridge. Stars indicate sites of known occurrences within the Shining Rock Wilderness. Sites 1-15 are from Simpson (1972a).

COMMON NIGHTHAWK
Chordeiles minor

This species is a rare and erratic summer resident in the Wilderness area from late April to late September. Individual birds are found below 1525 m (5000 feet), but during August and September migrating flocks may occur at all elevations. The breeding status of this bird in the southern Appalachians is uncertain, and most records are from urban areas.

WHIP-POOR-WILL
Caprimulgus vociferus

This bird is an uncommon to rare summer resident from early April to October at elevations up to 1525 m (5000 feet) within the Wilderness, where it prefers edge between open deciduous forests and secondary successional communities or grass balds. This species is more common at low elevations outside the Wilderness boundaries.

CHIMNEY SWIFT
Chaetura pelagica

Although this species is a fairly common summer resident, foraging on the wing at all elevations from late March to mid-October, there are no records suggesting breeding within the Wilderness.

RUBY-THROATED HUMMINGBIRD
Archilochus colubris

A fairly common summer resident, the Ruby-throat occurs from late April to early October at all elevations. The bird prefers early secondary successional communities, disturbed margins, and the understory of mature deciduous forests. Breeding evidence includes my record of a nest with two eggs at 1100 m (3600 feet) at Bennett Branch on 14 June 1963.

BELTED KINGFISHER
Ceryle alcyon

An uncommon summer resident, the kingfisher occurs along waterways below 1370 m (4500 feet) from early April to late October.

RED-BELLIED WOODPECKER
Melanerpes carolinus

This species is an uncommon to rare permanent resident in medium to mature deciduous forests, usually below 1280 m (4200 feet), except from March to May, when individuals wander up to 1675 m (5500 feet).

YELLOW-BELLIED SAPSUCKER
Sphyrapicus varius

Sapsuckers are permanent residents in medium to mature deciduous forests and late successional communities at Shining Rock Wilderness. The bird varies from uncommon to rare or absent at all elevations from October to early April. From late April to late September, sapsuckers are found above 1100 m (3600 feet). Breeding evidence includes my records of adults carrying food into a nesting cavity on Shining Rock (1688 m/5540 feet) in June 1963, 1965, and 1968 (Simpson 1972b).

DOWNY WOODPECKER
Picoides pubescens

Downy Woodpeckers are permanent residents in medium to mature deciduous and coniferous forests and late successional communities at all elevations, although the population density decreases at successively higher elevations. These birds are uncommon above 1200 m (4000 feet) and fairly common below 1200 m, except during severe winters, when they are rarely seen in the high elevations. Breeding evidence includes my observation of a nest with four eggs at Shining Creek Gap (1100 m/3600 feet) on 13 June 1970.

HAIRY WOODPECKER
Picoides villosus

Hairy Woodpeckers are less frequently encountered than Downy Woodpeckers at Shining Rock Wilderness. The Hairy Woodpecker is an uncommon permanent resident in medium to mature deciduous and coniferous forests at all elevations, although it often abandons elevations above 1525 m (5000 feet) during harsh winters. Breeding evidence includes my record of adults carrying food into a nesting cavity on Cold Mountain (1737 m/5700 feet) on 22 June 1963.

NORTHERN FLICKER
Colaptes auratus

A fairly common summer resident, the flicker occurs at Shining Rock Wilderness from late March to late October at all elevations. The bird prefers open, mature deciduous forests and medium-aged secondary successional communities. Breeding evidence includes my record of a nest with adults carrying food to young at Shining Rock (1706 m/5600 feet) on 21 June 1963 and the report by McNair (1987) of a female incubating eggs at 1769 m (5804 feet) on 30 June 1987 at Shining Rock Gap.

PILEATED WOODPECKER
Dryocopus pileatus

This species is an uncommon permanent resident in mature deciduous forests at all elevations, although the population density decreases at higher elevations. Pileateds tend to abandon the high elevations during harsh winter months and are uncommon to rare above 1370 m (4500 feet) from late October to early March.

EASTERN WOOD-PEWEE
Contopus virens

The Eastern Wood-Pewee is a fairly common summer resident from late April to late October, mostly in medium to mature deciduous forests and rarely in spruce-fir forests. Although found at all elevations, the bird is more common below 1525 m (5000 feet) than above that level.

Fig. 2. Alder Flycatcher on nest. The bird was incubating two eggs when the nest was discovered on 11 June 1984 at an intersection of the Art Loeb Trail and USFS Road 816. (Photo by Jerry Young, © 1984)

ACADIAN FLYCATCHER
Empidonax virescens

Although it is fairly common in suitable habitat throughout the southern Appalachians, the Acadian Flycatcher is an uncommon to rare summer resident within the Wilderness from late April to early October. The birds prefer the shrub and understory layer along streams and ravines in mature deciduous forests up to 1200 m (4000 feet). Breeding evidence includes my record of a nest with an incubating adult along the East Fork Pigeon River at 1100 m (3600 feet) on 15 June 1963.

ALDER FLYCATCHER
Empidonax alnorum

This species has rapidly expanded its nesting range in the Carolina mountains in recent years and now occurs in the Shining Rock Wilderness as a summer resident, May through September, preferring secondary successional communities, especially mixes of fire cherry, blackberry, and low shrubs. First noted near the Wilderness in 1976 (Chat 40:103, 1976; LeGrand 1979), the species has become particularly common in secondary successional communities along Shining Rock Ledge south of the Wilderness boundary (Simpson, present study; McNair 1987). The species occurs fairly regularly within the Wilderness between 1675 m (5500 feet) and 1770 m (5800 feet) on the southeast slope of Grassy Cove Top. Nesting has been documented just south of the Wilderness area by Young (1984).

LEAST FLYCATCHER
Empidonax minimus

A rare summer resident, this species occurs from May through September in open, mature deciduous forests up to 1525 m (5000 feet).

EASTERN PHOEBE
Sayornis phoebe

Phoebes are permanent residents up to 1675 m (5500 feet), although the birds becomes less numerous in the high elevations. Within the Wilderness, they are uncommon from April to September and rare to absent from late September to March. Phoebes prefer disturbed areas and secondary successional communities, particularly along waterways. Breeding evidence includes my record of a nest with three eggs along East Fork Pigeon River (1036 m 3400 feet) near US 276 on 8 June 1970.

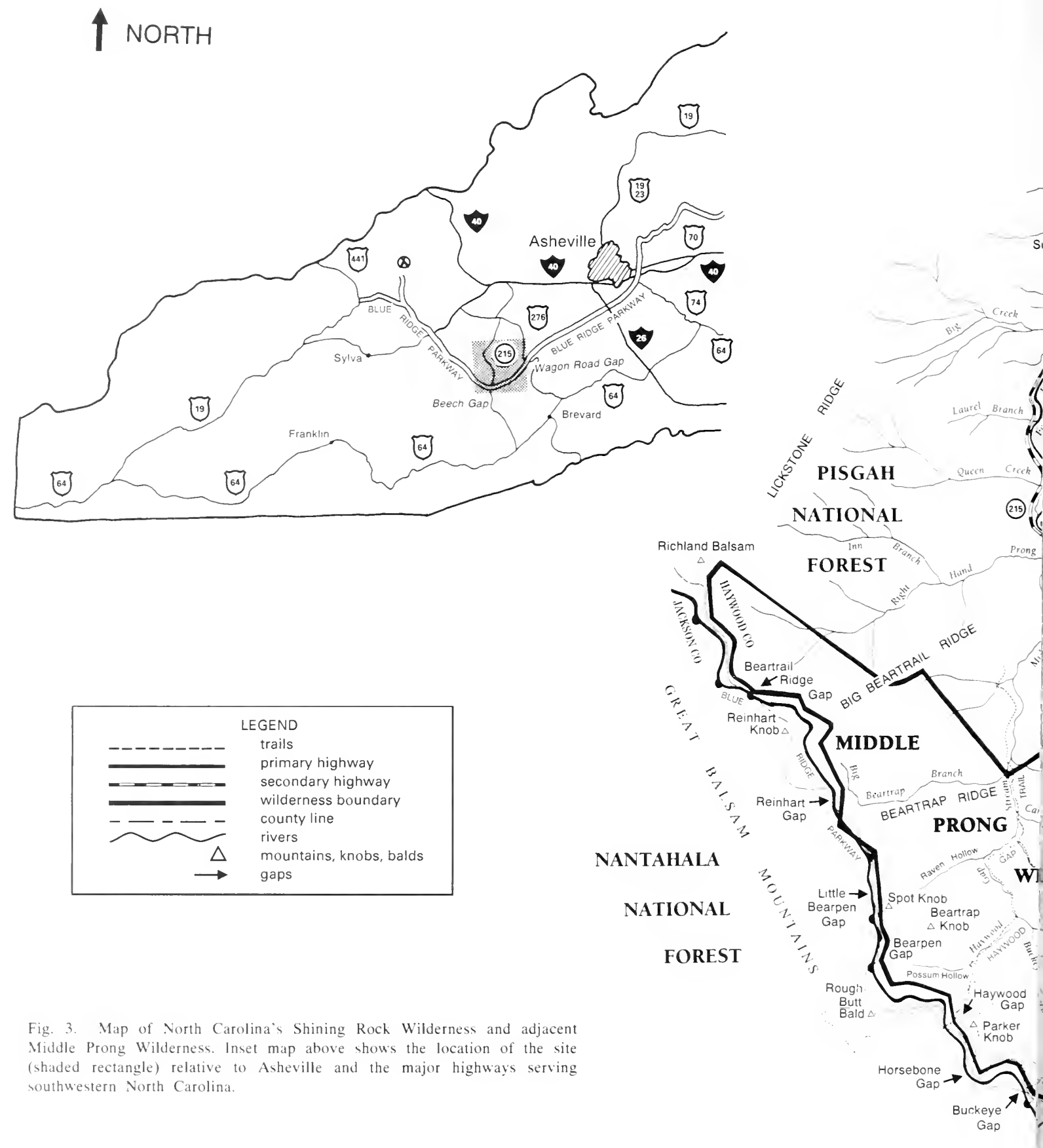
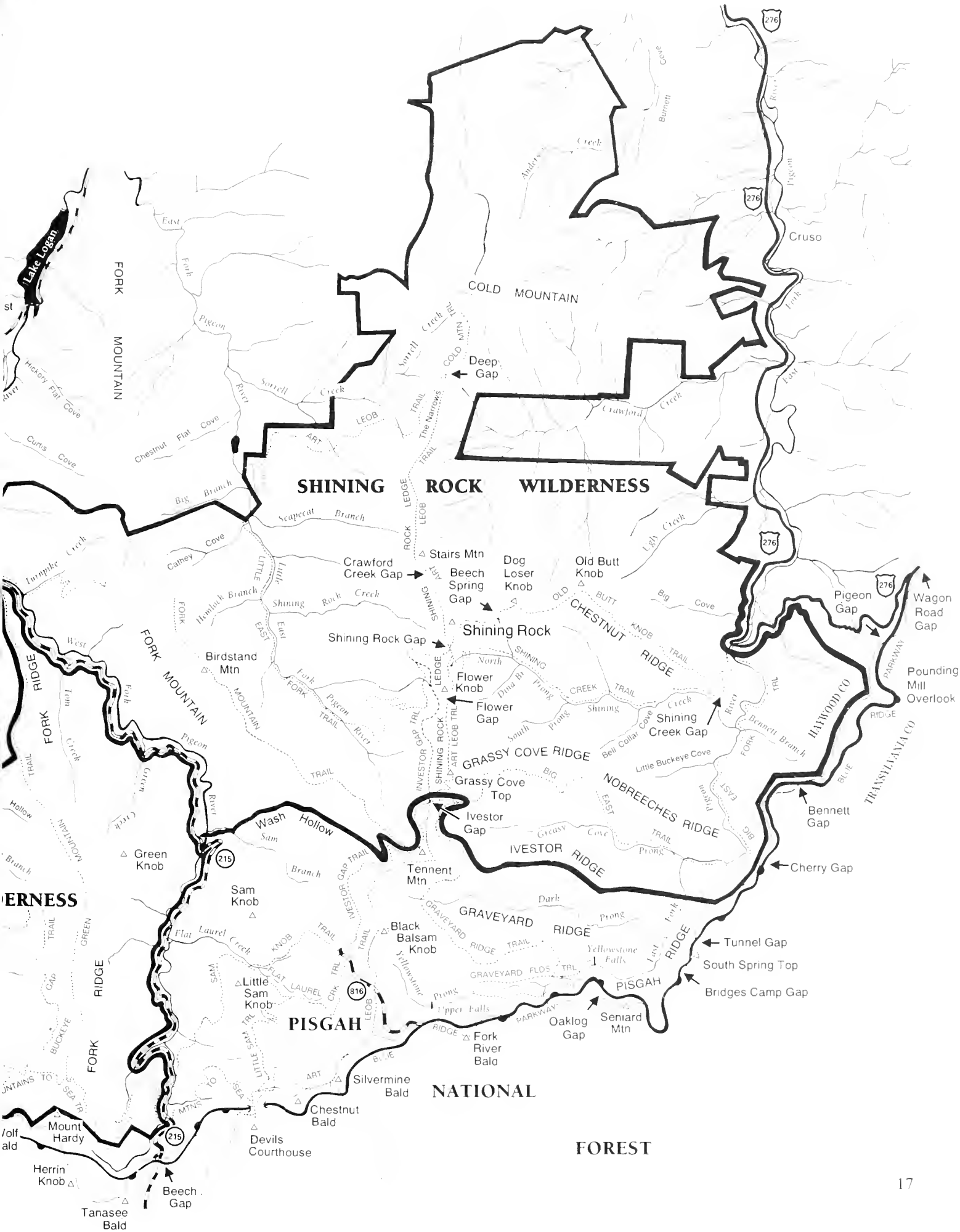
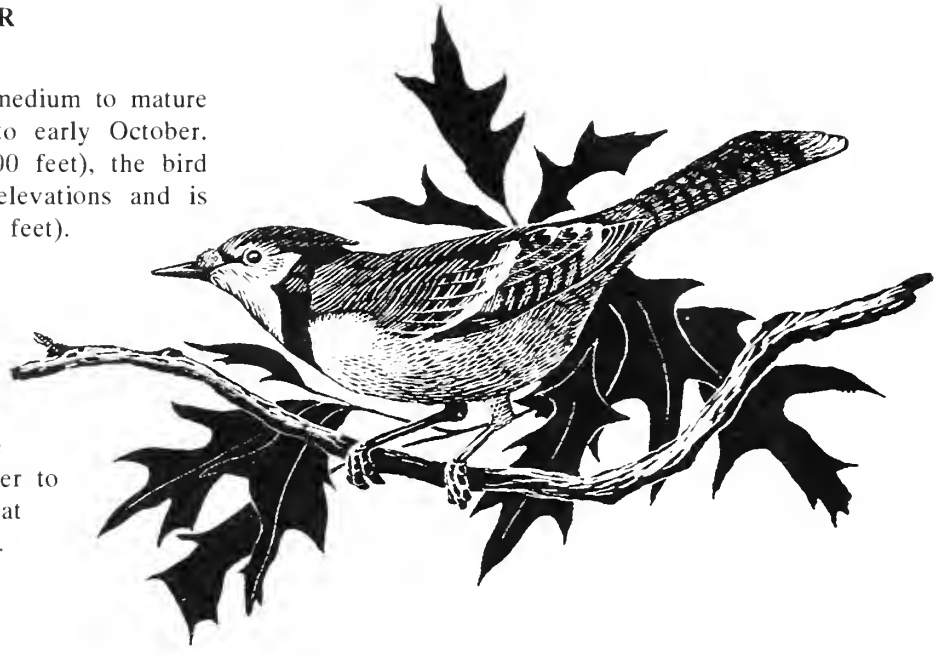


Fig. 3. Map of North Carolina's Shining Rock Wilderness and adjacent Middle Prong Wilderness. Inset map above shows the location of the site (shaded rectangle) relative to Asheville and the major highways serving southwestern North Carolina.


Lake Logan
FORK MOUNTAIN
COLD MOUNTAIN
Cruso
Deep Gap
SHINING ROCK WILDERNESS
Crawford Creek Gap
Stairs Mtn
Beech Spring Gap
Dog Loser Knob
Old Butt Knob
Shining Rock
Shining Rock Gap
OLD CHESTNUT RIDGE
Pigeon Gap
Wagon Road Gap
Pounding Mill Overlook
Birdstand Mtn
Flower Knob
Flower Gap
Shining Creek Gap
HAYWOOD CO
TRANSYLVANIA CO
GRASSY COVE RIDGE
Grassy Cove Top
NOBREECHES RIDGE
Bennett Gap
Ivestor Gap
IVESTOR RIDGE
Cherry Gap
Green Knob
Tennent Mtn
Sam Knob
GRAVEYARD RIDGE
Black Balsam Knob
Tunnel Gap
South Spring Top
Bridges Camp Gap
Little Sam Knob
PISGAH
Oaklog Gap
Seniard Mtn
Fork River Bald
Silvermine Bald
NATIONAL
Chestnut Bald
Devils Courthouse
FOREST
Mount Hardy
Herrin Knob
Beech Gap
Tanasee Bald

GREAT CRESTED FLYCATCHER
Myiarchus crinitus

This summer resident occurs in medium to mature deciduous forests from late April to early October. Fairly common below 1200 m (4000 feet), the bird becomes less numerous at higher elevations and is generally rare above 1525 m (5000 feet).



HORNED LARK
Eremophila alpestris

Although absent in some years, the Horned Lark is generally a rare and erratic winter resident, November to April, preferring open grassy areas at all elevations within the Wilderness.

PURPLE MARTIN
Progne subis

This species is a spring and fall transient at elevations below 1280 m (4200 feet). The birds are uncommon to rare from early April to early June and rare from late August to mid-September.

NORTHERN ROUGH-WINGED SWALLOW
Stelgidopteryx serripennis

This species is a fairly common summer resident at all elevations from late March to early September, although the birds become somewhat less numerous at successively higher elevations. No evidence suggesting breeding has been noted in the Wilderness; but W. and N. Siebenheller (pers. comm.) report the species nesting near Tanasee Bald about 5 miles south of the Wilderness boundary, and McNair (1987) reported nests along the Blue Ridge Parkway in the nearby Southern Great Balsams and Pisgah Ridge between 1434 m (4705 feet) and 1647 m (5404 feet).

BARN SWALLOW
Hirundo rustica

The Barn Swallow is a rare summer resident below 1200 m (4000 feet) from June through July; an uncommon transient at all elevations from early April to late May, and a fairly common transient at all elevations from early August to mid-September. Barn Swallows are common summer residents in farmlands at middle and low elevations outside the Wilderness area.

BLUE JAY
Cyanocitta cristata

Permanent residents at all elevations, jays prefer medium to mature deciduous and coniferous forests. The birds are common from April to October and fairly common to uncommon from November to March, when they often abandon elevations above 1375 m (4500 feet), especially during harsh weather. Breeding evidence includes my record of adults feeding young out of the nest at Shining Creek (1460 m/4800 feet) on 24 June 1963.

AMERICAN CROW
Corvus brachyrhynchos

Crows are fairly common permanent residents in the Wilderness, although the population density decreases at progressively higher elevations. The birds are uncommon to rare above 1600 m (5200 feet).

COMMON RAVEN
Corvus corax

Uncommon permanent residents, ravens occur in all major plant communities but usually prefer medium to mature forests at elevations above 1200 m (4000 feet). In some years ravens nest on the cliffs at Devil's Courthouse, south of the Wilderness.

BLACK-CAPPED CHICKADEE
Parus atricapillus

Although this species apparently occurs in the high elevations of Pisgah Ridge and southern Great Balsam Mountains near Shining Rock (Simpson 1977, 1992; Tove 1980; W. and N. Siebenheller, pers. comm.), there are few acceptable records from within the Wilderness. Two birds were seen near Pounding Mill Overlook on 28 September 1985 by W. and N. Siebenheller (pers. comm.), and I observed a lone bird at close range for about 30 minutes at Shining Rock Gap (1740 m/5700 feet) on 16 June 1988. Assessing the status of the Black-capped Chickadee is difficult in the region, owing to probable interbreeding with the Carolina Chickadee and mutual imitation of songs in zones of sympatry (Tanner 1952, Simpson 1977). Separation of the two species is problematic in the field, and reliance cannot be placed on habitat or elevation as the basis for distinguishing the birds in the high elevations of the southern Appalachians (Simpson 1977). The Black-capped still occurs in the Great Smokies and in the Plott Balsam Mountains (Stupka 1963; Simpson 1976b, 1977, 1992), but it has apparently been extirpated from its former range in the Black Mountains (Simpson 1972c, 1977).

CAROLINA CHICKADEE
Parus carolinensis

The Carolina Chickadee is a permanent resident in medium and mature deciduous forests, coniferous forests, and late successional communities. Common below 1600 m (5200 feet), it becomes less numerous at progressively higher elevations up to 1770 m (5700 feet). Carolina Chickadees usually withdraw from the area above 1200 m (4000 feet) from November through March. Breeding evidence includes my record of a nest with three young in Big Cove (1100 m/3600 feet) on 26 June 1963.

TUFTED TITMOUSE
Parus bicolor

This species is a permanent resident in mature deciduous forests at all elevations, but the population density decreases at progressively higher elevations, with the birds becoming rare above 1600 m (5200 feet). Titmice are fairly common from April to October; they usually abandon elevations above 1375 m (4500 feet) from November to March. Breeding evidence includes my record of adults carrying food into a nesting hole at Cherry Gap (1280 m/4200 feet) on 7 June 1970.

RED-BREASTED NUTHATCH
Sitta canadensis

A permanent resident in the Wilderness, the Red-breasted Nuthatch is fairly common from April through October in spruce-fir forests above 1375 m (4500 feet). Erratic from November through March, the species varies from abundant to absent at all elevations, depending on the availability of food. Breeding evidence includes my record of a nest with adults feeding young on Stairs Mountain (1740 m/5700 feet) on 28 June 1963.

WHITE-BREASTED NUTHATCH
Sitta carolinensis

This species is a fairly common permanent resident in mature deciduous forests up to 1600 m (5200 feet). The birds typically abandon elevations above 1375 m (4500 feet) from October to March.

BROWN CREEPER
Certhia americana

The creeper is usually a year-round resident in the Wilderness, where it is uncommon to rare in mature spruce-fir forests from mid-April to mid-September. From October to late March the bird may be found in forests at all elevations, but it is often rare or absent above 1375 m (4500 feet).

CAROLINA WREN
Thryothorus ludovicianus

This species is a permanent resident in secondary successional communities and in the shrub layer of deciduous forests. It is uncommon to rare up to 1200 m (4000 feet) from mid-October through March and uncommon from April to mid-July up to 1375 m (4500 feet). The birds are also uncommon postbreeding wanderers at all elevations from mid-July through early October.

BEWICK'S WREN
Thryomanes bewickii

Formerly a very common summer resident in the southern Appalachians, this wren was rare to uncommon in the Shining Rock area as late as the 1950s, when it occurred in mature deciduous forests up to 1200 m (4000 feet) from late March to mid-September. This species has not been reported from the Wilderness in the past two decades and may have been extirpated as a breeding species in the southern Appalachians (Simpson 1978a, 1992).

HOUSE WREN
Troglodytes aedon

This species is a summer resident in disturbed areas and late secondary successional communities up to 1675 m (5500 feet) and occasionally up to 1800 m (5900 feet). Although uncommon to rare from late April to mid-September, the bird is fairly regular in some localities, such as the open woodland edges just east of Ivestor Gap.

WINTER WREN
Troglodytes troglodytes

A permanent resident within the Wilderness, this species is fairly common from mid-March to mid-November above 1200 m (4000 feet) in secondary successional communities, heath balds, and the shrub layer of all forest types, with a preference for coniferous woods. From early December to late February, the Winter Wren is uncommon at all elevations and often absent above 1375 m (4500 feet).

GOLDEN-CROWNED KINGLET
Regulus satrapa

Golden-crowned Kinglets are fairly common to uncommon permanent residents in spruce-fir forests and hemlock stands above 1200 m (4000 feet) from mid-April to mid-October. From late October to early April, they occur at all elevations in the Wilderness, at which time they may be found in virtually any plant community except grass balds. Breeding evidence includes my record of adults feeding two young out of the nest at Stairs Mountain (1750 m/5750 feet) on 23 July 1968.

RUBY-CROWNED KINGLET
Regulus calendula

Ruby-crowned Kinglets are winter residents in the Wilderness in all habitats except grass balds. They are fairly common at all elevations from early September through October; uncommon to rare, November to late March, usually below 1525 m (5000 feet); and uncommon to fairly common at all elevations from April to early May.

BLUE-GRAY GNATCATCHER
Polioptila caerulea

Rare summer residents in the Wilderness, gnatcatchers are present from late March to mid-October in medium to mature deciduous forests below 1200 m (4000 feet).

EASTERN BLUEBIRD
Sialia sialis

Bluebirds are permanent residents at all elevations in the Wilderness, where they prefer the edges of disturbed secondary successional communities and forests. The birds are uncommon from February to October and rare to absent from November through late January. Rarely found above 1525 m (5000 feet), the species becomes more common at progressively lower elevations. McNair (1987) reported nesting just south of the Wilderness at 1769 m (5800 feet) in 1986.

VEERY
Catharus fuscescens

A fairly common to common summer resident from late April to mid-September, the Veery prefers medium and mature coniferous and deciduous woods at all elevations. The species becomes more common at progressively higher elevations. Breeding evidence includes my record of a nest with three eggs at Shining Rock Gap (1768 m/5800 feet) on 18 June 1963.

GRAY-CHEEKED THRUSH
Catharus minimus

A rare fall transient in September and October, the Gray-cheeked Thrush has been found at all elevations and in all habitats except grass balds.

SWAINSON'S THRUSH
Catharus ustulatus

Swainson's Thrush is a spring and fall transient that prefers fairly mature forests at all elevations at Shining Rock, although it is less frequently encountered in the higher elevations. The species is rare in May and uncommon from early September to late October.

HERMIT THRUSH
Catharus guttatus

The Hermit Thrush is a winter resident in the shrub understory of deciduous forests below 1375 m (4500 feet), where it is uncommon in April and October and rare from November through March. Individuals are occasionally noted above 1375 m during spring and fall migration. Although this species extended its summer range southward down the Appalachian Mountains in the 1980s (Lee et al. 1985, Simpson 1992), as of June 1992 there was no evidence of its presence as a summer resident in the Shining Rock area.

WOOD THRUSH
Hylocichla mustelina

A regular summer resident in mature deciduous forests below 1375 m (4500 feet), the Wood Thrush is fairly common at Shining Rock from mid-April to mid-October. Breeding evidence includes my record of adults feeding young out of the nest along East Fork Pigeon River (1150 m/3800 feet) on 8 July 1965.

AMERICAN ROBIN
Turdus migratorius

The robin is a permanent resident at all elevations and in all habitats except grass balds, although it prefers mature deciduous and coniferous forests and medium to late secondary successional communities. Common to abundant from mid-March to late October, the species is uncommon to rare, particularly at the higher elevations, from November to early March. Among the numerous breeding records is my observation of a nest with an adult incubating three eggs near Ivestor Gap (1585 m/5200 feet) on 22 June 1963.

GRAY CATBIRD
Dumetella carolinensis

Catbirds are fairly common to common summer residents from mid-April to mid-October, when they occur at all elevations in secondary successional communities, heath balds, and the shrub layer of all forest types. Breeding data include my note of a nest with four eggs at Ivestor Gap (1713 m/5620 feet) on 31 May 1969.

BROWN THRASHER
Toxostoma rufum

Thrashers are summer residents from late April to late September in secondary successional communities and in the shrub layer of deciduous forests. Fairly common below 1200 m (4000 feet), the species becomes progressively less common with increasing elevation. The birds are rare above 1675 m (5500 feet), although individuals are fairly regular at Ivestor Gap (1713 m/5620 feet) and have been noted up to 1861 m (6106 feet) by McNair (1987). Breeding records include my observation of a nest with three eggs at Dry Branch (1100 m/3600 feet) on 7 June 1969.

WATER PIPIT
Anthus spinoletta

Spring and fall transients at all elevations, pipits prefer open areas and grass balds, where they are uncommon to rare and erratic from March to May and from October through November.

CEDAR WAXWING
Bombycilla cedrorum

Cedar Waxwings are found at all elevations in late secondary successional communities, shrub balds, and medium-age coniferous and deciduous forests. These birds are usually fairly common from June to late October and erratic from November through May.

EUROPEAN STARLING
Sturnus vulgaris

The European Starling is an erratic wanderer into the Wilderness during April and May in disturbed open areas below 1675 m (5500 feet).

WHITE-EYED VIREO
Vireo griseus

White-eyed Vireos are summer residents in early secondary successional communities and in the shrub layer of mature deciduous forests, particularly along waterways. The birds are uncommon to rare up to 1375 m (4500 feet) from mid-April to late July, and they occur as uncommon postbreeding wanderers up to 1760 m (5800 feet) from late July to late September.

SOLITARY VIREO
Vireo solitarius

This characteristic mountain species is a regular summer resident in medium to mature coniferous and deciduous forests, heath balds, and late secondary successional communities at all elevations. Solitary Vireos are fairly common to common from late March to mid-October, and occasional individuals have been

noted in the low elevations in each of the intervening fall and winter months. Breeding evidence includes my record of a nest with incubating adults at Flower Top (1737 m/5700 feet) on 30 May 1970.

YELLOW-THROATED VIREO
Vireo flavifrons

The Yellow-throated Vireo is a summer resident in mature forests, especially pine communities, below 1200 m (4000 feet), where it is rare from mid-April to early October.

RED-EYED VIREO
Vireo olivaceus

Red-eyed Vireos are regular summer residents in mature deciduous forests up to 1525 m (5000 feet), although the population density decreases as elevation increases. The species is fairly common to common from mid-April to early October. Postbreeding individuals wander to elevations above 1525 m after late August.

GOLDEN-WINGED WARBLER
Vermivora chrysoptera

This species is an uncommon to rare summer resident from mid-April to late September in secondary successional communities at all elevations. Breeding evidence includes my record of adults feeding two young out of the nest on Ivestor Ridge (1525 m/5000 feet) on 23 July 1968.

TENNESSEE WARBLER
Vermivora peregrina

A fairly common fall transient, the Tennessee Warbler occurs at all elevations and in all habitats except grass balds from early September to mid-October.

NORTHERN PARULA
Parula americana

Parulas are uncommon to fairly common summer residents from early April to late September in medium to mature deciduous forests up to 1525 m (5000 feet), although the species becomes less numerous as the elevation increases. Breeding records include my observation of an incubating adult on a nest along the East Fork Pigeon River (1150 m/3800 feet) on 7 June 1969.

YELLOW WARBLER
Dendroica petechia

This species is an uncommon summer resident from early April to early August in medium to mature deciduous forests bordering streams up to 1200 m (4000 feet).

CHESTNUT-SIDED WARBLER
Dendroica pensylvanica

This characteristic mountain species is a common to abundant summer resident at all elevations in the Wilderness from late April to early October. The population density decreases noticeably below 1160 m (3800 feet). The Chestnut-sided prefers medium to late secondary successional communities, heath balds, and open mature deciduous forests, such as oak orchards. Breeding records include my observation of a nest with four eggs on Fork Mountain (1585 m/5200 feet) on 18 June 1963.

MAGNOLIA WARBLER
Dendroica magnolia

Magnolia Warblers occur in the Wilderness as spring and fall transients at all elevations and in all habitats except grass balds. Uncommon to rare from late April to mid-May, the birds are fairly common from early September to mid-October. This species has apparently been expanding its breeding range southward down the Appalachians in recent years and now occurs in summer occasionally as far south as Roan Mountain (Potter and LeGrand 1980), Grandfather Mountain (Lee 1985, Simpson 1992), Richland Balsam (Chat 45:23), the Unaka Mountains (Simpson, pers. obs.), and the Black Mountains (Simpson 1992). As of 1992, however, there were no records during the breeding season from Shining Rock, although apparently suitable habitat is present.

CAPE MAY WARBLER
Dendroica tigrina

This species is a spring and fall transient at all elevations, preferring late secondary successional communities and medium-age deciduous forests. The birds are uncommon from mid-April to mid-May and from mid-September to late October.

BLACK-THROATED BLUE WARBLER
Dendroica caerulescens

This warbler is a summer resident at all elevations in the Wilderness from mid-April to late October. The birds vary from uncommon to common in the high shrub layer and understory of deciduous and coniferous

forests and in secondary successional communities; they are less common in heath balds. The species prefers medium to mature deciduous forests below 1525 m (5000 feet). Breeding evidence includes my record of a nest with three eggs on Fork Mountain (1645 m/ 5400 feet) on 18 June 1963.

YELLOW-RUMPED WARBLER
Dendroica coronata

Yellow-rumped Warblers are winter residents in deciduous forests and medium to mature secondary successional communities. They are fairly common during October and from mid-April to early May, when individuals may occur up to 1675 m (5500 feet). The birds are uncommon to rare from late October to early April, when they are found mostly below 1200 m (4000 feet).

BLACK-THROATED GREEN WARBLER
Dendroica virens

These birds are fairly common summer residents from early April to mid-October, preferring mature deciduous and coniferous forests at all elevations.

BLACKBURNIAN WARBLER
Dendroica fusca

This species is a regular summer resident, although its status varies from rare to fairly common. The birds are present from mid-April to early October, mostly in spruce-fir forests and hemlock stands above 1200 m (4000 feet); they are less common in mature deciduous forests.

PINE WARBLER
Dendroica pinus

The Pine Warbler is a postbreeding wanderer and fall transient at all elevations and in all habitats except for grass balds. The birds are uncommon to rare from late July to September.

PRAIRIE WARBLER
Dendroica discolor

This species is a rare postbreeding wanderer and fall transient from late July to late September, when individuals may occur in secondary successional communities up to 1525 m (5000 feet).

PALM WARBLER
Dendroica palmarum

A spring and fall transient at all elevations, the Palm Warbler prefers secondary successional communities and the shrub layer of medium to mature deciduous forests. The bird is rare to uncommon from early April to late May and uncommon from mid-September to early November.

BAY-BREASTED WARBLER
Dendroica castanea

This species is a spring and fall transient at all elevations and in all habitats except grass balds. It is rare in early May and uncommon to rare from mid-September to mid-October.

BLACKPOLL WARBLER
Dendroica striata

A spring and fall transient at all elevations, the Blackpoll Warbler prefers medium and mature deciduous forests, where it is common from late April to late May and rare in October.

BLACK-AND-WHITE WARBLER
Mniotilta varia

This summer resident occurs in mature deciduous forests from April to early October, during which

time it is fairly common below 1525 m (5000 feet) and uncommon to rare up to 1675 m (5500 feet). After mid-July, individuals may be found at higher elevations as postbreeding wanderers. Breeding evidence includes my record of adults feeding two young out of the nest at Cherry Gap (1280 m/4200 feet) on 15 July 1968.

AMERICAN REDSTART
Setophaga ruticilla

The redstart is an uncommon postbreeding wanderer and fall transient, mid-August to early October, at all elevations and in all habitats except grass balds.

WORM-EATING WARBLER
Helmitheros vermivorus

This species is an uncommon to rare summer resident in mature deciduous forests up to 1280 m (4200 feet) from late April to mid-September.

OVENBIRD
Seiurus aurocapillus

Ovenbirds are fairly common to common summer residents from mid-April to mid-October, inhabiting the ground and low shrub understory of mature deciduous forests up to 1525 m (5000 feet). The population density decreases at progressively higher elevations during the breeding season, but the birds are fairly common postbreeding wanderers and fall transients at all elevations after early September.

LOUISIANA WATERTHRUSH
Seiurus motacilla

A rare to uncommon summer resident, the Louisiana Waterthrush is present from late March to late September in the shrub layer of mature deciduous forests along waterways up to 1200 m (4000 feet). The bird is also a rare postbreeding wanderer up to 1675 m (5500 feet) after mid-July.

KENTUCKY WARBLER
Oporornis formosus

The Kentucky Warbler is a rare summer resident, from late April to mid-September, in the shrub layer of mature deciduous forests up to 1150 m (3800 feet).

COMMON YELLOWTHROAT
Geothlypis trichas

The yellowthroat is a fairly common to common summer resident from mid-April to mid-October. The species occurs at all elevations, primarily in early to medium secondary successional communities and less often in heath balds and in the shrub layer of mature deciduous forests bordering waterways. Breeding evidence includes my record of a nest with three eggs in a blackberry thicket at Ivestor Gap (1700 m/5600 feet) on 17 June 1963.

HOODED WARBLER
Wilsonia citrina

This species is a fairly common to uncommon summer resident from mid-April to mid-October. The bird prefers the shrub layer of mature deciduous forests up to 1200 m (4000 feet), rarely to 1375 m (4500 feet). Postbreeding wanderers occur after late July in all elevations and in all habitats except grass balds.

WILSON'S WARBLER
Wilsonia pusilla

This warbler is a spring and fall transient in open secondary successional communities and deciduous forests at elevations up to 1375 m (4500 feet). The species is rare in May and uncommon to rare from late August to early October.

CANADA WARBLER
Wilsonia canadensis

This typical montane species is a common to fairly common summer resident from late April to mid-September at all elevations, although the population density decreases noticeably at progressively lower elevations. The bird prefers the shrub layer of deciduous and coniferous forests, heath balds, and medium to late secondary successional communities. Breeding evidence includes my record of adults feeding three young in a nest on Grassy Cove Ridge (1737 m/5700 feet) on 16 July 1963.

YELLOW-BREASTED CHAT
Icteria virens

An uncommon summer resident from late April to early October, the chat occurs at elevations up to 1200 m (4000 feet), rarely to 1525 m (5000 feet). The species prefers secondary successional communities and the shrub layer of deciduous forests.

SCARLET TANAGER
Piranga olivacea

This species is a fairly common to uncommon summer resident, late April to mid-October, in mature deciduous forests up to 1525 m (5000 feet).

NORTHERN CARDINAL
Cardinalis cardinalis

The cardinal is an uncommon to rare summer resident, March to mid-November, in secondary successional communities and in the shrub layer of deciduous forests up to 1200 m (4000 feet), rarely to 1525 m (5000 feet).

ROSE-BREASTED GROSBEAK
Pheucticus ludovicianus

This species is a summer resident in medium to mature deciduous forests and in late secondary successional communities from late April to mid-October. The bird is fairly common up to 1645 m (5400 feet) but uncommon to rare at higher elevations except as a postbreeding wanderer after early August. Breeding evidence includes my observation of adults feeding young in a nest at Cherry Gap (1280 m/4200 feet) on 22 June 1969.

INDIGO BUNTING
Passerina cyanea

This summer resident is fairly common from late April to mid-October in secondary successional communities. Males occur at all elevations, but females and young are rarely found above 1280 m (4200 feet). South of the Wilderness, McNair (1987) reported nesting as high as 1833 m (6014 feet).

RUFOUS-SIDED TOWHEE
Pipilo erythrophthalmus

Towhees are permanent residents at all elevations in secondary successional communities, heath balds, and the shrub layer of deciduous and coniferous forests. They are common to abundant from mid-April to late October and uncommon to rare from November to March, when they often abandon elevations above 1525 m (5000 feet) during harsh winters. Breeding evidence includes my record of a nest with four eggs north of Ivestor Gap (1740 m/5700 feet) on 30 June 1965.

CHIPPING SPARROW
Spizella passerina

This species is an uncommon to rare summer resident from mid-March to mid-October in open mature deciduous forests at elevations up to 1765 m (5800 feet).

FIELD SPARROW
Spizella pusilla

The Field Sparrow is an uncommon to rare summer resident, late March to mid-October, in medium-age secondary successional communities, especially at the border with grass balds, up to 1765 m (5800 feet).

VESPER SPARROW
Pooecetes gramineus

An uncommon to rare spring and fall transient, the Vesper Sparrow is present from mid-March to April and from October to early November. The species occurs in grass balds and early secondary successional communities at all elevations, but the birds are not frequently encountered in the highest elevations.

SAVANNAH SPARROW
Passerculus sandwichensis

This species is an uncommon to rare spring transient, early April to mid-May, occurring at all elevations in secondary successional communities and grass balds. A single fall record consists of several birds in a grass bald near Ivestor Gap on 6 October 1984 (W. and N. Siebenheller, pers. comm.).

FOX SPARROW
Passerella iliaca

A spring and fall transient at all elevations, the Fox Sparrow occurs in the shrub layer of deciduous and coniferous forests, in secondary successional communities, and in open heath balds, although it is infrequently encountered above 1375 m (4500 feet). The species is uncommon from late October through late November and uncommon to rare from mid-February through March.

SONG SPARROW
Melospiza melodia

Although Song Sparrows are permanent residents at all elevations, they usually abandon the high mountains during severe weather in midwinter. The birds are fairly common to locally abundant (as at Ivestor Gap) from mid-March to late October and uncommon to fairly common from November through February. They occur in early to medium secondary successional communities, in disturbed areas, and in open heath balds. Breeding evidence includes my record of a nest with three young on Fork Mountain (1615 m/5300 feet) on 26 June 1970.

SWAMP SPARROW
Melospiza georgiana

An uncommon to rare spring and fall transient in April and November, the Swamp Sparrow occurs principally in early secondary successional communities at all elevations, although it is infrequently encountered in the high elevations.

WHITE-THROATED SPARROW
Zonotrichia albicollis

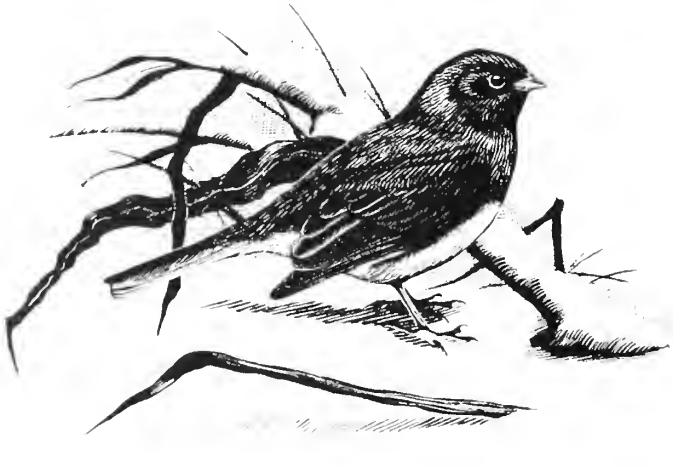
This species is a winter resident in secondary successional communities, grass balds, heath balds, and the shrub layer of deciduous and coniferous forests. The birds are fairly common from mid-October to late November and from mid-April to early May. They usually abandon the higher elevations during midwinter and are uncommon to rare from December to March.

WHITE-CROWNED SPARROW
Zonotrichia leucophrys

White-crowned Sparrows are spring and fall transients at all elevations in secondary successional communities, heath balds, and grass balds. They are rare from mid-October to mid-November and from mid-April to early May.

DARK-EYED JUNCO
Junco hyemalis

This conspicuous species is a permanent resident at all elevations and in all habitats, although the maximum abundance occurs in heath balds, open secondary successional communities, and the shrub layer of deciduous and coniferous forests above 1200 m (4000 feet), rarely down to the boundary of the Wilderness around Dry Branch (1030 m/3380 feet).



Abundant from mid-March to late October, the species is common to fairly common from November to early March. Breeding evidence includes my record of a nest with four eggs at Shining Rock (1830 m/6000 feet) on 7 June 1970.

RED-WINGED BLACKBIRD
Agelaius phoeniceus

The Red-winged Blackbird is an uncommon to rare spring and fall transient from late February to late March and from late October to mid-November at elevations up to 1675 m (5500 feet) in secondary successional communities.

EASTERN MEADOWLARK
Sturnella magna

Eastern Meadowlarks are uncommon spring and fall transients from late February to mid-May and from mid-October to late November. Individuals and small flocks occur at all elevations, preferring grass balds and early secondary successional communities.

COMMON GRACKLE
Quiscalus quiscula

Erratic but occasionally common spring and fall transients, grackles occur from March to early April and from October to mid-November in secondary successional communities and deciduous forests up to 1675 m (5500 feet).

PURPLE FINCH
Carpodacus purpureus

The Purple Finch is an erratic, uncommon to common winter resident from mid-October to late April. Individuals and small flocks occur at all elevations, predominantly in mature deciduous forests and in medium to late secondary successional communities. This species has been extending its breeding range southward down the Appalachian chain in recent years (Simpson 1992) and has been reported as a summer resident on Roan Mountain (Eller 1977). As of 1992, there was no evidence of its presence in the Shining Rock area during the summer months.

RED CROSSBILL
Loxia curvirostra

These erratic and generally rare residents are most frequently observed from June to November. Individuals and small flocks occur at all elevations and in all

plant communities except grass balds, although spruce-fir forests appear to be the preferred habitat. The only breeding evidence is my record of a pair constructing a nest near Shining Rock Gap (1740 m/5700 feet) on 13 June 1970 (Simpson 1974).

PINE SISKIN
Carduelis pinus

Siskins are erratic and generally unpredictable at Shining Rock. Completely absent in some years, the birds may be present in widely fluctuating numbers in other years. They occur in all habitats and at all elevations, apparently preferring spruce-fir forests and secondary successional communities above 1200 m (4000 feet).

AMERICAN GOLDFINCH
Carduelis tristis

The American Goldfinch is a permanent resident in secondary successional communities and mature forests at all elevations. Goldfinches are fairly common from mid-April to late October and uncommon to rare, especially in the higher elevations, from November through March.

EVENING GROSBEAK
Coccothraustes vespertinus

This species is a rare and erratic winter resident, mid-October to late April, at all elevations and in all habitats except grass balds.

DISCUSSION

The most striking feature of the avifauna at Shining Rock Wilderness is the alteration in species diversity and relative abundance resulting from the extensive destruction of boreal forests in the higher elevations. The largest stand of spruce-fir forest in the southern Appalachians once covered the upper slopes of Shining Rock Ledge and the adjacent Great Balsam Mountains and Pisgah Ridge (Holmes 1911), until it was decimated by logging and repeated wildfires. The patchwork removal of climax forests and the fire damage to soils resulted in a mosaic of secondary successional communities, grass balds, heath balds, and scattered remnants of boreal and hardwood forests.

Although particularly severe at Shining Rock, these changes in vegetation and bird life are typical consequences of the widespread destruction of boreal, or Canadian Zone, forests throughout the southern Appalachians (Burleigh 1941; Simpson 1972c, 1978b, 1980, 1992), where over 90% of this community type has been destroyed by human activities during the past 100 years (Korstian 1937). Elsewhere in the southern Blue Ridge Mountain Province, strikingly similar changes in plant communities and bird populations are present in the high country at Mount Rogers, where the history of logging and wildfires closely parallels the situation at Shining Rock Ledge (Simpson 1992). However, the ecological damage is of greater significance at Shining Rock because that area is part of the southernmost disjunct spruce-fir community in the eastern United States.

Marked alterations in bird life have followed the removal of the coniferous and northern hardwood forests, with breeding species being the most conspicuously affected. The destruction of the spruce-fir and northern hardwood canopy has been of such magnitude at Shining Rock that species dependent on the presence of such forests have been greatly reduced in number or, presumably, extirpated altogether. The Black-capped Chickadee has rarely been reported from the Wilderness, although the species is present in the nearby Great Balsam Mountains (Simpson 1977, 1992; Tove 1980; W. and N. Siebenheller, pers. comm.). Destruction of spruce-fir forests in the Black Mountains has been cited as a cause for the disappearance of the Black-capped Chickadee from the Mount Mitchell area (Burleigh 1941; Simpson 1972c, 1977, 1978b, 1980), and the severe deforestation at Shining Rock may account for the species' rarity in the Wilderness. Nevertheless, Black-cappeds are fairly common in similar habitat in the Mount Rogers area of Virginia (Simpson 1992), which suggests that additional factors are affecting the status of the species at Shining Rock.

Olive-sided Flycatchers (*Contopus borealis*) were also reported from the Black Mountains prior to logging of the range (Cairns 1889, 1891) but have not been observed there subsequently (Burleigh 1941, Simpson 1972c) or at Shining Rock. The continued presence of the Olive-sided Flycatcher in undisturbed boreal forests in the Great Smokies through the 1970s (Stupka 1963; H. D. Pratt, pers. comm.; Don Defoe, pers. comm.) suggests that disruption of the Canadian Zone woodlands in areas such as Mount Mitchell and Shining Rock is a contributary factor in the absence of the bird in these areas. The Olive-sided Flycatcher has been declining over much of its range, however, and other factors, such as tropical deforestation, may be contributing to the increasing rarity of the bird as a breeding species in North America (Hall 1983, McNair 1987, Marshall 1988, Terborgh 1989).

Although they seem to prefer hardwood-conifer mixes, which are extensive at Shining Rock, North-

ern Saw-whet Owls have been noted only twice in the Wilderness, despite numerous records during the same period of time in the nearby southern Great Balsams and at Pisgah Ridge (Simpson 1968, 1972a). The paucity of Saw-whet records at Shining Rock may simply reflect the relative lack of observers in the Wilderness, however, because suitable habitat at Shining Rock is much less accessible than that along the Parkway to the south.

Brown Creeper, Golden-crowned Kinglet, Red-breasted Nuthatch, and Blackburnian Warbler have been greatly reduced in numbers and distribution with the removal of the spruce-fir forests at Shining Rock. Black-throated Green Warbler, Rose-breasted Grosbeak, Yellow-bellied Sapsucker, Downy Woodpecker, Hairy Woodpecker, and Barred Owl have been affected additionally by the loss of northern hardwood forest in the higher elevations. Most of these species are typical of mature boreal and northern hardwood forests in the Great Smoky Mountains (Alsop 1970, Stupka 1963), Black Mountains (Burleigh 1941, Simpson 1972c), Plott Balsam Mountains (Simpson 1976b), Roan Mountain (Potter and LeGrand 1980), and Grandfather Mountain (Lee 1985, Lee et al. 1985).

Despite the effects of deforestation on the birds associated with spruce-fir communities, it is important to note that no breeding bird species in the southern Appalachians has been convincingly shown to be strictly dependent on these Canadian Zone forests. A critical examination of the literature and of the data from the present study indicates that bird species traditionally considered as confined to spruce-fir forests have, in fact, been demonstrated to occur in other habitats, often using Carolina hemlock or mixed deciduous-coniferous woods at lower elevations (Brewster 1886; Simpson 1976a, 1976c, 1978b, 1980, 1992). The best candidate for dependency might be the Northern Saw-whet Owl, even though the absence of breeding-season records away from spruce-fir forests may result from the lack of field work in potentially suitable localities during the calling season. Black-capped Chickadee, Golden-crowned Kinglet, Brown Creeper, Olive-sided Flycatcher, Red-breasted Nuthatch, Blackburnian Warbler, and Northern Saw-whet Owl have certainly been reduced by removal of spruce-fir forests; but it is not clear that the complete loss of all Canadian Zone forests would invariably mean the disappearance of these birds as breeders in the southern Appalachians.

On the other hand, such dramatic loss of preferred nesting habitat might reduce some species below the numbers needed to maintain reproduction of their southern Appalachian disjunct populations. How many individuals are required to sustain a disjunct population may become an important question, in light of the severe damage to spruce-fir forests noted during the 1980s in the Black Mountains, the Great Smoky Mountains, and the southern Great Balsam Mountains, where airborne pollutants and acid rain are suspected to be causing the extensive loss of those boreal forests that managed to escape the logging and wildfires of previous decades.

In contrast to those birds that depend on the presence of forest trees or canopy, a second group of breeding birds includes those that also occur regularly in the spruce-fir and hardwood communities but are able to maintain, or even increase, their numbers following the disruption or removal of the mature forests. Winter Wren, Gray Catbird, Black-throated Blue Warbler, Canada Warbler, Rufous-sided Towhee, and Dark-eyed Junco are found not only in the mature coniferous and deciduous forests but also in late secondary successional communities and heath balds. Their continued presence in a region where the climax spruce-fir and northern hardwood forests have been destroyed is related to their using the understory layer of saplings and ericaceous shrubs in the mature forest. These birds readily use heath balds and late successional stages when these community types develop after removal of the canopy trees, but those species that disappear with the removal of the overstory are more dependent on the canopy or the main trunks of the forest for their presence. Furthermore, some species, such as Gray Catbird, Canada Warbler, and Rufous-sided Towhee, often increase in density following the removal of the forest, because their associated understory shrub layer may be relatively sparse in mature spruce-fir and northern hardwood forests, but secondary successional and heath bald communities that often replace the forests usually form a dense tangle of vegetation apparently more suitable for these species.

A third group of breeding birds, including Veery, Solitary Vireo, American Robin, Cedar Waxwing, Common Raven, and Dark-eyed Junco, is capable of using a broad range of habitats at the elevations of the Wilderness. These birds may be found in the canopy as well as the understory of spruce-fir and hardwood forests, in late-stage secondary successional communities, and, to a lesser extent, in the canopy of tall, mature heath balds. Such species often show no readily predictable change in density, except during the early stages of succession, when they may be uncommon or absent. Once the woody vegetation reaches sufficient height, however, these species begin to reappear. This flexibility in

habitat use may account in part for the relative abundance of the Dark-eyed Junco in the southern Blue Ridge Mountains. No other bird at Shining Rock is able to use every type of plant community present in the area, ranging from grass balds to mature climax forest, an adaptation that certainly enhances the junco's success as a breeding species in the region.

The fourth major group of breeding birds at Shining Rock includes those species that are usually rare or absent in mature high-elevation forests but have invaded the area and become established in association with the secondary successional communities. Thus, American Woodcock, Common Yellowthroat, Song Sparrow, Field Sparrow, Indigo Bunting, American Goldfinch, Eastern Bluebird, House Wren, Brown Thrasher, Golden-winged Warbler, and, to a lesser extent, Chestnut-sided Warbler, occur in numbers only where the forest canopy has been disrupted or removed. These species occur widely at Shining Rock, their numbers and distribution depending on the availability of preferred habitat. Several of these, such as Common Yellowthroat, Field Sparrow, Indigo Bunting, House Wren, and Brown Thrasher, are often regarded as birds of the valleys and lower elevations in the southern Appalachians (Potter et al. 1980, Simpson 1976b, Stupka 1963). Their presence along the main crest at Shining Rock suggests that lack of suitable plant community types is a greater barrier than elevation to their occurrence in the high elevations of the southern Blue Ridge Mountains. Although the magnitude of this influx is particularly striking at Shining Rock, similar, but less dramatic, changes have been noted in disturbed areas in the Black Mountains, in the Great Smokies (Burleigh 1941, Simpson 1972c, Stupka 1963), and around Mount Rogers (Simpson 1992).

The persistence and density of some of the invading species at Shining Rock is also related to the fact that severe soil damage from wildfires has slowed the process of plant succession, causing tracts of suitable habitat to be present for longer periods of time than would occur with spontaneous reforestation in the absence of fire damage (Simpson 1971). In the central Appalachians of West Virginia, Stewart and Aldrich (1949) noted that cutting over of spruce forests had little effect on the zonal affinities of the bird populations in the Cheat Mountains; but when cutting was followed by fires, there was a dramatic change favoring the influx of bird species more characteristic of the so-called Austral Zone at lower elevations. A similar phenomenon has apparently occurred in the Shining Rock area, where natural reproduction of spruce, fir, and northern hardwood species is negligible in severely burned areas, leading to the establishment of breeding bird species more typical of lower elevations in the southern Appalachians.

Although helpful in understanding the breeding bird populations at Shining Rock, the broad categories of habitat preference discussed above represent a simplification of the complex events in avian and plant succession in the Wilderness and vicinity. Many birds show a decided "edge" effect, as with Northern Saw-whet Owls preferring open transition mixtures of spruce-fir and hardwood forests. The Field Sparrow, Indigo Bunting, and Eastern Bluebird use the irregular border between grass balds and open secondary successional communities of medium to advanced age. The various successional communities often have distinctly different breeding species or relative numbers of those present. Most bird species are not strictly confined to any single community or stage, and the continuum of secondary stages is reflected in a complex and ever-changing continuum of breeding bird species. The general trend is toward an increasingly "forest" composition of bird life at the expense of those invading species that appear when the canopy is damaged or removed. The speed with which these changes occur depends in large measure on the extent of soil damage, which strongly influences the rate and pattern of revegetation.

Breeding bird populations in oak and cove hardwood forests of low and intermediate elevations at Shining Rock, where fire damage has been absent or less severe than in the spruce-fir forests, are similar to those in comparable habitat in the Great Smoky Mountains (Stupka 1963), at Grandfather Mountain (Lee 1985, Lee et al. 1985), in the Unicoi Mountains (McConnell and McConnell 1983), and in the Plott Balsam Mountains (Simpson 1976b). The general absence of shorebirds, waterfowl, and herons at elevations above 1000 m is also typical of other high mountain ranges in the southern Blue Ridge province, such as the Black Mountains (Burleigh 1941, Simpson 1972c), the Plott Balsam Mountains (Simpson 1976b), and the Great Smoky Mountains (Stupka 1963).

Other noteworthy changes in the breeding bird populations of the southern Appalachians are reflected in the Wilderness area. The Golden Eagle and the Peregrine Falcon, once rumored to nest near Shining Rock, had disappeared by the 1950s. Subsequently, they have been found almost entirely during migration and winter, despite local hacking projects in the 1980s. Bewick's Wren was among the most abundant breeding birds in the region during the

1800s (Brewster 1886; Cairns 1889, 1891; Simpson 1980), but apparently the species has been virtually extirpated from the southern Appalachians, including the Shining Rock area where it was last recorded in the 1950s (Simpson 1978a).

Other species have invaded the region and become established as breeders, extending their nesting ranges over considerable distances. The Song Sparrow, which formerly occurred only as a winter resident in North Carolina, rapidly expanded its range down the Appalachian chain during the 1890s and early 1900s and is now among the most conspicuous breeding species in disturbed areas of the region (Simpson 1975). More recently, Alder Flycatchers have colonized the southern Appalachians, pressing southward into and beyond the Wilderness (Young 1984, Simpson 1992). The Northern Goshawk, also extending its range southward in the Appalachians, has been observed in the Shining Rock Wilderness, although its status there is not certain.

Several other species have expanded their breeding range down the Appalachian crest but have not become established at Shining Rock (Simpson 1992). Although John S. Cairns reportedly took a nest of the Magnolia Warbler in the Craggy Mountains during the 1890s (Pearson et al. 1919), this species was regarded as breeding only from West Virginia northward until recent years, when a steady southward push brought summer records at Roan Mountain, Grandfather Mountain, the Black Mountains, the Unaka Mountains, and Richland Balsam. Likewise, the Hermit Thrush and the Purple Finch appear to be extending their summer ranges southward. As of 1992, however, none of these species had been observed in the Shining Rock Wilderness during the breeding season. Brown-headed Cowbirds (*Molothrus ater*) have become fairly common and conspicuous residents through much of the southern Appalachians during the past 50 years, but the species has not yet been observed at Shining Rock Wilderness. Future observers should be alert for evidence of continued range expansion by these and other species.

In addition to producing changes in breeding populations, the alterations in habitat have affected the winter bird populations at Shining Rock. In early autumn and winter, species that feed on the spruce-fir cone crop, such as Red Crossbills, American Goldfinches, and Pine Siskins, appear more likely to abandon the Shining Rock area than they are to leave the Great Smoky Mountains (Stupka 1963) or the Black Mountains (Burleigh 1941, Simpson 1972c). On the other hand, the Golden Eagle occurs as a rare but apparently somewhat regular winter visitor in the Shining Rock Ledge area. The extensive open tracts of grassy terrain covering many of the higher peaks provide a foraging area for the eagle and also for the Northern Harrier. Controlled burnovers have been conducted just south of the Wilderness area in an effort to preserve tracts of habitat that are attractive to the eagle.

The present study provides a baseline for further work in Shining Rock Wilderness and adjacent areas. Specific nesting records need to be documented for most summer residents; and more data are needed on dates of occurrence, elevation range, and habitat selection. With its diversity of plant community types and successional stages, Shining Rock Wilderness provides an excellent site for detailed and quantitative studies of the relationship between vegetation and bird populations in the high elevations of the southern Blue Ridge Mountain Province. The Shining Rock area is part of the southernmost extension of the disjunct relict spruce-fir forests of the eastern United States, thus providing a valuable field site for monitoring the southward expansion of northern breeding species down the Appalachian Mountains and for evaluating the continued environmental changes in the region's boreal community.

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ILLUSTRATIONS

Margaret Cotrufo, N.C. State Museum: front cover (Common Raven), title page (Northern Saw-whet Owl), 16-17 (map).
Barry Nehr, Bill Duyck, and USDA Forest Service: 4.
John Henry Dick, reprinted from *The Chat*: 12 and outside back cover (Ruffed Grouse).
Ann Cotrufo Nash, museum volunteer: 16-17 (map).
H. Douglas Pratt, reprinted from *The Chat*: 10 (Red-breasted Nuthatch), 21 (Solitary Vireo), 23 (Black-throated Green Warbler).
John W. Taylor, courtesy of N.C. Wildlife Resources Commission: 2 (Tufted Titmouse, White-breasted Nuthatch), 18 (Blue Jay), 26 (Dark-eyed Junco), 32 (Song Sparrow).
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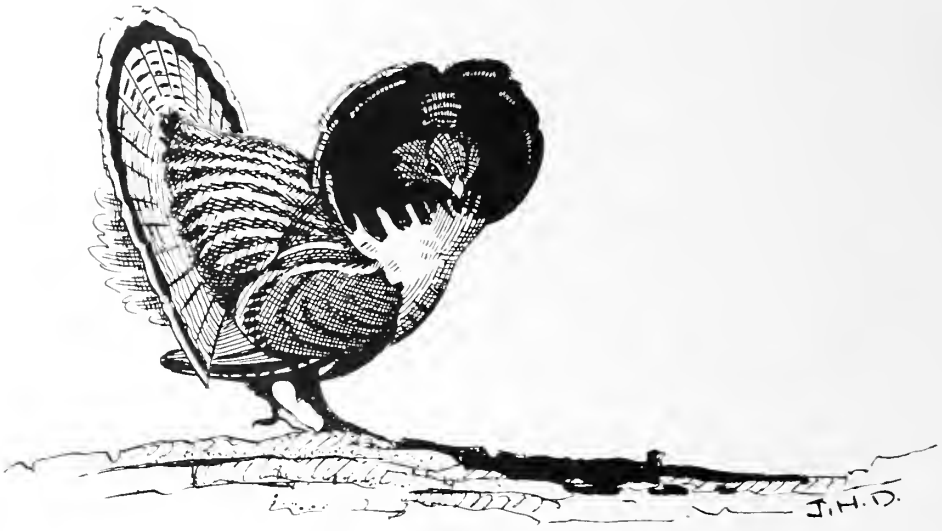
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