Terrestrial Resources of the Big Creek Watershed

The Big Creek (BC) watershed provides a diverse landscape for wildlife with ample hunting and Naturewatch opportunities for the public. Terrestrial habitats, management indicator species, and demand species identified in the Cherokee National Forest (CNF) Revised Land and Resource Management Plan (RLRMP) that occur in the BC watershed on Forest Service lands are discussed in this report.

Habitats

Major Forest Communities

Mesic deciduous forests (MDF) include northern hardwood, mixed mesophytic hardwood, bottomland hardwood, and dry (xeric) to moist (mesic) oak forest communities. They cover a major percentage of the CNF (USDA Forest Service 2004), and are the most prominent forest community in the BC watershed (Figure 1). These forests often have a high diversity of herbaceous plants in the understory or may have dense shrub layers. Over 200 species with viability concerns on the CNF are associated with these communities.

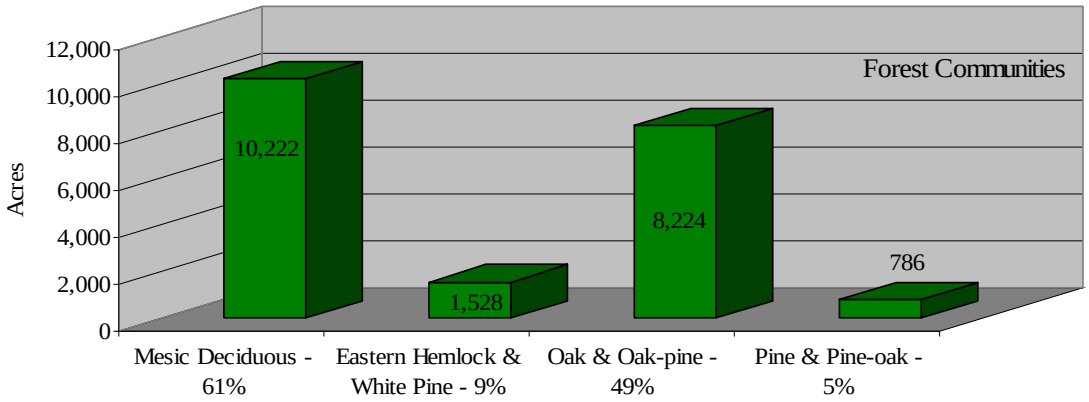
Eastern hemlock and white pine forests (HWPF) include conifer-northern hardwood communities. These forests typically occur over acidic soils in moist areas, but sometimes occur on dry slopes. Many of the white pine forests are old plantations. HWPF cover a small portion of the CNF (USDA Forest Service 2004), and likewise in the BC watershed (Figure 1). The amount of eastern hemlock on the CNF is dropping and is expected to be greatly reduced by the infestation of hemlock wooly adelgid (HWA). These forests generally have low abundance and/or diversity of herbaceous plants, but may have dense shrubs (rhododendron) and rich bryophyte communities. Their canopies shade and cool riparian systems and provide cover and nesting habitat for wildlife. Some species adapted for higher elevations may be found at lower elevations in hemlock forests.

Oak and oak-pine forests (OOPF) occur in dry to moist conditions. These forests cover a large part of the CNF (USDA Forest Service 2004) and dominate the BC watershed (Figure 1). OOPF provide acorns, an important food source, and dens for many species of wildlife. ***Mast Production*** is greatest in mid to late-successional oak forests. Hard mast production fluctuates from year to year due to climatic and other factors. Most oaks begin to produce acorns from 40 years of age, although production decreases in later years (USDA Forest Service 2004). Roughly half of the acres of the BC watershed contribute measurably to mast production.

Pine and pine-oak forests (PPOF) include all southern yellow pines with hardwoods as minor components. Historically, these forests typically occurred on ridges and south facing slopes where they were subject to natural fire regimes, but expanded due to past land uses. PPOF are well distributed across the CNF, but have been severely impacted

by southern pine beetles (SPB) (USDA Forest Service 2004). They contribute only a small portion to the BC watershed (Figure 1), including a Table Mountain pine forest on Round Mountain. Many fire-adapted or disturbance-dependant species depend on these forests for habitat.

Figure 1. Composition of forest communities the BC watershed.



Successional Forest Habitats

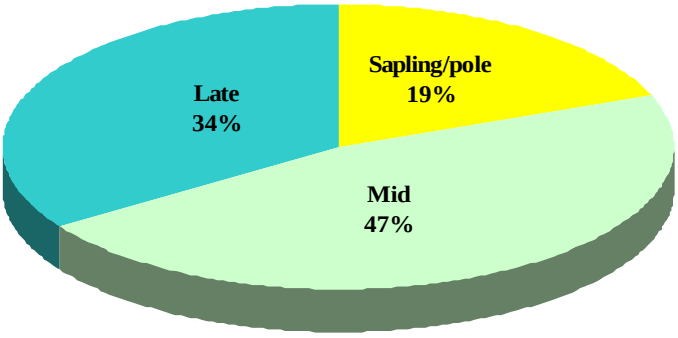
Early-successional forests (ESF) are regenerating forests from zero to ten years old, not including permanent openings. These forests are short-lived and dominated by relatively dense, young trees where an overstory is absent or sparse. The amount of ESF on the CNF (1%) has been and continues to be very low. Only six acres of ESF (0.04%) exists in the BC watershed (Figure 2). Early-successional forests are important to a wide variety of wildlife species. This habitat provides a diversity of food sources, high productivity of forage, soft mast, insect production, and for nesting and escape cover. Many species associated with late-successional forests also use early successional forests periodically, or depend upon them during some portion of their life cycle. The abundance of these forests is sporadic and declining on National Forests in the Southern Appalachians and the eastern U.S. (USDA Forest Service 2004).

Sapling/pole forests (SPF) are between 11 and 40 years old. Although timber harvesting has declined drastically in the last 20 years, a moderate amount of this habitat is available on the CNF (14%) and a comparable amount (19%) in the BC watershed (Figure 2). These forests are generally of least value to wildlife because closed canopies limit understory development and trees are not yet large and old enough to begin producing mast or other wildlife benefits. However, this successional stage does provide value as dense cover for some species such as ruffed grouse (USDA Forest Service 2004).

Mid-successional forests (MSF) are between 41 and 80 years old. A large amount of the CNF is in the mid-successional stage (31%), but the amount in the BC watershed (Figure 2) is much higher (47%). These forests begin to develop a more diverse canopy structure, functioning like late-successional forests. They provide suitable habitat for many wildlife species, but a lower quality than late-successional forests (USDA Forest Service 2004).

Late-successional forests (LSF) are 81 years or older. They provide habitats and food sources for a group of habitat specialists as well as habitat generalists. These forests provide high canopy nesting, roosting, and foraging habitat, tree cavities, and relatively large volumes of seed and hard mast. They dominant the Southern Appalachians and the CNF and continue to increase (USDA Forest Service 2004). At least half of the CNF is in late-successional forest, but the amount of LSF is considerably lower (34%) in the BC watershed (Figure 2).

Figure 2. Composition of successional forest habitats in the BC watershed.



Other Terrestrial Habitats

Permanent openings are composed of a variety of grasses, broadleaf non-woody plants, seedlings, saplings, and shrubs. They include frequently maintained openings, old fields, utility right-of ways, and improved pastures. These openings are important habitats within forested areas and are used by a variety of wildlife. Openings provide travel corridors, foraging, nesting, brood-rearing, and roosting habitats. Permanent openings comprise less than one percent of the CNF landscape (USDA Forest Service 2004) and are comparible in the BC watershed (102 acres). Over one-third of these permanent openings are powerline corridors, and the remaining acres are wildlife openings and mountain balds.

High elevation shrubby habitats include woodland complexes, old fields, and regenerating forests 0-10 years old. These habitats overlap with permanent opening habitats (old fields). Several wildlife species are dependant on these types of habitat strictly at high elevations. High elevation shrubby habitats have been declining as a result of succession of old fields, fire suppression, and reduced management activities, and this has put associated species at risk (USDA Forest Service 2004). Open, shrubby habitats represent four percent of the CNF high elevation acreage. Although over half of the BC watershed is high elevation, less than one acre of this habitat is present.

Riparian habitats include the transition between aquatic systems and terrestrial systems. These areas often provide rich, moist environments, serve as corridors for animal movement, and connect habitats and populations. Input of plant material, particularly large woody debris (LWD), from riparian habitats is one of the most important processes for stream ecosystems. Riparian forests make up almost a quarter of the CNF (USDA Forest Service 2004) and 16% (2,642 acres) of the BC watershed.

Snags, dens, and downed wood are important components to both aquatic and terrestrial habitats. They are typically most abundant in late-successional forests. Snags and downed wood along streams provides energy, nutrients, and structure to stream, creates refuges from drought and flood, and alters movement of sediment downstream (Dolloff and Webster 2000). An average of 183 snags and hemlock trees per mile along the streams in the BC watershed may contribute LWD over the next 10 years. Snags provide birds with nesting and feeding sites, perches, and lookouts. Bats roost and live in maternity colonies in cavities and under loose bark. Amphibians, reptiles, small mammals, and invertebrates utilize wood as dens, cover, travel ways, and feeding areas. Turtles and snakes use logs for basking and sunning. Fungi and other decomposers of woody debris are key components of food webs. Rotting wood tends to absorb moisture during wet periods and release it in dry periods thus helping to maintain a cooler microclimate (USDA Forest Service 2004).

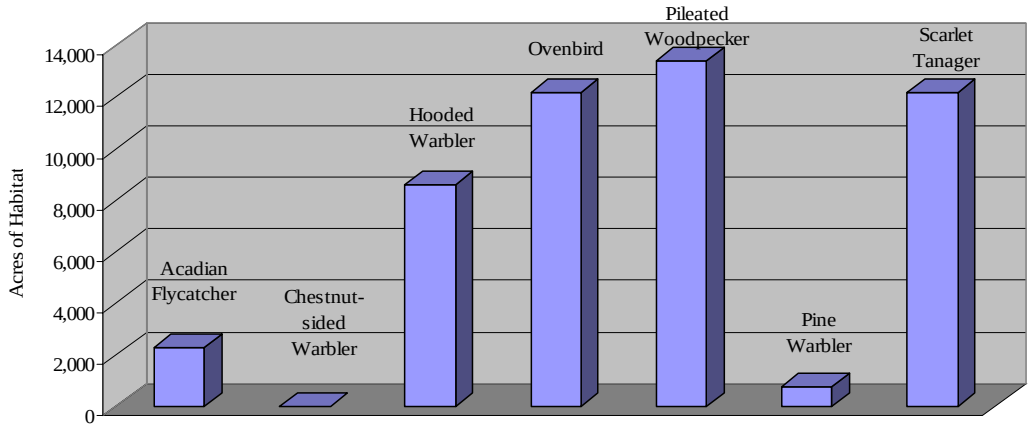
Availability of snags, dens, and downed wood is currently not considered a limiting factor on the CNF. It has increased due to SPB outbreaks and will continue because of HWA infestation over the next ten or more years. It is expeced to gradually increase over the long-term as the average age of forest communities in the CNF and the BC watershed continues to increase (USDA Forest Service 2004).

Wildlife Species

Management Indicator Species

Management indicator species (MIS) for the CNF are birds monitored yearly across the Southern Region and CNF, including four points in the BC watershed. Population trends on NF lands in the Blue Ridge and CNF have been gathered from the Southern National Forests bird monitoring program, 1992-2004 (La Sorte et al 2007). Information on long-term population trends (1966-2006) has been gathered from the USGS Breeding Bird Survey (Sauer et al 2007) for the Blue Ridge Region. Potential habitat available in the BC watershed for MIS is listed in Figure 3.

Figure 3. Potential MIS habitat available in the BC watershed.



Acadian flycatcher (*Empidonax virescens***)** breeds in most of the eastern half of the U.S. and winters in South America (NatureServe 2007). It requires deciduous forests near streams for breeding. It prefers forests with a high, dense canopy and few shrubs at elevations lower than 3500 feet in elevation (Nicholson 1997). Approximately 2,284 acres of mature riparian forests are available in the BC watershed (Figure 3).

This species was selected as a MIS to represent mid- and late-successional riparian forest habitat. Surveys on NF lands in the Blue Ridge and the CNF indicate population declines in the last decade (Figure 4). Long-term Acadian flycatcher populations trends in the Blue Ridge region also appear to be negative.

Figure 4. Population trends for Acadian flycatchers, 1992-2004.

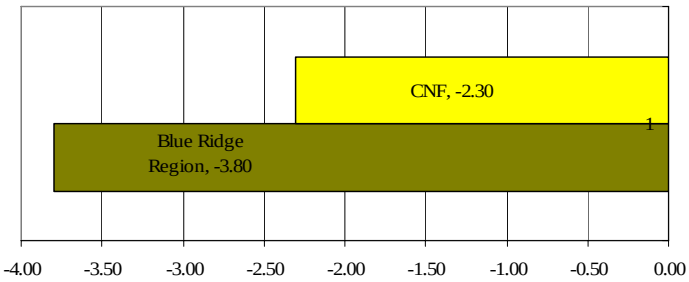


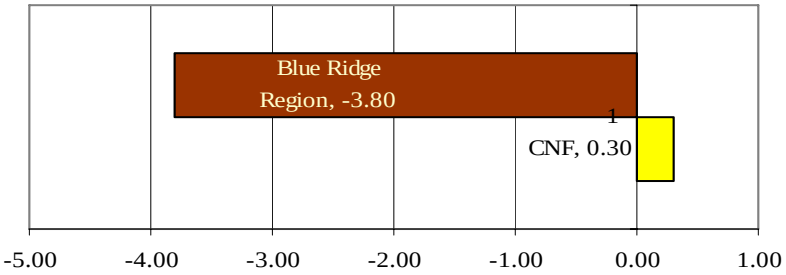
Photo: George Peck
(Carolinian Canada 2008)

Chestnut-sided warbler (*Dendroica pensylvanica*) breeds in most of the eastern half of the U.S. and winters in Mexico, South America, and the Carribean Islands (NatureServe 2007). It is common above 3,000 feet in elevation in forests with an open canopy and dense shrub layer. These birds prefer deciduous brush and young growth in abandoned farms, orchards, and pastures, cutover forests, roadsides, thickets, and clearings (Dunn and Garrett 1997). Less than one acre of high elevation open, shrubby habitat is available in the BC watershed (Figure 3).

The chestnut-sided warbler was selected as a MIS to represent high elevation early successional forests (shrubby habitats). Surveys on NF lands in the Blue Ridge indicate population declines in the last decade, but populations on the CNF appear to be stable (Figure 5). Long-term populations trends in the Blue Ridge region appear to be slightly negative.

Figure 5. Population trends for chestnut-sided warblers, 1992-2004.

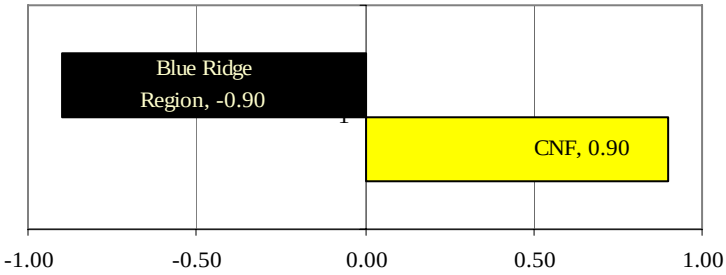
(Wikipedia 2008)



Hooded warbler (*Wilsonia citrina*) breeds in most of the eastern half of the U.S. and winters in Mexico, Central America, and the Carribean Islands (NatureServe 2007). It is found in moist deciduous forests with fairly dense understories (Hamel 1992). Approximately 8,623 acres of mature MDF are available in the BC watershed (Figure 3).

Hooded warbler was selected as a MIS for mid-late successional MDF with canopy gaps and structurally diverse understories (USDA Forest Service 2004). Surveys on NF lands in the Blue Ridge indicate slight population declines in the last decade, but populations on the CNF appear to be slightly increasing (Figure 6). Long-term populations trends in the Blue Ridge region appear to be slightly positive.

Figure 6. Population trends for hooded warblers, 1992-2004.

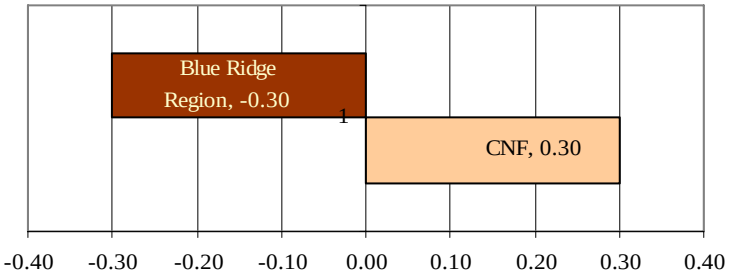


(FMNH 2008)

Ovenbird (*Seiurus aurocapillus***)** breeds in most of northern and eastern U.S. and winters in Mexico, Central America, and the Carribean Islands (NatureServe 2007). It typically nests in older closed-canopied deciduous and mixed deciduous-coniferous forest with deep litter layer and limited understory. Large, contiguous forested tracts are needed to support successful breeding and long-term population viability (USDA Forest Service 2004). Approximately 12,192 acres of mature deciduous or mixed forests are available in the BC watershed (Figure 3).

This species was selected as a MIS because of its association with mature deciduous forest interiors. Surveys on NF lands in the Blue Ridge indicate population declines in the last decade, but populations on the CNF appear to be slightly increasing (Figure 7). Long-term populations trends in the Blue Ridge region appear to be slightly negative.

Figure 7. Population trends for ovenbirds, 1992-2004.



(FMNH 2008)

Pileated woodpecker (*Dryocopus pileatus*) is a permanent resident across most of the eastern U.S., portions of the northwest and across Canada (NatureServe 2007). It requires large cavity trees for nesting and forages on dead trees and downed logs across a variety of community types. The occurrence of this species may be correlated with forested habitats with abundant large dead trees and fallen logs (USDA Forest Service 2004). Approximately 13,418 acres of mature forests are available in the BC watershed (Figure 3).

Pileated woodpecker was selected as an MIS because it requires large snags for nesting and feeding. It was also selected to help indicate the effects of management activities on the availability of forests with desired abundance of snags. Surveys on NF lands in the Blue Ridge indicate population declines in the last decade, but populations on the CNF appear to be increasing (Figure 8). Long-term populations trends in the Blue Ridge region appear to be positive.

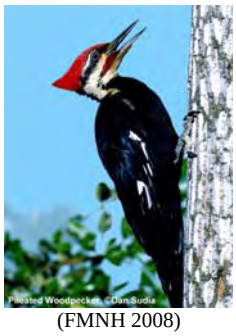
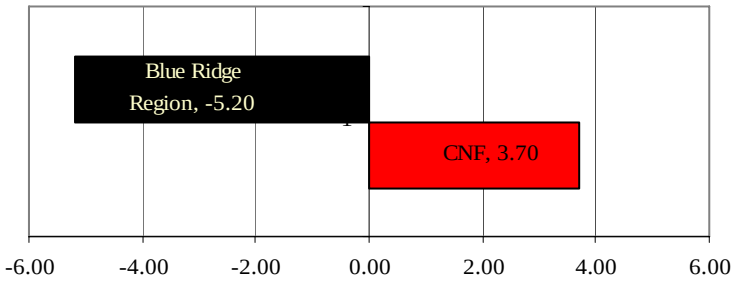

(FMNH 2008)

Figure 8. Population trends for pileated woodpeckers, 1992-2004.

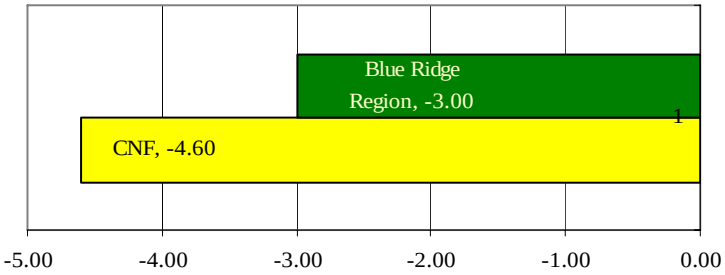


Pine warbler (*Dendroica pinus*) breeds in portions of the northeastern U.S., including the Southern Appalachians and is a permanent resident or winters in the southern U.S. and the Carribean Islands (NatureServe 2007). This bird inhabits open pine and pine/hardwoods forests with sparse understory. It occurs in lower densities in white pine stands (Nicholson 1997). Approximately 753 acres of mature pine and pine/hardwood forests are available in the BC watershed (Figure 3).

The pine warbler was selected as a MIS to represent mid to late-successional pine forests. Surveys on NF lands in the Blue Ridge and on the CNF indicate population declines in the last decade (Figure 9). Declines in the CNF are a result of recent extensitve southern pine beetle kills. Long-term populations trends in the Blue Ridge region also appear to be somewhat negative.

Figure 9. Population trends for pine warblers, 1992-2004.

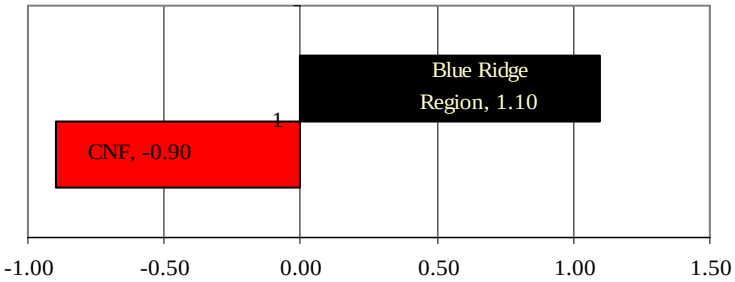
(FMNH 2008)



Scarlet tanager (*Piranga olivacea*) breeds in most of the eastern half of the U.S. and winters in South America (NatureServe 2007). Primary habitat includes mature deciduous forests, especially in uplands; they also breed in bottomlands (Hamel 1992). Approximately 12,192 acres of mature deciduous or mixed forests are available in the BC watershed (Figure 3).

The scarlet tanager was selected as a MIS to represent oak and oak/pine forests. Surveys on NF lands in the Blue Ridge indicate population increases in the last decade, but populations on the CNF appear to be slightly decreasing (Figure 10). Long-term populations trends in the Blue Ridge region appear to be negative.

Figure 10. Population trends for scarlet tanagers, 1992-2004.

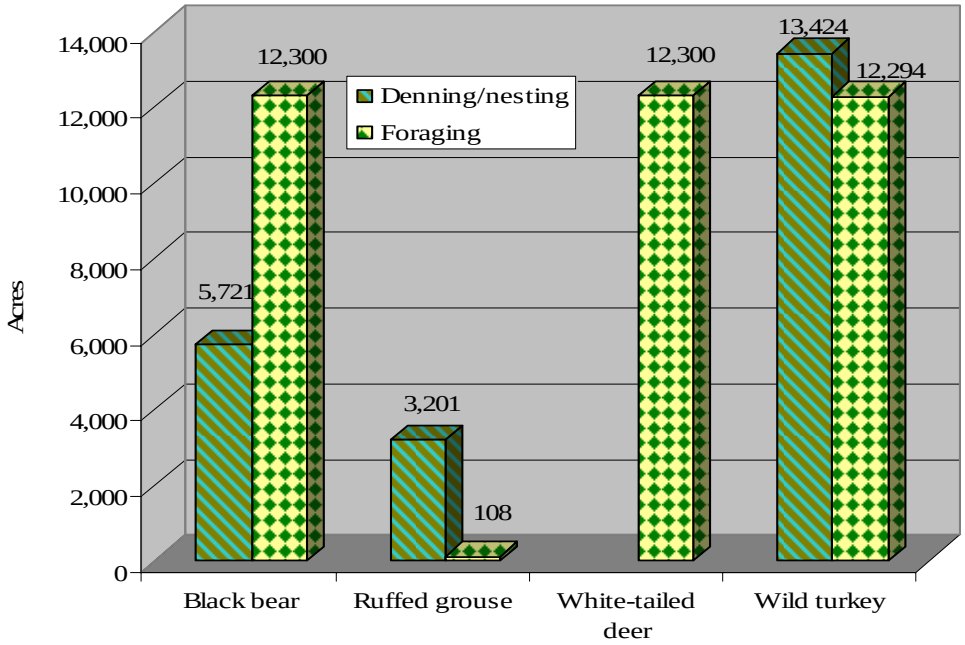


(FMNH 2008)

Demand Species

Providing quality habitat for game species is an important aspect of CNF management. Hunting is an American tradition crossing all boundaries including age, race and economic status. Hunting in Tennessee alone has an economic impact of over one billion dollars (IAFWA 2002). Demand species in the CNF include four of the most popular hunted wildife. Hunting and population management are regulated by Tennessee Wildlife Resources Agency (TWRA). Information on population trends is gathered primarily from harvest data. Potential habitat available in the BC watershed for demand species is displayed in Figure 11.

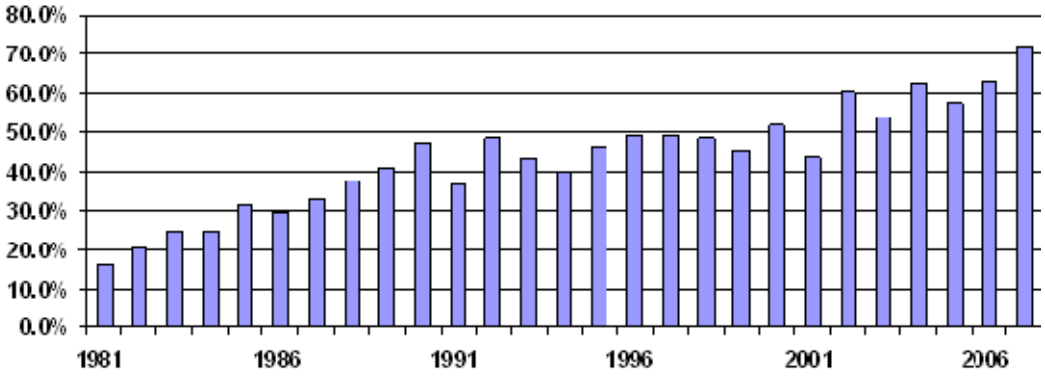
Figure 11. Demand species habitat available in the BC watershed.



Black bear (*Ursus americanus***)** uses a wide variety of habitats in the Southern Appalachians. Important habitat elements include remoteness and diversity, hard mast, den sites, and large home ranges (USDA Forest Service 2004, Whitaker and Hamilton 1998). Black bear was selected as a MIS to help indicate management effects on meeting hunting demand for this species. About one-third of the BC watershed may provide potential denning habitat (LSF), and the majority of the forests in the watershed provide foraging habitat (Figure 11).

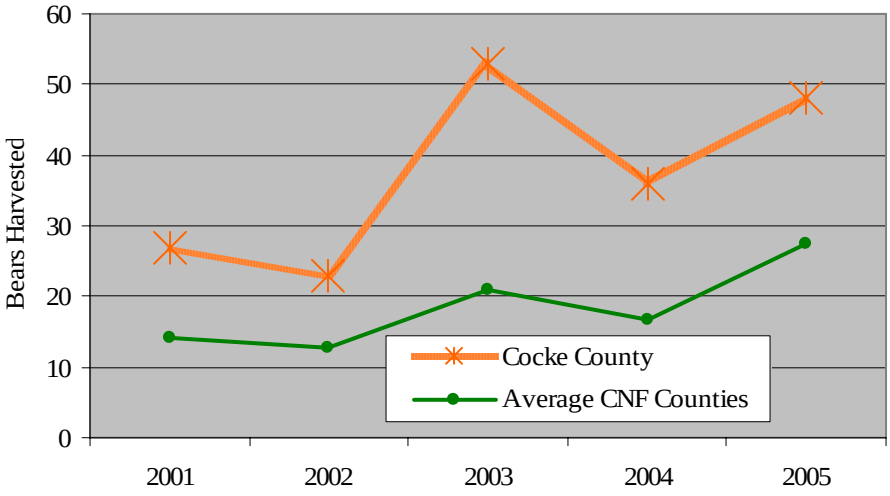
Black bear populations throughout the southeast have increased considerably over the last 20 years on the CNF (USDA Forest Service 2004). TWRA bear bait station surveys, including a station from the BC watershed, from 1981 to 2007 (Figure 12) indicate this increase (TWRA 2008b). These trends are due to increases in older oak forests, increased protection, and conservative hunter harvest (SAMAB 1996).

Figure 12. Tennessee Black Bear Bait Station Index, 1981-2007.



No bear sanctuaries are located in Big Creek watershed. Trend data shows a fluctuating bear harvest from 2001 to 2005, generally increasing across the CNF (Figure 13). Harvest in Cocke County reflects the same trends, but at an above averagle level (TWRAa 2008).

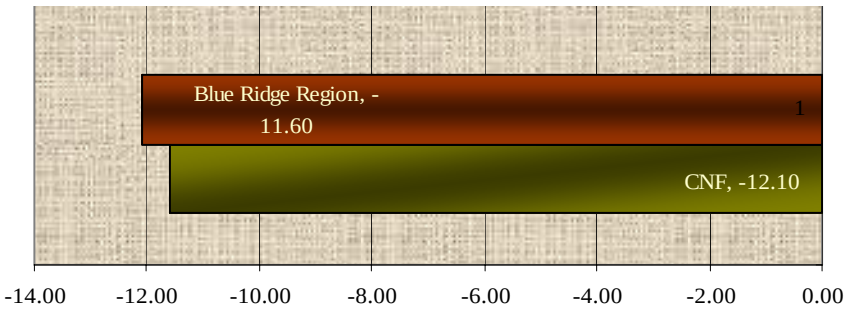
Figure 13. Bear harvest for CNF counties, 2001-2005.



Ruffed grouse (*Bonasa umbellus*) utilize a variety of forest habitats and successional stages. Grouse generally nest in pole timber (or larger) hardwood stands. Dense and diverse herbaceous vegetation, offering low overhead cover and easy movement, provides high quality brood habitat. Adults use cover in young forests (6-15 year-old) or shrubby habitats, but also use older stands with dense cover. Close proximity of nesting habitat to secure adult cover and brood habitat is critical. Grassy areas are important brood habitat and bugging areas for young. Linear openings, especially those associated with young regenerating forests provide optimal brood habitat (USDA Forest Service 2004). Less than 20% of the BC watershed is suitable for nesting habitat (SPF) in the BC watershed, and less than one percent (ESF & PO) provides optimal foraging habitat (Figure 11).

According to the Ruffed Grouse Conservation Plan (Dessecker et al 2007), grouse populations in the southern portion of the range exist at relatively low densitites. Breeding population densities are declining (-6% trend) in conjunction with young forest habitats. Harvest data for ruffed grouse in east Tennessee is not available. USGS breeding bird surveys from 1966 to 2004 indicate negative trends for ruffed grouse populations. NF bird monitoring data from 1992 to 2004 (Figure 14) shows a large decrease in numbers in the Blue Ridge region, including the CNF (La Sorte et al 2007).

Figure 14. Population trends for ruffed grouse, 1992-2004.

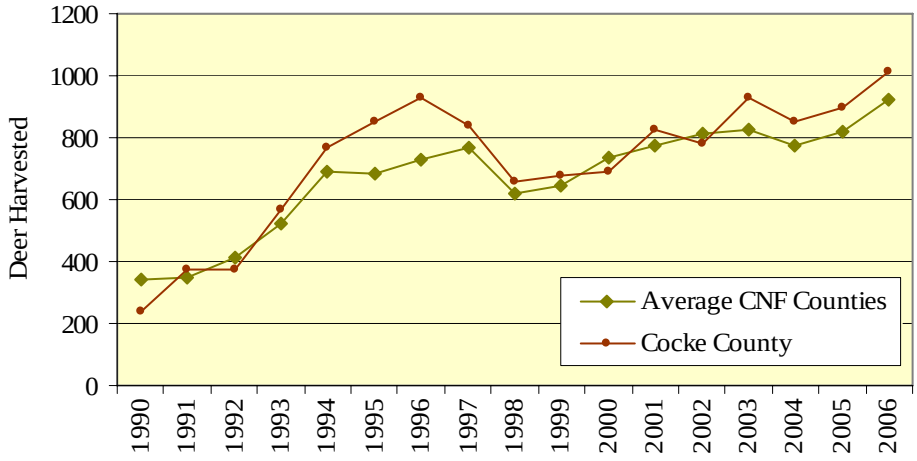


White-tailed deer (*Odocoileus virginianus*) use a variety of forest types and successional stages to meet their year-round needs. In the Southern Appalachians, regeneration areas and older forests provide complimentary benefits to deer. Older forests are most important in fall and winter providing acorns, the dominant food item. In spring and summer, regeneration areas provide an abundance of food (woody browse, herbs, fungi, soft mast), which is limited in older forests. Wildlife openings, especially those containing a clover-grass mixture, are used most extensively in early spring. They are also an important source of nutritious forage in winter, especially when acorns are in short supply (USDA Forest Service 2004). The majority of the acres in the BC watershed provide foraging habitat for deer (Figure 11).

Deer densities have greatly increased in the last 25 years, likely as a result of extensive restoration efforts, protection, and conservation harvest strategies, as well as increased acorn capability resulting from the increase in mid- to late–successional oak forests (USDA Forest Service 2004).

TWRA deer harvest data for CNF counties indicate an overal increase since 1990, with harvest in Cocke County reflecting the same (Figure 15). The Cocke County population continues to grow despite a limited amount of quality habitat in the mountains (TWRA 2008d).

Figure 15. Deer harvest for CNF counties, 1990-2006.



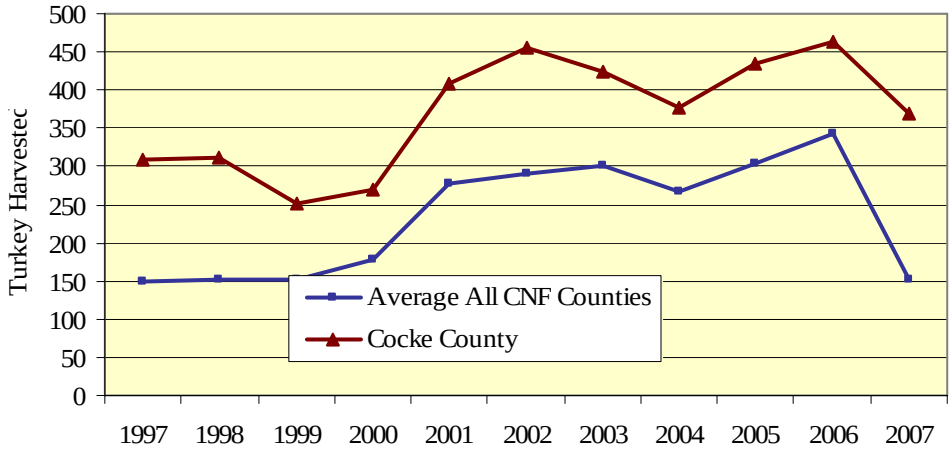
Wild turkey (*Meleagris gallopavo***)** is present throughout the Southern Appalachians and occupies a wide range of habitats. This includes mature mast-producing stands during fall and winter, shrub-dominated stands for nesting, and herb-dominated communities, including clearings for brood rearing. High population densities are associated with greater amounts of oak forest and cropland, and lesser amounts of developed and coniferous forestland. Forest openings also are a key habitat component for wild turkeys throughout the year. Permanent openings provide nutritious green forage in the winter and early spring and seeds during late summer and fall. Because of the abundance of insects and herbaceous plants, they are especially important as brood rearing habitat for young turkeys (USDA Forest Service 2004). Potential nesting habitat is available in about 80% of the BC watershed and foraging habitat is also very abundant (Figure 11).

(Wikipedia 2008)

Before the 1970's, wild turkeys were essentially absent from the northern CNF. Wild turkey populations have expanded in range and density over the past 25 years (USDA Forest Service 2004), primarily from the restoration efforts and management of TWRA. Turkey hunter numbers have been increasing and are projected to continue for the next 15 years.

The number of turkeys harvested (spring) in the counties of the CNF (Figure 16) has fluctuated over the last decade and generally increased with the exception of 2007. Harvest in Cocke County reflects the same trends, but the numbers are above average. With these healthy populations of turkeys temporary local population declines (contributed to weather unfavorable to poult survival) can be absorbed by a wider population distribution without a major drop in total harvest (TWRA 2008c).

Figure 16. Spring turkey harvest for CNF counties, 1997-2007.



Non-native Invasive Species

A multitude of invasive, non-native plants threaten the integrity of native ecosystems in the Southern Appalachian area. Many occur in the BC watershed (Table 1), although the abundance is relatively low when compared to many areas across the CNF. Most of these plants are associated with road corridors, trails, riparian areas, wetlands, and forest edges. Eight species found in the watershed are recognized in the RLRMP as having significant occurrences with a high potential for impacts to native communities on the CNF. These must be tracked as they are encountered. At least eight other non-native plants not on the tracking list have been found in the watershed.

Table 1. Non-native invasive species of the BC watershed.

Scientific Name	Common Name	Tracked in RLRMP
Ailanthus altissima	Tree-of-heaven	Yes
Barberis thunbergii	Japanese barberry	No
Celastrus orbiculatus	Oriental bittersweet	No
Coronilla varia	Crown vetch	No
Dioscorea batatas	Cinnamon vine	No
Pueraria montana var. lobata	Kudzu	Yes
Lespedeza cuneata	Sericea lespadeza	Yes
Ligustrum sinense	Chinese privet	Yes
Lonicera japonica	Japanese honeysuckle	Yes
Microstegium vimineum	Nepal grass	Yes
Miscanthus sinensis	Chinese silvergrass	No
Paulownia tomentosa	Princess tree	Yes
Spiraea japonica	Japanese spiraea	No
Rosa multiflora	Multiflora rose	Yes
Vinca minor	Common periwinkle	No
Tussilago farfara	Coltsfoot	No

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April 11, 2008