

**A Comparative Winter Vertebrate Survey of Similar Ecosystems  
at King College Campus and Steele Creek Park  
in Bristol, Sullivan County, Tennessee**

Submitted to  
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## Table of Contents

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I.	Introduction	1
II.	Literature Review	2
III.	Design and Methods	4
IV.	Results	10
V.	Discussion	22
VI.	References	26
VII.	Appendix	27

## **Introduction**

The purpose of this study was to survey winter vertebrate life in two very similar ecosystems at distinct locales within Bristol, Tennessee (Sullivan County). It was designed to document the different types of vertebrate animals and provide a rough assessment of abundance on a portion of the King College campus in comparison to Steele Creek Park. The methods focused primarily on visible vertebrates, although some other forms of sampling were employed such as baited observations and aquatic surveys. One objective of this survey was to give some baseline data to which data from future studies could be compared.

Another objective of this project was to provide information that will hopefully be helpful to King College as they begin the expansion of the campus. Therefore, three related habitat types were chosen at each locale (two examples of each).

This project was undertaken in order to complete the required hours for a biology minor at King College.

## Literature Review

An ecosystem can be defined as a unit that includes all the organisms in a particular area that are interacting with the environment; whereas a community is composed of all the living organisms in a given area. Ecosystems are capable of self-regulation and self-maintenance. Such control depends on feedback. If the feedback is positive, the quantity of organisms grows. However, negative feedback is also essential for control. It has been noted that maintaining the equilibrium between organisms and environment may be due to the resistance of change to the system (Odum 8-9). Maintenance of homeostasis by units in an ecosystem (regulation) requires close interaction between the organisms. Two important components of successful regulation of a community or ecosystem are communication and coordination. Communication, at the organismal level, is defined as action taken by one organism that changes the probability of a behavior in another organism in an adaptive way. Coordination is the interaction of units of a group so that the effort is divided among the units without any one unit assuming leadership over the others (Wilson 8-9).

Many organisms live in groups for reasons of safety and supportive behaviors. The costs and benefits of such group living are influenced by food and predators. This can be illustrated by the feeding behaviors of sparrows. When a sparrow comes upon a food source that is divisible, they give a chirrup to call other sparrows and they feed together; however, if the food source is indivisible, the sparrow will feed alone. It has been recorded that sparrows scan less when feeding in groups. Thus, organisms demonstrate a rather complex

understanding of which situations will benefit them the most (Krebs & Davies 132-134). Many organisms, such as titmice, form mixed species groups in order to aid in finding food and detecting predators. This can sometimes be seen in birds and squirrels when feeding. The birds feed on insects that are stirred up by the squirrels; the birds also provide earlier warning of predators for the squirrels (Halliday 107).

Other threats with which organisms are faced, are man-made. These include pollution and habitat destruction. Some organisms are very adaptive and learn to live successfully in changing environments. However, the majority of species are not this lucky. Therefore, unless human behavior is altered, the environment will only be able to support a small fraction of the species that now inhabit the world (Halliday 133-139). Humans must be custodians of the organisms that are here now.

## Design and Methods

### Description of Study Areas

The study areas were located either on the campus of King College or within the boundaries of Steele Creek Park, both of which are located in Sullivan County Tennessee. King College is located near the Tennessee/Virginia border. Steele Creek Park is approximately four miles west of King College.

In order to get an accurate estimate of the types of vertebrate animals in differing habitats at both King College and Steele Creek Park, six study areas were chosen at each location (2 forested areas, 2 manicured grass areas, and 2 edge habitat areas). There were a total of 12 study areas for this project.

To ensure accuracy of the comparison between Steele Creek Park and King College, the areas were as similar as time, safety and availability would allow. A description of each area follows.

#### **KING COLLEGE SITES:**

**K1 (forested):** The boundaries of this area are a roadway (King College Road) and manicured grass areas. It contains an old, partially fallen fence line and many young trees. It also has heavy underbrush in spots and a large pile of dirt and brush that was placed there months before this project began.

**K2 (manicured grass):** This area is lined with Eastern White Pine trees (*Pinus strobus*) and a roadway to one side and a building on another side. There are a few other trees scattered throughout the area.

**K3 (forested):** This area contains older, larger trees than K1.

These trees consist of American Sycamore (*Platanus occidentalis*), American Beech (*Fagus grandifolia*), Red Maple (*Acer rubrum*), and European Alder (*Alnus glutinosa*) trees. A trail runs through the majority of this plot. The boundaries include a manicured grass area and a parking lot/roadway. This area also has some areas of heavy underbrush. Cedar Creek, a tributary of Beaver Creek, runs through or along side this plot.

**K4 (edge):** This area is between more densely forested areas and a manicured grass area. It contains a large amount of underbrush and several fallen trees among a mixture of older and younger living trees. The main composition of this area is made up of American Beech, American Sycamore, Maple, and Alder trees.

**K5 (manicured grass):** This area is located on the former college golf course. It includes a golf green, three coniferous trees (Eastern White Pine) and three deciduous trees. About twelve days before the completion of the field data for this project, this area received a great amount of destruction due to the plans for expansion of the campus.

**K6 (edge):** This area is surrounded by manicured grass. It is home to both old and young trees including Black Cherry (*Prunus serotina*) trees. A large amount of dirt had been placed around this area prior to the beginning of this project. There was also a dirt



driving trail through the middle of this area. This trail was continuously muddy and had a very small pool of water at one spot. There is a large amount of underbrush and briars in this plot. This study area also received extensive damage due to campus expansion.

#### **Steele Creek Park Sites:**

**S1 (forested):** This area is located near the Mill Creek Trail. It is a younger, forested area with remains of a fence line and an old logging road. It is home to older trees. The main composition of this area is Eastern White Pine trees and Virginia Pine (*Pinus virginianus*) trees. The boundaries for this area include the trail itself and other markers throughout the forested area. There are numerous fallen trees and little underbrush in this area.

**S2 (manicured grass):** The boundaries of this plot include a line of coniferous trees (Eastern White Pine and Virginia Pine). There are also a couple of young trees scattered throughout. A roadway runs alongside this area on one edge. This area will be developed into grassland, which will be home to grasses native to this region.

**S3 (forested):** This site is on the trail that leads to the dam. A creek (Steele Creek) runs through the middle splitting the area. It consists of two steep hillsides that are home to both young and old trees. These trees included American Sycamore, Northern Red

Oak (*Quercus rubra*), Chestnut Oak (*Quercus prinus*), Silver Maple (*Acer saccharinum*), and Eastern Hemlock (*Tsuga canadensis*).

Natural landmarks mark the boundaries.

**S4 (edge):** This area is located between the roadway (and manicured grass) and the Mill Creek Trail. It is home to mostly young trees and a few older ones. This area is composed mostly of Virginia Pines and Eastern White Pine trees. It has areas of thick underbrush and a few fallen trees. The boundaries are marked by a group of large rocks to one side, the trail, the manicured grass and a section of fallen trees.

**S5 (manicured grass):** This area is part of the Steele Creek Golf Course. It runs parallel to the driving range and has a row of Eastern White Pine and Virginia Pine trees that serve as one of the boundaries. It had a paved drive that ran through it also.

**S6 (edge):** This area is located between the golf course and the trail to the dam. It has a creek that runs through it (Steele Creek) and also a little pool of water at the base of a fallen tree. It includes two hillsides and the flat area in between them. It is home to both old and young trees, including Red Oak, American Sycamore, Chestnut Oak and Eastern Hemlock trees.

## Procedure

This survey was conducted for a total of six weeks beginning 21 February 2000 and continued through 3 April 2000 (three extra observations were conducted to assess damage at some of the King College sites and to be able to include a recent aquatics survey of Mill Creek). There were a total of 55.25 observation hours. This gives an average 9.21 hours of field data per week of the study. Between 21 February 2000 and 6 March 2000, the observations consisted of becoming familiar with the sites and the animals. The next four weeks (7 March 2000 to 3 April 2000) consisted of fifteen to thirty-minute walk-throughs of each area. Fifteen minutes was the more common observation length for King College sites. As for the Steele Creek sites, the observations were usually approximately 20-30 minutes in length. The difference was due to the limited time slots that the observer could actually use to observe at Steele Creek Park. A total of 20 field observations were completed at King College (26 hours total) and 17 were completed at Steele Creek Park (29.25 hours total).

The observations usually consisted of noting what types of animals were seen or heard and in what abundance. The majority of the observations were conducted during the day; however, there were three night observations (26, 28 March, 2 April 2000) in attempt to identify the nocturnal animals of the areas. There were also two aquatics surveys conducted (one at King College on 18 March 2000 and one at Steele Creek Park on 7 April 2000). Each of these was done in 1-1 ½ hours.

In two of the night observations, bait was used in an attempt to attract mammals. None of the day observations involved bait. For a number of the observations, the primary investigator was accompanied by friends, family, and/or interested parties. This was very helpful because it allowed for extra sets of eyes and ears. It was also done to ensure safety of the observers.

## Results

Two abundance systems were used during this study; the first of which was based on the following scale:

A=abundant: 2 per plot per observation

C=common: 1 per plot per observation

F=fairly common: 1 per plot per every other observation

U=uncommon: 1 per plot per week

O=occasional: 1 per plot per every 2 weeks

R=rare: 1 per study; might not be expected.

The first rating scale was for all of the habitats combined at each locale; whereas, the second scale included vertebrate animals found both in the study areas and outside the study plots at each locale (see appendix for detailed definition of this abundance rating).

A total of 29 different species of birds were recorded in the six different study areas (Table I) at both locales. The results for each location (King College versus Steele Creek Park) were very similar in the species found and in abundance. The most common sightings were of American Robins (*Turdus migratorius*), Carolina Chickadees (*Parus carolinensis*), and Song Sparrows (*Melospiza melodia*). However, other species were found to be abundant in these areas also (Table II). Evidence of one Wild Turkey (*Meleagris gallopavo*) scratching was also found in a forested study plot at Steele Creek Park.

TABLE I. Bird species recorded by habitat.

	<u>KC</u> <u>EDGE</u>	<u>SC</u> <u>EDGE</u>	<u>KC</u> <u>FORESTED</u>	<u>SC</u> <u>FORESTED</u>	<u>KC</u> <u>MANICURED</u>	<u>SC</u> <u>MANICURED</u>
Wild Turkey ( <i>Meleagris gallopavo</i> )		X				
Cooper's Hawk ( <i>Accipiter cooperii</i> )			X	X		
Killdeer ( <i>Charadrius vociferus</i> )						X
Mourning Dove ( <i>Zenaida macroura</i> )	X		X	X		X
Eastern Screech-Owl ( <i>Otus asio</i> )				X		
Barn Owl ( <i>Tyto alba</i> )					X	
Belted Kingfisher ( <i>Megasceryle alcyon</i> )	X					
Red-bellied Woodpecker ( <i>Melanerpes carolinus</i> )	X	X	X	X		
Downy Woodpecker ( <i>Picoides pubescens</i> )	X	X	X	X		
Hairy Woodpecker ( <i>Picoides villosus</i> )	X	X	X	X		
Blue Jay ( <i>Cyanocitta cristata</i> )	X	X	X	X	X	X
American Crow ( <i>Corvus brachyrhynchos</i> )	X		X	X	X	
Carolina Chickadee ( <i>Parus carolinensis</i> )	X	X	X	X		
Eastern Tufted Titmouse ( <i>Parus bicolor</i> )		X	X	X		
White-breasted Nuthatch ( <i>Sitta carolinensis</i> )	X	X	X	X		
Carolina Wren ( <i>Thryothorus ludovicianus</i> )	X	X	X	X		
Ruby-crowned Kinglet ( <i>Regulus calendula</i> )	X			X		
Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	X	X	X	X		
Eastern Bluebird ( <i>Sialia sialis</i> )						X
Brown Thrasher ( <i>Toxostoma rufum</i> )		X				
American Robin ( <i>Turdus migratorius</i> )	X		X		X	X
Northern Cardinal ( <i>Cardinalis cardinalis</i> )	X	X	X	X		X
Northern Mockingbird ( <i>Mimus polyglottos</i> )	X	X		X		
Eastern Towhee ( <i>Pipilo erythrophthalmus</i> )	X	X	X	X		
White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	X	X	X	X		

TABLE I (continued). Bird species recorded by habitat.

	KC	SC	KC	SC	KC	SC
	<u>EDGE</u>	<u>EDGE</u>	<u>FORESTED</u>	<u>FORESTED</u>	<u>MANICURED</u>	<u>MANICURED</u>
Chipping Sparrow ( <i>Spizella passerina</i> )						X
Song Sparrow ( <i>Melospiza melodia</i> )	X	X	X	X		X
Dark-eyed Junco ( <i>Junco hyemalis</i> )	X		X			
Common Grackle ( <i>Quiscalus quiscula</i> )			X			
House Finch ( <i>carpodacus mexicanus</i> )				X		X
American Goldfinch ( <i>Carduelis tristis</i> )	X			X		

TABLE II. Abundance of bird species in each locale (combining habitat types).

	KING COLLEGE	STEELE CREEK
Wild Turkey ( <i>Meleagris gallopavo</i> )		R
Cooper's Hawk ( <i>Accipiter cooperii</i> )	R	R
Killdeer ( <i>Charadrius vociferus</i> )		O
Mourning Dove ( <i>Zenaida macroura</i> )	C	U
Eastern Screech-Owl ( <i>Otus asio</i> )		R
Barn Owl ( <i>Tyto alba</i> )	R	
Belted Kingfisher ( <i>Megasceryle alcyon</i> )	R	
Red-bellied Woodpecker ( <i>Melanerpes carolinus</i> )	F	F
Downy Woodpecker ( <i>Picoides pubescens</i> )	F	C
Hairy Woodpecker ( <i>Picoides villosus</i> )	F	C
Blue Jay ( <i>Cyanocitta cristata</i> )	C	C
American Crow ( <i>Corvus brachyrhynchos</i> )	A	C
Carolina Chickadee ( <i>Parus carolinensis</i> )	A	A
Eastern Tufted Titmouse ( <i>Parus bicolor</i> )	A	F
White-breasted Nuthatch ( <i>Sitta carolinensis</i> )	F	F
Carolina Wren ( <i>Thryothorus ludovicianus</i> )	A	A
Ruby-crowned Kinglet ( <i>Regulus calendula</i> )	U	U

TABLE II (continued). Abundance of bird species in each locale (combining habitat types).

	KING COLLEGE	STEELE CREEK
Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	C	U
Eastern Bluebird ( <i>Sialia sialis</i> )		C
Brown Thrasher ( <i>Toxostoma rufum</i> )		O
American Robin ( <i>Turdus migratorius</i> )	A	A
Northern Cardinal ( <i>Cardinalis cardinalis</i> )	A	A
Northern Mockingbird ( <i>Mimus polyglottos</i> )	O	O
Eastern Towhee ( <i>Pipilo erythrophthalmus</i> )	F	U
White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	C	C
Chipping Sparrow ( <i>Spizella passerina</i> )		R
Song Sparrow ( <i>Melospiza melodia</i> )	A	A
Dark-eyed Junco ( <i>Junco hyemalis</i> )	U	
Common Grackle ( <i>Quiscalus quiscula</i> )	O	
House Finch ( <i>Carpodacus mexicanus</i> )		R
American Goldfinch ( <i>Carduelis tristis</i> )	O	R

The Mourning Dove (*Zenaida macroura*) was found more commonly at King College (CHART 1). This may have been a result of the observation that these particular birds tend to prefer living in and around buildings. The habitats that were studied at King College were in closer proximity to such buildings.

CHART 2 illustrates the differences in abundance of Hairy Woodpeckers (*Picoides villosus*). They were found to be twice as abundant at Steele Creek as compared to King College. This can most likely be attributed to the greater availability of older trees and more dead trees at Steele Creek Park.



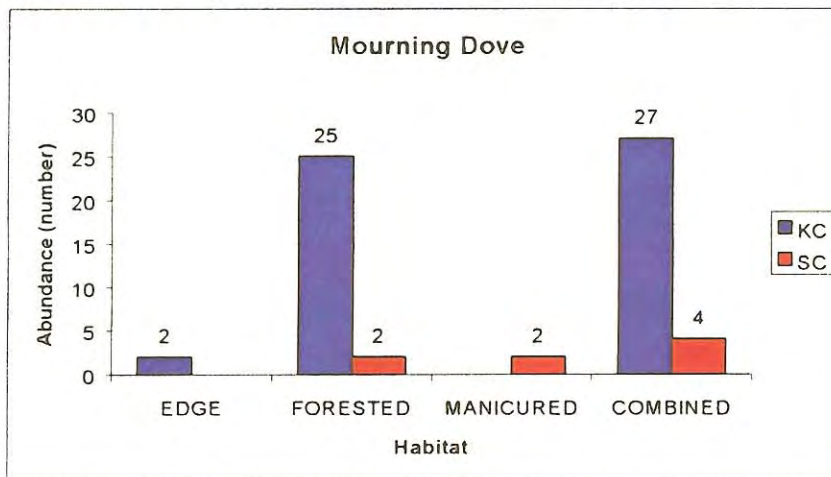
American crows (*Corvus brachyrhynchos*) were observed in all three habitat types on the campus of King College; however, they were only seen in the forested habitat at Steele Creek Park (CHART 4). This may be due to having more litter and trash scattered throughout the sites at King College.

At both locales, American Robins were most abundant in the manicured grass habitats (CHART 9). The reason for this could be explained by the ease with which the American Robins can find food in such areas.

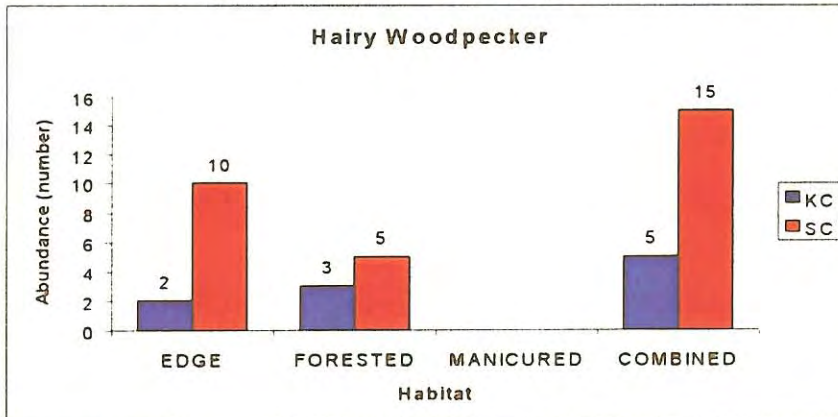
The Eastern Towhee (*Pipilo erythrophthalmus*) was found to be more abundant in the edge habitats of King College than in any of the other habitats (CHART 11). This is probably due to the amount of underbrush that is in these areas.

The following charts illustrate the differences in abundance of particular bird species according to habitat type.

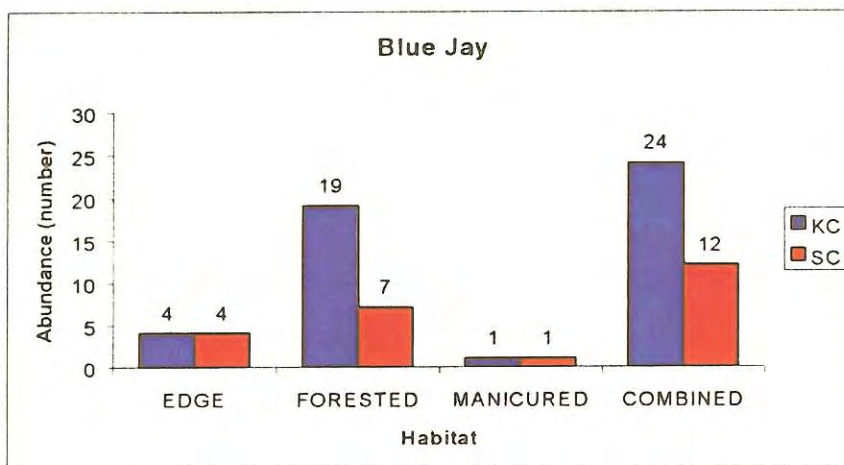
**CHART 1.** Comparison of Mourning Dove abundance



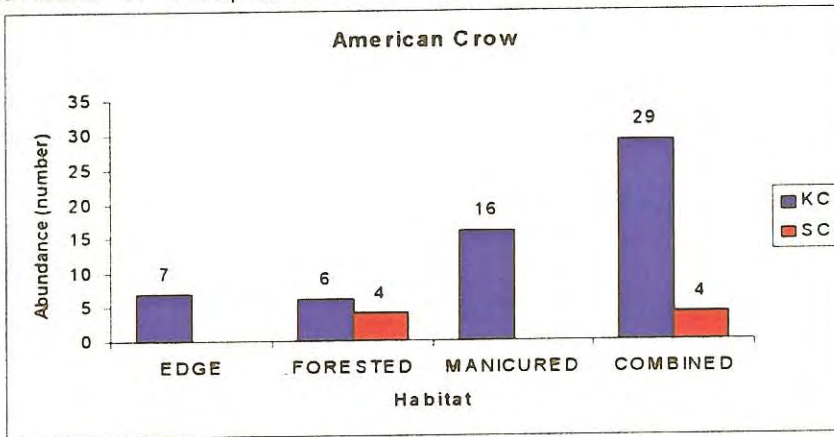
**CHART 2.** Comparison of Hairy Woodpecker abundance.



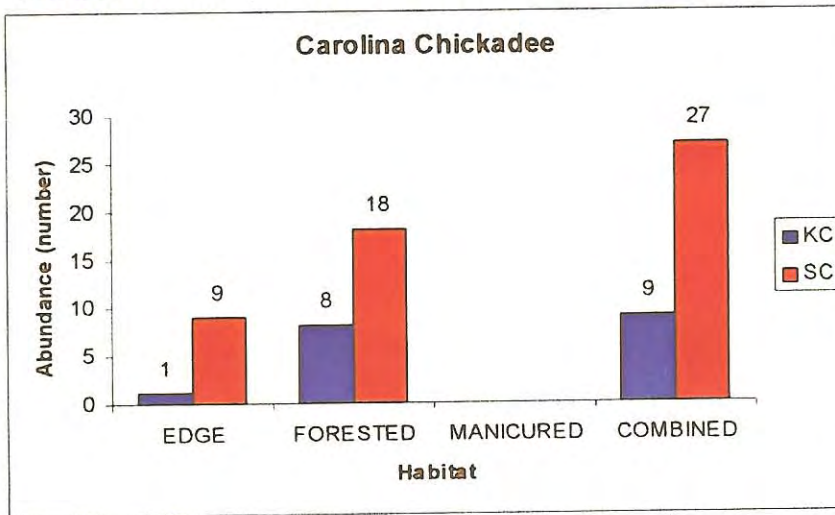
**CHART 3.** Comparison of Blue Jay abundance.



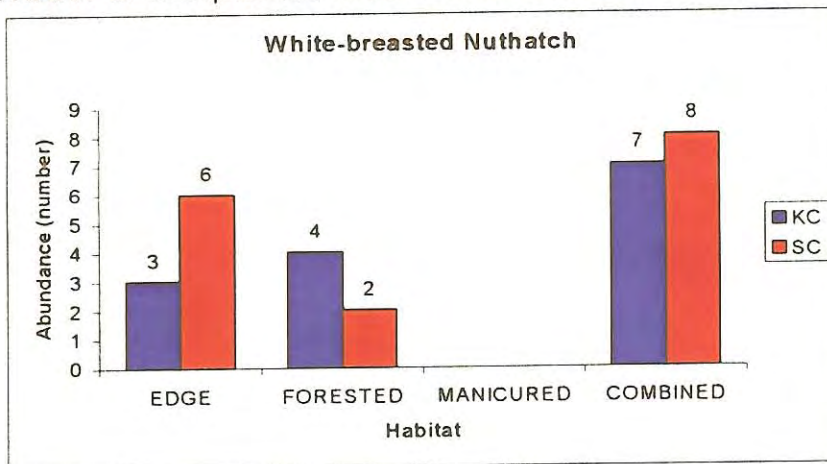
**CHART 4.** Comparison of American Crow abundance.



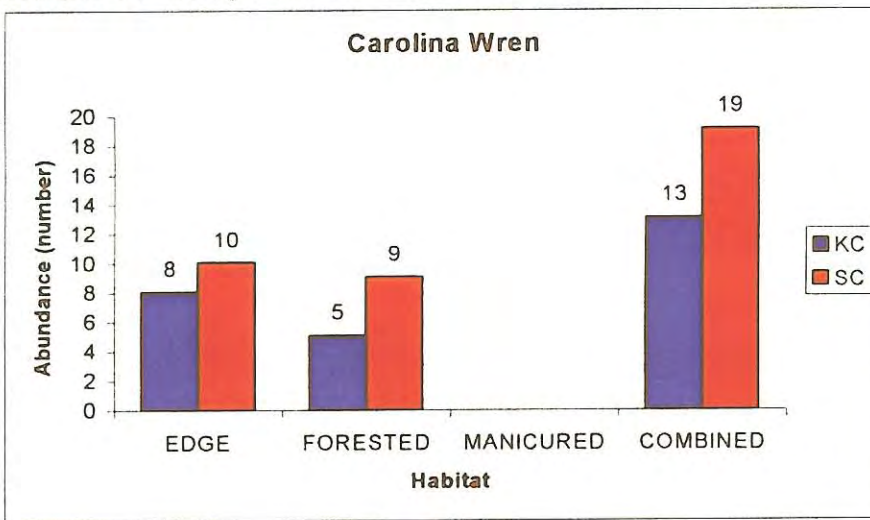
**CHART 5.** Comparison of Carolina Chickadee abundance.



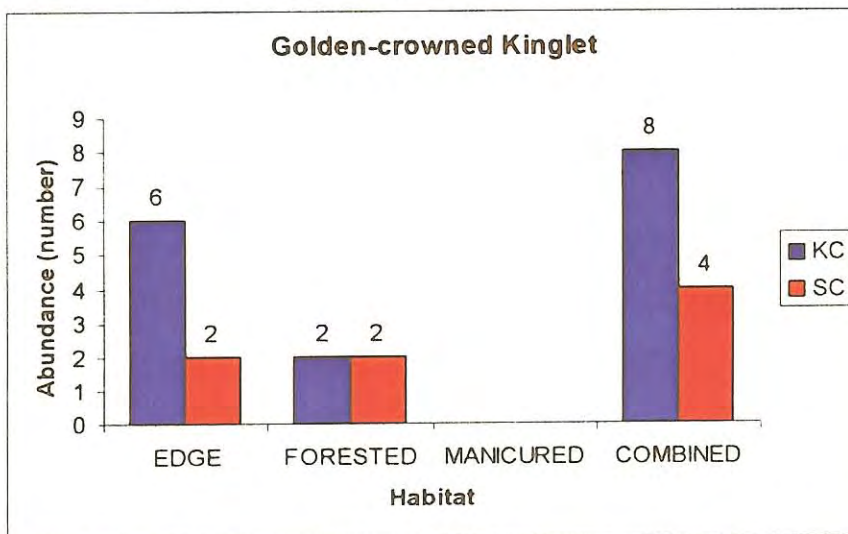
**CHART 6.** Comparison of White-breasted Nuthatch abundance.



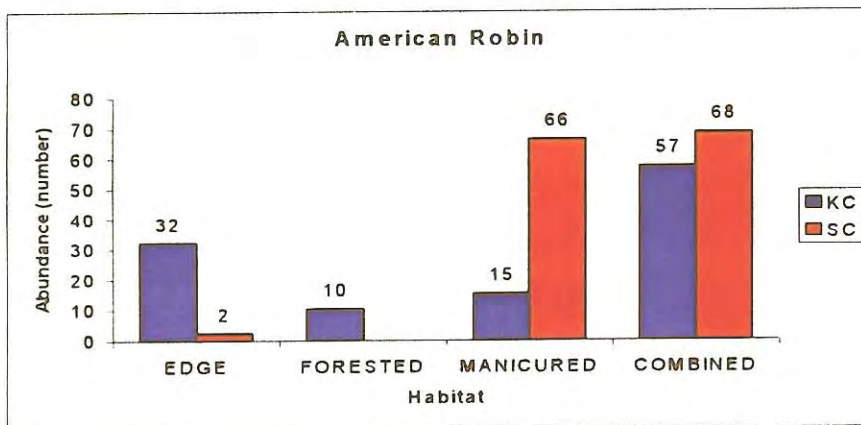
**CHART 7.** Comparison of Carolina Wren abundance.



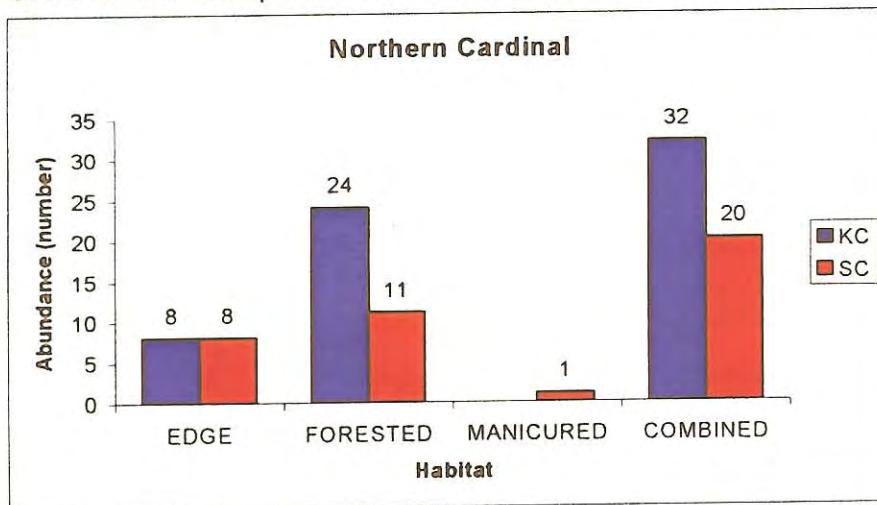
**CHART 8.** Comparison of Golden-crowned Kinglet abundance.



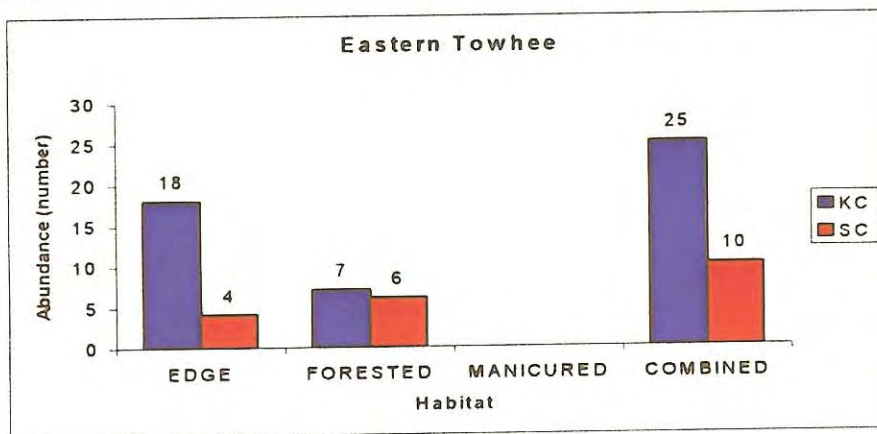
**CHART 9.** Comparison of American Robin abundance.



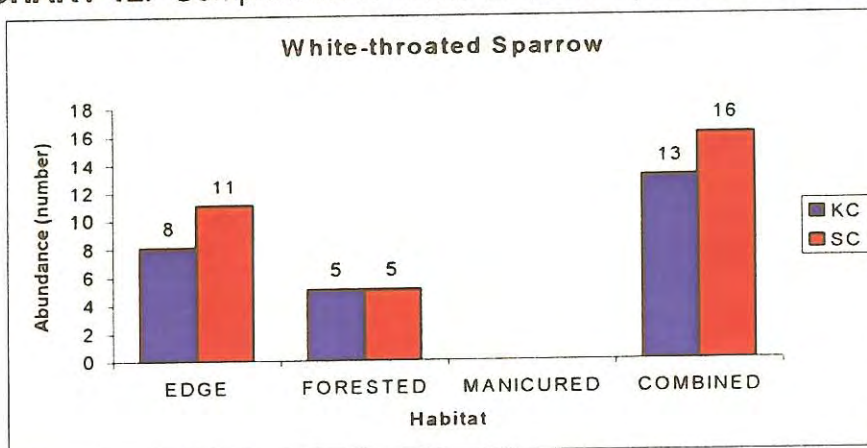
**CHART 10.** Comparison of Northern Cardinal abundance



**CHART 11.** Comparison of Eastern Towhee abundance

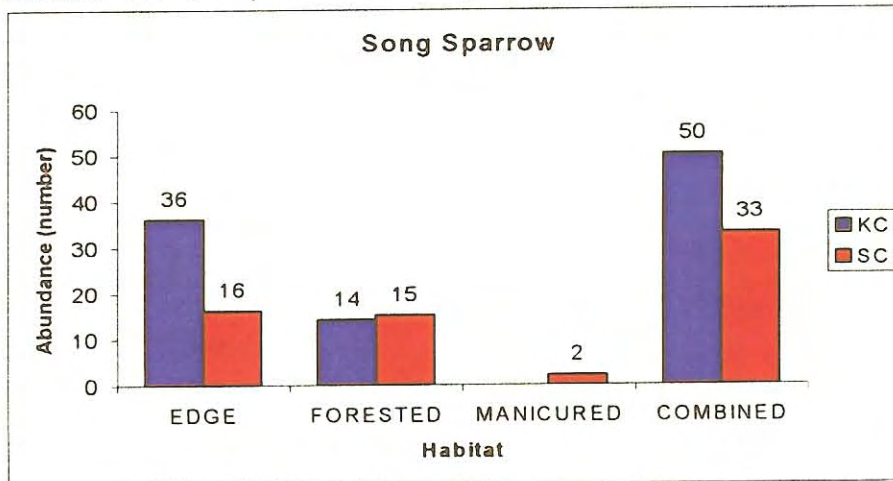


**CHART 12.** Comparison of White-throated Sparrow abundance.





**CHART 13.** Comparison of Song Sparrow abundance.



A number of small mammals were also recorded in the study areas (Table III). The most abundant of which was the Gray Squirrel (*Sciurus carolinensis*). Other small mammals seen during this project include the Eastern Chipmunk (*Tamias striatus*), Virginia Opossum (*Didelphis virginiana*), the Striped Skunk (*Mephitis mephitis*), and the Southern Flying Squirrel (*Glaucomys volans*). (Some of these mammals were only observed outside the actual study plots. See Appendix.) Also found in one of the manicured grass habitats at King College was an owl pellet containing two skulls. The skulls were found to be those of a Short-tail Shrew (*Blarina brevicauda*) and a Southern Red-back Vole (*Clethrionomys gapperi*). Table IV lists the abundance of each species of mammals seen at the different locales.

TABLE III. Mammal species recorded by habitat.

	KC	SC	KC	SC	KC	SC
	<u>EDGE</u>	<u>EDGE</u>	<u>FORESTED</u>	<u>FORESTED</u>	<u>MANICURED</u>	<u>MANICURED</u>
Eastern Chipmunk ( <i>Tamias striatus</i> )		X	X			
Southern Flying Squirrel ( <i>Glaucomys volans</i> )				X		
Gray Squirrel ( <i>Sciurus carolinensis</i> )	X	X	X	X	X	X
Eastern CottonTail Rabbit ( <i>Sylvilagus floridanus</i> )		X	X	X		

TABLE IV. Abundance of mammal species at each locale (combining habitat types).

	King College	Steele Creek
Eastern Chipmunk ( <i>Tamias striatus</i> )	U	X
Southern Flying Squirrel ( <i>Glaucomys volans</i> )		X
Gray Squirrel ( <i>Sciurus carolinensis</i> )	A	A
Eastern Cottontail Rabbit ( <i>Sylvilagus floridanus</i> )	O	O

No reptiles were seen during the study. However, three amphibians were recorded. The Upland Chorus Frog (*Pseudacris triseriata feriarum*) was never actually seen but its distinct call was heard on several occasions at Steele Creek Park in both an edge habitat and a forested habitat. Two other amphibians were found during the aquatic surveys. The Mountain Dusky Salamander (*Desmognathus ochrophaeus*) was found in both Cedar Creek on the King College campus and Mill Creek at Steele Creek Park. Also found in Mill Creek was the Blue Ridge Two-lined Salamander (*Eurycea wilderae*). This is the first record of this species in Mill Creek.

The fish found in both creeks surveyed were Black-nose Dace (*Rinichthys atratulus*) and Creek Chubs (*Semotilus atromaculetus*). Also found in Cedar Creek at King College were two types of crayfish: *Cambarus dubious* and *Cambarus rusticus*. One small Blue Gill (*Lepomis macrochirus*) was recorded in Mill Creek. Table V shows the abundance of each of these at the different locales.

TABLE V. Abundance of fish species at each locale.

	Cedar Creek (at King College)	Mill Creek (at Steele Creek)
Blue Gill ( <i>Lepomis macrochirus</i> )		X
Creek Chubs ( <i>Semotilus atromaculetus</i> )	O	C
Black-nose Dace ( <i>Rinichthys atratulus</i> )	A	A
Crayfish:		
<i>Cambarus dubious</i>	O	
<i>Cambarus rusticus</i>	A	



## Discussion

This study was undertaken in order to conduct a comparative winter survey of vertebrate animals in two similar locales. At each locale, three habitat types were included in the observation areas.

Some important information must be noted when looking at the data collected for this study. First, the limited variance in times that were used to complete field work. Very few observations were done at night or very early morning. Also, there was a large variance in weather. During observation times, the range of temperature was 35°F (1.7°C) to 72°F (22.2°C), with a mean temperature of 59°F (15°C). Two observations were completed during slight rain. All these factors can play a role in how animals behave and, thus, whether they are seen at certain times.

When considering the species and numbers of birds found during the duration of this study, it must be noted that the project was completed during late winter and the early days of spring. Thus, in abundance, some species might be listed as rare due to migration. Also, an owl pellet was found in a manicured grass habitat at King College. It was believed to be that of a Barn Owl. However, this bird may have only been passing through the area since no other signs were found of such birds actually inhabiting this area.

The number of mammals observed was not representative of the numbers that are actually known to be in this region. However, signs of several types of mammals were seen throughout the study. These included Raccoon tracks and diggings of other mammals such as Virginia Opossums or Striped Skunks. The

fact that the bait that was left during one observation was gone the next day also gives evidence of these mammals. The owl pellet that was found contained skulls of two small mammals. The skulls were determined to be that of a Short-tail Shrew and a Southern Red-back Vole. The Southern Red-back Vole usually does not live away from the forested mountain slopes. Although it cannot be equivocably stated, the most likely explanation is that the wandering owl had carried it to this unlikely location. The Southern Flying Squirrel was seen during one of the night observations at Steele Creek Park (2 April 2000). It was noticed when two Eastern Screech-Owls began making passes at a particular tree. The flying squirrel took the opportunity to glide from the top of the tree to dense underbrush when both of the owls had moved away from the tree for a moment. After speaking with Fred Alsop in the biology department at East Tennessee State University, it was noted that the Screech-Owls were possibly protecting their nesting cavity due to the fact the Southern Flying Squirrels will eat any type of bird egg.

The number of amphibians recorded for this study was also less than would be expected for such an area. This was most likely due to weather conditions and the season during which the study was conducted.

The Blue Ridge Two-lined Salamander, which was found in Mill Creek, is common in this region. They usually are found in more densely forested areas. This individual was found in the creek at an edge habitat. As the trees of Steele Creek Park mature, these salamanders are being found in more park locations.

The fish that were found in the two creeks surveyed were common for this area. It would have been expected that more Creek Chubs would have been recorded in Cedar Creek at King College. It should be noted that the day the Mill Creek aquatic survey was completed, the Black-nose Dace were in full breeding colors and that spawning behaviors were observed. Such behaviors included defending of territory by the male and clearing an area of small gravel by the female in which she could release her eggs. The male was seen chasing the female and gently nudging her from behind with his snout. This causes the female to release the eggs. After the eggs were released, the fertilization of the eggs was also observed. Circling and dancing behaviors were observed as the spawning process took place. This all took place in a very shallow section of the creek (approximately 5-cm in depth) where there was only a small amount of movement in the water. The substrate in which these fish were spawning was one of small, fine gravel.

This study may illustrate some distinctions between similar habitat types that are due to the methods of management at each locale. The data indicates that there may be more of a similarity between the edge habitat types at King College and the manicured grass habitat types at Steele Creek Park. Steele Creek Park is dedicated to enhancing the diversity of vertebrate species it can support. Therefore, as the park grows and develops naturally, the vertebrate species found there are likely to increase in number and in variety. However, on the campus of King College, there are many ongoing changes of land use. Some of these changes will undeniably affect the vertebrate species that can be

found at this locale. This data will provide a baseline from which future  
comparisons can be made.

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## Appendix

### Abundance ratings:

A= Abundant: 10 or more per day

C= Common: 5-9 per day

F= Fairly common: 2-4 per day

U= Uncommon: one per day

O= Occasional: one per week

R= Rare: less than 1 per week

TABLE A. Abundance of different species of animal for the entire King College campus compared to Steele Creek Park.

BIRDS	KING COLLEGE	STEELE CREEK
Wild Turkey ( <i>Meleagris gallopavo</i> )		R
Cooper's Hawk ( <i>Accipiter cooperii</i> )	R	R
Red-tailed Hawk ( <i>Buteo jamaicensis</i> )	R	
Killdeer ( <i>Charadrius vociferus</i> )		O
Mourning Dove ( <i>Zenaida macroura</i> )	A	U
Eastern Screech-Owl ( <i>Otus asio</i> )		R
Barn Owl ( <i>Tyto alba</i> )	R	
Belted Kingfisher ( <i>Megasceryle alcyon</i> )	R	
Red-bellied Woodpecker ( <i>Melanerpes carolinus</i> )	F	C
Downy Woodpecker ( <i>Picoides pubescens</i> )	C	C
Hairy Woodpecker ( <i>Picoides villosus</i> )	C	C
Pileated Woodpecker ( <i>Dryocopus pileatus</i> )	O	
Blue Jay ( <i>Cyanocitta cristata</i> )	A	A
American Crow ( <i>Corvus brachyrhynchos</i> )	A	C
Carolina Chickadee ( <i>Parus carolinensis</i> )	A	A

TABLE A (continued). Abundance of different species of animal for the entire King College campus compared to Steele Creek Park.

Eastern Tufted Titmouse ( <i>Parus bicolor</i> )	A	F
White-breasted Nuthatch ( <i>Sitta carolinensis</i> )	F	F
Carolina Wren ( <i>Thryothorus ludovicianus</i> )	A	A
Ruby-crowned Kinglet ( <i>Regulus calendula</i> )	U	U
Golden-crowned Kinglet ( <i>Regulus satrapa</i> )	C	C
Eastern Bluebird ( <i>Sialia sialis</i> )		F
Brown Thrasher ( <i>Taxostoma rufum</i> )		U
American Robin ( <i>Turdus migratorius</i> )	A	A
European Starling ( <i>Sturnus vulgaris</i> )	A	F
Northern Cardinal ( <i>Cardinalis cardinalis</i> )	A	A
Northern Mockingbird ( <i>Mimus polyglottos</i> )	F	U
Eastern Towhee ( <i>Pipilo erythrophthalmus</i> )	C	F
White-throated Sparrow ( <i>Zonotrichia albicollis</i> )	F	C
Chipping Sparrow ( <i>Spizella passerina</i> )		R
Song Sparrow ( <i>Melospiza melodia</i> )	C	A
Dark-eyed Junco ( <i>Junco hyemalis</i> )	U	
Common Grackle ( <i>Quiscalus quiscula</i> )	O	
House Finch ( <i>Carpodacus mexicanus</i> )		C
American Goldfinch ( <i>Carduelis tristis</i> )	U	A

MAMMALS	KING COLLEGE	STEELE CREEK
Eastern Chipmunk ( <i>Tamias striatus</i> )	F	F
Southern Flying Squirrel ( <i>Glaucomys volans</i> )		U
Gray Squirrel ( <i>Sciurus carolinensis</i> )	A	A
Striped Skunk ( <i>Mephitis mephitis</i> )	C	C
Raccoon ( <i>Procyon lotor</i> )	F	F
Virginia Opossum ( <i>Mephitis mephitis</i> )	C	F

TABLE A (continued). Abundance of different species of animal for the entire King College campus compared to Steele Creek Park.

MAMMALS	KING COLLEGE	STEELE CREEK
Woodchuck ( <i>Marmota monax</i> )	C	C
Eastern Cottontail Rabbit ( <i>Sylvilagus floridanus</i> )	C	C
White-tailed Deer ( <i>Odocoileus virginianus</i> )	O	



This topographic map depicts the study areas for King College, showing a mix of urban and rural terrain. The map is oriented with North at the top. Key features include:

- Urban Areas:** Edgemont and Fairmont are shown with dense street grids. Major streets like Georgia Avenue, Kentucky Avenue, and Alabama Avenue are labeled. Other streets include Sixth St, Seventh St, and various numbered streets.
- Landmarks and Buildings:** Slater School, King College, and several churches (e.g., Methodist, Baptist) are marked with specific symbols. Other buildings include a Post Office, a Library, and a Silo.
- Topography:** Contour lines indicate elevation, with peaks reaching over 1800 feet. The terrain is more rugged in the eastern and southern parts of the map.
- Water Features:** A creek or river flows through the lower right portion of the map, near the town of Paperville.
- Infrastructure:** A railroad line runs through the center of the map, and several roads are shown connecting the different areas.

Topographic map of Steele Creek Park Study Areas. The map shows contour lines, roads, and various landmarks. Key features include: Kingsport 20 MI. to the north, Blountville 5.0 MI. to the east, and Blountville 197-SE to the south. Local landmarks include Steele Creek Park, Golf Course, and several cemeteries (Meadow View, Modre, Steele, Valley Station, Blue Ridge, Sunset Village, Trinity). Roads shown include Kingsport, Blountville, and various local streets like Pine Street, Elm Street, and Oak Hill. The map is oriented with North at the top.

