A Comparison of Small Mammal Diversity in Upland and Lowland Areas in Watauga County, North Carolina

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Abstract

This paper is a compilation of eight years worth of data on small mammals conducted on the Blue Ridge Parkway and other areas in Watauga County, North Carolina. Data were collected between the last weeks of June and the first weeks of July in 2000-2005, 2009, and 2010. The purpose is to contrast small mammal diversity in upland successional areas and lowland areas. Traditional mammal trapping techniques were employed. The results showed that lowland areas had a greater diversity in species than the upland areas, but not by a significant amount. Using more consistent data and a larger data pool would more likely have produced definitive results.

Introduction

There are all sorts of habitats from long-leaf pine forests to deciduous hardwood forest, from swamps to rivers, and from conifer forests to open meadows. Each one is suited to certain animals and each one contains a diversity of animals. Habitats provide specific niches, so only certain animals can live there. North Carolina has many different habitats which creates a unique diversity of animals all over the state. The Blue Ridge Parkway and other mountain areas have several of these special habitats, making them great places to collect data.

This study compared lowland and upland communities. Lowland areas consisted of low creek beds, bogs, and riparian (stream side) areas. Vegetation was comprised of plenty of ground cover including tall grasses, weeds, downed trees or limbs, rhododendron shrubs, and a few canopy trees providing shade and keeping the areas moist and cool. Upland areas were open meadows bordering woods with very tall grasses, blackberry bushes, and other shrubs. These

areas were drier and warmer. Both areas provided cover from predators as well as from poor weather.

The study compiled several years worth of data, gathered by Field Biology and Ecology classes in the Summer Venture program at UNC Charlotte over various years, to compare the diversity of small mammals in lowland and upland communities in Watauga County. The results from the study can be used to determine whether a certain area is more likely to contain a more diverse population of small mammals.

The goal of the study is to compare the diversity of lowland and upland areas small mammal populations in Watauga County, North Carolina. It is thought that lowland areas are more diverse. A reason why they may be more diverse is that they provide more niches with cooler temperatures, dampness, and cover from predators.

Procedures

After finding suitable locations with both upland and lowland communities, stations were created. In 2010, each location had seven stations. Each station had eight Sherman traps, two medium-sized traps, and one large Havihart trap. Sherman traps are solid rectangular box-like structures with a door that is folded down to provide an entrance and a back door which is used to place bait in the trap. Both the medium-sized traps and the Haviharts were wire-mesh traps. Large Haviharts were baited with both a Beggin' Strip (dog treat) and a piece of apple to entice both herbivores and carnivores. One medium trap was baited with Beggin' Strip and cat treats while the other contained an apple slice. The Sherman traps were baited with either peanut butter or a piece of oatmeal cookie. These were put in pairs, one with each kind of bait. Traps were usually placed in a somewhat circular fashion with the Havihart in the middle, the mediums on opposite sides, and the Shermans in between. In other years, different numbers of stations or

traps were used due to the number of traps available. Traps were placed in a spot where they would remain upright and that seemed to be an opportune spot to catch mammals.

In 2010, traps were first set on the afternoon of July 6th. They were checked every morning from 8:30-9:30. Any animals that were caught were identified, had their body length measured, and sex identified. The larger animals that could have harmed the handlers were only identified. Animals were identified using a dichotomous key and Webster (1985). All animals were released. Those that had expired were brought back to the lab. Traps were reset and re-baited for the next day. Every trap was checked to see if it had been disturbed in any way. All trap alterations and animals trapped were recorded. The traps were left in the field until the 10th of July. All the traps were collected.

Results were determined back at the laboratory at UNC Charlotte using software from Brower et al. (1997). The data were analyzed using several different methods. The primary method was the Shannon Diversity index using number of species and individual. Evenness and species richness were determined. Other methods were Bray-Curtis similarity and Mann-Whitney statistical test. The Mann-Whitney test used data from Tables 1-8. All tests compared uplands and lowlands for the number of species along with the number of individuals (Table 11). The Shannon index, also known as Shannon diversity, was used to determine the answer to the question of this study. Overall, eight years worth of data was included in this study. Turrentine (2001) was used to help format this paper

Results

Tables 1-8 present the capture data for each year. The Shannon index showed that the lowlands were more diverse (Figure 1). Five out of eight lowland areas were more diverse than their upland counterparts. Lowland and upland areas both had a score of four for evenness (Table 10). Lowland species richness was generally greater than the uplands (Figure 2). For percent similarity, only three years had 50% or greater similarity (Table 12). Of the remaining five years, four were less than 30% similar. For Bray-Curtis index, only two of the years had 50% similarity or greater (Table 13). The Mann-Whitney test was used twice, once to compare the number of species and once for the number of individuals (Table 11). Neither showed a significant difference in diversity.

Discussion

Shannon diversity varied from year to year (Table 9). Sometimes an upland community would have a greater diversity than the lowland, so lowland communities were not always more diverse. In 2000, 2001, and 2010 the number of mammals captured was higher than in the lowlands. The other five years the uplands contained more mammals. In Figure 1, there seems to be no data for lowlands in 2003. The Shannon diversity for that year was so low it doesn't show up on the figure. The species richness showed an interesting trend overall. From 2000 to 2003 the lowland species richness declined and then rose again to reach another peak at 2005. It then declined again.

Conclusion

Since the Shannon diversity was overall higher in the lowland areas, it supported the idea that lowland communities provided more niches so more different species could find a home there. However, the data used in this study were not consistent and the data pool was limited so more continuous data is needed to be more accurate. Also, the results would be more definitive if

the same test sites were used every year. An even better way would be to use several locations for several years to compare locations. Using the same number of traps along with using the same bait would be another way to even out the data and eliminate variables.

Literature Cited

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Tables

Table 1

2010 Species and Number of Individuals Caught

Species	Lowland	Upland
Deer Mice (*Peromyscus maniculatus*)	8	4
Appalachian Cottontail (*Sylvilagus obscurus*)	0	1
Golden Mouse (*Ochrotomvs nuttalli*)	0	1
Raccoon (*Procyon lotor*)	1	0
Masked Shrew (*Sorex cinereus*)	1	0
Total	10	6

Table 2

2009 Species and Number of Individuals Caught		
Species	Lowland	Upland
Deer Mice (*Peromyscus maniculatus*)	19	26
Golden Mouse (*Ochrotomys nuttalli*)	1	1
Harvest Mouse (*Micromys minutus*)	0	2
Southern Short-tail Shrew (*Blarina carolinensis*)	0	1
Meadow Vole (*Microtus pennsylvanicus*)	3	0
Southern Redback Vole (*Clethrionomys gapperi*)	1	0
Woodland Jumping Mouse (*Napaeozapus insignis*)	1	0
Racoon (*Procyon lotor*)	1	0
Total	26	30

Table 3

2005 Species and Number of Individuals Caught		
Species	Lowland	Upland

Deer Mice (*Permycus maniculatus*)	5	21
Masked Shrew (*Sorex cinereus*)	0	1
Woodland Jumping Mouse (*Napaeozapus insignis*)	2	0
Appalachian Cottontail (*Sylviagus obscurus*)	1	0
Raccoon (*Procyon lotor*)	1	0
Meadow Vole (*Microtus pennsylvanicus*)	1	0
Total	10	22

Table 4

2004 Species and Number of Individuals Caught		
Species	Lowland	Upland
Deer Mice (*Peromyscus maniculatus*)	3	5
Meadow Vole (*Microtus pennsylvanicus*)	1	0
Woodland Jumping Mouse (*Napaeozapus insignis*)	1	0
Appalachian Cottontail (*Sylvilagus obscurus*)	0	3
Southern Short-tail Shrew (*Blarina carolinensis*)	0	2
Masked Shrew (*Sorex cinereus*)	0	1
Total	5	11

Table 5

2003 Species and Number of Individuals Caught		
Species	Lowland	Upland
Opossum (*Didelphis virginiana*)	0	2
Woodland Jumping Mouse (*Napaeozapus insignis*)	0	1
Deer Mice (*Peromyscus maniculatus*)	3	2
Racoon (*Procyon lotor*)	0	1
Southern Short-tail Shrew (*Blarina carolinensis*)	0	1
Total	3	7

Table 6

2002 Species and Number of Individuals Caught		
Species	Lowland	Upland

Deer Mice (*Peromyscus maniculatus*)	3	1
Chipmunk (*Tamias striatus*)	1	0
White-footed mouse (*Peromyscus leucopus*)	0	4
Total	4	5

Table 7

2001 Species and Number of Individuals Caught		
Species	Lowland	Upland
Meadow Vole (*Microtus pennsylvanicus*)	1	1
Harvest Mouse (*Micromys minutus*)	0	1
Woodland Jumping Mouse (*Napaeozapus insignis*)	4	1
Eastern Cottontail (*Sylvilagus floridanus*)	2	0
White-footed mouse (*Peromyscus leucopus*)	4	0
Old-field Mouse (*Peromyscus polionotus*)	2	0
Southern Short-tail Shrew (*Blarina carolinensis*)	1	0
Woodland vole (*Microtus pinetorum*)	1	0
Deer Mice (*Peromyscus maniculatus*)	10	0
Opossum (*Didelphis virginiana*)	3	0
Racoon (*Procyon lotor*)	1	0
House Mouse (*Mus musculus*)	1	0
Total	30	3

Table 8

2000 Species and Number of Individuals Caught		
Species	Lowland	Upland

Woodland vole (*Microtus pinetorum*)	1	0
Woodland Jumping Mouse (*Napaeozapus insignis*)	12	0
Eastern Cottontail (*Sylvilagus floridanus*)	3	3
Masked Shrew (*Sorex cinereus*)	2	4
Southern Short-tailed Shrew (*Blarina carolinensis*)	2	0
Old-field Mouse (*Peromyscus polionotus*)	1	1
Deer Mice (*Peromyscus maniculatus*)	14	0
Harvest Mouse (*Reithrodontomys humulis*)	3	0
Opossum (*Didelphis virginiana*)	1	0
Southern Redback Vole (*Clethrionomys gapperi)*	1	0
Meadow Vole (*Microtus pennsylvanicus*)	0	3
Total	40	11

Table 9

Shannon Diversity		
Year	Lowland	Upland
2010	0. 277	0. 377
2009	0. 425	0. 231
2005	0. 590	0. 080
2004	0. 413	0. 539
2003	8. 6 E09	0. 673
2002	0. 244	0. 217
2001	0. 895	0. 477
2000	0. 755	0. 562

Figure 1

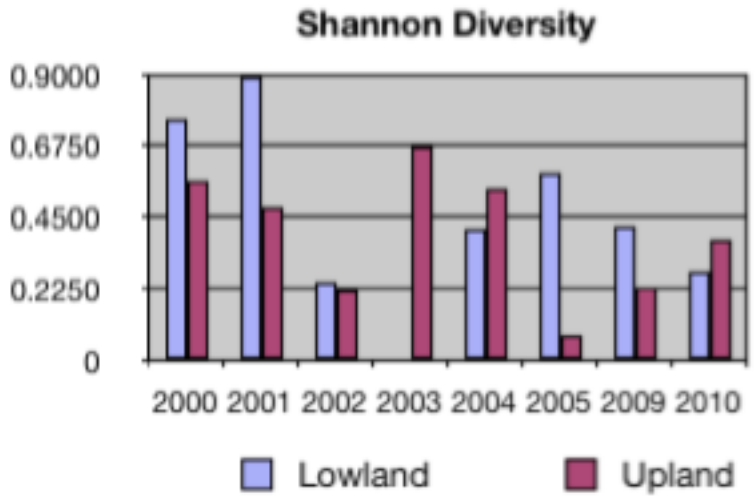

Table 10

Richness/Evenness		
Year	Lowland	Upland
2010	0. 95/0.582	1. 22/0.667
2009	1. 18/0.547	0. 73/0.383
2005	1. 58/0.845	0. 43/0.267
2004	1. 34/0.865	1. 21/0.895
2003	0. 58/1.00	1. 89/0.963
2002	1. 00/0.811	0. 89/0.722
2001	2. 01/0.86	1. 73/1.00
2000	1. 58/0.775	1. 21/0.934

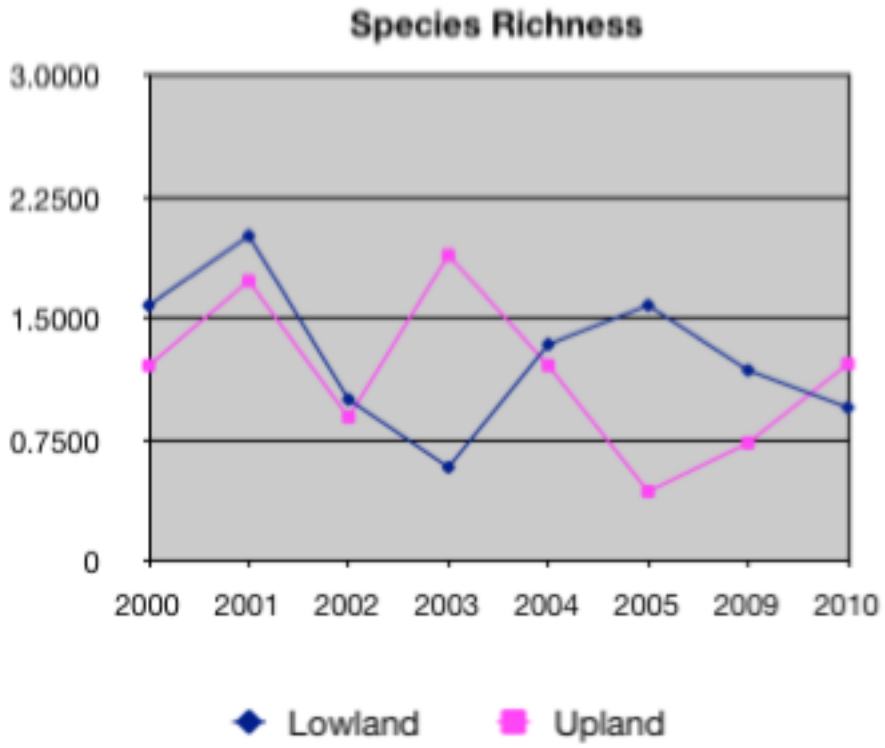

Figure 2

Table 11

Mann-Whitney Tests			
	U	U’	Critical Value (p=0.05)
Number of Species	24. 5	39.5	51
Number of Individuals	30. 5	33.5	51

Table 12

Percent Similarity	
Year	Percent (in decimals)
2010	0. 667
2009	0. 764
2005	0. 5
2004	0. 455
2003	0. 286
2002	0. 2
2001	0. 167
2000	0. 15

Table 13

Bray-Curtis Index	
Year	Percent
2010	0. 5
2009	0. 764
2005	0. 313
2004	0. 375
2003	0. 4
2002	0. 222
2001	0. 121
2000	0. 235