THE INFLUENCE OF RIPARIAN AND ADJACENT HABITATS ON SMALL MAMMAL DISTRIBUTIONS IN GRAND TETON NATIONAL PARK, WYOMING

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♦ INTRODUCTION

Riparian ecosystems are among the most productive biological systems providing food, water, shade, and cover for wildlife (Thomas et al. 1979). Furthermore, they may display a greater diversity of plant and animal species and vegetative structure than adjacent ecosystems (USDI 1986). Previous investigators have sought to document rodent associations within riparian vegetation (Moor and Bradley 1975, Anderson et al. 1977, Boeer and Schmidly 1977, Gier and Best 1980, Paul 1981, Cross 1985, Doyle 1986, 1990, MacCraken et al. 1985, Anthony et al. 1987). Generally, these studies demonstrate that riparian habitats contain higher abundance and lower diversity of small mammal species when compared to adjacent upland sites or nearby sites which contained variable non-riparian habitats.

Odum (1978) states that for wildlife populations, the riparian zone provides a classic example of the ecological principle of "edge effect". This effect is exerted by adjoining communities on the population structure within the ecotone which often contains greater numbers of species and higher densities of some species then either adjoining communities. He further states that density and diversity of species tend to be higher at the land-water ecotone than in adjacent communities. This relationship between edge effect and wildlife has not been well documented (Forman and Godron 1986) in part, because research has focused more on induced edges created by corridors than by patches (Yahner 1988).

The principle objective of our study is to understand the environmental and landscape factors in which the riparian edge habitat or ecotone, which is the area of transition or boundary between the stream and upland communities in which an organism has access or resides, influences small mammals. To accomplish this main objective, four sub-objectives require elaboration. They are:

1. to develop baseline data on plant and small mammal species present in riparian, edge, and upland habitat of three streams in Grand Teton National Park, Wyoming.

2. to describe, analyze, and compare the importance of "edge effect" between riparian and upland patches in forest and sagebrush-grassland habitats.

3. to predict small mammal population characteristics with plant and soil microhabitat variables and associate small mammal populations with patch characteristic variables measured within the riparian, edge, and upland habitats of three streams.

4. to initiate research on the movement patterns and relative habitat use of small mammals in the stream corridor, edge, and upland habitats.

♦ METHODS

TRAPPING ANIMALS

Three study sites were live trapped for small mammals from 6/91 through 10/91 in Grand Teton National Park, Wyoming: Beaver Creek, Cottonwood Creek, and Glacier Gulch. At each site, six live-trapping lines were established - two each in riparian, edge, and upland habitats. The lines were developed parallel to the stream, and each line per habitat was separated by 100 m within 180 degrees. Edge and upland lines were also separated by at least 100 m within 90 degrees. Each line consisted of 10 trap stations at 10 m intervals. Two Longworth live traps containing nonabsorbent nesting material were placed within 1 m of each station. Traps were baited with whole wheat, and unset traps were positioned at the trap stations for at least two days prior to trapping to attract small mammals to the traps (Mullican and Keller 1986). Trap lines were set for 3 consecutive nights and checked each morning. Each animal was ear tagged with an individually numbered, fingerling fish tag. Species, sex, reproductive condition, weight, and trap location were recorded. All animals were released at the point of capture, and all traps were removed from the sites after each sampling period to prevent habituation. At each site, streamside, edge, and upland habitats were sampled three times during the summer.

HABITAT ASSESSMENT

To provide a vegetative description of areas that were sampled with live-traps, 5 trap stations were randomly selected from each line and sampled with the line interception method (Floyd and Anderson 1987). A vegetative profile analysis technique (Nudds 1977) was used to determine the vertical vegetative cover at each trap station. Soil samples were collected at a depth ranging from 5 to 10 cm at each trap station and will be analyzed for bulk and particle density, pore space, and soil texture.

HABITAT USE

The edge effect will be ascertained by movement patterns, small mammal habitat use, and comparing trapping data of species' relative density and Shannon-Weaver's index of diversity at the edge with the riparian and upland habitats. Because the amount of edge habitat in an area is a function of edge width, edge length, and its configuration (Thomas et al. 1979), the riparian edge habitat will be quantified with measures of patch characteristics such as shape (Forman and Godron 1986).

To determine movement patterns and habitat use by small mammals, important species within each habitat were powdertracked with fluorescent pigments and a UV light source (Lemen and Freeman 1985, Jike et al. 1988). Detailed mapping of habitat use can be accomplished with polar coordinates. X and Y coordinates will be computed to analyze home range sizes, and relative habitat use and movement patterns will be described and compared.

♦ RESULTS AND DISCUSSION

During 3,207 live-trap nights undertaken at 3 sites, 473 individuals were captured during the 1991 field season. Eight species of rodents and one species of shrew were caught. The results of a second and third tier of captures obtained in these areas are presented in Tables 1 and 2, respectively. A difference in species diversity of the rodent species is apparent among areas, being highest at the Glacier Gulch site. On the basis of these preliminary data, riparian areas appear to contain more microtine rodents and shrews than other areas. Riparian areas also appear to have the highest species diversity, whereas, the edge usually contains the greatest abundance of small mammals. At the edge, it is apparent that animals have access to both riparian and upland areas and may utilize benefits available in both habitats.

Species composition and the relative density decreased as the trapping season progressed at Beaver Creek (Table 3). At Cottonwood Creek, species composition increased through the season while relative density peaked during mid-season. Species composition decreased through the season at Glacier Gulch, however, relative density increased. Two species of small mammal account for these seasonal changes in species composition and relative density: the deer mouse (*Peromyscus maniculatus*), and the southern red-backed vole (*Clethrionomys gapperi*). These two species may be more numerous in some areas, and their reproductive patterns may account for these seasonal fluctuations in such areas.

Table 1. Total captures and kinds of small mammals live trapped during the second sampling undertaken in riparian (R), edge (E), and upland (U) habitats at Beaver Creek, Cottonwood Creek, and Glacier Gulch during July and August, 1991.

SPECIES	Beaver Creek R	E	U	Cottonwood Creek R	E	U	Glacier Gulch R	E	U
P. maniculatus	6	7		20	43	40	2	13	14
S. cinereus	5	1	2	4			3	2	
Z. princeps	1								
M. pennsylvanicus	1			1					
T. amoenus			2	4				2	4
M. montanus						1	1	1	1
C. gapperi							10	10	4

Table 2. Total captures and kinds of small mammals live trapped during the third sampling undertaken in riparian (R), edge (E), and upland (U) habitats at Beaver Creek, Cottonwood Creek, and Glacier Gulch during September and October, 1991.

SPECIES	Beaver Creek R	E	U	Cottonwood Creek R	E	U	Glacier Gulch R	E	U
P. maniculatus	1	5		6	16	38	4	10	18
T. amoenus		3	1				1	1	
C. gapperi	1	4	3	1			15	4	3
S. cinereus	1			1			2	1	
M. montanus				2	1			1	
M. pennsylvanicus				1					
M. longicaudus				1					

Table 3. Total species captured, number of live-trap nights, and relative density per 500 trap nights during trapping intervals at Beaver Creek, Cottonwood Creek, and Glacier Gulch, 1991.

Area and Season	Total catch	Trap nights	Relative density
Beaver Creek			
mid June	32	360	45.0
mid July	25	360	34.7
late September	19	357	26.6
Cottonwood Creek			
late June	48	339	70.8
early August	113	360	156.9
mid October	67	354	94.6
Glacier Gulch			
early July	34	360	47.2
mid August	65	360	90.3
mid September	70	357	98.0

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