

Survey of Small Mammals in a Wet Meadow Habitat of the Upper Mississippi River Floodplain

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ABSTRACT

Small mammals were surveyed in a wet meadow habitat of the Upper Mississippi River floodplain by live trapping in late July and August 1998. Two trapping grids were established at Halfway Creek wet meadow area of the Upper Mississippi River National Wildlife and Fish Refuge, near Midway, WI. One grid of 25 traps set one meter apart was placed in a section of meadow that was burned in May. The other grid of 50 traps was established on an unburned section. The trapping was conducted for a total of eight nights on the burned and 14 nights on the unburned plots. Meadow voles (*Microtus pennsylvanicus*) were the most abundant species captured on both the burned (35) and unburned (57) sites. Seven short-tailed shrews (*Blarina brevicauda*) were captured, all at the unburned site. Meadow jumping mice (*Zapus hudsonius*), a species previously not reported in La Crosse County, were captured in both grids in very small numbers. Physical characteristics such as sex, reproductive condition, and weight of individual animals were examined and compared between plots.

INTRODUCTION

Wet meadow habitats and small mammals, particularly those on the Upper Mississippi River (UMR) floodplain, have been neglected in current research. Small mammal research on floodplain habitats, in general, is virtually nonexistent and the research that has been conducted is outdated, not applicable to a large river system such as the UMR, or concerns floodplain forest habitat (Stickel 1948; Wetzel 1958; Batzli 1977).

A large portion of the land along the UMR is under public management. The Upper Mississippi River National Wildlife and Fish Refuge (UMRNWFR) contains 46,468 acres of land in the La Crosse District, which manages all refuge land in pools 7 and 8. About 3487 acres are classified as wet meadow (Hill, Wildlife Biologist, UMRNWFR, personal communication). Wet, or fresh, meadow habitats have been characterized by a U.S. Fish and Wildlife Service inventory during the 1950s as frequently flooded meadows that lack standing water through the growing season (Mitsch and Gosselink 1986).

Monocultures of reed canary grass (*Phalaris arundinacea*) that may negatively impact species diversity have become common in wet meadow habitats of the upper Midwest and along the UMR. According to 1994 land cover data from the Upper Midwest Environmental Sciences Center in Onalaska, WI, reed canary grass covered more than 1,795 acres of wet meadow in the La Crosse District (Hill, Wildlife Biologist, UMRNWFR, personal communication). The refuge has been applying controlled burning in some wet meadow areas in the floodplain to reduce the reed canary grass monocultures.

Some studies focusing on the effects of fire on small mammal populations have shown that burning changes microhabitat characteristics (i.e. coverage of certain plant species, litter and bare ground), making these characteristics more desirable to certain species of small mammals. Fire reduces the amount of litter and vegetative cover, which favors species such as the deer mouse, *Peromyscus maniculatus*. However, later increases in litter and vegetative cover tend to favor meadow voles, *Microtus pennsylvanicus* (Beck and Vogl 1995; Snyder and Best 1998; Tester 1965; Vacanti and Geluso 1985). However, it is impossible to assess the effect of burning on mammals in wet meadow habitat if the species using that habitat on the UMR are unknown.

Studies conducted in dry meadows, prairies, and riparian shrublands of the Midwest have found *Microtus pennsylvanicus*, *Microtus ochrogaster*, *Peromyscus maniculatus*, *Peromyscus leucopus*, and *Blarina brevicauda* to be common species (i.e. Beck and Vogl 1995; Kirsch 1997; Rice 1932; Snyder and Best 1988). Although, no studies were found addressing species found specifically in wet meadow habitats, many of the same species captured in prairies and dry meadow may be expected based upon similar habitat affinities (Jackson 1961).

The purpose of this study was to determine which species of small mammals are using a wet meadow habitat on the UMR floodplain. Differences in species composition between a recently burned site and an unburned site were also investigated to provide information for the La Crosse District of the UMRNWFR about the effects of controlled burning on the small mammals located in the habitat.

METHODS

Two trapping grids were placed in a wet meadow area adjacent to Halfway Creek in the Upper Mississippi Wildlife and Fish Refuge (Figure 1). The Halfway Creek area includes approximately 97 acres, making it one of the major tracts of wet meadow in the refuge. One grid of 50 traps was placed just SW of the Great River State Bike Trail. Another grid of 25 traps was placed in a nearby portion of the area that had been burned in early May. All traps were placed one meter apart with one trap per station.

The unburned site was trapped June 30, July 3-4, 21-22, 24-27, and August 19-23. The burned site was trapped only on July 25-27 and August 19-23 because of difficulty in accessing the site due to high water earlier in the season. The late July and August trapping sessions occurred during the week of a new moon to take advantage of increased activity of animals at that time (Clark and Kaufman 1991; Whitaker 1997).

Collapsible Sherman live box traps (7.5 x 7.6 x 25.4 cm) were baited with rolled oats and mixed bird seed and set around 6:00 p.m. in the evening. Traps were checked about 6:30 a.m. the next morning and closed for the day. Captured animals were ear marked with Monel size #1 Fingerling Fish Tags (National Band and Tag Co., Newport, Kentucky). Shrews, however, could not be ear marked and were not marked in any other manner.

Measurements of the ear, tail, hind foot, and total body length were taken on individual animals using calipers. Species, weight, sex, reproductive activity, and approximate age (juvenile or adult) were also determined before releasing the animals. Institutional Animal Care and Use Committee (IACUC) and Institutional Biohazard Committee (IBC) forms were completed and approved before fieldwork began.

Shannon-Wiener indices of diversity and evenness were calculated using only the data from nights that both grids were trapped. H'_{max} is estimated as the natural log of the total number of species captured. Average daily trap success for each grid and month was compared with a two-way ANOVA. Statistical analysis was completed with Statistical Product and Service Solutions (SPSS, version 7.5).

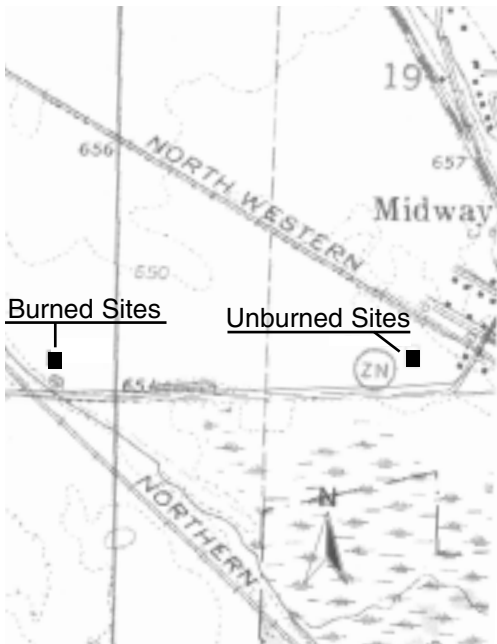


Figure 1. Map of burned and unburned grids at Halfway Creek wet meadow, La Crosse County, WI.

RESULTS

A total of 104 different animals were captured, representing three different species; meadow voles (*Microtus pennsylvanicus*), short-tailed shrews (*Blarina brevicauda*), and meadow jumping mice (*Zapus hudsonius*) (Table 1). Meadow voles accounted for the largest number of animals, with a total of 93 individuals and 25 recaptures for both grids. All three species were captured at the unburned site, but only *M. pennsylvanicus* and *Z. hudsonius* were found at the burned site. Four individuals of *Z. hudsonius* were trapped within a two day period in July and none were recaptured. Seven individuals of *B. brevicauda* were captured throughout the trapping periods; as shrews were not marked, recaptures could not be identified.

Table 1. Total number of captures and recaptures (the latter indicated in parentheses) of each species by grid and month for all trapping dates, June-August, 1998.

Species	Unburned Site			Burned Site ^a		
	June	July	August	June	July	August
Meadow Vole (<i>M. pennsylvanicus</i>)	4 (0)	43 (10)	10 (8)	--	22 (1)	13 (7)
Short-tailed Shrew (<i>B. brevicauda</i>)	0 ^b	3 ^b	4 ^b	--	0 ^b	0 ^b
Meadow Jumping Mouse (<i>Z. hudsonius</i>)	0 (0)	1 (0)	0(0)	--	3 (0)	0 (0)

^a Burned site was not sampled for the same number of days as unburned site; refer to Methods for actual trapping dates.

^b *B. brevicauda* individuals were not marked.

Trap success varied between both grids and throughout the season (Figure 2.). Average trap success for 14 nights on the unburned site, utilizing 50 traps, was 13% (range = 0%-36%). Average trap success for eight nights on the burned site, utilizing 25 traps, was 24% (range = 8%-56%). The interaction between grid and month was statistically significant ($P < 0.05$).

The Shannon-Wiener diversity index was lower in the burned site ($H' = 0.276$, $E = 0.398$) than the unburned site ($H' = 0.719$, $E = 0.398$). Evenness values were the same for each grid.

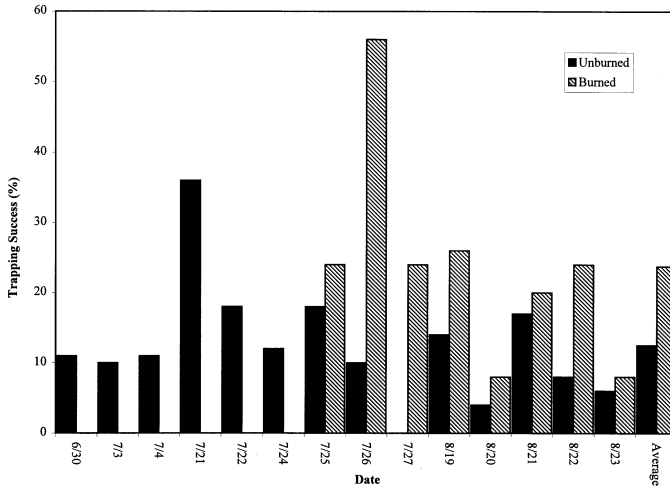


Figure 2. Percent trapping success for the unburned and burned sites at halwy Creek, La Crosse County, WI, June-August 1998.

DISCUSSION

The large number of meadow voles captured was not surprising; meadow voles are typically one of the most numerous of the species in riparian shrubland and tallgrass prairies (Snyder and Best 1988; Kirsch 1997). Although deer mice are typically also common in the shrubland and prairies, none were captured in this study. A possible explanation may be because deer mice, especially the subspecies prairie deer mouse found in Minnesota and Wisconsin (*P.m. bairdii*), tend to use dry, well drained open areas (Jackson 1961).

The meadow jumping mouse has not been reported for La Crosse County and adjacent counties (Trempealeau, Jackson, Monroe, and Vernon). Only four meadow jumping mice were captured, however, others have observed relatively low capture rates of meadow jumping mice in comparison to other species (Beck and Vogl 1972; Sheldon 1938; Snyder and Best 1988).

Dominance of meadow voles compared to meadow jumping mice could be due to behavioral differences, such as runway use, between the two. Meadow jumping mice do not typically use runways like those of meadow voles (Hamilton 1935) and may be less likely to stumble into traps because of this behavioral difference. Shrews also use runways, and thus are more likely to be trapped than meadow jumping mice (Jackson 1961).

Differences in foraging behavior between the three species may also account for the differences in the number of individuals captured. Meadow voles and shrews typically forage along the ground and therefore may be more likely to be captured. Meadow jumping mice also forage along the ground but are capable of climbing up a stalk of grass, cutting off the head, and then carrying it to the ground (Whitaker 1997). This behavior decreases the amount of time spent on the ground foraging and reduces the likelihood that the meadow jumping mouse will be attracted to the trap.

Several studies have discussed the importance of vegetative cover to voles (Beck and Vogl 1972; Cook 1959; Getz 1961). Dense cover is thought to offer more protection from predators and greater food availability. Vole populations in recently burned prairies remained low until some litter and new growth had accumulated (Vacanti and Geluso 1985). Other factors such as predation due to lack of vegetative cover, interspecific competition, and the size of the burned area may also impact the rate at which voles recover in a burned area (Vacanti and Geluso 1985). In this study it is not known how quickly the vole population recovered at the burned site because of the length of time, approximately three months, between the burn and first trapping period. Since a relatively large number of voles were captured at the burned site, this suggests that by late July there was enough litter and vegetative cover to make the site a suitable habitat for the voles.

Short-tailed shrews may have been absent in the burned site because of reduced litter and cover. Shrews are typically found in habitats with dense litter and it is likely that not enough had accumulated in the burned site to offer enough cover (Jackson 1961). Other smaller species of shrews, such as the masked shrew or least shrew, that might have occurred in the Halfway Creek wet meadow may not have been captured because the traps were too large.

The large difference in diversity indices between the two grids is because of the absence of short-tailed shrew captures in the burned grid. Although the shrews were captured in small numbers in the unburned grid, their presence increases the uncertainty that the next individual captured will be of the same species. The similarity in evenness values between the two sites is due to the large number of meadow voles in relation to the shrews and meadow jumping mice.

Observations of characteristics of captured individuals led to the discovery of small unidentified orange skin spots on several meadow voles. On most individuals the spots were limited to the inner ear, however, one lactating female was covered on several areas of her body. These spots have not been noticed in other trapping conducted in different habitats of La Crosse County and could not be identified (D. Sutherland, University of Wisconsin-La Crosse, personal communications).

Differences in population structure and characteristics of individuals between the two grids could be determined by looking at age, weight, and the reproductive condition of captured animals. However, this was not possible because some individuals escaped before all measurements were taken, decreasing the sample sizes. The small sample sizes made it impossible to effectively evaluate differences in population characteristics between the burned and unburned sites.

CONCLUSIONS

The primary goal of this project was to determine the species composition in a wet meadow habitat of the Upper Mississippi River floodplain. Expected species included *Microtus pennsylvanicus*, *Microtus ochrogaster*, *Peromyscus maniculatus*, *Peromyscus leucopus*, and

Blarina brevicauda since these species are typical in dry meadows, prairies, and riparian shrublands. Only two of these species were actually present at Halfway Creek wet meadow area. Meadow voles (*Microtus pennsylvanicus*) were captured in large numbers at both burned and unburned trapping sites. Short-tailed shrews (*Blarina brevicauda*) were captured only at the unburned site. An important discovery was the presence of meadow jumping mice (*Zapus hudsonius*) at both sites, since *Zapus* have not been previously reported in La Crosse County.

It is difficult to draw conclusions concerning population differences between the burned and unburned sites. Further trapping should be conducted, ideally before the area is burned and much earlier after the burn to look at the rate of recovery of the vole populations and vegetation.

It is likely that the litter-dependent shrews had not yet recolonized or recovered at the burned site. Since more meadow jumping mice were captured at the burned site than the unburned and the mice are not dependent upon litter accumulation, the meadow jumping mouse population may not have been significantly affected by the burn.

Future trapping studies in wet meadow habitats should focus on other sites such as the other large wet meadows, like Miller's Pond, in the La Crosse District of the UMNWFR to determine if the same species are present and populations are similar. A more comprehensive study on the effect of burning on small mammal populations would need to start trapping before and soon after the burn, which was impossible within the time-line of this study. Further information is needed to completely evaluate the effect of burning (and other habitat management techniques) on the small mammal populations in riparian wet meadows.

Only a small portion of the total acreage of Halfway Creek wet meadow area was trapped, and large numbers of individual meadow voles were captured. The population within the whole meadow must be very large and have a significant impact upon vegetation as well as mammalian, avian, and reptilian predators. Considering the size of meadow area itself and that large numbers of small mammal prey inhabit the area, it is important to have clear understanding of the effect of management practices on small mammals.

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