

**SMALL MAMMAL COMMUNITIES IN GLACIER NATIONAL PARK'S
FESCUE GRASSLANDS: IMPLICATIONS OF EXOTIC PLANT INVASIONS
2002 REPORT**

Prepared by

DEAN E. PEARSON and LEONARD F. RUGGIERO
USDA Forest Service, Rocky Mountain Research Station, PO Box 8089
Missoula, Montana 59807

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Western jumping mouse – Photo by Milo Burcham

Introduction

Bunchgrass habitats located in the valleys of the Northern Rocky Mountains are unique floristic communities that differ from the more extensive bunchgrass habitats in the Columbia River Basin (Lynche 1955, Mueggler and Stewart 1980). However, like other grassland ecosystems in North America, intermountain bunchgrass is critically threatened by agriculture, development, livestock grazing, and exotic plant invasions (Flather et al. 1999). National parks and other designated natural areas provide protection from direct human threats, but they offer little security against the more insidious biological threats associated with exotic plant invasions. Despite the well-documented impacts of exotic plants on native plants (e.g., Tyser and Key 1988, Tyser and Worley 1992), little is known about how exotic plant invasions affect native fauna or the complex interactions that serve to structure native communities through trophic interactions. In fact, remarkably little is known about the ecology of these grassland systems under natural conditions. Understanding the process of exotic plant invasions and their impacts on native fauna and flora is critical to developing strategies to combat these invasions and to provide the information necessary for restoring systems after invasion. The purpose of this research is to 1) establish baseline information on small mammal communities in bunchgrass habitats on the east side of Glacier National Park (GNP), 2) expand our knowledge of small mammal community composition and relative abundance in intermountain bunchgrass habitats and, 3) assess the effects of exotic plant invasions on small mammal communities.

This document provides an update on the third year of an ongoing study of small mammal communities in GNP east-side bunchgrass habitat. Background information on the problem of exotic plant invasions in intermountain bunchgrass communities and detailed information on the study methods and objectives are outline in the first annual report (Pearson and Ruggiero 2000).

Methods

Small mammals were live trapped along 25-trap transects of Sherman live traps for four days in Belly River (2 sites – 8 transects), Many Glacier (1 site - 4 transects), Saint Mary's (2 sites – 8 transects), and Two Medicine (1 site – 6 transects) drainages (after methods in Pearson and Ruggiero 2000). The only difference in protocol from previous years was that 1 live-captured vole from each transect where voles were captured was collected by cervical dislocation (ASM

1998). This was done to establish positive identifications of voles for the four species, of vole look-a-likes that could occur in GNP bunchgrass habitats. Standard body measurements were taken for trap mortalities and collected specimens. Skulls were cleaned, and species were identified from skull and dental characteristics based on Foresman (2001a) and Hoffmann and Pattee (1968). All identifications were made by D. E. Pearson and confirmed by K. R. Foresman, mammalogist, University of Montana. Specimens are repositied at the USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana. Vegetation cover percentages were determined from ocular estimates as in Pearson and Ruggiero (2000). Detailed analyses of habitat use will be made after the final year of trapping in 2003.

Results

Trapping resulted in 2600 trap nights at 6 study sites in 4 major drainages on the east side of GNP that produced 101 captures of 63 individuals representing 4 species of small mammals (Table 1). This compares with 49 captures of 32 individuals representing 5 species in 2001 and 68 captures of 48 individuals representing 3 species in 2000. No new species were added to the species list for the study as a whole, but new species were identified at 3 of the 6 study sites (Table 2). At the Belly West site a deer mouse (*Peromyscus maniculatus*) was captured for the first time and one of the captured voles was collected and identified as a meadow vole (*Microtus pennsylvanicus*). Western jumping mice (*Zapus princeps*) were captured for the first time during this study at Belly East and Two Dog Flats.

Vegetation data has been entered and summarized, but is not presented here since it does not differ greatly from 2000 data (Pearson and Ruggiero 2000). A complete analysis of species richness and diversity and habitat selection at macro- and microhabitat scales and will be presented in the final report after 4 years of data have been gathered. The final report will be submitted to GNP and to a manuscript version will be submitted to a peer-reviewed scientific journal for publication.

Table 1. Results from small mammal trapping in bunchgrass habitat at 6 locations on the east side of Glacier National Park 2000-2003. Values indicate the number of individual animals captured by species and by location.

Species	Year	Location						Total
		Belly West	Belly East	Windy Flats	Two Dog Flats	Saint Mary	Two Medicine	
PEMA	00	0	0	15	17	4	3	39
	01	0	0	16	2	6	1	25
	02	1	0	17	14	16	3	51
ZAPR	00	0	0	5	0	0	0	5
	01	0	0	1	0	0	0	1
	02	0	1	0	4	0	0	5
MIPE	00	0	0	0	0	0	0	0
	01	0	1	0	0	0	1	2
	02	1	2	0	0	0	0	3
PHIN	00	0	0	0	0	0	1	1
	01	0	0	0	0	0	0	0
	02	0	0	0	0	0	1	1
SYBO	00	0	0	0	0	0	0	0
	01	0	0	0	0	0	1	1
	02	0	0	0	0	0	0	0
TAAM	00	0	0	0	0	0	0	0
	01	0	0	1	0	0	1	2
	02	0	0	0	0	0	0	0
VOLE	00	2	0	0	0	0	1	3
	01	0	0	0	0	0	1	1
	02	0	2	0	0	0	1	3
Total		4	6	55	37	26	15	143

PEMA = *Peromyscus maniculatus*, ZAPR = *Zapus princeps*, MIPE = *Microtus pennsylvanicus*, PHIN = *Phenacomys intermedius*, SYBO = *Synaptomys borealis*, TAAM = *Tamias amoenus*, VOLE = unidentified voles.

Table 2. Species list for small mammals documented in fescue grasslands on the east side of Glacier National Park based on sign surveys or trapping.

Species	Location					
	BW	BE	WF	TD	SM	TM
PEMA	X		X	X	X	X
ZAPR		X	X	X		
VOLE	X	X		X ^a		X
MIPE	X	X				X
MILO			X ^b			
PHIN						X
SYBO						X
SOCI				X ^a	X ^a	
TAAM			X			X
SPCO ^c		X	X	X	X	X
THTA ^c						X

a - Indicates species detected by Tyser (1991) that were not detected in this study.

b - This individual was collected from a glass bottle (Pearson and Ruggiero 2000).

c - Indicates species sampled using sign surveys rather than trapping data.

PEMA = *Peromyscus maniculatus*, ZAPR = *Zapus princeps*, VOLE = unidentified voles, MIPE = *Microtus pennsylvanicus*, MILO = *Microtus longicaudus*, PHIN = *Phenacomys intermedius*, SYBO = *Synaptomys borealis*, SOCI = *Sorex cinereus*, TAAM = *Tamias amoenus*, SPCO = *Spermophilus columbianus*, THTA = *Thomomys talpoides*.

Discussion

Previous research by Pearson et al. (2001) in western Montana described valley bunchgrass habitats as species-poor small mammal communities compared with adjacent bunchgrass and shortgrass prairie east and west of the Rocky Mountains. They found that deer mice were abundant and dominated the small mammal community, montane voles (*M. montanus*) were uncommon, and montane shrews (*Sorex monticolus*) were rare. Pearson et al. (2001) concluded that deer mice will probably normally dominate valley bunchgrass habitats, but that voles might become dominant during certain years particularly in wetter locations. They also predicted that additional species such as meadow voles and western jumping mice might also be captured in these habitats.

The current study provides valuable baseline information on small mammal communities in bunchgrass habitats of GNP and expands our understandings of small mammal communities in native valley bunchgrass habitats of the Northern Rocky Mountains. Deer mice clearly dominated the small mammal community at 3 of the 6 study sites as would be predicted from previous research, but they were surprisingly uncommon, rare, or absent from the other 3 sites.

Other species were also very rare at study sites where deer mice were not well-established. Meadow voles appear to replace montane voles observed in valley bunchgrass elsewhere (Pearson et al. 2001). Montane voles still have not been documented for GNP although they occur not far to the south (Foresman 2001b) and should occur in this habitat. The absence of montane voles may be the reason that meadow voles occur in GNP valley bunchgrass, since montane voles and meadow voles are fierce competitors (Koplin and Hoffmann 1968) and montane voles are generally more common than meadow voles in more xeric habitats such as bunchgrass (Hodgson 1972). Shrews should occur in these habitats at low densities based on previous research (Pearson et al. 2001). Although we have not yet captured shrews in this study, Tyser (1991) captured shrews at the Saint Mary's and Two Dog Flats sites in a previous study, confirming their presence in this system as rare components. This study confirms the presence of meadow voles and western jumping mice in valley bunchgrass that were predicted by Pearson et al. (2001) and also documents the presence of montane heather voles (*Phenacomys intermedius*), a species not predicted for these habitats by Pearson et al. The presence of montane heather voles is interesting in that this species is generally associated with wetter habitats (Foresman 2001b). In fact this species is commonly captured in bog-fen habitats in GNP (Pearson 1991, D. E. Pearson unpublished data). Western jumping mice occur sporadically on 3 of the study sites, but appear to be more abundant than the other species observed.

Additional trapping will help establish the relative importance of montane heather voles and other species in this system.

In general, small mammal communities in GNP bunchgrass appear to be more diverse than in other valley bunchgrass habitats that have been sampled, but the density of small mammals is much lower. We attribute the higher diversity to the fact that bunchgrass habitats that we sampled in GNP are wetter than sites sampled elsewhere (Pearson et al. 2001, D. E. Pearson unpublished data) as indicated by the fact that they are dominated by rough fescue (*Festuca scabrella*) rather than the more xeric Idaho fescue (*F. idahoensis*) or blue-bunch wheatgrass (*Pseudoroegneria spicata*) (Mueggler and Stewart 1980). The low densities of small mammals in GNP bunchgrass are more perplexing. Low sample returns are partly attributable to the early trapping period in June which is phenologically spring in GNP in most years, but small mammal populations sampled at the same time or much earlier than this (e.g., April or May) elsewhere in

valley bunchgrass habitats in western Montana usually produce much higher densities of small mammals, particularly deer mice (Pearson et al. 2000, 2001, D. E. Pearson unpublished data). Deer mice prefer open habitats where bare ground is readily available (Elliott et al. 1997, Pearson et al. 2001, Pearson and Ruggiero 2000), so deer mice could respond negatively to GNP grasslands because they have higher vegetative cover than dryer valley bunchgrass types that are not dominated by rough fescue. Habitat analyses conducted thus far on the GNP data suggest that avoidance of heavy cover may account to some extent for the lower deer mouse numbers (Pearson and Ruggiero 2000). However, voles select for heavy cover and moister conditions (Hodgson 1972, Belk et al. 1988, Pearson et al. 2001) and should be much more abundant in GNP valley bunchgrass than has been observed thus far.

One possible explanation for low densities of small mammals in this study is that predators inflict a heavier toll on small mammals in GNP where a full compliment of avian, mammalian, and even reptilian predators occurs in abundance. The role of predators in affecting populations of small mammals is simply not known in these systems. Research in European grasslands suggests that predators do not control small mammal populations, rather their populations are controlled by small mammals (Korpimäki and Nordahl 1991). However, these studies have not manipulated entire complexes of predators, and these systems do not have the diversity and abundance of predators present in GNP. Research recently initiated in valley bunchgrass habitats elsewhere in western Montana was designed specifically to measure the effect of predators on small mammals by experimentally removing predators from the system (J. L. Maron and D. E. Pearson). This research should shed light on the role of predators in affecting small mammal populations and structuring small mammal communities as well as determine the important roles that small mammals play as herbivores, and seed and insect predators in native bunchgrass.

Capture rates in 2002 were the highest they have been so far during this study. This pattern of increasing small mammal populations was consistent with that observed at other bunchgrass locations in western Montana (D. E. Pearson unpublished data). Although it was possible to predict that small mammal populations would be higher in 2002 (Pearson and Ruggiero 2002), it is unclear from current patterns whether this increase will continue for another year or whether small mammals will begin to decline in 2003. In either case, an additional year of data will be

critical to provide a minimum baseline for small mammals in this system. We suspect that future trapping will identify additional species within GNP bunchgrass communities. Possible additions include montane voles, vagrant (*S. vagrans*), montane, and Preble's (*S. preblei*) shrews. Continued trapping will be necessary to further develop our understandings of community composition, and allow us to quantify habitat use and the effects of exotic plant invasions on these small mammal communities. We recommend at least 1 more year of trapping towards this end. Future understandings of how exotic plants affect not only small mammals but also the critical ecological roles they play and the predators that depend on them in these threatened systems will depend on this baseline research.

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