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Impacts of grazing , wildfire and drought on rodent populations in a semi-arid grassland of southwestern north America

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Introduction Rodents are ecologically important vertebrates in semi-arid grasslands of North America , both for their effects on plant community structure and because they support a wide range of predators . Previous work has indicated the importance of both livestock grazing and wildfire to southwestern U .S . rodent populations , but little is known about their possible combined effects . A 2002 wildfire burned both grazed and ungrazed grasslands in southeastern Arizona where rodent populations were being monitored , providing an opportunity to compare rodent responses to the interactive as well as independent effects of grazing and fire .

Materials and methods The Appleton-Whittell Research Ranch is a sanctuary and research facility managed by the National Audubon Society , in the Sonoita Plain , Santa Cruz County , Arizona , USA . Ungrazed by domestic livestock since 1968 , the "Madrean Mixed-grass Prairies" (Bock & Bock , 2000) , of the Research Ranch are surrounded by operational cattle ranches , providing opportunity for cross-fence comparisons (Bock et al . , 1984 ; Jones et al . , 2003) . The Ryan Wildfire of April 2002 encompassed nearly 15 ,000 hectares of semi-arid grassland , including parts of the Research Ranch and surrounding cattle ranches . Widespread drought has impacted the region since 1999 , partially alleviated by above average monsoon precipitation in 2006 and 2007 . Post-fire changes in rodent populations were evaluated by live-trapping (60 traps per site) on six grazed and six ungrazed sites during the summers of 2002 through 2007 , and the results were compared to earlier studies on the Research Ranch (Bock et al . , 1984 ; Jones et al . , 2003) .

Results and discussions Prior to the wildfire of 2002 , rodent communities on the Research Ranch were dominated by members of the Muridae family (i .e . deer mice , cotton rats) . Representatives of the Heteromyidae family (pocket mice) were relatively common on the cattle ranches , where vegetation cover was reduced . After the Ryan Fire , when all cover was reduced , Heteromyidae dominated all trap sites . Through 2005 , the murid rodents had not re-appeared in significant numbers on grazed or ungrazed sites . By 2007 , composition of rodent populations was similar to conditions prior to the wildfire .

Conclusions The size and completeness of the Ryan Fire , such that there were no nearby refugia from which the grass-loving rodents might re-colonize , and the drought conditions that slowed re-establishment of the more dense vegetation habitat preferred by the murid species may have contributed to the lag in re-establishment of pre-wildfire population densities and proportions .

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