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SMALL MAMMAL USE OF MODIFIED CULVERTS ON THE LOLO SOUTH PROJECT OF WESTERN MONTANA

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Abstract

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Project Period: January 1, 2001-August 31, 2001

A highway reconstruction project, termed the Lolo South Project, is currently underway in west-central Montana to expand Highway 93 from two lanes to four over a distance of approximately 45 miles from the town of Lolo to that of Hamilton. Portions of this highway bisect a series of wetlands, which currently support a variety and abundance of wildlife. As one wildlife mitigation approach, several three- and four-foot diameter culverts have been placed at these sites to encourage animal movement between the fragmented wetlands. Metal shelves serviced by ramps were installed in three of the culverts to allow animal movement during periods of high water. The current research project was designed to determine the effectiveness of these shelves and to document all species that used them.

A total of six culverts spaced over a distance of approximately three miles along a series of wetlands are being studied, three with 25"-wide shelves (experimentals) and three without (controls). The study was initiated in January 2001 and will continue through August 2001. Remote sensing TrailMaster® cameras which are triggered by a combination of heat and motion were mounted on the roof of each culvert approximately 15 meters from one entrance. Two additional cameras were mounted outside the entrance to two culverts. All cameras were positioned so that any mammals traversing the culverts either on the floor of experimental or control culverts or on the ramps in the experimental culverts would be photographed. Cameras are being checked once each week and film is replaced as needed.

Once each month a census is made of the small mammal populations that exist along the wetlands adjacent to each culvert. For this purpose, 25 Sherman® live traps baited with rolled oats are placed in single transect lines approximately 10 meters from each entrance, with a trap spacing of five meters. Traps are checked twice per day at 6:00 a.m. and 6:00 p.m. for a total of 3 days. All animals captured are identified to species, sexed, weighed, their reproductive status noted, they are aged (immature/juvenile/mature), and marked before being released at the point of capture. Environmental data loggers which record temperature, light, and humidity levels at 30-second intervals 24 hours per day were placed at three sites; information from each data logger is downloaded each week. Finally, habitat characteristics adjacent to each culvert entrance are being described. Given this experimental design we are able to determine which small mammal species are present adjacent to the culverts and which of these are actually using the culverts to move between wetland sites on each side of the highway. Seasonal use of the culverts and use of the shelves during periods of high water are being assessed. Activity patterns of those animals traversing the culverts are determined from date and time information imprinted on each photograph. Activity patterns are also being correlated with prevailing environmental conditions.

Trapping data to date has identified four small mammal species living adjacent to the culverts: meadow voles (*Microtus pennsylvanicus*), deer mice (*Peromyscus maniculatus*), vagrant shrews (*Sorex vagrans*) and short-tailed weasels (*Mustela erminea*). Additional species too large to enter these traps have been documented by photographs and include striped skunks (*Mephitis mephitis*), muskrats (*Ondatra zibethicus*), raccoons (*Procyon lotor*), coyotes (*Canis latrans*), domestic cats (*Felis domesticus*), and domestic dogs (*Canis familiaris*). Photographic evidence has so far demonstrated culvert use by deer mice, skunks, short-tailed weasels, muskrats, raccoons, and domestic cats. No evidence of culvert use has been observed for coyotes, domestic dogs, or meadow voles.

During periods in which water has covered the floor of the culverts the smaller species (deer mice, short-tailed weasels, and domestic cats) used the shelves in the experimental culverts. Raccoons were observed to walk through the water even when a foot deep. Interestingly, the smallest species (weasels and mice) always walked along the solid frame at the edge of the shelf rather than using the open, diamond-shaped, grated surface. Ninety-eight percent of the photographs documenting animal use during the months of January through April (n = 246) were recorded during periods of darkness. Trapping data indicate that vole populations were highest along wetland areas where dense ground vegetation was present. Deer mouse populations were highest in more open areas.

From this preliminary data several tentative conclusions can be drawn. Most importantly, several species of small mammal appear to readily use the shelves when water in the culvert would otherwise prevent movement thus these devices seem to be very effective. However, nearly all photographs of smaller species using these shelves clearly shows movement along the solid frame which supports the edge of the flooring rather than movement over the floor surface. This suggests that it is difficult for these species to walk over the large, 1" diamond-shaped openings of the grate surface.

One species, the meadow vole, though abundant within a few meters of most culvert entrances, has yet to be documented in any culvert (on the floors during dry periods or on shelves during wet periods) suggesting that this species may view the culverts as a barrier. This is not surprising, as this species is known to prefer an environment where protective cover is available. Meadow voles rarely venture into an open area such as short grass vegetation or a road surface. Species' presence near culvert entrances clearly appears to be affected by vegetative characteristics at these sites. Deer mice are more abundant where the vegetation is low and more open while voles are abundant where vegetation is denser.

Continued work through wet periods in the spring and early summer will provide further data to address the questions posed. Additional modifications of the existing shelves are being considered to test the observation that the shelf surface is too open to provide adequate support for the smaller species. In addition, modifications are also being considered that would address the unwillingness of voles to enter the culverts. Possibly some form of enclosure which runs through the culverts and extends in to the vegetation would provide the needed protection for this species to successfully traverse the highway. Currently populations of this species on opposite sides of the highway appear to be entirely isolated.

A grant proposal has been submitted to expand upon this study in order to increase the sample size of culverts, and to test modifications of the shelf structures and the concerns with vegetative cover at and adjacent to the culvert entrances.

Biographical Sketch: Kerry Foresman is professor of biology and wildlife biology at The University of Montana where he has taught for the past 18 years. His primary research interests concern the ecology and reproductive biology of the mustelids, soricids, and chiropterans. Current studies, funded by USFWS; USDA Forest Service; Montana Fish, Wildlife, and Parks; and the World Wildlife Fund, are being conducted by he and his graduate students on the ecology of the American marten, the fisher, and the black-tailed prairie dog, as well as the prevalence of plague in small mammal populations in north central Montana. His lab has recently developed survey protocols for the Forest Service for the detection and ultimate monitoring of mid-level forest carnivores, specifically marten, fisher, wolverine, and lynx. Most recently, studies on the effects of highway development on fragmentation of small mammal populations and ways to mitigate such effects through the use of modified culverts have been initiated with funding from Montana Department of Transportation. He is the author of two recent books: "The Wild Mammals of Montana" (Allen Press, Inc. 2000: www.mammalsociety.org), and a field guide, "Key to the Mammals of Montana" (The University of Montana Bookstore 2000: www.onlinemontana.com) on the mammals of this state, as well as numerous scientific publications.