RESEARCH SUMMARY

Research Project: ***SP909B4M***
Date: ***August, 2011***

AN INVESTIGATION INTO THE USE OF ROAD DRAINAGE STRUCTURES BY WILDLIFE IN MARYLAND

Problem

Roads cause problems for wildlife, such as habitat fragmentation, disrupted gene flow, and direct mortality. Road drainage structures function as underpasses, mitigating many of the negative impacts caused by roads.

Objective

This statewide study of culvert use by wildlife was designed to: 1) provide information useful in building safer highways, 2) provide guidance for improving wildlife mitigation in a cost effective manner, 3) contribute to the reduction of vehicle collisions with wildlife, and 4) assist in repairing wildlife-habitat continuity.

Description

We placed infra-red motion detecting digital cameras in drainage structures throughout the State of Maryland to document wildlife use between 28 August 2008 and 3 January 2011. All sites were selected along paved state roads maintained by the State Highway Administration (SHA). We used *t*-tests, ANOVA, Chi-square (χ^2) tests, and Canonical Correspondence Analysis (CCA) to analyze the effects of season, physiographic region, and structural, environmental, and land use/land cover variables at culverts on species use. Our primary species of interest was the white-tailed deer (*Odocoileus virginianus*).

This large box culvert was located in Anne Arundel County, Maryland.

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Results

We recorded 32,783 identifiable images of wildlife, 46.5% of the total images taken during our 2.3 year survey. Forty species were recorded by camera traps and an additional 17 species were noted by direct visual observation.

White-tailed deer frequency of culvert use differed among seasons ($F_{[3,196]} = 3.400$, $P = 0.019$), with summer being highest. Mean frequency of culvert use by white-tailed deer also differed among regions ($F_{[3,261]} = 5.995$, $P \leq 0.001$), with culverts in the Piedmont used most often. White-tailed deer frequency of use was less for culverts without fencing on either side of the road ($\chi^2_{[5]} = 26.491$, $P \leq 0.001$); in contrast, culverts with five feet or greater fencing on either side of the roadway that could function as a wildlife guide or funnel resulted in greater use.

White-tailed deer used culverts most often with shallower water depth ($t_{[260]} = -3.404$, $P = 0.001$), greater distance to the road ($t_{[263]} = 2.475$, $P = 0.014$), and steeper slope ($t_{[263]} = 2.234$, $P = 0.027$). Culverts that were wider ($t_{[263]} = 5.510$, $P \leq 0.001$), taller ($t_{[263]} = 5.213$, $P \leq 0.001$), and longer ($t_{[262]} = 3.822$, $P \leq 0.001$) were more likely to be used by white-tailed deer. Openness was not a significant factor ($t_{[262]} = 1.159$, $P = 0.250$). White-tailed deer used culverts more frequently at sites that had more traffic lanes ($t_{[262]} = 3.161$, $P = 0.002$) and greater traffic volume ($t_{[255]} = 2.844$, $P = 0.006$).

We demonstrated that existing culverts improved habitat permeability across roads for a number of diverse species. Proper dimensions of culverts to accommodate target species, such as white-tailed deer, can be determined more accurately from our large sample of culverts. While many culverts located in riparian corridors had high use by white-tailed deer, placement of appropriately sized culverts at road-kill hot spots could also help mitigate deer-vehicle collisions, particularly with the effective use of deer fencing as a wildlife guide or funnel.

Alternately, or perhaps complementary to fencing, allometrically-scaled wildlife crossings may be used to improve wildlife movements. Allometrically-scaled wildlife crossings are suitable crossings which are placed at distances reflecting the home range size of the target species. A combination of the above mentioned techniques could substantially reduce road-kills and related vehicular accidents.

Report Information

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