The Influence of Structure Characteristics on Wildlife Movement Frequency Through Bridges and Culverts

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Introduction

Wildlife need to cross busy roads to move between valuable habitats, endangering both wildlife and highway users. We assessed wildlife use of culverts and bridges to clarify relationships from Marangelo and Farrell (2016) between design characteristics of transportation structures habitat characteristics of the surrounding site, and the frequency of wildlife use for under-road movement. Project results can be used to identify sound investment opportunities to modify transportation structures to increase their usability by wildlife.

Methodology

We assessed wildlife through-passage frequency at culverts and bridges designed for fluvial conveyance in order to clarify previously investigated relationships between structural dimensions and frequency of wildlife use of transportation structures. Eighty-four game cameras were set up at 26 culverts/bridge sites on State, US, and Interstate highways within road segments important for wildlife habitat connectivity. Structures represented a range of structure design characteristics (round pipe, box, and "squash pipe" culverts, bridges with and without: concrete abutment footings, riprap banks vs. no riprap).

Results

Bridge spans with usable movement surfaces (even floodplains or fine particle streambanks) were the most frequently used by the largest variety of wildlife species. In non-embedded culverts, movement surface availability and substrate type for wildlife was a simple function of structure design-type and structure size with respect to its stream. Perpetually wet flat-bottomed concrete box culverts performed especially poorly, with little wildlife use, while other culvert types with bankful width ratios >0.5 had low to moderate wildlife use frequencies. Substrate development in embedded culvert designs appears important, as high gradient structures that retain only boulder or cobble have poorer movement surfaces suited to a smaller set of wildlife species.

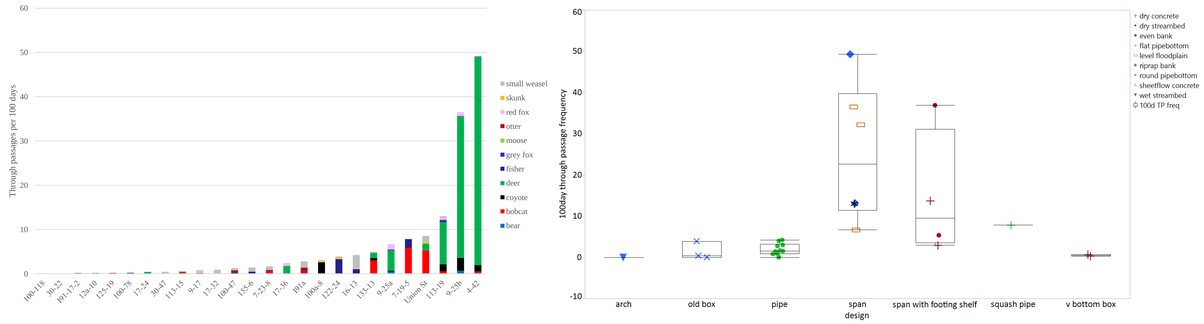

Figure 1. a) Wildlife through-passage frequency for all study sites; b) structure design and movement surface type vs through-passage frequency.

Figure 2. a) New box culvert with cleared construction footprint; b) high gradient box culvert with coarse substrate development; c) natural, even substrate under spans was the most favorable for wildlife through-passage.

Conclusions/Recommendations

A complex suite of structure design and site characteristic factors influenced wildlife use of culverts and bridges. Structure designs that permit the development of consistently dry, natural substrate movement surfaces appear to be most favorable for wildlife use. Flat-bottom concrete box culverts appear to have value for only a limited number of species, while pipe culverts benefit a greater (though still limited) variety of species. Wildlife use of new post-Irene structures is minimal despite more favorable structure design characteristics, likely because of clearing of tree/brush cover in site construction footprints.

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References (Calibri, 48 points, bold)

Marangelo P. and L. Farrell. 2016. *Reducing Wildlife Mortality on Roads in Vermont: Documenting Wildlife Movement near Bridges and Culverts to Improve Related Conservation Investments.* Report to the Vermont Agency of Transportation. 36 pp plus appendices.