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Integrating road ecology mitigation measures with beaver exclusion techniques at road drainage culverts

Road mortality is a leading cause of decline for many reptile (turtle and snake) species and is a well-documented threat on Ontario's highways. Safe passages under highways is possible through existing drainage culverts, and also requires exclusionary fence and guide-wall systems to guide animals to these passages. A challenge to implementing these systems is that often existing drainage culverts located in wetlands have a beaver exclusionary device which also blocks turtles from using these safe passages under the highway. With funding from the Ministry of Transportation (MTO) Highway Infrastructure Innovations Program (HIIFP) and in partnership with Queen's University we present a four-year study (2015-2019) where different techniques that are commonly used to prevent beavers from damming a drainage culvert were employed at a site in Eastern Ontario, Canada. This site was ideal because 500 m of exclusionary fence and an upsized drainage culvert (800 mm to 1200 mm) were installed at the study site. We first created a diversionary dam with a pond leveler pipe at the north end of the drainage culvert that a beaver built on over several years of testing. This method proved functional but a larger dam on the south side of the highway hampered water drainage through the culvert. We then installed a pond leveler system at the larger dam on the south side in 2019. Monitoring of the system documented two turtles passing through the culvert under the highway and no evidence of beaver damming near the culvert. This research study proved successful in integrating road ecology with beaver management techniques at drainage culverts along highways. Next steps are to provide guidelines and protocols, and standard drawings to be used on a case-by-case basis along the MTO highway network. Prioritization criteria for selection of sites should be the co-existence of both beavers and turtles at adjacent wetlands and a known threat of flooding and/or roadbed damage due to high water levels caused by beaver damming. Beaver dams away from drainage culverts are primary locations for installation of pond leveler pipes and could be funded and implemented during culvert replacement projects. In addition, pipes can be installed and maintained during routine maintenance procedures as currently done in the



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MTO Northeastern Region. On new roads, larger box culverts and bridges are ideal for highways that bisect turtle habitat because beavers are reluctant to dam these structures, flooding is less of a threat, and turtles can easily move through these structures.