

# Accommodating the Passage of Aquatic and Other Organisms

Technical Brief

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## Report Title

*Assessment of  
 Embedded Culvert  
 Low Flow  
 Hydraulics*



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## Report Link

<https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962y.htm>

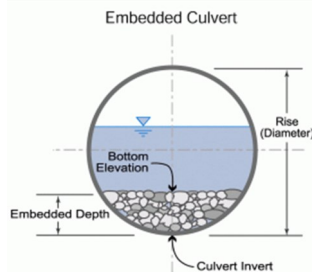
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## Why was it studied?

In 2010, New Hampshire adopted new rules for the permitting of stream crossings. One aspect of the rules was that new culvert installations should be geomorphically sized and preferably have natural materials placed in the stream crossing bed to better accommodate aquatic organism passage (AOP).

In culverts that are not open bottom, this means oversizing the culvert and partially filling the bottom with natural material. This partially filled culvert is known as an embedded culvert. While culverts are recommended to be embedded, the practice is criticized for its impact on aquatic habitat.



The goal was to inspect and assess previous installations, synthesize current knowledge, and modify design protocols, as necessary, for successful embedded culvert installations that provide passage for aquatic organisms. The study included evaluation of a condition known as “hyporheic”, where the material used for an embedded culvert is so coarse that at low stream flows the stream disappears into those sediments, reducing or eliminating AOP.



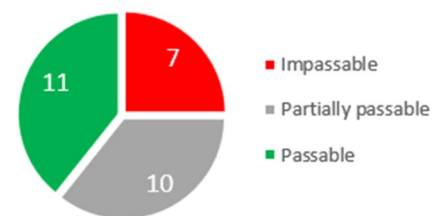
## What was done?

The research team evaluated 28 embedded culverts identified by NHDOT, NH Fish & Game, and other sources. At each site, longitudinal profiles, culvert dimension measurements, stream gauging, bed sediment sampling, and AOP assessments were performed.

## What did we learn?

Most sites with bottom topography, such as baffles, did not have hyporheic or sediment issues. Steeper culvert channel slopes exhibited hyporheic conditions or loss of sediment. Some of these steeper culvert slopes mimicked a steeper natural stream bed, therefore loss of embedment sediments may be related to inadequately sized bed material. None of the field or design variables of this study could statistically describe with confidence why some culverts were hyporheic.

Aquatic Organism Passage for Identified Embedded Culverts



## How can we use it?

This evaluation indicates that the Department’s current design practices provides necessary AOP. Shared with our regulators, it demonstrates that the culvert may not always be the limiting factor. The Department has assurance that each projects’ special provision has addressed state and federal guidance for sizing embedment material. Since none of the interviewed regulatory agencies outside of NH has performed an embedded culvert performance study, the results have captured national interest.