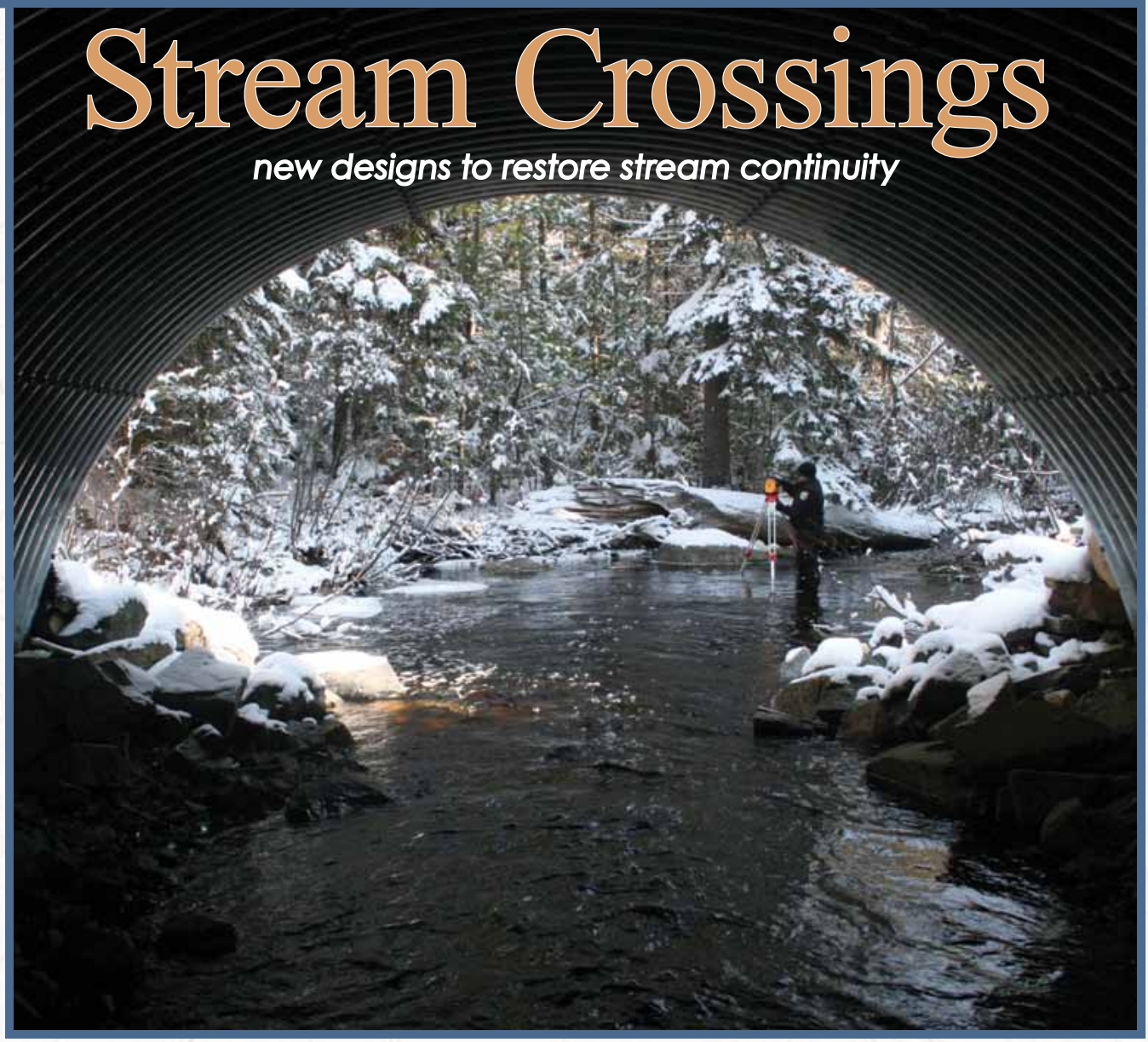
MAINE

Stream Crossings

new designs to restore stream continuity



Jacques Tardie/Project SHARE

Project SHARE Bowles Brook Restoration

Brook Trout

Thousands of miles of streams flow through Maine. These streams are habitat for a variety of fish, birds, insects, reptiles, mammals, and amphibians, and they provide recreational opportunities and economic benefits to Maine residents. Maine also has an extensive network of roads that are vital to the social and economic health of our communities. Wherever a road crosses a stream, a bridge or culvert made that crossing possible. Most bridges allow streams and the wildlife that they support to pass freely under them, but incorrectly sized, poorly placed, or damaged bridges and culverts can prevent fish and wildlife from accessing food, breeding areas, and other important habitat particularly on smaller streams. Fortunately, efforts are underway to improve road-stream crossings. With proper stream crossing sizing and installation, our streams can function naturally, our fish and wildlife can freely migrate, and our roads can be improved.

COMMON PROBLEMS WITH ROAD-STREAM CROSSINGS

UNDERSIZED CROSSINGS
restrict natural stream flow, causing several problems including scouring and erosion, high flow velocity, clogging, and ponding.

SHALLOW CROSSINGS
have water depths too low for many organisms to move through them and may lack appropriate bed material.

PERCHED CROSSINGS
are above the level of the stream bottom at the downstream end. Perching erodes streambeds and can prevent wildlife from migrating upstream. They can result from either improper installation or from years of downstream bed erosion.

Above images courtesy of Ethan Nadeau of Biodrawversity.com

scouring and erosion

high flow velocity

clogging

ponding

low flow areas

damaged culvert

Road-stream crossings that do not allow fish and wildlife to freely migrate are most often undersized structures that would not meet today's design criteria for fish passage. This is primarily because designs were historically based on standards only intended to protect roads.

In many cases, crossings that were once wildlife-friendly are now barriers to migration because of:

- clogging at inlets,
- scouring and erosion around outlets,
- deteriorating construction materials, or
- stream channels shifting out of alignment with the structure.

These problems result in further long-lasting effects on natural systems by:

- degrading stream water quality, and
- isolating large portions of habitat, which in turn alters natural dispersal patterns for fish and wildlife.

Incorrectly sized, poorly placed, or damaged bridges and culverts tend to have a shorter service life. They usually require frequent maintenance and extensive repairs that place a significant demand on the limited resources of towns, forestry companies, and other private landowners.

Safe, stable, and fish and wildlife friendly stream crossings, on the other hand, can accommodate wildlife and protect stream health while reducing expensive erosion and structural damage.

Fortunately, efforts are underway to improve road-stream crossings.

BOX AND PIPE CULVERTS

Box and pipe culverts are the most common structures used for road-stream crossings. However, they are not as effective at allowing fish and wildlife to migrate compared to bridges or open-arch culverts, especially if they are incorrectly sized or installed. When box and pipe culverts are used, some simple steps can be taken to make them more friendly to fish and wildlife:

- Avoid installing culverts that are 60 feet or longer.
- Include secondary culverts on floodplains to pass high flows.
- The widths and depths of the culverts should match those of the natural banks and full stream channels.
- Ensure that they are level and that the streambeds are "flat." In other words, avoid using box and pipe culverts in areas with slopes greater than two percent.
- Embed the culverts into the natural streambed to at least 20 percent of the culvert height at the downstream end.
- Choose corrugated pipe over smooth bore.

culvert properly embedded into streambed

SLIPLINING

Inserting a smooth plastic liner inside an existing culvert may save money in the short term, but it raises water levels and increases flow velocities, which removes bed material and increases downstream scour. These problems make passage more difficult for fish and wildlife.

KEY FEATURES OF GOOD ROAD-STREAM CROSSINGS

bridge

open-arch culvert

Good road-stream crossings simulate the upstream and downstream characteristics of the natural stream channel. Well-designed crossings:

- use *natural substrate* within the crossing;
- match the natural *water depths* and *velocities*; and
- are *wide and high* relative to their length. Structures should be at least 1.2 times the natural stream bank width so they can retain natural substrates and allow fish, wildlife, floods, and debris to pass.

Bridges and open-arch designs are the preferred structure types because they allow characteristics of the natural stream channel to be simulated. Replicating the slope, dimensions and streambed material creates water depths and velocities similar to the natural channel. These structures are also capable of handling a range of flows and will allow most organisms to freely pass through them.

Safe, stable, and fish and wildlife friendly stream crossings can accommodate wildlife and protect stream health while reducing expensive erosion and structural damage.

Above images courtesy of UMASS

WHY UPGRADE ROAD-STREAM CROSSINGS?

Stream crossing designs have improved. Structures based on today's designs:

- **Require less frequent repairs.**
  Upgrading Maine's road-stream crossings will reduce long-term maintenance costs and periodic losses of use. Newer designs also last longer. For example, open-arch culverts can last in excess of 75 years.
- **Help wildlife access stream natural areas.**
  Upgrading will in turn improve fishing, hunting, and wildlife observation opportunities for Maine's residents and visitors.
- **Handle a wider range of flows.**
  Climate change is increasing the amount and intensity of precipitation. A study in Keene, New Hampshire revealed that 30 to 80 percent of the city's culverts were likely to fail under projected flow conditions. Upgrading will prevent or minimize the potential negative impacts of increased flow conditions on Maine's infrastructure.

Grant funding and technical assistance may be available to help defray costs for new stream crossings that are more friendly to wildlife.

HELP CARE FOR OUR STREAMS

We now understand that a well-designed road-stream crossing should meet our transportation needs *and* allow for natural stream functions and wildlife migration. The Maine Forest Service, the U.S. Fish and Wildlife Service Gulf of Maine Coastal Program, and many other state, federal and NGO partners are eager to work with towns, agencies, and private landowners to improve fish passage at crossings. The goal is to accomplish several objectives: to spread the word of why we need to fix these culverts, to demonstrate improvements in crossing designs, to help find funding to share restoration costs, and, in the end, to restore passage for fish and wildlife in our streams.

American Shad

Blueback Herring

Alewife

Produced by Maine Forest Service, GOMC-NOAA Community Based Habitat Restoration Partnership, and USFWS Gulf of Maine Coastal Program.