



# Stream Smart Crossing Principles

[FIN - An information sharing network for Maine forest landowners, fisheries agencies and NGO's](#)

Designing and installing stream crossings that function effectively for the road infrastructure while maintaining the ecological function of the stream is becoming increasingly important. Crossings designed using stream smart principles allow for adequate capacity for high flows and minimize the impact of the crossing on stream function. Applying these principles maintains flexibility in the choice of stream crossing structure (bridge vs. culvert for example) while concentrating on the desired outcomes.

## Principle # 1 – Span the Stream Channel

A crossing that is narrower than the natural stream channel can cause water flow to accelerate through the crossing. This can lead to problems such as water moving faster than a fish can swim, creating a barrier to fish movement. When water exits a culvert that is too narrow it can have enough force to push streambed material downstream. This can create a scour hole causing the culvert to become perched above the streambed, also limiting fish passage. Crossings that are at least as wide as the stream channel allow natural flows to be maintained though the crossing minimizing velocity problems. In *most* cases a crossing sized to be as wide as the stream channel will also accommodate at least a 50 year flood.



A culvert that is spanning the stream channel



Water ponded upstream of an old crossing is a good indication that the crossing is set at too high an elevation

## Principle #2 – Set the Crossing at the Correct Elevation

Stream crossings, including closed bottom culverts and footers of open bottom structures, should be set below the elevation of the ORIGINAL stream channel. This is particularly important to be aware of when replacing a stream crossing, since old crossings were often set at too high an elevation. Water ponded up stream of a crossing is an excellent indicator of a crossing that has not been set at the correct elevation.



A culvert installed to stream smart principles that is accumulating substrate in the bottom

## Principle #3 – Slope Matches the Stream

Crossings should be set at the same gradient as the natural stream channel. This allows the stream to maintain its natural velocity and minimizes problems such as head cutting above the crossing.

## Principle #4 – Substrate in the Crossing

Stream bottom material (substrate) in the bottom of the crossing is a good indicator that the crossing has been

installed correctly and is functioning well ecologically. Open bottom crossings such as bridges and arch culverts are open to the natural stream bottom. Properly sized and embedded closed bottom culverts can have a stream bottom redevelop in the crossing as stream bed material accumulates. Material may need to be added to culverts, particularly on steeper streams.

### Stream Smart Training

Training in how to design and install crossings according to stream smart principles is available. To discuss scheduling training for your group contact:

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Field training session on culvert installation

The Fisheries Improvement Network is a cooperative effort of the Maine Sustainable Forestry Initiative, Maine Forest Service, Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources and the US Fish and Wildlife Service

