cspi
corrugated steel pipe institute

Beavers Our Natural Storm Water Managers

Beavers have played a major role in the development of Canada. Many made the ultimate sacrifice in support of our early fur trade economy. By damming rivers and streams they created water habitats that are necessary for the beaver's survival and at the same time improved the transportation routes for canoe travel across our land.

In terms of storm water management an actively maintained beaver dam is a beautiful thing. While it holds back water creating safe habitat for a variety of species upstream it also leaks at a controlled rate maintaining healthy environments and a steady flow during all seasons downstream. The sound in their ears and the feel on their whiskers of rushing water warns the beaver of a break in their dam. This causes the beaver to rush to the site to repair the damage. Beaver dams typically overtop during storm events but failure to repair the dam imme-diately after the storm can lead to the dam's destruction and serious consequences for all parties both upstream and down.

Often when we build a culvert across a stream we in-advertently create the model of a broken beaver dam. By constricting water flow under the road we sometimes create the noises and velocities that instruct a beaver to repair the dam. In order to do this, beavers quickly plug the culvert opening with sticks and mud. A plugged culvert impedes fish passage and restricts flow during flood events. This can lead to road wash outs and hydraulic uplift of the culvert entrance.

A roadway and culvert constructor has a number of options available for dealing with beaver blocked culverts. In some cases the beaver population is removed from the area. This must be done by a licensed trapper who may find it counterproductive to capture all of the beaver in an area. As the beaver are removed the dams must also be opened or removed as without beavers to maintain them

NATURAL BEAVER DAM ON A TROUT STREAM

Beavers Our Natural Storm Water Managers

they are weakened and become liabilities for sudden and sometimes catastrophic failure during storm events.

The best option to prevent beaver issues at stream crossings is to install a culvert that is large enough so as not to restrict the normal stream flow. Large open bottom arch culverts and imbedded round and pipe arch culverts can be constructed so as to mimic the natural stream channel and flow velocity. In these cases the culvert is no more attractive as a dam site than other parts of the natural stream.

Another option is to connect a length of same diameter perforated CSP to the road culvert inlet. This pipe projects into the upstream flooded area and is suspended from driven fence posts which hold the pipe off of the bottom. As CSP is longitudinally quite rigid in all temperatures and does not float it is well suited to this application. The many perforations along the pipes invert effectively increase the inlet capacity of the pipe without increasing velocities or creating the sound of running water. The beaver senses that the dam is working and even if motivated to stop the water that is upwelling through the perforations is unable to do so. Fish and animals are able to move freely through the open ended culvert.

Another design includes a vertical CSP "T" at the end of the pipe that is projecting into the pond. Upwelling water allows fish passage and the open grated top handles flood water. A hinged attachment eases routine cleaning and maintenance.

Heavy wire mesh entrance tubes are available for culvert add-on. These function in a similar manner to the perforated CSP. In these installations the beavers make extensive efforts to block the outer mesh tube while flow is maintained within the inner mesh tube.

CONICAL GRATES WITH FISH OPENING (PATENTED DESIGN)

SLOPING GRATES IN CSP END SECTIONS

Beavers Our Natural Storm Water Managers

If and only if it becomes apparent that beavers are damming the end of a culvert (including the perforated extensions described above) it is common practice to install an open steel grate over the inlet end and in some cases the outlet end. This prevents the beaver from building dams inside of the culvert where they are very difficult to remove. The grate should be sized to allow for fish passage and designed to facilitate easy cleaning and maintenance either by hand or excavating equipment. Conical shaped and sloping grates are safer for children playing nearby and can provide some advantages for cleaning but all grates make it easier for beavers to construct a dam. A number of proprietary options are available.

CONICAL GRATE WITH PERFORATED CSP

As with natural beaver dams a beaver blocked culvert will allow some water to pass thereby regulating pond levels. It is during storm events when flows increase and the dam or road is overtopped that damage occurs. In anticipation of these flood events it is often possible to install overflow culverts at a higher elevation in the road embankment. These can operate as dry animal crossings in normal weather. They also can provide overflow relief in areas where culvert icing is an issue.

As an alternative to large size and overflow culverts it is suggested that a low point be graded in the road away from the culvert structure. This can prevent damage to the culvert during major storm events and can make the road repair easier. An armoured ford crossing at the low point can provide an economical solution to seasonal flooding on low traffic volume roads and will continue to function even if the culverts are blocked by beavers.

REMOVABLE BED SPRING GRATE

Beveled ends on culverts and perforated CSP vertical risers with drop inlets can be effective in maintaining an overflow opening during storm events.
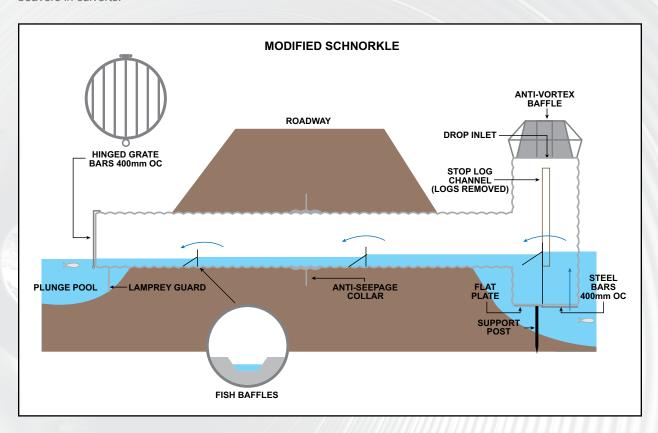
Beavers Our Natural Storm Water Managers

Culvert accessibility and ease of maintenance will help to determine the most cost effective means of dealing with beavers in culverts.

MODIFIED SCHNORKLE

- HINGED GRATE BARS 400mm OC
- ROADWAY
- ANTI-VORTEX BAFFLE
- DROP INLET
- STOP LOG CHANNEL (LOGS REMOVED)
- PLUNGE POOL
- LAMPREY GUARD
- ANTI-SEEPAGE COLLAR
- FLAT PLATE
- STEEL BARS 400mm OC
- SUPPORT POST
- FISH BAFFLES

The "Schnorkle" is said to have been invented in 1955 by a farmer in Maine. He wanted to maintain a pond on his property for agricultural needs but was frustrated by over zealous beavers. Various modifications of this design are in use by DOTs throughout North America. While the original design with a stop log controlled inlet and perched outlet would prove to be a barrier for fish passage the design can be modified making the road crossing fish friendly if desired. Beaver dams and road crossings can perform as effective barriers for species segregation and control. As examples the spawning of sea lampreys in Great Lakes tributaries and the separation of introduced aggressive

PERFORATED CSP RISER DROP INLET WITH ANTI VORTEX BAFFLE

Beavers Our Natural Storm Water Managers

Pacific salmon from native brook trout can be managed with select CSP road crossing designs.

A number of optional features are available to optimize the performance of beaver affected road crossings.

UP FLOW / OVER FLOW HINGED INLET (PATENTED DESIGN)

UP FLOW / OVER FLOW HINGED INLET (PATENTED DESIGN)