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Preventing beaver dams from blocking culverts

Abstract

This report discusses installation of the Beaver Stop® device and evaluation of the effectiveness of this and other methods for preventing beavers from damming culverts. The advantages and disadvantages of these methods are reviewed.

Keywords:

Culverts, Beavers, Dams, Prevention, Beaver Stop®.

Introduction

Damage to forest roads caused by beaver activity is a serious problem in many areas of Canada. Beavers plug culverts and create dams downstream from the road that can wash out roadside embankments and flood the road itself, resulting in damaged roads or culverts. Beaver dams upstream from forest roads can also cause significant damage if the dam bursts. A road may have to be closed during repairs, delaying wood transportation or forcing trucks to use longer, more costly routes.

Beaver control methods come in three categories: trapping or shooting the animals, installing devices that prevent beavers from damming culverts, and installing devices that maintain water flow through beaver dams. Each type of method can be effective if properly applied, but road construction techniques can also help to avoid the problem in the first place. This report discusses the advantages and disadvantages of each approach.

Trapping or shooting beavers

Beavers can either be killed or live-trapped and relocated to a less problematic area. Both activities are subject to government regulations, which vary from region to region, so always check local regulations before conducting either activity. Both approaches are fairly cheap, and if planned well, can remove beavers before they can build dams or clog culverts. However, these types of control activity must be repeated annually because other beavers are also likely to find the area inviting. Moreover, it may be difficult to find licensed trappers willing to perform the work. In this approach, a systematic annual program must be implemented to ensure effective control and to avoid simply moving the problem elsewhere.

Preventing beavers from damming culverts

Various devices can prevent beavers from entering and damming culverts. Dams constructed within culverts are much more costly to remove than dams that can be reached by an excavator. Protective devices can be simple wire screens or fences at the culvert inlet (Figure 1), or more complicated devices such as the Beaver Stop®, which both prevents beavers from entering culverts and maintains water flow. (See the case study later in this

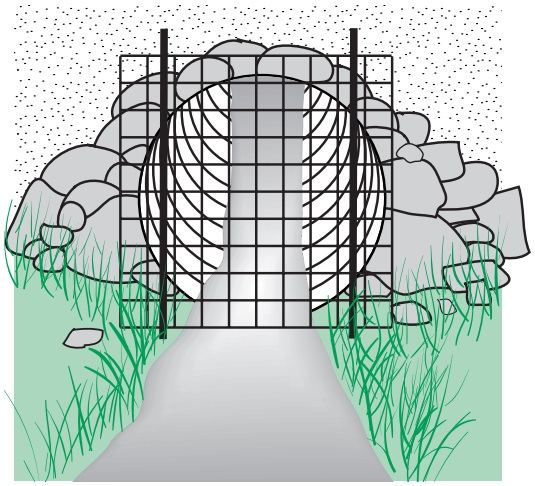

Figure 1. (*Left*) An example of a simple screen that prevents beavers from building a dam inside culverts.

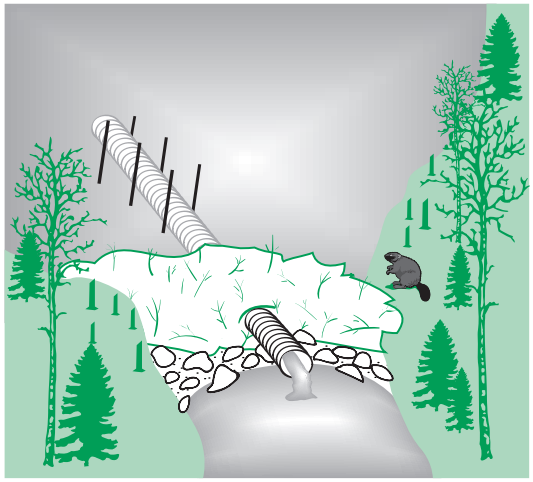

Figure 2. (*Right*) An example of a drainage pipe that reduces the water level behind a beaver dam.

report for details.) The simple wire screens are the most common types of devices used to control beavers because they are inexpensive, easy to install, and effective. However, regular maintenance is required to remove accumulated debris; in contrast, the Beaver Stop requires relatively little maintenance. With any device based on wire mesh, the mesh must be wide enough to allow the passage of fish.

Devices that maintain water flow through dams

Devices that preserve water flow through beaver dams are less common, and are mainly used where wetlands created by the dams must be preserved. These devices are generally small pipes inserted through the dam to drain excess water and maintain the desired water level (Figure 2). These devices vary mainly in the design of the pipe's inlet, which is usually covered by a cage and suspended above the pond's floor and below the water surface to prevent beavers from clogging the inlet. These structures preserve the wetland, are relatively inexpensive, and have been used successfully in many jurisdictions. However, it is difficult to choose a pipe size that can maintain the desired water level. Too-small pipes with insufficient water flow don't prevent the dam from bursting during heavy rains, but if the pipe drains too much water, the beavers may simply build another dam further downstream. These structures also do not permit the passage of fish and require routine maintenance to continue performing adequately.

Road construction techniques

Various road construction techniques can also minimize or prevent beaver damage. These techniques primarily involve choosing an appropriate size or type of culvert. Beavers identify areas suitable for dam construction by the sound of increased water flow, so oversized round culverts, bottomless arch culverts, and bridges that do not restrict the flow of water can all reduce the likelihood that a beaver will build a dam. With suboptimal structures, don't immediately install a device to prevent beavers from building a dam inside the structure, since a steel cage or screen can actually help beavers build their dam. Instead, wait until you see signs of beaver

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activity. Avoid installing several smaller culverts side-by-side in regions with high beaver activity; these installations are easier for beavers to dam than larger culverts that provide comparable drainage. Roads that are being permanently or temporarily abandoned should have their water crossings removed in regions with high levels of beaver activity, since the crossings on these roads are unlikely to be maintained sufficiently often to prevent beaver damage.

Case study of the Beaver Stop device

FSI Culvert Inc. (www.fsiculvert.com) manufactures the Beaver Stop, a device that fits over the ends of a culvert and maintains water flow while preventing damming. The Beaver Stop is available in sizes that fit corrugated steel, plastic and concrete pipe culverts and corrugated steel pipe arches from 600 to 1800 mm in diameter. The Beaver Stop consists of four cylindrical steel screens. At the culvert's upstream end, three nested mesh screens attach to the culvert and extend upstream. A fourth, shorter mesh screen fits on the downstream end. All three screens have a mesh size wide enough to allow the passage of fish. The Beaver Stop (Figure 3) is shipped as a 1.8-m (6-ft) tubular section that can be delivered to the site in the bed of a pickup truck.

Installation

FERIC helped install a Beaver Stop at Domtar Inc.'s Trenton (Ont.) operation. This area of south-central Ontario is covered mainly by hardwood forests dotted with small lakes and streams, and damage caused by beavers is an ongoing problem. A site was chosen that had previous and continuing problems with beavers damming a 24-in. (600-mm) corrugated-steel culvert. A wire screen had previously been installed at the site, but the company wanted a more-effective, lower-maintenance device because the road was not used frequently enough for maintenance to be performed regularly.

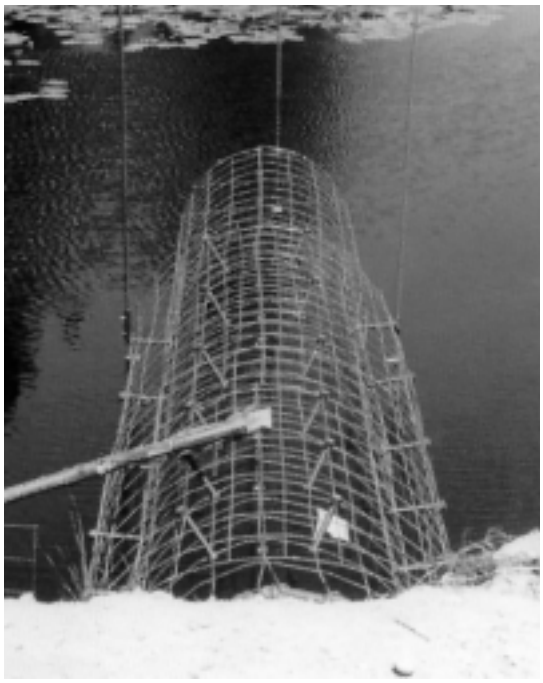

Figure 3. An installed Beaver Stop. (Photo courtesy of FSI Culvert Inc.)

The Beaver Stop used in this case study consisted of a 6-ft (1.8-m) downstream culvert cap, three 6-ft cylindrical sections that were joined to create the 18-ft (5.6-m) main upstream cylinder, and a 10-ft (3.1-m) overlay section that fits over the main upstream cylinder. Proper assembly of the product requires no special tools; installation used a socket and wrench set, a hammer, and a screwdriver. Three workers took approximately 2 hours to fully assemble the Beaver Stop and have it ready for installation.

Before the Beaver Stop could be installed, a small beaver dam was removed from the upstream end of the culvert. A loader removed most of the debris outside the culvert, and a steel rake was pulled through the culvert to remove debris inside the culvert. It took approximately 1 hour to fully remove the debris. To ensure that the Beaver Stop could be securely attached to the culvert, the loader excavated the area around the upstream and downstream ends of the culvert. The device must fit around the entire end of the culvert, and the upstream section should be installed first to prevent any debris loosened during this phase of the installation from getting caught in the downstream end of the device.

The upstream end was lifted by the loader and guided into place. This step took several tries until the attached legs on the end of the Beaver Stop could be positioned at the proper height to ensure that the device would remain at water level. The upstream end was then clamped into place; no drilling into the culvert is required. The downstream end was then put in place manually and clamped securely to the culvert. It took three workers approximately 2 hours to complete the installation, for a total assembly and installation time of 5 hours.

The installation took place in October 2001, and the device's effectiveness was evaluated in October 2002. During this time, Domtar performed no maintenance on the Beaver Stop, though the company checked periodically to confirm that it remained effective. Beaver activity had continued in the area, and beavers had attempted to dam the Beaver Stop by placing debris in and around the device. However, this had no effect on water flow through the culvert. As well, the Beaver Stop was not damaged by snow or ice during the winter.

Economics

The size of Beaver Stop used in the case study cost approximately $900. Installation required two workers (at $30/h each for 5 hours) plus a loader and its operator (at $80/hour for 5 hours), for an estimated total cost of around $1600. This cost should be compared with the costs of repeated maintenance to remove debris placed by beavers trying to dam a culvert. These costs are minimal for small culverts on frequently traveled roads, as these culverts can often be unplugged by hand in about an hour. For larger culverts or culverts on seldom-used roads, the amount of debris may be too large to remove by hand, and an excavator or loader may be required. The cost of floating a machine to the site to remove a beaver dam can be substantial, especially when the machine isn't working in the same area as the blocked culvert. If we assume that a float truck ($75/h) and an excavator ($90/h) are needed for a total of 3 hours to clean a plugged culvert of this type, the estimated cost would be approximately $500. If maintenance is required twice per year, the Beaver Stop would pay for itself in around 1.5 years, depending on the size of the culvert.

Implementation

Although road construction techniques can minimize the risk of beaver problems, managers have three main solutions available when these problems arise:

- Shooting or trapping beavers and relocating them are subject to government regulations, but are inexpensive and potentially effective solutions. However, a systematic annual program must be implemented to ensure effective control and to avoid simply moving the problem elsewhere.
- Simple wire screens or fences at the culvert inlet can prevent beavers from entering and damming culverts. Although inexpensive, easy to install, and effective, regular maintenance is required to remove accumulated debris, and the mesh must be wide enough to allow the passage of fish. Specialized products such as the Beaver Stop may be a more economical solution in the long term.
- Devices that preserve water flow through existing dams (drainage pipes) can preserve wetlands, are relatively inexpensive, and have been used successfully. However, it is difficult to choose a pipe size that maintains the desired water level, and these structures also require routine maintenance.

Acknowledgments

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