Baystate Roads Program
Tech Notes

Tech Note #21

Flow Devices to Control Beaver-Related Flooding

Wetlands greatly influence the flow and quality of water. They function like natural tubs or sponges, storing water and slowly releasing it. This reduces flooding and erosion. Beaver ponds with properly installed and maintained pond-leveling devices can also be effective in decreasing flooding. These devices lower the pond below the top of the dam so storm runoff is held back. Once the rains have ceased, properly functioning drainage systems will return the pond level to below the top of the dam. Beavers will not continue to raise the height of their dam unless there is water flowing over it, so the size of the beaver pond can be controlled if it is necessary to prevent the flooding of adjacent property.

Wetlands help improve water quality, including that of drinking water, by intercepting surface runoff and removing or retaining its nutrients, processing organic wastes, and reducing sediment before it reaches open water. Wetlands help to detoxify most runoff toxins (e.g. pesticides and fertilizers) and act as the "Earth's kidneys". They filter runoff and adjacent surface waters to protect the quality of our lakes, bays and rivers. Erosion and waterway siltation are decreased by the ponding.

The "Trapezoidal Fence" System

A road culvert probably appears to a beaver as a hole in what would otherwise be a wonderful dam. As the roadbed with a blocked culvert produces a large pond area for minimal work, beavers are naturally attracted to these sites. However, a flooded road or washed-out roadbed is not a tolerable situation for humans, due to the time, energy, and expense involved in unclogging the culvert and repairing any roadbed damage.

Wildlife biologist Skip Lisle invented the "Beaver Deceiver" fencing method which has proven extremely effective in protecting culverts from beaver activity. He discovered that road culverts can be protected from beaver activity by building a trapezoidal shaped fence (see diagram). Beavers may start damming near the culvert, but give up as they get farther away from the culvert as it is an unnatural direction for them to dam. Beavers do not realize, as humans do, that if they continued to dam along the fence that they would eventually succeed.

These fencing systems can be used in areas where no flooding is desired. They are inex-

TRAPEZOIDAL FENCE FOR CULVERT PROTECTION

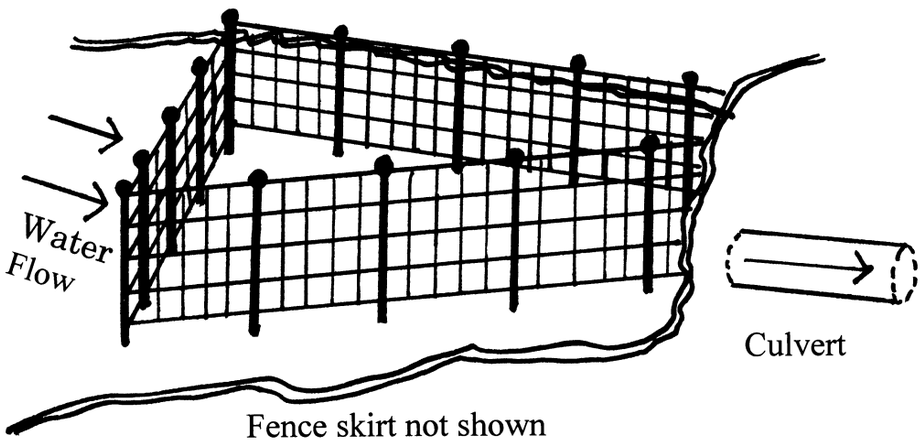


FIGURE A - SIDE VIEW

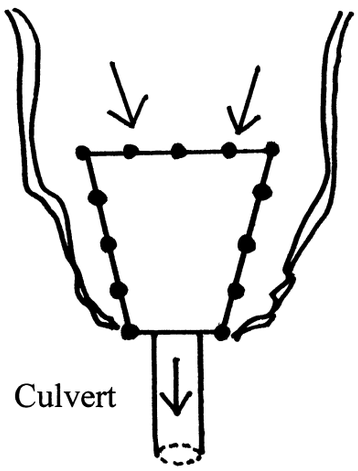


FIGURE B - TOP VIEW

pensive to build, and more than pay for themselves in a short period of time by improving road safety, decreasing road crew time spent unclogging culverts, and eliminating road damage from beaver-related flooding. Mr. Lisle uses cedar posts for his "Beaver Deceivers", but heavy duty metal fence posts (which are less expensive and easier to install) work well if the streambed is is not too rocky. It is crucial that these fences be built so that beavers cannot tunnel underneath the fence.

The fence shape, while ideally trapezoidal, is dictated by the topography of the area. The length of the angled sides is extremely important. Usually, a total perimeter length of 60 feet is adequate, but on occasion the fence may exceed 100 feet in total length.

Contributing factors for longer fences:

* Noisy culverts (Beaver activity is stimulated by the sound of water)

* High quality habitat (Many preferred trees such as aspen, ash, apple, alder, poplar, walnut & willow)

Materials

* 6 Gauge concrete reinforcing 6"x 6" mesh, 5' by 10' sheets

* Heavy duty metal fence posts

* Large hog rings with application pliers

* Galvanized wire

Total Material Cost

Approximately $100-$150

Installation Steps

1. Clear all debris out of the culvert.

2. Using a 100' cloth tape measure, determine the fence shape with a person at each corner. Plan on spacing the fence posts every 54" (4 ½ ft.). Avoid running the fence too close to embankments or other natural obstructions in order to prevent the beavers from being able to build a small dam between the fence and the prominence, thereby rendering the downstream length of fence useless. Once the shape is determined, drive the corner posts in until they are secure and extend 24" above the baseline water level.

3. Align and drive in the rest of the posts, spaced 54", and also extending 24" above the water.

4. Cut 1 or 2 horizontal wires off the bottom of the 6" by 6" wire sheets to create 6" to 12" prongs that can be pushed into the stream bottom. These prongs are important as beavers may attempt to tunnel under the fence to gain access to the culvert. The sheets can also be form-fitted with bolt cutters to fit irregularities (such as large rocks) in the streambed.

5. To prevent tunneling under the fence (they will try!), use hog rings to attach 24" wide strips of the 6" by 6" wire fencing on the bottom horizontal wire of each fence section. This strip of fencing will act as a "skirt" along the outside perimeter of the fence to prevent tunneling. Beavers attempting to dig under the fence will be stopped by the horizontal "skirt".

6. Position the first fence section and have two or more people step on it to push the prongs into the mud. Keeping the fence level eases installation. Remove and recut as necessary to ensure a good fit. All fence sections should extend 24" above the water (same as the posts).

7. Attach each fence section to the posts with galvanized wire. Attach the fence sections to each other using hog rings. Use the water as a level.

8. Continue to cut, place and secure fence sections until trapezoid is complete.

9. Remove rocks, branches, etc. from the fence perimeter in order to permit the "skirt" to lay flat. Once flat, hog ring the sections of skirting together to prevent the beaver from lifting it up.

10. The downstream opening of the culvert should <u>always</u> be covered with fencing to prevent the beavers from gaining access to the culvert from the downstream end. (12" above water level).

11. If the culvert is very noisy, building a small dam to backup water in the culvert just enough to silence it, will greatly decrease the beaver's motivation to tunnel or dam against the fence.

<u>Notes:</u>

- When narrow streambeds necessitate narrow devices, a floor of fencing rather than a "skirt" can be used effectively.

- A cylindrical metal "post pounder" is much easier and faster to use than a sledge or hammer.

- Painting the fence posts green, and having them evenly spaced and the same height greatly improves the aesthetics of the fence.

- Once beavers begin to work at a site, it becomes more difficult to discourage their activities. For this reason, whenever possible, culverts should be protected prior to beaver activity.

- New culverts should be installed level to prevent the noise of flowing water from attracting beavers.

The Cage Leveler

For beaver dam flow devices to work, they must be designed so that beavers cannot detect the flow of water into the pipe. The Cage Leveler is based on a flow device successfully used for 20 years by Michel LeClair at Gatineau Park in Ottawa, Canada. It works by surrounding the inflow area of the pipe with a large cage which prevents the beavers from getting close enough to the intake to detect the water movement. As a result, the beavers leave the pipe alone.

Materials

* 2-20 foot nonperforated corrugated unlined ADS pipe - 10" diameter

* 1- 10" ADS coupling

* 3 ½ - sheets (5' x 10') of Heavy Duty Concrete Reinforcing Mesh, Gauge 6

* 1- Box of Large Hog Rings with applicator pliers (May substitute wire, but more work)

* 3- Cinder blocks

* 9 gauge galvanized wire

* 2- 6' Heavy duty fence posts

<u>Note:</u>

Multiply the above materials by the number of levelers you plan on installing.

Total Material Cost

Approximately $190 per leveler

Prepare the site

Obtain proper permissions from the Division of Fisheries and Wildlife, the local Conservation Commission, and the landowner.

Breach the dam slowly for a few days prior to installation. This allows for a gentle pond lowering with minimal chance for downstream flooding and excessive siltation. Breaching early in the morning allows for the longest drainage period while the beavers are less active.

Preparing the cage and pipe

- Cut the spikes off the ends of the concrete reinforcing sheets

- Cut the sheets to size:
* 5 pieces: 4 ½ feet wide by 5 feet tall (Four sides and middle support wall)
* 2 pieces: 4 ½ feet square (Top and Bottom)

- Hog ring together the bottom, 3 sides, and middle support wall.

- Position the middle support wall 24" from the parallel side wall.

- Cut a 12" diameter hole in the center of the middle support wall at least 24" off the bottom, and in the parallel side wall at least 18" off the bottom. (Make the holes as high as possible, but the top of the holes at least 12" below the desired water level.)

- To create a 90 degree elbow for the intake: use a small tooth handsaw to

cut out a 90 degree angle "V" - shaped wedge extending nearly all the way through the pipe at the end of one pipe - approximately 6" from the end.

• Insert this intake end of the pipe through the holes in the side and the middle support wall of the cage. Fold the cut end of the pipe down into an elbow and secure with wire. Securely wire the pipe to the cage at the side wall and the middle support wall. Attach 4th side with hog rings. (The top is applied in the water.)

• Join the 2 pipes securely with the coupling and heavy wire.

Installation Directions

1. Carry the cage with the attached pipe to the deepest area, as far from the dam as possible.

2. With the cage in position, cut the height if needed (for aesthetics). Low visibility sites should not need adjusting. Keep the cage as high as possible.

3. Attach the top with hog rings.

4. Create a trench for the pipe (or pipes), in the pond bottom and extend it deep into the dam so that the pipe will enter the dam well below the final water level.

5. The downstream side of the dam should only be lowered to the desired water level as this will support the peak of the pipe, creating the "leveling" effect.

6. Lay the pipe through the trench in the dam with the outflow end extending past the dam.

7. Using fence pliers or an awl poke a small hole in each of the raised corrugations on the top side of the pipe. This allows air to escape when the pipe is sunk to the bottom.

8. Let the pipe fill with water from the cage (intake) end to the out flow.

9. Pound fence posts on upstream and downstream sides of cage. Wire cage to posts.

10. Wire cement blocks (spaced evenly) to the pipe to anchor it to the pond bottom.

11. Stepping on the pipe will help sink it in soft-bottomed ponds.

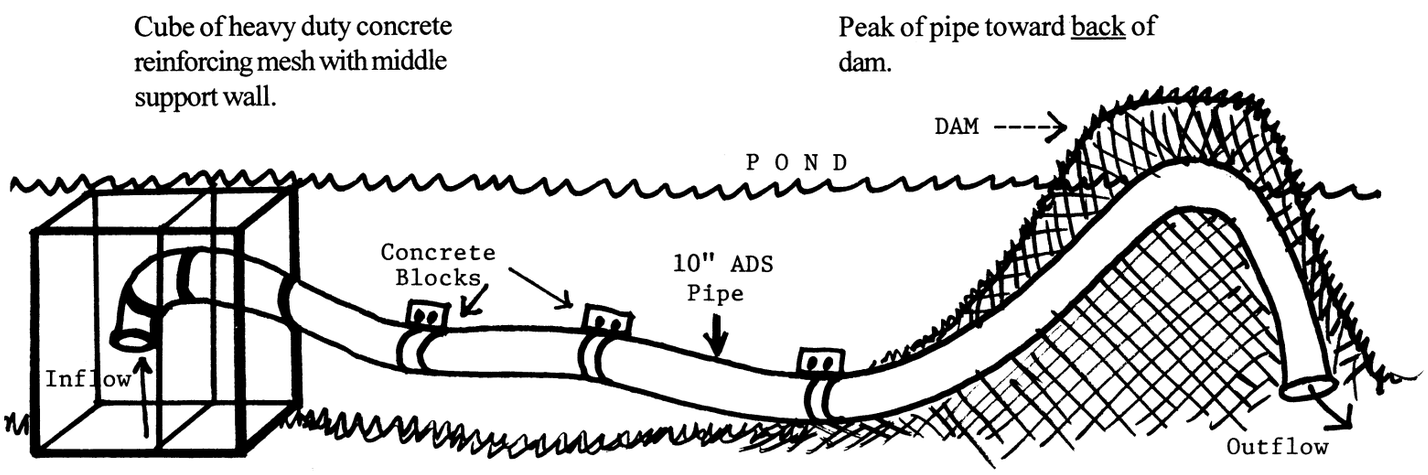
12. The pipe should run into the dam as deep as possible to prevent beaver chewing.

13. The peak of the pipe should be located in the downstream side of the dam. The peak of the pipe will dictate the ultimate pond level. Use strong sticks to support the peak in the pipe. The pond level can be raised or lowered by adjusting the peak of the flexible piping.

14. Use mud from the pond bottom to bury the pipe on the upstream side of the dam. Use sticks and mud to hide the pipe on the downstream side of the dam.

15. If more than one Cage Leveler is needed, use the pond water level as a reference to be sure that the peaks of the 10" pipes are the same height.

CAGE LEVELER



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