Beaver Institute Inc.

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Self Help Information – Culverts, Drains

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1. Beaver Basics

The North American beaver, Castor canadensis, is a large semi-aquatic rodent. They only eat vegetation. They build dams from mud and sticks that create wetlands that are among the most biologically productive ecosystems in the world, comparable to coral reefs and rain forests. Beaver ponds:

- Create diverse habitats and ecosystems
- Increase biodiversity
- Promote salmon/trout recovery
- Regulate stream flows
- Improve water quality, act as the "Earth's Kidneys"
- Replenish ground water
- Store surface water
- Repair eroded stream channels
- Restore watershed health
- Sequester carbon
- Reduce wildfire damage, and speed recovery after fires

And beaver ponds provide all these valuable ecological services for FREE!

A single beaver family can provide us with millions of dollars in ecological services every year! However, despite these valuable ecological services, beavers can cause humans significant damage. Fortunately though, cost-effective, long-term options exist to resolve most human-beaver conflicts and retain most of their wetland benefits. So while beaver removal is an option, removing the offending beavers should used only as a last resort.

2. Introduction to Flow Devices

(a.k.a. Water Control Devices, Beaver Deceivers™)

What is a flow device? A flow device controls beaver damming to prevent flooding issues with humans. Nearly every road culvert or manmade drainage structure can be protected from beaver damming with a flow device. They are typically made with fencing, pipes, or both. When properly built and installed, flow devices protect human properties and infrastructure from beaver dam flooding in the most long-term, cost-effective, environmentally friendly, and humane manner. They protect human interests and allow beavers to remain in place and create valuable wetlands.

Educational Links

Intro to Flow Devices Video:
https://www.youtube.com/watch?v=eCqaXLHyJco&t=9s

Flow Device Testimonial Video:
https://www.youtube.com/watch?v=SYXflMi9Wu4&t=1s

Municipal Beaver Management Study:
https://www.beaverinstitute.org/wp-content/uploads/2019/02/Billerica-Beaver-Study-AMWS-2019.pdf

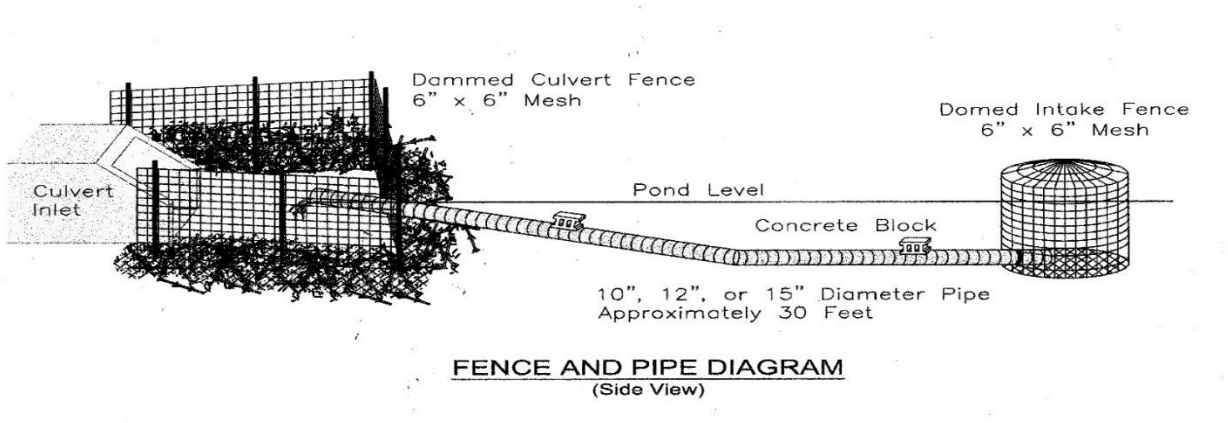
Road Culvert Protective Fence Instructions:
https://www.youtube.com/watch?v=BKJHd0mn6kY&t=5s

Fence and Pipe Device Instructions:
https://www.youtube.com/watch?v=aEznZRUKtIw&t=28s

3. Fence and Pipe Flow Device

A Fence and Pipe flow device is a very effective method to protect culverts or spillways in manmade dams from beaver damming. A Flexible Pond Leveler pipe maintains a steady flow of water, while an exclusion fence keeps all beaver damming away from the culvert or spillway. See diagram.

Beaver damming on the culvert fence does not raise the water level due to the permanent leak created by the pond leveler pipe. The pipe system controls the pond at a safe level and prevents flooding damage to the road or manmade dam, while the fence ensures the culvert remains completely open.



FENCE AND PIPE DIAGRAM
(Side View)

The pipe outlet elevation determines the pond level. This end of the pipe can be adjusted up or down if a higher or lower pond level is desired. Water will continuously flow from the pipe outlet unless the pond level drops below the peak of the pipe.

The domed intake fence prevents beavers from hearing or feeling the flow of water into the pipe. Therefore they ignore the intake end of the pipe, and only dam on the culvert fence where they hear the water flowing.

Unlike road culverts, Flexible Pond Leveler pipes do not need to be sized to handle catastrophic storm events because heavy storm runoff will simply flow over the top of the dam on the fence and through the unblocked culvert or spillway. Some mild pond fluctuations are possible following very wet periods, but the pond will be controlled at a safe level.

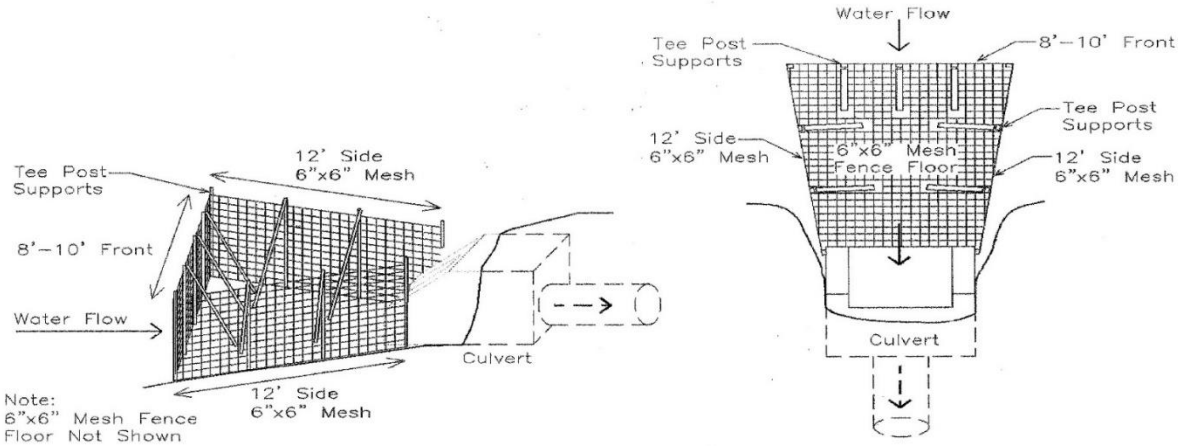
Routine maintenance is usually less than one hour per year. It involves removing sticks from inside teh culvert fence and ensuring the Pond Leveler system remains in good condition. With routine maintenance this flow device will remain effective for many years.

4. **Keystone Fence**

Road culverts dammed by beavers are a very common problem. Beavers often dam in culverts because with a little bit of work the entire roadbed becomes a large dam. To a beaver, a roadbed with a culvert probably looks like a dam with a hole in it that needs repair.

The Keystone Fence eliminates beaver damming of culverts. Beaver Solutions LLC has installed hundreds of these devices with a 95% success rate despite the continued presence of beavers. This device eliminates the never-ending cost of continued culvert clearing, repairs and trapping.

Keystone Fence Diagrams



There are 3 reasons why the Keystone Fence is so effective at protecting culverts from beaver damming.

First, damming 30 to 50 feet of fence is a lot more work for the beavers than simply plugging a narrow culvert. This discourages damming. See diagram.

Second, when beavers begin to dam near the culvert, the fence forces their damming away from the culvert which also discourages them.

Third, as beavers dam out on the fence the opening that the water flows into becomes wider and wider. Therefore, less water is moving through the fence where the beavers are damming. Less water flow through the fence at the point of damming further decreases the damming stimulus for beavers.

Note, any device exposed to the seasons and the beavers will require some maintenance. While Keystone Fences are designed to be very low maintenance, this maintenance is important. Quarterly all floated leaves and sticks should be cleared from the fence in order to keep the beavers from damming on it. When this routine maintenance is performed as recommended, the Keystone Fence should remain effective for many years.

5. Culvert Diversion Dams

Road culverts dammed by beavers are a very common problem. Beavers are motivated to block road culverts because a little damming turns the entire roadbed into a large dam. To a beaver, a roadbed with a culvert probably looks like a dam with a hole in it that needs repair.

Preventing beavers from blocking road culverts saves highway crews time and money, and also improves road and worker safety. A Culvert Diversion Dam (CDD) inexpensively protects road culverts from beaver damming by encouraging the beaver to dam immediately upstream of the culvert instead of inside it. This keeps the culvert open and works well when some ponding upstream of the road is tolerable.

The Culvert Diversion Dam is constructed 10 to 15 feet upstream of the culvert so when the beavers dam upon it the inlet of the culvert is not blocked. It can be made from any variety of materials, with the goal of creating a small pool. You want the CDD to create a small, noisy waterfall that will attract the beaver's attention. They will then dam on top of your CDD instead of the road culvert.

The CDD can be made from posts and fencing and branches, or a rock wall. Anything that will create a small pool of water upstream of the culvert.

Fig. 1 – Undammed Div. Fence

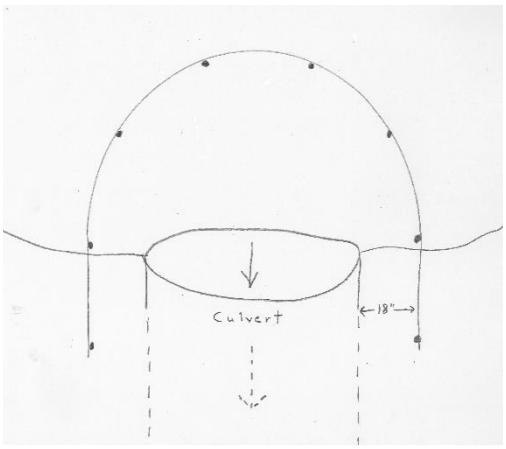
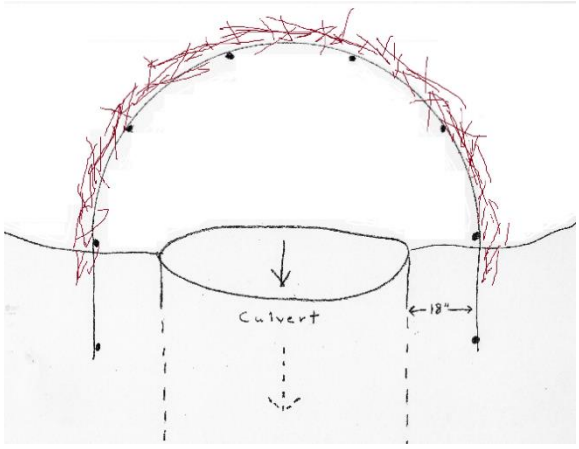


Fig. 2 – Dammed Div. Fence



The Culvert Diversion Dam encloses the culvert inlet or goes straight across the stream channel. In either case, both ends of the fence should terminate on high ground, at least 18 inches from the culvert so large turtles and other wildlife can continue to use the culvert for passage.

Interestingly, beavers usually will not go up on dry land then back down into the culvert with damming materials, so the wildlife passage does not usually result in a dammed culvert. However, if beavers use the wildlife passage to dam inside the culvert, then the passage may need to be closed off for a month or more to break that behavior.

When the height of the beaver dam must be limited to prevent flooding damage, a Flexible Pond Leveler pipe may be installed through the new beaver dam. However, if no ponding is tolerable near the culvert, a Keystone Fence would be a better choice than a CDD.

6. Beaver Dam Breaching and Permits

Beaver dams create important ecosystems, acre for acre equal in quality to coral reefs or rain forests. Therefore, in most regions permits are required from local, county, state/provincial and/or federal agencies to open, disturb or remove a beaver dam. Prior to altering a beaver dam it is incumbent upon you to know what regulations you need to adhere to.

Beaver dams are typically constructed with mud, sticks and rocks. Always be aware of any potential hazards to avoid injury to yourself, others, or property.

Dam Breaching Procedures

1. Determine what permits you need.

2. The tools (potato or clam rake) are hand carried to the site.

3. No heavy equipment will be used at any time. No significant damage is expected to any grassy, upland, wetland or other areas as a result of this manual work.

4. First, stand on the downstream side of the dam to remove sticks from the area to be breached. These sticks are piled on the top or side of the dam.

5. Once the loose sticks are removed, mud from the dam is manually dug out of the area to be breached with a potato rake and piled on top of the dam away from the moving water to reduce downstream siltation.

6. The width and depth of the breach are limited by the size of the stream channel and any downstream road culverts. At no time should a breach be made so large enough that water flows over the banks of the stream. All released water should remain in the channel and not exceed the volume of runoff from a large storm.

7. If beavers are living in the area to be drained, they will almost always repair the dam breach at night. If this occurs, breaching on successive days may be needed to reach the water level goal. Note, unless the beavers are removed from the area, dam breaching is almost always a short-term solution.

8. If the beaver dam is very old or very large, breach slowly, constantly assessing the dam integrity throughout the breaching process.

9. In cold climates, to prevent freezing deaths of beavers or hibernating turtles and other amphibians, ask the advice of a regional government wildlife biologist.

Always breach dams in a safe and environmentally responsible manner.

7. Tools, Materials and Supplies Lists

A. Fence and Pipe Device

Essential Tools List

Truck with Ladder Rack or Trailer	Bolt Cutters
Hog Ring Pliers	Cordless Saws-all
Cordless Drills	Cordless Batteries
Cordless Circular Saw	Fanny Pack with Fence Plier Holder
Pontoons	Fence Pliers
Post Pounder (Manual or Hydraulic)	

Recommended Tools List

Chain Saw w/ gas	Sledgehammer
Potato/Clam Rake	Pickax
Highway Cones	Pruners and Loppers
Scrap Bucket	Flashlight
Hog Ring Stapler	

Required Materials List

Non-Perforated HDPE Pipe	4” x 8” x 16” Concrete Blocks
Concrete Mesh Fencing	Steel Hog Rings
T Posts	Work Gloves
9 Gauge Utility Wire	Coupler(s) for the Pipes
Screws	Zip Ties for Coupler(s)
Safety Glasses	First Aid Kit

Recommended Materials List

Chest Waders	Charger Cord for Cell Phone
Fishing Boots	Sunblock
Neoprene Socks	Bug Spray
Hat	Maps
Trappers Gauntlets (in cold climates)	Notepad and Pen
Wet Suit (in cold climates)	Sanitizing Hand Wipes
Change of Clothes	Lunch cooler
Towels	Water

B. Keystone Fence

Essential Tools List

Truck with Ladder Rack or Trailer	Bolt Cutters
Hog Ring Pliers	Fanny Pack with Fence Plier Holder
Potato/Clam Rake	Fence Pliers
Post Pounder (Manual or Hydraulic)	

Recommended Tools List

Chain Saw w/ gas	Sledgehammer
Highway Cones	Pickax
Flashlight	Pruners and Loppers
Scrap Bucket	Hog Ring Stapler
Pontoons	

Essential Materials List

Concrete Mesh Fencing	Steel Hog Rings
T Posts	Work Gloves
9 Gauge Utility Wire	Safety Glasses
First Aid Kit	

Recommended Materials List

Hip Boots	Sunblock
Chest Waders	Bug Spray
Fishing Boots	Maps
Neoprene Socks	Notepad and Pen
Hat	Sanitizing Hand Wipes
Trappers Gauntlets (in cold climates)	Lunch cooler
Wet Suit (in cold climates)	Water
Change of Clothes	Towels

C. Diversion Fence

Essential Tools List

Truck with Ladder Rack or Trailer	Bolt Cutters
Hog Ring Pliers	Fanny Pack with Fence Plier Holder
Potato/Clam Rake	Fence Pliers
Post Pounder (Manual or Hydraulic)	

Recommended Tools List

Chain Saw w/ gas	Sledgehammer
Highway Cones	Pickax
Flashlight	Pruners and Loppers
Scrap Bucket	Hog Ring Stapler
Pontoons	

Essential Materials List

Concrete Mesh Fencing	Steel Hog Rings
T Posts	Work Gloves
9 Gauge Utility Wire	Safety Glasses
First Aid Kit	

Recommended Materials List

Hip Boots	Sunblock
Chest Waders	Bug Spray
Fishing Boots	Maps
Neoprene Socks	Notepad and Pen
Hat	Sanitizing Hand Wipes
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