Stalker Creek Beaver Pond Management
And Restoration

Preserve Assistant: Brad Shoger
11/30/2004

Stalker Creek Beaver Pond Management

There is a large beaver damn upstream from Stalker cabin that has created a pond 2.6 acres in size. This pond and the resulting backup of water has inundated land on Stevenson's property outside of the fenced off riparian corridor. The problem with this pond is that cattle are grazed on this land. The cattle, once released into the pasture, would trample the ground in and around the water creating massive erosion and polluting the water making all efforts to exclude them from the riparian zone ineffective. Therefore, the pond needed to be drained to an acceptable level to allow the for beavers survival, protect the riparian corridor from massive erosion, and maintain a good and cooperative relationship with the neighbors.

In order to drain the pond and keep it drained a series of beaver pond levelers were installed. The first two levelers were of the Clemson design (Appendix C), and the second two were a modified version of that design. All four levelers were installed after manually breeching the dam. The first three levelers were placed to the west of the original stream channel and the fourth was placed in the original stream channel. The first leveler was installed in the summer of 2003. This leveler followed the Clemson model including the holes drilled, cage used, and pipe lengths and diameters. The second leveler, which was of the same design, was installed in June of 2004. While installing this leveler, the pond drained substantially. Due to a high water volume from a tremendously wet summer, the pond refilled entirely.

The next two levelers were modified to facilitate easier installation. The third leveler was made using eight inch diameter, black, perforated tubing. Two twenty foot sections were used and the end inside the pond was not covered. This design was just as effective as the Clemson levelers but was easier to assemble and install. This leveler, installed in August of 2004, was placed in shallower water and so did not remove enough water to drain the pond. The final leveler, installed September 2004, used the same perforated pipe but in a twelve inch diameter. This leveler was placed three to four feet deep into the dam along the original stream channel. This leveler and the breech made to install it, succeeded in draining the pond to within the fence line and keeping it there. After draining, the other three levelers were mostly out of the water, but were left in to facilitate draining if the water level rises too high in the future.

An additional two, four inch pipes were placed in lateral ditches dug perpendicular to the fence between Stevenson's property and the preserve. These lateral pipes facilitated the draining of the northern arm of the pond and should be kept there in case of future flooding.

The pond is currently drained to a reasonable degree and should not be drained further. The ground on Stevenson's property has dried and is suitable for hay and late season grazing by cattle. The balance needed to drain the pond was achieved. The day to day journal log kept during the final weeks before the pond was drained can be found in Appendix A. This journal includes water depth measurements as the pond was drained. Photographs of the pond, levelers, and work done can be found in Appendix B.

Future Recommendations

Monitoring

The installed levelers need to be monitored once a week during high water flow periods and twice a month at other times to determine the effectiveness of the levelers and any changes that need to be made. A consistent monitoring program would allow the staff to act quickly and early on any potential problems that may arise reducing the potential for hastily made decisions.

Population Study

An important component in any management strategy is to know what you are working with. To this date, there has not been any study on the beaver population at Silver Creek. Undertaking such a study would reveal many factors vital to the proper management of the beavers on the preserve. A sustainable population size should be found to know if the preserve currently is at carrying capacity or if the population is in decline. Radio telemetry would provide knowledge on where the beavers den, since at this time it is still unknown. This information would help to plan restoration and other activities to enhance the beaver habitat and place some control over their numbers if need be based on accurate, scientific information.

Seeding and Planting

When the pond was drained, large areas of mud flats were exposed. While these areas do provide another important and uncommon habitat component, these areas are also highly susceptible to invasion by noxious weeds. Around the border of the pond, especially to the North, there is a large amount of Canada thistle that could easily colonize the newly exposed mud flats. To prevent this and help control water levels and the perimeter of the dam further I recommend two actions. First, I recommend seeding the majority of the mud flats. On the Stevenson's side of the property, I would recommend seeding in more upland and drought resistant species. The water is not likely to rise as high in the future and therefore those species seeded would be better able to survive there. Inside the Preserve boundary I would recommend wetland species due to the chance of occasional flooding at high water times and the higher water table. Seeding these areas will help to keep out the thistle, provide forage and cover for wildlife, and stabilize the soil to limit damage done through flooding. I would however, recommend keeping a portion of the mud flats open from seeding to retain their function in the habitat.

Secondly, I recommend planting willow stakes along the boundary of the water in the pond on the western side. Beavers will use natural barriers and structures to help in creating the boundaries of their dams. These willows would then encourage the beavers to build another side of the dam inside of our property and hopefully keep the water from flooding into the Stevenson's field. These willows would also help to stabilize the soil and provide browse and cover. The willows should be planted fairly close together to

ensure use by the beavers. I would plant no less than 175 willows to allow for die offs and possible removal by the beavers to be eaten.

Move Fence

The fence built around the riparian zone on Stevenson's property could be moved back to enlarge the riparian zone. This zone and flood plain extend well beyond the current perimeter of the fence. The fence, having been installed after and during numerous years of drought, was not built far enough back to encompass the entire area that needed to be fenced off. The fence could be moved back to encompass the normal flood zone so that any subsequent years of high water will be kept within the fenced off area. In most places this would involve moving the fence back only ten feet to rest on top of a bank that would contain any flooding. Any change regarding the boundary of the riparian exclusion zone must be done in consultation with the landowner.

Make Culverts into Levelers

There are several culverts on Stevenson's property that are continuously blocked by beaver dams. The solution up to this point has been for the Stevenson's to kill trap them out of the area. The preserve could assist the Stevenson's with their problem and protect the beavers by installing levelers at the culverts. There are several different designs that could be used, but all would stem the necessity of kill trapping the beavers and keep the channel open and flowing. A design possibility can be found in Appendix C.

Live Trapping

Live trapping beavers for relocation is an option that needs to be explored. There are several people throughout the community that have requested beavers be introduced onto their land. If the populations become high enough at Silver Creek that they cause problems, then live trapping should be implemented. Relocation should be done with caution so as to not remove too many beavers and to release them in suitable habitat. Radio collars would be helpful to determine success rates of relocations and movements of relocated beavers.

Kill trapping should be considered only as a last resort. The beavers on Silver Creek preserve are of no significant threat to the people or structures to warrant kill trapping. There would be outrage throughout the community if the staff began killing off the beavers for anything less than a disaster. Their population numbers are not high enough to warrant thinning and removal of too many would be potentially harmful to the resident population. Furthermore, due to the low gradient nature of the stream, there is no significant threat of a powerful flash flood that could blow out a beaver dam and destroy a bridge or roadway in the process. The dams simply need to be monitored and when the water levels are deemed unacceptable, breeched. Kill trapping does not reflect the mission of The Nature Conservancy or this Preserve. One final point on kill trapping beavers; the brown trout in the stream are far more dangerous to the health and well being of the beloved rainbow trout than the beavers are to any natural system here. Brown trout are a non-native, introduced species. The trout are not going to be killed off, so why should the beavers?

Patience

Above all else, dealing with beavers requires patience. The preserve staff, along with the Wildlife and Lands Stewards, needs to continue to implement different techniques until solutions are found. It took the installation of four levelers in the Stalker Creek dam before equilibrium was achieved and the flooding stopped. A balance exists and can be found through patience, diligence, and a little bit of creativity. The beavers are an integral part of this land; therefore it is our duty to protect them.

Beaver Pond Drainage Restoration

The large beaver pond on Stalker Creek upstream from Stalker cabin needed to be drained due to it flooding part of the neighbor's field and grazing pasture. Once the water was drawn down, using beaver pond levelers, a large area of mud flat was exposed. Due to the pockets of invasive species, particularly Canada thistle (*Cirisium arvense*), near to the mud flats and the prevailing wind direction which could easily seed the area with invasives from the Stevenson's property, manual seeding of the area and other restoration efforts were employed in advance of a potential invasive species problem. All seeds were collected in and around the preserve and all seeding was done manually by hand. A mix of wetland seeds (rushes, sedges, and rocky mountain iris) was distributed along the southwestern edge of the pond. Rocky Mountain bee plant (*Cleome serrulata*) was seeded along the rise, parallel to the fence boundary with Stevenson's at the southwestern corner of the mud flat. A mixture of rocky mountain iris (*Iris* missouriensis) and showy milkweed (*Asclepias* speciosa) was seeded near the fence on the slope of the rise north of the bee plant seeding. Asters were seeded along the fence in a drier portion of the mud flat in the partial shade of dead rose bushes grown into the fence. Water Birch (*Betula* occidentalis) was seeded in the northern portion of the mud flat approximately 5 feet from the fence and 15 feet from the water.

Willow stakes were also utilized in this restoration. 130 willow stakes were shoved into the mud along the border of the pond. These willows could be utilized in the future by beavers as a boundary for a dam. The dam would then prevent flooding onto the Stevenson's field. The willow stakes were collected from several different species from around the preserve. Photographs from the restoration are located in Appendix D.

I would recommend careful observation and monitoring of the area to determine seed establishment and act quickly on any invasive species. I would also recommend continued seeding of the area with different species to attract a large array of wildlife species. I especially encourage future plantings of Showy Milkweed for Monarch butterflies and red-osier dogwood (*Cornus stolonifera*) for good browse and berries for songbirds.

Appendix A

8/24/2004
Install 2, 4" lateral pipes
Install 2 depth gauges on 1st and third levelers
    Both gauges are resting on the ground
    Both are 3' gauges
1st gauge is called E for Eastern: 2.7'
2nd gauge is called W for western: 2'
Walked pond perimeter
    2.6 acres
    0.3 miles

8/25
E: 2.5'
W: 1.8'
Enlarged dam undermining (small breeches made to let water flow through the dam, not over)
Created a second on the breech point

8/26
W: 1.9'
E: 2.6'
Water level rose 1" since yesterday, possible from rain
Cleaned out undermine holes, clogged up, possibly by beaver

8/27
W: 1.9'
E: 2.6'
Looked for second possible breech point if need 5th leveler
12" perforated pipes delivered today
Enlarged undermine holes

8/29
W: 1.85'
E: 2.55'
Enlarged undermine
Created small breech at 2nd location
Pond drained 1/2" while I was there

8/30
W: 1.65'
E: 2.35'

New dam created upstream by beavers at Stevenson culvert
May be holding water back and therefore pond is draining faster
Look at possible leveler installation on Stevenson property

8/31
W: 1.525'
E: 2.225'
First main dam breech
After breech water dropped approx. 2 ½ " before leaving

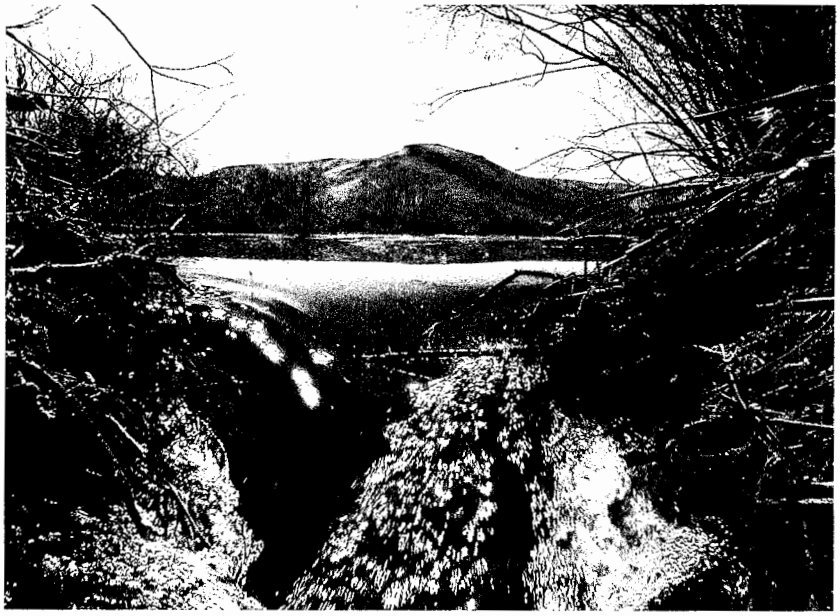
9/1
W: 1.21'
E: 1.91
Continued breeching and draining

9/2
W: 0.81'
E: 1.51'
Installed 12" leveler

9/7
W: 0.33'
E: 1.0'
Pond drained and mud beginning to dry

Appendix B

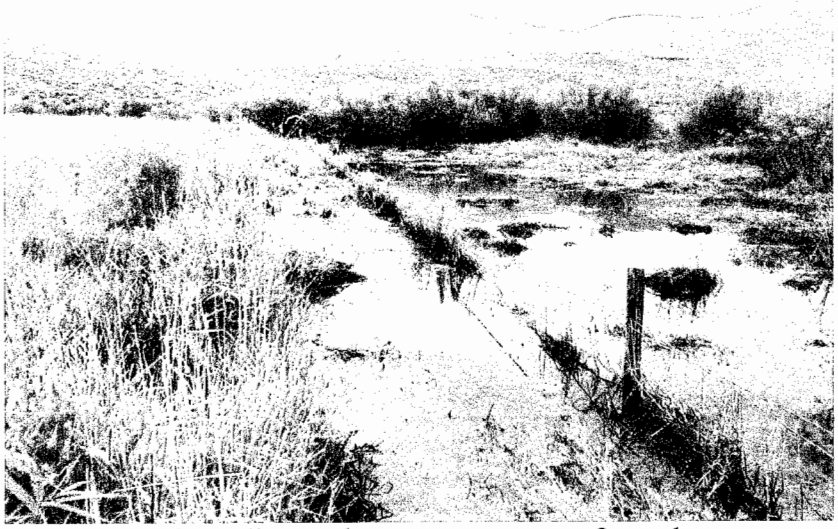
Brad in main dam breech 8/31



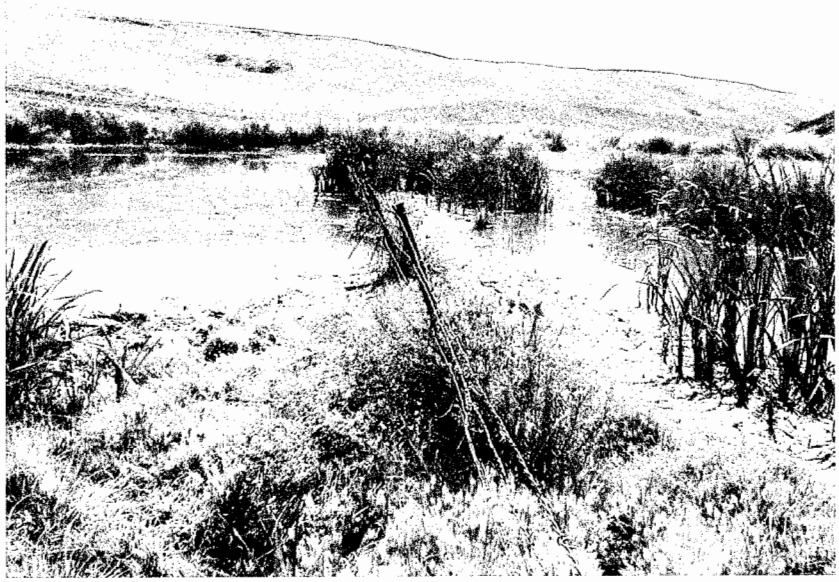
Main dam breech 8/31

Lateral Pipe draining

Latteral Pipe drained



Stevenson's fence line underwater, upstream from dam

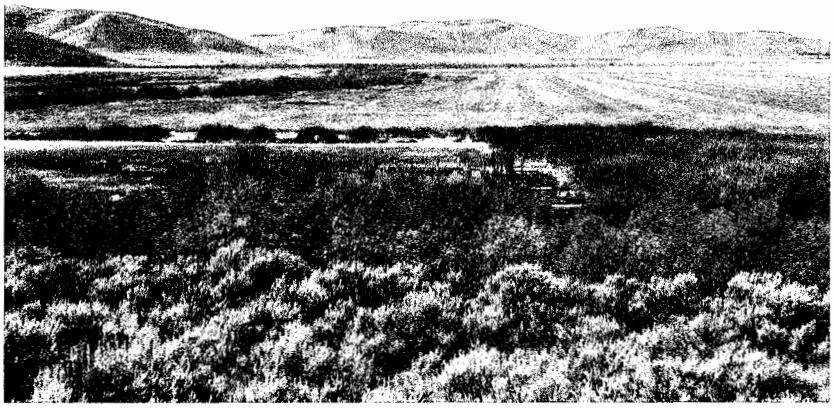


Stevenson's property draining

Pond drained from Stevenson's property

The two Clemson levelers while pond is draining. They used to be completely submerged.

The beaver pond from the hillside behind Stalker Cabin before it was drained.



The beaver pond from the hillside behind Stalker Cabin after it was drained.

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Appendix C

Rev. November 1992

Extension

THE CLEMSON BEAVER POND LEVELER

DEPARTMENT OF AQUACULTURE, FISHERIES AND WILDLIFE

The Clemson Beaver Pond Leveler (Figure 1) was developed to meet two goals. The need to suppress the problem of flooding agricultural and timber lands was paramount. The second goal was to maintain or improve some of the benefits derived from beaver ponds and associated plant communities while preventing extensive flood damage. The leveler does not negate the need for direct control of beaver populations where problems are both extensive and severe; however, it may reduce this need. The leveler offers the opportunity to get along with, and in some cases, derive benefits from the existence of a few beavers.

How the Leveler Functions

The pond leveler intake device is designed to minimize the probability that current flow can be detected by beavers, therefore minimizing dam construction. Device testing at about 30 sites in South Carolina during the past three years has shown that beavers were unable to detect a submerged intake device as the source for pond water loss. The intake device should be installed so that it is always below the water surface even when the pond level is at a minimum.

A second stimulus that causes beavers to build dams and fill culverts and standpipes is the sound of falling or trickling water. When the outlet end of the leveler assemblage can be below water on the downstream side of a dam, problems should not develop. At test sites where standpipes have been used and water flows out in a fountain-like fashion, beavers have made no attempt to stop water flow. Stand-pipes regulate the water levels in the ponds and are essential where periodic drawdown and reflooding is desirable.

Special Considerations

The Clemson Beaver Pond Leveler device should help reduce flooding, manipulate pond levels, solve road culvert plugging problems, and prevent filling of standpipes and culverts used as water control structures in fish ponds. However, the leveler is not a panacea for eliminating all beaver problems. This particular design will be limited to situations where the water input to a pond is from a small stream or spring. During periods of unusually high rainfall, problems may develop. In fish ponds, where the leveler is used in combination with a standpipe and culvert water control structure (Figure 2), prolonged flow of water over the standpipe riser boards may cause beavers to fill the standpipe. To reduce this possibility, riser boards should extend about one foot above the normal water level so that storm water can be stored and drained slowly through the leveler.

Some indications suggest that where a pond was drained and the intake device was above water and near the dam, the beaver may be stimulated to construct the new dam on the upstream side of the device. It's important that the intake device be installed so that it is totally or mostly submerged at all times.

Leveler Installation at Active Beaver Sites

In the South, beaver activity levels are highly correlated with seasonal temperatures. Most dam-building, expansion, and repair occur during the cool months. If the leveler is installed at an active dam site, installation during this cool period is best. The dam can be dug out and the device laid in place. Beavers will rebuild over the outflow pipe, which will not deter water flow through the pipe.

Beaver dams can be dug out by hand more easily than most people imagine using a fire-fighting tool called a pulaski. A pulaski has an ax bit on one side and a mattock on the other. Dams should be broken first on the downstream side so that water pressure can be used to push out dam materials.

When parts of a leveler assemblage have to be transported across a stretch of water, they can easily be floated. Ends of outflow pipes are taped over with water-resistant tape. The pipes are then tied together to form a raft. The intake device and other assemblage parts are set on the raft and floated to the site.

For further information on the Clemson Beaver Pond Leveler contact Dr. Gene W. Wood, Mr. Larry A. Goodwin or Dr. Greg Yarrow • Department of Aquaculture, Fisheries and Wildlife • 105 Lehotsky Hall, Clemson University, Clemson, South Carolina 29634. (803) 656-3117

A list of materials is provided in Table 1. The leveler design is shown in Figures 3 and 4

Table 1. List of Materials

Quantity	Item
1	10' section, 10" dia. PVC pipe (Schedule 40)
1	PVC cap for 10" dia. PVC pipe (Schedule 40)
1	10" x 8" PVC pipe reducer coupling (Schedule 40)
4	86" sections, 3/4" dia. plastic roll pipe (water pipe), 160 psi grade
4	¾" metal couplings for roll pipe
16	¼" x 2" galvanized eyebolts
16	¼" galvanized nuts
16	¼" galvanized washers
16	16" sections, 8 ga. galvanized wire (medium hardness)
2	96" sections, 2" x 4" 12 ½ ga. galvanized welded wire
2 lbs	Crab trap clamps (fasteners)

The above materials are required to assemble the intake device for the Clemson Beaver Pond Leveler. The carrying pipe (flow pipe) may consist of 20 to 40 feet of 8" diameter PVC, Schedule 40 with coupling sleeves and elbows appropriate to the desired configuration.

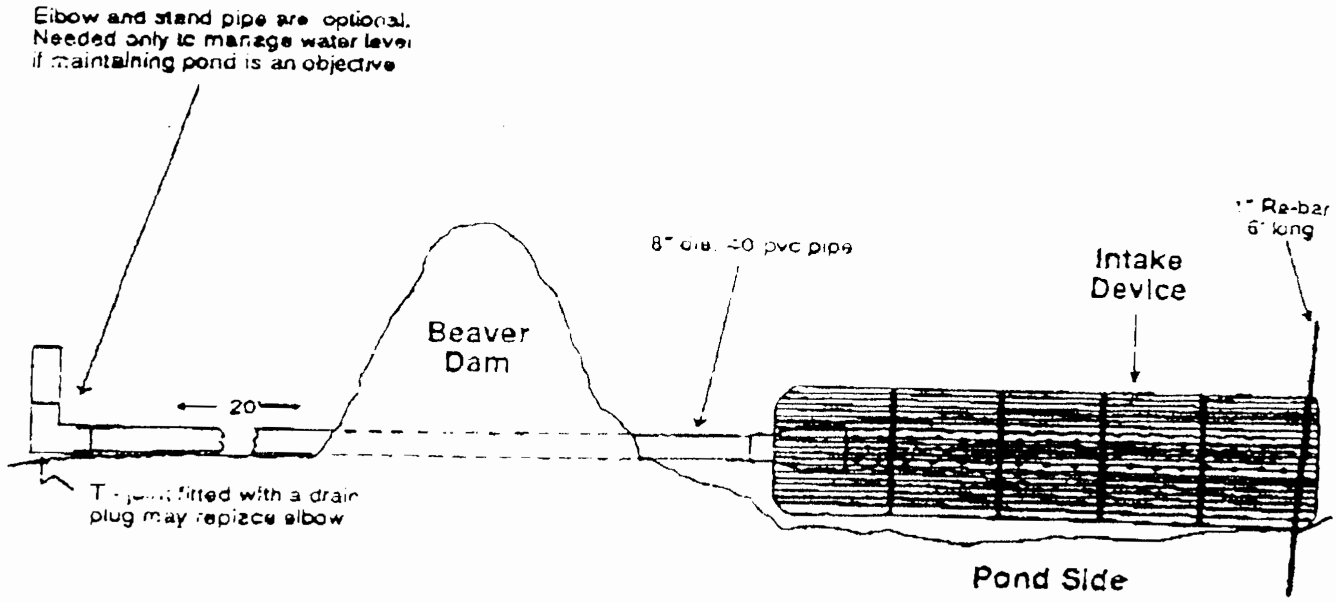

Figure 1. Clemson Beaver Pond Leveler

Clemson Beaver Pond Leveler

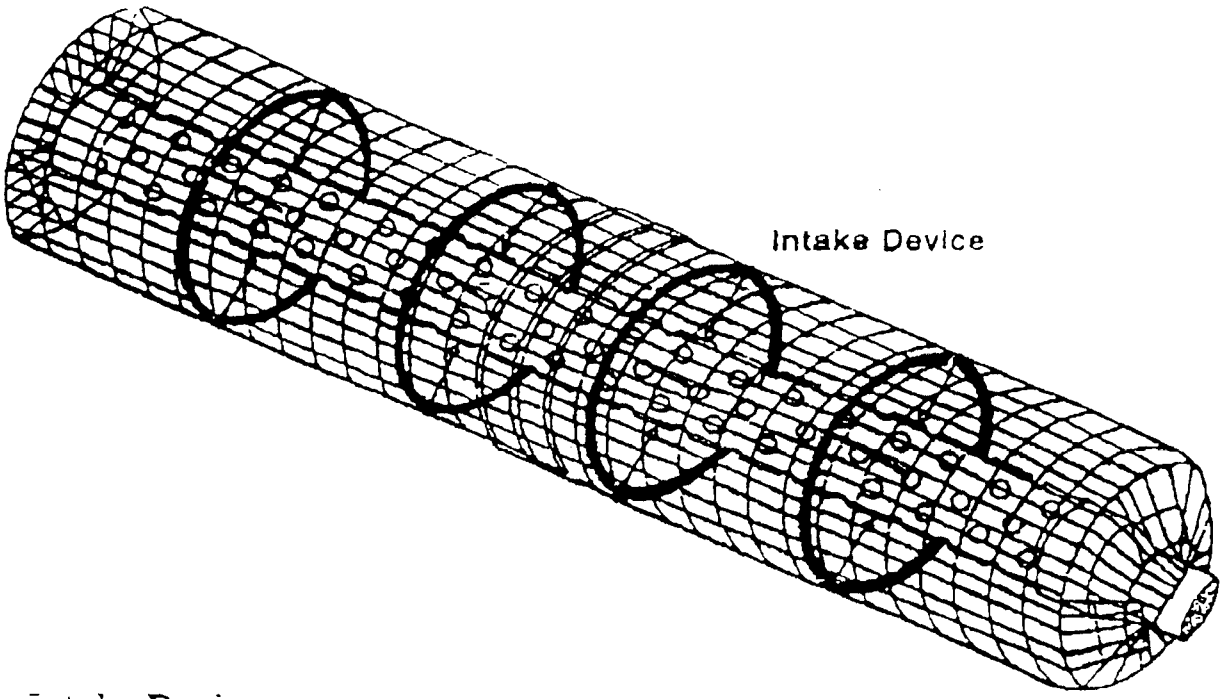

Figure 4. Intake Device

From "Engineering Field Notes" Vol. 18, Jan-Feb, '86

Keeping Beavers From Plugging Culvert Inlets

Philip H. Fisher
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The PROBLEM

Where indigenous, beavers are found in areas with an abundance of water and trees. Their propensity for building dams--unique among animals--is well known. Busy beavers within National Forests can be a headache for road maintenance crews because one of the easiest ways for a beaver to build a dam is simply to plug the inlet of a culvert. A plugged culvert often results in a washed-out road. Unplugging the culvert can take a considerable amount of labor and equipment. And, besides, by the morning after clearing a spot, the culvert usually is completely blocked again. At sites where beavers are active and detailed cost records have been kept, the average cost to keep a culvert cleared of a beaver dam is approximately $800 per year.

Because of this persistent problem, the San Dimas Equipment Development Center (SDEDC) was asked to evaluate existing methods or develop new ones for keeping beavers from building dams at culvert inlets. Each approach that was investigated hinged on one of two traits characteristic of beavers:

(1) They normally do not try to plug a culvert if the area to be plugged is very much greater than the culvert opening itself.

(2) They usually will not try to plug an opening through which water flows vertically upward.

SOLUTIONS INVESTIGATED

On the Ottawa National Forest in northern Michigan, SDEDC tested four different methods for keeping beavers from plugging culvert inlets. The equipment used in these methods included perforated pipes, perforated culverts, downspouts, and bafflers. These primary approaches, usually installed in conjunction with a secondary backup approach, were put in place in the summer of 1983.

The Perforated Pipe Method

The perforated pipe method consists of laying a piece of the pipe with one end inside the culvert inlet and the other end extending upstream, well beyond the culvert entrance. A cap or plug must be installed on the upstream end of the perforated pipe. The theory here is that, although beavers might build a dam in the culvert entrance, water can still flow into the pipe through the perforations and then out the end of the pipe downstream of the dam. Beavers might plug some of the perforations but they usually will not get them all.

To allow for a large enough volume of water flow, it may be necessary to use more than one pipe or to put a "Y" or "T" in the pipe upstream of the culvert so that extra arms of perforated pipe can be installed. The pipe or pipes can rest on the bottom of the culvert interior but should be supported--by a stake or a cross-bar between two stakes--above the bottom of the stream or pond.

As an additional step, a baffler or fence (constructed of $12\frac{1}{2}$ gauge wire-mesh fencing well supported with stakes) can be built around the culvert entrance; the perforated pipe or pipes should be passed through a hole in the fence. Then, the beavers have to build their dam against the fence, where it is much easier to remove than if it were built inside the culvert.

The Perforated Culvert Method

The perforated culvert method consists of adding a short length of a specially designed, same-diameter culvert, as shown in figure 1, onto the end of the culvert already in place. The theory here is that

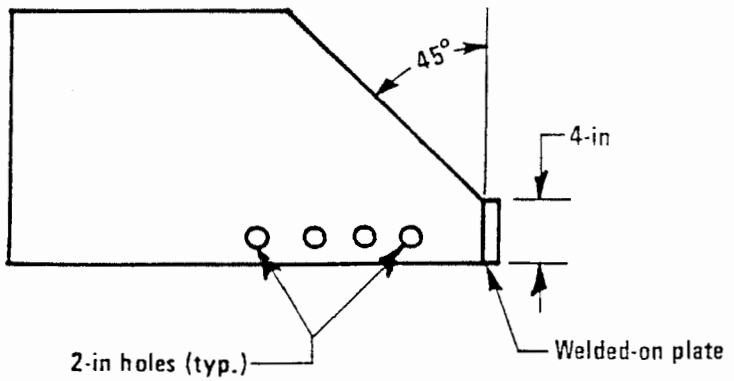

Figure 1.--Perforated culvert approach.

water will flow vertically upward through the holes cut into the bottom of the attachment. Beavers do not plug these holes, but if they should become plugged or if the flow of water increases greatly, water can flow into the end of the culvert extension as soon as the water level rises over the 4-inch welded-plate lip. Further, steel mesh or bars can be welded over the sloping opening to keep beavers from crawling into the culvert for dam-building purposes.

The Downspout Method

The downspout method consists of cutting a section of culvert at a 45-degree angle and welding this piece back to form a 90-degree angle, as shown in figure 2. When this is attached to the in-place culvert with the right-angle section pointing downward, water must rise vertically to flow through the culvert. The attachment should be installed to extend downward as far as possible without picking up debris from the bottom of the stream or impoundment. Again, steel mesh or bars should be welded across the opening to prevent beavers (or large debris) from getting inside.

The Baffler Method

The baffler (or fence) method of preventing beavers from reaching culvert inlets can be tried at locations where a fast-flowing or a shallow stream precludes other approaches. First, on the upstream end, construct a box fence around the culvert opening. Then, extend two parallel fences, 3 feet apart, upstream from the box fence for approximately 30 feet and join their ends together. Fabricate the fences from 12½-gauge wire mesh with approximately 4-inch openings. Support the fences on steel posts driven at least 3 feet into the stream bed. Now, to construct a dam, the beavers would have to plug the baffler along its entire length; usually they will not attempt this.

The specific method to be used at any site depends upon such conditions as the flow rate and depth of the water. The specific design of the approach must take into consideration hydraulic efficiency to ensure that full water flow will be accommodated.

RESULTS OBSERVED

After monitoring the Ottawa National Forest sites for a year, SDEDC observed the following pertaining to each approach that was tried. At the site with perforated pipes and a fence built around the culvert, beavers had built a dam around the fence. The perforations in the pipes were still open. However, there was a pond behind the dam and no

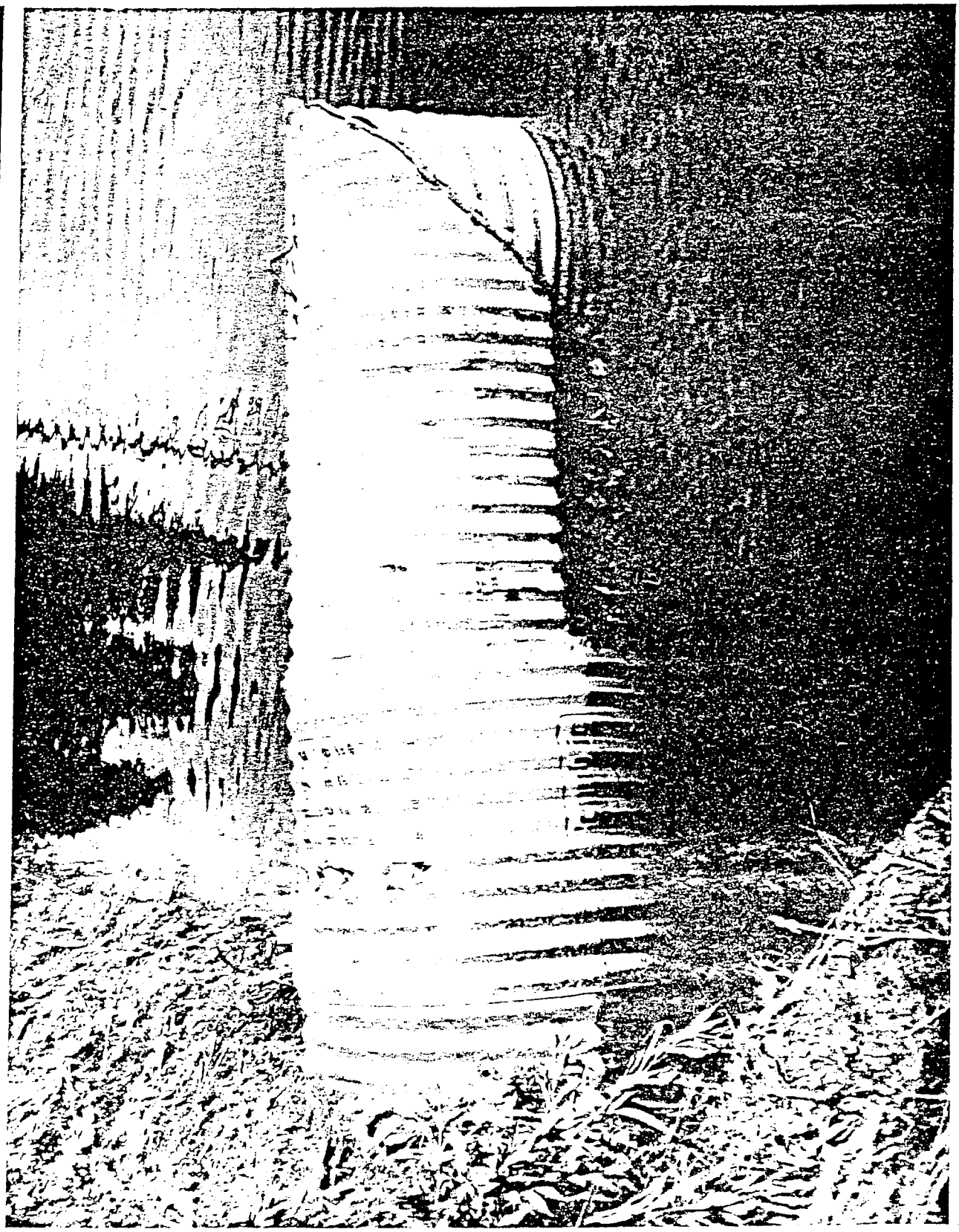

Figure 2.--Downspout approach.