

Best Management Practices for Resolving Human-Beaver Conflicts in Vermont



Vermont Fish & Wildlife Department
Vermont Department of Environmental Conservation



August 2002
Revised 2004

TABLE OF CONTENTS

Purpose	1
Beaver Management in Vermont	1
Biology and Behavior of Beavers	2
Definition of the Problem	4
Best Management Practices for Handling Human-Beaver Conflicts	4
<i>Damage Prevention Techniques</i>	5
<i>Obstructed Culverts and Dams Less Than Two Years Old</i>	6
<i>Conflicts with an Established Beaver Dam or Dam Complex</i>	7
Appendices	8
<i>Appendix 1 – List of Regional Offices, Wardens and Other Contacts</i>	9
<i>Appendix 2 – Installation of Wire and Electric Fencing</i>	10
<i>Appendix 3 – People Available to Trap Nuisance Beaver</i>	11
<i>Appendix 4 – Beaver Recipes</i>	11
<i>Appendix 5 – Giardiasis</i>	12
<i>Appendix 6 – Installing a Siphon to Lower Water Levels</i>	13
<i>Appendix 7 – Beaver Fencing and Exclusionary Devices</i>	14
<i>Appendix 8 – Water Control Devices</i>	16
<i>Appendix 9 – Nicholson Culvert Wing Extension</i>	22
<i>Appendix 10 – Three Log Drain</i>	23
<i>Appendix 11 – Beaver Dam Removal</i>	23
<i>Appendix 12 – 1272 Order</i>	24
<i>Appendix 13 – Statutes and Regulations Pertaining to Beaver and Beaver Dams</i>	25
<i>Appendix 14 – References and Additional Readings</i>	28

Acknowledgements:

We would like to thank the New York State Department of Environmental Conservation for the framework for this document. The Northwest Science and Technology Group in Ontario, Canada; the Massachusetts Division of Fisheries and Wildlife; and the University of New Hampshire Cooperative Extension all provided both text and illustrations. Skip Lisle, wildlife biologist with the Penobscot Indian Nation, generously contributed a major portion of the text under the section heading “Beaver Management in Vermont.”



PURPOSE

Goal: The goal of the agency in dealing with human-beaver conflicts is two-pronged. First, as the Agency of Natural Resources, we are interested in maintaining, whenever possible, the valuable wetlands in Vermont that support biodiversity and vital ecological processes. Secondly, we hope to provide the public with the best information available for managing problem situations that result from beaver activity.

This document has been prepared to simplify and unify the legal and regulatory framework related to beaver management. It describes **Best Management Practices (BMPs)**, which provide a logical protocol with steps that should be considered and followed in determining: 1) whether beaver activity threatens the public safety and/or welfare of public or private property; 2) which practices could be applied to resolve the specific problem (including beaver removal, water level lowering and dam removal); 3) how to select the least environmentally damaging alternative; and 4) how to minimize potential conflicts with adjacent and downstream landowners.

The practices and steps outlined in this document (beginning on page 4) are what we would consider to be Best Management Practices for dealing with Human-Beaver conflicts. By following these BMPs, the impacts on resource values associated with beaver ponds, wetlands and streams may be minimized and the risks to downstream landowners should be reduced.

In addition, any person or organization who complies with these BMPs will need no further authorization from the agency to take the necessary actions to manage human-beaver conflict.

Cooperators:

Department of Fish & Wildlife (VDFW)

*Department of Environmental Conservation,
Wetlands and Water Quality (VDEC)*

*United States Department of Agriculture,
Wildlife Services (Wildlife Services)*

BEAVER MANAGEMENT IN VERMONT

Beavers are North America's preeminent keystone species. They have an ecological importance far greater than that suggested by the tiny percentage of biomass they represent. Beavers increase biological productivity in countless ways. The small wetlands they create in the northern forests increase landscape heterogeneity. This value endures even when beavers leave a wetland. When dams decay through lack of maintenance, flowages initially become wet meadows. Like "active" flowages, these meadows are unique habitats that also have great natural value.

Whether beavers live in flowages or "permanent" water bodies, their rooting, feeding and digging behaviors have the effect of tillers recirculating nutrients. Their feeding activities and general movements can breakup monocultures like cattails and reed grass (*Phragmites communis*), creating habitat that is more diverse and accessible to a greater number of species. Another common product of beaver activity, dead trees – felled or downed, vertical, horizontal, or diagonal – make fantastic habitats for a wide variety of wildlife.

Beaver offer society many values in addition to a productive landscape. Their pelts, a renewable resource, are the most obvious of these and the only value that is easy to quantify. Beavers also help to abate regional flooding by, paradoxically, damming. Flowages act as small reservoirs that, when numerous in a watershed, retain large amounts of water during floods. In addition, beavers have educational value: their building, chewing and felling activities are fascinating to adults and children alike. These behaviors, combined with a myriad of other wildlife activity, makes flowages perfect places to study ecology. The symphony of color, movement and song found in flowages also gives them aesthetic and spiritual value. Ironically, many of these values seem most in need where beavers and humans appear least compatible--urban and suburban areas.

Beavers are an ancient species that have been widespread and abundant for a long time. All aquatic and semi-aquatic species in existence today have evolved in their presence. Theoretically, therefore, species such as trout and salmon have learned to survive despite the activities of beavers and in fact probably benefit from them.

Beaver have played a critical role in the history of New England and the United States. The early conflict that went on between the French, English and Dutch in New England was the result, at least in part, of attempts to control the fur trade. Beaver pelts were a main item of trade and provided the incentive for European settlement, exploration and expansion into the continent's heartland. Beaver pelts were often used as currency in place of gold. Eighty beaver pelts made a 100 pound pack, which was valued at three to five hundred dollars during the 1800s. Along with uncontrolled trapping, habitat destruction brought about the virtual extinction of beavers in Vermont by the mid-1800s.

In 1910 beaver were protected by state law and thereafter made a slow comeback. Beaver were reintroduced into Vermont by the Vermont Fish & Wildlife Department in the 1920s and 1930s from New York and Maine. The reintroduction coincided with the abandonment of many of Vermont's farms. The reforestation of Vermont created a habitat excellent for the growing beaver population. By the 1940s and 1950s beaver had again become well established in the state. The first open trapping season of 15 days was set in 1950.

Today the Agency of Natural Resources (ANR) recognizes beaver as a valuable natural resource. The ANR strives to maintain beaver population levels compatible with public uses of land while attempting to minimize impacts to humans. The maintenance of beaver populations not only ensures the continued production and enhancement of valuable wetland habitat but provides an array of social benefits including activities such as regulated hunting, fishing and trapping, as well as wildlife viewing and educational pursuits. In addition to the above-mentioned values, beaver can be utilized as a naturally healthy, organic and renewable source of protein for human consumption. The U.S. Department of Agriculture rated beaver meat higher in protein and lower in fat than beef, based on a pound-for-pound comparison!

While beaver and the habitat they effect are a valuable resource, they can also cause significant problems. The Vermont Department of Fish & Wildlife attempts to regulate beaver population levels by varying the time and length of regulated fur trapping seasons. Besides providing a means of controlling beaver

numbers, the annual harvest of beaver is a sustainable use of wildlife that provides wildlife-related benefits directly to households who trap. The private trapper (who traps for recreation, food and financial gain) conducts population reductions at no cost to the general public. The residents of the state derive a financial savings due to decreased amounts of property damage caused by furbearers, as well as a decreased need for paid control agents.

BIOLOGY AND BEHAVIOR OF BEAVER

The beaver, *Castor canadensis*, is the largest rodent in North America with adults ranging from 35 to 46 inches long (including a flattened 12-18 inch tail) and weighing from 40 to 50 pounds. The hind feet are very large with five long webbed toes. Front feet are small and dexterous, which allows the beaver to carry dam construction material such as stones and sticks. Beaver have the characteristics of well-developed yellow-brown teeth and a massive skull that supports strong chewing muscles.

Generally beavers have relatively few offspring. Development of the fetuses requires 120 days with the young being born between April and July. Litter sizes range from one to nine, with an average litter size of four. The heavier the female, the larger her litter. The number of young a female beaver gives birth to also is inversely related to her family size at the time of breeding. In a beaver family, the adult pair breeds and usually produces one litter per year. The young beavers (kits) are born fully furred and make their first trip outside of the lodge at about two weeks of age.

The occupants of a beaver pond (or group of ponds) generally consists of a family resulting from two breeding seasons. Beavers mate for life; however, if one of the adult breeding pair is removed from the population, the remaining member will readily accept a new mate. The kits remain with the parents until they are two-years-old and then are driven off to find their own territories. This dispersal of juveniles contributes greatly to the total number of property damage complaints.

As a food source, beaver prefer aspens, birch, alder, willow, cottonwood, and water lilies, but will eat the leaves, twigs and bark of most species of woody



JOHN HALL

plants found along the water's edge. During the growing season beaver also will consume large quantities of non-woody plants, such as grasses and cattails. During the fall, they will stockpile their woody food supply in the water near their house for use during the winter months. The underwater food piles are cold winter food caches. These piles of branches, sticks and twig serve as important indicators of an active beaver lodge. During the ice covered winter months beaver are generally inactive with regard to tree cutting and dam building.

The beaver dam and lodge are constructed of mud, branches, sticks, and stones, with some beaver utilizing bank burrows along streams or ponds. Lodges consist of one or more compartments with each compartment having two underwater openings for exit or entry. These also are important for escape from potential predators and provide protection from freezing winters. Their aquatic habitat and instinctive behavior minimizes the adult beaver's susceptibility to predators. Domestic dogs, coyotes, bears, and bobcats are among the larger predators, including humans, that will prey on beaver if the opportunity arises. Because beaver rarely travel far from water, they are relatively safe from most predators. Young beaver are the most susceptible to predators and are occasionally targeted by predaceous mammals, such as otter and mink.

Beaver are most active at dusk and dawn during the ice-free months. Beaver activities focus on building and maintaining dams during high water periods, and activities shift to channels and canals during the drier summer months. During the early fall months tree cutting is at its most intense level as all individuals in

the lodge work on building and repairing dams for winter.

Beaver construct dams that form ponds within which the lodge and winter food cache are located. It is believed to be a combination of water flow sensation and the sound associated with running water that stimulates this dam building activity. Within and around the pond, the beaver construct canals for security and for the transport of food and building materials. Beaver are primarily active at night with regard to their dam building and tree cutting activity.

Beaver construct 'scent mounds' by depositing a secretion from their scent gland on a pile of mud. It is believed that this type of chemical communication helps determine their territory.

When food supplies run out, beaver usually abandon the pond site in search of new food supplies. Dams will eventually fall and the beaver pond drains. The nutrient rich substrate that is left turns into a meadow where herbaceous plants flourish. The process starts again when beaver return to reestablish themselves and feed on the new growth. This cycle is important to maintain productivity of beaver impoundments for other wildlife.

In some situations, beaver have been associated with concerns about drinking water. A *Giardia* parasite may cause an intestinal ailment referred to as "beaver fever." Although some beaver may carry the *Giardia* parasite, so may many other animals associated with lakes and ponds, including humans and domestic dogs. The situation may create further concern when the water body is a drinking water supply.

The impoundments created by beaver provide valuable wildlife habitat for assorted furbearer, bird, plant, and waterfowl species. For example, the federally endangered northeastern bulrush occurs in southern Vermont only in beaver flowages. Beaver activities also may stabilize stream banks, control sedimentation of streams and provide groundwater recharge areas. In this way, the beaver provides ecological benefits to the public at large. On the other hand, the beaver's dam building activity can result in widespread flooding of woodlands and agricultural land, and cause numerous complaints by plugging road culverts, flooding roads and railroad tracks, and causing general property damage.

DEFINITION OF THE PROBLEM

Due to a decrease in pelt values and a corresponding decrease in trapping pressure, beaver populations in Vermont increased by more than 130% from 1980 to 1990. The creation of new dams and the expansion of beaver dams within existing wetlands, although beneficial to a whole host of other wildlife species, can create problems for humans. Problem situations may include: an impoundment that threatens downstream property; upstream flooding of land; trees killed or damaged; flooding of highways or railroads; contamination of water supplies; impairments of drainage; interference with the operation of septic systems; flooding of agricultural crops; and flooding of homes. Some of the measures that have been commonly used to address human-beaver conflicts have, in themselves, created environmental problems, such as loss of valuable wetlands, degradation of water quality, and flooding and damage to downstream property. Therefore, appropriate action should be taken to address the problem and eliminate the hazard in an environmentally sound manner.

Presently, many private landowners, town road commissioners, Agency of Transportation personnel, and railroad employees routinely remove dams where they believe flooding could potentially affect the safety and use of the property, road or railroad. Vermont Fish & Wildlife wardens made over 199 site visits between 1993 and 1998 (a small fraction of the number of calls that come in) to address beaver and human conflicts. Wildlife Services Hotline has received an average of 72 beaver-related calls per year since 1992.

The use of inappropriate dam removal methods (such as the removal of a beaver dam with a backhoe or dynamite), however, can cause significant environmental damage and should only be used in situations that pose an imminent hazard. Not only is the wetland destroyed, but large amounts of sediment are discharged into the stream, severely affecting invertebrate and fish populations, and threatening life and property downstream. Flooding of downstream properties as a result of the sudden release of large amounts of water can result in extensive property damage. The Vermont Supreme Court has held that liability for damages can rest with either the owner of

the land on which the beaver dam is located or the municipality or state agency that removes a beaver dam.

Through the application of the BMPs in this booklet, we hope to reduce the risk to the property owner and adjacent landowners, including their own potential personal liability for damages caused by beaver removal activities, while at the same time protecting important wildlife habitat and water quality.

BEST MANAGEMENT PRACTICES FOR HANDLING HUMAN-BEAVER CONFLICTS

Although some Vermont statutes allow the removal of both nuisance beaver and beaver dams, other statutes require that water quality and wetlands be protected (see Appendix 13). These BMPs have been designed to address the issues of nuisance beaver and the alteration or removal of beaver dams while at the same time, to the greatest extent possible and feasible, protect water quality and wetland values. By following these BMPs, including complying with the requirements of the 1272 Order contained in Appendix 12, a person or organization will be considered in compliance with the law.

1. Beaver problems should be brought to the attention of a Fish & Wildlife warden, one of the Agency of Natural Resources regional office closest to the problem site, the Wetlands office, or the Wildlife Services Hotline (see Appendix 1).
2. Upon receipt of the call, the responding person will ask the caller to provide the following information:
 - a. Does the dam pose a hazard to human health, safety or property, and what is the nature of the hazard? Is the hazard imminent so that there is an emergency situation?
 - b. What is the location of the dam, how long has it been there, and approximately how large is it?
 - c. What is the nature of the problem (flooding of water supply, concerns regarding *Giardia*, threat to roads or cropland, etc.)?
 - d. What are the property uses downstream?

3. The ANR representative will either refer the call to the appropriate individual or discuss the problem with the affected party and, whenever possible, satisfy his or her concerns through information and advice. In consultation with the ANR representative, the landowner may decide that there is no immediate problem or that the problem can be solved through prevention or management techniques and, therefore, does not require action by the warden or ANR staff. If the problem cannot be solved through prevention, then an ANR representative will discuss other options.

Beaver-caused conditions can range from very simple to complex. The management approach will vary accordingly. Beavers are adaptable and can readily tolerate living in close association with people. Likewise, people who learn to tolerate a certain amount of beaver influence on their land generally find that co-existing with beavers provides many benefits. In situations in which beavers are simply an inconvenience to landowners, tolerance is the easiest solution. However, when beaver activity results in property damage or concerns about public health and safety, there are a number of steps that may be taken to alleviate the problems. In addition, there are some measures that can be taken during construction projects that can prevent problems from occurring after construction. (Refer to Appendix 9 as an example). The following BMPs relate to the level of complexity of the problem and ecological value of the wetland.



courtesy of CURTIS SMILEY

Type 1: Damage Prevention Techniques

- A. Problem Description:** Beaver are eating ornamental trees and shrubs or damaging other landscape.
- Management Response:**
- Install wire or electric fencing around ornamentals or landscaping. (Refer to Appendix 2 for examples of how to install this kind of protection.)
 - Arrange for lethal reduction and/or removal of beaver population. While problem beavers may legally be removed any time, removal of beaver during the normal trapping season may minimize costs to the landowner and maximize the use of a renewable resource.
- B. Problem Description:** Beaver are digging ditches and channels. There also may be a proliferation of small dams and lodges resulting from an expanding beaver population. No damage has occurred yet.
- Management Response:**
- Arrange for lethal reduction and/or removal of beaver population. While problem beavers may legally be removed any time, removal of beaver during the normal trapping season may minimize costs to the landowner and maximize the use of a renewable resource.
- C. Problem Description:** Landowner is concerned about rabies or *Giardia*.
- Management Response:**
- Provide educational materials or personal consultation regarding rabies and *Giardia* (Appendix 5).
 - Arrange for lethal reduction and/or removal of beaver population. While problem beavers may legally be removed any time, removal of beaver during the normal trapping season may minimize costs to the landowner and maximize the use of a renewable resource.

Type 2: Obstructed Culverts and Dams Less Than Two-Years-Old

Problem Description: This applies to the specific condition where beaver have obstructed a culvert or constructed a dam that is less than two-years-old and the dam poses a hazard to public health or safety on public or private property.

Management Response: The following are the BMPs for resolving Type 2 conflicts:

- Municipalities and state agencies should develop a regular monitoring program for roads, highways and bridges to identify potential beaver problems, implementing appropriate control measures as described and authorized in this document as soon as possible. Regular monitoring can help to prevent expensive repairs and potential liability as well as conserve valuable wetland resources.
- The landowner, municipality or state agency should first consider arranging for the lethal removal or reduction of the nuisance beaver (live trapping and the relocation of beaver is not authorized by this procedure). Arrange for lethal reduction and/or removal of beaver population. While problem beavers may legally be removed any time, removal of beaver during the normal trapping season may minimize costs to the landowner and maximize the use of a renewable resource.



- The landowner, municipality or state agency should investigate the possibility of installing and maintaining water control structures (such as the use of piping to serve as a siphon to lower the water level in the beaver pond) or exclusionary devices. If installation of these devices is possible and appears to have some potential for success, follow the installation procedures as listed in Appendices 6, 7, 8, 9, 10, and 15. When installing one of these devices, it also may be necessary to control the size of the beaver population through an annual trapping program.
- Because dam alteration or removal has the potential for flooding adjacent and/or downstream properties, all parties whose land can be affected by the person's dam alteration or removal must be notified in advance of dam alteration or removal.
- If a decision is made to remove the culvert obstruction or beaver dam as the means of eliminating the hazard, the first step is to lower the water level of the beaver impoundment by using a pump or siphon (refer to Appendix 6 for an example). The water level must be reduced gradually so that the impoundment is lowered not more than one foot per day. This will help minimize erosion, stream degradation, the potential for downstream flooding, and personal liability for damages. (Note: Beaver could potentially respond in one of two ways: they may abandon the area or attempt to work against all efforts to reduce water levels).
- To maximize the protection of spawning trout and salmon and the development of their eggs and fry, and if no imminent hazard exists, dam removal takes place only between June 1st and October 1st. Dam removal must be done in accordance with the requirements of Appendix 11.
- Immediately following dam removal, beaver fencing or water control devices should be installed and maintained in accordance with procedures contained in Appendices 7, 8, 9, 10, and 15 for the purpose of preventing future beaver dam construction. Not all water control devices will work for all situations.

Landowners should consult with an ANR representative to determine which form of control will work the best in their situation. Examples of different types of water control structures include screening, grills, wire meshes, electric fences, pipes, pond levelers, log drains, low water crossings, and culvert extenders.

- Persons who remove beaver dams or culvert obstructions in accordance with these BMPs must notify a Fish & Wildlife warden, one of the Agency of Natural Resources regional offices, or the Wildlife Services Hotline at 1-800-472-2437 as soon as possible.

- Any person who complies with the requirements listed in this section for Type 2 beaver dam problems will need no further authorization from the Agency for these activities. Compliance with the Type 2 requirements constitutes compliance with the 1272 Order contained in Appendix 12.

Type 3: Conflicts with an Established Beaver Dam or Dam Complex

Problem Description: Beaver dam or dams (inhabited or uninhabited) and which have been in existence two years or more, pose a hazard to human health or safety, or to public or private property.

Management Response: In most cases involving well-established beaver dams and associated wetlands, a site visit by one or more representatives of the agency will be necessary. Agency personnel must be contacted and will work with the landowner, municipality or state agency to identify solutions to the problem. The goal is to appropriately manage the nuisance beaver and associated hazard, while maintaining wetland values and minimizing the negative environmental impacts and personal liability for damages. Responses may vary. For example, with respect to the following situations:

- If the beaver dam, and any associated wetland, poses a hazard to human health or safety or has in the past caused substantial damage to property, roads or railroads, then the procedures described in Type 2 may be

appropriate in some cases and will be determined on a site-by-site basis.

- In a situation where a beaver pond is no longer inhabited by an active colony, the potential failure of the unmaintained dam poses a likely threat to adjacent and/or downstream properties; and the retention of water no longer serves the ecological function that it once did, the ANR personnel may determine that the dam can be removed, lowering the water level no more than one foot per day. Other measures may be necessary during dam removal to protect downstream water quality and habitats.

In all cases listed above, if a municipality, railroad or the Agency of Transportation deems a situation to be an imminent hazard (i.e. high water during a significant rain event) to public health or safety, or to public or private property and cannot follow the BMPs due to the need for immediate action, they should contact the Department of Environmental Conservation or the Department of Fish & Wildlife as soon as possible after taking immediate action.

Beaver dams obstructing man-made dams or their gates or spillways result in higher pond levels and reduce spillway capacity. This may cause an imminent hazard situation to occur with little to no warning. These beaver dams must be removed immediately upon discovery and as part of routine maintenance of other man-made dams. People who remove beaver dams in this type of situation do not need to comply with the BMPs, but it is recommended that they use the BMPs as guidance.

NOTICE: The alteration or removal of a beaver dam in accordance with these BMPs does not authorize dredging, filling, dam construction or any other activities that may have an adverse effect on wetlands or the waters of the state not authorized by these BMPs.

Scott Johnstone, Secretary
Agency of Natural Resources

Dated: _____

APPENDICES

LIST OF APPENDICES

1. LIST OF REGIONAL OFFICES, WARDENS AND OTHER CONTACTS
2. INSTALLATION OF WIRE AND ELECTRIC FENCING
3. PEOPLE AVAILABLE TO TRAP NUISANCE BEAVER
4. BEAVER RECIPES
5. GIARDIASIS
6. INSTALLING A SIPHON TO LOWER WATER LEVELS
7. BEAVER FENCING AND EXCLUSIONARY DEVICES
8. WATER CONTROL DEVICES
9. NICHOLSON CULVERT WING
EXTENSION
10. THREE LOG DRAIN
11. BEAVER DAM REMOVAL
12. 1272 ORDER
13. STATUTES AND REGULATIONS
PERTAINING TO BEAVER AND
BEAVER DAMS
14. REFERENCES AND ADDITIONAL
READINGS



APPENDIX 1 – LIST OF REGIONAL OFFICES, WARDENS AND OTHER CONTACTS

A. VERMONT FISH & WILDLIFE AND ENGINEERS

Springfield Dist. Natural Resources Office
(802) 885-8855

Wildlife Biologist – Kimberly Royar

Wildlife Biologist – Forrest Hammond

Rutland North Natural Resources Office
(802) 786-0040

Wildlife Biologist: Scott Darling

Wildlife Biologist: Douglas Blodgett

Stream Alteration Eng. – Fred Nicholson
Rutland (802) 786-5900

Essex Dist. Natural Resources Office
(802) 878-1564

Wildlife Biologist – Bill Crenshaw

Wildlife Biologist – John Gobeille

Barre Dist. Natural Resources Office
(802) 476-0199

Wildlife Biologist – John Buck

Wildlife Biologist – John Austin

St. Johnsbury Dist. Natural Resources Office
(802) 751-0100

Wildlife Biologist – Cedric Alexander

Wildlife Biologist – Tom Decker

Stream Alteration Eng. – Barry Cahoon

B. WILDLIFE SERVICES HOTLINE

USDA-APHIS

(800) 472-2437

C. VERMONT WETLANDS OFFICE

(802) 241-3770

State Wetlands Coordinator – Carl Pagel

D. STATE GAME WARDENS

Any State Game Warden may be contacted by radio by telephoning the nearest State Police Office. Leave your name, telephone number, and information.

SOUTHERN DISTRICT

Radio No.	Warden *Dist. Chief	State Police Office Tel.	Home Tel.	Residence
987	*Lt. Dane Hathaway	257-7101	257-7920	Brattleboro
935	Travis Buttle	442-5421	442-4383	Shaftsbury
961	Wayne Dengler	875-2112	869-2390	Saxtons River
967	Greg Eckhardt	773-9101	287-9367	Poultney
986	Paul Gaudreau	442-5421	394-2973	W. Rupert
982	Kelly Price	257-7101	251-2171	Brattleboro
981	George Scribner	773-9101	259-3551	Belmont
958	Meira Selby	257-7101	464-1420	West Dover

CENTRAL DISTRICT

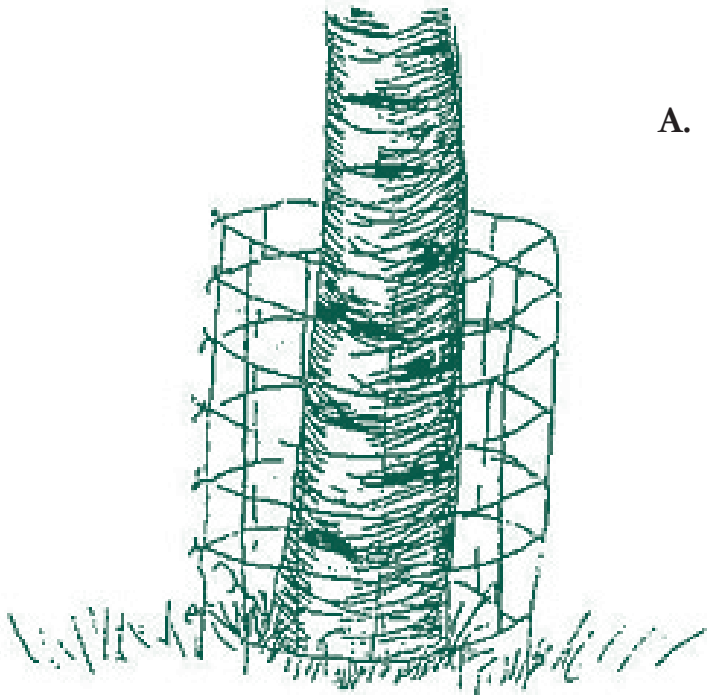
Radio No.	Warden *Dist. Chief	State Police Office Tel.	Home Tel.	Residence
954	*Lt. Douglas Lawrence	234-9933	728-4220	Randolph
941	Christopher Connor	234-9933	296-2240	West Hartford
938	Evan Eastman	234-9933	333-4815	Fairlee
959	Keith Gallant	234-9933	728-9215	Randolph
947	Donald Isabelle	773-9101	483-2017	Pittsford
983	David Rowden	773-9101	247-3667	Brandon
942	Robert Sterling	773-9101	265-4602	Fair Haven
946	Dale Whitlock	388-4919	453-7399	E. Middlebury

NORTHWESTERN DISTRICT

Radio No.	Warden *Dist. Chief	State Police Office Tel.	Home Tel.	Residence
948	*Lt. David LeCours	878-7111	479-3465	South Barre
970	Christopher Clark	878-7111	434-3463	Huntington
978	Tom Cook	878-7111	899-6716	Underhill Ctr.
949	Robert Lutz	524-5993	524-7438	Georgia
974	Dennis Reinhardt	635-7036	253-0974	Moscow
945	Lawrence Rosenberger	878-7111	893-3876	Milton
937	Curtis Smiley	229-9191	476-4485	Plainfield
969	Dan Swainbank	524-5993	868-3295	Swanton
984	Trevor Szymanowski	229-9191	479-7590	Barre
952	Carl Wedin	524-5993	285-2087	Franklin

NORTHEASTERN DISTRICT

Radio No.	Warden *Dist. Chief	State Police Office Tel.	Home Tel.	Residence
976	*Lt. Kenneth Denton	748-3111	684-2219	Danville
956	Dennis Amsden	748-3111	751-7695	Danville
936	Kevin Carvey	748-3111	584-3985	Groton
979	Paul Fink	723-4343	266-8937	Canaan
980	Sean Fowler	748-3111	751-0459	E. St. Johnsbury
960	David Gregory	748-3111	626-4390	Lyndon Ctr.
968	Kim Klein	748-3111	754-9464	Irasburg
940	Robert Lewis	766-2211	766-8824	Derby
965	Bradley Mann	766-2211	895-2993	Morgan
943	Russell Shopland	766-2211	472-3040	E. Hardwick



A. INSTALLATION OF RIGID WIRE TO PROTECT TREES

A rigid enclosure fence pulled around the base of treasured trees and shrubs will generally offer protection from beaver damage. The rigid enclosure (not chicken wire) should be at least four feet high. This method works best for a small number of individual trees or shrubs and may be prohibitive for larger acreage or orchards.

B. INSTALLATION OF ELECTRIC FENCE TO PROTECT SHRUBS AND TREES

An electric fence may be used to help offer protection to larger areas. Usually one strand is used which should not be placed higher than 6 inches above the ground. Property could be protected by installing equipment similar to what farmers use to keep cattle within field boundaries.

Electric fences also may be used effectively to help keep beaver from plugging culverts. Solar generators or battery packs may be used for power. Fluctuating water levels may result in problems if the wire is set at a certain level.



APPENDIX 3 – PEOPLE AVAILABLE TO TRAP NUISANCE BEAVER



FOR FURTHER INFORMATION COVERING YOUR AREA, CONTACT:

United States Department Of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services Hotline
Parker Professional Center
617 Comstock Road, Suite 9
Berlin, Vt 05602
Telephone: (802) 223-8690

APPENDIX 4 – BEAVER RECIPES

BEAVER ROAST

Prepare hindquarter of beaver by removing all traces of fat. Coat with flour seasoned with salt and pepper. Place in roasting pan. Lard heavily with beef suet. Preheat oven to 450°. Bake 15 minutes and then reduce oven to 325°.

Continue baking for a total time of 20 minutes per pound.

Sue Kirbeis – Carmel, ME

DICK'S ROAST BEAVER

One 10 to 15 pound beaver, dressed. Remove as much fat as possible. Place in large roaster, salt and pepper inside and out. Make a dressing as for roast turkey with a little more Bell's seasoning than for fowl. Roast in slow oven, about 4 to 5 hours at 300°. Baste with cooking wine. Serve with baked potatoes, turnip and salad. Yield or number of servings: 12 to 15.

Dick Shearer – Bradford, VT

BEAVER BURGER MEAT LOAF

Obtain hind quarters and loin of a freshly killed beaver. Trim all fat (that is very important) and bone. Grind with beef suet.

Meat Loaf:

2 lbs. ground beaver meat	2 eggs
1 envelope onion soup mix	1/3 cup catsup
1 cup fine bread crumbs	3/4 cup water

In large bowl combine all ingredients. Shape into loaf, place in baking dish. Bake about 1 hour at 375°.

Joan Caron – Old Town, ME

BEAVER MINCEMEAT

9 cups meat (about 3 lbs. beaver meat and 1 lb. ground beef)	
18 cups chopped apples	18 tbsp. molasses
9 cups brown sugar (3 lbs.)	19 tbsp. vinegar
18 tbsp. butter	3 tsp. cinnamon
2½ tsp. cloves	3 tsp. nutmeg
8 cups raisins (chopped or whole)	9 tsp. salt

Cut meat in chunks. Cook meat well done and put through grinder. Simmer all ingredients until apple is done. Add 6 tbsp. jelly (apple or grape) and ½ cup brandy. Pack in pint mason jars. Makes about 14 pints. Makes delicious pies and tarts.

Ken Warner – Winterport, ME

BEAVER STEW

¼ cup vinegar	1 quart tomatoes
1 large onion, sliced	1 pkg. carrots, sliced
4 med. potatoes, diced	½ tsp. garlic salt
¼ tsp. thyme leaves	1 tsp. gravy master

Place neck and/or front shoulders in pot of water with the vinegar and bring to a boil. Boil slowly 10 minutes. Pour off liquid. Add fresh water and simmer until meat can be removed from the bones. Add the vegetables and seasonings. Cover and simmer for ½ to ¾ hour. Add dumplings, then cook uncovered for 20 minutes. (Dumplings can be made using 2 cups flour, ½ teaspoon salt, 8 teaspoons baking powder, and about 1 cup of water).

Ann Anderson – Cundy's Harbor, ME

What Is Giardiasis?

Giardiasis is a gastrointestinal infection caused by microscopic parasite called *Giardia lamblia*. This is a common parasite causing gastrointestinal illness in the United States. Giardiasis can be a problem in areas where sanitation is poor, in settings in which there may be problems with personal hygiene, such as institutions or day-care centers, or when unfiltered water supplies are contaminated with the organism.

How Is Giardiasis Spread?

A *Giardia* infection can be acquired when you ingest food or water which has been contaminated with the parasite. The parasite multiplies in the small intestine and is passed out with a bowel movement. Any food or drink which has become contaminated with an infected stool can transmit the parasite. The infection also can be spread person-to-person when hands, which are contaminated with an infected person's stool, are brought in contact with the mouth. Swallowing as few as ten parasites can cause the infection. Person-to-person transmission is the main way that giardiasis is spread, such as in day care centers and institutions, where personal hygiene may be poor due to age (infancy, elderly) or disability. Giardiasis also can be spread in this manner in a household setting.

Are Animals Involved In The Spread Of Giardiasis?

Giardia parasites have been found in the stools of many animals, including rodents, dogs, cats, cattle, and wild animals. Animals living near water supplies, such as beavers and muskrats, have been found to be infected with *Giardia*. The extent of direct animal-to-human transmission of *Giardia* is minimal; there is greater evidence of indirect transmission such as through contamination of water supplies.

Do All People Who Are Infected With Giardia Get Sick?

No. Some people who are infected with the parasite may only have minor symptoms and some people may not have any symptoms at all. However, these people can still pass *Giardia* parasites in their stool and become a source of infection for others.

What Are The Symptoms Of Giardiasis?

Symptoms of Giardiasis usually appear seven to ten days (and sometimes as long as four weeks) after ingesting the parasite. The most common symptoms are diarrhea, foul greasy stools, abdominal cramps, bloating, increased gas, weakness, and weight loss.

How Is Giardiasis Diagnosed?

Giardiasis is usually diagnosed through a laboratory examination of a stool sample. Your physician will forward the stool sample to a laboratory which will use a microscope to look for the parasite. Several stool samples may need to be examined to detect the parasite. The disease can also be diagnosed through a sample of fluid or a biopsy from the small intestine.

Some General Guidelines:

1. Always thoroughly wash your hands with soap and water before meals, before preparing food, after having a bowel movement, after changing diapers, and after playing with your pets.
2. Do not drink untreated water from a surface water supply such as a pond, lake or stream. Although the water may appear to be clean, it may contain *Giardia* parasites which cannot be seen without a microscope. If only untreated water is available, boil the water before drinking it.
3. If you are taking care of a person with Giardiasis, use extra precautions after contact with the person's stool (for example, after changing diapers). Promptly and carefully dispose of any material which has been contaminated with stool and always wash your hands after such contact.
4. If your source of drinking water is from a well or another surface water supply, do not allow humans or animals to defecate (have bowel movements) near the water. In addition, appropriate water filtration systems can be effective in removing *Giardia* parasites from contaminated water.

APPENDIX 5 – GIARDIASIS (continued)

What Is The Treatment For Giardiasis?

There are several medications which are effective in treating the infection. They are only available by prescription from your physician. Other treatments for diarrhea, such as increased fluid intake, may also be recommended by your physician.

How Can Giardiasis Be Prevented?

Giardiasis can be prevented by practicing good hygiene and using caution before drinking water from an unknown source.

From: New York State Department of Environmental Conservation Bureau of Wildlife 1996.

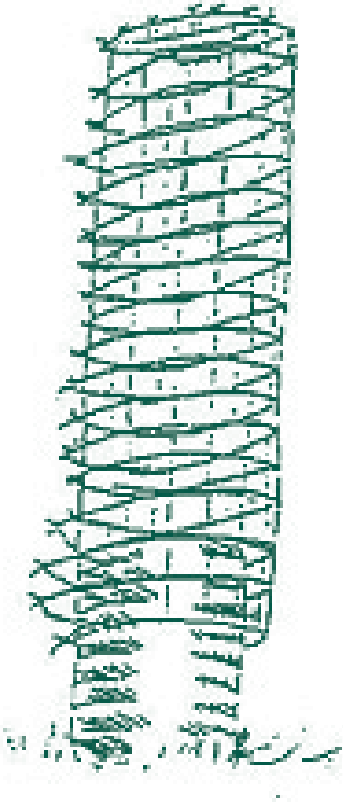
APPENDIX 6 – INSTALLING A SIPHON TO LOWER WATER LEVELS

A flexible black pipe siphon may be used when beaver have raised water levels to the point of causing considerable property damage. A risk would be involved to downstream properties by the sudden removal of a section of the dam.

This method is recommended for the installation of various “beaver pipes” as it reduces the risk of the beaver dam “blowing out” and sending a wall of water downstream. It also helps to prevent water quality problems caused by the sudden release of water. Using pipe larger than 6 inches in diameter to lower the water will make it difficult to start the siphon.

You may choose to use a flexible pipe to lower the water level 12 to 18 inches before installing a beaver pipe. Once the pipe has been installed, the beaver will usually repair the dam, giving you the ability to control the water level.





A. THE “BEAVER STOP” CULVERT ROLL FROM CANADA

The “Beaver Stop” culvert roll consists of a roll of rigid wire covering the end of the culvert and extending 20 to 30 feet into the beaver pond. This allows the landowner the ability to prevent clogged culverts and to control the water level. The patented product is generally staked in place. The end of the roll is covered with a wire cap. Like any exclusionary devices, some maintenance is involved.

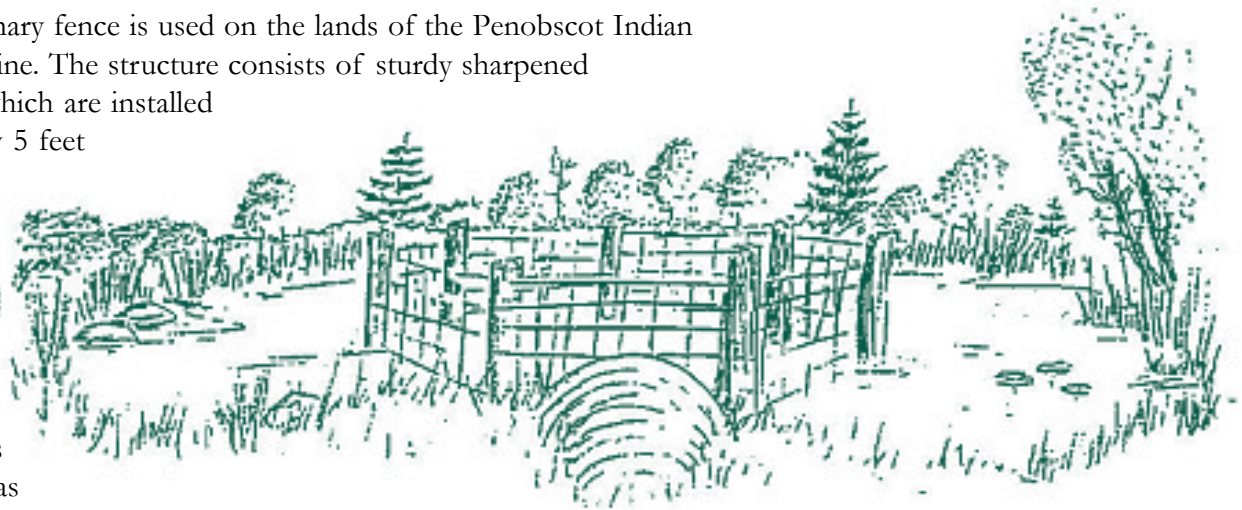
For information contact:

D.C.P. Consulting, Ltd.
3219 Coleman Road N.W.
Calgary, Alberta T21 1G6
Phone: (403) 282-2506

The New York Department of Environmental Conservation also has used mesh culverts. They constructed their mesh culverts from concrete reinforcing mesh panels. Shallower pond areas generally needed long mesh culverts.

B. PENOBSCOT BEAVER FENCE

This exclusionary fence is used on the lands of the Penobscot Indian Nation in Maine. The structure consists of sturdy sharpened cedar posts which are installed approximately 5 feet apart. The poles may be braced on the inside to help prevent ice damage. A trapezoid shape appears to work well as it apparently confuses the beaver.



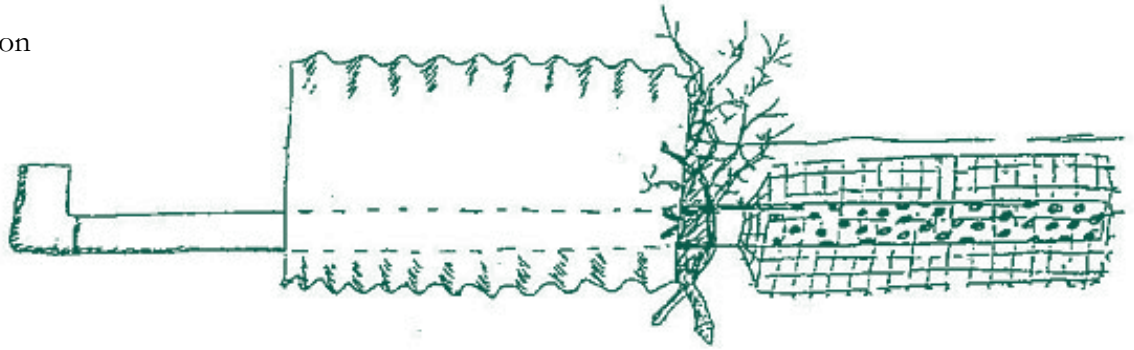
A rugged wire mesh-like concrete reinforcing wire may be stapled to the poles. The larger mesh openings also would provide smaller mammals, such as mink and muskrats, the ability to move through the enclosure. Some maintenance is required.

Fences built around culverts to exclude beavers.



A. CLEMSON BEAVER POND LEVELER THROUGH CULVERT

This pond leveler originated at Clemson University and has been field tested for several years. It is designed to resist clogging by beaver activity and requires minimal maintenance. The



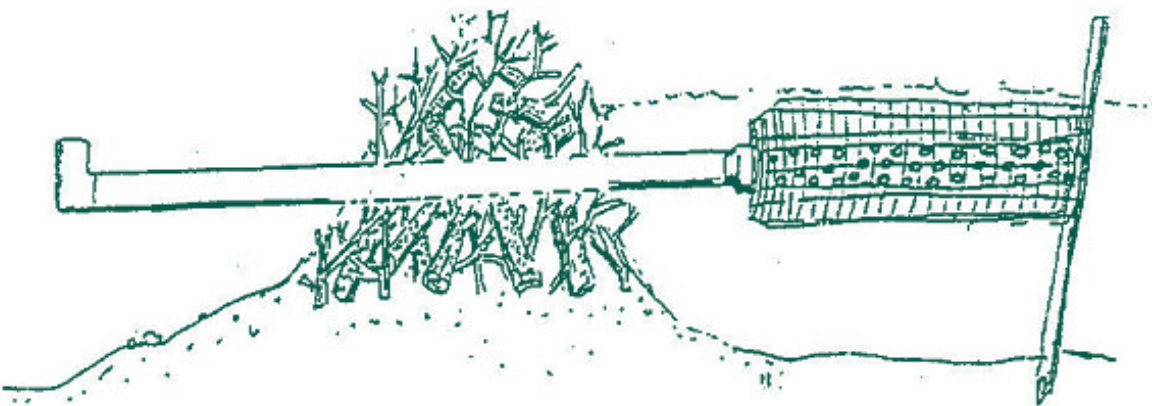
wire mesh intake basket is constructed with at least a 10 foot long section of perforated PVC pipe approximately 8 inches in diameter. A long section will need to be added to extend through the culvert. The tubing is surrounded by welded wire (with a mesh size not smaller than 2 inches x 4 inches) and the end is capped with wire. Support wires are necessary to hold the tubing in the center of the mesh basket.

The downstream end of the tubing should extend at least three to four feet past the end of the culvert. Water levels can be controlled by the elevation of the elbow on the end of the pipe. The mesh basket is supported off the bottom by sturdy metal stakes.

For more information, contact: Dr. Gene Wood
Dept. of Agriculture, Fisheries & Wildlife
G08 Lehotsky Hall, Clemson University
Clemson, SC 29634
Phone: (803) 656-3117

B. CLEMSON BEAVER POND LEVELER THROUGH BEAVER DAM

This pond leveler also can be used with beaver dams. Once the water level has been lowered by removing a small section of the dam, the plastic pipe can be installed. An approximate rule of thumb is to install an



8-inch plastic pipe for every 3 square miles of drainage. Several pipes may be needed for larger projects.

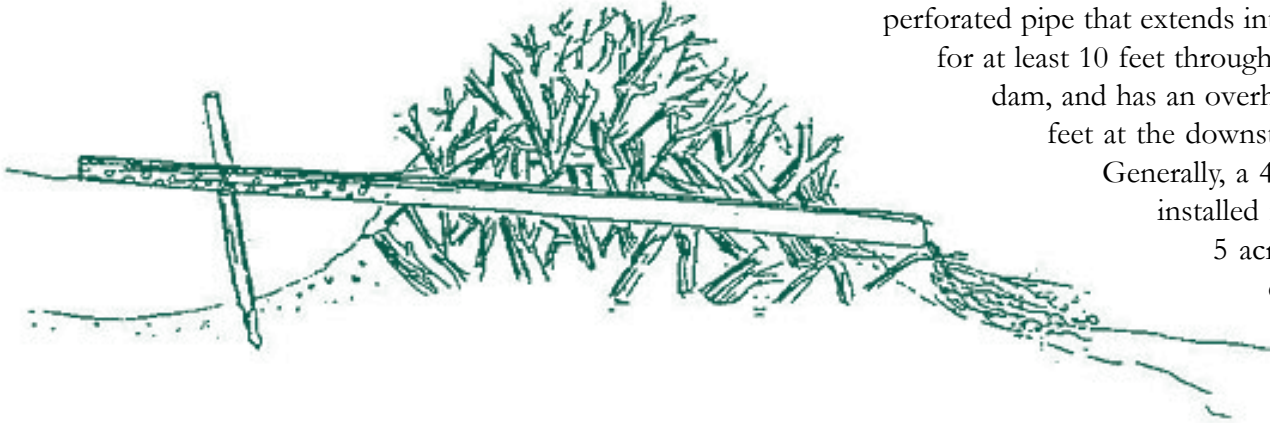
For construction and installation information, refer to Appendix 8A.

C. BASIC BEAVER PIPE THROUGH BEAVER DAM

The reasoning behind a beaver pipe is to allow the landowner to control the water level of the pond and help retain many existing wetland-related values. A basic

beaver pipe consists of at least a 4-inch perforated pipe that extends into the pond for at least 10 feet through the beaver dam, and has an overhang of 3 to 4 feet at the downstream outlet.

Generally, a 4-inch pipe is installed for every 1 to 5 acres of drainage basin.



The pipe should be held

in place with metal posts. Installation of the pipe necessitates the removal of a small section of the beaver dam. Active beaver in the area will usually repair the hole in the dam overnight and seal in the pipe. Pipes of this type usually require periodic maintenance.

D. PERFORATED CULVERT PIPE

This perforated culvert pipe works best when it is submerged and extended through a culvert. The 8-inch pipe is held off the panel bottom with metal posts. Both ends should be covered with rigid wire. The end of the culvert should also be covered with wire. Generally, the more holes in the pipe, the more difficult it will be for the beaver to plug them. Periodic maintenance is required.



E. INSTALLATION OF A BEAVER BAFFLE (CLEMSON BEAVER POND LEVELER)



A beaver baffle.



Notching the dam.



Floating the baffle to the dam.

E. INSTALLATION OF A BEAVER BAFFLE (CLEMSON BEAVER POND LEVELER)

Attaching the first of three outflow pipes.



The entire baffle and outflow pipes ready to be placed into the dam.



Placing the outflow pipe into the dam; situating the baffle over deep water.



E. INSTALLATION OF A BEAVER BAFFLE (CLEMSON BEAVER POND LEVELER)



Sinking the baffle into the pond.



Patching the dam to secure the outflow pipe in place.



Repairs made to the dam by the beaver after one month.

E. INSTALLATION OF A BEAVER BAFFLE (CLEMSON BEAVER POND LEVELER)

The new, lower water level maintained by the beaver baffle.



A Cylindrical Beaver Baffle
(original design by Skip Lisle)



F. LOGGERS ROAD CROSSING

This method is used in logging and remote areas that experience periodic flooding because of plugged culverts. The crossing is actually an emergency outlet for ponded water and will allow travel across through the area.

The crossing consists of a sturdy rock base covered with coarse gravel. Some maintenance will still be involved as active beavers could dam the upstream edge causing upstream erosion. Solid construction is important as well as plans for the crossing after it is no longer needed.



A. BEFORE – SUSCEPTIBLE TO BEAVER IMPACT

Beaver realize that it takes considerably less effort to plug a culvert with sticks and mud to raise water levels. Culverts located in areas with abundant trees and shrubs can be easily impacted. Not all impacts occur on the



end of the culvert. A real problem may occur when the culvert's plugged in the middle (under a road). Rising water levels can impact the road.

B. AFTER – CULVERT WING EXTENSION

Observations of various culvert projects have shown that culverts which had wings constructed during installation had considerably less beaver problems. The wings are extended out

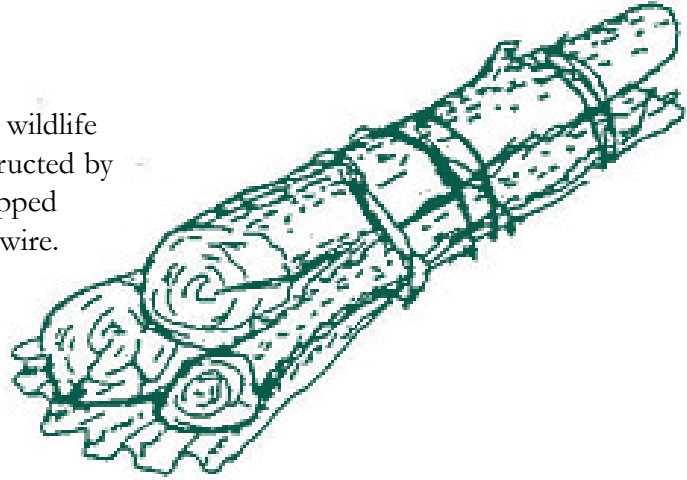


from the road bed approximately 20 feet and are generally 10 to 12 feet wide. The beaver will tend to build their dams at the ends of the wings and not impact the culvert.

If the project is in a mapped Class II wetland, a minor Conditional Use Determination may be needed from the Wetlands Office.

APPENDIX 10 – THREE LOG DRAIN

The three log drain is one of the earlier attempts by wildlife officials to control beaver dam problems. It is constructed by using fresh cut logs from the site. Roofing tin is wrapped between and around the logs and secured by strong wire. Although this is a relatively inexpensive method for water level control, it will not last as long as plastic pipes. Regular maintenance is usually required.



APPENDIX 11 – BEAVER DAM REMOVAL

The alteration of a beaver dam may be necessary for the removal of an obstruction, lowering of the water level behind the dam, or installation of various types of water control devices (see Appendices 8 and 10). Modifications of the dam must be carried out in a manner that releases water controllably, minimizes the discharge of sediments and debris to waters below the dam, thereby lessening disturbance to fish and wildlife habitats, and avoids damage to downstream properties as a result of flooding, erosion, culvert failure or depositing debris on other lands.

Also, many beaver dams are located on productive trout streams. Trout populations are particularly sensitive to environmental disturbances. The time of year when trout are spawning (fall and spring) and their eggs and fry are developing (winter and spring) must be avoided, whenever possible, when removing or altering beaver dams. By conducting this work in an appropriate manner during the period of June 1st through October 1st, severe adverse impacts on trout resources can be largely avoided.

To prevent potential problems, the water level within a beaver impoundment must be lowered gradually, i.e. less than one foot per day. The preferable method for

lowering the water level is to install one or more siphons constructed from PVC pipes (Appendix 6) or using a gas-powered portable pump. The number of siphons or pumps needed will be determined by the amount of water entering the beaver impoundment. Removing small sections of the beaver dam crest by means of manual tools (e.g., potato rake, pry bar, chain saw, winches) also may be employed but are less effective in preventing downstream problems. Furthermore, unless beaver numbers have been reduced or they have abandoned the site altogether, beaver may quickly repair any breaches made in the dam. **Explosives must never be used to remove a beaver dam.**

Once the water level behind the dam has been lowered to the extent necessary to implement more permanent water control, the remainder of the dam may be removed. Care must be taken during the process to avoid causing problems with downstream water quality and flooding. Dam debris must be transported away from the site and outside of the flood plain to prevent its re-entry into the waterway during the periods of high water or by beaver re-using it as source of dam building materials.

APPENDIX 12 – ADMINISTRATIVE ORDER

10 V.S.A. §1272

Re: Removal of Beaver Dams

The Secretary (“Secretary”) of the Agency of Natural Resources (“Agency”), pursuant to the provisions of 10 V.S.A. §1272, hereby makes the following findings in support of the issuance of an Administrative Order:

FINDINGS

1. The construction of dams and lodges by beavers can result in situations where beaver activity can pose a hazard to public safety or welfare or public or private property through flooding, contamination of water supplies, impairment of drainage and/or septic systems, impairment of agricultural lands, and other hazards.
2. In order to abate the hazard, landowners, municipalities, and state agencies may be required to drain and/or remove beaver dams.
3. The drainage and/or removal of beaver dams can reasonably be expected, in many instances, to create or cause a discharge to waters of the state in violation of 10 V.S.A. Chapter 47 of the Vermont Water Quality Standards and, in some situations, may violate the Vermont Wetlands Rules.
4. The Secretary has determined that for some situations, reasonable and proper methods exist which, if followed, can reduce or eliminate the potential violations.

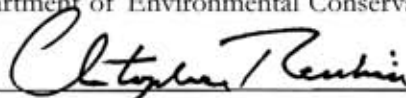
Based on the above findings, the Secretary hereby issues the following:

ORDER

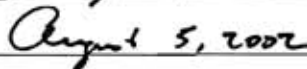
1. Any person who removes a beaver dam that is obstructing a culvert or who dewateres a beaver pond and removes the associated beaver dam is authorized to do so provided the following conditions are met:
 - a. The dam and associated pond are less than two years old unless the dam is obstructing a culvert, in which case the time limitation does not apply;
 - b. The dam and/or associated beaver activities pose a hazard to public health or safety or public or private property; and
 - c. The dewatering of the beaver pond and/or removal of the dam is performed in accordance with the *“Best Management Practices for Resolving Human-Beaver Conflicts in Vermont”* issued by the Agency dated August 5, 2002.
2. This approval does not grant any exclusive rights or privileges which would impair any rights possessed by other riparian or littoral owners of the State of Vermont. It does not grant any right, title, or easement to or over any land not owned in fee by the applicants, nor does it authorize any damage to private property or invasion of private rights or the violation of Federal, State, or local laws or regulations.
3. Any person granted approval under this Order is not relieved of his or her responsibility to comply with any other Federal, State, or local laws.
4. The Department of Environmental Conservation maintains continuing authority over this activity and may at any time under additional protective measures be taken to protect water quality or significant wetlands.
5. The Department of Environmental Conservation in granting this approval accepts no legal responsibility for any damage direct or indirect of whatever nature and by whomever suffered arising out of the activity described.

Christopher Recchia, Commissioner
Department of Environmental Conservation

By



Date



**APPENDIX 13 – STATUTES AND REGULATIONS PERTAINING
TO BEAVER AND BEAVER DAMS**

- 1) **Title 10 V.S.A. §1259 – Prohibitions: (a)** “No person shall discharge any waste, substance, or material into waters of the state, nor shall any person discharge any waste, substance, or material into an injection well or discharge into publicly owned treatment works any waste which interferes with, passes through without treatment, or is otherwise incompatible with those works or would have a substantial adverse effect on those works or on water quality, without first obtaining a permit for that discharge from the secretary.”
- 2) **Title 10 §4828 – Taking of rabbit or furbearing animals by landowner; selectmen; certificate, penalty: (a)** “The provisions of law or regulations of the board relating to the taking of rabbits or furbearing animals shall not apply to an owner, his employee, tenant, or caretaker of property protecting the same from damage by rabbits or furbearing animals, or to the selectmen of a town protecting public highways or bridges from such damage or submersion with the permission of the owner of lands affected...”
- 3) **Title 10, App. §43 – Method of taking: (e)** “A person shall not interfere in any manner with dams, dens, or houses of beaver except upon special permit in writing from the commissioner, provided, however, that these provisions shall not apply to an owner of property, the agent, employee, tenant, or caretaker of the owner protecting the same from damage by beaver, or to the legislative body of a municipality or the agency of transportation, within their respective jurisdictions, when protecting public highways or bridges from such damage or submission, with permission of the owners of lands affected, or to a person acting under authority of an order under section 37 of Title 19.”
- 4) **Title 10 V.S.A. §4138 – Control of fish, game; powers of commissioner: (c)** “Any measures which involve temporary pollution of waters shall be carried out in accordance with the provisions of section 1263a of chapter 47 of this title.”
(d) “The commissioner shall cooperate with the transportation board in any proceeding brought under section 37 of Title 19 to protect a highway, railroad, or public airport from impoundments of water by beaver.”
- 5) **Title 10 V.S.A. §1263 – Discharge permits: (a)** “Any person who intends to discharge waste into the waters of the state or who intends to discharge into an injection well or who intends to discharge into any publicly owned treatment works any waste which interferes with, passes through without treatment, or is otherwise incompatible with that works or would have a substantial adverse effect on that works or on water quality shall make application to the secretary for a discharge permit. Application shall be made on a form prescribed by the secretary. An applicant shall pay for an application fee in accordance with 3 V.S.A. §2822.”
- 6) **Title 19, §37 – Impoundments of water created by beaver: (a)** “Transportation board jurisdiction. On petition of the agency of transportation, the legislative body of an affected municipality, or the owner or operator of an affected railroad or sponsor of an affected public airport, or on its own motion, the transportation board may, after notice and hearing under Chapter 25 of Title 3, issue an order requiring the removal or abatement of an impoundment of water created by beaver which threatens to damage or substantially submerge a highway, railroad, or public airport. Notice shall be given to the owner or owners of affected land, the legislative body of the affected municipality, and the secretary of the agency of natural resources. If the board determines that an impoundment of water created by beaver threatens to substantially damage or submerge a highway, railroad, or public airport, its order shall direct that the impoundment be abated with as minimal impact on affected land and natural resources as possible, or if necessary, removed. Persons taking actions pursuant to an order of the board under this subsection shall be exempted from the requirements of 10 V.S.A. 905(7).”
- 7) **Wetlands Regulations**

**APPENDIX 13 – STATUTES AND REGULATIONS PERTAINING
TO BEAVER AND BEAVER DAMS (continued)**

8) Title 10 V.S.A. §1272 – Regulations of activities causing discharge or affecting significant wetlands – “If the secretary finds that any person’s action, or an activity, results in the construction, installation, operation or maintenance of any facility or condition which reasonably can be expected to create or cause a discharge to waters in violation of this subchapter, or to violate the board’s rules under section 905(9) of this title relating to significant wetlands, the secretary may issue an order establishing reasonable and proper methods and procedures for the control of that activity and the management of substances used therein which cause discharges or violations of board rules with respect to significant wetlands in order to reduce or eliminate those discharges and rule violations with respect to significant wetlands. Any person who receives an order pursuant to this section may appeal to the board as provided in section 1269 of this title.”

9) Title 10 V.S.A. §1274 – Enforcement:
(a) “Notwithstanding any other provision or procedure set forth in this chapter, if the secretary finds that any person has discharged or is discharging any waste in violation of this chapter or that any person has failed to comply with any provisions of any order or permit issued in accordance with this chapter, the secretary may bring suit in the superior court in any county where the discharge or noncompliance has occurred to enjoin the discharge and to obtain compliance. The suit shall be brought by the attorney general in the name of the state. The court may issue a temporary injunction or order in any such proceedings and may exercise all the plenary powers available to it in addition to the power to:

- (1) Enjoin future discharges.
- (2) Order the design, construction, and installation or operation of pollution abatement facilities or alternate waste disposal systems.

- (3) Order the removal of all wastes discharged and the restoration of water quality.
- (4) Fix and order compensation for any public property destroyed, damaged, or injured. Compensation for fish taken or destroyed shall be deposited into the fish and wildlife fund.
- (5) Assess and award punitive damages.
- (6) Levy civil penalties not to exceed \$10,000.00 a day for each day of violation.
- (7) Order reimbursement to any agency of federal, state, or local government from any person whose discharge caused governmental expenditures.”

(b) “The secretary, by rule, shall define those violations which are significant, based upon the magnitude, duration, consequences, and causes of the violation. When a significant violation occurs, the secretary may initiate proceedings to compel compliance by and seek penalties from the violator. A court, upon finding that such a violation has occurred, shall order compliance and retain jurisdiction to assure that compliance schedules are met. The court also shall impose penalties. Action under this section shall not restrict the secretary’s authority to proceed under section 1267 of this title.”

10) Title 10 V.S.A. Chapter 37, §905 – Duties; powers: (7) “Adopt rules for the identification of wetlands which are so significant that they merit protection. Any determination that a particular wetland is significant will result from an evaluation of at least the following functions which the wetland serves:

- (A) provides temporary water storage for flood water and storm runoff;
- (B) contributes to the quality of surface and groundwater through chemical action;

**APPENDIX 13 – STATUTES AND REGULATIONS PERTAINING
TO BEAVER AND BEAVER DAMS (continued)**

- (C) naturally controls the effects of erosion and runoff, filtering silt and organic matter;
- (D) contributes to the viability of fisheries by providing spawning, feeding, and general habitat for freshwater fish;
- (E) provides habitat for breeding, feeding, resting, and shelter to both game and nongame species of wildlife;
- (F) provides stopover habitat for migratory birds;
- (G) provides for hydrophytic vegetation habitat;
- (H) provides for threatened and endangered species habitat;
- (I) provides valuable resources for education and research in natural sciences;
- (J) provides direct and indirect recreational value and substantial economic benefits; and

(K) contributes to the open-space character and overall beauty of the landscape.

(8) Act on petitions, or on its own motion, to designate specific wetlands as significant, when considered under the criteria established in subdivision (7) of this section;

(9) Adopt rules protecting wetlands which have been determined under subdivision (7) or (8) of this section to be significant; provided, however, that the rules may only protect the values and functions sought to be preserved by the designation. The board shall not adopt rules that restrain agricultural activities without the consent of the commissioner of the department of agriculture, food and markets and shall not adopt rules that restrain silvicultural activities without the consent of the commissioner of the department of forests, parks and recreation.”



ERIC SORENSON

APPENDIX 14 – REFERENCES AND ADDITIONAL READINGS

- Chapman, J. and G. Feldhamer. 1982. Wild mammals of North America: Biology-Management-Economics. John Hopkins University Press, Baltimore.
- D-Eon, R., R. Lapoint, N. Bosnick, J. Davies, B. MacLean, W. Watt, and R. Wilson. 1995. The Beaver Handbook: A Guide to Understanding and Coping with Beaver Activity. OMNR, Northeast Science and Technology, FG-006, Timmins, Ontario.
- Ermer, E. 1988. Managing beaver in New York. The Conservationist, Department of Environmental Conservation.
- Godin, A. 1997. Wild Mammals of New England. John Hopkins University Press, Baltimore.
- Hamelin, D., D. Dougherty, G. Fuerst, D. Jenks, T. Raffaldi, V. Gilligan, G. Golja, and B. Tuller. 1996. Beaver Damage Control Techniques Manual, New York State Department of Environmental Conservation, Bureau of Wildlife.
- Hammerson, G. 1994. Beaver (*Castor canadensis*): Ecosystem alterations, management, monitoring. The Nature Conservancy, Boston.
- Hilfiker, E. 1991. Beavers, Waters, Wildlife and History. Heart of the Lakes Publishing, Interlaken.
- Hodgdon, K. and J. Hunt. 1958. Beaver Management in Maine. Reprint of second edition (1995). Department of Inland Fisheries and Game, Augusta.
- Jackson, S. and T. Decker. Undated. Beavers in Massachusetts – Natural History, Benefits, and ways to resolve conflicts between people and beavers. University of Massachusetts Cooperative Extension System and Massachusetts Division of Fisheries and Wildlife.
- Laramie, H. and S. Knowles. 1990. Beavers and their control. University of New Hampshire Cooperative Extension. Wildlife Fact Sheet 10.
- Lisle, S. Penobscot Nation methods to control damming by beaver.
- Marsh, J. and C. Dyer. 1981. The Maine Way: A collection of Maine fish and game recipes. Maine Department of Inland Fisheries and Wildlife.
- Novak, M., J. Baker, M. Obbards, and B. Mallock. 1987. Wild Furbearer Management in North America, Ontario Trappers Association, Ontario Ministry of Natural Resources, Toronto.
- Remillard, M., G. Gruending, and D. Bogucki. 1987. Disturbance by beaver (*Castor canadensis*) and increased landscape heterogeneity. In: M. Turner ed. Ecological Studies, Vol. 64. Landscape heterogeneity and disturbance, Springer-Verlag.
- Roblee, K. 1984. Use of corrugated plastic tubing for controlling water levels at nuisance beaver sites. New York Fish and Game Journal, Vol. 51, No. 1.
- Rue, L. 1964. The World of the Beaver. Lippincott Co., Philadelphia and New York.
- Vermont Game Warden's Association. 1990. Vermont Wildfoods Cookbook. Vermont Game Warden's Association, PO Box 153, Danville.
- Wilde, S., C. Youngberg, and H. Hovind. 1950. Changes in composition of ground water, soil fertility, and forest growth produced by the construction and removal of beaver dams. Journal of Wildlife Management 14: 123-128.
- Young, M. 1994. Beaver: Friend or Foe. Ducks Unlimited Magazine, Memphis.