

MANAGING WILDLIFE DAMAGE

Beavers

(Castor canadensis)

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BIOLOGY AND BEHAVIOR

The beaver is North America's largest rodent. Adult beavers normally weigh 40 to 50 pounds, but exceptionally large animals may weigh up to 80 pounds. They range in length from 35 to 50 inches, including the tail, which normally is about 10 inches long. Beavers have short legs, strong digging claws on the front feet, and large, powerful, webbed hind feet used for swimming. The broad, scaly, paddle-like tail is used as a rudder when the beaver swims, and also helps steady the beaver when it stands on its hind feet. Although beavers communicate principally by using whines, grunts, hisses, and a variety of nasal sounds, they will slap the surface of the water with the tail as a warning to alert other beavers of potential danger. The tail also acts as a storage organ for accumulated fat to be used as a reserve energy source during the wintertime.

Beavers groom and clean their dark brown fur daily using a modified (i.e., split) second toenail on each hind foot. The fur then is coated with a material produced by an oil gland located beneath the tail. This coating makes the fur water repellent.



Properly groomed fur also is capable of holding a thin layer of air next to the skin to help insulate the beaver from the effects of cold water. The short ears and nose each have unique muscles and valves that close to

keep water from entering when the animal is submerged, and each eye has a transparent membrane that protects it when under water. These adaptations make the beaver well suited for life in the water.

Beavers have a compact head with strong jaws and sharp chisel-like front teeth adapted for cutting trees and peeling bark. The two center top and bottom teeth (incisors) grow continuously throughout the life of the beaver. These teeth grow at an angle such that they actually are sharpened every time the beaver gnaws on trees.

Beavers have lived as long as 20 years in captivity, but normally average no more than 5 to 8 years of age in the wild. Although they are viewed as being primarily nocturnal (i.e., active at night), individuals can be observed during daylight hours, especially when dispersing to new territory or when repairing damage to a dam or lodge. Beavers are monogamous animals, which

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means they pair with the same mate for life. Mating takes place during January and February, and kits (young beavers) are born in May or June. The typical litter has 3 or 4 kits, but may have more or less depending on environmental factors and the physical condition of the female. A colony of beavers usually consists of the adult pair, last year's offspring (often called yearlings), and the current crop of kits. Once the yearlings have reached 2 years of age, they leave or are forced out of the colony by the adults and start new colonies of their own in other locations.

Beavers today are found throughout all of the North American continent. Here in Virginia, biologists believe beavers are present in every county. Given their large size and the limited amount of time they spend away from the protection of water, adult beavers have relatively few natural predators. However, kits and yearlings may be preyed upon by black bears, coyotes, dogs, bobcats, and perhaps great horned owls. Because of the low natural mortality and an abundance of suitable habitat, Virginia's resident beaver population currently is expanding, but the exact statewide population has not been estimated.

Beavers will inhabit nearly any water source that has a reliable and plentiful supply of nearby food, but they prefer water systems characterized by low gradient flow. Stream and lake habitats are used heavily, but beavers also may be found in farm ponds, wetlands, sewage treatment plants, and other riparian areas. Beavers are notorious for being Mother Nature's little engineers. In fact, they are one of only a few wild animals capable of significantly altering a habitat to suit their needs. Beavers spend considerable time building and meticulously maintaining dams. In fact, the sound of running water will stimulate a beaver to investigate all its impoundment structures for leaks or breaches. Construction of dams and lodges usually occurs during late summer and early fall. Female beavers assume a major role in the construction of a dam or lodge, whereas males act more as building inspectors. Dams are constructed to impound water of a sufficient depth to provide protective cover for the lodge and to facilitate the beaver's movement about the territory. Beaver dams can range from 2-10 ft. in height and can extend more than 100 ft. in length. In most situations, once water has reached a minimum depth of \pm 24 inches, the beavers will start construction of the living quarters and will use materials similar to those used to construct dams (i.e., sticks, brush, briars, rocks, mud). Lodges can be identified by their round, dome-like appearance, and may extend 3 to 6 feet above the water's surface.

Beavers enter and leave the lodge through an underwater opening, which helps prevent predators from entering the lodge. Beavers do not live only in lodges. Along the shoreline of ponds, lakes, and larger streams, beavers simply may burrow into the soft embankment to make a bank den. A covering of sticks and mud often is piled just above the burrow entrance along the shore and can help identify the location of a bank den. Beavers are territorial and, as a means to delineate the extent of their domain, they create small (usually less than 4-6 inches in height) mounds of mud, leaves, and sticks, which they then cover with pungent oil (castoreum), to serve as boundary markers. These scent mounds are recognized by other beavers as a warning of their presence.

Once all initial construction activities have been completed, beavers spend their time eating, maintaining the various structures, and collecting food for the winter. Beavers are herbivores, which means they eat plants and plant material. A beaver may consume up to 20-30 oz. of food per day (about equal to the bark and smaller branches of a 2-inch diameter tree every 2 days). They consume a wide variety of aquatic plants and trees, including pine, red cedar, willow, alder, tulip poplar, red maple, dogwood, sweet gum, beech, and others that grow near water. During spring and summer, beavers consume mostly grasses, sedges, rushes, some farm crops (e.g., soybeans, corn), and the succulent new growth of small bushes. As winter approaches, they switch more to woody material (i.e., trees and branches). Beavers cut felled trees to manageable lengths for transport back to the lodge area and then anchor the stems and branches into the sand or mud at the bottom of the pond. In climates where water bodies are subject to freezing over, beavers will use this underwater food cache of stored tree sections to survive the winter under the ice. Once all the bark and leaves have been stripped and eaten, these limbs and branches will be used as building materials to maintain or repair the dam and lodge. Given Virginia's mild winters, beaver ponds here rarely freeze over for extended periods of time, so beavers will cut and eat fresh trees and plants throughout the winter months. In the event of an unusually harsh winter, beavers will use the stored food cache and rely on their fat reserves to make it through the winter.



ECONOMIC STATUS AND IMPORTANCE



In North America, beavers were hunted and trapped by Native Americans as a staple source of meat and fur. Beginning in the mid-1600s and extending through the 1800s, beaver populations were exploited heavily by early European settlers. In fact, the westward expansion of human settlement into the “new frontier wilderness areas” of North America occurred primarily as a result of the growing demand for pelts, especially beaver, by the fur industry. Beaver fur was a valuable commodity and pelts were traded like currency for almost anything a person needed. Large trading companies shipped beaver pelts around the world, where they were made into coats and other fashion goods.

By the late 1800s, the high demand for beaver pelts had led to the extirpation of beavers over much of their natural range in North America, but especially east of the Mississippi River. The Virginia Game Commission began a reintroduction program for beavers between 1932 and 1938, when 35 beavers were purchased from states that still had native populations of beaver and released them into 9 counties within Virginia. These beavers bred and the offspring from the original 35 beavers then were restocked to other parts of Virginia. By the early 1950s, beavers had reoccupied many parts of their former range in Virginia. In 1953, a regulated trapping season on beaver in Virginia was opened and prime beaver pelts brought a trapper a fair price. In subsequent years, and due to changes in the international fur market, the price of beaver pelts dropped and fewer people trapped beaver for recreation and/or their commercial value.

Today, trapping of beavers remains a recreational endeavor regulated by the Virginia Department of Game and Inland Fisheries (VDGIF). Recent VDGIF data (1997-1998 harvest season) show that a beaver pelt was valued at \$15.13 and the reported statewide total value of pelts sold (5,811) in Virginia was \$87,909.34. Beavers also are valued for the oily secretion they produce (castoreum), which is used in the manufacture of perfumes as well as the scents and lures used to improve trapping success.

Beavers are important in that they create new habitats that benefit a variety of other animals. Their dams slow the flow of moving waters and allow other wildlife and plant species to colonize this modified ecosystem. Ducks and other waterfowl, as well as many reptiles, amphibians, and aquatic insects, are attracted to beaver ponds. However, the impaired flow and removal by beavers

of the woody vegetation along the shoreline can raise the water's temperature and allow more sediment to collect behind the dam. Lower dissolved oxygen levels and higher water temperatures may favor some organisms, but at the expense of others (e.g., trout and aquatic insects dependent upon cool, flowing waters).

Physical damage caused by beavers in the Southeast is estimated in the millions of dollars annually. Examples of this damage include timber and agricultural crop loss, damage to roads, septic systems and other property by flooding, and destruction of ornamental plants used in landscaping.

Although incidence is rare, beavers may pose a potential threat to humans from several diseases associated with them or the habitats that they have created. *Giardia limbia*, a pathogenic intestinal parasite, can be transmitted or deposited with the feces of beaver and other mammals (including otters, mink, and even infected humans) into water systems. Drinking water supplies (e.g., ponds, reservoirs) that have been contaminated with *Giardia* and lack chlorination or fine mesh filtration treatment facilities can lead to the spread of giardiasis, an intestinal ailment that can be debilitating to those infected with the parasite. Another health concern, though much less common, is *Blastomyces dermatitidis* (or Gilchrist's Disease). Individuals who have had recent contact with old beaver lodges and dams may be exposed to blastomycosis, a pneumonia-like disease that arises from the inhalation of fungal spores into the lungs. The spore-producing fungi reside in soils, decaying foliage, and vegetation, but the spores they produce cannot become airborne unless the soil or decaying material has been disturbed. Because very specific temperature, nutrition, and humidity conditions are necessary for the growth and production of the infecting spores, the incidence of blastomycosis is quite low. In several of the few documented cases involving beaver (e.g., in Minnesota), individuals became exposed while trying to dismantle or remove an old beaver dam. In cases of suspected exposure, treatment is available for both giardiasis and blastomycosis at most medical facilities today.

The reestablishment of beavers in Virginia has had both positive and negative effects. With the demise of the fur market, fewer people are trapping beaver than in the past and that may be a factor for the growth in beaver populations. Also, because human populations continue to expand into more rural areas where beavers are more prevalent, humans are encountering beavers more often than ever before. Thus, as beaver populations continue to

expand into new habitats, many residents will be looking for ways to control the damage caused by beavers.

CONTROL TECHNIQUES

To reduce the potential for damage to personal property, precautions should be taken before a beaver develops an interest in your property. As with most wildlife damage problems, no single technique exists that will provide absolute protection from beaver depredations. However, certain measures that are initiated in a timely fashion, maintained properly, and applied with an understanding of the habits or behaviors of beavers can reduce the likelihood of significant damage. People residing within the beaver's range (primarily owners of shoreline property) should recognize that beavers are clever and persistent animals and they may be able to circumvent some of the control techniques mentioned below. Therefore, anyone affected by beavers must be willing to implement a comprehensive management strategy involving multiple techniques.

TOLERANCE:

Knowing that beavers fulfill an important role in creating wetlands and providing new habitat for a variety of wildlife, an easy approach to dealing with beavers is simply to learn to live with them. Beavers are intriguing animals and being able to see how a beaver lives and to observe the engineering skills at work can be fun and educational. If a beaver has moved onto your property and is in a location that will not cause damage to driveways, septic systems, or landscaping, you may choose to leave the beaver alone. On small ponds and streams, a colony of beavers usually will leave the area after 4 to 7 years, or once the food supply they are dependent upon has been depleted. However, other wildlife species attracted to the pond the beavers abandoned will remain long after the beavers have left.

PREVENTIVE MEASURES:

Realistically, it is difficult to keep beavers away from your property once they take an interest in it. Techniques such as cutting down scrubby trees and other vegetation along the water's edge and into the adjoining upland have been suggested as means to eliminate potential food sources and construction materials that beaver would use. Theoretically, this should cause them to overlook your property for other areas with more suitable resources. However,

this has not been shown to be a feasible method of keeping beavers off your land and likely would have only a minimal impact on beaver.

REPELLENTS:

There is only one product registered by the US Environmental Protection Agency for use as a repellent on beavers. The active ingredient in this repellent is denatonium saccharide, and the formulation is marketed under the trade name Ro-pel®. Ro-pel® is a bitter-tasting liquid that can be painted or sprayed on trees, shrubs, and ornamental landscaping to deter chewing. Ro-pel® would be most effective when used at the first indication of beaver presence or in areas where beavers are most actively feeding. However, as is true with many other repellents, frequent reapplication may be required to maintain best results.

NON-LETHAL CONTROLS:

Non-lethal controls used to deter beavers can be expensive and require substantial investment of time by a landowner to put them into use. Examples include the use of fencing and water leveling devices.

Fencing

- Heavy gauge woven wire fence (2 inch x 2 inch mesh size) can be wrapped around the base of a tree and connected to itself using strong metal fasteners to create a tree guard that a beaver cannot pull apart. Never attach a guard directly to a tree with nails or staples. The tree guard should be wide enough to allow for normal tree growth (leave 1-2 inches of space all the way around) and at least 3 feet tall to prevent the beaver from reaching up and gnawing on the tree above the fence. Each guard should be staked securely to the ground to prevent the beaver from pushing under or lifting it (remember: put your support stakes inside the guard or the beaver will chew them off!). In areas where substantial snow cover may accumulate, tree guards should be taller to prevent beavers from standing on packed snow and reaching over the top of the guard.
- Temporary or permanent, single strand, high-tensile electric wire can be staked on short posts about 3-4 inches above



the soil surface, and attached to a reliable charger (powered either by a direct 110-volt supply or a rechargeable battery pack). This “fence” should be constructed along the entire shoreline just above the slope where beavers would haul out of the water or across the paths beavers might use. The intent of this approach is to use the electric wire to deter beavers from coming out of the water and gaining access to areas where valuable trees, landscape plantings, or other vegetation likely would be cut and removed. The electric wire delivers a mild shock to the beaver in the nose/head region and encourages the animal to move to another location. Such fencing requires periodic maintenance to remove limbs that may have fallen across the wire and grass or weeds growing up beneath and contacting the wire, both of which will ground or short the electric circuit.



Example of tree wrapping

- Other types of prefabricated electric and non-electric fences are available commercially. Some of the simplest prefab electric setups are made with support posts already attached. A landowner simply unrolls the fence, pushes the stakes in the ground, and has a fast, easy set-up ready to charge. Fences can be used in two ways: (a) as a horizontal barrier between the shoreline and the land to be protected from beavers, and (b) as an enclosure to protect an

area or group of plantings from the beaver. Any electric fence must be used with caution, especially around young children and pets. In fact, many municipalities have adopted ordinances prohibiting the use of electric fencing. Landowners must check with local authorities to determine if it is legal to operate an electric fence in their area before installing and activating any such device.

Water Leveling Devices

Water leveling devices are used to manipulate the level of water behind a beaver dam or plugged road culvert without a need to remove the dam or destroy the beavers. These devices disperse the flow of water in a way that beavers do not detect a leak nor are they alerted to the strong sound of running water, which would trigger them to find and plug a suspected breach in the dam. Water leveling devices can be made from a variety of materials, including wood, logs, plastic and metal pipes, and mesh covered boxes or troughs. Some of these devices can be a bit complicated to build and most will require the services of a hydraulic engineer to properly assess or gauge the volume of flow in the water source and to determine how many leveling units would be needed to adequately handle that volume. Also, because alteration of a beaver dam may affect the integrity of the wetland system upstream from it, **an alteration permit may be required** under local, state, and/or federal wetland regulations; landowners must check with permitting authorities before any alteration work begins and construction of such devices is contemplated.

Some examples of water-leveling devices include the following:

- The Clemson Beaver Pond Leveler—this device consists of a variable length, solid, 8-inch diameter, polyvinylchloride (PVC) culvert pipe and elbow riser as a discharge unit coupled to an intake device made from a 10-foot section of 8-inch diameter, perforated PVC pipe surrounded by a cylinder of galvanized welded wire (Figure 1). The height of the elbow riser will determine the elevation of the water behind the dam.
- The 3-Log Drain—this device is constructed by lashing 3 full-length logs together and fastening sections of roofing tin to the bottom of the lashed logs (Figure 2). By inserting the device into a notch cut in the dam and parallel to the direction of flow, this drain will be incorporated into the structure of the dam as the beavers

BEAVER DAM

Elbow and stand pipe are optional
Needed only to manage water level
if maintaining pond is an objective

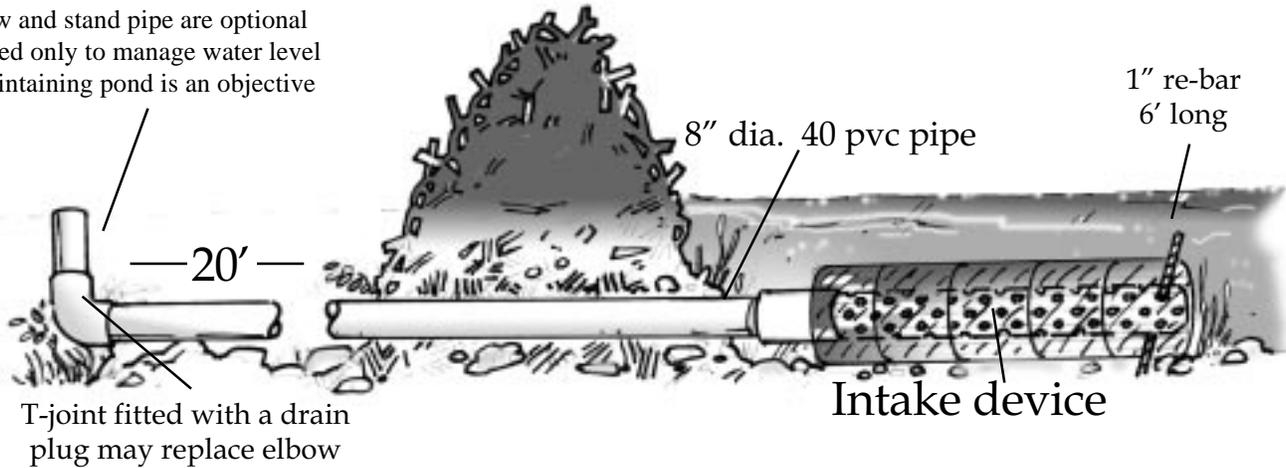


Figure 1

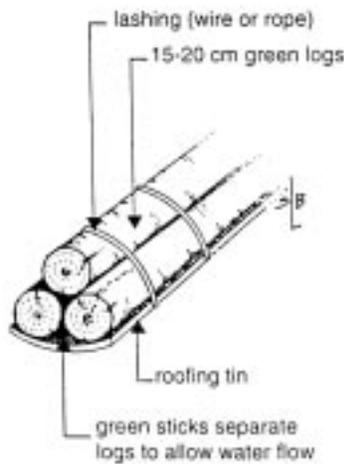


Figure 2

repair the cut you made in the dam. However, water will continue to flow between the logs that comprise this device and allow water to be maintained at a desired elevation.

- A variety of other beaver flow pipes—there are many designs for other pipes that can be inserted through a beaver dam or road culvert to regulate the flow of water out of the impoundment. Modifications to the upstream end of these devices, ranging from simple holes cut into the pipe or the addition of strainer baskets, diffuser caps, or “T” shaped attachments, are used to spread the intake of water over a larger area and help avoid a concentrated flow of water into the device. Similarly, various attachments have been affixed to the outflow end to help silence the flow of water coming out (to avoid raising suspicion in the beaver that a leak may have occurred) and to establish the desired elevation of water within the impoundment (Figure 3).

All of these devices are designed to be incorporated into the dam structure. Pipes should extend a considerable distance back into the pond and away from the dam (a minimum of 20 feet) to reduce the likelihood of detection by beavers and thus prevent them from plugging up the intake pipe. A key factor in assuring success with a water leveling device is to not drop the elevation of the water in the impoundment below a level that will expose the opening to the den or lodge. If that happens, beavers often will move either upstream or downstream from the existing dam and construct another structure that will reestablish water cover over the lodge opening. Therefore, correct installation of these devices requires time and some engineering knowledge. Water leveling devices often can be expensive; costs range from a few hundred to several thousand dollars, depending on the price of the construction materials and the number of devices needed to properly handle the volume of flow. However, when properly sized and placed, water control devices provide an opportunity for beaver and landowners to coexist without the serious threat of flooding.

LETHAL CONTROLS:

If all attempts to deter beaver from your land have failed, then removal of the problem animals may be necessary. Where damage to timber, crops, ornamental or landscape plants, septic systems, or roads has occurred, the owner or lessee of the property may receive authorization to remove a colony of beavers, but only after the damage has been reported to and verified by the local game warden (§29.1-518 of the Code of Virginia, Wildlife and Fish Laws). The warden will issue a permit that clearly

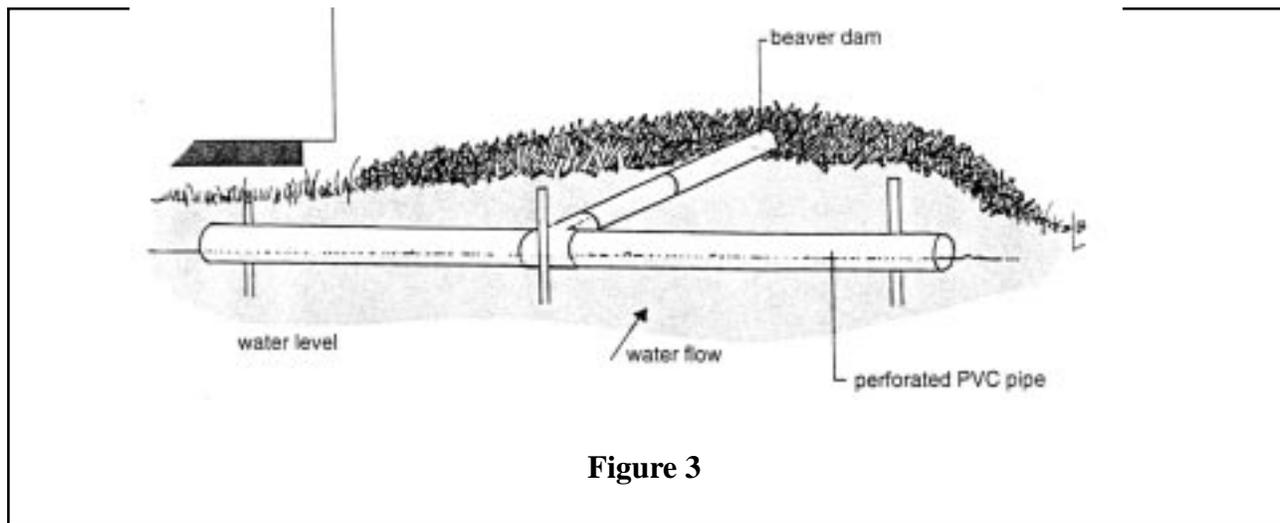


Figure 3

states any limitations on the taking of beaver (e.g., length of time permit is valid, authorized methods of kill, disposition of any carcasses) and requires that a report is sent to VDGIF that summarizes the outcome of beaver removal efforts. Two methods commonly used to remove beaver are trapping and shooting the problem animals. Other lethal methods of take, such as the use of poisons, are not allowed in Virginia. There currently are no toxicant or fumigant products registered by the US Environmental Protection Agency for use on beavers.

Trapping—Trapping can be an efficient and cost effective means to manage beaver populations within watersheds. Although trapping will not prevent beavers from recolonizing suitable habitat in the future, it does provide affected individuals and communities with a methodology to keep beaver numbers in balance with society’s desires and tolerances.

Even though landowners may be allowed to use traps to capture beaver, many individuals today are not familiar with the technology nor do they possess the equipment and field skills necessary to be successful. Thus, trapping may best be left to professionals. Your local warden may be able to recommend a licensed trapper who would be willing to help you. Alternatively, representatives from the Virginia Trappers Association (VTA) might be willing to assist landowners wanting to have beavers removed from a

property (for those with internet access, the homepage for the VTA can be viewed at <http://www.geocities.com/Yosemite/Gorge/2512/index.htm>)

Two basic types of traps are available for taking beaver: live traps and kill traps. Live traps are designed to capture the animal alive and allow the trapper some options in the disposition of the captured animal whereas kill traps, as the name implies, are designed to put the animal to death as humanely as possible. Bailey and Hancock “suitcase-type” traps (Figure 4) are examples of live traps suitable for capturing beaver. However, by state regulation, any beaver captured alive by a homeowner may not be removed from that property and transported and released elsewhere. This restriction is intended primarily to prevent the potential transfer of a beaver problem from one area to another.



Figure 4

The Conibear®, a type of body-gripping trap (Figure 5), is an example of a commonly used and authorized kill trap for beaver. Steel leghold traps also may be used to capture beaver. Snares with an opening of less than 12 inches in diameter and set with the top of the loop not more than 12 inches above the ground may be used, but only on private lands and only with written permission of the landowner. In situations where body-gripping or leghold traps or snares are used, trappers must possess the required license or permit and all traps used must bear a metal tag that

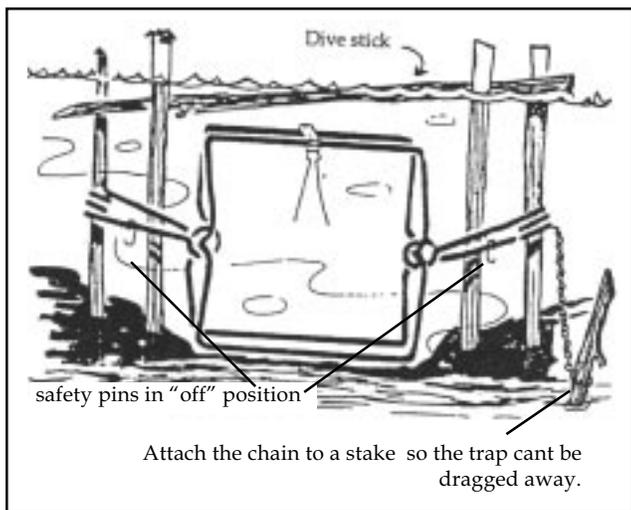


Figure 5

displays the trapper's name and address. Specific details on allowable trap sets and sizes, dates of trapping seasons, and allowable bag limits are available in a summary of hunting and trapping regulations published annually by the VDGIF. Similarly, your local game warden can provide answers to any questions you may have about state trapping regulations. For additional details on specific trap sets and designs, readers are encouraged to review Miller and Yarrow (1994), cited at the end of this publication.

Shooting—Although allowed by state law, shooting raises a number of practical and safety concerns. Many cities and towns have local ordinances that prohibit the discharge of firearms within their municipal boundaries. Before considering shooting as an option, you must first determine whether a firearm can be used in your area. Where shooting is allowed, special care should be taken when firing at or near water bodies. Rifle shots aimed toward water are subject to ricochet and slugs glancing off water can travel substantial distances; thus, care

must be taken prior to pulling the trigger to verify that a safety zone exists well beyond the target area. To reduce the potential for ricochet, consider using a shotgun with heavy waterfowl loads or buckshot instead of a rifle. Also, whenever possible, beavers should be shot while they are on land. It is advisable that advanced notification be given to your local warden and/or police department if you intend to implement a shooting effort outside the normal hunting season. By so doing, you will save them time and effort that might needlessly be wasted in investigating and responding to calls of firearms being discharged in your area.

References and Suggested Readings

- Linzey, D. W. 1998. *The Mammals of Virginia*. The McDonald and Woodward Publishing Company, Blacksburg, VA.
- Miller, J. E., and G. K. Yarrow. 1994. Beavers. Pages B-1 to B-11 in S. E. Hygnstrom, R. M. Timm, and G. E. Larson, eds. *Prevention and Control of Wildlife Damage*. University of Nebraska Cooperative Extension, US Department of Agriculture (APHIS-WS), and the Great Plains Agricultural Council Wildlife Committee cooperating.
- The Humane Society of the United States. 1997. *Wild Neighbors: The Humane Approach to Living with Wildlife*. Fulcrum Publishing, Golden, CO.
- Virginia Department of Game and Inland Fisheries. 1999. *The Virginia Department of Game and Inland Fisheries Home Page—Virginia Fish and Wildlife Information Service—The Beaver*. (site URL address <http://128.173.78.162/scripts/oicgi.exe/>)
- Webster, W. D., J. F. Parnell, and W. C. Biggs, Jr. 1985. *Mammals of the Carolinas, Virginia, and Maryland*. University of North Carolina Press, Chapel Hill, NC. 55pp.

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