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BEAVERS

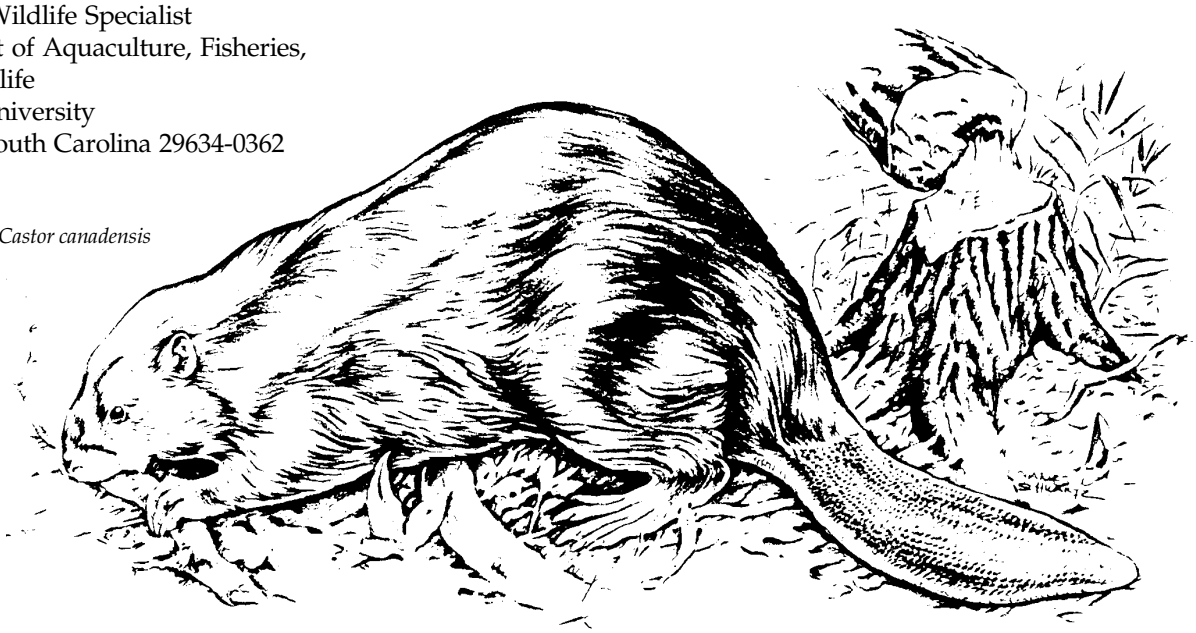


Fig. 1. Beaver, *Castor canadensis*

Damage Prevention and Control Methods

Exclusion

Fence small critical areas such as culverts, drains, or other structures.

Install barriers around important trees in urban settings.

Cultural Methods and Habitat Modification

Eliminate foods, trees, and woody vegetation where feasible.

Continually destroy dams and materials used to build dams.

Install a Clemson beaver pond leveler, three-log drain, or other structural device to maintain a lower pond level and avoid further pond expansion.

Frightening

Shooting of individuals or dynamiting or other continued destruction of lodges, bank dens, and dams, where legal, will occasionally move young colonies out of an area.

Repellents

None are registered; however, there is some evidence that repellents may be useful.

Toxicants

None are registered.

Trapping

No. 330 Conibear® traps.

Leghold traps No. 3 or larger (including coil-spring types with equivalent jaw spread and impact).

Basket/suitcase type traps are primarily used for live trapping.

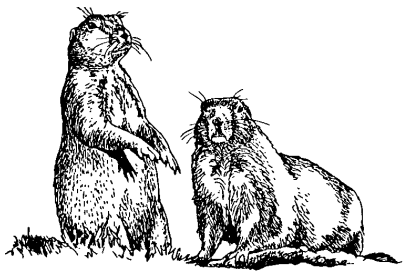
Snares can be useful, particularly in dive sets and slides where legal.

Shooting

Rarely effective (where legal) for complete control efforts and can be dangerous to humans.

Other Methods

Other methods rarely solve a beaver damage problem and may increase risks to humans and nontarget species.



PREVENTION AND CONTROL OF WILDLIFE DAMAGE — 1994

Cooperative Extension Division
Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln

United States Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

Great Plains Agricultural Council
Wildlife Committee

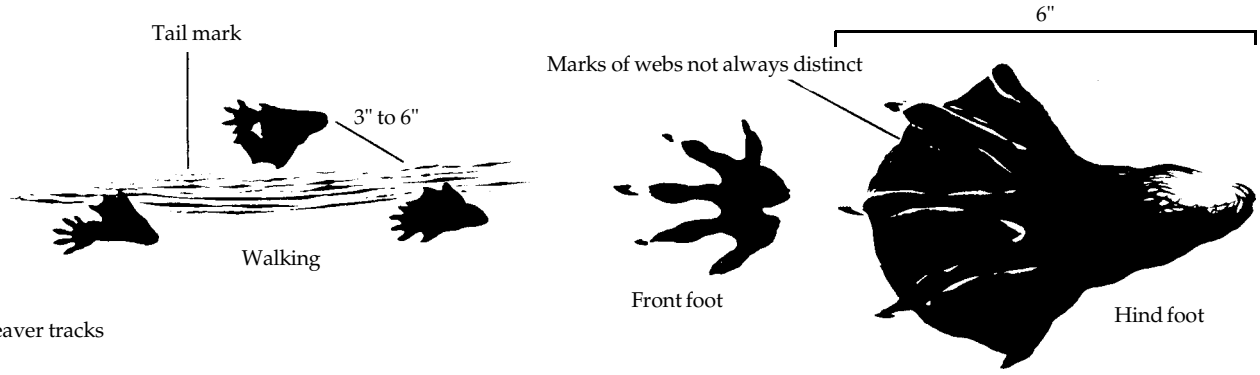


Fig. 2. Beaver tracks

Identification

The beaver (*Castor canadensis*, Fig. 1) is the largest North American rodent. Most adults weigh from 35 to 50 pounds (15.8 to 22.5 kg), with some occasionally reaching 70 to 85 pounds (31.5 to 38.3 kg). Individuals have been known to reach over 100 pounds (45 kg). The beaver is a stocky rodent adapted for aquatic environments. Many of the beaver's features enable it to remain submerged for long periods of time. It has a valvular nose and ears, and lips that close behind the four large incisor teeth. Each of the four feet have five digits, with the hind feet webbed between digits and a split second claw on each hind foot. The front feet are small in comparison to the hind feet (Fig. 2). The underfur is dense and generally gray in color, whereas the guard hair is long, coarse and ranging in color from yellowish brown to black, with reddish brown the most common coloration. The prominent tail is flattened dorso-ventrally, scaled, and almost hairless. It is used as a prop while the beaver is sitting upright (Fig. 3) and for a rudder when swimming. Beavers also use their tail to warn others of danger by abruptly slapping the surface of the water.The beaver's large front (incisor) teeth, bright orange on the front, grow continuously throughout its life. These incisors are beveled so that they are continuously sharpened as the beaver gnaws and chews while feeding, girdling, and cutting trees. The only way to externally distinguish the sex of a beaver, unless the female is lactating, is to feel for the presence of a baculum (a bone in the penis) in males and its absence in females.

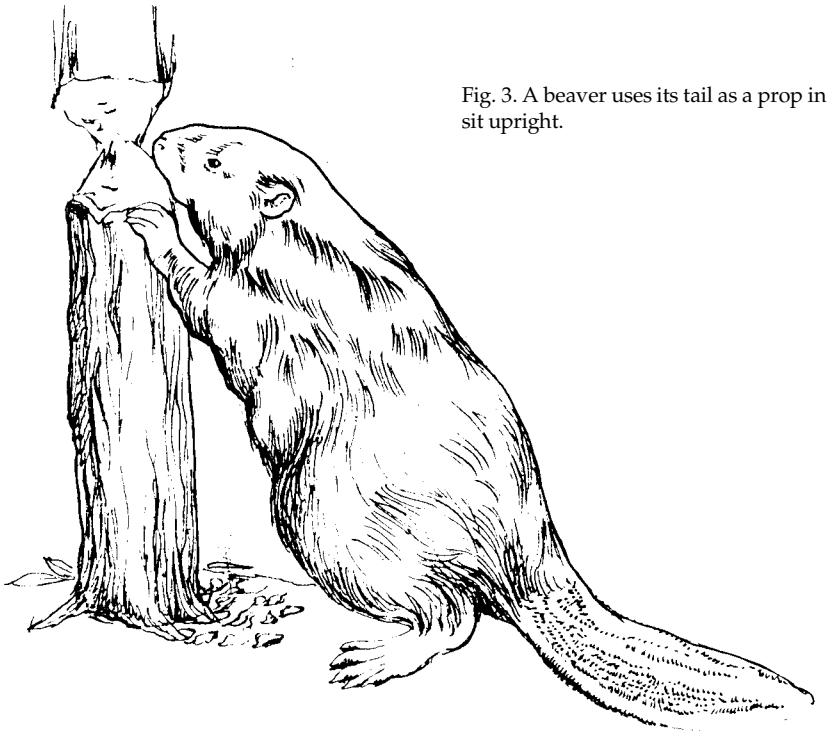
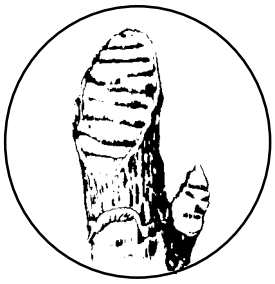


Fig. 3. A beaver uses its tail as a prop in order to sit upright.



Details of beaver cuttings.

Fig. 4. Range of the beaver in North America.

Range

Beavers are found throughout North America, except for the arctic tundra, most of peninsular Florida, and the southwestern desert areas (Fig. 4). The species may be locally abundant wherever aquatic habitats are found.

Habitat

Beaver habitat is almost anywhere there is a year-round source of water, such as streams, lakes, farm ponds, swamps, wetland areas, roadside ditches, drainage ditches, canals, mine pits, oxbows, railroad rights-of-way, drains from sewage disposal ponds, and below natural springs or artesian wells. Beavers build dams to modify the environment more to their liking. Dam building is often stimulated by running water. The length or height of a dam generally depends upon what is necessary to slow the flow of water and create a pond. In areas of flat topography, the dam may not be over 36 inches (0.9 m) high but as much as 1/4 miles (0.4 km) long. In hilly or mountainous country, the dam may be 10 feet (3 m) high and only 50 feet (15 m) long. Beavers are adaptable and will use whatever materials are available to construct dams — fencing materials, bridge planking, crossties, rocks, wire, and other metal, wood, and fiber materials. Therefore, about the only available aquatic habitat beavers avoid are those systems lacking acceptable foods, lodge or denning sites, or a suitable dam site. Some of the surrounding timber is cut down or girdled by beavers to form dams. Subsequent flooding of growing timber causes it to die, and aquatic vegetation soon begins growing. Other pioneer species (for example, willow, sweetgum, and buttonbush) soon grow around the edges of the flooded area, adding to the available food supply. The beaver thus helps create its own habitat.

Food Habits

Beavers prefer certain trees and woody species, such as aspen, cottonwood, willow, sweetgum, blackgum, black cherry, tulip poplar, and pine, depending on availability. However, they can and will eat the leaves, twigs, and bark of most species of woody plants that grow near the water, as well as a wide variety of herbaceous and aquatic plants. Beavers often travel 100 yards (90 m) or more from a pond or stream to get to corn fields, soybean fields, and other growing crops, where they cut the plants off at ground level and drag them back to the water. They eat parts of these plants and often use the remainder as construction material in the dam.

General Biology, Reproduction, and Behavior

Beavers are active for approximately 12 hours each night except on the coldest of winter nights. The phrase "busy as a beaver" is appropriate. It is not uncommon, however, to see beavers during daylight hours, particularly in larger reservoirs.

Beavers are generally monogamous; copulation may take place either in the water or in the lodge or bank den.

After a gestation period of about 128 days, the female beaver generally gives birth to 3 or 4 kittens between March and June, and nurses them for 6 weeks to 3 months. The kittens are born fully furred with their eyes partially opened and incisors erupted through the gums. They generally become sexually mature by the age of 1 1/2 years.

Beaver communicate by vocalizations, posture, tail slapping, and scent posts or mud mounds placed around the bank and dam. The beaver's castor glands secrete a substance that is deposited on mud mounds to mark territorial boundaries. These scent posts are found more frequently at certain seasons, but are found yearround in active ponds.

Fig. 5. Cross section of a beaver lodge.

Beavers have a relatively long life span, with individuals known to have lived to 21 years. Most, however, do not live beyond 10 years. The beaver is unparalleled at dam building and can build dams on fast-moving streams as well as slow-moving ones. They also build lodges and bank dens, depending on the available habitat. All lodges and bank dens have at least two entrances and may have four or more. The lodge or bank den is used primarily for raising young, sleeping, and food storage during severe weather (Fig. 5).

The size and species of trees the beaver cuts is highly variable — from a 1-inch (2.5-cm) diameter at breast height (DBH) softwood to a 6-foot (1.8-m) DBH hardwood. In some areas beavers usually cut down trees up to about 10 inches (25 cm) DBH and merely girdle or partially cut larger ones, although they often cut down much larger trees. Some beavers seem to like to girdle large pines and sweetgums. They like the gum or storax that seeps out of the girdled area of sweetgum and other species.

An important factor about beavers is their territoriality. A colony generally consists of four to eight related beavers, who resist additions or outsiders to the colony or the pond. Young beavers are commonly displaced from the colony shortly after they become sexually mature, at about 2 years old. They often move to another area to begin a new pond and colony. However, some become solitary hermits inhabiting old abandoned ponds or farm ponds if available.

Beavers have only a few natural predators aside from humans, including coyotes, bobcats, river otters, and mink, who prey on young kittens. In other areas, bears, mountain lions, wolves, and wolverines may prey on beavers. Beavers are hosts for several ectoparasites and internal parasites including nematodes, trematodes, and coccidians. *Giardia lamblia* is a pathogenic intestinal parasite transmitted by beavers, which has caused human health problems in water supply systems. The Centers for Disease Control have recorded at least 41 outbreaks of waterborne Giardiasis, affecting more than 15,000 people. For more information about Giardiasis, see von Oettingen (1982).

Fig. 6. Pine plantation in Arkansas killed in flooding caused by beavers.

Damage and Damage Identification

The habitat modification by beavers, caused primarily by dam building, is often beneficial to fish, furbearers, reptiles, amphibians, waterfowl, and shorebirds. However, when this modification comes in conflict with human objectives, the impact of damage may far outweigh the benefits.

Most of the damage caused by beavers is a result of dam building, bank burrowing, tree cutting, or flooding. Some southeastern states where beaver damage is extensive have estimated the cost at $3 million to $5 million dollars annually for timber loss; crop losses; roads, dwellings, and flooded property; and other damage. In some states, tracts of bottomland hardwood timber up to several thousand acres (ha) in size may be lost because of beaver. Some unusual cases observed include state highways flooded because of beaver ponds, reservoir dams destroyed by bank den burrows collapsing, and train derailments caused by continued flooding and burrowing. Housing developments have been threatened by beaver dam flooding, and thousands of acres (ha) of cropland and young pine plantations have been flooded by beaver dams (Fig. 6). Road ditches, drain pipes, and culverts have been stopped up so badly that they had to be dynamited out and replaced. Some bridges have been destroyed because of beaver dam-building activity. In addition, beavers threaten human health by contaminating water supplies with *Giardia.*

Identifying beaver damage generally is not difficult. Signs include dams; dammed-up culverts, bridges, or drain pipes resulting in flooded lands, timber, roads, and crops; cut-down or girdled trees and crops; lodges and burrows in ponds, reservoir levees, and dams. In large watersheds, it may be difficult to locate bank dens. However, the limbs, cuttings, and debris around such areas as well as dams along tributaries usually help pinpoint the area.

Legal Status

The legal status of beavers varies from state to state. In some states the beaver is protected except during furbearer seasons; in others it is classified as a pest and may be taken year-round when causing damage. Because of its fur value, dam building, and resulting water conservation, it is generally not considered a pest until economic losses become extensive. Fur prices for beaver in some states, particularly in the Southeast, make it hardly worth the skinning and stretching. In some northern states, trapping is prohibited near lodges or bank dens to protect and perpetuate beaver colonies. Fur prices for beaver pelts are usually much higher in these areas.

Damage Prevention and Control Methods

Exclusion

It is almost impossible as well as cost-prohibitive to exclude beavers from ponds, lakes, or impoundments. If the primary reason for fencing is to exclude beavers, fencing of large areas is not practical. Fencing of culverts, drain pipes, or other structures can sometimes prevent damage, but fencing can also promote damage, since it provides beavers with construction material for dams. Protect valuable trees adjacent to waterways by encircling them with hardware cloth, woven wire, or other metal barriers. Construction of concrete spillways or other permanent structures may reduce the impact of beavers.

Cultural Methods

Because beavers usually alter or modify their aquatic habitat so extensively over a period of time, most practices generally thought of as cultural have little impact on beavers. Where feasible, eliminate food, trees, and woody vegetation that is adjacent to beaver habitat. Continual destruction of dams and removal of dam construction materials daily will (depending on availability of construction materials) sometimes cause a colony or individual beavers to move to another site. They might, however, be even more troublesome at the new location.

The use of a three-log drain or a structural device such as wire mesh culverts (Roblee 1983) or T-culvert guards (Roblee 1987) will occasionally cause beavers to move to other areas. They all prevent beavers from controlling water levels. However, once beavers have become abundant in a watershed or in a large contiguous area, periodic reinvasions of suitable habitat can be expected to occur. Three-log drains have had varying degrees of success in controlling water levels in beaver impoundments, especially if the beaver can detect the sound of falling water or current flow. All of these devices will stimulate the beavers to quickly plug the source of water drainage.

A new device for controlling beaver impoundments and keeping blocked culverts open is the Clemson beaver pond leveler. It has proven effective in allowing continual water flow in previously blocked culverts/drains and facilitating the manipulation of water levels in beaver ponds for moist-soil management for waterfowl (Wood and Woodward 1992) and other environmental or aesthetic purposes. The device (Fig. 7) consists of a perforated PVC pipe that is encased in heavy-gauge hog wire. This part is placed upstream of the dam or blocked culvert, in the main run or deepest part of the stream. It is connected to nonperforated sections of PVC pipe which are run through the dam or culvert to a water control structure downstream. It is effective because the beavers cannot detect the sound of falling or flowing water as the pond or culvert drains; therefore, they do not try to plug the pipe. The Clemson beaver pond leveler works best in relatively flat terrain where large volumes of water from watersheds in steep terrain are not a problem.

Repellents

There are no chemical repellents registered for beavers. Past research efforts have tried to determine the effectiveness of potential repellent materials; however, none were found to be effective, environmentally safe, or practical. One study in Georgia (Hicks 1978) indicated that a deer repellent had some potential benefit. Other studies have used a combination of dam blowing and repellent soaked (Thiram 80 and/or paradichlorobenzene) rags to discourage beavers with varying degrees of success (Dyer and Rowell 1985).

Additional research is needed on repellents for beaver damage prevention.

Toxicants

None are registered. Research efforts have been conducted, however, to find effective, environmentally safe and practical toxicants. Currently there are none that meet these criteria.

Fumigants

None are registered.

Trapping

The use of traps in most situations where beavers are causing damage is the most effective, practical, and environmentally safe method of control. The effectiveness of any type of trap for beaver control is dependent on the trapper's knowledge of beaver habits, food preferences, ability to read beaver signs, use of the proper trap, and trap placement. A good trapper with a dozen traps can generally trap all the beavers in a given pond (behind one dam) in a week of trap nights. Obviously in a large watershed with several colonies, more trapping effort will be required. Most anyone with trapping experience and some outdoor "savvy" can become an effective beaver trapper in a short time. In an area where beavers are common and have not been exposed to trapping, anyone experienced in trapping can expect good success. Additional expertise and improved techniques will be gained through experience.

A variety of trapping methods and types of traps are effective for beavers, depending on the situation. Fish and wildlife agency regulations vary from

Table 1. List of materials for the Clemson Beaver Pond Leveler.

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

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

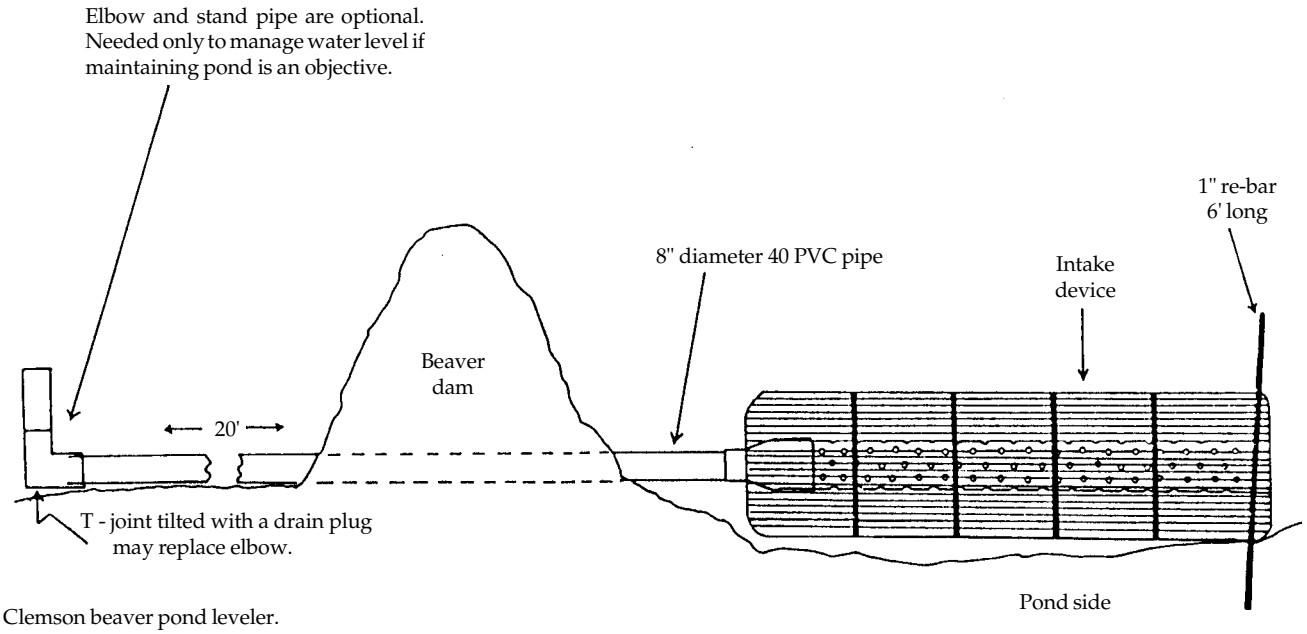


Fig. 7. Clemson beaver pond leveler.

state to state. Some types of traps and trapping methods, although effective and legal in some states, may be prohibited by law in other states. Individual state regulations must be reviewed annually before beginning a trapping program

In some states where beavers have become serious economic pests, special regulations and exemptions have been passed to allow for increased control efforts. For example, some states allow trapping and snaring of beavers and other control measures throughout the year. Others, however, prohibit trapping except during established fur trapping seasons. Some states allow exemptions for removal of beavers only on lands owned or controlled by persons who are suffering losses. In some states a special permit is required from the state fish and wildlife agency.

Of the variety of traps commonly allowed for use in beaver control, the Conibear® type, No. 330, is one of the most effective (Fig. 8). Not all trappers will agree that this type of trap is the most effective; however, it is the type most commonly used by professional trappers and others who are principally trapping beavers. This trap kills beavers almost instantly. When properly set, the trap also prevents any escape by a beaver, regardless of its size. Designed primarily for water use, it is equally effective in deep and shallow water. Only one trap per site is generally necessary, thus reducing the need for extra traps. The trap exerts tremendous pressure and impact when tripped. Appropriate care must be exercised when setting and placing

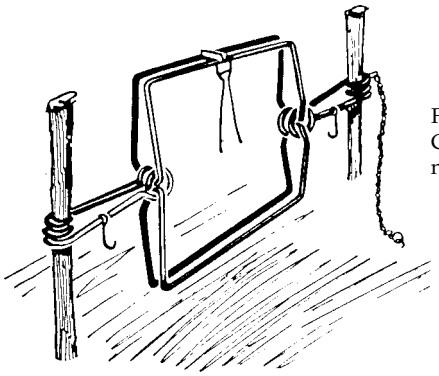


Fig. 8. Basic method of setting and staking a Conibear® 330 trap. Additional stakes are normally used (see Fig. 9).

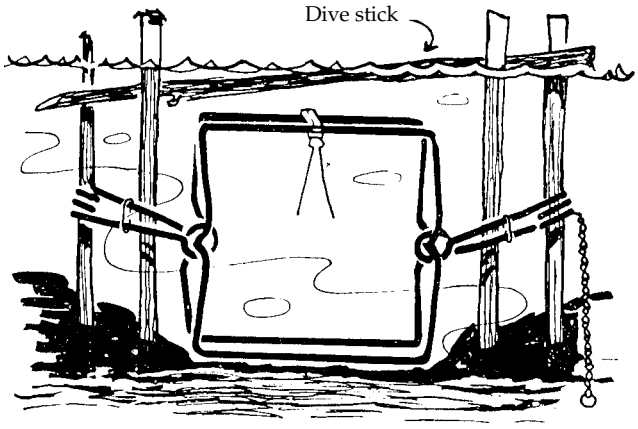


Fig. 9. Conibear trap in dive set.

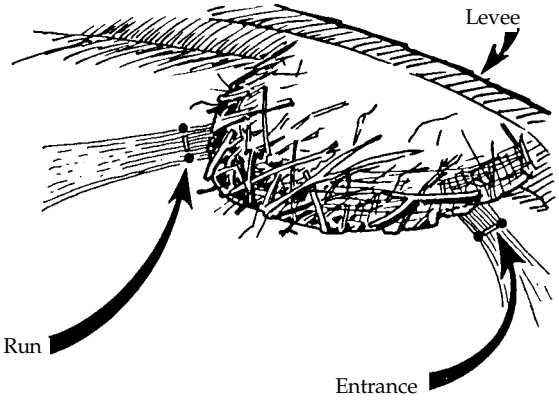


Fig. 10. Runs or underwater entrances to lodges are good places to set beaver traps.

the trap. Care should also be taken when using the Conibear® type traps in urban and rural areas where pets (especially dogs) roam free. Use trap sets where the trap is placed completely underwater.

Some additional equipment will be useful: an axe, hatchet, or large cutting tool; hip boots or waders; wire; and wire cutters. With the Conibear®-type trap, some individuals use a device or tool called "setting tongs." Others use a piece of 3/8- or 1/2-inch (9- or 13-mm) nylon rope. Most individuals who are experienced with these traps use only their hands. Regardless of the techniques used to set the trap, care should be exercised.

Earlier models of the Conibear® type of trap came with round, heavy steel coils which were dangerous to handle unless properly used in setting the trap. They are not necessary to safely set the trap. However, the two safety hooks, one on each spring, must be carefully handled as each spring is depressed, as well as during trap placement. On newer models an additional safety catch (not attached to the springs) is included for extra precaution against inadvertent spring release. The last step before leaving a set trap is to lift the safety hook attached to each spring and slide the safety hook back from the trap toward the spring eye, making sure to keep hands and feet safely away from the center of the trap. If the extra (unattached) safety catch is used, it should be removed before the safety hooks that are attached to the springs to keep it from getting in the way of the movement of the safety hooks.

Conibear®-type traps are best set while on solid ground with dry hands. Once the springs are depressed and the safety hooks in place, the trap or traps can be carried into the water for proper placement. Stakes are needed to anchor the trap down. In most beaver ponds and around beaver dams, plenty of suitable stakes can be found. At least two strong stakes, preferably straight and without forks or snags, should be chosen to place through each spring eye (Fig. 8). Additional stakes may be useful to put between the spring arms and help hold the trap in place. Do not place stakes on the outside of spring arms. Aside from serving to hold the trap in place, these stakes also help to guide the beaver into the trap. Where needed, they are also useful in holding a dive stick at or just beneath the water surface (Fig. 9). If necessary, the chain and circle attached to one spring eye can be attached to another stake. In deep water sets, a chain with an attached wire should be tied to something at or above the surface so the trapper can retrieve the trap. Otherwise the trap may be lost.

Trap Sets. There are many sets that can be made with a Conibear®-type trap (for example, dam sets, slide sets, lodge sets, bank den sets, "run"/trail sets, under log/dive sets, pole sets, under ice sets, deep water sets, drain

pipe sets), depending on the trapper's capability and ingenuity. In many beaver ponds, however, most beavers can be trapped using dam sets, lodge or bank den sets, sets in "runs"/trails, dive sets or sets in slides entering the water from places where beavers are feeding. Beavers swim both at the surface or along the bottom of ponds, depending on the habitat and water depth. Beavers also establish runs or trails which they habitually use in traveling from lodge or den to the dam or to feeding areas, much like cow trails in a pasture.

Place traps directly across these runs, staked to the bottom (Fig. 10).

Use a good stake or "walking staff' when wading in a beaver pond to locate deep holes, runs, or trails. This will prevent stepping off over waders or hip boots in winter, and will help ward off cottonmouth snakes in the summer. The staff can also help locate good dive holes under logs as you walk out runs or trails. In older beaver ponds, particularly in bottomland swamps, it is not uncommon to find runs and lodge or bank den entrances where the run or hole is 2 to 3 feet (0.6 to 0.9 m) below the rest of the impoundment bottom.

To stimulate nighttime beaver movement, tear a hole in a beaver dam and get the water moving out of a pond. Beavers quickly respond to the sound of running water as well as to the current flow. Timing is also important if you plan to make dam sets. Open a hole in the dam about 18 inches to 2 feet (46 to 60 cm) wide and 2 to 3 feet (60 to 90 cm) below the water level on the upper side of the dam in the morning. This will usually move a substantial amount of water out of the pond before evening (Fig. 11). Set traps in front of the dam opening late that same evening. Two problems can arise if you set a trap in the morning as soon as a hole is made: (1) by late evening, when the beavers become active, the trap may be out of the water and ineffective; or (2) a stick, branch, or other debris in the moving water may trip the trap, again rendering it ineffective.

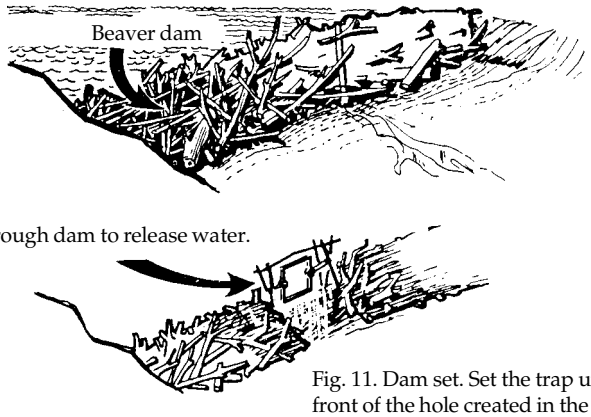


Fig. 11. Dam set. Set the trap underwater in front of the hole created in the dam. When the beaver returns to patch the hole, it will be caught in the trap.

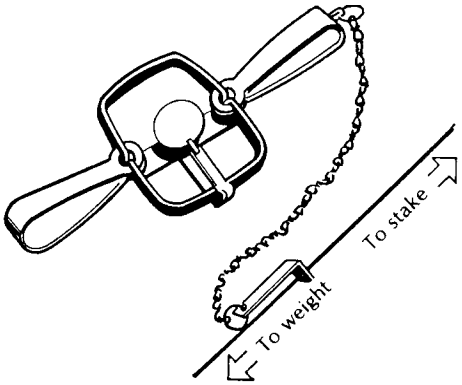


Fig. 12. Leghold trap (No. 3 or No. 4, double spring) attached to wire for drowning set.

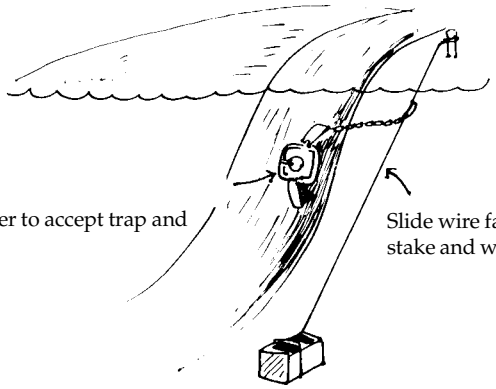


Fig. 13. Leghold trap in slide set.

The best dam sets are made about 12 to 18 inches (30.8 to 45.7 cm) in front of the dam itself. Using stakes or debris on either side of the trap springs, create a funnel to make the beaver go into the jaws of the trap. Always set the trigger on the Conibear®-type trap in the first notch to prevent debris from tripping it before the beaver swims into the trap. The two heavy-gauge wire trippers can be bent outward and the trigger can be set away from the middle if necessary, to keep debris from tripping the trap. This can also keep small beaver or possibly fish or turtles from springing the trap.

Double-spring leghold traps have been used for hundreds of years and are still very effective when properly used by skilled trappers. Use at least No. 3 double (long) spring or coil spring type leghold traps or traps of equivalent size jaw spread and strength. Use a drowning set attachment with any leghold trap (Fig. 12). As the traps are tripped, the beaver will head for the water. A weight is used to hold the trapped beaver underwater so that it ultimately drowns. Some trappers stake the wire in deep water to accomplish drowning. If leghold traps are not used in a manner to accomplish drowning, there is a good likelihood that legs or toes will be twisted off or pulled loose, leaving an escaped, trap-wise beaver.

Placement is even more critical with leghold traps than with the Conibear®-type. Place leghold traps just at the water's edge, slightly underwater, with the pan, jaws, and springs covered lightly with leaves or debris or pressed gently into the pond bottom in soft mud. Make sure there is a cavity under the pan so that when the beaver's foot hits the pan, it will trigger the trap and allow the jaws to snap closed. Place traps off-center of the trail or run to prevent "belly pinching" or missing the foot or leg. With some experience, beaver trappers learn to make sets that catch beavers by a hind leg rather than a front leg. The front leg is much smaller and easier to twist off or pull out.

Sometimes it's wise, when using leghold traps, to make two sets in a slide, run, dam, or feeding place to increase trapping success and remove beavers more quickly. In some situations, a combination of trapping methods can shorten trapping time and increase success.

Trappers have come up with unique methods of making drown sets. One of the simplest and most practical is a slide wire with a heavy weight attached to one end, or with an end staked to the bottom in 3 or more feet (>0.9 m) of water. The other end of the wire is threaded through a hole in one end of a small piece of angle iron. The trap chain is attached to a hole in the other end of the angle. The end of the wire is then attached to a tree or stake driven into the bank (Fig. 13). When the beaver gets a foot or leg in the trap, it immediately dives back into the water. As the angle slides down the wire, it prevents the beaver from reaching the surface. The angle iron piece will not slide back up the wire and most often bends the wire as the beaver struggles, thus preventing the beaver from coming up for air. Trappers should be prepared to quickly and humanely dispatch a beaver that is caught in a trap and has not drowned.

The leghold trap set in lodges or bank dens is also effective, especially for trapping young beavers. Place the set on the edge of the hole where the beaver first turns upward to enter the lodge or den, or place it near the bottom of the dive hole. Keep the jaws and pan off of the bottom by pulling the springs backward so that a swimming foot will trip the pan. Stake the set close to the bottom or wire the trap to a log or root on the bottom, to avoid the need for drowning weights, wires, and angle iron pieces. Generally, more time and expertise is necessary to make effective sets with leghold traps and snares than is required with the Conibear®-type trap.

Use scent or freshly cut cottonwood, aspen, willow, or sweetgum limbs to entice beaver to leghold trap sets. Bait or scent is especially useful around scent mounds and up slides along the banks or dams. Most trappers who use Conibear®-type traps do not employ baits or scent, although they are occasionally helpful. In some states it is illegal to use bait or scent.

Several other types of traps can be used, including basket/suitcase type live traps. These are rarely used, however, except by professionals in urban areas where anti-trap sentiment or other reasons prevent the killing of beavers. These traps are difficult and cumbersome to use, and will not be further discussed here for use in beaver damage control. Any type of traps used for beavers or other animals should be checked daily.

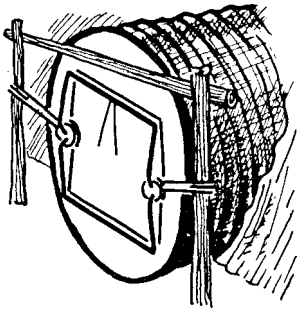
Snaring can be a very cost-effective method for capturing beavers. Snaring equipment costs far less than trapping equipment and is more convenient to use in many situations. In addition, beavers can be captured alive by snaring and released elsewhere if desired.

Snare placement is similar to trap placement. First, look for runways and fresh sign that indicate where beaver activities are focused. Find a suitable anchor such as a large tree, log, or root within 10 feet (3 m) of the runway where the snare will be set. If necessary, anchor snares by rods driven into the ground, but this is more time consuming and less secure. Attach three 14-gauge wires to the anchor so that each can swivel freely. Cut each wire to length so they reach about 1 foot (30 cm) past the runway. Twist the wires together to form a strong braided anchor cable. Drive a supporting stake into the ground near the runway and wrap the free end of the anchor cable around it twice. Prepare a new, dyed, No. 4 beaver or coyote snare, consisting of 42 inches (107 cm) of 3/32-inch (2.4-mm) steel cable with an attached wire swivel and slide lock. Twist the free ends of the three anchor wires around the wire swivel on the end of

the snare cable. Wrap the longest anchor wire around the base of the wire swivel and crimp it onto the snare cable about 2 inches (5 cm) from the swivel. Use both the stake and the supporting anchor wire to suspend a full-sized loop about 4 inches (10 cm) above the runway. If necessary, use guide sticks or other natural debris to guide beaver into the snare.

The described snare set is very common, but there are several variations and sets that can be used. Snares are frequently placed under logs, near bank dens, and next to castor mounds. Drowning sets can be made using underwater anchors, slide cables, and slide locks.

Fig. 14. Conibear® in culvert set. When beavers are stopping up a drainage culvert, (1) clean out the pipe to get water flowing through freely; (2) set the trap at the level of the drain pipe entrance, but far enough away to clear the culvert when the beaver enters; (3) put stakes on either side to make the beaver enter the trap correctly.



Snares should be checked at least every 24 hours. Dispatch snared beavers with a sharp blow or shot to the head. Beavers can be chemically immobilized and transported to suitable sites for release if desired.

Snares must be used with great care to avoid capturing nontarget animals. Avoid trails or areas that are used by livestock, deer, or dogs. Check with your local wildlife agency for regulations associated with trapping and snaring. Snaring is not allowed in some states.

For more information about the use of snares see *A Guide to Using Snares for Beaver Capture* (Weaver et al. 1985) listed at the end of this chapter.

Shooting

In some states, because of the extent of damage caused by beavers, regulations have been relaxed to allow shooting. Some states even allow the use of a light at night to spot beavers while shooting. Before attempting to shoot beavers, check regulations, and if applicable, secure permits and notify local law enforcement personnel of your intentions.

Beavers are most active from late afternoon to shortly after daybreak, depending on the time of year. They usually retire to a lodge or bank den for the day. Therefore, if night shooting is not permitted, the early evening and early morning hours are most productive. Choice of weapons depends on the range and situation. Most shooting is done with a shotgun at close range at night. Shooting alone is generally not effective in eliminating all beaver damage in an area. It can, however, be used to quickly reduce a population.

Other Methods

Because of the frustration and damage beavers have caused landowners, almost every control method imaginable has been tried. These range from dynamiting lodges during midday to using snag-type fish hooks in front of dams, road culverts, and drain pipes. Such methods rarely solve a damage problem, although they may kill a few beavers and nontarget species. They are not recommended by responsible wildlife professionals. One method used occasionally along streams prone to flooding is shooting beavers that have been flooded out of lodges and bank dens. This method is often dangerous and rarely solves a damage problem.

Economics of Damage and Control

The economics of beaver damage is somewhat dependent on the extent of the damage before it has been discovered. Some beaver damage problems are *intensive*, such as damage caused by one or two beavers in a new pond, damming or stopping up a culvert or drain pipe, flooding roads, or crops. Other problems are *extensive*, such as several beaver colonies in a flatland area, responsible for the flooding of several hundred acres of marketable timber that will die unless the water is removed quickly. Generally speaking, if a culvert or drain pipe can be unstopped, a knowledgeable trapper can remove one or two beavers in a night or two and eliminate further damage in an intensive damage situation (Fig. 14). However, an extensive situation may require a concentrated effort with several trappers, dynamiting or pulling dams, and a month or more of trapping to get the water off the timber and reduce further timber losses.

Economic damage is estimated to have exceeded $40 billion in the Southeastern United States during a recent 40-year period (Arner and Dubose 1982). This would include all damage to crops, forests, roads, pastures, and other rural and urban properties.

Economically, one must assess the situation and weigh the tradeoffs: the potential loss of thousands of board feet of timber and years of regeneration versus the cost of trapping. The cost of a couple of nights' trapping and a half-day of labor to clear the culverts is much less than the cost of rebuilding a washed-out road or losing flooded crops or timber.

The most important point is that damage control should begin as soon as it is evident that a beaver problem exists or appears likely to develop. Once beaver colonies become well established over a large contiguous area, achieving control is difficult and costly. One of the most difficult situations arises when an adjacent landowner will not allow the control of beavers on their property. In this situation, one can expect periodic reinvasions of beavers and continual problems with beaver damage, even if all beavers are removed from the property where control is practiced.

Although benefits of beavers and beaver ponds are not covered in depth here, there are a number. Aside from creating fish, waterfowl, furbearer, shorebird, reptile, and amphibian habitat, the beaver in many areas is an important fur resource, as well as a food resource. For those who have not yet tried it, beaver meat is excellent table fare if properly prepared, and it can be used whether the pelts are worth skinning or not. It also makes good bait for trapping large predators.

Proper precautions, such as wearing rubber gloves, should be taken when skinning or eviscerating beaver carcasses, to avoid contracting transmissible diseases such as tuleremia.

Acknowledgments

The authors thank, for their cooperation, past and present employees of the Fish and Wildlife Service, US Department of the Interior, county extension agents with the Cooperative Extension Service in various states, cooperators with the USDA-APHIS-ADC program in a number of states, and the many landowners with beaver problems across the South. The experience gained in efforts to assist landowners with wildlife damage problems provided most of the information contained herein.

Figures 1, 2, 4 and 5 from Schwartz and Schwartz (1981).

Figure 3 by Jill Sack Johnson.

Figure 6 and 7 by the authors.

Figures 8 through 12 and 14 from Miller (1978).

Figure 13 by Jill Sack Johnson after Miller (1978).

For Additional Information

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