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Muskrats

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MUSKRATS

Fig. 1. Muskrat, *Ondatra zibethicus*

Damage Prevention and Control Methods

Exclusion

Riprap the inside of a pond dam face with rock, or slightly overbuild the dam to certain specifications.

Cultural Methods and Habitat Modification

Eliminate aquatic vegetation as a food source.

Draw down farm ponds during the winter months.

Frightening

Seldom effective in controlling serious damage problems.

Repellents

None are registered.

Toxicants

Zinc phosphide.

Anticoagulants (state registrations only).

Trapping

Body-gripping traps (Conibear® No. 110 and others).

Leghold traps, No. 1, 1 1/2, or 2.

Where legal, homemade "stove pipe" traps also are effective when properly used.

Shooting

Effective in eliminating some individuals.

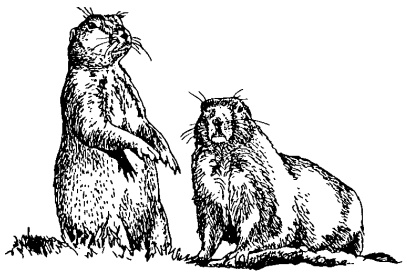
Other Methods

Integrated pest management.

Identification

The muskrat (*Ondatra zibethicus,* Fig. 1) is the largest microtine rodent in the United States. It spends its life in aquatic habitats and is well adapted for swimming. Its large hind feet are partially webbed, stiff hairs align the toes (Fig. 2), and its laterally flattened tail is almost as long as its body. The muskrat has a stocky appearance, with small eyes and very short, rounded ears. Its front feet, which are much smaller than its hind feet, are adapted primarily for digging and feeding.

The overall length of adult muskrats is usually from 18 to 24 inches (46 to 61 cm). Large males, however, will sometimes be more than 30 inches (76 cm) long, 10 to 12 inches (25 to 31 cm) of which is the laterally flattened tail. The average weight of adult muskrats is



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

B-61

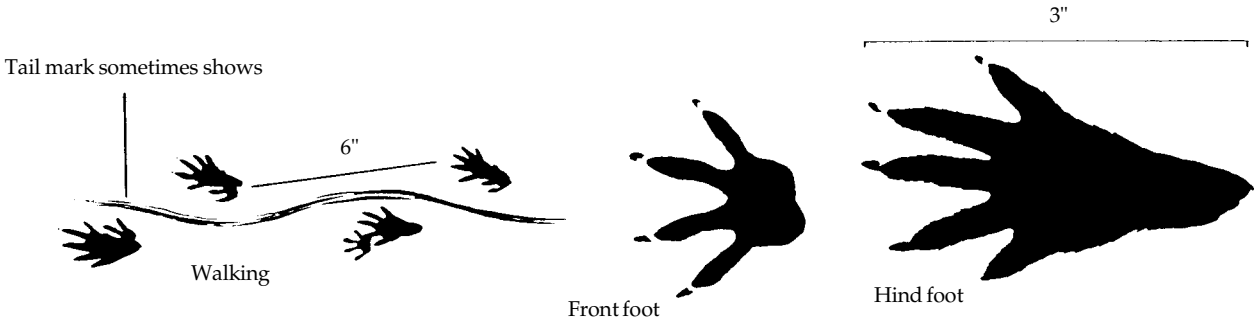


Fig. 2. Muskrat tracks

from 1 1/2 pounds (0.7 kg) to over 4 pounds (1.8 kg), with most at about 2 1/2 pounds (1.1 kg). The color of the belly fur is generally light gray to silver to tan, and the remaining fur varies from dark tan to reddish brown, dark brown, and black.

The name *muskrat*, common throughout the animal's range, derives from the paired perineal musk glands found beneath the skin at the ventral base of the tail in both sexes. These musk glands are used during the breeding season. Musk is secreted on logs or other defecation areas, around houses, bank dens, and trails on the bank to mark the area.

The muskrat has an upper and a lower pair of large, unrooted incisor teeth that are continually sharpened against each other and are well designed for gnawing and cutting vegetation. It has a valvular mouth, which allows the lips to close behind the incisors and enables the muskrat to gnaw while submerged. With its tail used as a rudder and its partially webbed hind feet propelling it in the water, the muskrat can swim up to slightly faster than 3 miles per hour (4.8 kph). When feeding, the muskrat often swims backward to move to a more choice spot and can stay underwater for as long as 20 minutes. Muskrat activity is predominantly nocturnal and crespuscular, but occasional activity may be observed during the day.

Muskrats in the wild have been known to live as long as 4 years, although most do not reach this age. In good habitat and with little competition, muskrats are very prolific. With a gestation period of between 25 and 30 days, females in the southern part of the range commonly produce 5 to 6 litters per year.

Range

The range of the muskrat extends from near the Arctic Circle in the Yukon and the Northwest Territories, down to the Gulf of Mexico, and from the Aleutians east to Labrador and down the Atlantic coast into Georgia (Fig. 3). The muskrat has been introduced practically all over the world, and, like most exotics, has sometimes caused severe damage as well as ecological problems. Muskrats often cause problems with ponds, levees, and crop culture, whether introduced or native. Muskrats are found in most aquatic habitats throughout the United States and Canada in streams, ponds, wetlands, swamps, drainage ditches, and lakes.

Fig. 3. Range of the muskrat in North America.

Habitat

Muskrats can live almost any place where water and food are available year-round. This includes streams, ponds, lakes, marshes, canals, roadside ditches, swamps, beaver ponds, mine pits, and other wetland areas. In shallow water areas with plentiful vegetation, they use plant materials to construct houses, generally conical in shape (Fig. 4). Elsewhere, they prefer bank dens, and in many habitats, they construct both bank dens and houses of vegetation. Both the houses of vegetation and the bank burrows or dens have several underwater entrances via "runs" or trails. Muskrats often have feeding houses, platforms, and chambers that are somewhat smaller than houses used for dens.

Burrowing activity is the source of the greatest damage caused by muskrats in much of the United States. They damage pond dams, floating styrofoam marinas, docks and boathouses, and lake shorelines. In states where rice and aquaculture operations are big business, muskrats can cause extensive economic losses. They damage rice culture by burrowing through or into levees as well as by eating substantial amounts of rice and cutting it down for building houses. In waterfowl marshes, population irruptions can cause "eat-out" where aquatic

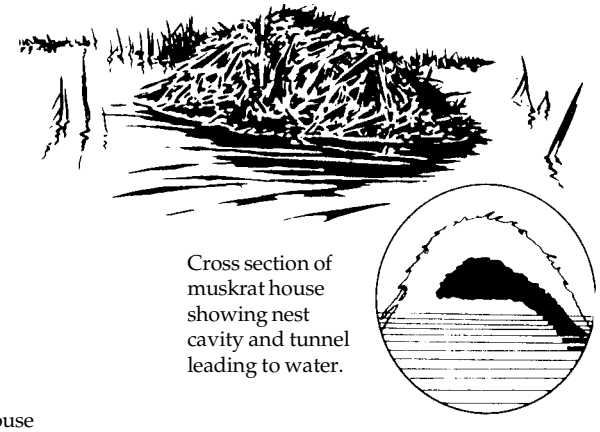


Fig. 4. Muskrat house

vegetation in large areas is virtually eliminated by muskrats. In some locations, such as in the rice-growing areas of Arkansas, muskrats move from overwintering habitat in canals, drainage ditches, reservoirs, and streams to make their summer homes nearby in flooded rice fields. In aquaculture reservoirs, damage is primarily to levees or pond banks, caused by burrowing.

Food Habits

Muskrats are primarily herbivores. They will eat almost any aquatic vegetation as well as some field crops grown adjacent to suitable habitat. Some of the preferred natural foods include cattail, pickerelweed, bulrush, smartweed, duck potato, horsetail, water lily, sedges, young willow regeneration, and other aquatics. Crops that are occasionally damaged include corn, soybeans, wheat, oats, grain sorghum, and sugarcane. Rice grown as a flooded crop is a common muskrat food. It is not uncommon, however, to see muskrats subsisting primarily on upland vegetation such as bermuda grass, clover, johnsongrass, and orchard grass where planted or growing on or around farm pond dams.

Although primarily herbivores, muskrats will also feed on crayfish, mussels, turtles, frogs, and fish in ponds where vegetation is scarce. In some aquaculture industry areas, this feeding habit should be studied, as it may differ significantly from normal feeding activity and can cause economic loss.

General Biology, Reproduction, and Behavior

Muskrats generally have a small home range but are rather territorial, and during breeding seasons some dispersals are common. The apparent intent of those leaving their range is to establish new breeding territories. Dispersal of males, along with young that are just reaching sexual maturity, seems to begin in the spring. Dispersal is also associated with population densities and population cycles. These population cycles vary from 5 years in some parts of North America to 10 years in others. Population levels can be impacted by food availability and accessibility.

Both male and female muskrats become more aggressive during the breeding season to defend their territories. Copulation usually takes place while submerged. The young generally are born between 25 and 30 days later in a house or bank den, where they are cared for chiefly by the female. In the southern states, some females may have as many as 6 litters per year. Litters may contain as many as 15, but generally average between 4 and 8 young. It has been reported that 2 to 3 litters per female per year is average in the Great Plains. This capability affords the potential for a prolific production of young. Young may be produced any month of the year. In Arkansas, the peak breeding periods are during November and March. Most of the young, however, are produced from October until April. Some are produced in the summer and early fall months, but not as many as in winter months. The period of highest productivity reported for the Great Plains is late April through early May. In the northern parts of its range, usually only 2 litters per year are produced between March and September.

Young muskrats are especially vulnerable to predation by owls, hawks, raccoons, mink, foxes, coyotes, and — in the southern states — even largemouth bass and snapping turtles. The young are also occasionally killed by adult muskrats. Adult muskrats may also be subject to predation, but rarely in numbers that would significantly alter populations. Predation cannot be depended upon to solve damage problems caused by muskrats.

Muskrats are hosts to large numbers of endo- and ectoparasites and serve as carriers for a number of diseases, including tularemia, hemorrhagic diseases, leptospirosis, ringworm disease, and pseudotuberculosis. Most common ectoparasites are mites and ticks. Endoparasites are predominantly trematodes, nematodes, and cestodes.

Damage and Damage Identification

Damage caused by muskrats is primarily due to their burrowing activity. Burrowing may not be readily evident until serious damage has occurred. One way to observe early burrowing in farm ponds or reservoirs is to walk along the edge of the dam or shorelines when the water is clear and look for “runs” or trails from just below the normal water surface to as deep as 3 feet (91 cm). If no burrow entrances are observed, look for droppings along the bank or on logs or structures a muskrat can easily climb upon. If the pond can be drawn down from 1 1/2 to 3 feet (46 to 91 cm) each winter, muskrat burrows will be exposed, just as they would during extended drought periods. Any burrows found in the dam should be filled, tamped in, and covered with rock to avoid possible washout or, if livestock are using

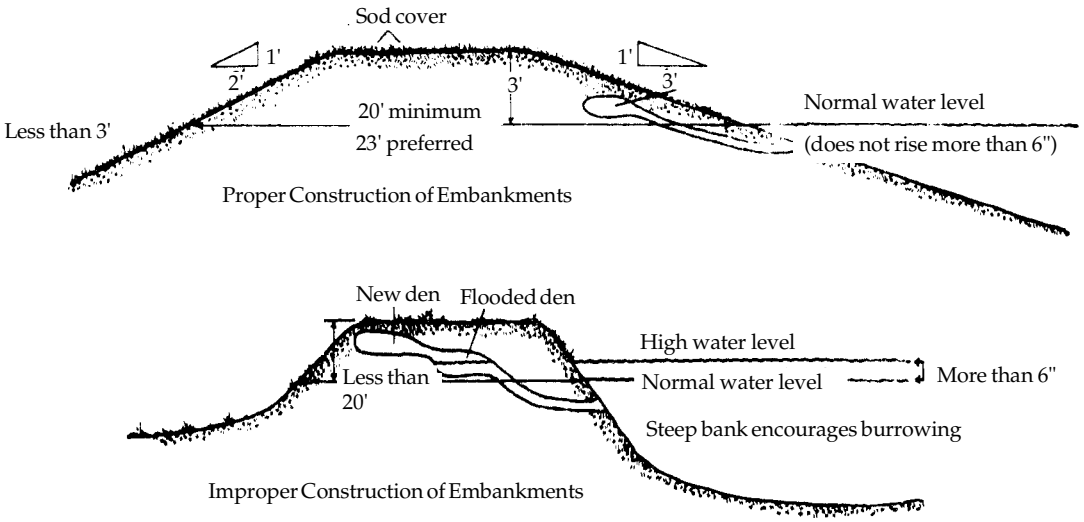


Fig. 5. Proper dam construction can reduce muskrat damage to the structure.

the pond, to prevent injury to a foot or leg.

Where damage is occurring to a crop, plant cutting is generally evident. In aquaculture reservoirs generally maintained without lush aquatic vegetation, muskrat runs and burrows or remains of mussels, crayfish, or fish along with other muskrat signs (tracks or droppings) are generally easy to observe.

Legal Status

Muskrats nationwide for many years were known as the most valuable furbearing mammal — not in price per pelt, but in total numbers taken. Each state fish and wildlife agency has rules and regulations regarding the taking of muskrats. Where the animal causes significant economic losses, some states allow the landowner to trap and/or use toxic baits throughout the year. Other states prohibit taking muskrats by any means except during the trapping season. Check existing state wildlife regulations annually before attempting to remove muskrats.

Damage Prevention and Control Methods

Exclusion

Muskrats in some situations can be excluded or prevented from digging into farm pond dams through stone rip-rapping of the dam. Serious damage often can be prevented, if anticipated, by constructing dams to the following specifications: the inside face of the dam should be built at a 3 to 1 slope; the outer face of the dam at a 2 to 1 slope with a top width of not less than 8 feet (2.4 m), preferably 10 to 12 feet (3 to 3.6 m). The normal water level in the pond should be at least 3 feet (91 cm) below the top of the dam and the spillway should be wide enough that heavy rainfalls will not increase the level of the water for any length of time (Fig. 5). These specifications are often referred to as overbuilding, but they will generally prevent serious damage from burrowing muskrats. Other methods of exclusion can include the use of fencing in certain situations where muskrats may be leaving a pond or lake to cut valuable garden plants or crops.

Cultural Methods and Habitat Modification

The best ways to modify habitat are to eliminate aquatic or other suitable foods eaten by muskrats, and where possible, to construct farm pond dams to previously suggested specifications. If farm pond dams or levees are being damaged, one of the ways that damage can be reduced is to draw the pond down at least 2 feet (61 cm) below normal levels during the winter. Then fill dens, burrows, and runs and rip-rap the dam with stone. Once the water is drawn down, trap or otherwise remove all muskrats.

Frightening Devices

Gunfire will frighten muskrats, especially those that get hit, but it is not effective in scaring the animals away from occupied habitat. No conventional frightening devices are effective.

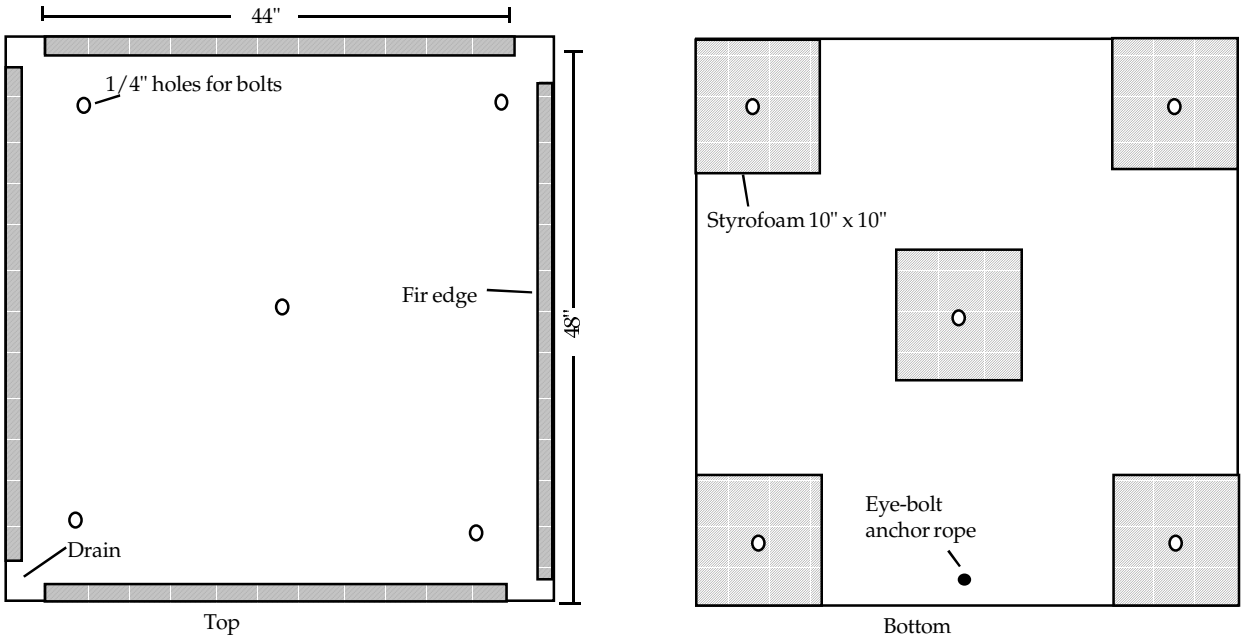
Repellents

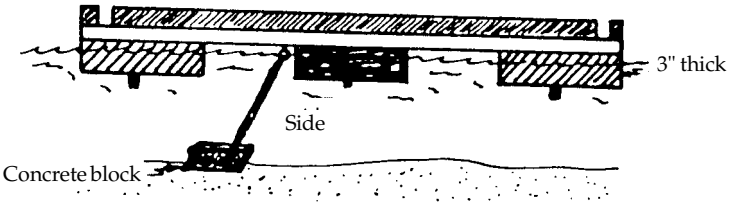
No repellents currently are registered for muskrats, and none are known to be effective, practical, and environmentally safe.

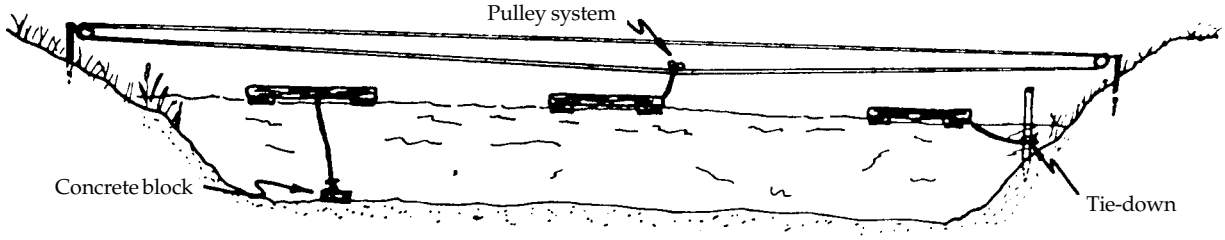
Toxicants

The only toxicant federally registered for muskrat control is zinc phosphide at 63% concentrate. It is a Restricted Use Pesticide for making baits. Zinc phosphide baits for muskrats generally are made by applying a vegetable oil sticker to cubes of apples, sweet potatoes, or carrots; sprinkling on the toxicant; and mixing thoroughly. The bait is then placed on floating platforms (Fig. 6), in burrow entrances, or on feeding houses. Use caution when mixing and applying baits treated with zinc phosphide. Carefully follow instructions on the zinc phosphide container before using.

Some states have obtained state registrations for use of anticoagulant baits







Rafts can be anchored in three ways.

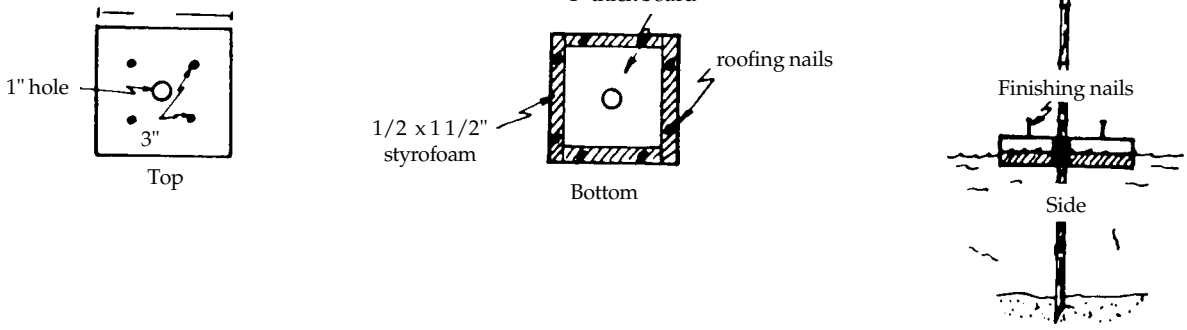


Fig. 6. A bait platform for controlling muskrats.

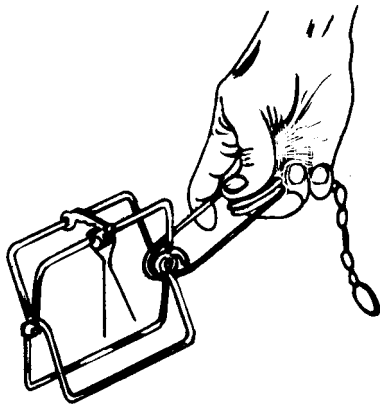


Fig. 7. Conibear®-type body-gripping kill trap

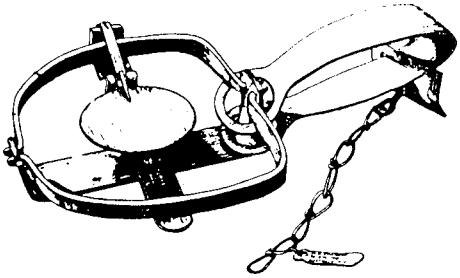


Fig. 8. Leghold trap

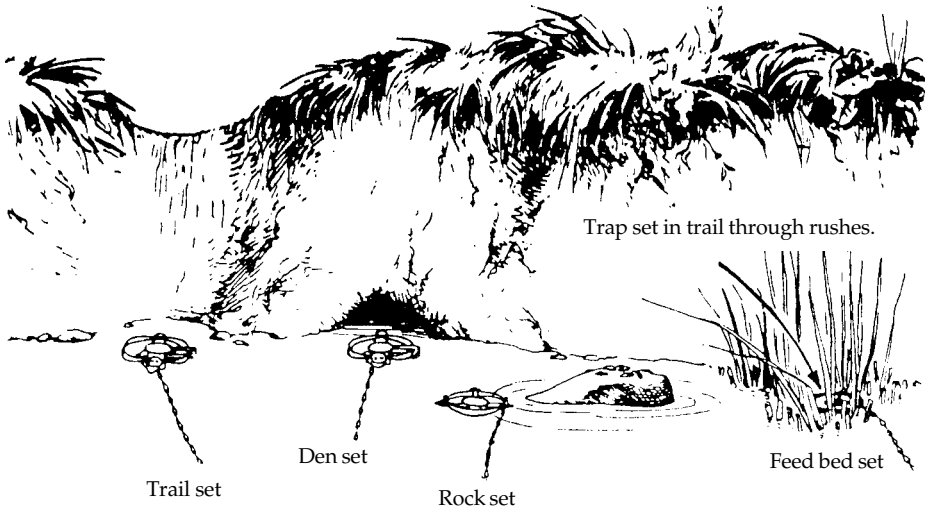


Fig. 9. Four sets for muskrats. Note: All traps are set under water. Chains are wired to anchors in deep water.

such as pivalyl, warfarin, diphacinone, and chlorophacinone. These materials have proven effective, species selective, practical, and environmentally safe in field applications to control muskrats. Apparently there is not sufficient demand or research available to consider federal registration of anticoagulants for muskrats. These same first-generation anticoagulants are, however, federally registered for use in control of commensal rodents in and around buildings, and for some use in field situations for rodent control.

Use of the anticoagulant baits, where registered, is in the form of a paraffinized "lollipop" made of grain, pesticide, and melted paraffin. It is placed in burrows or feeding houses. The anticoagulant baits also can be used as a grain mixture in floating bait boxes.

Fumigants

No fumigants are currently registered for muskrat control.

Trapping

There have probably been more traps sold for catching muskrats than for catching any other furbearing species. A number of innovative traps have been constructed for both live trapping and killing muskrats, such as barrel, box, and stovepipe traps.

The most effective and commonly used types of traps for muskrats, however, are the Conibear®-type No. 110 (Fig. 7) and leghold types such as the long spring No. 1, 1 1/2, or 2 (Fig. 8) and comparable coil spring traps. Each type has places and situations where one might be more effective than another. The Conibear®-type, No. 110 is a preferred choice because it is as effective in 6 inches (15 cm) of water as at any deeper level. It kills the muskrat almost instantly, thus preventing escapes. All that is needed to make this set is a trap stake and trap.

Muskrats are probably the easiest aquatic furbearer to trap. In most cases where the run or burrow entrance is in 2 feet (61 cm) of water or more, even a leghold trap requires only a forked

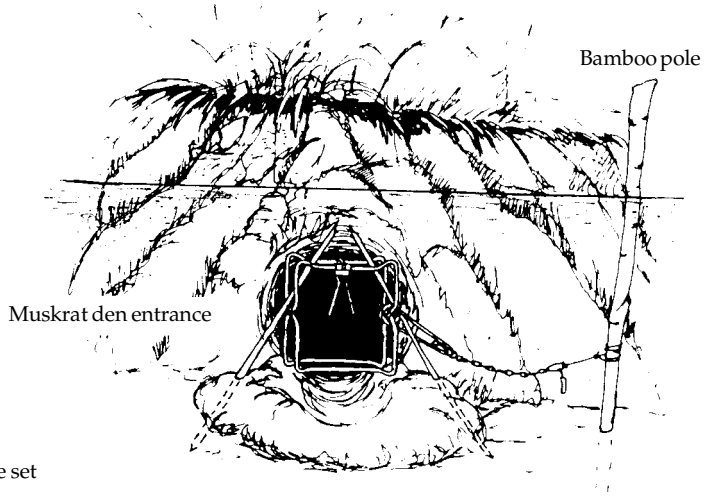
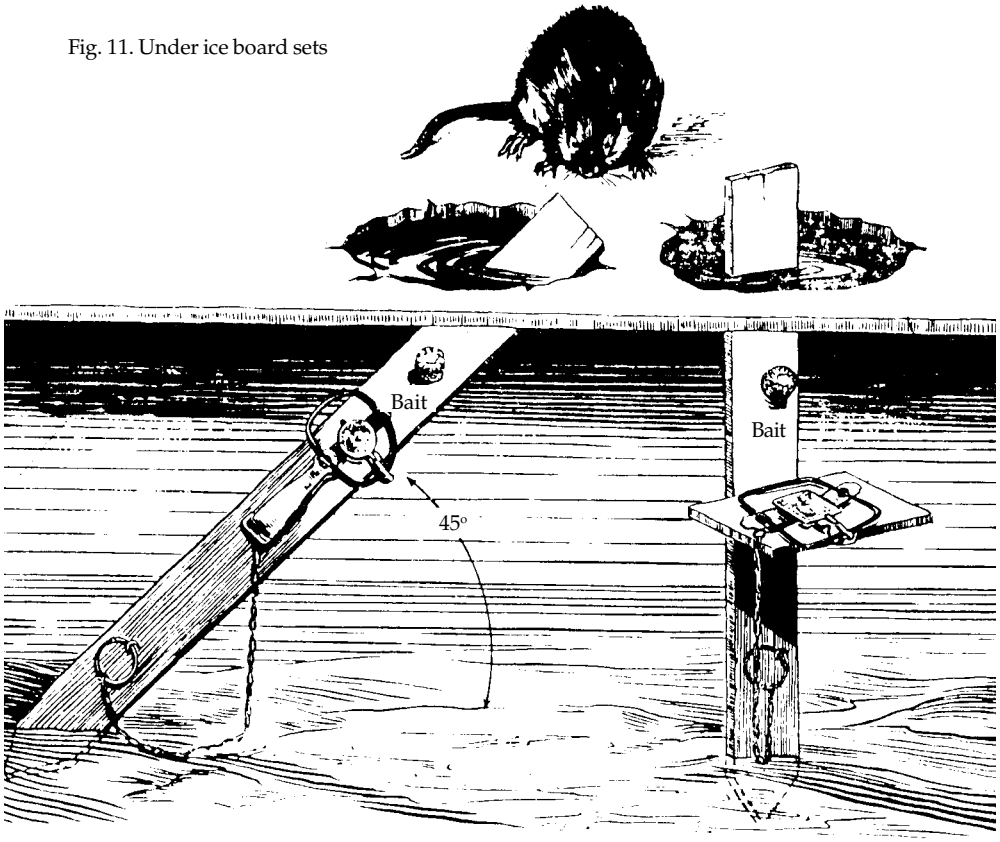


Fig. 10. Pole set

Fig. 11. Under ice board sets



stake to make a drowning set. A trap set in the run, the house or den entrance, or even under a feeding house, will usually catch a muskrat in 1 or 2 nights. As a test of trap efficiency, this author once set 36 Conibear®-type No. 110 traps in a 100-acre (40-ha) rice field and 24 No. 1 1/2 leghold traps in a nearby 60-acre (24-ha) minnow pond on a July day. The next day 55 muskrats were removed. The remaining traps had not been tripped. Obviously, both of these areas held high populations of muskrats and neither had been subjected to recent control efforts. Results were 93.3% effectiveness with the Conibear®-type, 87.5% effectiveness with the leghold traps, and 100% catch per traps tripped.

The most effective sets are those placed in "runs" or trails where the muskrat's hind feet scour out a path into the bottom from repeated trips into and out of the den. These runs or trails can be seen in clear water, or can be felt underwater with hands or feet. Which runs are being used and which are alternate entrances can usually be discerned by the compaction of the bottom of the run. Place the trap as close to the den entrance as possible without restricting trap movement (Fig. 9).

Other productive sets are pole sets, under ice sets (Figs. 10 and 11), and culvert sets. Other traps also can be used effectively in some situations.

The stovepipe trap (Fig. 12) is very effective in farm ponds, rice fields, and marshes — where it is legal. This type of trap requires more time and effort to set, but can be very effective if the correct size is used. The trap is cheap,

Note: A length of 5-inch-diameter stovepipe can be substituted for the side and bottom boards. In this case, the hinged doors must be made U-shaped.

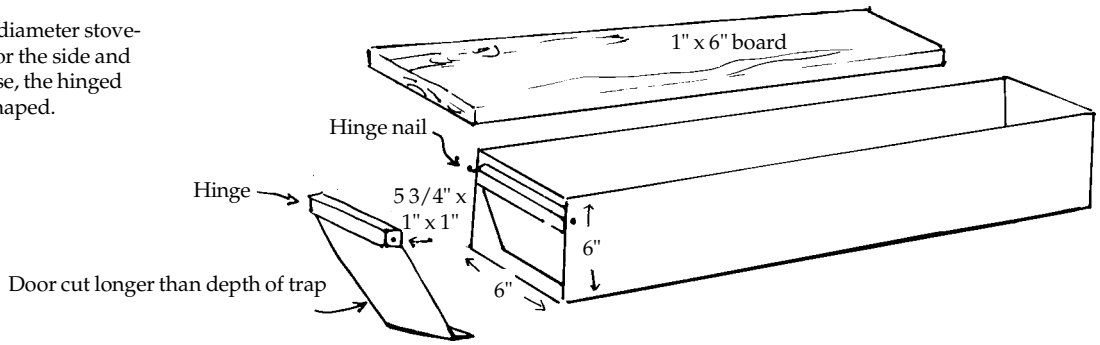


Fig. 12. Stovepipe trap

simple, and easy to make; however, to my knowledge, it is not available commercially. If properly set in a well-used den entrance, it will make multiple catches.

The stovepipe trap has the potential to catch from two to four muskrats on the first night if set in the primary den entrance. The trap is cumbersome to carry around, however, and must be staked down properly and set right up against the den entrance to be most effective. The traps can be easily made from stovepipe, as the name implies, but some of the most effective versions are variations. An example is a sheet metal, 6 x 6-inch (15 x 15-cm) rectangular box, 30 to 36 inches (76 to 91 cm) long with heavy-gauge hardware cloth or welded wire doors. The doors are hinged at the top to allow easy entry from either end, but no escape out of the box. Death from drowning occurs in a short time. The trap design also allows for multiple catches. Its flat bottom works well on most pond bottoms and in flooded fields or marshes, and it is easy to keep staked down in place. Such a trap can be made in most farm shops in a few minutes. All sets should be checked daily.

Trapping muskrats during the winter furbearer season can be an enjoyable past-time and even profitable where prices for pelts range from $2.00 to $8.00 each. Price differences depend on whether pelts are sold "in the round" or skinned and stretched. Many people supplement their income by trapping, and muskrats are one of the prime targets for most beginners learning to trap. Therefore, unless muskrats are causing serious damage, they should be managed like other wildlife species to provide a sustained annual yield. Unfortunately, when fur prices for muskrats are down to less than $2.00 each, interest in trapping for fur seems to decline. However, in damage situations, it may be feasible to supplement fur prices to keep populations in check.

Shooting

Where it can be done safely, shooting may eliminate one or two individuals in a small farm pond. Concentrated efforts must be made at dusk and during the first hours of light in the early morning. Muskrats shot in the water rarely can be saved for the pelt and/or meat.

Other Methods

Although a variety of other methods are often employed in trying to control muskrat damage, a combination of trapping and proper use of toxicants is the most effective means in most situations. In situations where more extensive damage is occurring, it may be useful to employ an integrated pest management approach: (1) modify the habitat by removing available food (vegetation); (2) concentrate efforts to reduce the breeding population during winter months while muskrats are concentrated in overwintering habitat; and (3) use both registered toxicants and trapping in combination with the above methods.

There may be other effective methods beyond those already discussed. Some may not be species selective or environmentally safe. Before using any control methods for wildlife damage prevention or control, check existing regulations and use tools and methods that do not pose a danger to nontarget species.

Economics of Damage and Control

Assessment of the amount of damage being caused and the cost of prevention and control measures should be made before undertaking a control program. Sometimes this can be easily done by the landowner or manager through visual inspection and knowledge of crop value or potential loss and reconstruction or replacement costs. Other situations are more difficult to assess. For example, what is the economic value of frustration and loss of a truckload of minnows and/or fish after a truck has fallen through the levee into burrowed-out muskrat dens? Or how do you evaluate the loss of a farm pond dam or levee and water behind it from an aquaculture operation where hundreds of thousands of pounds of fish are being grown? Rice farmers in the mid-South or in California must often pump extra, costly irrigation water and shovel levees every day because of muskrat damage. The expense of trapping or other control measures may prove cost-effective if damage is anticipated.

Obviously, the assessments are different in each case. The estimate of economic loss and repair costs, for example, for rebuilding levees, replacing drain pipes, and other measures, must be compared to the estimated cost of prevention and/or control efforts.

Economic loss to muskrat damage can be very high in some areas, particularly in rice and aquaculture producing areas. In some states damage may be as much as $1 million per year. Totals in four states (Arkansas, California, Louisiana, and Mississippi) exceed losses throughout the rest of the nation.

Elsewhere, economic losses because of muskrat damage may be rather limited and confined primarily to burrowing in farm pond dams. In such limited cases, the value of the muskrat population may outweigh the cost of the damage.

Muskrat meat has been commonly used for human consumption and in some areas called by names, such as "marsh rabbit." A valuable resource, it is delicious when properly taken care of in the field and in the kitchen. Many wild game or outdoor cookbooks have one or more recipes devoted to "marsh rabbit." Care should be taken in cleaning muskrats because of diseases mentioned earlier.

Muskrat pelts processed annually are valued in the millions of dollars, even with low prices; thus the animal is certainly worthy of management consideration. It obviously has other values just by its place in the food chain.

Acknowledgments

Most of the information in this chapter was obtained from experience gained in Alabama, where as a youngster I trapped muskrats and other furbearers to sell, and in Arkansas where muskrat control is a serious economic problem. Colleagues in the Arkansas Cooperative Extension Service, and especially county extension agents, provided the opportunity and background for obtaining this information. The Arkansas Farm Bureau, many rice farmers, fish farmers, and other private landowners/managers, as well as the Arkansas Game and Fish Commission and the Arkansas State Plant Board, were also important to the development of this information.

Figures 1 through 4 from Schwartz and Schwartz (1981).

Figure 5 from Henderson (1980).

Figure 6 from J. Evans (1970), *About Nutria and their Control*, USDI, Bureau of Sport Fisheries and Wildlife, Resour. Pub. No. 86. 65 pp.

Figures 7 and 8 from Miller (1976).

Figures 9, 10, and 11 from Manitoba Trapper Education publications.

Figure 12 by Jill Sack Johnson.

For Additional Information

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