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Muskrats

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**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
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 crepuscular, 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.

**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
vegetation in large areas is virtually
eliminated by muskrats. In some loca-
tions, such as in the rice-growing areas
of Arkansas, muskrats move from
overwintering habitat in canals, drain-
age 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 bur-
rowing.

**Food Habits**

Muskrats are primarily herbivores.
They will eat almost any aquatic vege-
tation 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, johnson-
grass, and orchard grass planted or growing on or around farm
pond dams.

Although primarily herbivores, musk-
rats will also eat on crayfish, mussels,
turtles, frogs, and fish in ponds where
vegetation is scarce. In some aquacul-
ture 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 dispers-
als are common. The apparent intent
of those leaving their range is to estab-
lish 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 popula-
tion 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 territo-
rries. 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. Lit-
ters 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 pro-
duction of young. Young may be pro-
duced any month of the year. In
Arkansas, the peak breeding periods
are during November and March.

**Damage and Damage Identification**

Damage caused by muskrats is prima-
arily 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 shore-
lines 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 pos-
sible washout or, if livestock are using
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.
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
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,
simple, and easy to make; however, to
my knowledge, it is not available com-
mercially. 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) rectangu-
lar 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 al-
 lows for multiple catches. Its flat bot-
tom 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 tar-
gets 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 situa-
tions, 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 dur-
ing 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 situa-
tions. In situations where more exten-
sive 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 envi-
ronmentally 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 preven-
tion 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 knowl-
dge of crop value or potential loss
and reconstruction or replacement
costs. Other situations are more dif-
fi cult 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 thou-
sands 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 trap-
ning or other control measures may
prove cost-effective if damage is
anticipated.

Obviously, the assessments are differ-
ent in each case. The estimate of
economic loss and repair costs, for
example, for rebuilding levees, replac-
ing 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, particu-
larly in rice and aquaculture produc-
ing areas. In some states damage may
be as much as $1 million per year.
Totals in four states (Arkansas, Califor-
nia, 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 popu-
lation 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 clean-
ing 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 cer-
tainly worthy of management consid-
eration. 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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