

Living with Wildlife

Muskrats

Muskrats (*Ondatra zibethicus*, Fig. 1) get their common name from their resemblance to stocky rats and from the musky odor produced by their scent glands.

Muskrats weigh 2 to 4 pounds and reach lengths of 18 to 25 inches, including their 8- to 11-inch, sparsely haired tails. Their coat color is generally dark brown, but individuals can range from black to almost white. Muskrats have partially webbed hind feet that function as paddles and much smaller front feet used primarily for digging.

Muskrats are found throughout still or slow-moving waterways, including marshes, beaver ponds, reservoirs, irrigation canals and ditches, and marshy borders of lakes and rivers. They don't live in mountainous areas where cold weather makes their food unobtainable.

Muskrats make a valuable contribution to aquatic communities. By harvesting plants for food and den sites, they create open water for ducks, geese, shorebirds, and other wildlife. In addition, a variety of animals—including snakes, turtles, frogs, ducks, and geese—use muskrat lodges and platforms to rest and nest in. However, muskrats are considered pests when their burrowing activity damages dams and dikes, and when their feeding activity damages new plantings and crops.

Facts about Washington's Muskrats

Food and Feeding Habits

- Muskrats eat a wide variety of plants, including cattails, sedges, bulrush, arrowhead, water lilies, pondweed, and ferns. They also eat alfalfa, clover, corn, and other crops if muskrats find them in their territories.
- Although muskrats will eat shellfish, snails, fish, frogs, and salamanders, such animal foods are a small part of their diet, and are generally consumed when plant foods are scarce.
- Muskrats normally feed within 150 feet of their main dwellings; however, they will travel much farther in search of food.
- When muskrats become too numerous, an “eat-out” can occur where nearly all the available food is eaten. The eat-out area becomes virtually uninhabitable for muskrats, and only a few animals may be found where dozens or more once were.

Den Sites

- Depending on site conditions, muskrat dens are located in banks or lodges.
- In dams, dikes, and banks, muskrats tunnel upward from below the water surface into the soil to make dens that remain dry (Fig. 2 and 4).



Figure 1. *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.*

(From Christensen and Larrison, *Mammals of the Pacific Northwest: A Pictorial Introduction*.)

- Bank dens range from a short tunnel leading to an enlarged nest chamber, to a long, complex system of chambers, air ducts, and entrances.
- In marshes and other areas lacking steep banks, muskrats build dome-shaped lodges from leaves, stems, roots, and mud.
- Lodges are constructed in open water that is 2 to 4 feet deep, and are built high enough to keep the den above high-water levels.

Reproduction and Family Structure

- Muskrats are prolific breeders and under favorable conditions may raise 20 young per season.
- The first litter is born in early spring; one or two litters may follow.
- An average of six kits are born after a 30-day gestation period. Kits are dependent on their mother for approximately 30 days, after which time they can swim, dive, and eat green vegetation.
- At about six weeks of age, kits leave the den or live in a separate chamber.
- Adult females are thought to overwinter with surviving offspring from the last litter and one or more adult males. In spring, the young seek out their own territories, generally within 300 feet of the maternal female's home range.

Mortality and Longevity

- Muskrats have many predators, including mink (a major predator), otters, bobcats, house cats, domestic dogs, coyotes, foxes, large hawks and owls, and largemouth bass.
- Muskrats are fierce fighters and fights among males are common when densities are high and food supplies are low.
- Spring flooding can drown early litters and inundate burrows and lodges, exposing muskrats to predators.
- Historically, muskrats have been one of the most commonly trapped animals in Washington. From 1991 to 2000, an annual average of 6,189 muskrats were trapped. This number has been greatly reduced with the passing of Initiative 713 in the year 2000 (See <http://wdfw.wa.gov/factshts/i-713.htm>).
- Most muskrats don't live more than one year.

Viewing Muskrats

Muskrats are active throughout the year. Although they may be seen at any time, they are most active at twilight and throughout the night. During the day they may be seen feeding when food is scarce, or basking in the sun when temperatures are low.

Rarely will muskrats be seen very far from water, and they are usually seen swimming. Muskrats tend to swim with their narrow, pointed tails snaking in the water behind them, or arched out of the water.

When startled, muskrats enter the water with a loud splash, and, being strong swimmers, they may swim long distances underwater before surfacing. (They can remain motionless under sparse vegetation, with only their noses and eyes above water, for 20 minutes.)

When cornered or captured, muskrats are aggressive biters and scratchers and can seriously injure pets and humans.



Figure 2. *In marshes and other areas lacking steep banks, muskrats build dome-shaped lodges from leaves, stems, roots, and mud.*

Living Areas

In marshes, ponds, and other water areas east of the Cascade mountains, prominent muskrat lodges are sure indicators of a present muskrat population.

Look for entrances into their bank dens along dams, dikes, and stream banks, particularly west of the Cascade mountains. Entry holes are particularly evident where muskrats are living in tidewater areas near the mouths of rivers. When the tide recedes, the entrances are exposed until the tide comes back in.

Similarly, in dry years the water in ponds and reservoirs can drop and expose den entrances. Muskrats will then usually dig new dens farther out in the pond.

Entry holes are 5 to 8 inches in diameter and are located 3 to 36 inches below the surface of the water.

Feeding Areas

Evidence of muskrat feeding includes plants gnawed to a stubble, floating cattail roots or other vegetation that has been clipped, and piles of clipped vegetation under overhanging vegetation or in a well-concealed spot at the water's edge.

Muskrats sometimes use feeding huts or eating platforms that they create from mud and compacted vegetation. Feeding huts look like small lodges about 1 foot above the water level and are hollow inside. Feeding platforms look like small piles of cut vegetation.

Both feeding huts and platforms are built near dens or lodges, and there may be travel channels through the mud leading to them.

Tracks

Muskrat tracks can be found in mud or sand along shorelines (Fig. 3). The mark of a dragging tail is sometimes apparent.

Droppings

Muskrat droppings can be found floating in the water, along shorelines, on objects protruding out of the water, and at feeding sites. The animals may repeatedly use these spots, and more than one muskrat may use the same spot. Droppings are dark green, brown, or almost black. They are slightly curved, cylindrical, and about ½ inch long and 3/8 inch in diameter.

Slides

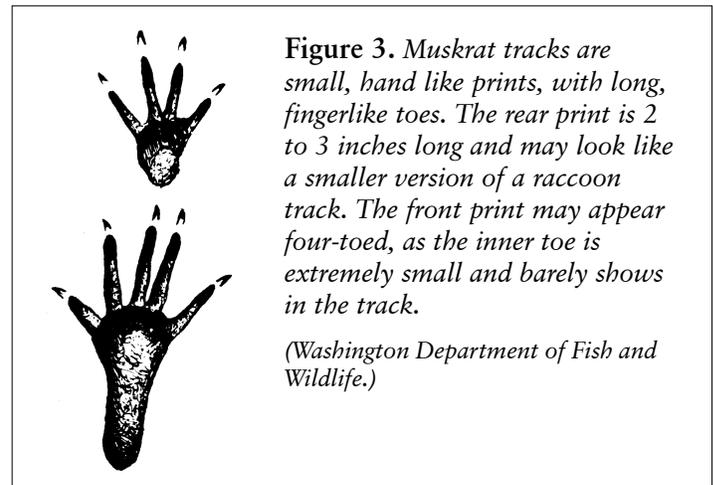
Slides are the narrow trails muskrats make where they enter and leave the water. Slides are about the width of a hand, look like muddy trails, and may be slicked down from the animals' sliding down them on their bellies.

Preventing Conflicts

Although muskrats are important contributors to natural aquatic systems, their burrowing may threaten the safety of dams, dikes, and other human-created embankments. Muskrats may also undermine retaining walls that shore up homes, bridges, and other structures. Muskrats occasionally eat new wetland plantings and agricultural crops growing in their territories.

Muskrat numbers may increase to the point where an area is denuded of aquatic plants. After foraging on entire plants, including the roots, they leave the area pitted with digging sites and deep swimming canals. This feeding behavior can destroy existing root mats that bind and secure a wetland together, and the area can be quickly eroded by wind and wave action.

The following suggestions will help to reduce conflicts. You can do the work yourself or hire a company to do all or part of the work (see the handout, *Hiring a Wildlife Damage Control Company*). In cases where these methods are not practical, contact your local County Extension Agent or Department of Agriculture for further information.



Water-level management: Muskrats (and occasionally voles and Old World rats) dig into dams, dikes, and other embankments to make dens (Fig. 4). Typically these dens have 2 feet or more of earth above them. However, when fluctuating water levels flood their initial den, muskrats burrow farther into the bank or dig new, higher den chambers close to the surface. In such cases this can weaken the bank, or livestock and other large animals can pierce holes in the bank, starting the erosion process.

To prevent muskrats from tunneling higher in an embankment, keep fluctuations in water levels to a minimum. This can require frequently monitoring the spillway to ensure an unobstructed flow, or widening the spillway to carry off surplus water so that it never rises more than 6 inches on the dam.

Water-level manipulation can also be used to force muskrats to other suitable habitat. Raising the water level in the winter to a near-flood level, and keeping it there, will force the animals out of their dens. Similarly, dropping water levels during the summer will expose muskrat dens to predators, forcing them to seek a more secure area.

Slope management: Muskrats prefer to burrow on steep slopes covered with vegetation. Hence, they can be discouraged by keeping side slopes to a 3:1 or less ratio, and by controlling vegetation growth. Managing vegetation by hand can be difficult in large areas, but routine mowing or cutting with a weed whacker can be effective. Only herbicides registered for use next to water should be used, and then only per the manufacturer's recommendations.

If possible, keep livestock off embankments to avoid the chance that an animal will put a hoof through a den chamber. If a roof is pierced, immediately fill in the cavity with soil, rocks, or a mudpack (see below).

Embankment barriers: A barrier installed 1 foot above to 3 feet below normal water level can prevent muskrats from burrowing into an earth embankment.

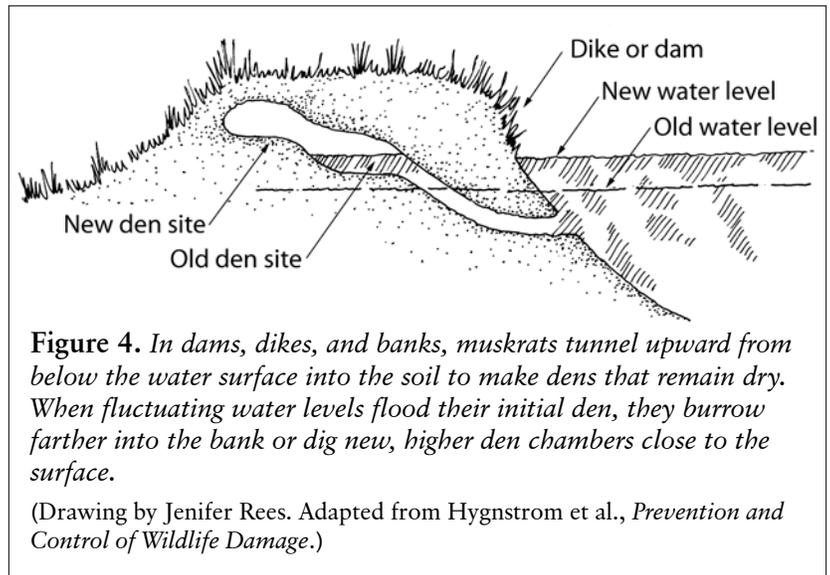
A barrier can be made from 1-inch mesh hardware cloth (aluminum and stainless steel are also available), or heavy-duty plastic or fiberglass netting. The barrier should be placed flat against the bank and anchored every few feet along all edges. To extend the life of galvanized hardware cloth, spray it with automobile undercoat paint or other rustproof paint before installation. Since the wire will eventually corrode, do not use this material where people are likely to swim.

Riprapping areas with stone creates an effective barrier and protects slopes from wave action. Stone should be at least 6 inches thick. Do not use rocks larger than 6 inches in diameter because when piled they tend to form cavities, providing hiding places for muskrats and Old World rats.

In situations where muskrats are burrowing into existing rock walls, place gravel or concrete in between the rocks to block up the holes. A permit may be needed when working near state waters (see "Legal Status").

Where a burrowing problem is extreme, use a gas-powered trenching machine (available at rental stores) to dig a narrow trench along the length of the embankment. Hand digging will be required to dig to the recommended depth—3 feet below the high-water level. Next, fill the trench with a mudpack. A mudpack is made by adding water to a 90 percent earth and 10 percent cement mixture until it becomes a thick slurry. The resulting solid core will prevent muskrats from digging through the embankment.

Floating dock barriers: Muskrats will burrow into floating docks, generally those floating on Styrofoam, scattering the broken white foam along the shoreline. This becomes an environmental danger, due to birds and other small animal eating this foam. To solve this problem, the dock needs to be pulled up on shore and 1-inch mesh hardware cloth (aluminum and stainless steel are also available) needs to be used to cover the Styrofoam.



Fences and other barriers: Muskrats are not climbers. A properly designed and maintained 2-foot tall wire fence will prevent muskrats from entering an area. The fence must be taller if snow or other materials are likely to build up near it.

Because muskrats are diggers, the fence will need to extend at least 12 inches below ground. Alternately, a tight fit to the ground and an L extension that runs 24 inches out on the soil surface toward the animal will also prevent entering from underneath and existing fence (Fig. 5).

Welded-wire cylinders around individual plants are often used where only a few plants need to be protected. *Note:* Lightweight plastic seedling protectors do not work because muskrats can chew through them.

A floppy fence can be constructed as a barrier between an active muskrat colony and a large area needing protection (Fig. 6). To prevent muskrats from walking around the fence, connect each end to an existing, impenetrable solid fence or structure.

Harassment and repellents: Muskrats are wary animals and will try to escape when threatened. When new burrows are discovered early on, the entry holes can be stuffed with rocks, balled-up window screen, and/or rags sprinkled with predator urine (mink, coyote, or bobcat—available from trapper supply outlets and over the Internet) or ammonia. Some people have had success applying used cat litter in this way. Exposing their tunnels from above may also work. The success of this type of control depends on persistence from the harasser and thus is often short-lived.

Large dogs that are awake during the night can be effective at keeping muskrats out of areas.

Commercially available taste repellents may be effective at preventing damage to crops and other plants.

Crop location: Unfenced crops and gardens located close to water will be more attractive to muskrats than those further from water. If you have a choice of where to locate your garden, consider muskrat damage. Natural vegetation buffers next to water bodies can provide feeding areas and reduce the attractiveness of vegetation further from the water.

Lethal Control

Since muskrats are usually found in waterways, there is often an unlimited supply of replacement animals upstream and downstream from where the damage is occurring. Rapid immigration coupled with a high reproductive rate makes ongoing lethal control a “high-effort” method of damage control that is often ineffective. (Lethal control can be effective in areas where the local population of muskrats is still small.) The exclusion methods described and referenced above are often the best long-term solution.

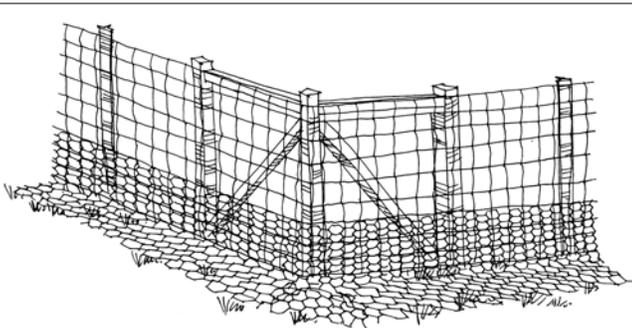


Figure 5. Muskrats are diggers and a fence will need to extend at least 12 inches below ground. Alternately, a tight fit to the ground and an L chicken wire or hardware cloth extension that runs 24 inches out on the soil surface toward the animal will also prevent entering from underneath an existing fence.

(Drawing by Jenifer Rees.)

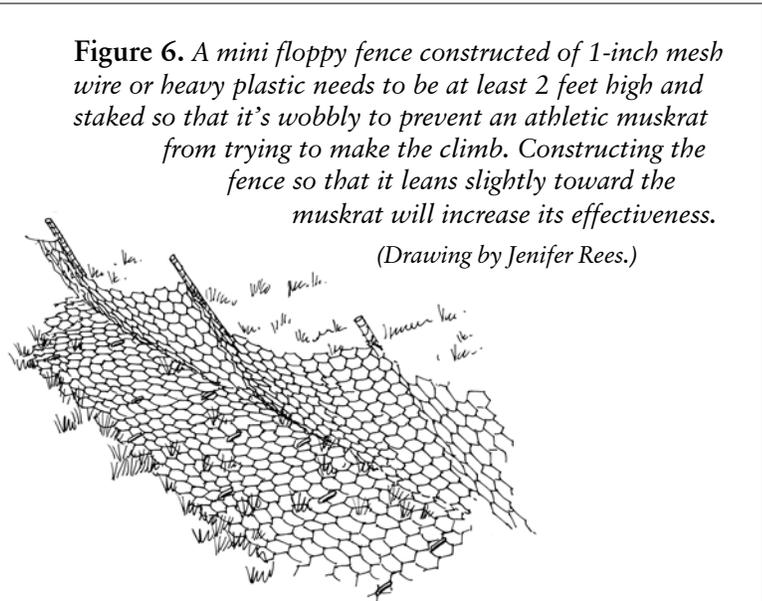


Figure 6. A mini floppy fence constructed of 1-inch mesh wire or heavy plastic needs to be at least 2 feet high and staked so that it's wobbly to prevent an athletic muskrat from trying to make the climb. Constructing the fence so that it leans slightly toward the muskrat will increase its effectiveness.

(Drawing by Jenifer Rees.)

Trapping

Lethal trapping has traditionally been the primary form of control. See “Legal Status” and the handout Trapping Wildlife for information on trapping muskrats. *Note:* State wildlife offices do not provide trapping services, but they can provide names of individuals or companies that do.

Shooting

Shooting has been effective in eliminating small isolated groups of muskrats. Shooting muskrats requires good marksmanship. For safety considerations, shooting is generally limited to rural situations and is considered too hazardous in more populated areas, even if legal.

Fumigants

No fumigants are currently registered for muskrat control.

Public Health Concerns

Rabbits, hares, voles, muskrats, and beavers are some of the species that can be infected with the bacterial disease **tularemia**. Tularemia is fatal to animals and is transmitted to them by ticks, biting flies, and via contaminated water. Animals with this disease may be sluggish, unable to run when disturbed, or appear tame.

Tularemia may be transmitted to humans if they drink contaminated water, eat undercooked, infected meat, or allow an open cut to contact an infected animal. The most common source of tularemia for humans is to be cut or nicked by a knife when skinning or gutting an infected animal. Humans can also get this disease via a tick bite, a biting fly, ingestion of contaminated water, or by inhaling dust from soil contaminated with the bacteria.

A human who contracts tularemia commonly has a high temperature, headache, body ache, nausea, and sweats. A mild case may be confused with the flu and ignored. Humans can be easily treated with antibiotics.

Muskrats are among the few animals that regularly defecate in water, and their droppings (like those of humans and other mammals) can cause a flu like infection, which old-time trappers referred to as “**beaver fever.**”

Anyone handling a dead or live muskrat or nutria should wear rubber gloves, and wash his or her hands well when finished.

Legal Status

Muskrats are classified as furbearers (WAC 232-12-007). A trapping license is required and they can only be trapped during seasons set by the state.

A property owner or the owner’s immediate family, employee, or tenant may kill or trap muskrats on that property if they are damaging crops or domestic animals (RCW 77.36.030). In such cases, no special trapping permit is necessary for the use of live traps. However, a special trapping permit is required for the use of all traps other than live traps (RCW 77.15.192, 77.15.194; WAC 232-12-142). There are no exceptions for emergencies and no provisions for verbal approval. All special trapping permit applications must be in writing on a form available from the Department of Fish and Wildlife (WDFW).

It is unlawful to release a muskrat anywhere within the state, other than on the property where it was legally trapped, without a permit to do so (RCW 77.15.250; WAC 232-12-271).

A permit issued by WDFW is required for work that will use, obstruct, change, or divert the bed or flow of state waters (RCW 77.55). A permit application can be obtained from your WDFW Regional Office or from the Hydraulic Project Approval (HPA) web page.

Because legal status, trapping restrictions, and other information about muskrats change, contact your local Fish and Wildlife office for updates.

Additional Information

Books

- Christensen, James R., and Earl J. Larrison. *Mammals of the Pacific Northwest: A Pictorial Introduction*. Moscow, ID: University of Idaho Press, 1982.
- Hygnstrom, Scott E., et al. *Prevention and Control of Wildlife Damage*. Lincoln, NE: University of Nebraska-Lincoln, Institute of Agriculture and Natural Resources, 1994. (Available from: University of Nebraska Cooperative Extension, 202 Natural Resources Hall, Lincoln, NE 68583-0819; phone: 402-472-2188; also see Internet Sites below.)
- Ingles, L. G. *Mammals of the Pacific States*. Stanford, CA: Stanford University Press, 1965.
- Larrison, Earl J. *Mammals of the Northwest: Washington, Oregon, Idaho, and British Columbia*. Seattle: Seattle Audubon Society, 1976.
- Link, Russell. *Landscaping for Wildlife in the Pacific Northwest*. Seattle: University of Washington Press and the Washington Department of Fish and Wildlife, 1999.
- Maser, Chris. *Mammals of the Pacific Northwest: From the Coast to the High Cascades*. Corvallis: Oregon State University Press, 1998.
- Verts, B. J., and Leslie N. Carraway. *Land Mammals of Oregon*. Los Angeles: University of California Press, 1998.

Internet Resources

Burke Museum's Mammals of Washington

<http://www.washington.edu/burkemuseum/collections/mammalogy/mamwash>

Prevention and Control of Wildlife Damage

<http://wildlifedamage.unl.edu/handbook/handbook>

Adapted from "Living with Wildlife in the Pacific Northwest" (see <http://wdfw.wa.gov/wlm/living.htm>)

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Illustrations: As credited

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