Beaver *(Castor canadensis)*

Size:
Up to 60 pounds. 25–35" long, excluding the 1 ft. tail.

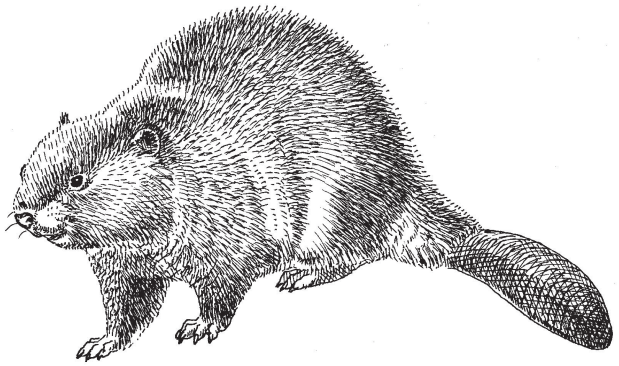
Signs of their presence:
- Flooded streams and beaver ponds; channels (they tend to use the same routes).
- Dams and dome-shaped lodges of sticks (usually aspen, willow, birch, and maple) caulked with mud. (Beavers will also build burrows in river banks, especially if living in a faster-moving stream or larger river).
- Chewed branches and trees, piles of wood chips, fallen trees, and stumps, usually found very close to water. Their tooth marks are obvious.
- Sounds: Tail slap: their alarm call. Young whine, squeal, and moan at night, but it's very hard to hear them.

- Tracks: not often seen; back foot may be nearly as large as your hand; webbed toes.

- Scats: look like sawdusty, ping-pong balls, usually left in the water at the bottom of a dam or lodge.
- Beavers have distinctive and powerful scents.
- "Mud pie" scent mounds: mud heaps perfumed with the beaver's oily scent (castor) which mark the family's territory. These heaps may be up to one foot tall and three feet wide, and are found at the water's edge, or along river or pond banks.

Diet:
Herbivore. They eat the leaves, twigs, and bark of trees and shrubs, especially aspen, willow, alder, birch, and maple. Also eat stems and roots of many water plants, such as cattails. Beavers will also eat acorns and corn, if the field is close to a pond or stream. In the fall, they create a food cache of mostly-submerged branches and poles placed near their lodge. They'll rely on this cache during the winter, after complete ice over.

Beavers gnaw around a tree, eventually cutting a deep groove. They usually fell smaller trees of 2–6" in diameter but are capable of cutting down much larger trees, even those 2–3 feet in diameter. And they're quick about it: beavers can cut down a 5" diameter willow in about three minutes. They'll trim the branches to a convenient size and then carry them in their mouths back to their impoundment. Then, as if eating a piece of corn, they'll turn the branch around to eat the bark, or, in the fall, may add it to the food cache they'll use during the winter.



Typical activity patterns:
Social style: Sociable within families. Building and maintaining dams and lodges takes a lot of muscle. Young may remain with their parents into the spring of their third year, helping with housekeeping. The average pond is home to four to eight beavers.
Daily activity: Mainly nocturnal, with peaks at dawn and dusk.
Hibernator? No.
Migrates? No. Once a colony has used up its food, it will move to a new area. When the young disperse, they may travel as far as 50 miles to find a territory.

Where found:
Distribution in NY and the Northeast: Widespread, in rural and suburban areas.
Habitat: Ponds, lakes, marshes, rivers, and streams with good cover nearby. They prefer streams that have a gentle slope of less than three percent. Beavers prefer deep water, and will dam areas to create deep ponds.
Territory and home range: Territorial by family group. Their home range is defined by a dam or series of dams, and the nearby foraging area, which is rarely more than 100 feet from the ponds.

Breeding habits:
Pair bonding style: Monogamous. Both parents cooperate in rearing the young. Females are dominant.
Breeding dates: January–March. Gestation takes about 4 months.
Litter size: 1–8 kits, usually 2–4.
Birthing period: May–July, depending on when breeding occurred. Newborn kits are fully furred, able to walk and even swim.
Weaning dates: from $1^1/_2$–3 months.
Amount of time young remain with parents beyond weaning date: 2–3 years.

Common nuisance situations:

Time of year: Any time of year. From ice-out through June, new problems are often associated with the dispersal of the two-year-olds. From October through ice-up, beavers are preparing for winter by cutting many trees and working on their dams.

What are they doing?

- Plug culverts, drainage ditches, and drainpipes, which floods or washes out roads or driveways.
- Beaver dams force water to collect against roads. This may saturate the road, causing potholes, settling, and instability.
- Their dams may flood upstream areas. Flooding may damage roads or homes or kill crops and trees. It may make certain areas unusable.
- Beavers cut down or girdle trees and shrubs for food. They can fell a tree that's up to 2–3 ft. in diameter.
- Beaver dams transform the environment. This will be good for some species and bad for others. Whether you see this as a problem or a gift depends on your perspective.
- They may contaminate water supplies or interfere with sewer systems.
- Disease risks: Rabies, tularemia, and Giardiasis (an intestinal infection caused by the protozoan, *Giardia lamblia*. There's still much to learn about this parasite and how the disease is transmitted).

Legal status in New York:

Protected. Game species with set season. Landowners—not the NWCO—may apply to the DEC for special permits that allows the taking of nuisance beaver or the disturbance of a beaver dam, house, or den. You may need additional DEC permits to alter a beaver dam to change the water level.

From ECL 11-0521: "2. The department may, by permit issued to a landowner, permit such landowner, and any person he may designate in writing as his agent, to take beaver on lands owned by the permittee, during any specified period, in any specified number, and by any specified means, notwithstanding the provision contained in paragraph d of subdivision 3 of section 11-0901 or any other provision of the Fish and Wildlife Law. Beaver so taken shall be disposed of as the department may direct."

From ECL 11-0505: "6. Except as permitted by the department, no person shall at any time disturb a beaver dam, house or den or a muskrat house or den or any structure constructed by a muskrat in which it can take shelter."

Best practices

This is an overview. Solutions for beaver damage problems can be far more complex than those for some of the other species in this manual. Repairing a hole that a squirrel chewed in a wall is much easier than replacing a culvert or installing a water level control device, for example. Additional training may be needed to help you successfully use an integrated approach to beaver damage management.

There are legal, safety, and environmental issues to consider if you seek to modify a beaver wetlands. You may need additional permits, perhaps even from different agencies. If improperly installed, water level control devices and culvert modifications could create dangerous road conditions or flood downstream areas. You could accidentally create a problem that's worse than the one you were hired to solve, and you might be liable for damages. Any actions that change a beaver wetlands could affect many species.

Consult with technical experts (such as DEC Bureau of Wildlife and Bureau of Habitat staff, highway departments, site engineers) before you do anything. It's equally important to talk to your customers to make sure you understand their goals.

Defining success with your customer

Complaints about beavers usually focus on flooding, tree-cutting, or some combination of those two. These problems are caused by their feeding and construction activities (building of dams and lodges).

You may need to know more details before you can solve the problem. For example, if one customer says, "I just don't want the beavers to cut down these three trees," then you might suggest a barrier to keep the beavers away from those trees. But if the customer says, "I really don't want them to cut these three trees or wash out this road," you have a very different situation.

The same problem at a different site may require a different solution. Take flooding, for example. You may need to totally exclude beavers near water supplies, sewer systems, certain road beds, or powerline right-of-ways, where flooding cannot be tolerated. But if the beavers are on a large private property, they may be tolerated or even welcome, because beaver create wet-

lands that are used by many wildlife species. Perhaps that landowner is happy with the water level and just wants to prevent flooding. The landowner might be able to secure a permit to allow the dam to be breached before a heavy rainfall. That might be the perfect solution for some people.

Here are examples of questions that may help you choose the right strategy for your customer.

- What exactly are you trying to stop or prevent?
- Can any level of beaver activity be tolerated at the site?
- Do you want the beavers to stay or go?
- Would you prefer only nonlethal techniques, only lethal techniques, or some combination of the two?

Some general tips:

- Trapping is often an important part of the solution. During the legal fur trapping season your customers can invite licensed trappers onto their property to remove the beavers—at no cost.
- Some beavers are more determined to fix a breached dam than others. This can be a problem if you're trying to use a water level control device to prevent flooding. It's possible that if you removed the individuals with what one NWCO calls "compulsive damming disorder," the other beavers would accept the device.
- Don't crawl into a culvert or stand in the water in front of it when you're trying to unblock it, or stand on the downstream end while trying to breach a dam. That could be dangerous.
- You'll need a good pair of waders and may want a wet suit.

Protect vulnerable trees and shrubs:

- Be aware that these options are meant to stop beavers from gnawing. They won't stop beavers from flooding the area, which could kill the plants.
- Wrap hardware cloth loosely around trees and shrubs to a height of at least 3 feet to prevent beavers from gnawing on them. Match the height of the hardware cloth to the typical snow depth for the area, because deep snow will allow the beavers to reach much higher on the tree. The cloth should be several inches from the plant, to give it room to grow.
- A 3-foot high fence (welded wire, 6x6' mesh) or foot-high electric fence (high tensile, 3 strands set 4" apart) can protect groups of plants. Make sure the fence can't be breached during deep snow.
- The National Wildlife Research Center (USDA-APHIS-WS) suggests that painting trees with a mix of 1 quart of sand in 1 gallon of exterior latex paint may prevent beavers from chewing on the trees.

Managing water levels:

General tips that apply to sites with a beaver dam or a culvert:

- The feel and sound of flowing water are the cues that attract beavers to a "hole," whether that opening is a breach in their dam or a culvert. These cues trigger their instincts to build or repair a dam.
- Faster-moving water also sounds louder and is more likely to attract beavers than slow-moving, quiet water.
- Think of a culvert from a beaver's point of view: it looks like a smallish hole in an otherwise terrific dam. Easily fixed, eh?
- The size of the "hole" (culvert or breach in dam) usually determines whether or not beavers will try to plug it. The smaller the hole, the more compelling the sound of water rushing through it, and the more likely they are to try to plug it.
- The shape of the culvert matters, too: beavers are less likely to plug a pipe-arch shaped culvert than a round one.
- There have been improvements in water level control devices (WLCDs). For greater success, use modern devices and ensure that they are properly installed and maintained. Choose your site wisely, because these devices only work in specific situations.
- Work with your customers and technical experts to determine the degree to which you need to drop the water level. (This depends on the pond's slope and other site factors.) Your "draw down" requirement determines the depth at which you install a WLCD, for example.
- Beavers usually build their dams on the upstream side of a culvert, so that's where you want to install the WLCD. This way, they're less likely to build a dam *within* the culvert. That's harder to deal with, so try to prevent it.
- WLCDs can be used to protect beaver wetlands while minimizing the risk of damage. Combine this tool with the harvesting of beaver to maintain sustainable population levels.
- When installing a WLCD, you'll need to leave enough water in the pond for the beavers to survive the winter. If you don't, they may try to foil your

device, or build another dam, or leave the area. (This is why WLCDs tend to work better in ponds that are least 4 ft. deep. In shallower water, the installation is trickier, and the beavers may be more determined to outsmart the device so they can maintain an appropriate water level for winter survival.) If the point of the device was to keep the beaver around but prevent them from causing damage, then if you drive them off you haven't exactly succeeded. So, in general, try to maintain at least 3 ft. of water at the lodge. Remember to factor in the typical depth of ice for that area. Three feet of solid ice will not do the beavers any good.

- If you install a WLCD in a culvert, make sure it can handle as much water as the culvert did before it was modified. Otherwise, it could cause flooding.
- Make sure you accurately estimate the rate of water flow, because if the WLCD is too small, there may be persistent flooding problems.
- Regular inspection and maintenance of WLCDs is critical, especially during the first two weeks after installation. The degree of required maintenance will depend on the device and the site. In some situations, weekly inspection and cleaning may be necessary. If the maintenance is inadequate the device may fail.
- Keep WLCDs clean of debris. If you don't, it may just turn into a dam! A 6x6" mesh size will keep the beavers out but allow debris to flow through the fence. Larger enclosures require less frequent cleaning. You may need to install a debris dam in front of your exclusion device.
- Check WLCDs after the leaves drop in the fall, after storms, and soon after ice out, because there's more debris moving through the water at those times.
- Where do water level control devices work best?
    - Temporary flooding of the site back to the original pond level won't cause much harm.
    - Pond is at least 3–4 ft. deep.
    - There's clay or gravel on the bottom of the pond.
    - People can easily reach the devices for inspection, and will do the maintenance.
- Some options, such as installing a WLCD or replacing a culvert, may be too expensive for some customers. These options may pay for themselves in the long term, if the devices work.
- If you install WLCDs or fences, consider offering maintenance services, too.
- Beavers often abandon ponds when their food runs out, so they may leave after a few years.
- For additional information, see the DEC's *Beaver damage control techniques manual*: www. dec.state.ny.us/website/dfwmr/wildlife/beaver

Special considerations for sites with culverts:

- If you're installing a new culvert, you may be able to prevent damage by choosing one that's the right shape and size for the site. The width of the culvert must be equal to, or greater than, the width of the stream. Use box or pipe-arch culverts with an inlet opening of at least 18 square feet. Better yet, bring the inlet size up to 38 square feet, or larger.
- The best WLCDs keep beavers away from the culvert's intake pipe and regulate the water level in the pond. They muffle the sound and feel of rushing water, reducing the beavers' compulsion to build dams.
- Replace smaller, round culvert pipes with oversized ones, where possible. Unfortunately, the up-front cost may be too high for your customers, although in the long run, this may be more cost-effective than yearly maintenance.
- Low-profile box culverts may be the most practical solution for roads that require a lot of fill to meet the size demands of a beaver-resistant culvert design.
- Don't create depressions at the inlet when you install a culvert, because beavers may just decide to enlarge the small pond you've created.
- In all but a few situations (see next section), no grates or guards over your culverts! Beavers will plug them, too.
- If beavers have a history of plugging a certain culvert, they may attempt to plug your replacement culvert, even if it's oversized. If this happens, trap the family group.

Water level control devices (WLCDs):

- Some devices exclude beavers AND muffle the water flow, which makes the "hole" less attractive to the beavers. Other WLCDs only act as barriers. If you start with a barrier and it's compromised, you can try adding a muffler. For example, deep water fences (barrier) are often combined with tubes (mufflers).
- Deep water fence (see Handout #4 at: www.dec.state.ny.us/website/dfwmr/wildlife/beaver/handout4.htm). These fences usually enclose an area of 10–20 sq. ft. to keep beavers from blocking the intake of a road culvert. They can be shaped to fit the site, often square, D-shaped, or trapezoidal. Deep water fences should be made of 6x6" concrete

reinforcement wire (6-gauge) or welded structural steel wire, and secured by heavy-duty steel posts. Install them tight against the bottom of the pond, or better yet, add a floor to keep the beavers from swimming underneath the fence. The fence must extend 18–24" above the water level. Properly installed and maintained, it should last 7–10 years. By themselves, deep water fences exclude beavers, but they do not muffle the sound and flow of water so the beavers may still be attracted to that hole. If the beavers construct a dam against the fence, install tubes into the fence. The tubes will muffle the flow of water, and may prevent the beavers from damming the fence again (see next bullet).

- Deep water fence combined with tubing (see Handout #7 at: www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handout7.htm). In this case, a 10 sq. ft. (or larger) rectangular fence is placed in the deepest water of the beaver pond. A piece of rigid, smooth PVC pipe is run from the fence through the dam at the desired water level. Angle the tube down, or use an elbow to keep its intake end underwater. The fence keeps the beavers from plugging the intake end of the pipe. The pipe, which helps muffle the sound and flow of water because of its material and angle of installation, may help prevent the beavers from building a dam around the deep water fence.
- Pond levelers, various designs, including the "Clemson" (see Handout #8 at: www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handout8.htm and Handout #10 at: www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handou10.htm). This is a perforated PVC tube fitted into a welded wire tube (it's a round fence). The entire cylinder is installed through the beaver dam, culvert, or pipe that they're blocking. The closed end should be upstream of the beaver dam, about 10–12 ft. away. It must always be submerged. The downstream end of the pond leveler should stick out no more than 3 ft. from the dam. This device should only be used where the pond is fed by a small stream or spring (flow should be no more than 10 cubic ft./second). Pond levelers may be overwhelmed by unusually high rainfall, so occasional flooding must be tolerable. They exclude beavers and muffle the water flow.
- Electric breach guard (see Handout #11 at: www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handou11.htm). A **grounded** electric fence that is used to keep beavers from repairing a breach in their dam. It's installed on the upstream side of the breach. The hot wire is suspended across the water, with a few wires dangling from it, down to about an inch above the water's surface. When a beaver swims up to inspect the breach in the dam, it touches the dangling wires and receives a nasty shock. Use only deep-cycle RV batteries. Do NOT use fence energizers with household current because that's dangerous. Although it's fairly easy to carry and install, the energizer and battery are expensive, and both are often stolen. Check the condition of the battery once each week.
- Pond drain tubes (see Handout #9 at www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handou9.htm) are long pipes with one perforated end that are usually suspended at an incline on posts 1–4 ft. above the bottom of the pond. The pipes lead from a deep part of the pond through the dam, at the desired water level. The harder the bottom of the pond, the longer they work. These WLCDs are less expensive and weigh less than some of the previously mentioned devices, but require more maintenance (they have to be cleaned more often).
- Pitchfork guard (see Handout #3 at www. dec.state.ny.us/website/dfwmr/wildlife/beaver/handou3.htm): A metal grate made of $^1/_2$–$^3/_4$" heavy steel rods that are 6" apart, braced at the top with two horizontal rods. The grate is pushed into the bottom, and is also held in place by the current. Because there are only vertical rods, it's a little less likely to collect debris than wire mesh. This device won't stop beavers from plugging the culvert—in fact, it may actually promote dam-building—but it will keep the beavers from building the dam inside the culvert. Removing a dam that's inside the culvert is much harder than plucking out one that's in front of the culvert, especially if the highway crew has the right equipment. So, if the beavers only plug a culvert every now and then, and the crew has the right tools, this device may be enough to solve the problem. Pitchfork guards require frequent cleaning.

Trapping:

General tips:

- It takes experience and skill to trap beavers effectively. Don't wing it! Beaver easily become trap-shy, so a botched trapping attempt may leave the customer with a worse problem. There are excellent courses, videos, and books that explain how to trap beaver.

- Trapping can be used in combination with non-lethal controls or by itself. It may be a particulary important option at sites where beavers have been plugging very large culverts (over 38 sq. ft.), or where a culvert can't be replaced with an oversized model.
- If lethal trapping is used as the sole control technique, be aware that other beavers may move into the site (depending on the conditions and the size of the beaver population), so you may need to continue trapping on a yearly basis.
- If the customer wants to minimize the number of beaver removed from the pond, trap as close to the site of the nuisance activity as your permit allows. Breach the dam (if allowed). The first beavers to investigate this hole are most likely the ones causing the most damage.
- If you want to remove the entire family, begin trapping away from the lodge so you don't spook the beavers.
- Otter now occur across upstate New York, thanks to a restoration project, but they are still protected in many areas. Otter frequently use beaver ponds and may be killed in traps intended for beaver. Follow the tips in the following section to avoid accidentally trapping river otter and muskrat.
- Trapping in front of a breach in a dam is difficult. The beaver may have a big stick in its mouth as it approaches the dam (because it wants to plug that hole). The trap may catch the stick instead of the beaver, allowing the beaver to escape. You may have greater success if you try to catch the beaver where it's looking for material to fix the hole. If you'd like to set near the dam (and your permit allows this) try placing your trap perpendicular to the dam, or about 10 ft. away.
- Beaver must be destroyed, unless specifically permitted. Don't expect to receive permission to trap and transfer beaver, because it's rarely given in New York. (Only the Regional Wildlife Manager has the authority to issue this permit.)

How to avoid accidentally trapping river otter:

- Look for otter and their sign. They could be anywhere in New York now.
- Get in, catch what you can, get out. Don't spend weeks trying to catch the last beaver or a trap-shy individual. Instead, give them a few weeks to calm down, then return with specialized traps.
- If using a body-gripping traps, choose a # 330 with an offset trigger. This trap provides enough room for otters to pass through without triggering the trap. Smaller traps, such as 220s and 280s, do not. Replace 4-way triggers with 2-way triggers. Crimp the trigger wires together and place them as far to the side as possible. This trigger modification doesn't affect the capture rate for beaver but reduces the accidental capture of otter by half.
- Using a tension-adjustable trigger may reduce the otter catch even further.
- Avoid channel sets, especially in main channels.
- Stay away from dams and other crossover locations.
- Use baited sets, where possible.
- Use castor mound sets with trap set 8–10" deep, for hind foot catches.
- Avoid setting traps near beaver lodges or burrows made in banks, even if those areas are old and seem to be unused.
- Carry a catchpole to carefully release any otter caught in a foothold trap.
- Use cable restraints. You'll need DEC training and certification to use this tool. Contact your regional DEC wildlife staff for information.
- If you accidentally catch an otter, or find a dead one, please call the DEC regional wildlife office immediately.
- In Central and Western New York, if you see otter or their sign, please report this to the DEC, to help us document their population status.
- For more information, see:
  - www.dec.state.ny.us/website/dfwmr/wildlife/wildgame/330modi.pdf
  - www.dec.state.ny.us/website/dfwmr/seasons/wortf.html
  - www.dec.state.ny.us/dfwmr/wildlife/wildgame/Trappers21.pdf

Live traps:

- A NWCO may be allowed to use cable restraints after completing special training.
- There are several other different types of live traps specially designed for beaver (Bailey, Hancock, Breathe Easy, Koro, Ram Ezee). Some are modified cage traps, some are funnel traps, and the Bailey and Hancock traps resemble suitcases. Cost and effectiveness varies. Some NWCOs report a significantly greater success rate with the Hancock design as compared to the Bailey.
- Here's how to set a Hancock trap in a culvert. Put some corrugated pipe into the culvert and secure it with stakes. Then place the trap in front of that.

Lethal traps:

- Body-gripping trap, #330, with a modified trigger to minimize the risk of catching otters.
- Trap placement is critical when using foothold traps. Beaver have short front legs. Consider where they will put down their feet. Pay attention to the water depth and distance from the shoreline. You might only catch belly fur.
- Foothold traps, #3, 4 or 5, equipped with submersion wires or cables that have sliding locks. Set the traps in at least three feet of water to keep the beaver from surfacing. This technique requires more skill than the use of the body-gripping trap.
- Specialized foothold traps for beaver (CDR 7.5, MB 750, Bridger #5) are expensive but well worth the cost, because they increase the chance of a good catch. They're especially useful for hind foot catches.
- Bait with castoreum (the secretion from the beaver's glands) or twigs or branches from aspen, alder, willow, or maple.
- Under ice, use channel, slanted-pole, and bait-pen (an underwater cubby) sets.

Preferred killing methods:

- Lethal trap
- Lethal injection of barbiturate, if possible
- Gunshot to the head, if no rabies testing is required, or to the heart/lungs. (With a special permit from the DEC, you can carefully breach the dam early in the morning or late in the evening to attract the beaver, then use a shotgun with #4 buckshot.)

Control strategies that don't work well, or aren't legal in New York:

- Installing several smallish culvert pipes instead of a single large one is a foolish choice. Doesn't matter how many pipes there are, if they're too small, chances are good they'll be plugged.
- Some differences in culvert pipe materials (smooth vs. corrugated pipe) and installation design (flush vs. projecting pipe inlet) do not matter to beavers. They'll plug any of them, if the culvert's too small.
- Large-scale removal of plants along roadsides may discourage beavers in certain situations, but can lead to erosion and could hurt other wildlife. This approach also requires regular maintenance.
- Although you may be able to secure a permit to destroy a beaver dam or lodge, this won't solve the problem by itself. Breaching a dam quickly can flood roads or downstream areas, which could be dangerous or cause a lot of damage for your neighbors. That's why you have to consult with the DEC first.
- Harassment doesn't work.