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## Living With Beavers -- by Erika K. Yery, licensed wildlife rehabilitator

Most calls received by licensed wildlife rehabilitators regarding beavers, are usually about beaver problems. Most complaints are from new developments, such as subdivisions, townhouses, suburban homes and office complexes, with small ponds or a stream nearby. In most cases the beavers were there before these places were constructed and the problem begins when beavers start cutting down trees, eating shrubs or flooding areas. Unfortunately, beavers are not aware of human property or property boundaries. Other problems occur on public lands and include interference with infrastructure such as sewers, culverts, and drainage ditches, flooding trails, streets and railroad tracks. When the problem involves beavers cutting down ornamental trees or shrubs, sturdy fencing is the only foolproof way of exclusion. Individual trees should be wrapped with hardware cloth forming a cylinder standing 6 inches away from the trunk. Use welded wire for fencing.

Outside motion detectors with automatic bright lights can be used as well. Some systems can also be equipped so that an outdoor sound system goes on with the sound of barking dogs or other loud noises. The sound has to be changed from time to time. This method may disturb neighbors, but it has worked on several occasions. A new gadget, called "Critter Gitter" by Amtek (1-800-762-7618) has been successfully used to deter various wild animals and may work with beavers.

Some of the more unusual calls are concerns about beavers eating fish in ponds. Beavers are herbivores, meaning they eat plant material only. As true vegetarians, they mainly eat bark, saplings, water scum, and other vegetation. Fish are safe in ponds and

streams and may actually benefit from the improved habitat.

I have received a few calls on beavers chewing on floating docks or patio decks near water. An application of bobcat or coyote scent available from sporting goods or feed stores will deter gnawing. This scent has to be reapplied frequently.



For more detailed information and practical advice on how to resolve common wildlife problems using humane and inexpensive methods there are several excellent publications available.

- The Humane Society of the United States offers an excellent book, "Wild Neighbors" the Humane Approach to Living with Wildlife, available from the Wildlife Rescue League.
- The Fund for Animals offers a 12 page brochure, "Living With Beavers," which describes techniques in further detail. Call the local office for a copy: 301-585-2591.
- For detailed information on the Clemson Beaver Pond Leveler (installed for problems that are created by rising water levels caused by the dam or plugging of road culverts), request additional information from the Wildlife Rescue League, 703-391-8625.

Relocating or killing beavers and destroying dams will not solve beaver problems as other beavers will sense a vacancy in the area and start building a new dam, often the same day. Enjoying and living with beavers is the way to go! The following material on beavers was presented by Harry E. Hodgdon,

Executive Director, The Wildlife Society, at the Regional Workshop on Beaver in Urbanizing Environment, 19-20 March 1997, at the National Wildlife Visitor's Center in Laurel, Maryland.

### Beaver in Urban Habitats: Understanding the New Reality

Beavers are very interesting creatures and they are now returning to this area after an absence of nearly 300 years. As beavers and people move into each others' backyards, many of us want to learn more about these wild animals -- either to enjoy watching them or to learn how to take preventive measures to protect property. The following information on the biology, life history, ecology, and behavior of *Castor canadensis* is provided so we can all gain a better understanding of this remarkable mammal.

### Basic Life History

Beavers are the largest rodent in North America; adults typically weigh from 35 to 50 pounds, but there are numerous records of them exceeding 100 pounds! They are between two and three feet in length, with an additional 12 to 18 inches for the tail. Beavers vary in color from light to dark brown; in this area most are dark brown to reddish brown in color. The fur contains long, shiny guard hairs covering dense, soft underfur that traps air and helps protect them from the cold. It is the underfur that is of value in the fur industry. Beavers are widely distributed, living in every Canadian province below tree line and in every state except Hawaii.

Beavers have numerous morphological, physiological, and behavioral adaptations that enable them to thrive in semi-aquatic environments. Their body is "torpedo" shaped; that contributes to their agility in water, but on land it makes them a bit awkward and clumsy. They are muscular animals with large bones, well-developed incisor teeth, and a massive skull that supports strong chewing muscles. Beavers have a broad, horizontally-flattened tail that is scaly in appearance. The tail is used for stability while sitting or standing upright on land, as a rudder and propulsion in water, as a warning device, and for both fat storage and thermal regulation. Their hind feet are large and webbed for propulsion; the toenail on the 4th toe of each hind foot is split for grooming. The front legs are short and the front paws have heavy toenails for

digging. Beavers' eyes are near the top of their head so they can see above the water while keeping most of their body underwater, and they have a translucent membrane that covers their eyes when underwater. Both ears and the nose have valves that close when the animal submerges. The throat can be blocked by the back of the tongue, and the lips close behind their incisors to permit gnawing and carrying sticks underwater without choking.

Beavers can regulate their blood chemistry, heart rate, and circulation pattern to enable them to remain underwater for 15 or more minutes. Beavers have no external sex organs, except teats on nursing females, and they have a common urogenital opening near the base of the tail (a "cloaca" similar to waterfowl). They can live up to 20 or more years, but in areas with large predators or trapping, most adults rarely exceed 10 years of age.

Beavers have relatively few external or internal parasites, but two are of interest to the public -- Giardia and tularemia. Waterborne outbreaks of Giardiasis, an internal ailment caused by the protozoan parasite Giardia lamblia, is referred to by some as "beaver fever" because some beavers carry the organism, but so do many other animals found around lakes and streams, including humans. Despite this, beavers will be a focus of concern because they spend so much time swimming in our drinking water! Tularemia, spread by water or ticks, has been reported as an important mortality factor in a few beaver populations and is occasionally contracted by trappers when handling beaver carcasses.

An important requirement for beavers is water deep enough to provide aquatic habitat beneath winter ice. As a result, they are generally associated with rivers, ponds and lakes, or areas that can be converted to beaver ponds. Although beavers are found in areas with steep slopes, they generally prefer valleys with flat terrain and perennial streams that can be dammed to create ponds. These areas also produce an abundance of preferred food. Beavers are vegetarians whose diet varies with changes in season. In spring and summer they feed on non-woody plants or plant parts such as water lilies, algae, grasses, sedges, herbs, ferns, and

shrub leaves and shoots. In the fall and winter they favor twigs, roots, bark and inner bark of woody plants. Aspen, birch, alder and willow are favored tree species, but beavers have been known to cut almost every kind of tree, including conifers. Bark and leaves may be eaten where they fall in the woods or dragged back to the water.

#### **Family Composition**

Beavers live in small, closed family units (often incorrectly termed "colonies") that generally consist of an adult pair and young from one or more years. Only the adults breed. One litter of three or four is born each year, and the young usually remain with the family until they are about 21-22 months old and then typically disperse. Some young may remain with the family for one or more additional years as subadults. Thus, an established family contains an adult pair, kits of the current year (less than 12 months old), yearlings born the previous year (12 to 24 months old), and possibly one or more nonbreeding subadults from prior breeding seasons (over 24 months old). Young reach sexual maturity between 18 and 30 months of age.

#### **Social organization**

The beaver family social system is unique among rodents. Each family occupies a discrete, individual site. The adult pair bond is long-term and monogamous, although a lost adult may be replaced by a transient or an offspring. The family strategy is characterized by low birth rate, low young mortality, prolonged behavioral development, and high parental care. An age-class hierarchy exists and is maintained through close-range interactions where body orientations, vocalizations, postures, and gestures convey status; physical aggression is rare among family members. Adults dominate yearlings and yearlings dominate kits. Either adult may be dominant, or they may be co-dominant.

#### **Daily activity patterns**

Beavers' activity during spring, summer, and fall is predominately dusk to dawn, with activity beginning later in spring and fall than in mid-summer. Active period length is 11-13 hours per night, but varies among individuals and families. One beaver usually emerges first from the lodge or burrow more frequently than any other family member. This individual may

be male or female, but typically is an adult. The adult male often patrols the pond perimeter after emerging.

In winter where ponds are frozen for several months, free-running circadian activity rhythms, with a period of 26-29 hours, probably are common. Activity above ice is correlated positively with air temperature. As temperature falls, above ice activity declines and at about 10-15 degrees F. it ceases.

#### **Annual cycle of activity**

Mating occurs in the water during winter. In late winter or early spring, beavers exit frozen ponds through holes in the ice and forage on nearby woody vegetation. As ice thaws, above ice activity increases and scent marking begins. With ice out, foraging expands to the entire occupied site and scent marking increases rapidly. Beavers shift from a woody to herbaceous diet as new growth appears.

Shortly after ice out, young approaching two years of age begin dispersing, although as population density nears carrying capacity, some young may delay departing for one or more years. Dispersal is not preceded by increased adult aggression. Most dispersal occurs within a few weeks after ice out and not all siblings leave together. Dispersers primarily follow water courses, do not avoid occupied sites, and often travel several miles before taking up residence. Some may form initial pair bonds prior to finding suitable habitat, but many occupy sites alone, initiate dam and burrow or lodge construction or maintenance, and begin scent marking before a mate arrives.

During high water in spring and early summer, families are active building new dams and maintaining or enlarging existing dams. Discarded peeled sticks from the winter food cache often are added to dams and the lodge. As water levels drop in summer, construction and maintenance of canals and channels increase.

Birth occurs in late spring (106 days after mating) within the burrow or lodge, and the adult female does not isolate herself from the family. The family concentrates activities near the lodge for a few weeks after birth. Kits nurse for several weeks, but begin consuming solid food within a few days. All family members transport

leafy branches and herbaceous vegetation into the lodge when kits are young. The adult male most actively provides kits with solid food and yearling males may be as active as the adult female. Kits can swim within hours after birth, but are too buoyant to submerge for several days. They first leave the lodge about two weeks of age, but rarely are seen in early evening until about one-month old. Initial activity of kits is confined to the vicinity of the lodge. They often emerge with and follow other family members, especially the adult female.

In late summer or early fall, beavers begin cutting trees, reflecting a gradual dietary shift from herbaceous to woody material. Families begin maintaining an existing lodge or start building a new burrow or lodge. Lodge construction or maintenance is performed nearly every night until ponds completely freeze over. As more trees are felled, beavers build new dams and maintain or enlarge existing dams. Storage of woody material in ponds is started after lodge maintenance or construction is begun and is associated with the lodge being maintained.

#### **Construction maintenance behaviors**

Beavers display many construction behaviors, but environmental conditions determine which building activities are elicited. Not all families or populations perform all behaviors. For example, beavers occupying stream or pond habitat build dams to increase water depth, whereas those living on lakes or rivers rarely construct dams.

#### **Burrow and Lodge**

Beavers dig with their forepaws a burrow underwater into the bank and extend it upward. If the ground surface is broken, sticks, branches, and mud are used to cover the exposed burrow, and a nest chamber is excavated out of the sticks; otherwise a nest chamber is excavated underground above the water level. Adult females initiate most burrows and are most active covering exposed burrow openings, although adult males often assist in widening burrows. All beavers, except kits, assist in digging and covering. In northern latitudes each fall, beavers add mud and sticks to lodges in which they will spend the winter. Mud, the primary material used, usually covers the entire exterior except the tip. All family members perform lodge maintenance, but

females are more active than males in each age-class, except kits. Kits contribute only sticks because bipedal carrying of mud is not developed fully by the first fall.

#### **Dams**

Dams are initiated where water flows over obstructions in streams and at outlets to pools; audible stimuli are important in releasing and orienting construction behavior. Dams begin with beavers pushing pond or stream sediment and stones into a ridge. Ridge size depends upon stream velocity and when the ridge no longer holds back water, sticks and branches are added for support, followed by more mud. As a dam takes form, building behavior is oriented where water flows over or around the structure. Building behavior generally ceases when water no longer flows over or around the dam or when ice forms. Adults begin most dams, with females starting more than males. All family members participate in dam construction and females of each age-class are more active than males.

Dams are maintained throughout the year, but most material is added during periods of excess water. Mud and sediment from the pond bottom are carried in the forepaws against the upper chest and are pushed along the upstream side of the dam to or near the crest. Sticks are towed to the dam and, using teeth and forepaws, slid over the crest to the downstream side. Maintenance behavior increases with age and all family members participate. Adult females may be slightly more active than males, but there is little sex difference in yearlings and kits.

Beavers frequently perform slow, close inspection of dams. This inspection appears to be visual, but sound detection of escaping water also may be important. About one-third of all close inspections result in dam maintenance. All family members perform the behavior, and the frequency increases with age. Adult males are more active than females and in other age-classes, males often are more active than females. Breaks in dams are rare, probably because of frequent inspections and maintenance. Materials selected for repairs follow a fixed sequence, similar to initial dam construction. Repaired crests often are higher than adjacent portions of a dam. Adults and yearlings repair breaks, with females more active than males.

#### **Canals and Channels**

Canals and channels facilitate movements. Both construction and maintenance involve rapid digging and pushing loosened material with the forepaws away from the center of the canal or channel. This activity is the least complex construction behavior. All age-classes participate, the frequency increases with age, and no sex differences are apparent.

#### **Food Cache**

Every fall beavers in northern latitudes construct food caches to provide a food source when ponds are frozen. Beavers at the southern extreme of their range do not build food caches. Cache construction may be initiated by the first hard frost. Most caches are located close to an underwater burrow or lodge entrance and are begun by securing the butts of branches underwater -- either into the pond bottom or into the underwater portion of the lodge. Either adult may initiate food storage, and adults are the most active provisioners. All age-classes participate, although kits do not contribute until late fall.

#### **Communications**

Beavers use several systems to communicate information among family members, neighbors, and transients.

**Tail-slapping** is a rapid striking of the tail against the water in response to unfamiliar or unusual stimuli. Most investigators have documented this behavior, but there is little consensus on its use. Number of tail-slaps seems to increase with age and, within each age-class, females are more easily provoked, but males slap more times per incident.

When an unusual stimulus is detected, beavers initially enter an alert posture with the nose raised out of the water and swim in wide circles or float in deep water oriented toward the disturbance. This behavior often culminates in tail-slapping. The stimulation threshold necessary to elicit alert investigation declines with increasing age, so adults are more likely to investigate a stimulus that elicits no response in younger animals.

The relative importance of stimuli releasing tail-slapping is unclear. Scent seems to be the most important stimulus, but multiple stimuli are the most effective releasers. Sound or movement often cause

investigation, but rarely release tail-slapping unless coupled with other stimuli.

The response to tail-slapping by beavers on land or in shallow water is to move to deep water. However, the response depends on the age of both the animal on land and the beaver slapping. Kits are often the least likely to move and their slaps are not as likely to cause other family members to move to deep water. Yearlings are intermediate. Adults are most responsive, and their slaps elicit the greatest response.

In addition to functioning as a warning signal to family members to move to deep water, tail-slapping also frightens or drives potential predators away and elicits more information from the stimulus source.

**Scent marking.** Beavers use mud, decaying vegetation, and twigs from pond and stream bottoms to build mounds around the edges of water areas occupied by the family. Nearly all mounds are within one meter of water and are distributed in clumps around the shore. Clumping of mounds occurs in high activity areas including near lodges and bank burrows, feeding sites, trails, occupied area boundaries, and dam construction sites. Number of mounds built annually per family is variable, but often exceeds 100. Adults build most mounds, with the male most active, and kits build none.

Mounds are scent marked with castor and anal gland secretions. Scent marking is limited to mounds and nearly 60% of all marks occur immediately after new building material is added. In areas where there is little or no ice, scent marking is high in January through March. Where ice confines beavers, marking begins in early spring, peaks in mid to late spring, declines rapidly, and continues at a low level during summer and fall. Some mounds are marked more frequently than others. The level of scent marking varies widely from night to night and generally increases sharply following precipitation. Families with high probabilities to encounter neighbors or transients have higher marking activity than in more isolated families.

All family members scent mark, marking frequency increases with age, and males

of each age-class mark more than females. The adult male scent marks the most. Unfamiliar scent elicits aggressive behavior and/or increased marking in resident adults. Adults can discriminate between male and female odors, with both sexes responding more intensely to male scent.

Scent marking serves multiple functions. The annual marking cycle in relation to dispersal and concentration of mounds in areas of high family activity indicate that labeling habitat with familiar odor is important and likely builds and maintains a sense of confidence in residents. It also may either deter transients from entering occupied habitat or alter their motivational state when passing through a resident family's area by reducing exploratory behavior. Scent also may function to provide residents, neighbors, and transients with information on family and population density and influence family spacing. Finally, it likely transmits such information as age, sex, reproductive condition, and nutritional status and provides residents and transients with insights into family composition, including a missing adult.

**Vocalization.** Seven vocal sounds have been documented from captive beavers, but most investigators recognize only three outside the lodge: whine, hiss, and growl. The whine is the most frequent vocalization. The hiss and growl are emitted infrequently and normally are associated with aggressive interactions.

All age-classes produce the whine, but its use declines with increasing age and can have wide variation in pitch, duration, and inflection. Kits account for nearly two-thirds of the incidents and usually repeat the whine several times in rapid succession. Repetitive calling declines as age increases. Most whine calls occur in social contexts and usually are directed toward older family members.

Whining immediately preceding or during social interactions appears to serve several purposes. A beaver feeding in water usually relinquishes food to a whining kit. This food begging provides growing kits with food without the risk of obtaining it on land. Kits also whine to advertise their reluctance to relinquish food when approached by another beaver. Further, because older animals are dominant over

younger family members, whining by kits likely reduces aggressive tendencies in older beavers and promotes increased contact among family members. Vocalizations also are important in initiating grooming and play.

### Summary

Beavers are extremely well adapted to their semi-aquatic life-style and their ability to dam streams, cut trees, and build lodges make their presence highly visible of the landscape. Beavers have played an active role in the Potomac basin ecology for thousands of years. Intensive trapping and deforestation that followed European colonization eliminated beavers from this region by the early 1700's and from far western Maryland and Virginia by 1800. Today, the landscape beavers are returning to is very different than the one they occupied 300 years ago. While trees and waterways are similar, they are now broken by transportation corridors and human developments. Beavers were not considered in human development patterns because they were absent, so areas with a low or gradual gradient, often next to streams and rivers, were selected for roads, railroads, housing developments, and parks. Because beavers have a dramatic impact on the landscape in very urban areas, their return to a human-dominated environment has not been without conflict.

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