

Moose

Alces alces



Vermont Wildlife Fact Sheet

Physical Characteristics

Moose are the largest member of the deer family (cervidae) which includes white-tailed deer, elk and caribou. They are tall animals with long legs, a short neck, a high hump on the shoulders, a very short tail and a small rump. An adult can stand from 5 to 6½ feet tall at the shoulder and can weigh from 600 to 1400 pounds, with a maximum weight attained in the fall. On average a moose's belly is 35 inches off the ground, twice as high as a deer's, and its front feet can be lifted nearly shoulder high, enabling it to travel easily over fallen trees and through deep snow. The head is long with an even longer nose and large ears. There is a slight mane on the neck and shoulders, and both males and females have a dewlap of skin and hair (called a **bell**) hanging from the underside of the throat. The bell, which is larger in males than in females, may aid in dispersing scents (called **pheromones**) given off by the various glands of the animals.

The front legs are longer than the hind legs, which make the gait awkward, but helps in jumping over fallen trees. The hooves are long, narrow, and pointed, leaving a heart-shaped track approximately 5 inches long. Antlers are present only in **bulls** (males) and are strongly **palmate** (resembling a hand with spread fingers) in adults. They

are bone-like structures which grow from a **pedicle** (outgrowth of the skull) on each side of the head. Antlers begin to grow in late March or April. As they are forming they are covered by a hairy skin layer (called **velvet**) that is nourished by small blood vessels. Moose antlers grow at an amazing rate, sometimes over one-half inch per day. In late August or early September the antlers stop growing and the velvet is rubbed off. Upon exposure the antlers are white with blood stains but eventually become dark tan in color. The bone recedes between the pedicle and the base of the antler until the antler is shed. This occurs in November or December for large bulls but can be as late as April on young bulls. Antler width, beam diameter, and number of points will grow larger each year until a bull is 5 years old, after which antler size begins to decline.

Coloration of adult moose may range from light tan to almost black depending on age and season. The new spring coat is blackish-brown and grayish-brown, paler on the head. Adult males exhibit a darker nose than females. The belly and legs are lighter in color than the rest of the body. Natural bleaching and hair breakage results in gradual lightening of the entire hair coat during the year. Females have a white patch of hair under their tail. Calves are reddish brown

when born and do not have spots like deer fawns.

Distribution

Moose primarily inhabit the northern evergreen (**boreal**) forests and tundra regions of the world including Europe, Asia and North America. In the eastern United States they are found in New England, New York, northern Wisconsin, Michigan and Minnesota. They are also found throughout Alaska, Canada and parts of the Rocky Mountains from Idaho to Colorado. Moose are occasionally sighted throughout Vermont but are most numerous in the **Northeast Kingdom** (Orleans, Essex, Caledonia Counties) and along the spine of the Green Mountains from Canada to the Massachusetts state line. The Vermont moose population is continuing to increase in number throughout most of the state.

Reproduction/Mortality

The breeding or **rutting** season for moose occurs from mid-September through mid-October. Bulls are capable of breeding during their second fall when they are known as **yearlings**, but most breeding is done by older, more dominant bulls. Although both sexes usually remain within a 2 to 10 mile radius throughout the year, young bulls may move much

farther during the rut. Bulls in the rut will thrash trees and shrubs with their antlers and dig pits in the ground into which they urinate and spread scent. Cow moose are attracted to these pits, and bulls will constantly travel to their various pits checking for the presence of cows. Bulls are also aided in their search by the loud “bellowing” call of the cow in heat. Strenuous shoving matches between bulls may occur to establish dominance for breeding. If accepted by a cow the dominant bull will stay with her for up to a week. In forested habitats such as Vermont has, each bull will probably breed only a few cows before all cows pass through their “heat” or “**estrus**” period.

Some cows have their first calves at 2 years of age but most will not calve until age 3. Cows between the ages of 3 and 9 are more likely to have twins than are 2 year-old cows, which generally give birth to only one calf. The pregnancy period for a moose is about 243 days and most calves are born in mid- to late May. Calves weigh 25 to 35 pounds at birth and grow very rapidly, gaining one pound per day during the first month and 2-3 pounds per day during the second month. Calves are generally weaned by mid-October, at which time they weigh 300 to 400 pounds. A durable bond is formed between cows and their calves, which will last until the following spring when new calves are born.

Moose are prolific. In healthy populations most adult cows (2 year-olds) are bred, and over half may give birth to twins. Up to 50% of yearling cows may also breed, especially on good

habitat and at latitudes with longer growing seasons, but generally only one calf will be born. Under ideal conditions moose populations may expand by 20% to 25% annually and dramatic increases have occurred when moose occupy new habitats, especially in the absence of major predators. For example, 31 moose stocked in one area of Colorado in 1978-1979 had increased to a herd of 170 by 1988, even with losses to poaching. Increased cutting of forests in Scandinavia contributed to moose population explosions in the 1970s. The moose population in Finland grew from 15,000 in 1969 to 100,000 in 1980. At the same time, hunter harvests increased from 5,000 to 50,000 moose annually.

Moose numbers eventually will decline, however, if population growth continues unchecked, usually as a result of malnutrition caused by overbrowsing on winter range. Poor winter range causes both increased mortality and reduced reproductive rates. A classic example of such a population crash occurred at Isle Royale in Michigan where a 1930 population of between 1,000 and 3,000 moose overbrowsed their range and declined to less than 200 by 1935.

The primary known cause of non-hunting moose deaths (**mortalities**) in Vermont is motor vehicles. Since the beginning of Vermont’s moose study in September 1980 nearly 65% of these reported mortalities were due to collisions with motor vehicles. Another 18% were losses by illegal shooting

(**poaching**) and the remaining were due to a variety of causes such as accidents, suspected brainworm and train kills. It is unknown how many moose are lost annually to **predation** but it’s likely that calves are occasionally killed by bears and coyotes.

The **brainworm** is a small worm that lives in deer and moose. Because the worm evolved with deer it apparently does the deer no harm. Moose on the other hand, may have only recently been exposed to the worm because of northward expansion of deer range over the last century. Moose are abnormal hosts of brainworm and it does them great harm. The life cycle of the brainworm includes several stages. The larval stage of the worm is expelled in deer droppings. Snails feeding on the droppings inadvertently ingest the worm larvae and become an intermediate host for the worm. The moose in turn becomes infected after unwittingly ingesting the snails while feeding on plants. The larvae migrate along the spinal cord to the moose’s brain sometimes destroying the spinal cord as well as brain tissue. The moose may then display symptoms such as loss of balance, circling, lack of fear, blindness and paralysis. The disease generally causes the eventual death of the moose.

Habitat Requirements

Moose use different habitats from summer to winter. They are excellent swimmers and are frequently seen feeding on water plants in ponds during summer. Moose can dive up to 18 feet for these preferred foods

which are sought because they have high concentrations of **macroelements** such as sodium, calcium and phosphorus. These macroelements are important for antler development, lactation and body growth. During the hot months moose can suffer from overheating and must have access to dense shade or cooling waters. For these reasons, lowland softwood forests, beaver ponds and other shallow bodies of water are favorite spring and summer habitats for moose.

Moose are generally not a social species but several may be seen together especially at preferred feeding sites. Clearcuts are used throughout the year with the animals moving to hardwoods located near softwood cover in the fall. These forest types usually provide more winter food, especially in recently cut-over areas. Moose will seek softwood shelter when snow depths reach approximately 35 inches, the snow gets a heavy crust, or during extreme cold and windy conditions.

Food Habits

In Algonquin the word 'moose' means "eater of twigs". Indeed, moose are mainly **browsers**, eating the new leaves and twig growth of trees and shrubs. They also graze on grasses, forbs, lichens and mushrooms, occasionally kneeling to do so. Tender shoots of waterlilies and other aquatic plants are preferred summer foods when available but moose are not dependent on them. After the fall frosts and winter snows either kill or deeply bury non-woody (**herbaceous**) foods, moose must

turn to woody twigs for food. Foods consumed by wintering moose vary, depending on preference and availability. Moose in the Northeast often browse on aspens; red, mountain, and striped maple; grey and white birch; willow; ash; pin cherry; hobblebush; and balsam fir. Moose also will strip and eat the soft bark of mountain ash and red, mountain and striped maples.

Moose and other closely related wildlife such as deer and elk like to feed at **salt licks**. At these areas moose lick or eat soil which has a high concentration of minerals such as sodium and calcium. Historically, naturally occurring salt licks were known to North American Indians and colonists as good hunting areas for large mammals. With the advent of civilization a new type of salt lick has developed. These man-made licks occur where road-salt runoff accumulates in the soil. The attraction of moose to these roadside salt licks often creates a hazard to both moose and motorists.

Interactions with Humans

Like humans moose need space to live, but their presence on some properties is not always welcome. Some farmers have been upset with moose walking through fences or tubing in their sugarbush. Others have grown tired of the nuisance created by an occasional bull moose associating with their livestock.

High moose densities have been known to cause serious concern to timberland owners. For example, moose densities above six per square mile were

shown to severely damage regenerating trees in Newfoundland during the 1960s and similar damage to young scotch pine trees has occurred more recently in Sweden. There has been no widespread concern expressed yet by industrial timber companies in Vermont, although moose have caused localized damage to regenerating balsam fir.

Moose that wander into villages and more urban areas create an element of risk to the public. Often these moose are suspected to be suffering from brainworm infections which may contribute to their lack of fear of humans. In one freak incident in downtown Burlington a moose suffering from an abnormal growth of one antler into its eye posed a physical threat to curious onlookers.

Moose present a serious road hazard, especially when their range is densely populated by humans, and Vermont's human population density is relatively high compared to most moose ranges across North America. A rise in vehicle collisions with moose is a growing concern in both New Hampshire and Maine and was also a principal reason that moose population growth in Finland and Sweden was recently halted.

Vermont motorists, especially in Essex County, must always be on guard when traveling - particularly at dawn and dusk. Many have suffered extensive vehicle damage and several people in Vermont and New Hampshire have lost their lives in collisions with moose. "Moose Crossing" warning signs

on Vermont highways should be seriously heeded by motorists. It is wise to reduce speed to **40 mph** or lower when traveling through these areas, especially during the non-winter months.

Moose Viewing

Not all moose/human interactions are negative of course. On the contrary, thousands of Vermonters and tourists enjoy the thrill of seeing a moose, whether on their commute to work, from their deer-hunting stand, or while making a special trip to prime moose viewing sites. We are fortunate that Vermont's largest wild animal is also one that can be easily viewed, especially during the spring and summer. Roadside salt licks are frequented by moose as soon as the snow cover melts in the springtime. The best times of day for finding a moose in a lick are at dawn and dusk. Moose also are easily viewed while feeding in open wetlands from June through September.

Although moose may often allow cars and pedestrians to approach closely while feeding at licks or ponds, moose viewers should never forget that they are watching a big, powerful, wild animal. Moose can cover a short distance in seconds, and a cow with a young calf or a rutting bull can be especially dangerous. It is wise to always keep a safe distance while viewing or photographing moose. Heavily-used salt lick areas are generally marked with moose crossing warning signs. For best viewing chances, look for salt licks near these signs in Essex County along Vermont State Highway 114 from

East Burke to Canaan, or 105 from Island Pond to Bloomfield.

Interactions with Deer

Moose and deer feed on many of the same plants. Concerns have been expressed by some Vermonters that the state's growing moose herd has reduced available deer foods, resulting in a decline of deer numbers. Several scientific studies conducted in Alaska and Canada, however, have shown that competition for foods between the two species is minimal, especially during the winter. Moose are able to winter in more open cover types than deer because they can travel through deep snow more easily. While a few Vermont moose have been observed wintering in deer winter range, the vast majority appear to winter at higher elevations where browse is more abundant.

There have been only a few studies of summer and fall range relationships of deer and moose. The results indicate that during non-snow months deer and moose have similar habitats. There is a tendency, however, for moose to be found in open hardwoods more frequently than deer, and for deer to prefer mixed hardwood/softwood types. In either case, in Vermont there is generally an abundance of browse for both deer and moose on non-wintering range at present population levels.

Scientific evidence to date indicates that deer are detrimental to moose and not vice versa. The brainworm is the culprit, for it is only where moose and deer ranges overlap that moose are

found dying of the disease. Although the reported evidence of brainworm in Vermont moose has been low, the potential for this disease to become a more limiting factor remains, especially if Vermont's deer herd continues to increase.

History of Moose in Vermont

Historically, moose were plentiful in Vermont, and many settlers relied heavily on moose for food. However, uncontrolled hunting, combined with habitat loss due to farm land clearing, eliminated moose from all but Essex County by the 1840s. By the mid 1870s nearly 75% of Vermont was deforested and moose were very rarely seen even in the Northeast Kingdom. This land use change had an additional, indirect impact on moose habitat - the loss of beaver ponds. Through their dam-building activities, beavers create shallow wetlands that provide moose with abundant and nutritious summer foods. Unregulated trapping and the loss of forest habitat combined to virtually exterminate beavers in Vermont during the nineteenth century.

Moose sightings remained very low throughout much of the 20th century, with most reports coming from Essex County. It was not until the 1970s that Vermont's moose population really began to expand.

There are several probable causes for the recent growth of Vermont's moose herd. The forests and wetlands used by moose increased in Vermont during the 20th century. Today

approximately 80% of the state is forested. Wetland habitats favorable to moose began increasing in 1932 when beavers trapped in Maine were released in Caledonia County and eventually throughout Vermont. Those restocking efforts, regrowth of the forest, and trapping regulations have resulted in the current widespread distribution of beaver ponds in Vermont.

In spite of habitat improvements Vermont's moose population showed little growth through the 1960s. The increase of Vermont's deer herd and its corresponding influence on moose brainworm may have kept Vermont's moose population in check. The surge in Vermont's moose population during the late 1970s and the 1980s may have been caused by a lowered deer population, which likely reduced the chance of moose contracting brainworm. At the same time forest cutting increased as landowners harvested maturing timber, resulting in an abundance of browse for moose.

Moose increased in number and spread to suitable habitat throughout the state in the 1980s. Since 1980 moose report cards have been used by state and federal field personnel to document mortalities, sightings of moose, or moose sign such as tracks, droppings or tree-barking. These reports showed that moose occurred in 117 towns by 1984. By 1999, however, the number had increased to 235 towns. Vermont's moose population is currently well established in the northeastern and mountainous regions, with lower numbers in the foothills and Connecticut

River Valley. The largely agricultural landscape of the Champlain Valley does not provide good moose habitat and sightings are infrequent in Grand Isle and western portions of Franklin and Addison counties.

Vermont's moose population overall is still well below carrying capacity with a high rate of reproduction. The sex and age structure and increasing population indicate that many calves are born each year. The increasing trend in known incidental mortalities (such as road kills) suggested that Vermont's moose herd grew by 10 to 15% each year during the 1980s and 90s.

Management of Vermont's Moose Population

The management of Vermont's moose technically began in 1896 when a law was first passed affording the species complete protection. Modern moose management began in Vermont in 1992 with the adoption of a **Moose Management Plan**. The plan was developed by the Vermont Department of Fish & Wildlife from biological data derived from studies conducted in Vermont since the early 1980s, applicable results of studies conducted in nearby States and Provinces of Canada, and public opinion derived from a series of public meetings held throughout the State in 1991 and 1992. This plan was updated in 1998, again with public input derived from a random survey of 1,005 households, a series of "open houses", and several public meetings.

The Department is required by law to protect and manage all wildlife species in the state. Its mission includes the goal to "provide a variety of high-quality fish and wildlife-based outdoor recreation opportunities compatible with the ecological integrity of affected resources". Many Vermonters and tourists enjoy the thrill of observing or photographing moose. Others are pleased just to know moose are doing well in Vermont and may have no desire to "use" moose in any sense of the word. As far back as 1980, some sportsmen expressed a desire to legally hunt moose, and several bills to that effect were introduced into the legislature. The Department opposed these proposed bills until 1991 when the biological data indicated a limited moose hunting season was possible. Moose population management through regulated hunting is an important component of the Moose Management Plan. Moose hunting in Vermont is regulated by a special license and is limited to a specific area with a specific number of licenses for the area determined annually. The license allows a party of up to 2 hunters and a guide to take 1 moose during the season beginning on the 3rd Saturday in October. Hunters are selected by random draw from a large pool of applicants. If experience shows that more female moose need to be taken to achieve an area-specific population goal, the Department allocates some of the licenses in an area to that purpose.

Vermont's first modern moose season was held in 1993 in Wildlife Management Unit

(WMU) E in which 25 moose were taken under 30 permits. Since that first year, moose hunting has expanded to 10 WMUs occupying nearly half of the State. and enjoyable component of Vermont's wildlife resource.

In the first decade of modern moose management in Vermont, the Department chose to be deliberately conservative, slowly expanding hunting units and in establishing license numbers. With experience and a growing biological database, the Department is able to fine-tune the management prescriptions needed to achieve regional population goals desired by the public.

Future

The Department of Fish & Wildlife expects to update Vermont's Moose Management Plan every 10 years. Biological data and public desires will continue to be used to guide future moose management. With the current trend of increasing moose populations in central and southern Vermont, it is likely that the Department will propose to open up additional areas to limited hunting. (HAMELIN Note: this has been, and is continuing to be done.) Antlerless permits will also likely be issued wherever population stability is desired. The physical characteristics and age structure of the herd will be closely monitored to ensure that reproductive levels are healthy and that large-antlered, prime bulls are available for viewing and photographing. With careful management, moose will continue to be an important, fascinating

References for Additional Information

Franzmann, A.W. and C.C. Schwartz, eds. 1997

Godin, A. J. 1977. Wild mammals of New England. Johns Hopkins University Press, Baltimore, MD. 304 pp.

Knopf, A. A. 1980. the Audubon Society field guide to north american mammals. Chanticleer Press, New York, NY 745 pp.

Runtz, M.W.P. 1991. Moose country, saga of the woodland moose. Stoddard Publishing Co. Limited, 34 Lesmill Road, Toronto, Canada M3B 2T6. 110 pp.

Schmidt, J.L. and D.L. Gilbert. 1978. Big game of North America. Harrisburg, PA: Stackpole Books; 494 pp.

Ecology and management of North American moose. Smithsonian Institution Press. Washington, D.C. 733 pp.