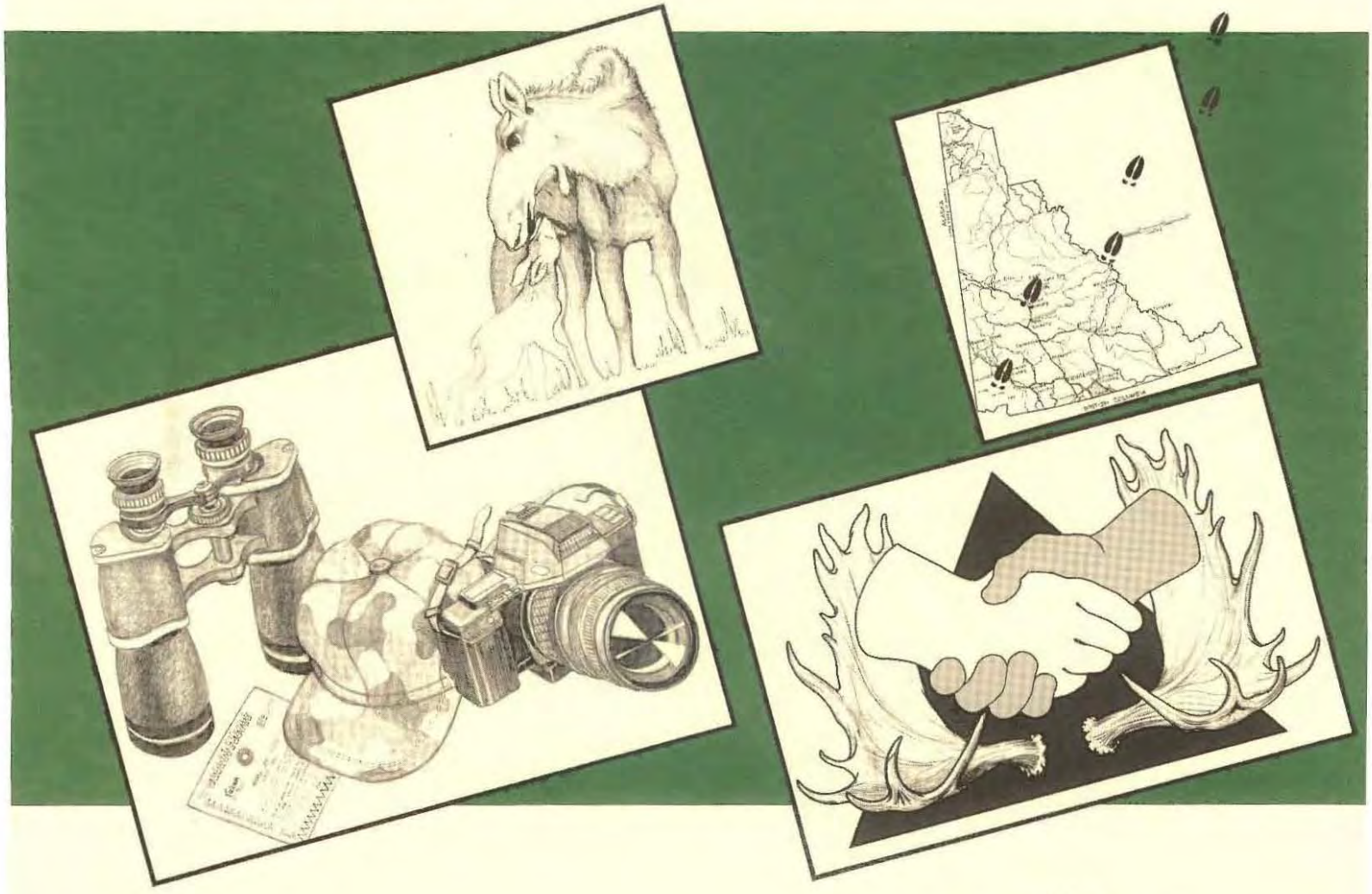
YUKON
MOOSE



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Moose – A Vital Species

Moose are a vital part of the Yukon environment. In the natural community, they are an essential prey species for large carnivores such as wolves and bears. Other species such as ravens and wolverines subsist, in large part, by scavenging on the remains of moose carcasses. To humans, moose are important for hunting and viewing. They also play a role in the cultural and spiritual activities of First Nation people and other Yukoners.

Yukon wildlife management aims to sustain moose populations, habitats, genetic diversity, and the full range of benefits that Yukoners obtain from this important species. Traditional and local knowledge, coupled with scientific methods, are helping us reach this goal. We can all contribute by showing respect for moose, the environment and other users.

July, 1999

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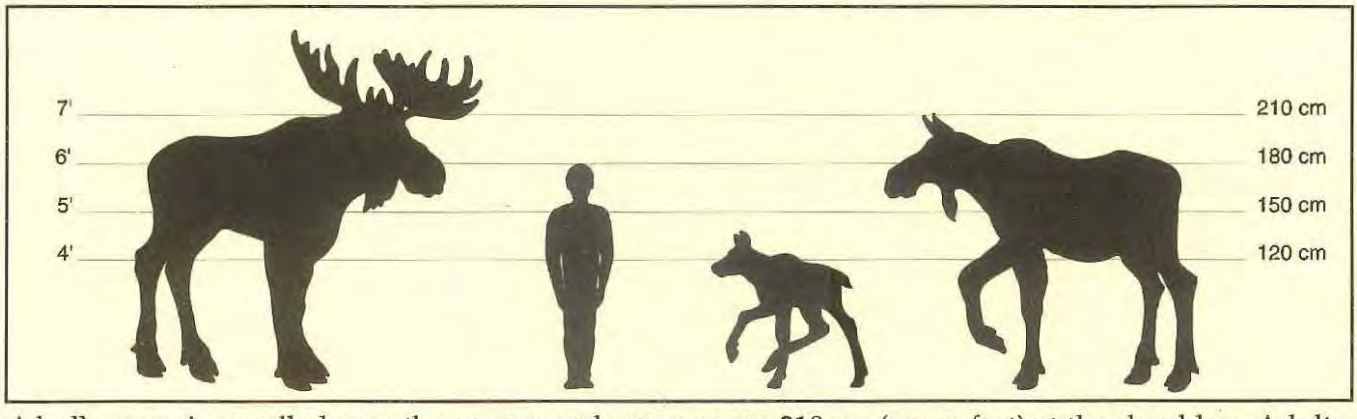
Biology

Physical Characteristics

The moose, *Alces alces*, is the largest member of the deer family *Cervidae*. There are four sub-species of moose recognized in North America; of these, two sub-species live in Yukon. The largest of all sub-species, *Alces alces gigas*, generally occupies the northern half of the territory while the other, *A.a.andersoni*, occupies the southern half. An east-west transition zone runs through central Yukon.

The winter coat of the moose consists of a fine hairy undercoat covered by stiff black-tipped guard hairs. In late May, moose moult their winter coats. The shedding starts with the hair on the back and shoulders and continues to the rest of the body. The result is a fine, brownish summer coat. Hair colours may vary but generally the shoulders have a grizzled appearance, the lower legs are grey and the underbelly is greyish or brown. Some older bulls may appear almost black.

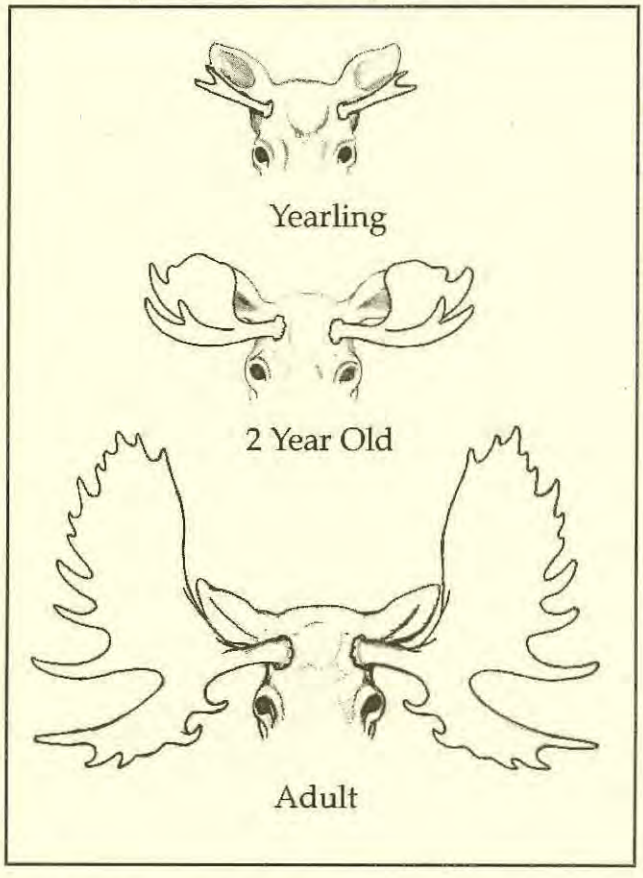
Size Comparison



A bull moose is usually larger than a cow and can measure 210 cm (seven feet) at the shoulders. Adults weigh up to 550 kg (1,200 lb.). Both sexes have long legs, humped shoulders, pendulous snouts, large ears, and a dewlap (bell) hanging from their throats.

Antlers

Female moose never grow full antlers. Bull moose grow and shed palmed antlers each year. Antlers begin to grow during the first year of life. They generally take four or five years to develop into the large shovels that characterize the mature bull moose. Bulls tend to grow their largest antlers during their sexual prime between the ages of five and 10 years. Antlers of Yukon moose can reach a spread of 150 cm (70 in.) or more.



Antler size tends to decline in older animals. Antlers begin to grow in spring; the growth continues through the summer. Growing antlers are covered in velvety skin and have a rich blood supply that provides essential nutrients. By late August, the growth is complete and the antlers have become hardened bone with no blood supply. The velvet has dried to a soft leather. In the fall, bulls can be heard crashing their antlers against willow shrubs to shed the last of the velvet in preparation for the breeding season or rut. Bull moose often eat the velvet as it is shed from their antlers.

During the rut, bulls use their antlers for ritual display to attract cows and to fend off competing bulls. Bulls with the largest antlers tend to have the most success attracting and breeding the cows. The older males generally drop their antlers in December or early January while the young bulls sometimes carry them until late February or early March.

Sex and age

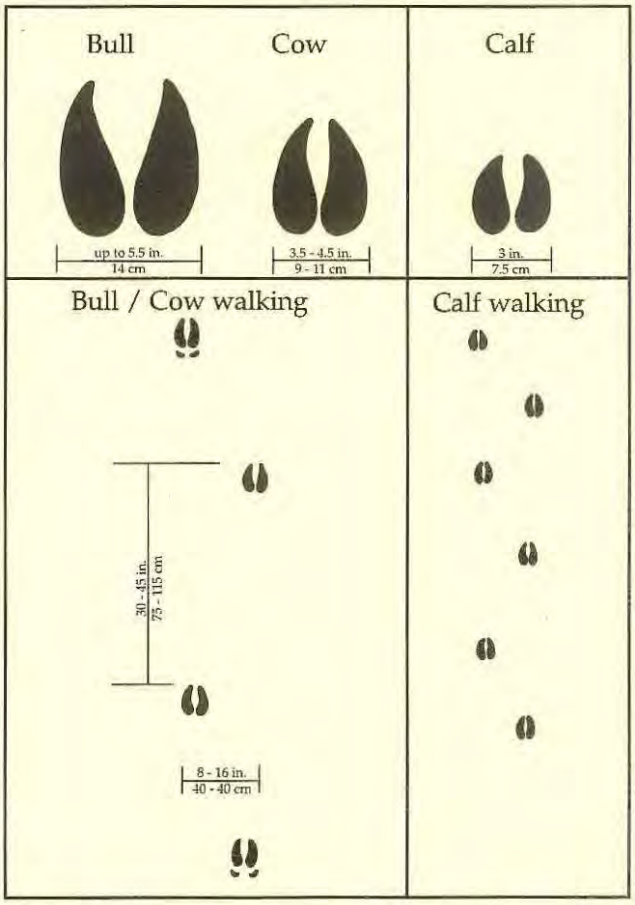
It is sometimes difficult to determine the sex of moose in late winter after the bulls have dropped their antlers. Cows are generally smaller than bulls and are distinguished by the presence of a white vulva patch just below the anus. A pregnant cow will also have a swollen underbelly.

Biologists tell the age of moose by removing one incisor or molar tooth. The root is cut lengthwise and studied under a microscope. The age of the animal is determined by counting the annual cementum rings or layers, just like counting the rings of a tree.

Yearling bulls can often be identified by their small antlers which are either single spikes, short forks or small palms. By age two, however, it is not possible to reliably estimate the age of a bull by the size and shape of his antlers.

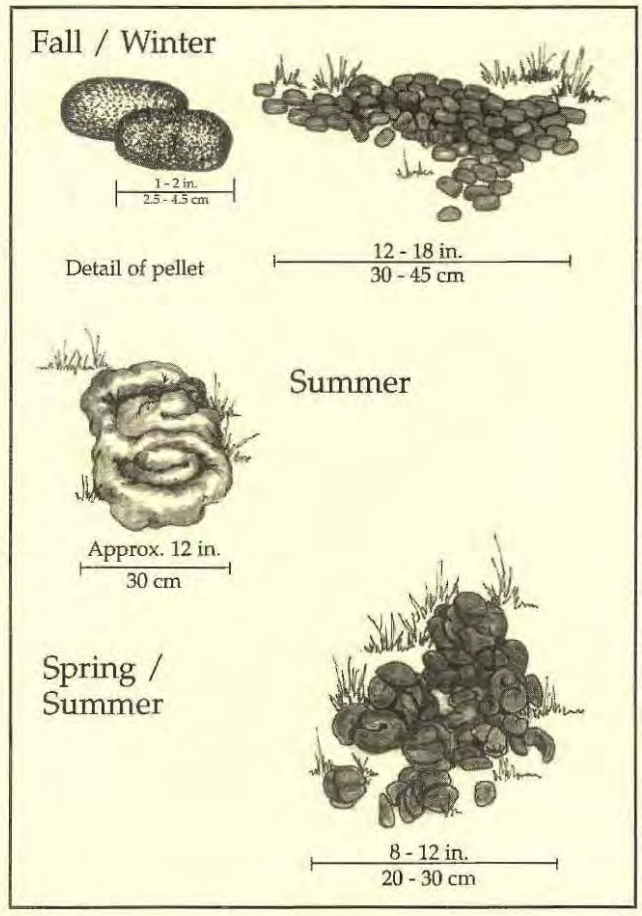
Even without seeing the animal, tracks and droppings can sometimes provide clues

Tracks



about the sex and age of a moose. Tracks can be difficult to read since they vary according to the type of soil, its wetness and the speed at which the animal was travelling. The shape of the cow moose's track tends to be long and pointed while the bull's track may be rounder or splayed at the tip. The width of a calf's track is about 7.5 cm (3 in.) in the fall; a cow's track is about 9 to 11 cm (3.5 to 4.5 in.) wide; and, a mature bull's track is up to 14 cm (5.5 in.) wide. If the animal is running in soft, moist sand, the track will show the marks of the dew claws which are small claws on the back of the hooves. The distance between each track is a good indication of the size of the animal as well as the speed at which it was travelling.

Moose Droppings



Moose droppings change dramatically from winter to summer. Dry bean-shaped pellets are dropped in fall and winter when moose are feeding on woody browse. In summer, when moose feed on fresh green vegetation with a high moisture content, the droppings merge into a large pancake similar to a domestic cow pie.

In fall and winter, moose droppings can provide hints about the animal's sex and age. Large moose pellets with small pellets nearby indicate a cow and calf are in the area. Some people believe that cow moose pellets are longer and narrower than bull pellets.

Reproduction

Moose have two distinct breeding and rutting strategies. One is a monogamous strategy common to forest dwelling moose. A male finds a female nearing her receptive period. If she accepts him, he stays with her until she is bred. After the mating, he moves on to find another receptive female. The other breeding strategy is based on harems of females defended by a dominant bull. This system is more common in moose that live in open sub-alpine areas which includes most of Yukon.

The rut

The mating, or breeding, season is called the rut. It begins in mid-September and generally lasts until mid-October. Some people believe that the first hard frost or the first full moon in September are reliable indicators of the beginning of the rut. Bull moose are very aggressive and restless during the rut. They spend much of their time searching for cows and challenging bulls with cows. They use a combination of ritualized displays of their antlers and low grunts to attract cows and intimidate other bulls that are competing for the same cows. They urinate in muddy depressions and then roll in these wallows. Hormones excreted with the urine during this period are thought to stimulate the cows to breed. When receptive, the cows respond by uttering low nasal calls.

Bulls will mate with more than one cow and it is possible to see a large bull in the company of several cows. Encounters between bulls are common but, usually, fierce battles only occur between evenly matched bulls. Hunters have reported finding the remains of bull moose with antlers locked together – both moose dead because of exhaustion and starvation.

Younger bulls are generally intimidated by the larger, more experienced bulls and back down without a fight. They seldom have the opportunity to breed until they are four or five years old.

Pregnancy

Cow moose generally mate for the first time when they are two and a half years old. Some cows may breed as yearlings if the habitat and conditions are good. A cow accepts a male during a critical 24-hour period of oestrus, when one or more eggs are released. If the cow is not bred during her first heat or receptive period, she will come into heat again in about three weeks. If the cow is bred during her second or third heat, her calf will be born later in the summer. The late calves tend to be smaller going into their first winter and have lower survival rates than those conceived during the first heat. The gestation period or pregnancy for moose is roughly 245 days.

Calves are born in late May or early June. Twins are often seen and on rare occasions triplets may be born, but the chance of all three calves surviving to adulthood is slim. Cows use a variety of habitats for calving. They seek sites that provide hiding cover for the calves, abundant browse for the cow, and open approaches so that predators can easily be spotted. They guard the new born calves for several weeks until the calves are strong enough to travel. Cow moose are very protective and will defend their young against all predators including people. Moose calves are wobbly and awkward during the first few weeks of life, but quickly gain strength. Calves weigh about 15 kg (30 lb.) at birth and double in weight in approximately three weeks. They will remain with their mothers for about one year. When the mothers are ready to mate again they drive the young moose away.

Behaviour

Moose are generally solitary animals except during the rut and during periods in the winter when several may congregate in feeding areas. They exhibit seasonal migration patterns, generally seeking higher elevations in early winter after the rut and descending into valley bottoms as snow depths increase in the high country. When snow depths do not exceed 40 to 50 cm (15 to 18 in.) moose often stay in the rich browse areas of the sub-alpine. At snow depths of about 80 cm (30 in.) or more, they may congregate in smaller areas of relatively abundant food and cover called yards. Moose yards are not common in the Yukon.

Moose are most active at early dawn and dusk. They spend most summer days bedded down in the shade, chewing their cud. Cud is partially digested food which is regurgitated, re-chewed and swallowed for a second digestion. Moose move less on windy days and are more active just after stormy weather. They have excellent senses of hearing and smell which they depend on more than their eyesight. Moose are quick to flee from the slightest noise. A breaking branch or a loud sound can seem to be a threat.

During rutting season, moose are less cautious and more aggressive. They have been known to approach a person running a chainsaw or chopping wood, sounds which may be similar to another bull raking its antlers in a challenge. Despite their size, moose can move quietly and gracefully through the boreal forest.

Willow, aspen, birch and balsam poplar are major foods in the winter diet of moose which straddle small trees and ride down the taller stems to reach the top branches. Their diet in spring and summer includes many aquatic plants, forbs, grasses and the new foliage of many of the trees they eat in winter. Their favourite summer food is aquatic vegetation and they go to great lengths to obtain these wetland plants, even diving for several minutes under water.

Factors Limiting Populations

Predators

Research in Yukon and Alaska shows that predation is the most important factor limiting the size of northern moose populations. Grizzly bears and wolves are the major moose predators. Grizzly bears take about 40 per cent of calves within their first eight weeks of life. This is the most significant cause of moose calf mortality. Compared to grizzly bears, wolves take more of the calves older than one month. About 80 to 90 per cent of calves die before their first birthday.

Grizzly bears and wolves are also the most significant cause of adult moose mortality. Studies in Yukon and Alaska show that 10 to 20 per cent of the adult moose population dies each year. Information collected from collared moose shows that 40 per cent of the adults that die are killed by wolves and 20 per cent are killed by grizzly bears. Hunting is responsible for up to 25 per cent of the adult losses.

Overall, predation by grizzly bears and wolves is responsible for 75 per cent of all mortality in moose populations. Hunting accounts for nine per cent of all deaths and the remainder result from a wide range of diseases, accidents and injuries.

Habitat

In boreal forest ecosystems, where moose, wolves and grizzly bears coexist, habitat does not normally limit moose populations. In these systems, predation generally keeps moose densities in the range of 100 to 250 moose for each 1,000 km^2. In the absence of predators, moose survival is limited by food availability. In these areas moose densities may reach 1,000 to 2,000 moose for each 1,000 km^2.

Predation generally keeps moose populations at densities well below what the habitat can sustain, but high quality habitats often contain more moose than poorer quality habitats. For example, one of the highest moose densities recorded to date was in the Teslin Burn in 1982. At its peak, this high quality post-fire environment had about 500 moose for each 1,000 km^2. Unburned adjacent habitats generally had from 150 to 250 moose for each 1,000 km^2.

Loss of habitat due to the encroachment of human development poses a significant threat to moose populations in some southern Yukon areas, but this does not appear to be a significant problem elsewhere. Still, it is an increasing concern as human development expands throughout the territory.

Common Parasites, Diseases and Injuries

Moose can suffer from many diseases, parasites and injuries, but these things do not appear to cause the deaths of significant numbers of moose in the Yukon. The effect of these mortality factors is limited by the Yukon's climate, geography, natural predators, low human population, small numbers of domestic animals, and few roads.

Although the Department of Renewable Resources does not have a formal testing program for moose parasites and diseases, moose samples from different sources are often sent to southern laboratories for analysis to broaden current knowledge of moose health conditions. On the basis of these tests, as well as common sense, it is assumed that the parasites and diseases found in Alaska, Northwest Territories and northern British Columbia can also be found here, although perhaps not to the same extent.

In the Yukon, healthy predator populations reduce the spread of diseases by removing many sick moose. Scavengers, such as wolverine and ravens, clean up most of the remains. The cold and dry climate of Yukon also helps to reduce the possible spread of diseases and parasites.

Diseases and parasites that live inside a host body can survive Yukon winters. Other parasites such as ticks, and some disease-causing bacteria and viruses, can not survive the extremes of the northern climate outside a host body. For example, the winter tick (*Dermacentor albipictus*), a common moose parasite in the south, is rare north of 60°.

Parasites

The tapeworm completes part of its life cycle in the body of a carnivore (meat-eating animal). The carnivore ingests the parasite when it consumes contaminated meat. The eggs of the tapeworm are returned to the open environment through the feces of the carnivore where they can infect another moose. This cycle also has significant consequences for human health.

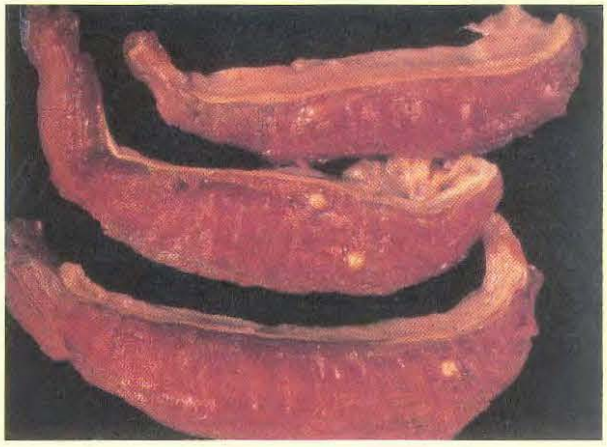


Figure A - *Taenia krabbei* in meat

Figure B - *Taenia krabbei* in heart

Figure C - Hydatid cysts of *E. Granulosus*

Figure D - Hydatid cysts of *E. Granulosus*

Figure E - *Onchocerca cervipedis*

Figure F - Fibroma on a moose leg

Photo credits - University of Saskatchewan

There are many different types of tapeworms in the Yukon. The types most commonly found are the larval tapeworms of *Taenia krabbei* and *Taenia hydatigena*. Both of these tapeworms have life cycles that require two hosts, or animal-carriers. The *Taenia krabbei* cysts are commonly found in the muscle mass and can range from the size of a grain of rice to the size of a pea **(Figure A & B).** These cysts are a sack of white fluid that contains a small grain. The grain is attached to a clear tail-like membrane. In a heavily infected animal, cysts may occur in every cubic inch of muscle. They may change the meat's appearance or make it unpalatable, but they are not infectious to humans.

The cysts of another tapeworm, *Echinococcus granulosus*, are sometimes found in the lungs or liver of moose and other ungulates **(Figure C).** These cysts of larval tapeworms, also called *hydatid cysts*, can range from the size of a grape to the size of a grapefruit. They can give the infected organ a lumpy appearance that looks similar to a bag of marbles **(Figure D).**

These cysts are not directly infectious to humans but infected meat should never be fed raw to dogs. The dog will replace the wild carnivore as the host in the life cycle of the parasite, and the person can take the place of the moose. A dog owner raking the yard in the spring can easily inhale the eggs contained in the dog's feces or ingest the eggs through the mouth from the hands after petting the dog. These tapeworms do not cause serious difficulties to the moose or the carnivore except in extreme cases. They can, however, cause severe problems in people. Some people have had portions of a lung removed to eliminate tapeworm cysts. These cysts could also develop in the brain or other organs.

To be safe, never feed raw wild meat to domestic animals.

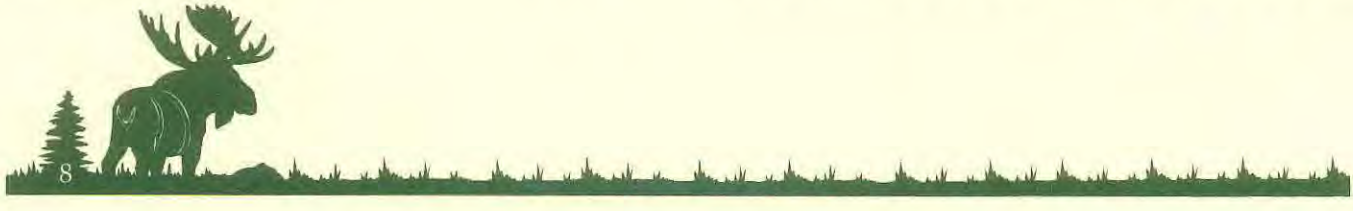
A tapeworm called *Moniezia* has been found in the small intestine of at least one Yukon moose. This tapeworm can mature into an adult of up to six metres inside the moose. It spends its larval stage in a small mite that clings to vegetation with which it is consumed. *Moniezia* is not considered dangerous to people.

Another parasite often encountered is the leg worm called *Onchocerca cervipedis*. This thin, hair-like, white worm is commonly found in tangled clusters just under the skin of the lower legs **(Figure E).** Its life cycle in Yukon has not been studied, but in other parts of North America it is transmitted by blackflies. Although commonly found in moose, it does not appear to cause problems for the animal, nor is it known to affect people.

Diseases

Warts or papillomas caused by a virus afflict Yukon moose just as they do other mammals. The warts can vary in appearance and size from small, grainy, dark lumps up to football-sized growths **(Figure F).** Warts only become a health problem when they are large or numerous enough to affect a part of the body so severely as to decrease its function. There is no known danger to people resulting from contact with these warts.

Moose can get a disease called lumpy jaw that affects the mouth. Evidence of this disease, common in wild sheep, has been found in one Yukon moose. The disease is similar to an abscessed tooth in humans. It is caused by a bacterial infection in the jawbone starting around the teeth. The bone erodes as the infection spreads and is



replaced with new bone that attempts to maintain the structure. The result is a deformed jaw often missing teeth. There can be holes or large chambers in the bone. Only in extreme cases, when the jaw is broken or the animal is unable to eat, is this condition thought to be fatal.

Accidents and injuries

Moose are injured in many ways.

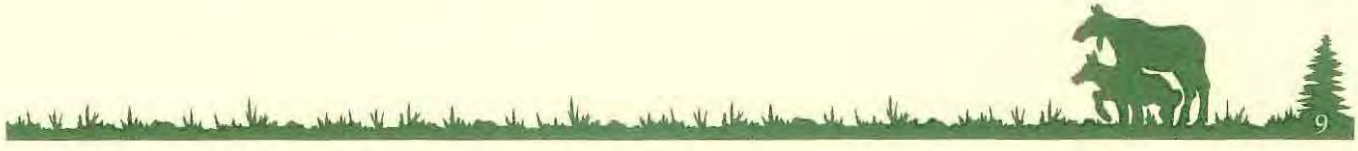
Calves can drown in swollen creeks during spring. Very small calves have been seen swimming for long periods in icy lakes near a cow that took to the water to avoid a bear.

Moose can suffer from a wide range of broken bones.

Scars on bulls from old battle wounds and close calls with predators often grow white hair instead of the normal brown, a permanent record of the event.

A number of moose are killed or injured every year on Yukon roads.

There is one record of a moose that was electrocuted when it touched a broken power line. A sow black bear and her cub also suffered the same fate when they discovered the carcass.



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* date and time

* location

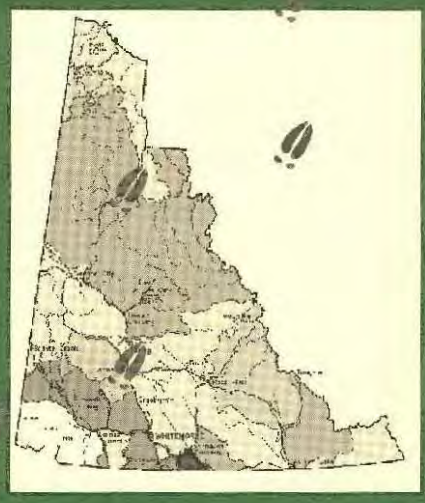
* number of people involved

* description of the people

* description of the vehicle and licence plate number

* details of the violation or activity

Please record this information in the space provided on the back of your hunting licence. When you reach a phone you can call a Conservation Officer or the TIP line at 1-800-661-0525 and report the details of the offence. You'll be helping the wildlife conservation effort and you may be eligible for a significant cash reward.



Distribution Status and Harvest

A Brief Description of the Yukon Landscape

The Yukon lies within the North American cordilleran region, a mountainous area stretching along the western side of the continent from Mexico to the Arctic Coast. The Yukon River and its major tributaries have created broad valleys separated by rolling hills and plateaus through the central part of the territory. Boreal forests, composed mainly of spruce and pine trees, cover these valley bottoms, hills and mountain slopes to an average elevation of about 1,300 metres (4,200 ft.). North of the Arctic Circle, forests are confined to narrow strips running alongside major rivers. A narrow coastal plain lies between the British Mountains and the Beaufort Sea.

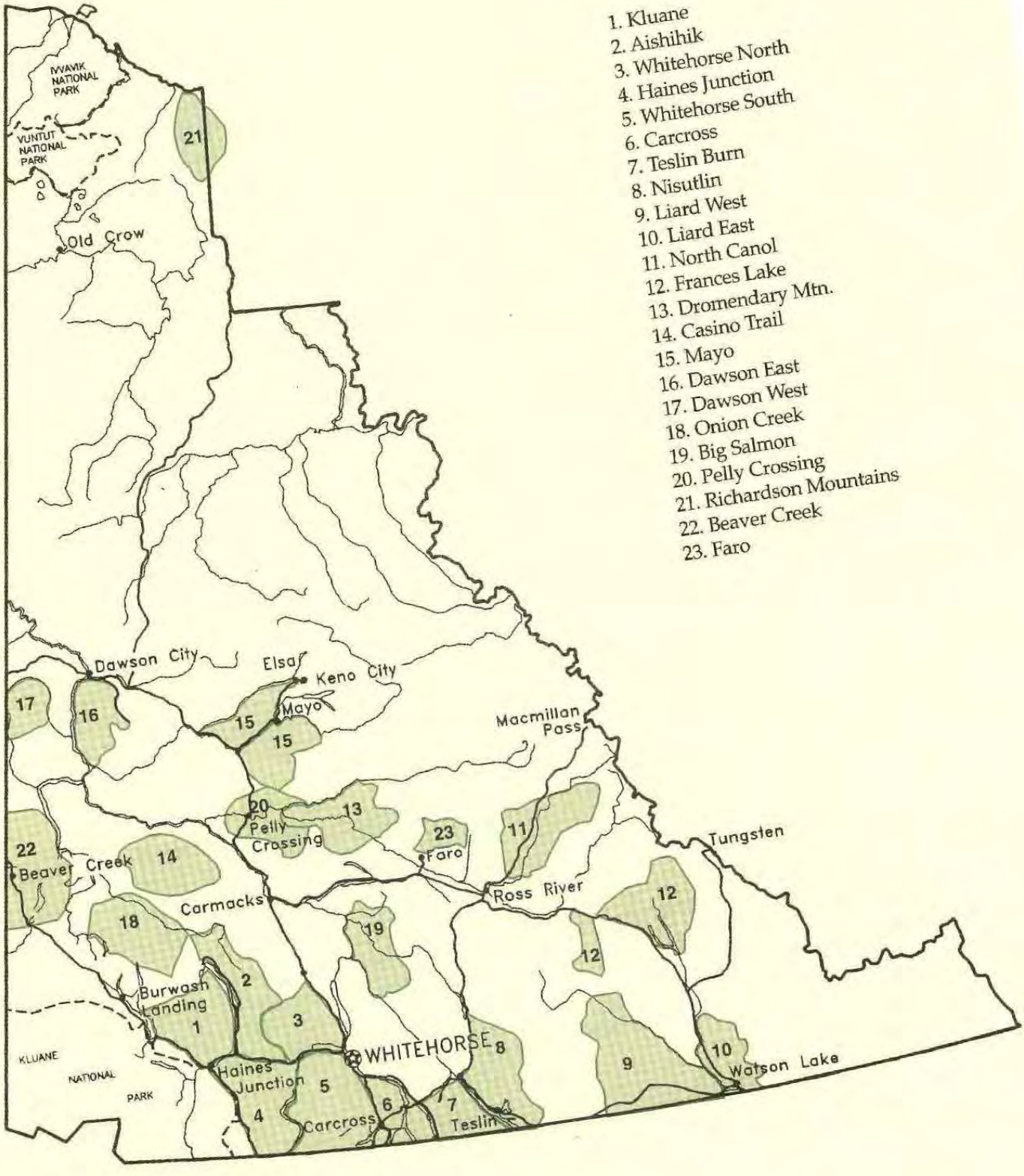
About 40 per cent of the Yukon's total surface area of 483,450 km^2 is forested; slightly less than one per cent is covered with freshwater. The remaining surface is covered with sub-alpine shrubs, alpine and arctic tundra, rock and ice.

Most of the Yukon was covered by glaciers and ice sheets as recently as 10,000 years ago. Glaciers created many of the landforms we see today including jagged mountain peaks, U-shaped valleys, pothole lakes, snake-like ridges called eskers, and piles of rubble called moraines.

The last Ice Age also had an affect on the evolution of moose. The Alaska-Yukon sub-species (*Alces alces gigas*) evolved in an ice-free area in the north-central Yukon and Alaska, known as Beringia, where it was isolated from other sub-species.

Approximately 80 per cent of the Yukon landscape is classified as wilderness, compared to an estimated three per cent of Europe. The human population of about 31,000 residents is concentrated in Whitehorse, the smaller communities and along roadway corridors. The rest of the land is home to subarctic wildlife populations, including about 65,000 to 70,000 moose.

Moose Survey Areas (1981 to 1998)

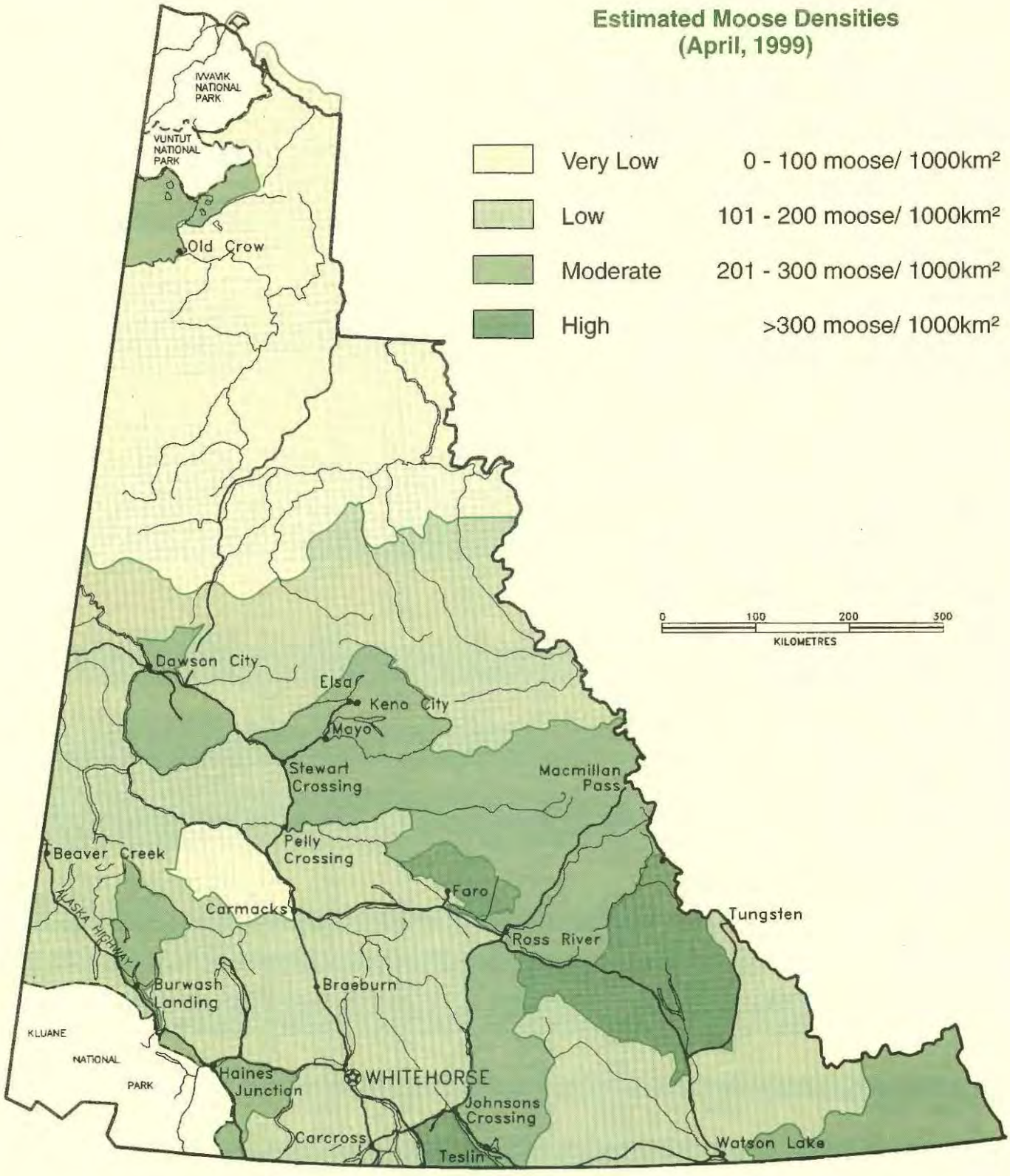


1. Kluane
2. Aishihik
3. Whitehorse North
4. Haines Junction
5. Whitehorse South
6. Carcross
7. Teslin Burn
8. Nisutlin
9. Liard West
10. Liard East
11. North Canol
12. Frances Lake
13. Dromendary Mtn.
14. Casino Trail
15. Mayo
16. Dawson East
17. Dawson West
18. Onion Creek
19. Big Salmon
20. Pelly Crossing
21. Richardson Mountains
22. Beaver Creek
23. Faro

Summary of Yukon Moose Survey Results (1980 - 1998)

Survey Area		Year	Population estimate	Number of moose in each 1000 km²	Estimated bulls for each 100 cows	Estimated yearlings for each 100 cows	Estimated calves for each 100 cows	Population status (P) = predicted (O) = observed
Kluane	3755 km²	1981	434	120	54	27	17	Increase 1992-98 (P)
Aishihik	3662 km²	1981	377	107	66	31	23	
		1990	301	82	62	21	53	
	2020 km²	1992	126	64	61	15	11	Slow decline 1981-92 (O)
		1998	349	173	85	30	51	Rapid Increase 1992-98 (O)
Whitehorse North	3108 km²	1982	533	170	45	1	6	
		1993	403	123	117	20	53	Stable to slow decline (O)
Haines Junction	2349 km²	1981	589	251	34	21	38	Decline 1981 - 84 (O)
		1982	351	150	37	3	11	
		1983	346	147	32	1	7	
		1984	330	141	47	1	18	Increase 1984 - 90 (O)
		1990	509	218	49	30	42	Stable to decline 1990-98 (O)
Whitehorse South	2671 km²	1981	608	218	31	25	21	
		1982	674	252	34	6	25	
		1983	654	245	41	4	30	
		1986	715	283	27	18	31	Slow increase 1981-86 (O)
		1995	457	159	58	28	42	Decline1986-95 (O)
Carcross	927 km²	1980	406	443	51	41	37	
		1982	320	345	73	2	8	
		1983	171	184	51	7	4	
		1994	118	127	70	18	19	Decline 1980-94 (O)
Teslin Burn	2512 km²	1982	1,383	550	39	12	19	Decline 1982-84 (O)
		1984	1,051	417	66	13	39	Decline 1984-98 (P)
Nisutlin	4270 km²	1986	559	131	88	36	48	
		1994	1,017	235	74	19	52	Increase 1986-1994 (O)
Liard West	7217 km²	1983	829	115	71	18	18	
	4380 km²	1995	827	189	43	34	47	Increase 1983-95 (O)
Liard East	2210 km²	1986	305	138	79	37	51	Stable/Slow increase (P)
North Canol	2744 km²	1987	512	187	66	50	64	
	2954 km²	1991	988	335	90	38	52	Rapid increase 1987-91 (O)
		1996	820	277	102	41	28	Stable to Decline 1991-96 (O)
Frances Lake	3894 km²	1987	741	190	56	65	69	
		1991	1,454	376	57	42	44	Rapid increase 1987-91 (O)
		1996	1,323	338	46	18	30	Stable to Decline 1991-96 (O)
Dromedary Mtn.	3540 km²	1982	230	65	37	1	14	Increase (P)
Casino Trail	3055 km²	1987	137	45	①	①	①	Stable (P)
Mayo North	2235 km²	1988	286	128	59	42	68	
Mayo South	2616 km²	1988	387	148	76	11	56	
Mayo	3073 km²	1993	372	122	82	18	51	Stable 1988-93 (O)
		1998	615	200	70	37	58	Increase 1993-98 (O)
Dawson East	2565 km²	1989	691	269	65	41	76	
		1997	626	244	68	39	36	Stable 1989-97 (O)
Dawson West	1870 km²	1989	313	168	105	25	45	Stable to slow decline (P)
Onion Creek	3394 km²	1992	416	122	49	12	21	
		1998	999	294	67	22	18	Rapid Increase 1992-98 (O)
Big Salmon	2698 km²	1993	527	195	71	17	50	
		1998	526	195	68	41	49	Stable 1993-98 (O)
Pelly Crossing	3581 km²	1995	748	209	62	31	85	Increase (P)
Richardson Mtns.	9367 km²	1989	283	30	108	②	41	Increase (P)
Beaver Creek	5492 km²	1998	951	173	83	n/a	27	Stable (P)
Faro	967 km²	1997	566	586	30	29	35	
Yukon Wide	483,000 km²		70,000	150	70	27	40	Stable or Slow increase (P)

① Sample size too small to calculate ratios.
② Classified as adults.


Estimated Moose Densities
(April, 1999)
Very Low 0 - 100 moose/ 1000km²
Low 101 - 200 moose/ 1000km²
Moderate 201 - 300 moose/ 1000km²
High >300 moose/ 1000km²
0 100 200 300
KILOMETRES
IVVAVIK NATIONAL PARK
VUNTUT NATIONAL PARK
Old Crow
Dawson City
Elsa
Keno City
Mayo
Stewart Crossing
Macmillan Pass
Pelly Crossing
Beaver Creek
ALASKA HIGHWAY
Carmacks
Faro
Tungsten
Ross River
Burwash Landing
Braeburn
KLUANE NATIONAL PARK
Haines Junction
WHITEHORSE
Johnsons Crossing
Carcross
Teslin
Watson Lake

Distribution and Status

Moose can be found wherever suitable habitats occur. Depending on the seasons, moose will select a variety of habitats, from wetlands to willow-covered mountain slopes, ranging across Yukon from the Liard River to the Beaufort Sea. In areas of deep winter snow accumulation moose migrate hundreds of kilometres from summer feeding areas to the shelter of mature conifer forests. Where there is low accumulation of snow, moose tend to stay in the same area year-round.

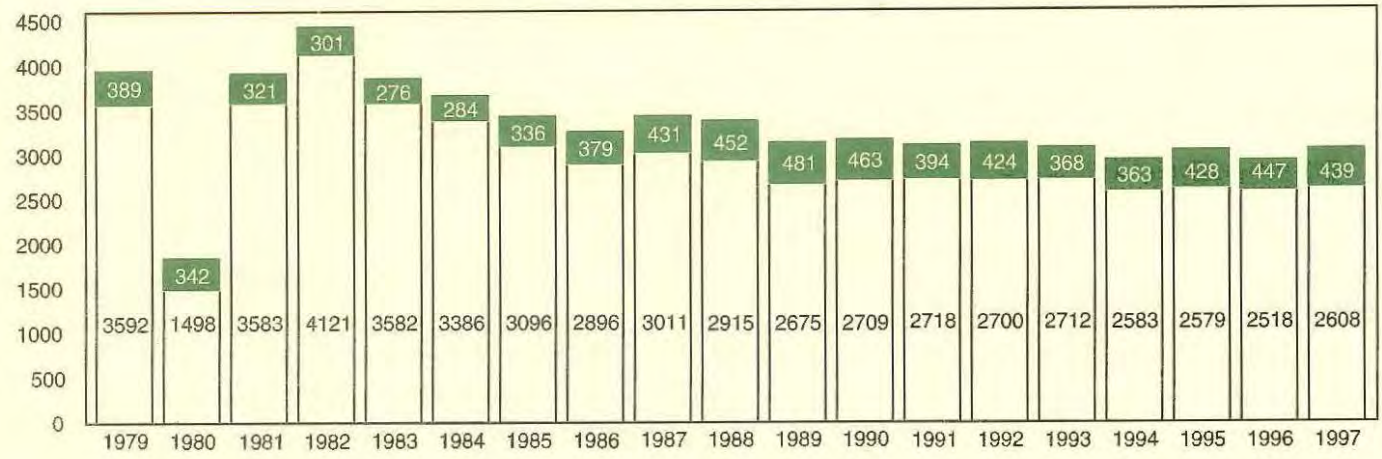
In general, moose population densities are higher in the southern Yukon than in the north. Southern habitats tend to be more productive because of longer warmer summers and greater precipitation but, in a few high quality habitats in northern areas such as the Old Crow Flats, moose densities can rival even those found in the south.

Historical information on moose population abundance is sketchy. Traditional knowledge suggests that moose may have been scarce, at least in some areas of Yukon, at the time of the arrival of the first white men in the mid 1800s. Other sources suggest that moose may have been much more abundant from the 1930s to 1960s than they are now. The reasons for a shift in moose distribution and abundance throughout Yukon are not known, but may have been influenced by different factors. The northward expansion of moose populations from the mid- to late-1800s to the present may have been caused by the climatic warming and changes to habitat that have resulted from human activity since that time. The greater number of moose in the 1930s through 1960s may have been due partially to predator control programs at that time.

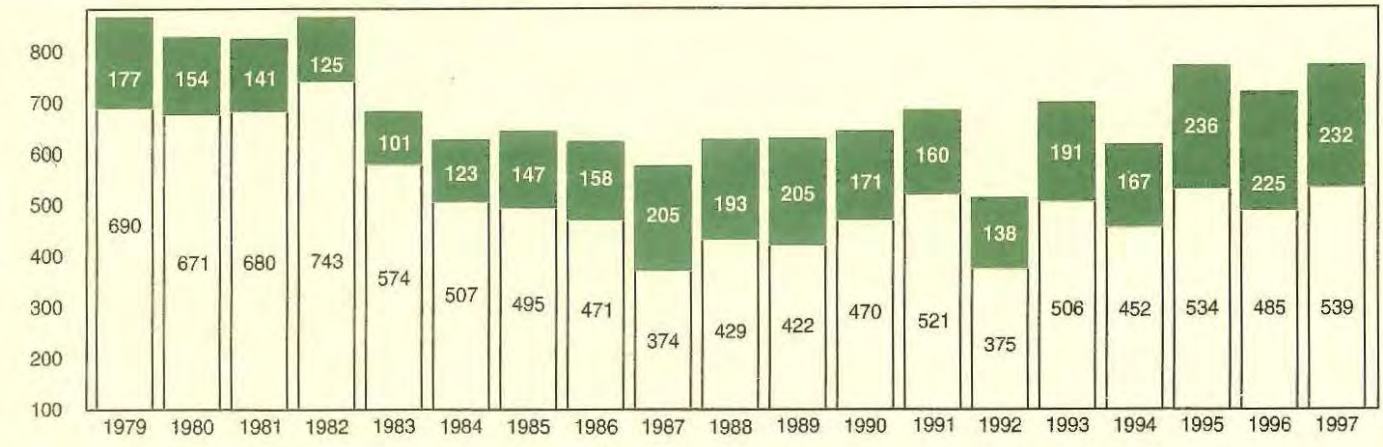
Overall, Yukon's moose populations are thought to be stable or increasing slowly. The trends in moose abundance are variable across the territory. Populations increase when times are good and many young survive to become adults. This may occur in years of early spring or when the habitat provides extra abundant food sources. Populations decline when few calves survive or many adults die. Late springs, habitat changes that produce less or lower quality forage, and increased numbers of predators can contribute to a population decline.

Between 1980 and 1998, 23 moose populations were surveyed at least once. Of these, 15 moose populations are currently considered stable or increasing and eight populations are stable or declining. As of 1998, the total area surveyed is approximately 84,000 km^2 or about 20 per cent of the Yukon's surface. Current population densities range from 45 moose for each 1,000 km^2 in the Carmacks/Casino Trail area to greater than 350 moose for each 1,000 km^2 in the Faro and Finlayson Lake area. The average moose density in the Yukon is about 150 moose for each 1,000 km^2. There are about 65,000 to 70,000 moose in Yukon or about two moose for every person.

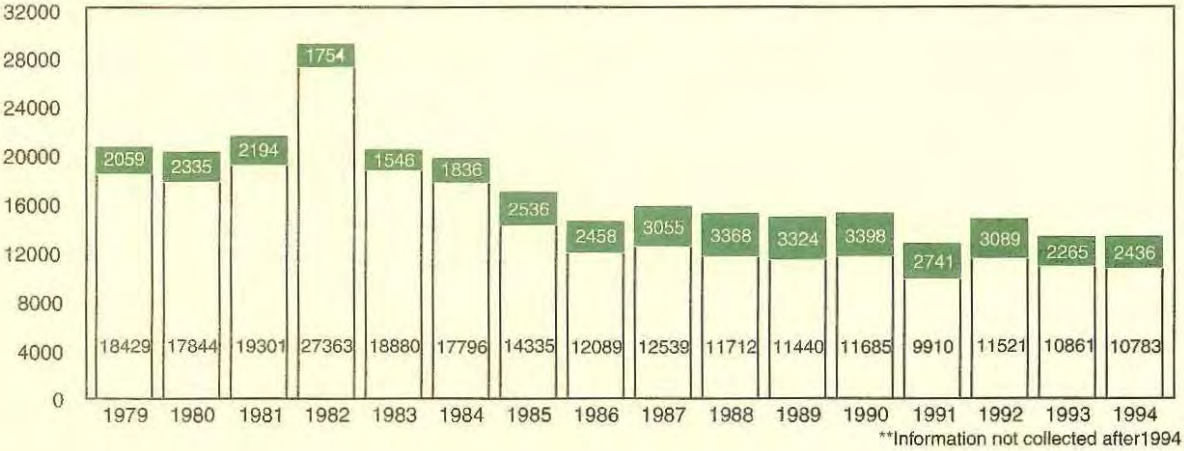
Number of moose tags sold* (1979 - 1997)



Number of moose harvested* (1979 - 1997)



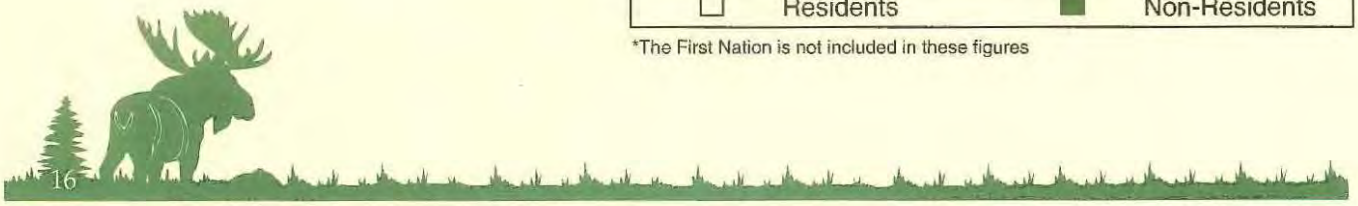
Number of days spent hunting for moose* (1979-1994)



**Information not collected after1994

☐ Residents ■ Non-Residents

*The First Nation is not included in these figures



Harvest Patterns and Trends

Moose is the most harvested big game species in Yukon. An average of 3,000 resident and non-resident hunting licences for moose were sold annually from 1993 to 1997. This represents 35 per cent of all big game hunting licences sold. Between 1990 and 1994 hunters spent an average of 14,000 days each year hunting moose. This is 60 per cent of the total days spent hunting all types of big game.

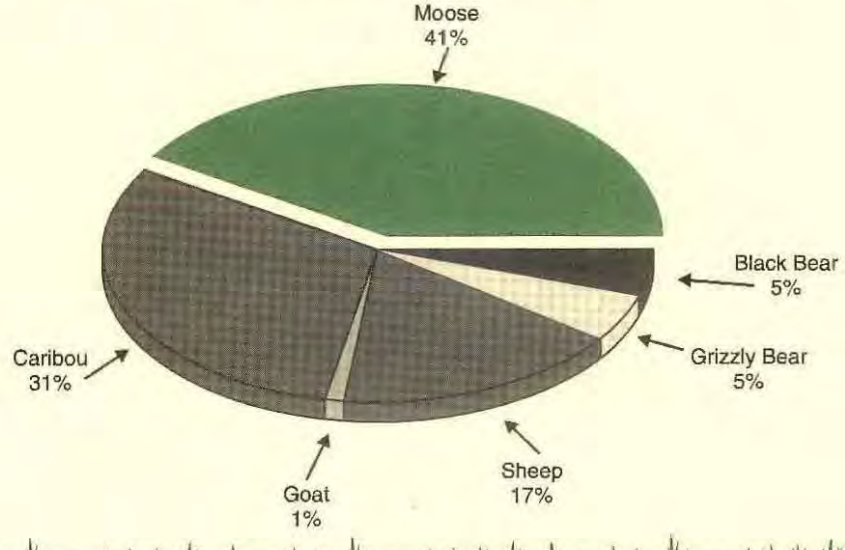
Resident and non-resident hunters report harvesting an average of about 710 moose annually, according to information gathered from 1993 to 1997 surveys. This represents 41 per cent of all big game animals harvested by resident and non-resident hunters. Residents harvest about 70 per cent of the moose. Managers consider the First Nations harvest to be equal to that of resident hunters. Assuming that it is, the actual moose harvest in the Yukon is about 1,000 to 1,300 animals or about two per cent of the total population.

According to current moose management guidelines, an overall harvest rate of three to four per cent is considered sustainable. This represents an annual harvest of 2,000 to 2,800 moose.

Although moose remain the most frequently hunted big game species in the Yukon, residents' interest in hunting moose has shown a general decline since the late 1970s when record keeping began. In 1982, over 4,000 moose hunting licences were sold to resident hunters. By 1988, that number had dropped to less than 3,000. Since then the number of moose hunting licenses for resident hunters has held steady between 2,500 to 2,750.

The total number of days spent hunting moose by resident hunters has also declined from a peak of 27,400 days in 1982 to a low of 9,900 days in 1991. In 1982, each resident hunter spent an average of nine days hunting moose. In 1991, the average was fewer than 6.5 days. Information on days hunted was not collected after 1994.

Breakdown of Big Game Harvest by Species
(Average 1993 - 1997)



The total annual moose harvest by resident hunters also showed a general decline during the 1980s. In 1982, a total of 743 moose were harvested by resident hunters.

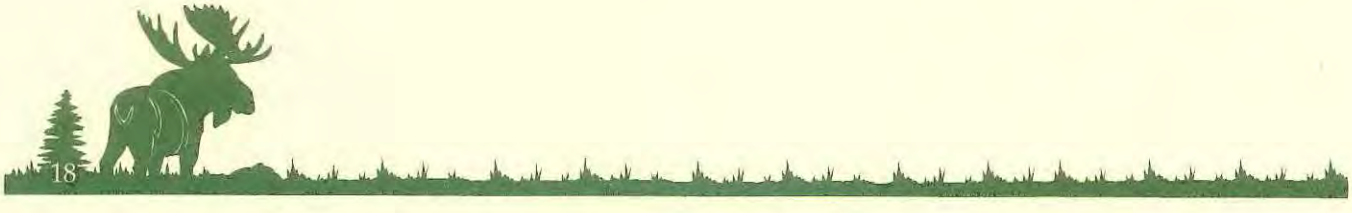
By 1987 the harvest had declined to 374 moose. Since 1987 the harvest has increased again to about 530 moose in 1995 and 1997.

Relationship between moose harvest and hunter effort* (Average 1990 - 94) **

	Resident	Guided Non-Resident	Total
Number of moose shot per year	467	165	632
Number of active hunters	1629	341	1970
Percentage of successful hunters	28.6%	48.4%	32%
Number of days per hunter	6.2	8.2	7
Days hunted per moose shot	23	17	22

*The harvest by First Nations is not included in these figures.

** Hunter effort (days hunted) not available after 1994.



Recreation and Subsistence Use

Hunting

Each year, non-aboriginal hunters report taking from 600 to 800 moose. Assuming that First Nation hunters take another 400 to 500 moose, the total estimated annual harvest is 1,000 to 1,300 moose. This means that moose provide about 250,000 kg (550,000 lb.) of high quality meat to Yukoners each year.

Yukon hunting regulations identify three hunter groups - First Nations, residents, and guided or outfitted non-residents. Harvesting rights are different for each hunter group and harvest information is gathered through different systems.

First Nation hunters

Before First Nation Final Agreements were negotiated, all aboriginal people had a legal right to hunt anywhere in the Yukon, at any time of year, for any species except those declared in danger of extinction (elk, bison, mule deer and muskox).

First Nation Final Agreements protect Yukon Indian peoples' right to hunt for food inside their own traditional territory, but not inside the traditional territory of another First Nation. To hunt inside the traditional territory of another First Nation, a Yukon Indian person must get permission from that First Nation, or get a hunting licence and follow the regulations described in the hunting synopsis. Final Agreements also allow First Nations to restrict subsistence hunting by their members and other Yukon Indian people to ensure wildife is used on a sustainable basis. (These rules only apply to First Nations that have Final Agreements in place, and are not a complete summary of harvesting rights.)

Moose harvests by First Nations people before 1987 are not well documented. First Nation hunters did not need licences and most did not complete hunter questionnaires as resident hunters did. In 1987, a voluntary harvest reporting system, based on community hunter interviews, was initiated for First Nation hunters. The Selkirk First

Nation, Liard First Nation, Ross River Dene Council, Teslin Tlingit Council, Vuntut Gwitchin First Nation and Tr'on dek Hwech'in First Nation took part in this new reporting system during the first year. In 1988, the Kwanlin Dun, Carcross-Tagish, Champagne and Aishihik, and Kluane First Nations also participated. In 1989, the Little Salmon/Carmacks First Nation joined the voluntary reporting program. The number of First Nations participating has fluctuated for a number of reasons, until 1994, when the program was cancelled as a result of the settlement of land claims.

Under the land claims agreement, First Nations have the authority and responsibility to collect harvest information for their members. Several have initiated their own reporting system. In an effort to standardize reporting systems to enable the sharing of information, The Yukon Fish and Wildlife Board is taking the lead in the development of a common system for all hunters. This sytem is currently being developed in consultation with all First Nations, Renewable Resource Councils and The Yukon Department of Renewable Resources. It is anticipated that this system will be in place by the year 2000.

Resident hunters

To qualify for a resident hunting licence, a person must have lived in Yukon for one full year. Hunting is a privilege, not a right. A number of responsibilities come with this privilege.

All residents who wish to hunt must have a valid licence. Hunters also need to buy a tag for each big game species they plan to hunt. Hunters must obey hunting seasons and bag limits. Moose hunting season for residents is from August 1 to October 31. The limit is one bull for each licensed hunter. Registered trappers have an extended season and may take one moose on their trap line until January 31 if they have not harvested a moose during the regular season.

Since 1979, residents have reported their big game harvests through an annual mail-in questionnaire. The questionnaire asks about the location of the hunt, the number of days spent hunting, and whether or not the hunt was successful. The response rate was between 60 and 70 per cent until the questionnaire became mandatory in 1995. The mandatory requirement ensures that accurate and complete moose harvest information is available to wildlife managers. Hunters must provide information on their hunting activities before they are issued a hunting licence for the following year. This system is currently under review.

Non-resident hunters

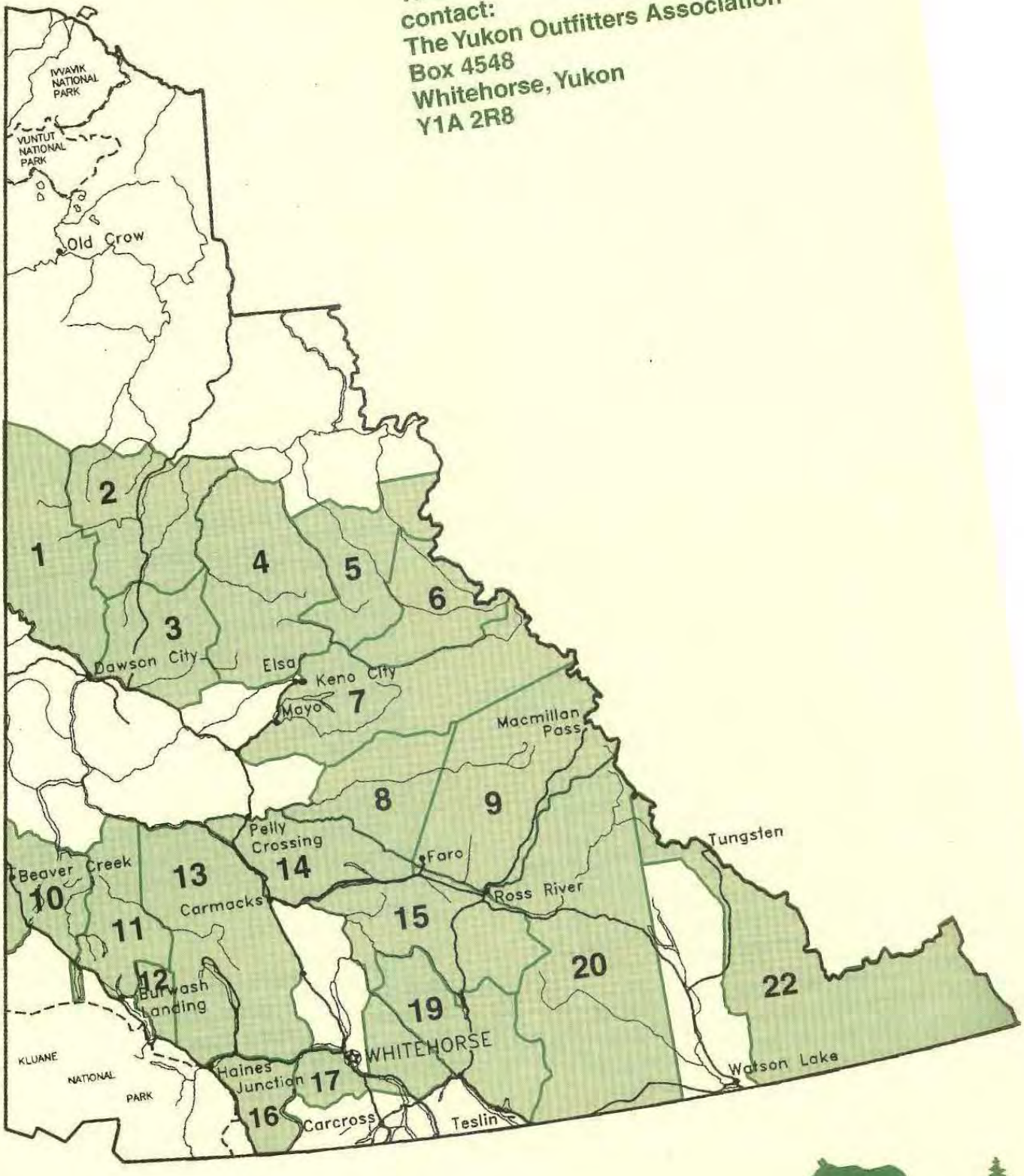
Non-residents are people who do not reside in Yukon or those who have not lived here a full year before applying for a hunting licence. Besides licences and permits to hunt, non-residents must be guided by a Yukon resident who has a Special Guiding Permit, or by a professional big game outfitter. There are 20 big game hunting outfitters in Yukon.

Cadmium in livers and kidneys

Research on contaminants in wild foods has shown that moose livers and kidneys can contain cadmium, a toxic heavy metal that comes from natural sources. Yukon Health and Social Services recommends a consumption limit of one moose liver and one kidney per person each year.
There is no limit on the amount of moose meat that can be safely eaten.

Big Game Outfitting Concessions

For more information on Yukon Big Game Outfitting Concessions contact:
The Yukon Outfitters Association
Box 4548
Whitehorse, Yukon
Y1A 2R8



Non-resident hunters are required by law to report their harvest directly to the Fish and Wildlife Branch. They must also pay trophy fees for each animal they harvest. They are subject to the import regulations of their own country.

Hunter education and ethics

Ethics are standards that govern a person's behaviour at all times. Respect is the foundation of ethics; respect for other people, property and for all living things and their environment. Greater demands are being placed upon wildlife and its habitat. We all share responsibility for our environment. Hunting is a privilege that must be taken seriously to ensure opportunities for the next generation.

Hunters should consider many factors when choosing where to hunt.

- They need information about the areas they are considering for their hunt.
- They must have the proper equipment and adequate time to care for the meat.
- They need the right calibre firearm for a quick and humane kill.
- Hunters who don't need a whole moose should hunt with a partner or share the meat with someone who needs it.

The Hunter Ethics Education Program (HEED) of the Department of Renewable Resources offers a workshop that deals with hunting ethics, wildlife management and firearm safety. The workshop also provides tips on how to choose the right equipment, field techniques, survival, first aid, and legal responsibilities.

Videos are also available from Yukon Department of Renewable Resources, Field Services Branch on hunting techniques, field dressing of game and meat care.

Viewing

Wetlands are great habitats to see moose feeding in spring and summer. In the fall, sub-alpine slopes covered with willows and shrub birch provide the best viewing opportunities. During winter, most moose are in boreal forest areas where willow and aspen provide food, and spruce and pine trees provide protection from the weather.

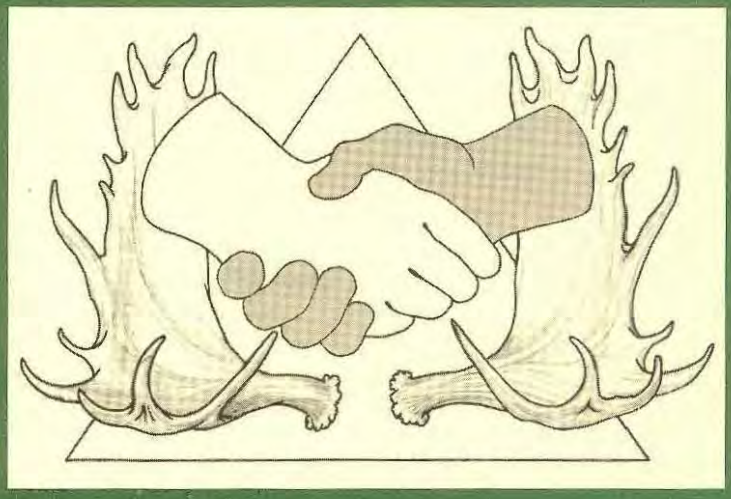
Moose, like most wildlife species, are more active at dawn and dusk. Binoculars help people scan sites where an animal may be hiding. They make it possible for viewers to get a closer look without scaring away the animal or endangering themselves. Moose should never be approached too closely. Cow moose, in particular, do not tolerate intruders and may charge to protect their calves.

There are as many good places to see moose as there are appropriate habitats. Good summer viewing areas include: the Nisutlin River and Bay near Teslin; the Dezadeash Trail in Haines Junction; the Nordenskiold River along the Klondike Highway south of Carmacks; the wetlands of the Devil's Elbow on the Silver Trail Highway near Mayo; and, Two Moose Lake at km 102 (mi 63.4) on the Dempster Highway.

In fall and winter, moose viewing is good in the Ibex valley near Whitehorse, in the valleys of Kluane National Park, along the Haines Road and in the valleys of the Frances Lake area.

Droppings, tracks, grazed willow shrubs and trembling aspen trees or even cast antlers are all clues that moose may live in the area. People, however, should not leave clues of their presence. Outdoor activities are more enjoyable when no traces of previous use can be found.

Respect wildlife.
Take only what you need.
Use all that you take.



Management

Why Manage Moose?

It's a good question. The Department of Renewable Resources spends more than $250,000 each year in monitoring moose populations, developing regulations to conserve them, and working through the processes that go along with making informed management decisions. So why bother? The answer lies in the importance of moose to the Yukon's natural environment and to human users.

Moose are an essential source of food for large carnivores such as wolves and bears. Other species such as ravens and wolverines also subsist, in large part, by scavenging on moose carcasses. To humans, moose are important for hunting and viewing as well as for the role they play in cultural and spiritual activities.

While humans depend on moose in many ways, moose are also dependent on humans. A wide range of human activities can have negative effects on moose populations and their habitat. If not managed carefully, roadbuilding, housing development, agriculture, hunting, wildlife viewing and adventure tourism can all lead to the reduction or loss of moose populations. Moose management, of course, is mainly about managing ourselves.

Recognizing the inherent value of moose, its important role in the ecosystem, and the diverse benefits it provides to humans, the Department of Renewable Resources has developed a set of guidelines for making moose management decisions. The complete guidelines, which are summarized here, are available at Renewable Resources offices.

Management Guidelines

Habitat

Habitat management objectives include:

- identifying and mapping important moose habitats;
- protecting key habitats through land-use guidelines, the land-use review process, and the establishment of protected areas;
- using management plans to minimize the combined effects of land developments on moose habitats;
- enhancing habitat where appropriate.

Allocation

Allocation of recreational opportunities is based on:

- conserving moose, their habitats and ecosystem biodiversity;
- giving priority to viewing activities in selected areas along roads and close to communities;
- sharing harvest opportunities among all Yukoners;
- setting allowable harvest levels for moose populations on the basis of management units composed of groups of game management subzones;
- giving harvest priority to First Nations as laid out in First Nation Final Agreements;
- allocating 50 to 75 per cent of the non-First Nation harvest to resident hunters, and 25 to 50 per cent to outfitters.

Viewing

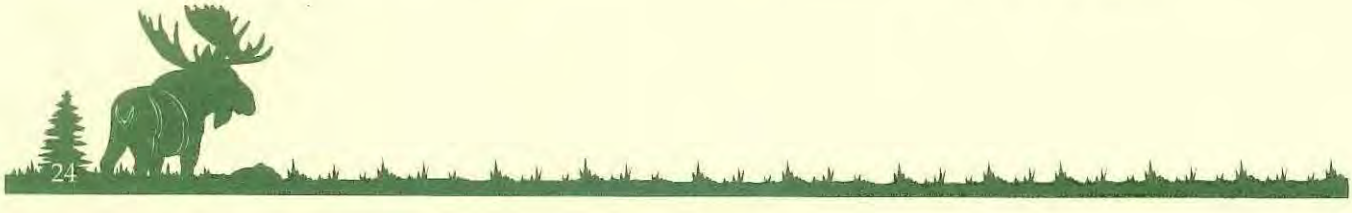
Management objectives for moose viewing include:

- identifying potential sites for moose viewing;
- developing and promoting viewing opportunities throughout the Yukon;
- promoting the preferred option of a complete hunting closure in areas where viewing has been identified as the management objective;
- developing guidelines to mitigate the impact of viewing activities on moose;
- exploring other recreational opportunities related to moose.

Harvest

Moose harvest management is based on:

- setting allowable annual harvest rates for local moose populations within the range of two to five per cent of the total population; in most cases the rate will be between three and four per cent;
- adjusting allowable harvest rates for each moose population on the basis of:
  - population objectives
  - population levels
  - population trends (increasing, decreasing, or stable)
  - quality of population and harvest data
  - effectiveness of the harvest management system
  - number of user groups involved
  - harvest trends
  - composition of harvest (bulls only or bulls and cows)
  - accessibility
  - habitat quality and quantity;



- setting harvest rates for some moose populations at less than two per cent when it is considered necessary:
  - to protect small, isolated moose populations with limited habitat, or
  - for cultural, social or economic reasons.

- setting temporary harvest rates over five per cent only under the following circumstances:
  - a moose population is at a high density, is rapidly growing or has temporarily elevated numbers
  - an experimental management program is in place, the associated risk is low and there is adequate monitoring, or
  - a moose population is stable or increasing in size and is counted regularly;

- controlling moose harvests directly (The control of moose harvests should not impose unreasonable limits on the recreational, cultural, and economic opportunities provided by hunting and should not cause undue difficulty or inconvenience to hunters.);

- considering alternate harvest management strategies, such as minimum antler size regulations, in situations where management objectives are to maintain hunting opportunities while ensuring that the harvest remains low.

Partnerships in Management

A new system of cooperative wildlife management is emerging as Yukoners adapt to the requirements of First Nation Final Agreements and the Yukon *Environment Act*. These documents have laid the groundwork for greater public involvement in wildlife management. They also establish a partnership between First Nation people and other Yukoners.

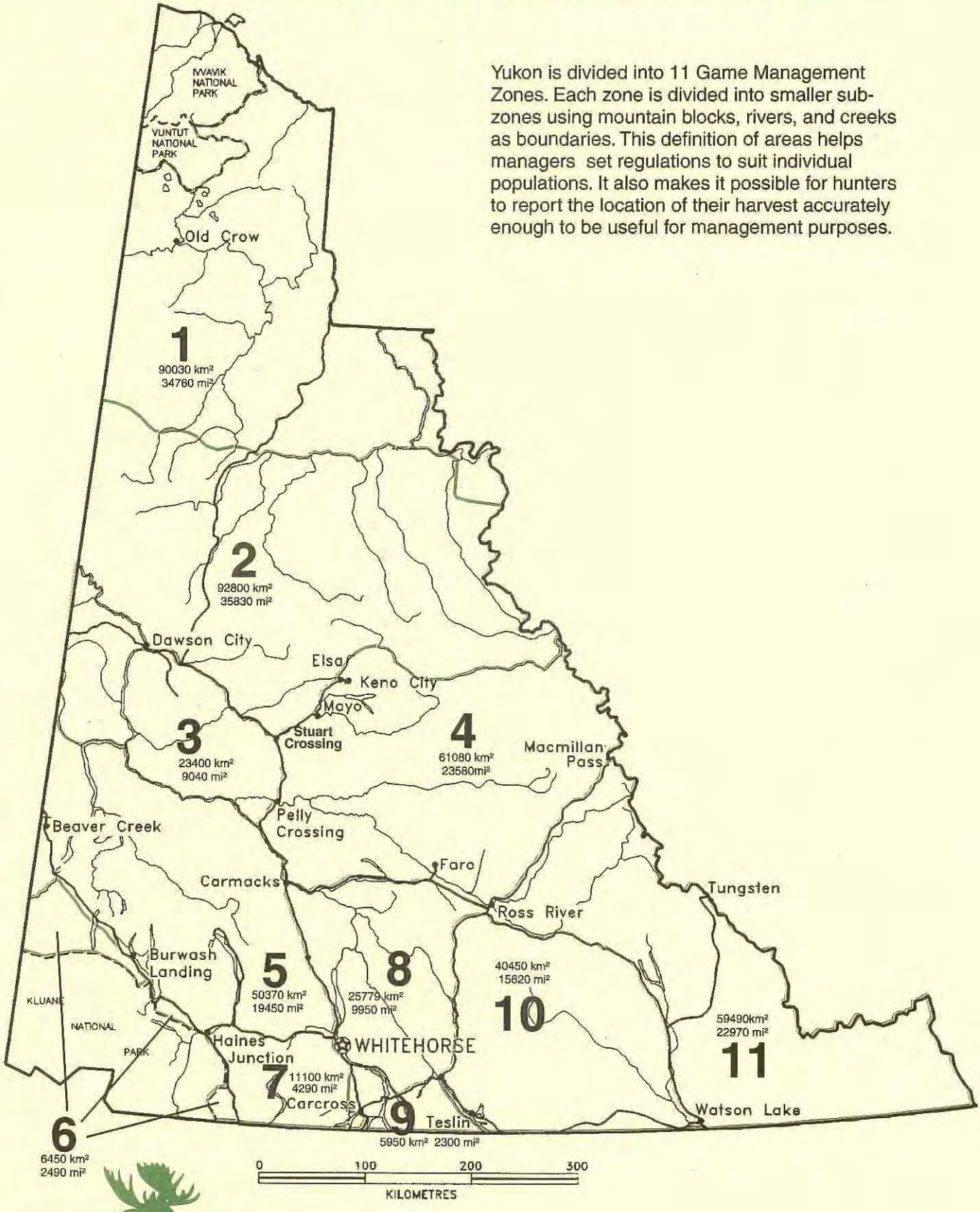
The *Environment Act* requires a minimum of 60 days of public consultation on all new fish and wildlife laws.

The Yukon Fish and Wildlife Management Board, set up through the Umbrella Final Agreement, gathers public input on territory-wide fish and wildlife issues. One of the Board's most important jobs is to hold public hearings on the annual fish and wildlife regulation changes, including all changes to the moose hunting regulations.

Local Renewable Resources Councils, with members appointed by First Nations and the Yukon government, also provide opportunities for public involvement in fish and wildlife management. These councils are being set up through First Nation Final Agreements. They gather public input on a regional basis.

GAME MANAGEMENT ZONES

Yukon is divided into 11 Game Management Zones. Each zone is divided into smaller sub-zones using mountain blocks, rivers, and creeks as boundaries. This definition of areas helps managers set regulations to suit individual populations. It also makes it possible for hunters to report the location of their harvest accurately enough to be useful for management purposes.



Good Moose Management Depends on Accurate Information

The Department of Renewable Resources manages moose by:

- limiting the harvest through hunting regulations and agreements with First Nations,
- protecting critical moose habitat,
- educating the public about moose, and
- managing predators according to the guidelines set out in the *Yukon Wolf Conservation and Management Plan.*

The best management decisions are made when wildlife managers have accurate information about the number of moose in an area, where they are located (distribution), the percentages of cows, calves, yearlings and bulls in the population (composition) and harvest patterns. This information comes from four sources:

- aerial surveys, or moose counts,
- radio-telemetry studies,
- harvest records, and
- traditional and local knowledge.

Aerial moose surveys

Aerial surveys, repeated at least every five to 10 years, provide information about moose numbers, distribution and composition. These surveys are usually carried out in early winter when the snow makes it easier to see moose from the air. At this time of year, moose tend to gather in sub-alpine areas which also increases their visibility. Finally, bull moose still have their antlers which makes it easier to determine the sex and age of the animals.

The basic method of counting moose

A survey map is prepared before the field work begins. The entire survey area is outlined on the map and then divided into small blocks of about 20 km^2 each, called sample units. The boundaries of sample units usually follow natural terrain features such as rivers and hills.

There are three steps involved in counting moose.

The first step is to get a rough idea of the number of moose in each sample unit. To do this, the survey crew flies quickly over the entire survey area with a fixed wing aircraft. The location of every moose seen is marked on the survey map. Back on the ground, this information is used to rate each sample unit as having high or low numbers of moose.

The second step is to come up with a preliminary estimate of the total number of moose in the survey area. This is done by going back to some of the sample units and carrying out an intensive search with a helicopter in an attempt to count every moose in those units. All sample units with high moose numbers and up to half of the units with low numbers are surveyed. Back on the ground again, biologists add up the number of moose seen in each sample unit to come up with a first estimate of the total population. An important assumption is made when these numbers are added up. It is assumed that the low-rated sample units which *were not surveyed* contain the same number of moose as the low-rated units that *were surveyed.*

The third step is to improve the accuracy of the population estimate by figuring out how many moose were missed during the intensive helicopter search. This is done by going back to a few of the sample units and carrying out a final search using twice as much helicopter time. Almost all moose are seen during this extremely careful search. (Although that may seem unlikely, remember that surveyors are looking for dark moose against white snow, from a slow-flying helicopter at low altitude.) If the final count in the selected sample units is 10 per cent higher than the first count, the entire population estimate is increased by 10 per cent.

Here is an example of how it's done. Let's say the survey crew covers all of the high-rated sample units during the first helicopter search, counting a total of 500 moose. They also cover half of the low-rated units, counting a total of 20 moose. They then assume that the other half of the low-rated units contain another 20 moose. This yields a preliminary population estimate of 540 animals (500+20+20=540). Next, the biologists carry out a final search of three sample units and find 10 per cent more moose in those units than they did during the first helicopter search. The preliminary estimate is increased by 10 per cent yielding a final estimate of 594 moose (540+54=594).

Variations on the basic method

The basic aerial survey method described above provides a reliable moose count along with details about the number of cows, calves, yearlings and bulls that make up the population. The disadvantage of this method is its high cost. For this reason, wildlife managers sometimes use less-precise variations of this method to collect information more frequently, or over a larger area, within the same budget.

For example, sometimes only the first step in the basic method is used. This does not provide an exact moose count or details about the composition of the population, but it does give a rough estimate of moose numbers and distribution in the area of concern.

At other times, a small part of a previously-surveyed area may be surveyed every year. This method can give an indication of whether the surrounding moose population is increasing, falling or stable.

Radio-telemetry studies

In a radio-telemetry study, collars emitting radio signals are placed on moose so biologists can track them from aircraft and observe their movements. These studies can provide information about the distribution of moose, the size and characteristics of their home ranges, the type of habitats they prefer, birth rates and causes of death.

When a collar is being placed on a tranquilized moose, blood samples, body measurements and a tooth are usually taken to determine the age of the animal, the state of its health and whether or not it is pregnant.

In the early 1980s, radio-telemetry studies in the southwest Yukon showed that bears, not wolves, were responsible for the majority of moose calf deaths in that area. There are no radio-telemetry studies underway in the Yukon today, but there may still be a few moose in the Whitehorse, Teslin and Watson Lake areas wearing collars from past studies. The collars do not harm moose or interfere with their activities.

Hunters who harvest a moose wearing a collar are asked to return the collar to the Fish and Wildlife Branch.

Harvest records

The Department of Renewable Resources has been keeping records of the annual moose harvest in each Game Management Subzone since 1979. This information plays a critical role in moose management.

When the moose harvest is lower than the sustainable harvest rate that has been set for a local moose population, there may be little cause for concern. When the harvest is higher than the set rate, however, the moose population may be at risk. Biologists would respond by first seeking more information from community residents. If local and traditional knowledge confirm that the moose population is in decline, a decision might be made to carry out an aerial moose survey to gather more information. The final result might be a public education program or a hunting regulation aimed at reducing the harvest.

More information about how Yukon moose harvest data is collected can be found in the *Recreation and Subsistence Use* section. See page 19.

Traditional and local knowledge

Traditional knowledge is the knowledge that First Nation people have accumulated through their long history of living on the land. Local knowledge is what community residents have learned about wildlife in their region through their own experience in the bush and that of their neighbours.

Today's biologists and wildlife managers work closely with local communities and First Nations. When moose surveys or other wildlife projects are being planned, meetings are held in nearby communities so local residents can contribute their knowledge and biologists can explain the project. One of the reasons why regional biologists have been placed in Whitehorse, Mayo, Watson Lake, Dawson and Haines Junction is so that they can facilitate this exchange of information. Regional biologists are in a good position to pick up local knowledge which sometimes provides the first warnings of possible declines in wildlife populations.

Traditional knowledge studies are a relatively new part of wildlife management in the Yukon. These studies are usually carried out by First Nation researchers who collect traditional knowledge about wildlife through interviews with elders. Traditional knowledge studies can provide wildlife managers with a valuable source of information about historic population trends and wildlife distribution.

Traditional and local knowledge are playing an increasing role in Yukon wildlife management. This is partly because of the requirements of recent land claim agreements and partly because wildlife managers have come to recognize the common-sense value of this approach. They recognize that people who spend a lot of time in the bush pick up a lot of valuable information about wildlife in their area, and it just makes sense to tap into this knowledge. Managers also know that when local people are involved in defining wildlife problems and developing the solutions, there is a much greater chance of success.

NOTES

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YUKON MOOSE

Yukon
Renewable Resources