
The
VERMONT BLACK BEAR



by **CHARLES H. WILLEY**

VERMONT FISH & GAME DEPARTMENT
Agency of Environmental Conservation



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Only a very small percent of the bear hunters use dogs. A permit is required.



INTRODUCTION

The black bear has been one of Vermont's most interesting but least understood wild animals. In 1968, the Vermont Fish and Game Department began a 5-year study of its black bear population to determine the bear's biological status as a basis for management. In 1972, the study was extended for another five years. The study was funded by federal moneys derived from taxes on sporting arms and ammunition and by state moneys derived through the sale of hunting and fishing licenses.

The purpose of this publication is to inform the public of the study findings and to provide a better understanding about black bears in general and Vermont black bears in particular.

This publication is divided into four sections. Section 1 takes a general look at North American black bears and provides information about their distribution, characteristics, and life history. Section 2 traces the history of the black bear in Vermont since colonial days and discusses the continually changing relationships between bears, habitat, and man. Section 3 gives the results of Vermont's research study through 1975. Section 4 takes a look at the future of the black bear in Vermont.

Tables and graphs have been kept to a minimum for the sake of brevity. For those interested, more detailed information may be obtained by writing to the Research and Management Center, Roxbury, Vermont 05669.

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SECTION 1

BLACK BEAR CLASSIFICATION, DISTRIBUTION, CHARACTERISTICS, AND LIFE HISTORY

CLASSIFICATION

The black bear belongs to the class Mammalia (nurses its young), the order Carnivora (meat eater), and the family Ursidae.** Although the generic name *Euarctos* has been used in the past, current authors generally prefer *Ursus*. The black bear's scientific name is *Ursus americanus*.** Other common names besides black bear include brown bear, cinnamon bear, American black bear, and common black bear.^b

* Lower case letters (like "a" and "b" above) are in alphabetical order and designate footnotes for each page. The numbers following these letters at the bottom of each page refer to specific references listed in the literature cited section.

** Scientific names of all plants and animals mentioned are listed on page 46.

DISTRIBUTION

The black bear is found throughout much of North America. Its range includes most of the United States (including Alaska), Canada, and the mountainous regions of Mexico.^a Of all the bears, this is the most common and most widely distributed^b (Figure 1).

CHARACTERISTICS

General.^c The black bear is the smallest bear in North America. The body of the black bear is bulky and characterized by short, stout legs. The outline of its back is straight; it does not have a hump at its shoulders like the grizzly. When walking, its back is arched and its head held low. The head is pointed and flat in profile. The eyes are small and dark, and the ears are relatively small and rounded. Long fur practically conceals its short tail.

The black bear is plantigrade, walking flat on the soles of its feet like man and not on its toes as the dog and cat do. While not as graceful as the dog or cat, it is far from clumsy. It has five toes on both front and back feet and is equipped “. . . with short, narrow, strongly curved, black, non-retractile claws; those on the hind feet are similar to those on the forefeet but not so strongly curved.”

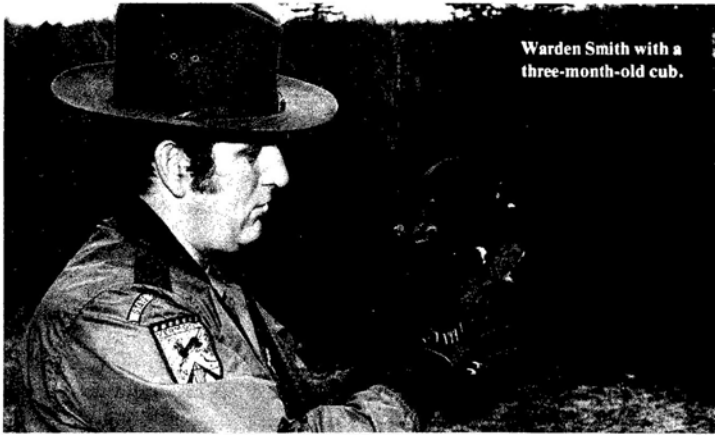
Color.^d The color of the black bear is far from being only black. Black bears in eastern North America are almost exclusively black; in the West they are cinnamon or black; and on Gribble Island, British Columbia, they are nearly white. Pure white albino black bears have also been observed, but their occurrence is extremely rare. The most common color phases of the black bear, in order of their abundance, are black, brown, and cinnamon.

Particular color phases of the black bear are not limited to certain states, provinces, or locales alone. Color phases may vary greatly, even within local areas. Although New England black bears are not known to be anything but black, brown-phase black bears have occurred as close to New England as Pennsylvania. In some parts of the country it is not uncommon for more than one color phase to occur in the same litter. In New Mexico one captive cub reportedly developed into a true cinnamon-phase bear but after two years in captivity molted into a black-phase pelage (coat).

It appears that one character of the black bear's pelage holds true for all color phases; all have a brown muzzle. Some black bears have white breast marks which may vary from a rather large splash of white to a few white hairs. These white breast marks are fairly common in Vermont black bears.

Weight and Size.^e *Cubs and Yearlings.* When one considers the size of an adult black bear, it would seem logical to expect large offspring; yet, a cub only weighs eight to ten ounces at birth. In comparison, a porcupine will weigh approximately one pound or about twice the weight of a black bear at birth. The new cubs are little more than eight to nine inches in length. At two months of age, the cubs will weigh about five pounds.

a 86; b 13; c 10, 12, 13, 33, 77, 94; d 2, 10, 13, 33, 56, 71, 77, 80, 94; e 12, 14, 33, 77, 79, 86, 87, 94.



Warden Smith with a three-month-old cub.

The weight^a and development of black bears are subject to a great deal of variation. By their first fall, cubs may weigh close to 30 pounds or as much as 100 pounds. As yearlings (the bears' second year), their weights may be equally as variable. They may weigh less than 40 pounds or weigh as much as 120 pounds.

Adults. Adult black bears exhibit sexual dimorphism in size; that is, the size of one sex is unlike the size of the other. Female black bears are generally smaller than males of the same age class, sometimes substantially smaller. The dressed weights (all organs, including heart and liver, removed) of adult female black bears usually fall between 100 and 150 pounds. Females exceeding 200 pounds dressed weight are uncommon. In New York and Maine two female bears were examined that actually exceeded 300 pounds dressed weight.

The largest black bears are invariably male bears, and very heavy weights have been recorded. Not all records, however, indicate whether the weights are live weights or dressed weights. While Vermont's largest bear since 1968 weighed 413 pounds dressed, much larger bears have been recorded in other states. Florida has recorded a 580-pound black bear. Pennsylvania's records show one 650-pound bear and another 633-pound live-weight bear. Until 1975, New York's record black bear weighed 562 pounds dressed; biologists estimated its live weight to be approximately 650 pounds. During 1975, however, a 770-pound black bear was taken that weighed 660 pounds dressed. New York's largest trapped bear was live-weighted at 599 pounds. Maine's record bear weighed 540 pounds (live weight) and 465 pounds (dressed weight). Additional records kept of black bears indicate the following weights: Quebec 635 pounds live weight, Louisiana 671 pounds, and Oklahoma 720 pounds.

a 8, 25, 33, 34, 47, 55, 77, 79, 86, 88, 94.

Dressed bear weights^a may differ from live weights by as much as 21 percent and perhaps more. The visceral contents of Montana black bears ranged from 11.6 to 20.7 percent of the bears' live weights and averaged 15.9 percent. Larger bears, however, lose a smaller percentage of weight to viscera removal than smaller bears.

In spite of their heavy weights, black bears are not overly large in body size. Their length ranges from four and a half to as much as seven feet and their height at the shoulder about two to three feet.

Senses.^b The black bear is well known for its acute sense of hearing and well-developed sense of smell. With the snap of a twig or a slight change of wind, the bear is often immediately gone. Its eyesight, however, is poor. Many a black bear has blundered its way into meetings with humans due to its poor eyesight.

Sounds.^c The black bear is normally silent, but its vocal abilities are varied. During infancy, the black bear has ample opportunity for communicating and making its desires known. The mother and her cubs converse with sounds that range from grunts and mumbles to squeaks. If cubs become separated from their mother, they will cry a peculiar, whimpering, high-pitched moan for hours or until they are exhausted.

Adult black bears are basically "loners" and have little occasion to do much in the way of communicating by sound. When under stress, however, they may give forth growls of anger, coughs of menace, and numbers of bawls expressing pain and rage that can sound almost human. An angered male may be heard from half a mile away. His hoarse, panting roars may be broken by snarls and violent "woofs."

In New England and northern New York a mating call has been alleged to the black bear. This call has been variously described as a "hoot," "holler," "wail," or "whoop" and sometimes likened to a man's or woman's scream. Scientifically undocumented, this supposed mating call frequently is heard during the early fall—at a time when black bears are not mating! This author seriously questions the validity of black bear screams because as a child he heard alleged bear screams, but as an adult years later he verified porcupines screaming identical sounds during their fall mating season. Although it is possible that black bears may call to one another from mountaintop to mountaintop, it appears more likely that the controversial "mating call" of the eastern black bear originates from sources other than the black bear.

Intelligence.^d The bear is credited with being quite an intelligent animal. It uses that intelligence to its advantage whether in the wild or in captivity. Extreme wariness is one manifestation of that intelligence. Black bears know that man usually represents a potential danger. Yet, in places such as national parks, they learn quickly that man is not a danger but a source of food. Black bears even invent tricks to draw more attention and bigger handouts.

Temperament.^a The black bear is not considered one of the more dangerous animals. It usually runs first and finds out later from what it was running. It has a fragile temper, however, and therefore cannot be depended upon to act as one might think it should. On rare occasions black bears have been known to attack and kill man without provocation, but less than a half-dozen people have died from such attacks.

Strength.^b It has been said of the black bear that no animal of equal size is more powerful. A bear in search of insects or rodents can flip over boulders and old logs almost effortlessly. It can also break the necks of large animals with one blow of its forepaw.

The strength of the black bear is revealed in its climbing, running, and swimming abilities. The black bear can climb surprisingly fast and has been credited with nearly the climbing speed of a pine squirrel. A frightened bear climbed a tree sufficiently fast to send a chill up the spine of this author, who recalled being told as a child to climb trees to escape bears! The front legs are primarily used for clasping the tree while repeated forceful downward movements of the rear legs propel the bear up the tree. When coming down the tree, the black bear prefers to back down much like a cat until it reaches a point where it can leap to the ground.

The black bear can run rapidly, particularly over short distances. It can reach a speed of 25 miles per hour. At every jump the hind legs reach farther and farther forward and outside so that the back arches until the bear looks like a speeding ball.

The black bear is a strong swimmer and has been known to cross swift rivers and swim lakes five miles in width.

Cleanliness.^c One seldom sees a dirty black bear. When it is shedding its winter coat, the black bear may appear faded or ragged, but it is clean. It scrubs itself on the grass and licks and grooms its coat frequently. In summer it sometimes takes mud and dust baths to get relief from insects that burrow into its coat.

Signs.^d One of the better known and more easily recognizable signs of the black bear is its track. The front paw usually leaves the imprint of a pad and five toes. In soft ground, the imprint of the claws may be visible. The track left by the hind foot is similar in appearance to that left by a human's bare foot. In terms of size, the track of the adult bear's forefoot is approximately four and a half inches wide by five inches long and the track of the hindfoot approximately four inches wide by seven inches long.

Wherever bears are to be found, bear trails may also be found. Anyone living in bear country has almost certainly seen bear trails, whether he recognized them or not. Bears use the same trails for generations, and even though they may wander seemingly aimlessly through the woods in search of food, they will repeatedly use the same crossings at roads, trails, or field borders. Bear trails may be so well developed that in time they become recognizable depressions in the ground.

Bear tracks up a beech tree.



The large telltale clawmarks on aspen, beech, and apple trees are good indicators^a of black bears being in the area. Punctures and scratches in the soft bark heal over leaving scars that may be visible for decades. Black bears also have "bear trees" which are rubbed upon, clawed at, and bitten at. Besides giving the bear something to rub upon, the "bear tree" may be a signal tree indicating the bear's height as a challenge to rival bears. It may also serve as a scent post similar to the scent posts of the dog tribe. Bears also strip bark from trees to feed on the soft inner layers beneath. The vertical stripping may extend many feet up the tree and extend sufficiently around it to girdle and kill the tree. The only stripping of bark by bears in Vermont was bark stripped from a white cedar tree as a lining for a bear's bed.

Droppings are signs of the black bear's recent presence. Adult black bear droppings generally have a distinctive form and tend to maintain a fairly even diameter of about one and three eighths inches although they may be much larger. Since black bears are largely vegetarians, most of their droppings consist of grasses. During the summer, the seeds of wild berries and cherries may be noted in the droppings. During the fall, the droppings will contain the recognizable pulp and seeds of apples or shells from the nuts of mast crops. When black bears feed on carrion, their droppings consist largely of hair.

Other bear signs indicating bear presence are anthills, logs, and stumps torn apart; rocks turned over; and remote buildings and signposts clawed or chewed. The twisted and broken branches of cherry, apple, beech, and oak trees are also signs of bear feeding activity.

a 32, 46, 57, 61, 66, 79, 87.

LIFE HISTORY

Breeding Biology.^a Little is known about the breeding biology of black bears, but available data indicate that both males and females become sexually mature at about three and a half years of age. Barring other difficulties, sexually mature female bears will produce young every other year. They will continue to do so until they are 18 to 20 years old or older.

The breeding season for black bears occurs during June and July with the female remaining in constant heat until she is bred. There is reason to believe that in some areas the breeding season might last all summer. It is essentially only at this time that adult male and female bears are tolerant of one another. Although black bears were once thought to be monogamous (one male pairing with one female), more recent investigators feel that under certain conditions black bears are promiscuous (breeding indiscriminately with more than one mate).

The gestation period (time from conception to birth) for black bears is approximately seven months. Development of the embryo is delayed, however, for approximately five months. A developmental arrest or retardation at the blastocyst stage means that the embryo does not begin developing until approximately six to eight weeks before it is born. This explains why the developing embryos of fall-harvested female bears are not observable to the hunter when field dressing his bear. The young are born during late January or early February in the winter den. The number of young varies from one to four or five, with as many as six being reported. The first litter is probably a solitary cub with subsequent litters normally containing twins and less frequently triplets.

Care of Young.^b Only the mother black bear cares for the young, and she does not tolerate the male being near them. A mother black bear is extremely attentive to her young and vigorously defends them. She is both a tolerant and indulgent parent who by example teaches the cubs how to hunt, dig for food, swim, and escape to safety. She is also a strict disciplinarian who straightens out too much foolery or rank disobedience by a quick swat with her paw.

Sows do not all react alike in defense of their young. Some bears will either temporarily or permanently abandon their young with little provocation. During Michigan bear trapping and tagging operations, female bears abandoned their cubs when they felt danger was imminent. Even maternally protective sows who charged the researchers were successfully scared off when the researchers made loud noises. Dened bears disturbed from their winter sleep will also abandon cubs, perhaps more quickly than under other circumstances. Abandonment of young during the denning period obviously would have disastrous results, but once the cubs have reached five and a half to six months of age, abandonment need no longer mean their demise. Research studies have shown that cubs of either sex, released in unfamiliar range and as small as 18 pounds, were completely able to take care of themselves.

a 10, 11, 12, 15, 19, 24, 26, 33, 34, 50, 69, 71, 77, 86, 93; b 10, 15, 28, 29, 33, 51, 77, 87.

Black bear family ^a groups not only remain together throughout the summer and fall months but winter together as well. They may all sleep together in the same den or den separately within a few yards of one another. No conflict arises of the mother giving birth to young that winter since nursing of her cubs during the previous breeding season prevented her heat cycle and prevented the possibility of her being bred.

The family group remains together through their second spring until the cubs are about 16 months old. The cubs are by then fairly woods-wise and somewhat disregarded by the mother. Before long, maternal indifference and the nearby presence of an adult male bear heralding the breeding season mean it is time for the family to break up.

Even though the current family ties are broken as the mother starts on a new family, the one and a half year old cubs (now yearlings) usually remain together until they are about two and a half years of age. At that time, they part company and then begin the hermit-like existence of other adult bears.

Movements.^b Movements of black bears show variation with the bears' age and sex, the abundance of food supplies, and the distances to which trapped bears may have been transplanted. Most movement studies to date have been based on trapping, tagging, and recapture data. Radio telemetry and even weather satellites are currently being used to closely monitor bear movements and hold great promise for determinations of daily, seasonal, and long range movements of individual bears.

Movements of Trapped and Tagged Bears. Adult bears remain in the same general area year after year, and indications are that they seldom leave it. Capture-recapture data do indicate that older bears tend to range more than younger bears.

The home ranges of male bears and female bears, however, are not alike. Adult males range more widely than adult females. Michigan studies of retrapped bears showed movements following initial capture averaged 5.4 miles for males and 3.2 miles for females. Oregon studies revealed mean movements of 3.3 miles for males and 0.7 miles for females. New York studies, undefined as to bear sex and age, indicated an average movement of 3.6 miles from the release points.

Bear home ranges may be determined by mapping or plotting recovery points of tagged bears. Frequently recovering a bear near its original point of capture suggests that the bear is being recaptured within its home range. Michigan studies revealed that bear recovery distances were not great and that the home range of the black bear was somewhat circular. Recoveries were felt to indicate probable normal cruising diameters of the bears. Based on this assumption, average minimal summer range was about six miles, and annual home ranges were in the vicinity of 15 miles.

Movements of Transplanted Bears. Bears which have been moved long distances from their home range wander at random before establishing new ranges. In Michigan, adult males were found to travel further than adult

females and older bears to travel^a further than younger bears; relocated bears averaged over 20 miles of travel from their release points before being recovered. In Newfoundland, an immature male moved 111 miles from its release site in less than two years. In New Hampshire, a large male bear traveled a little over 100 air-line miles from its release site in a 6-month period.

Not all transplanted bears stay transplanted. Some bears exhibit homing behavior. A Michigan male bear removed 96 miles from the point of capture was shot about a month later within six miles of its original capture site. Another Michigan bear, a female, separated 64 miles from its cubs, followed a circuitous route around several large cities and a farming area and was recovered 120 days later within 19 miles of its original capture site. In New York, a transplanted male bear returned 32 miles to its original trap site in eight days. In Newfoundland, three nuisance bears were transported to islands in Bonavista Bay. Within three weeks all three bears had swum a minimum of 0.6 miles through sea water to the mainland and journeyed overland an average of 11 miles to their original capture site.

Food Habits.^b Although classified in the order Carnivora (meat eater), the black bear is in reality a perfect example of an omnivore. An omnivore eats both animal and vegetable matter. The black bear has been said to eat anything a pig will eat, including carrion, flesh, fish, insects, fruits, berries, nuts, tree seeds, and roots. Furthermore, it will eat nearly anything and everything that smells, tastes, or looks like food. When a particular food is readily available, the black bear makes the best of the opportunity and gorges itself until the food is gone or until another food source becomes more available or preferred.

Spring Foods.^c Following the bear's departure from its winter den, it is faced with a time of short food supply. This is undoubtedly the most difficult period for the bear during the entire year. Spring foods consist of an assortment of grasses, sedges, herbs, horsetail, skunk cabbage, acorns, evergreen needles, buds, roots, bulbs, and carrion.

In Vermont, carrion is a highly significant spring food of black bears. Plagued by overpopulation of white-tailed deer in the winter deer yards, staggering winter losses of Vermont deer provide an easy source of food to the bears. Little but hair, portions of hide, hooves, and chalk white bear droppings mark the spot where the efficient bear consumed the remainder of the deer carcass, bones and all.

To the dismay of timber growers on the West Coast, the newly formed sapwood of Douglas fir and redwood also serves as a spring food for black bears and may be fed on into the summer as well. To a far lesser extent, balsam fir is fed on in Maine.

In some sections of the country, black bears may occasionally exhibit predatory behavior during the lean spring months. Bears have been observed killing mature bull elk, elk calves, moose calves, white-tailed deer fawns, and adult white-tails in box-traps.

Smaller prey^a may also be taken. The eggs and young of low-nesting birds are eaten but are undoubtedly found largely by chance. Ground squirrels and woodchucks are dug out, and snapping turtles are eaten. Where easily available, fish are caught and fed upon.

Summer Foods.^b During the summer, bears have a greater diversity of foods. In addition to many of the spring foods which are still available, summer foods predominant on the bears' list are fruiting species (raspberries, blackberries, blueberries, wild cherries, and hazelnuts) and insects (wasps, bees, grubs, ants, crickets, and grasshoppers). Many kinds of roots continue to be dug up for food, and in Vermont the jack-in-the-pulpit appears important.



Fall and Early Winter Foods.^a During the fall, an assortment of fruits and nuts are eaten. Apples, beechnuts, and acorns predominate in the fall and early winter foods of black bears. Where available, grapes are also important fall food.

Predations.^b Inevitably, some bears have trouble distinguishing between what is wild food and theirs and what is domestic and man's. It is these latter predations that raise the unpopularity of the black bear in the eyes of man. The season varies in which predations occur.

During the spring months, black bears may prey upon domestic livestock (sheep, hogs, goats, and cattle). Black bear predation of livestock is largely sporadic in nature, however, and when black bears do go after domestic stock repeatedly, it is usually an individual bear which has developed the habit.

Predations may also occur during the summer and the early fall. Bears and honey have been a winning combination historically, and bears continue to plunder apiaries today. Corn, ripe or unripe, has also traditionally been raided. Grain crops are not immune, and oats are eagerly consumed.

Most predation in Vermont occurs in summer and early fall and appears to be most significant during years of short natural bear food supplies. Vermont predations include livestock, beehives, corn, and oats.

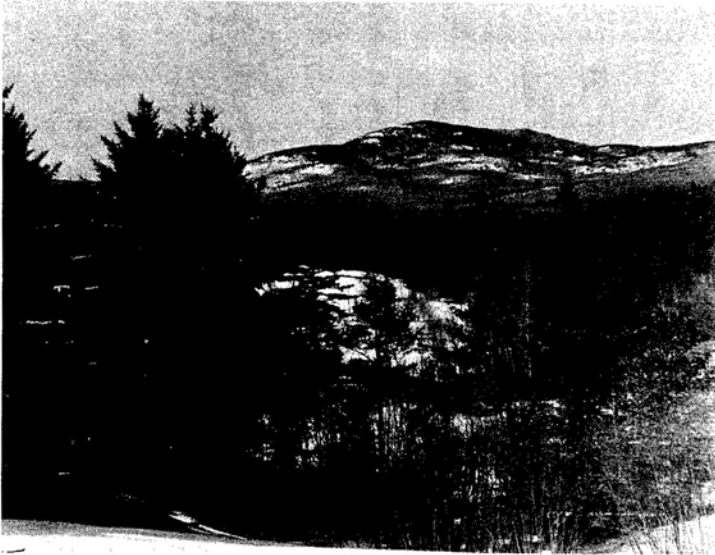
Cannibalism.^c Black bears do not search out other black bears as a food source, but when the opportunity presents itself, they will feed on their own kind. Following mortal combat, the victor has been known to feed on the losing bear. Observations have been made of a bear carrying the carcass of a smaller bear slung over its shoulder while gripping the smaller bear firmly in its teeth. It is not known if the deceased bear was killed by the larger bear or not. Actually, black bears can be readily baited to a trap site using the carcass of another black bear.

Black bear cannibalism has also taken place in Vermont. Hunters found an age class 3 male bear in Warner's Grant, Essex County, which had obviously been killed and partially eaten by a much larger bear. Tracks in the snow revealed that the smaller bear had stumbled into the larger bear within a brush pile. A fight apparently ensued with the larger bear killing the smaller with crushing bites into the smaller bear's spinal column. The smaller bear's abdomen was partially eaten out before the larger bear left. Numerous puncture and claw marks were obvious on the smaller bear, and its mouth, frozen shut by rigor mortis, contained bear hair and blood.

Black Bears as Prey.^d Rarely does the black bear fall victim to circumstances in which it is the prey rather than the predator, but those circumstances do occur. Mountain coyotes in Sequoia National Park, California, were observed to have pulled a yearling black bear from the side of a tree, killed it, and eaten it. It is clearly reasonable to expect that any large predator which chanced upon a malnourished, badly wounded, extremely small, or otherwise defenseless black bear would take advantage of the

situation and try to kill the bear.

Parasites. Not unlike other domestic or wild animals, the black bear is host to a variety of parasites.^a The black bear has few external parasites; most parasites are internal. Roundworms are fairly common, and when observed during the field dressing process, they have unnecessarily dissuaded many a hunter from eating his bear. Trichinae larvae are also present in some bears, but studies in New York and Vermont indicate that the incidence is low. People recognize this parasite as the cause of trichinosis, which results from consuming inadequately cooked pork or bear meat. Other parasites occur in black bears but are of less general interest.



Habitat Requirements.^b The black bear, like other creatures of the field and forest, not only needs food but also needs cover. Cover for a black bear means cover large enough to afford not only a canopy over its head for protection from the weather but escape cover as well. Forested habitat generally fulfills these requirements. Trees provide protection from the adversities of weather and escape from enemies such as dogs. A mixture of habitat which includes conifers, hardwoods, and topographical variations makes the best bear range. Land devoid of coniferous species does not provide the concealment the timid black bear requires; level, fertile land is usually in agriculture and therefore unsuitable. Rough and wooded topography provides the black bear with well-drained den sites, a well-distributed water supply, and the solitude it desires.

a 42; b 34, 86.

KINDS OF BEAR HABITAT



1. Remote mountainous terrain
2. Fertile pastureland close to forest
3. Abandoned farmland
4. Extensive forest

Winter Denning Urge.^a Winter denning is a natural characteristic of black bears, particularly in the northern latitudes. The denning period varies depending upon the climate in which the bears live. In the southern United States, bears may den for a few days or a week, but in the Far North, denning may last for six to seven months.

a 15.

The exact mechanism which stimulates the denning process^a is not completely agreed upon by researchers. It may very well be a combination of factors, including weather (temperature and snowfall) and the abundance of food. It also could depend entirely upon the condition of the individual bear and not be directly related to any of the above factors. A sense of being glutted with food or adequately fat could precipitate the bear's desire to make preparations for denning.

Eight years of general observations of factors stimulating black bear denning in Vermont suggest that food supplies may be the most critical factor influencing when bears will den in the fall. When abundant food supplies are available, bears will continue feeding throughout the snows of November and even into December. When fall foods are in poor supply, the bears do the only practical thing—they den up. Most bears then are denned before mid-November. During these poor food years, early snows undoubtedly hasten the denning process.

Den Selection and Preparation.^b Male and female bears do not select dens with the same amount of care. Females, especially pregnant ones, generally take more pains than males in selecting dens. Often the males den up almost anywhere. Individual females, however, may be slovenly or individual males fastidious in their selection.

Male and female bears do not always den at the same time. In some parts of the country, females may den before males by as much as two weeks.

Dens may be located in all types of terrain from ridges with various exposures to coniferous swamps and flats. They are often located so that winter snows pile around the dens and insulate them. The selected den may be a pocket or cave in rocky ledges; a hollow in a large tree or fallen log; a sheltered or unsheltered depression or excavated cavity at the base of logs, trees, or upturned roots; or a self-excavated hole in a hillside.



Ledge den



Yearling's tree den ▶

a 15, 51, 76, 79; b 1, 15, 24, 27, 33, 51, 52, 58, 76, 77, 78, 79, 84, 87.

The more careless bears undoubtedly select windfalls, thickets, and the limited shelter of dense and drooping conifers. Black bears have also been known to den^a in such unorthodox places as old lumber camps and pig pens, drainage culverts, and the steam-heated rooms of hot spring formations in Yellowstone National Park. Many dens, however, have been found to be wholly exposed with little or no shelter over the denning bear.

The den itself is often lined with leaves, grasses, or ferns. Females are a little bit more fussy, perhaps because of their coming family, and are more likely to line their dens than males.

Dormancy.^b The black bear does not hibernate but, rather, sleeps in a dormant state during the winter months. Hibernation has been defined “. . . as a condition characterized by a marked lowering of body temperature with a concurrent drop in metabolism, heart rate, respiration and other vital functions.” Although the black bear’s respiration may drop from normal to only two to five breaths per minute and its metabolic rate may be greatly reduced, its temperature remains reasonably close to normal.

Arousing true hibernators may be accomplished by simply moving the animal. Once started, the awakening process proceeds irreversibly until the normal body temperature is reached. In the case of the hibernating hamster, the process takes about three hours. In the case of the woodchuck, its heart may race at 600 beats per minute at the peak of the waking process.

The black bear may also wake up if moved, but it needs no such amount of time to fully awaken. It is essentially in a deep sleep from which it is relatively easily aroused and seemingly with full sensibility and use of faculties.

A denned female bear with cubs and a denned adult male bear were observed from time to time in Vermont. Respiration was noted to be as slow as three and a half breaths per minute while sleeping and as high as 18-20 breaths per minute when awake. Sounds made from a distance appeared to have little influence on the sleeping bears, but crunching of snow within four to eight feet of them caused them to slowly lift their heads, alert to the disturbance. Hearing no further sounds, they lowered their heads and soon fell asleep.



East Enosburg, Vermont. Perhaps a woodchuck dug this hillside den first, then a fox took it over and enlarged it for her family. Finally this sow bear adjusted it to fit her needs. She had two tiny cubs with her at the time.

SECTION 2

A HISTORY OF VERMONT BEARS AND LAND USE; THE DEVELOPMENT OF BEAR BOUNTIES, LAWS, AND REGULATIONS

BEARS AND LAND USE

The black bear was in Vermont long before the settlers arrived. When the settlers did arrive, their use of the land was to be felt by the black bear, and the settlers in turn were to feel the impact of the black bear. As time went on, the black bear was bountied as an outlaw. Later, laws and regulations would give it recognition as a valuable natural resource worthy of protection.

Land use by man is undoubtedly one of the greatest factors affecting the abundance and distribution of the black bear in Vermont. Forested land increases bear habitat; cleared land decreases it. During Vermont's history, the pendulum has swung from mostly forested, to mostly cleared, and back to mostly forested land.

In the 1600's, Vermont was a vast timbered wilderness; over 95 percent of the land was forested.^a The Indians' use of the land did not compete with that of the bear. They cultivated little land and lived mostly by hunting and fishing.^b

The first white men who frequented Vermont did not interfere with the bear's habitat. They used Vermont as a hunting and trapping ground and as a highway to Canada for over 100 years following the colonization of New England.^c

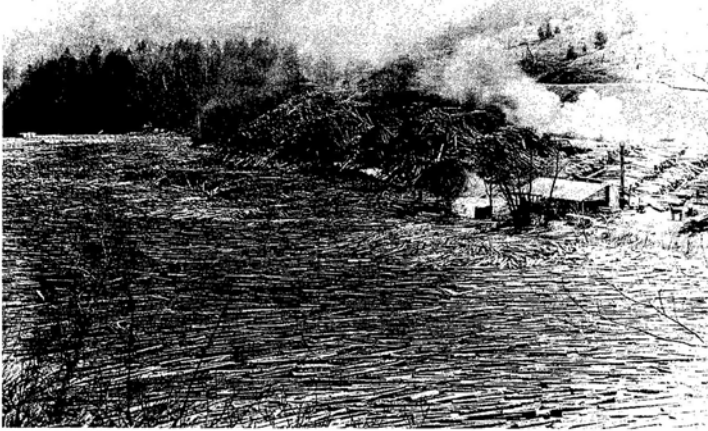
The first permanent white settlement in Vermont was established at Fort Dummer (near modern-day Brattleboro) in 1724.^d This marked the beginning of an influx of settlers into Vermont. With their axes, the settlers literally cut their farms out of the forests.^e As the forests were gradually whittled away, so was the habitat of the black bear.

Vermont's human population was to grow in size tremendously. From an estimated aboriginal (Indian) population of less than 10,000,^f Vermont's settler population had grown to 85,000 by 1790. Ten years later it had nearly doubled to 154,000, and by 1810 it had grown to 218,000.^g When most of the flatter lands of the river valleys had been cleared, settlers were forced into establishing their farms on mountainsides—a further encroachment upon the black bear's habitat.

The severe and prolonged winter of 1816 temporarily stopped the burgeoning population growth in Vermont.^h Though some settlers left Vermont, clearing of land did not cease. Land exhausted by continued cultivation without the use of fertilizers had to be replaced with newly cleared land. The clearing continued throughout the 1800's. The amount of cleared land reached its maximum during the last quarter of that century. At that time 68 percent of Vermont's land area was being used for agricultural purposes.ⁱ

a 43; b 35; c 16; d 16; e 43; f 35; g 38; h 38; i 43.

"Long logs" for Connecticut River mills shown on the White River at Sharon, Vermont (late 1800's).



Three quarters of the way through the 19th century, Vermont's bear population may have reached its lowest point. With much of Vermont cleared land, the black bear was largely confined to those mountainous areas too steep or rocky to farm. Historical accounts at that time used phrases such as "occasional bear," "may yet be caught," and "not wholly extinct" to describe the status of the black bear.^a

Late in the 19th century, the pendulum began to swing in the opposite direction. Vermont farms were abandoned in increasing numbers as more and more farming attempts failed. More lucrative work was available in the manufacturing centers of southern New England.^b With the abandonment of farmlands came the slow but natural reversion to woodland. As land gradually reverted through its successional stages to woods, more and more habitat was being created for the black bear.

Historical accounts from 1900 through 1938 indicated that bears were not considered necessarily abundant but were found regularly to occasionally in the forested and mountainous areas throughout the state.^c Although these accounts gave no indication of bear population changes, in 1944 Vermont's game biologist felt that bears had been increasing in numbers since 1880 and were still doing so.^d

During the 86-year period from 1880 to 1966, land use changed drastically. Approximately 1.7 million acres of farmland reverted to forest land. The decline of land being farmed was not at a constant rate. The depression of the 1930's and World War II saw a short-lived revival of agriculture. By 1968, 73 percent of Vermont's total land area was commer-

a 16; b 35, 43; c 16; d 30.

cial forest land^a. In the last century, Vermont has completely reversed its use of the land. Correspondingly, bears have made a strong comeback to the point where the bear population is much higher now than it was in the late 1800's.

BEARS AND BOUNTIES

The establishment of a bounty on Vermont black bears resulted from deep concern over the damage caused by these animals. When the settlers moved into Vermont, interactions with black bears were inevitable. The interactions were sometimes quite detrimental to the settlers. Bears broke into pigstys, cabins, and homes. Crops were destroyed. Sheep and cattle were lost. Occasionally, settlers themselves were severely mauled attempting to corner and kill the marauding bears. These predations were not looked upon lightly. Loss of crops or livestock could mean the difference between farming success or failure to the settlers. Sparked by public outcry, Vermont's Legislature established a \$5.00 bounty on bears in 1831. In 1834, the bounty was changed to a payment of \$5.00 on adult bears and \$3.00 on cubs.^b

For a brief period, the settlers may have had some respite from bear damages. In an 1846 historical account of Vermont, Hosea Beckley sorrowfully predicted that the time would soon come when wolves, bears, and deer would be a thing of the past. Mr. Beckley also stated that the wasting of cornfields by bears was then almost unknown.^c

Despite these ups and downs in the bear population, bears were said to be quite plentiful in the 1850's. Forty to fifty \$5.00 bounty claims were being paid annually. Then in 1857, the bounty was raised to \$10.00 for adult bears and \$5.00 for cubs.^d

Bear trapping became a profitable enterprise in the 1850's, at which time pelts were bringing \$2.00 to \$5.00 apiece depending upon size and quality.^e Bountying the animal first and then selling its pelt provided a built-in bonus for those who killed a bear.

The bounty remained at the 1857 figure until 1868 when it was increased to \$15.00 (a very large sum then considering what one could purchase with a dollar). In 1886, the bounty was dropped to \$6.00 and remained there for two years. In 1888, it was raised again to \$15.00. Then in 1898, as if the Legislature were catching its breath, there was no bounty for one year. In 1899, however, the bear bounty was re-established and set at \$12.00. During the period from 1831 to 1900, 1,295 bounty claims were paid, an average of 19 bears annually.^f

In 1900, the bounty was decreased to \$10.00 per bear. It remained at that figure until 1941. During that period 1,300 bounty claims were paid, an average of 25 bears annually.^g

By 1920, sentiment about the black bear started to change. Although the bear's occasional predation was still recognized, the black bear was also being recognized as a valuable game animal. A repeal of the bounty and the

a 43; b 16; c 16; d 16; e 16; f 16; g 16.

protection of a closed season were requested, but it was 21 years later before such actions were taken.^a

In 1941, the bear bounty was repealed, and the black bear was elevated to the status of a big game animal.^b Acknowledging the possibility of future bear damage and public indignation over it, the Vermont Legislature obligated the then "Fish and Game Service" to reimburse persons for future damages caused by black bears. Specifically, persons who suffered damage by black bears to their cattle, sheep, swine, poultry, bees, or beehives on land not posted against hunting of black bears were entitled to reimbursement for the damage. Beginning with 1941, damage payments were made annually with the exception of those few years when no valid or complying damage complaints were received. A total of \$17,389.04 was paid out for bear damages from 1941 through 1975.

BEAR LAWS AND REGULATIONS

The 1941 repeal of the bounty, the establishment of the black bear as a game animal, and the protection of bears by a season (June 1 — December 31) were the first of many laws and regulations that would favorably affect the black bear. In May, 1959, the season for bears in Bennington, Orange, Washington, and Windham counties was shortened to October 1 through December 31. Mandatory reporting and a one bear per hunter limit were set for those counties. During 1955, mandatory reporting of all trapped and shot bears was required statewide. In 1961, the Vermont Legislature passed the Omnibus Bill, which set the statewide bear season from September 1 through November 30 and removed the one bear limit in Bennington, Orange, Washington, and Windham counties. This bill also gave the Fish and Game Board the power to set regulations on all wildlife species excepting deer.

In 1967, the Fish and Game Board prohibited the trapping of bears. A one bear limit per hunter per season was placed on the black bear during 1968. In 1969, the regulation was passed that every bear taken into possession must be tagged, and a bear tag was added to the hunting license.

During 1972, regulations were established affecting the hunting of bears with dogs, baiting of bears, and shooting of bears at dumps. The actual regulations follow:

1. A person shall not take black bear in a baited area. A baited area shall be construed as an area where meat, carrion, honey or other substance capable of luring or attracting bear has been placed or deposited.

2. Unless the person in control of the dogs has a permit to do so from the Commissioner, a person shall not take black bear with the aid of dogs. Such a permit shall specify the particular dogs to be included in the permit. Permits are to be issued at no fee at the discretion of the Commissioner.

3. A person shall not take black bear with the aid of more than six dogs acting in unison as a single pack nor by relaying packs. The term "relaying packs" shall be deemed to mean using two or more consecutive packs of dogs on the trail of the same bear.

4. A person shall not take a bear into his actual possession except by killing the bear by shooting in a humane manner.

During 1974, Vermont significantly modified the length of its bear season. The new season commenced on September 15 and closed on the ninth day of the regular deer season. The same season was set during 1975 and 1976.

SECTION 3

VERMONT BLACK BEAR RESEARCH FINDINGS 1968-1975



DATA COLLECTION

Vermont's black bear research during the 1968-1975 period was almost completely confined to investigations of hunter-harvested bears. Much of the information needed to evaluate the biological status of the bear population could be collected from these bears. Dependence upon hunter-harvested bears as *the* source of biological data meant that hunter cooperation had to be excellent, which it was.

Bear Hunter Contacts. Bear hunters are required to report their bear within 48 hours and exhibit the carcass to a game warden, town or city clerk, or duly deputized person. The report cards are mailed to the Research and Management Center, Roxbury, Vermont. The secretary at the Research and Management Center notifies a game biologist who then contacts the hunter. Under ideal conditions, a hunter shooting and reporting his bear one day would be contacted by a game biologist in the next day or two.

Numerous difficulties reduce the number of bears which are actually available for examination. Delays of reporting, of report submission, of postal service, and of biologist contacts all increase the possibility that the bear will not be available for examination. In addition, bears shot by nonresidents are frequently unavailable for examination since they are more often than not already out of state before the report card is received at the Research and Management Center.

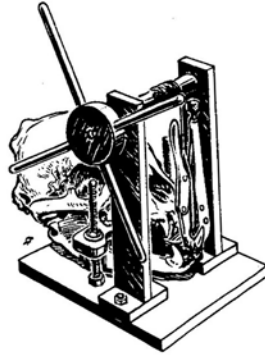
In efforts to minimize data loss, personnel were reminded to submit reports immediately. Successful hunters were mailed instructional forms soliciting cooperation, and bear hunter alerting posters and instructional forms were displayed at town clerks' offices. Nevertheless, many contacts were made too late to collect the bear tissues needed.

Difficulties in processing bears were still encountered even after contacting successful hunters. It is legal for Vermont residents to sell bear skins and carcasses, and some bears had changed hands one or more times before being located. Some bears, before being examined, had to be field dressed by the biologist. Many bear carcasses were not fresh, which occasionally necessitated a return when decomposition was less violently active. Some bears had been buried in gardens, swamp holes, and sanitary landfills. They were unearthed by hand shovels and large earth-moving equipment. The time required to examine the bears varied from a few minutes to an hour or more. Despite the many potential sources of data loss, large quantities of data were collected.

Once successfully contacted, the bear hunter was asked to provide biological information about his bear, observations about the hunt, and economic data relating to time and money expenditures. Questions were added and deleted as the study progressed.

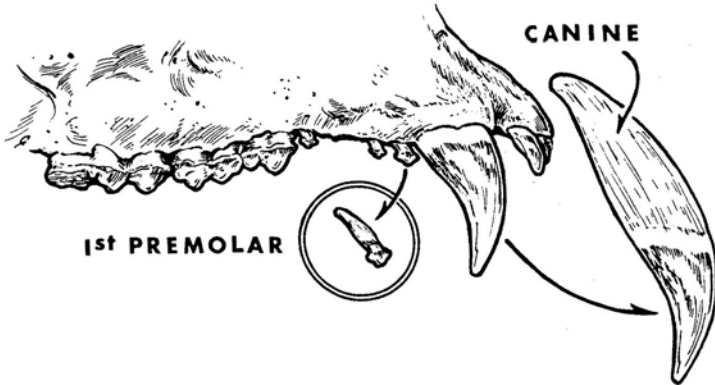
Canine Tooth Collection. The greatest emphasis of data collection was placed on the collection of bear teeth. Black bear research during the mid-1960's^a revealed that annual layers of cementum laid down on the roots of the bear's teeth could be used for age determination. The rings, much like the annual growth rings in a tree, were microscopically evident in cross-sectioned, laboratory-stained bear teeth. For the first time, investigators could determine the exact age of a black bear and, therefore, determine the age distribution of the harvested segment of a bear population.

The conventional technique for collecting bear canines for aging during



Canine tooth puller

the mid-1960's was cutting off part or all of the bear's jaw and boiling the canines loose. Since nearly one quarter of Vermont's harvested bears end up at a single Vermont taxidermy shop that uses the original teeth, and since few hunters want their bear's head disfigured, it was necessary to develop a canine tooth extractor. With the assistance of a dentist and a high school machine shop instructor, an extractor was designed, constructed, and tested.^a An unblemished record of successful extractions with the device encouraged all but two of nearly 500 hunters to have a canine tooth extracted from their bears.



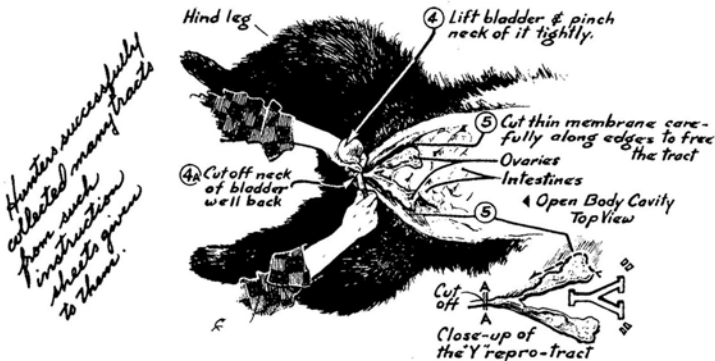
First Premolar Tooth Collection. Canine tooth extraction was found to be time-consuming (approximately 20 minutes per tooth). It was also expensive because the taxidermist had to glue and pin sectioned canines back into bear skulls. During the fall of 1971, first premolars and matching canines were extracted from 117 bears and their cementum annulations compared. Except for older age bears, first premolars were determined to be as reliable as



Cross section of the cementum (outside) layers of premolar tooth, magnified 400x. Note annular ring (one/yr.).

canines for aging. After 1971, first premolars rather than canines were extracted, and canines were pulled only from those bears felt to be ten years of age or older. The advantages of using the first premolar as a substitute for the canine included ease of extraction (15 to 20 seconds), near elimination of canine tooth replacement costs in mounted specimens, and increased sample size because it was easy for sportsmen and taxidermists to remove and mail the premolar.^a

Stomach Content Collection. While some hunters brought in their bear's stomach contents, most samples were collected by returning to the site where the bear had been field dressed. The volume of each item making up the stomach contents was estimated, and a representative sample was saved. In those cases where the stomach contents were unknown, all the material was saved for future analysis.



Reproductive Tract Collection. Reproductive tracts were collected from female bears. Many tracts were obtained by returning to the site where the bear had been field dressed; some were still within the bear's body cavity when it was examined. Some hunters, particularly those hunting with trained bear dogs, removed and stored reproductive tracts from their bears for the Fish and Game Department. All reproductive tracts collected were stored in 10 percent formalin to prevent tissue decomposition.

a 90.

Trichinosis Sample Collection. In cooperation with the National Communicable Disease Center, Atlanta, Georgia, the University of Vermont College of Medicine, and the State of Vermont Department of Health, bears were sampled to determine the incidence of trichinosis. Approximate 1-inch square pieces of diaphragm and/or tongue tissues were collected, stored in sodium borate Whirlpaks, and mailed to the appropriate laboratory for analysis. Samples were analyzed at the College of Medicine during 1968, the National Communicable Disease Center during 1969, and the Department of Health in subsequent years.

Physical Measurements. Bears were weighed by the project leader at homes, at camps, and in the field. His vehicle was equipped with a 600-pound capacity set of balance-beam scales. Bears were also weighed at deer checking stations on balance-beam portable and permanent scales.

The bear's total length (tip of nose to base of tail) was measured to the nearest quarter inch.



Bear Project Leader Willey using his portable scales.

Right front and hind foot length and width measurements were taken to the nearest eighth inch. Pad length measurements were taken from the posterior extreme of the pad to the anterior extreme of the toe pads. Pad width measurements were taken at the widest portion of the pad. Foot measurements of frozen bears or bears with apparently malformed or cramped feet were not taken.

Verification of Sex. The bear's sex was verified whenever such evidence was available. Unless otherwise noted, where measurement data are presented, the bear's sex has been verified.

BEAR BIOLOGY

Distribution. Based on legal bear reports from 1955 through 1975, Vermont's bear population appears distributed essentially statewide. Reported bear harvests suggest that the bulk of Vermont's bear population lies within the Green Mountains and the northeastern section of the state. A map overlay of Vermont's mountains of 2,000 feet elevation and above corresponds closely with the major bear range (Figure 2). This area is also predominantly wooded.

Two areas of the state do stand out as either having no bears or only one bear reported taken during the past 21 years. They are the areas immediately adjacent to the length of Lake Champlain and immediately adjacent to the Connecticut River from the Massachusetts line to central Vermont. These areas are low-lying, agricultural or urban in character, and sufficiently removed from the forested and mountainous regions of the state to preclude continuous occupation by bears.

Since 1955, bears have been reported harvested in 81 percent of Vermont's 246 towns, unorganized towns, gores, and grants. Twenty-two towns had only one bear harvested; 46 towns had no bears harvested (Figure 2).

Chronological Distribution of Harvest. Reported bear harvest figures provide a means for interpreting bear distribution over a period of time. Since harvests may vary substantially from one year to the next, the combining of several years permits a more effective appraisal of distribution trends.

A consecutive 7-year grouping of reported harvest figures from 1955 through 1975 revealed little change in bear distribution over the 21-year period. During the 14-year period between 1962 and 1975, the bear harvest was generally more widely distributed than during the seven preceding years. The presumed denser population during the 1962 to 1975 period may have resulted in population "spillover" into towns bordering established

bear range. "Spillover" was slight, however, because changes in harvest on the periphery of the bear range amounted to little more than changes of one or two bears for any given town during any given 7-year period. A few exceptions occurred where towns previously not contributing to the bear harvest were trending toward significant harvests. In one case the opposite was true.

Abundance. In general, bear harvest figures provide an indication of population abundance. Since 1955, a total of 5,643 black bears have been taken legally in Vermont. In 7-year increments, the average annual harvest between 1955 and 1961 was 250 bears; between 1962 and 1968 it was 311 bears; and between 1969 and 1975 it was 245 bears. The average annual harvest for the 21-year period was 269 bears, quite a different figure from the few dozen bears harvested annually in the 1800's and early 1900's. Report card data suggest that the bear population reached a peak during the mid-1960's. During 1966, a record of 455 bears was harvested (Figure 3).

Beginning in 1968, the collection of age ratio, sex ratio, and productivity data provided a basis on which to make scientific population estimates. Between 1968 and 1975, it was conservatively estimated that the bear population ranged from a high of 1,500 to a low of 1,200.

County Harvest Records. The county with the highest annual bear harvest has varied since 1955 (Table 1). Windham County had the highest harvest in 1955; Windsor County led in 1958; and Rutland County held the lead from 1959 through 1962. These southern counties contributed more significantly to the harvest during the 1950's. Whereas Windham, Windsor, and Rutland counties each accounted for 10 to 18 percent of the harvest in the 1950's, their more recent harvests have seldom exceeded 8 percent (Table 2). Essex County, located in northeastern Vermont, had the highest annual bear harvest for most of the years since 1956 and the highest average bear harvest (43) for 1955 through 1975. One bear is taken for about every 15 square miles of land area in Essex County (664 square miles) or double the state average.

During 1975, two records were set. The 1975 statewide bear harvest was the lowest on record, and Caledonia County led the statewide harvest for the first time.

Town Harvest Records. Most towns contribute only two or three bears to the harvest annually. Montgomery in Franklin County set a state record in 1969, however, with a harvest of 17 bears. Montgomery also had the highest total harvest of any town during the 1955 to 1975 period with a harvest of 164 bears. It was followed by Granville in Addison County with 143 bears and Rochester in Windsor County with 112 bears.

Population Dynamics. Dynamics suggest motion or change, and animal populations are continually undergoing change. Management merely serves as a control on the degree of change.

The study of population dynamics is an ongoing process which examines sex ratio, age ratio, and breeding biology of the population and evaluates

the influence these factors have on one another. Sex and age ratio are so interrelated that they cannot reasonably be isolated from one another during discussions of population dynamics. To that extent, even though sex and age ratio will be presented separately, discussions will often involve both. **Sex Ratio and Vulnerability.** Sex ratio means the percentage of males to females in the population. The sex ratio of Vermont's harvested black bears varies substantially from month to month and year to year. Factors which may influence sex ratio for any month or year include the amount of harvest and differential vulnerability by sex. The sex ratio of the 3,526 bears reported during the period from 1963 through 1975 was 57.3 percent males and 42.7 percent females (Table 3).

Variability in monthly sex ratio is more pronounced during September and October when bear harvests are often substantially lower than November harvests (Table 4). When harvests are very low (during some years fewer than 30 bears have been taken in September or October), the likelihood increases that the sex ratio will not be representative of the population.

Some species, due to behavioral aspects, color, size, or whatever, are more vulnerable to harvest than others. In some cases, both sexes within a species may be equally vulnerable to harvest, but in other cases, one sex may be more vulnerable than the other. Under the latter circumstances, a differential rate of vulnerability exists.

Vermont male bears tend to be more vulnerable to harvest than females, particularly during September and October. This differential vulnerability is felt to be directly related to the aggressive behavioral feeding patterns of males. Males are harvested in orchards, fields, and otherwise "open" situations. Females are seldom taken in other than wooded areas. Data suggest that the few females which are harvested in "open" situations are young bears or presumably very hungry bears in that their appearances are only noted during years of poor food supplies.

Vulnerability data were also evaluated considering the bear's sex and age in relation to the time of kill (hour, day, month, and year), the weather, and the bear's activity at the time of harvest. No clear-cut evidence of vulnerability for these criteria was found, but some matters of interest were brought to light. The data suggested that younger bears may be progressively more vulnerable to harvest throughout the season. Seasonally declining hunter selectivity coupled with possible behavioral differences of bears could be responsible for younger bears being taken at a greater rate during November. As anticipated, September harvests predominantly took place during times of greater bear activity, the feeding times of early morning and late afternoon. November harvests occurred most frequently during the morning hours, presumably due to greater deer hunter activity at that time rather than due to behavioral patterns of the bears.^a

During the past ten or 12 years, there has been an unmistakable trend of fewer bears being taken during September and October (Table 3). It is

a 92.

suspected that this is due to decreased hunter participation. As a result, the importance of sex vulnerability may play a smaller role in Vermont's bear management than was previously anticipated. Whereas the September and October harvests of the early to mid-1960's totaled about 200 bears annually, the September and October harvests of today do not reach half that number. Then, the 4 to 5 percent variation in sex ratio effected by vulnerability meant eight to ten female bears were being spared during those months annually. A small number of bears, true, but over a long period of time apparently sufficient females were spared to create quite dissimilar age structures between the two sexes.

Minnesota research of denned bear families revealed a cub sex ratio at birth of 53.2 percent male: 46.8 percent female.^a Assuming that the sex ratio of Vermont cubs is similar, it appears that the Vermont bear harvest (57.3 percent male: 42.7 percent female) is clearly removing males at a faster rate than females and therefore favoring female bear survival.

One must not make the mistake of assuming that bear vulnerability to harvest by sex is no longer of any management value in Vermont. On the contrary, it may be extremely important at a later date if changes in hunter participation or bear season timing significantly increase hunter pressures during September and October. We could easily compare this vulnerability to a denned bear which, barring disturbance, may lie idle for some time, but once aroused, may command a good deal of attention.

November Deer Season Sex Ratio—The deer season sex ratio of harvested bears is very important considering that as much as 79 percent of Vermont's bear harvest is taken during the regular 16-day November deer season (Table 5). The sex ratio of bears harvested during the deer season is essentially the same sex ratio as the total November harvest because few bears are taken in November prior to the deer season or after the deer season. Since 1963, only 169 bears have been taken prior to the deer season, and only eight bears have been taken after the deer season. In comparison, 2,055 bears have been taken during the deer season since 1963.

The November sex ratio is heavier to females than either the September or October sex ratios. The November sex ratio is made up of 44 percent female bears as compared to approximately 40 percent females in September and 41 percent females in October.

Although progressively more female bears are generally harvested from September through November, the progression is neither constant nor consistent from one year to the next. Even within months, females may not be taken at progressively greater rates from beginning to end.

It has been said that female black bears den prior to males.^b Where bear seasons fall during the denning period, such a behavioral attitude could have great management implications. This protective mechanism of female bears could better ensure their survival. The opportunity for managing the selective harvest of male black bears would, in theory, simply lie in the determination of *when* the females had denned. Early denning of females

a 68; b 24, 77.

may not occur in all of the black bear's range, however, and where it does occur, it may have no influence on harvests whatsoever.

The only evidence which strongly suggested the early denning of female bears was collected in Michigan.^a Michigan studies of denning chronology indicated that female and juvenile bears appeared to den about two weeks before adult males. Adult female and juvenile bear denning was found to be "... more abrupt, commenced sooner, and completed earlier." These studies also revealed an unusual aspect of harvest; there was no differential vulnerability of bears in or out of dens. Bears discovered in dens or out of dens were harvested in proportions that maintained the same sex ratios throughout November. The greater vulnerability of earlier denned female and juvenile bears to harvest once discovered resulted in denning not being a protective mechanism at all. The same proportion of male and female bears was harvested whether or not they were denned.

Examination of Vermont's bear harvest sex ratio data by 4-day intervals throughout the 16-day November deer season revealed relatively constant sex ratios. On the surface, at least, these data would suggest that neither sex has a tendency for denning before the other (Table 6). Still, based on Michigan's observations, early denning of Vermont female bears could exist, but constancy of sex ratios during November does not now permit deer season bear management by sex.

Age Ratio and Vulnerability. Age ratio means the distribution of age classes in the population—that is, the number of bears in age class 1, the number in age class 2, etc. The sampled age structure of Vermont's 1968 to 1972 bear population strongly indicated a *downward* trend. Whereas the average age of bears in the 1968 harvest was 5.38 years, the average age in the 1972 harvest had decreased to 4.18 years. The 1973 to 1975 age ratio, however, showed a reversing *upward* trend. In 1973, the average age of the bears in the harvest was 4.44, and by 1975, it had improved to 5.39 (Table 7).

Even though the average age of all harvested bears between 1968 and 1972 showed a gradual but constant decline, the rate of decline was not equal for both sexes. From 1968 to 1972, male bears underwent a net loss of 2.16 years in their age structure as compared to a female net loss of 0.91. If the population age structure were to experience a similar decline throughout the next 5-year period, the *average age* of male bears left in the population would have been 1.0 year. Females, in contrast, would have averaged closer to 4.5 years. Since males as well as females do not reach sexual maturity until approximately three and a half years of age, the question of how the 1977 female bear segment would have been bred would be paramount. Obviously the age composition decline could not be allowed to continue—and was not.

Age distribution data suggest that subtle changes in bear sex ratio are being effected by the greater vulnerability of males to harvest. Between 1968 and 1975, the average percentage of harvested male bears between the age classes of 1 and 5 was 77.5, as compared to only 55.1 percent for

a 24.

females. The persistence of many female bears into the older age classes in comparison to few males indicates the females' lesser vulnerability to harvest (Table 8). For purposes of illustration, the 1972 bear harvest data graphed by sex and age depicts the heavy removal of males in the younger age classes (Figure 4).

One would expect that according to the laws of chance approximately one half of the adult female bears would breed one year and the other half would breed the next year. In reality, however, it seldom works that way. New York researchers,^a examining bear age composition data, came to the conclusion that a breeding synchrony had developed in New York bears whereby larger numbers of bears bred one year than did the next. These "flushes" of breeding females every other year naturally resulted in large cub crops every other year. Vermont data indicate that a similar situation exists here. The variation in cub production between odd and even numbered years can be substantial. Vermont data suggest that approximately 65 percent of its female bears breed during even years, thereby producing during the odd years. How and when this reproductive synchrony started is open to question. Theories have been postulated but none proven as yet. More recent data suggest that for Vermont, at least, this alternate year breeding synchrony is evening out.

Alternate year synchrony of breeding affects the distribution of age classes in a bear population to a very large extent. Alternate year spurts of heavy cub crops result in alternate age classes being heavily represented in the harvest. As an example, consider the age distribution of the 1969 bear harvest (Table 9). Recalling that odd years are the heavy cub crop years, you will note that age classes 3, 5, 7, and 9 are heavily represented. That is due to the heavy cub crops in 1967, 1965, 1963, and 1961 which produced these bears. Age classes 2, 4, 6, and 8, however, are poorly represented because those bears were born during low cub production years. As indicated by the harvest data in graph form (Figure 5), the plotted ages appear like a series of mountain peaks. Therefore, in order to accurately appraise age composition data, one must compare odd years with odd years and even years with even years. From this perspective, trends are more apparent.

Cursory examination of the seasonal average ages of bears by sex in Table 7 gives the impression of annual "ups and downs" in age structure; yet, when bearing in mind the comparison of alternate years, trends are obvious.

Monthly average ages (Table 7) do not show the gradual 1968 to 1972 decline in bear age composition as clearly as the seasonal average ages. The fortuitous harvest of several very old or very young bears can materially affect monthly age ratios, particularly during months when only a small number of bears are harvested.

In general, the average age of male and female bears has shown a progressive monthly decline from September through November each year (Table 7). This decline has been somewhat more pronounced in males and is

partially due to vulnerability. The lower age of male and female bears in November is attributed to cub harvests. Few to no cubs are harvested in September and October when females and their cubs apparently remain in wooded areas. Not only are cubs less likely to be seen by hunters, but faced with a one bear limit, most hunters are more selective about the bear they shoot in early to mid bear season. When cubs are harvested in November, the monthly average age reflects the inclusion of cubs and thus shows a decline.

Breeding Biology. Study of the breeding biology of the black bear in Vermont has consisted primarily of the analysis of female bear reproductive tracts. During this study, complete reproductive tracts were collected from 62 female bears and were examined according to methods described by Cheatum.^a The sexually immature (age class 2) tracts were examined but not included with the producing bears in productivity calculations.

Female black bears attain sexual maturity at three and a half years of age according to investigators from other states.^b Vermont studies and recent North Carolina studies^c indicate that some female bears may attain sexual maturity prior to three and a half years of age.



The presence of corpora lutea (egg release sites) in the ovaries of a female black bear indicates that the bear has been bred.^d Egg release (ovulation) from the ovaries is induced by breeding.^e Ovarian examination of nine age class 3 Vermont bears indicated that six had ovulated at the age of two and a half years. Examination of ten age class 4 bears revealed that seven had ovulated when three and a half years of age; two had ovulated at the age of two and a half years as indicated by placental scars (dark areas left within the horns of the uterus where the placentae were attached); and one had passed through its third summer without having been bred. Except for

five bears (three age class 3, one age class 4, and one age class 21), examination of the reproductive tracts of all other bears age class 3 and older disclosed the presence of either corpora lutea or placental scars. In other words, in all but two of the cases examined, the segment of the population typically considered to be the "producers" (age class 4 and older) was either in the process of carrying young or had given birth to young earlier in the year.

Michigan studies^a revealed a 2.42 average ovulation rate for 12 adult bears. The average number of corpora lutea from 41 Vermont bears age class 3 and older was 2.10 (Table 10). Five Vermont reproductive tracts contained no corpora lutea, three contained one corpora lutea, 18 contained two corpora lutea, 13 contained three corpora lutea, and two contained four corpora lutea. The average number of placental scars from 22 age class 3 and older bears was 2.18. These data suggest that the ovulation rate and conception rate in Vermont black bears are quite similar. If conception rates nearly equal rates of egg release and uterine losses are low (as Michigan researchers suggest), corpora lutea counts will closely reflect the number of cubs carried to term.

There were no indications that female bears become less productive with age. Bears exhibiting corpora lutea or placental scars averaged counts of 2.0 or better from age class 3 through 14.

Physical Measurements. The weight of a black bear is the measurement that appears to be of greatest interest to the public. Almost without exception, the first question from a passer-by viewing a hunter's bear is, "What did it weigh?" If the bear has not yet been accurately weighed, the answer one gets may depend upon a number of conditions: (1) how far the bear was dragged out of the woods, (2) how many people dragged it, and (3) how difficult the dragging conditions were. Dragging a bear has been likened to dragging a huge bag filled with sand; even the most ethical hunter may unintentionally exaggerate the weight of his bear. A bear's rolling fat and roundish figure seem to be the biggest reasons for dragging difficulties. The carcass seems to seek out every topographical hollow or mound, thereupon triggering itself quite securely. Since 1968, the few harvested Vermont bears approximating 400 pounds in size have reportedly been dragged out by horse or tractor.

Sexual Dimorphism. Vermont's male black bears are often much heavier than females of the same age. Sixty-seven verified male bears from age class 1 through 16 were weighed. Of that number, 12 males, age class 5 and older, weighed over 200 pounds dressed. Three of those males, age classes 6, 7, and 10, weighed over 300 pounds dressed.

Fifty-two verified female bears, age class 1 through 12, were weighed. An additional 14 females (sex not verified) were also weighed. In general, dressed weights of adult female bears ranged between 100 and 150 pounds regardless of age. Of 31 verified female bears, age class 5 and older, only five exceeded 150 pounds dressed weight. Although female bears ex-

a 26.

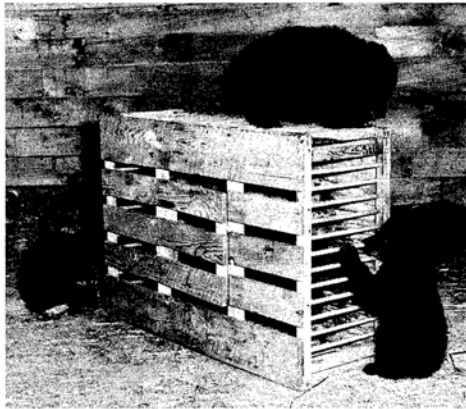
ceeding 200 pounds dressed weight may have been harvested in Vermont in the past or may be killed in the future, these recorded weights suggest that few female bears attain such size (Table 11).

Record Vermont Bear Weights. The heaviest male bear (sex not verified) was an age class 11 bear taken in Newport during the 1971 deer season. It weighed 413 pounds dressed. The heaviest male bear of verified sex was an age class 6 bear taken in Lyndon during September, 1968. It weighed 355 pounds dressed.

The heaviest female bear of verified sex was an age class 5 bear taken in Warner's Grant during October, 1974. It weighed 188 pounds with the heart and lungs included. The next heaviest female bear of verified sex was an age class 5 bear taken in Ferdinand during the 1969 deer season. It weighed 177 pounds dressed.

Bear Weight versus Age. It is apparent that the age of Vermont bears may not be reliably estimated from body weights. Michigan^a and New York^b researchers also concluded that weight per se is an invalid method of aging bears of either sex. The variation between bear weight and age is so extreme that even grossly assigning ages by weight would be valueless.

As one might expect, bear weights generally increase with age. This holds true under most circumstances from birth until a bear attains physical maturity. After that time, bear weight fluctuations may become a function of diet and/or physical condition. It is suspected that some of the variability encountered in the weight of bears during their pre-adult years is closely linked with the abundance of available food supplies. In support of this premise, Michigan investigations indicated that captive cubs fed ample food made "substantial weight gains." One cub held in captivity for three months weighed 12 pounds initially but weighed 81 pounds when released!^c



a 26; b 73; c 29.

- Age class 1 (cubs). The fall weight of Vermont bear cubs is apt to vary considerably. Two thirds of the cubs handled weighed close to 50 pounds dressed, but the remaining one third weighed closer to 20 pounds. The lightest cub weighed ten pounds dressed and the heaviest 63 pounds dressed. The lightest cub was in its ninth month of age and the heaviest in its tenth month.

- Age class 2 and 3. Immature bears of both sexes are also subject to weight variation. The lightest yearling bear (age class 2) weighed 50 pounds dressed and the heaviest 138 pounds dressed. The lightest age class 3 bear weighed 76 pounds dressed and the heaviest 159 pounds dressed (Table 11).

- Adults. Vermont bears continue to increase in weight during their early adult years. With the admittedly limited weight data of older age bears available in this study, it does appear, however, that male bears attain physical maturity at about age class 6 or 7 and that female bears may reach that point a year or two sooner. There was little indication that bears beyond these ages would necessarily weigh any more than the weight extremes encountered at this stage in their lives. The extremely heavy weights of male bears beyond age class 6 or 7 seem to be more a function of obesity than progressive physical maturity.

Total Body Length and Foot Measurements versus Age. Vermont black bear body length and foot length and width measurements are not statistically reliable indicators of a bear's age. Similar conclusions were reached by investigators researching body size criteria in New York.^a Although average body and foot measurements of Vermont bears show a roughly graded increase in size in relation to the bear's age, these measurements appear as though they reach a maximum for male bears at about age class 5 or 6. Females appear to reach maximum body length measurements one year earlier, at about age class 4 or 5.

As encountered with bear weights, total body length measurements overlap sufficiently to preclude association with specific age classes. For example, 14 age class 3 male bears were found to range from 45 to 58 inches in total body length. Nineteen out of 26 other male bears that were measured in age classes 2 through 7 and age class 9 also fell within that range. Seven age class 3 females ranged from 41.75 to 52 inches in total body length. Twenty-three of 31 female bears measured in age classes 2 through 10 also fell within that range.

Bear front and hind foot length and width measurements were also found to be very poor indicators of bear age. Measurements exhibited considerable overlap in all sampled age classes of male bears. Average foot measurements of female bears, on the other hand, remained essentially the same after age class 2.

Based on the data collected in this study, one cannot assume that a very large bear track was made by a very old and a very heavy bear, but one usually can assume it was made by a *male* bear. The oldest male bear measured, an age class 15 bear weighing 268 pounds, did happen

a 73.

to be the bear with the largest feet. Its front foot was 6.0 inches square, and its hind foot was 5.0 inches wide and 8.75 inches long. The heaviest bear measured, an age class 11 male of unverified sex weighing 413 pounds, had feet approximately one inch shorter and narrower than the oldest bear.

The foot measurements of female bears were considerably smaller than those of male bears. In comparison, the oldest female bear measured, an age class 19 bear weighing 119 pounds, had a front foot 3.62 by 4.0 inches and a hind foot 3.5 by 6.5 inches. The heaviest female bear measured, an age class 5 bear weighing 177 pounds, had foot measurements that were almost identical to those of the oldest female bear. An age class 9 female, estimated to weigh 125 pounds, had the widest front foot. It was 4.25 inches wide.

Food Habits Study. The stomachs of 39 September bears, 18 October bears, and five November bears were analyzed as to content by frequency of occurrence. Since most of the stomachs came from bears harvested in northeastern Vermont, it should be kept in mind that they do not necessarily represent statewide food habits.

September Food Habits. During September, the bear's diet is more varied than during October or November. Vegetative materials are more abundant as they have not yet been killed by frosts. The most important September food was apples. Surprisingly, succulent jewelweed, which had not previously been recognized as a bear food, ranked second in importance. In field observations, jewelweed patches were observed to have been consumed to ground level by bears. Chokecherries ranked third, carrion ranked fourth, and grasses ranked fifth. An assortment of other vegetative materials, small mammals, tree needles, seeds, insects, roots, papers, and cloth occurred in bear stomachs to varying degrees.

October Food Habits. Again, apples were the most important food item.



Beechnuts were second. Carrion and grasses ranked third and fourth respectively. Except for acorns and miscellaneous vegetative materials, the few other items showing up in the bears' stomach contents were at trace levels.

November Food Habits. Surprisingly, apples continued to be the most important food item. It had been anticipated that mast crops would predominate in the stomachs of November harvested bears, but they did not. Acorns ranked second, carrion ranked third, and vegetative materials ranked fourth. Except for varying hare remains in one bear's stomach, the few other items recorded were at trace levels (Table 12).

Vermont bears do not seem to be discouraged by snow if they are aware that a good food supply exists beneath it. During the fall of 1971, bears stayed on the ridges feeding on mast crops throughout the snows of deer season. Soon after deer season, the bears moved into abandoned farm apple orchards. Pawing through the snow well into December, they fed on apples they had virtually ignored months earlier.

Trichinosis Study. During 1964 and 1965, a study of the incidence of trichinosis in Vermont black bears was started.^a This study was continued in 1968 as part of the black bear project. Since 1964, of 120 bears sampled, only one bear tested positive for trichinosis.

The expensive laboratory testing of bear meat is no more needed than the laboratory testing of pork purchased in a supermarket. As long as all portions of the meat are well cooked, there is no danger of contracting trichinosis from bear meat. When meat portions reach 65.6° centigrade (150° Fahrenheit), any trichinae larvae present are killed.^b

During the course of the Vermont black bear study, the impression was gathered that the meat of many harvested bears is not eaten. Bear meat is excellent tasting and should no sooner be discarded for fear of trichinosis than a pork roast.

Abandoned apple orchards are scattered all over Vermont. When apples are present, they attract deer, grouse, and other wildlife. They also top the list of preferred bear foods from September until denning time. (Exception: nuts are preferred first when abundant.)



a 3; ;b 3.



BEAR HUNTING AND THE HUNTER

Hunting Methods. Vermont black bears are harvested as the result of chance encounters as well as the result of careful planning, preparation, skill, and patience by the hunter. Bears crossing roads and fields, raiding gardens and beehives, and accidentally encountering hunters pursuing other game are likely to be shot at. Other than chance encounters like these, during 1968 the bear hunter in Vermont basically had the option of four hunting methods. He could (1) hunt for bear by the conventional means of stalking or making a "stand," (2) bait a bear with meat scraps or similar bait into an area of his choosing, (3) hope to bag a bear at one of the few town dumps attracting bears, or (4) hunt a bear with the assistance of trained dogs. Within a few years, taking of bears at dumps and baiting of bears were to be prohibited.

The taking of bears by the conventional means of stalking or making a stand needs little explanation or elaboration. The other methods, however, have been more controversial and will be explained in greater detail.

Conventional Hunting Methods. Stalking of bears and making "stands" were the main methods of hunt. During the study period, an average of 86.2 percent of the bears harvested annually were taken by these means. Those bears taken by chance encounters would also fall within this category.

Baiting of Bears. Fewer than ten bears per year were reported taken over bait during the first four years of the project, and by the fifth year baiting was prohibited.

Bear baiting ranged from the hunter who sat patiently by a discarded stillborn calf or other carrion to the hunter who erected elaborate tree stands and baited the site continuously for weeks prior to the opening of bear season. Meat scraps from the local butcher often made up the bulk of the bait material. Many attempts to bait bears were futile. Baiting success depended to a large degree upon the availability of natural bear foods in the woods.

Harvests at Dumps. During the study period, no bears were reported as having been taken at dumps. In 1968, one or two bears were illegally taken at a dump with the aid of a light. Following this incident, bears were deliberately frightened away from some dump areas by Fish and Game Department personnel immediately prior to the bear season. Firecrackers, handguns, and rifles were used to scare the bears away. These preventative measures apparently were successful. In 1972 the taking of bears at dumps was prohibited.

Today, little opportunity exists for bears to gather at dumps. Recent sanitary landfill laws have virtually eliminated the accumulation of garbage which attracted some bears.

Hunting of Bears with Trained Dogs. Hunting bears with trained dogs was also found to be a controversial method of hunting. Many people were concerned that hunters using dogs would get all the bears. Data collected during this study discounted this concern. Hunters using trained bear dogs took little more than 10 percent of the annual bear harvest (Table 13).

The use of trained bear dogs does not guarantee successful hunts. It took some hunters using dogs every weekend of September and October to eventually take one bear, and some hunters using dogs were not successful at all. Some owners of bear dogs, in addition to their own hunting, often guide paying clients. Even then, no more than six or eight bears were harvested ahead of any set of dogs in any year. Occasionally, a hunter never had the chance to run a bear. Usually, a great deal of time, effort, and expense is involved for each bear harvested with the aid of dogs.

Beginning in 1972, the owners of bear dogs were required to register their dogs and obtain a permit from the Fish and Game Department in order to take bears with the use of dogs. In 1972, 270 dogs were registered, and 61 permits were issued. The average number of dogs to a permit was

4.4. Of the 270 dogs, 31.1 percent were Plotts, 20.4 percent were Walkers, 15.9 percent were black and tans, 15.2 percent were blueticks, 4.8 percent were redbones, 4.8 percent were "hounds," and the remaining 7.8 percent were mixed breeds.

During 1972, 26 bears were taken with the aid of trained dogs. This meant a success rate of less than one bear for two permits. It also must be kept in mind that many hunters other than the actual owners of the dogs took part in the hunt; this meant a far lower success rate when comparing numbers of bears harvested to numbers of hunters actively engaged in the hunts.

In comparison to the 61 bear dog permits issued in 1972, 46 were issued in 1973, 65 were issued in 1974, and 63 were issued in 1975. The success rate continued to be approximately one bear for every two permits.

A look at a bear hunt using trained dogs may be of interest to those who have never participated in such a hunt. The dog owner and his companions arise before dawn and load the dogs into their vehicle. Dirt roads and remote terrain are often travelled for an hour or more in search of fresh bear tracks or scent. Little time is wasted since the scent-laden, heavy morning air and dew will gradually disappear as the sun comes up and the morning wears on. The "strike dog" may "sound off" on a raccoon, bobcat, or even a cold bear track as well as a hot bear track. When the hunters are satisfied that it is a fresh bear track and that the strike dog can make out the trail sufficiently for a chase, the rest of the pack is released.

Now the hunt really begins. Once jumped out, the bear may lead the dogs and hunters on a chase of many miles. The bear's trail may cross mountains, swamps, thickets, ledges, ponds, rivers, and streams with obviously no concern to the bear how rough the country gets. The bear's only concern is to lose its pursuers, and often it does. If so, the hunt ends here.

Main roads are the dog owner's greatest fear for his dogs. The bear crosses them with reckless abandon. Sometime later, the dogs rush out onto the road. Oblivious to all else, they run up and down the road trying to pick up the tire-worn and scattered bear scent. Hopefully, the dogs will quickly pick up the scent, or the bear's crossing will be fresh enough to carry the dogs straight across the road. If not, there is a good possibility of one or more dogs being struck by vehicles.

Sometimes the bear makes an on-the-ground stand. If the hunters are lucky, the dogs will hold the bear at bay until the hunting party arrives. At other times, the bear is able to make a successful escape. If the hunters are far behind, there is the likelihood that one or more of the dogs will be injured, sometimes fatally. The bear rarely loses to the dogs. The most the dogs give the bear is a nip now and then.

The hope of the hunters is to have the dogs tree the bear and keep it treed until the hunters arrive. Ideally, the bear will stay up the tree, the dogs will be unharmed, and the hunters will have the opportunity to carefully size

up their quarry. Even though the bear is treed, it is not necessarily taken by the hunters. Non-trophy animals are usually spared, and some hunters deliberately avoid taking suspected female bears.

Bear Hunting vs. Target of Opportunity. Data collected from bear report cards suggest that during most years Vermont deer hunters will harvest well in excess of 50 percent of the bears taken (Table 14). Significantly, most of this harvest is the result of chance rather than deliberate encounters with bears. The 50 percent figure is probably minimal since some error unintentionally occurs at the reporting location due to too literal interpretation of the question, "What were you hunting for when you shot your bear?" Literally, hunters were hunting for bear at the moment they shot their bear, but actually they had been deer hunting. The bear just happened to come by, or they stumbled onto it. Some hunters contacted later acknowledged that they had interpreted and answered the question in such a literal manner.

Data indicate that hunters actually hunting for bears take an average of 43 percent of the bears annually. Bear hunters only take most of the bears in those years when bears are unavailable to the deer hunters. This takes place in the years when bears den early.

As mentioned earlier in this publication, the number of bears taken by September and October bear hunters is declining. Whereas bear hunters harvested an average of 180 bears during the combined months of September and October from 1963 through 1967, they only harvested an average of 121 bears for those two months from 1968 through 1972. This decline is more likely a result of a decline in actual bear hunting pressure than a decline in success by bear hunters.

Each year a few bird hunters bag a bear. Bird hunters harvested an average of three bears annually from 1968 through 1975. Presumably, rifled slugs or buckshot are kept readily accessible by many bird hunters on the chance they might happen upon larger game.

From 1968 through 1975, only 17 bears were taken by hunters who were hunting for species other than deer, bears, or birds. Most hunters did not indicate what "other species" they were hunting (Table 14).

Hunter Statistics. Hunter statistics contain a number of biases not easily weeded from collected raw data. Sources of possible error include not fully understanding questions asked, imperfect memories, hasty replies, and deliberate misrepresentations of fact. To assume that every hunter interviewed introduced these sources of error would be as unrealistic as assuming that no hunter did. Undoubtedly, most hunters made every attempt to answer questions as accurately as possible. These data, however, are presented with the caution of possible error introduced by sample size and data source.

Hunter Success. Hunter success may be measured in many ways. A successful hunt to one hunter may not be a successful hunt to another. One hunter may consider just seeing a bear a successful hunt; another may feel that he has to actually shoot at a bear; yet, another may feel that he has to actually harvest a bear to be successful. In this study, only hunters who actually harvested a bear were considered successful.

Between 1969 and 1972, 293 successful bear hunters were asked whether or not they had previously shot at a bear that fall. Eighteen hunters replied that they had. Over 90 percent of the hunters taking a bear said it was the first they had seen that fall.

These same 18 hunters were asked whether or not they had wounded the bear they had previously shot at. Five hunters replied that they had, 11 hunters felt they had not, and two hunters were uncertain.

Hunter success is usually calculated by dividing the number of licenses issued by the number of animals harvested. States selling separate licenses for each game species hunted have the opportunity to calculate success rates by species. Vermont's one license for all game precludes calculation of hunter success rates by species, but some important generalities can be made.

Most hunters in Vermont are potential bear hunters. Every hunter hunting for bear in Vermont cannot shoot any other game he sees because of closed seasons. Because of the length of the bear season, however, a hunter pursuing game other than bear has the privilege of shooting a bear when he sees it.

Between 1968 and 1975, Vermont sold an average of 140,986* hunting licenses while harvesting an average of 236 bears annually. If, in fact, most hunters would shoot a bear when they saw it, the overall bear success ratio is extremely low. Since 57.6 percent of the bears harvested between 1968 and 1972 were harvested by hunters *not hunting for bears*, it is evident that many hunters will shoot a bear when afforded the opportunity.

Between 1968 and 1972, 344 hunters who had harvested bears were asked the question, "Is this the first bear you have shot in Vermont?" For 71.2 percent of the hunters, it was their first Vermont bear.

Inasmuch as deer hunters and bear hunters harvest nearly all of the bears, a comparison of their respective opportunities to harvest bears is interesting. Eighty-four percent of the hunters pursuing deer when they shot their bear said it was their first bear; 61.2 percent of the hunters pursuing bears when they shot their bear said it was their first bear. As might be expected, bear hunters undoubtedly had greater opportunities to harvest bears in previous years than did deer hunters.

Resident versus Nonresident Hunter Success. Since 1968, Vermont residents have harvested annually approximately two thirds of the bears taken. Considering that roughly two thirds of the bear season harvest usual-

* Excluding resident and nonresident bow and arrow and nonresident small game licenses.

ly takes place during deer season and that Vermont license sales since 1968 have been 71 to 76 percent resident, it is understandable that residents harvest most of the bears. Not knowing how many resident or nonresident hunters specifically hunted for bears in Vermont, however, it is impossible to calculate actual hunter success rates.

Future Bear Hunts. The 344 hunters mentioned earlier were also asked whether or not they would shoot another bear in Vermont during subsequent seasons. Of the deer hunters who had just shot their first bear, nearly 75 percent said they would, 19 percent said they would not, and 6 percent were uncertain. Of the deer hunters who had previously shot bears, over 90 percent said they would shoot another. Of the bear hunters who had just shot their first bear, 92 percent said they would shoot another bear, only 1 percent said they would not, and 7 percent were uncertain. All the bear hunters who had previously shot bears said they would shoot another. Although the bear hunters were decidedly more positive about shooting bears in the future, it was apparent that the majority of the deer hunters who had already harvested a bear would not pass up the opportunity in later years either. It was interesting to observe that some of the interviewed hunters who emphatically stated that they would not shoot another bear did shoot another bear during subsequent seasons.

Hunter Game Preference. A measure of the importance of bear hunting to the hunters harvesting bears was arrived at by asking them if they preferred to shoot a bear to any other game animal. For hunters pursuing deer, 24.7 percent replied yes, 64.3 percent said no, and the remainder was uncertain. For hunters pursuing bears, 47.0 percent replied yes, 41.5 percent said no, and the remainder was uncertain.

Hunter Time and Costs. Analysis of time and costs of hunters harvesting bears confirmed the suspicion that Vermont's black bear largely represents a "bonus species" for opportunistic deer hunters. Most deer hunters taking a bear had no intention of doing so. Their time and costs, therefore, were pretty much limited to the moment of harvest and the rifle cartridge expended. The time and costs figures in the following paragraphs illustrate this.

Hunters who had successfully harvested a bear were questioned as to the number of 8-hour days they had expended getting their bear that season. Approximately 77 percent of the 170 hunters pursuing deer when they shot their bear spent half a day or less; the remaining hunters spent anywhere from one to 30 days. The average number of days was 1.6. In comparison, approximately 9 percent of the 194 hunters pursuing bears when they shot their bear spent half a day or less; the remaining hunters spent anywhere from one to 35 days. The average number of days was 3.2.

These hunters were also asked the number of days that they *usually* had spent bear hunting in previous years. Deer hunters averaged 1.8 days, and bear hunters averaged 6.3 days. Both of these time expenditures were higher

than the corresponding figures in the previous paragraph. Perhaps in recalling previous seasons' hunts, hunters tend to exaggerate the actual time they spent, or perhaps these figures lend support to the observation that bear hunter participation may be declining.

A total of 155 deer hunters estimated the cost of harvesting their bear. The average cost was \$23.29. Approximately 82 percent felt their bear cost them \$10 or less. The greatest expenditure by any one deer hunter was estimated at \$300.

A total of 183 bear hunters estimated the cost of harvesting their bear. The average cost was \$44.81—almost double that of the deer hunters. Approximately 70 percent felt their bear cost them \$10 or less. The greatest expenditure by any one bear hunter was estimated at \$1,000. It should be kept in mind that these expenses are based on 1969 to 1972 costs.

SECTION 4

THE FUTURE OF VERMONT'S BLACK BEAR

Vermont's black bear research is not concluded. Initially set up as a 5-year project in 1968, it has been re-funded through 1977. The bear project will be continually renewed and updated as necessary to manage Vermont's future bear population. The project has already been expanded to include the handling of some live bears as well as hunter-harvested bears.

Management of black bears is a relatively new and complex science. Only recently have states begun the research that is a necessary basis for sound management. Many of the intricacies of black bear population structure, harvest, and management are being measured and analyzed for the first time. While some earlier established Vermont theories have retained credibility throughout this study, it is obvious that in the future new theories will be developed which may replace those earlier ones. Despite the fact that a comparative wealth of knowledge has been gained about Vermont's black bears, a lot remains to be learned.

Vermont's valuable black bear resource must be managed for the benefit of the nonconsumptive as well as the consumptive user. This resource belongs to all VermonTERS, whether they be naturalists, hikers, or hunters.

Black bear populations are usually managed by controlling the numbers of bears taken by hunters. This may be achieved by controlling the methods by which the bears are taken. The degree to which controls are applied may be varied, permitting a great deal of management flexibility. The bear harvest by hunters may be decreased by strengthening controls when bear population decreases indicate the need. Correspondingly, the bear harvest by hunters may be increased by a relaxation of controls when bear popula-

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tion increases necessitate population reduction. The following controls are the ones most commonly applied by black bear managers. Within the past decade, Vermont has used all of them.

(1) **Season length.** In 1974 the bear season in Vermont was modified in order to correct a subtly declining age structure in the bear population. The usual 3-month season was shortened by approximately three weeks. It was the first time in 13 years that Vermont's bear season had been changed. But even more significantly, it was the *only* time in Vermont's history that bear population data were available to evaluate the impact of a season change. The modified season begun in 1974 was continued in 1975 and 1976 to further improve upon the age structure revealed by the 1974 bear harvest and to also allow better evaluation of the 1974 season modification.

(2) **Season timing.** During 1974, 1975, and 1976, the bear season in Vermont opened two weeks later and closed one week earlier than in the previous years. The season ran from September 15 through the second Sunday of the regular deer season.

(3) **Bag limit.** A one bear limit was imposed in Vermont in 1968. This significantly reduced the cub harvest.

(4) **Methods of taking.** Bear trapping was prohibited in Vermont in 1967. Dump hunting and baiting were prohibited in 1972. Permits and restrictions on hunting with dogs were also imposed during 1972.

The results of black bear management are not immediate but rather long-term in scope. Due largely to their small numbers and low reproductive rate, a black bear population responds slowly to management moves made in its behalf. Therein lies the basis for the continuous monitoring and close management of Vermont's bear population. With little outward signs of danger, an unmanaged bear population could easily be overharvested to the point where it would take many years for the population to rebuild itself.

Correspondingly, bear numbers have to be held within reason. A fine line may exist, however, between an abundant and an overabundant bear population. Along with the expansion of a bear population comes the likelihood of increases in bear-related problems. Bears in crops, bears in barns and sheds, bears near homes, and bears investigating downtown business areas attest to periods of bear population abundance in Vermont.

Perhaps the very key to bear population well-being is to a large extent an uncontrollable factor. The destruction and disruption of woodland (bear habitat) are factors not always within the control of the Fish and Game Department, the one agency responsible for protecting Vermont's bear resource. Large-scale manipulations of land (thousands of acres) can be examined, and effects on the bear population can be projected. Small habitat changes, however, may appear inconsequential as they nibble at bear

habitat, but altogether these small intrusions may have a serious effect on the bear population. The difficulty, of course, comes in justifying to the satisfaction of Environmental Commissions handling land-use permits why a ski lift here or a 150-acre subdivision there is detrimental to the interests of local resident bears. It appears, however, that the developers will prosper with their condominiums and hot dog stands—and more will come; for theirs is the argument of dollars against the seemingly intangible arguments of aesthetics, recreation man days, and habitat damage which the wildlife manager will use. Two or three bears utilizing a proposed million dollar development site do not carry much weight. Perhaps in time they will. But until then, the bulldozers will roar, man will have another artificial recreation area at the expense of a natural one, and these two or three bears, like others, will retreat further back into the mountainous or undeveloped terrain in their efforts to avoid man.

During the next few decades, Vermont's bear habitat may not be too unchanged outwardly from what it is today. Land clearing continues to take place, but also valuable new food and cover is being created for the black bear with abandonment and reversion of farmland to woodland. Important as abandoned farmland may be to the bear, it is quite unlikely that within the next quarter century Vermont will have any more abandoned farmland in the stages of reversion than currently exists, as Vermont is already more than 70 percent wooded.^a It is more likely that there will be less abandoned farmland. Rather than bear habitat increasing, it is much more probable that development will continue to insidiously but steadily destroy it as vacation homes, second homes, camps, and the erection of small- and large-scale developments serve as contaminants to bear habitat.

In terms of distribution of bear harvest, it is reassuring to see that the black bear range in Vermont has not visibly declined in two decades. Bear harvest figures, however, do indicate that changes have occurred in the number of bears harvested within that range. Bear harvests in southern Vermont have generally declined while harvests in northern Vermont have increased. It is suspected that these trends will continue.

Biologically speaking, there is no reason why Vermont cannot have a healthy bear population for centuries to come. Only the politics and the "progress" of man stand as threats to Vermont's bears. Even in an age of world-wide ecological awareness, legislative control means that professional wildlife managers are not permitted to manage Vermont's deer resource. As for progress, progress today means the exploitation of the old homestead. Land changes today are a far cry from the land alterations our ancestors made, and for the bear these changes may be more permanent. Unfortunately, the bear population has no say in ruling its destiny.

To look into the future and try to predict the status of Vermont's black bear population in 50 or 100 years can only be speculative. Sound management practices, continued development, and environmental laws will all play important roles in the future prosperity or decline of Vermont's bear population. The continued availability of adequate bear habitat will be a key factor. Without it, even the most sound management practices will fail.

a 43.



APPENDIX

Common and Scientific Names of Plants and Animals Referred to in the Text

PLANTS	
Common Name	Scientific Name
Apple	<i>Pyrus</i> spp.
Balsam fir	<i>Abies balsamea</i>
Bedstraw	<i>Galium</i> spp.
Beech	<i>Fagus grandifolia</i>
Blackberry	<i>Rubus</i> spp.
Blueberry	<i>Vaccinium</i> spp.
Cherries	<i>Prunus</i> spp.
Chokecherry	<i>Prunus virginiana</i>
Corn	<i>Vea mays</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
Evergreen needles (balsam fir)	<i>Abies balsamea</i>
(spruce)	<i>Picea</i> spp.
Ferns	Polypodiaceae
Grapes	<i>Vitis</i> spp.
Grasses	Gramineae
Hazelnut	<i>Corylus</i> spp.
Horsetail	<i>Equisetum</i> spp.
Ironwood	<i>Carpinus caroliniana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
Jewelweed	<i>Impatiens</i> spp.
Oak	<i>Quercus</i> spp.
Oats	<i>Avena sativa</i>
Pondweed	<i>Potamogeton</i> spp.
Raspberry	<i>Rubus idaeus</i>
Redwood	<i>Sequoia sempervirens</i>
Sedges	Cyperaceae
Skunk cabbage	<i>Symplocarpus foetidus</i>
Tupelos	<i>Nyssa sylvatica</i>
Viburnum	<i>Viburnum</i> spp.
White cedar	<i>Thuja occidentalis</i>

ANIMALS

Common Name	Scientific Name
Ants	Hymenoptera
Bees	Hymenoptera
Birds (Ruffed grouse)	Bonasa umbellus
Black bear	Ursus americanus
Bobcat	Lynx rufus
Cat	Felis domesticus
Cattle	Bos taurus
Crickets	Orthoptera
Dog	Canis familiaris
Elk	Cervus canadensis
Fish	Osteichthyes
Fly larvae	larvae of Diptera
Goats	Capra spp.
Grasshoppers	Orthoptera
Grizzly bear	Ursus spp.
Ground squirrel	Citellus spp.
Hamster	Rodentia
Insects	Insecta
Mammals	Mammalia
Moose	Alces americana
Mountain coyote	Canis spp.
Pig	Sus scrofa
Pine squirrel	Citellus spp.
Porcupine	Erethizon dorsatum
Poultry	Gallus domesticus
Raccoon	Procyon lotor
Rodents	Rodentia
Roundworm	Ascaris spp.
Sheep	Ovis spp.
Snapping turtle	Chelydra serpentina
Trichinae larvae	larvae of Trichinella spiralis
Varying hare	Lepus americanus
Wasps	Hymenoptera
White-tailed deer	Odocoileus virginiana
Woodchuck	Marmota monax

Table 1. Vermont black bear harvest by county and year 1955-1975.

COUNTY	YEAR																				
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Addison	18	30	25	40	38	35	18	32	29	38	32	39	28	10	38	30	25	21	14	13	4
Bennington	23	19	10	21	15	25	35	29	21	15	27	24	20	7	18	13	25	10	13	15	14
Caledonia	8	9	7	9	12	11	10	14	14	20	27	28	20	22	32	21	38	21	12	24	25*
Chittenden	3	9	1	10	6	7	8	1	8	14	12	13	6	2	13	10	6	6	8	5	4
Essex	21	44*	37*	50	39	34	24	38	47*	70*	44*	77*	39*	33*	64*	46*	61*	36*	39*	34*	18
Franklin	6	13	18	13	10	10	8	17	16	11	16	23	34	19	21	9	12	15	10	9	4
Grand Isle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lamoille	4	22	6	34	9	23	7	25	23	38	19	42	26	12	30	14	20	27	10	21	7
Orange	3	6	0	5	5	4	5	11	12	4	10	15	9	4	11	7	21	15	3	15	8
Orleans	16	24	15	24	16	24	12	28	26	25	21	45	36	23	42	23	25	27	12	16	12
Rutland	27	21	23	44	44*	56*	36*	39*	43	28	38	47	32	10	23	25	24	17	14	24	13
Washington	14	13	2	18	12	16	12	21	21	25	15	35	20	4	30	9	21	14	17	22	10
Windham	28*	19	17	16	11	20	31	12	28	9	15	22	10	12	15	17	18	10	13	14	21
Windsor	24	41	14	55*	29	41	13	37	28	38	20	45	19	13	28	19	26	18	6	15	9
Unreported	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
Totals	195	270	175	339	246	306	219	304	316	335	296	455	299	171	368	243	322	237	171	227	149

* Record harvests by year.

Table 2. Percentage composition of Vermont's black bear harvest by county 1955-1975.

COUNTY	PERCENT OF STATEWIDE HARVEST AND YEAR																				
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Addison	9.5	11.1	14.3	11.8	15.4	11.7	8.2	10.5	9.2	11.3	10.8	8.6	9.4	5.9	10.4	12.4	7.8	8.9	8.2	5.7	2.7
Bennington	12.1	7.0	5.7	6.2	6.1	8.1	16.0	9.5	6.6	4.5	9.1	5.3	6.7	4.1	4.9	5.4	7.8	4.2	7.6	6.6	9.4
Caledonia	4.2	3.3	4.0	2.7	4.9	3.6	4.6	4.6	4.4	6.0	9.1	6.2	6.7	12.9	8.8	8.6	11.8	8.9	7.0	10.6	16.8
Chittenden	1.6	3.3	0.6	3.0	2.4	2.3	3.6	0.7	2.5	4.2	4.0	2.9	2.0	1.2	3.6	4.1	1.9	2.5	4.7	2.2	2.7
Essex	11.0	16.3	21.1	14.8	15.8	11.1	11.0	12.5	14.9	20.9	14.9	16.9	13.0	19.3	17.5	18.9	18.9	15.2	22.8	15.0	12.1
Franklin	3.2	4.8	10.3	3.8	4.1	3.3	3.6	5.6	5.1	3.3	5.4	5.1	11.4	11.1	5.8	3.7	3.7	6.3	5.8	4.0	2.7
Lamoille	2.1	8.2	3.4	10.0	3.7	7.5	3.6	8.2	7.3	11.3	6.4	9.2	8.7	7.0	8.2	5.8	6.2	11.4	5.8	9.2	4.7
Orange	1.6	2.2	0.0	1.5	2.0	1.3	2.3	3.6	3.8	1.2	3.4	3.3	3.0	2.3	3.0	2.9	6.5	6.3	1.8	6.6	5.4
Orleans	9.0	8.9	8.6	7.1	6.5	7.8	5.0	9.2	8.2	7.5	7.1	9.9	12.0	13.4	11.5	9.5	7.8	11.4	7.0	7.0	8.0
Rutland	11.0	7.8	13.1	13.0	17.9	18.2	16.4	12.8	13.6	8.4	12.8	10.3	10.7	5.9	6.3	10.3	7.4	7.2	8.2	10.6	8.7
Washington	7.4	4.8	1.1	5.3	4.9	5.2	5.5	6.9	6.6	7.5	5.1	7.7	6.7	2.3	8.2	3.7	6.5	5.9	9.9	9.7	6.7
Windham	14.7	7.0	9.7	4.7	4.5	6.5	14.2	3.9	8.9	2.7	5.1	4.8	3.3	7.0	4.1	7.0	5.6	4.2	7.6	6.2	14.1
Windsor	12.6	15.2	8.0	16.2	11.8	13.4	5.9	12.1	8.9	11.3	6.8	9.9	6.4	7.6	7.7	7.8	8.1	7.6	3.5	6.6	6.0

Table 3. Vermont's black bear harvest by year, month, sex, and sex ratio 1963-1975.

YEAR	MONTH AND SEX*												SEASON SEX RATIO*	SEASON SEX RATIO*	SEASON SEX RATIO*
	September			October			November								
	Percent Male	Female	Count	Percent Male	Female	Count	Percent Male	Female	Count						
1963	58.1	79	57	60.0	12	8	54.8	85	70	176/135 (56.6:43.4)	316				
1964	68.4	39	18	52.5	21	19	54.2	124	105	184/142 (56.4:43.6)	335				
1965	50.8	67	65	55.0	33	27	68.8	64	29	164/122 (57.3:42.7)	296				
1966	63.5	47	27	65.6	40	21	54.3	164	138	251/186 (57.4:42.6)	455				
1967	70.0	42	18	54.3	19	16	46.9	90	102	151/136 (52.6:47.4)	299				
1968	48.7	37	39	58.1	25	18	51.0	26	25	89/82 (52.0:48.0)	171				
1969	62.0	31	19	65.1	28	15	56.8	150	114	211/148 (58.8:41.2)	368				
1970	70.6	36	15	66.7	26	13	48.4	74	79	136/107 (56.0:44.0)	243				
1971	69.6	16	7	50.0	13	13	56.4	154	119	183/139 (56.8:43.2)	322				
1972	60.0	18	12	55.6	20	16	56.7	97	74	135/102 (57.0:43.0)	237				
1973	57.1	16	12	65.9	29	15	59.6	59	40	104/67 (60.8:39.2)	171				
1974	75.0	6	2	60.6	20	13	63.4	118	68	144/83 (63.4:36.6)	227				
1975	61.1	22	14	51.0	25	24	68.8	44	20	91/58 (61.1:38.9)	149				
Overall Sex Ratio	59.9:40.1			58.8:41.2			56.0:44.0			57.3:42.7					
Mean of Annual Sex Ratios	62.7:37.3			58.5:41.5			56.9:43.1			57.4:42.6					

* Variation from season harvest totals due to bears of unreported sex and unreported month of harvest.

Table 4. Vermont's monthly black bear harvest by percent 1963-1975.

MONTH	YEAR						
	1963	1964	1965	1966	1967	1968	1969
September	43.7	17.5	46.3	16.9	20.9	44.7	14.0
October	6.4	12.3	21.1	14.0	12.2	25.3	12.0
November	49.9	70.2	32.6	69.1	66.9	30.0	74.0

MONTH	YEAR						Mean Percent
	1970	1971	1972	1973	1974	1975	
September	21.0	7.1	12.7	16.4	3.5	24.2	22.2
October	16.0	8.1	15.2	25.7	14.5	32.9	16.6
November	63.0	84.8	72.1	57.9	82.0	42.9	61.2

Table 5. Percent of total black bear season harvest taken during Vermont's 16-day November deer season 1963-1975.

Percent of Harvest	YEAR						
	1963	1964	1965	1966	1967	1968	1969
	44.9	66.3	30.7	65.4	65.1	29.1	70.8

Percent of Harvest	YEAR					
	1970	1971	1972	1973	1974*	1975*
	56.5	79.2	67.5	50.8	70.0	36.9

* Shortened bear season - September 15 through the 9th day of deer season.

Table 6. Percent female black bear harvest by progressive 4-day intervals during Vermont's 16-day November deer season 1963-1975.

YEAR	INTERVAL PERIOD AND TOTAL HARVEST							
	1	(n)	2	(n)	3	(n)	4	(n)
1963	42.0*	(81)	48.6	(35)	41.7	(12)	44.4	(9)
1964	50.4	(119)	47.5	(40)	37.0	(27)	41.4	(29)
1965	26.9	(52)	54.6	(11)	11.1	(9)	46.2	(13)
1966	46.6	(176)	39.5	(43)	45.4	(22)	56.4	(39)
1967	52.4	(124)	55.2	(29)	16.7	(6)	57.7	(26)
1968	50.0	(36)	00.0	(3)	100.0	(1)	66.7	(3)
1969	46.2	(145)	40.7	(54)	40.7	(27)	31.6	(19)
1970	50.0	(74)	59.3	(27)	47.4	(19)	55.6	(18)
1971	36.7	(150)	52.1	(73)	63.2	(19)	38.5	(13)
1972	44.0	(109)	50.0	(24)	50.0	(14)	30.8	(13)
1973	44.8	(58)	44.4	(9)	45.4	(11)	25.0	(8)
1974**	35.1	(131)	31.8	(22)	--	--	--	--
1975**	29.7	(37)	25.0	(12)	--	--	--	--
Average	42.7	99	42.2	29	45.3	15	44.9	17

* Percent of female bears in 4-day harvest

** Modified bear season

n Total number of male and female bears in 4-day harvest

Table 7. Average ages of harvested Vermont black bears by month, season, year, and sex 1968-1975.

YEAR AND SEX		TIME PERIOD			
		September	October	November	Season
1968	Male	4.78	4.00	2.00	4.14
	Female	7.13	6.83	5.29	6.61
	Combined	5.85	5.55	3.92	5.38
1969	Male	5.79	5.19	4.69	5.13
	Female	5.36	6.40	5.18	5.47
	Combined	5.66	5.65	4.90	5.26
1970	Male	4.25	3.54	3.83	3.88
	Female	5.33	9.00	5.22	5.67
	Combined	4.55	5.06	4.64	4.70
1971	Male	5.54	3.00	3.77	3.97
	Female	7.00	4.70	5.87	5.77
	Combined	5.94	4.13	4.56	4.68
1972	Male	3.73	3.17	3.02	3.14
	Female	7.82	4.55	5.00	5.40
	Combined	5.77	3.83	3.90	4.18
1973	Male	5.82	4.59	4.35	4.71
	Female	6.43	3.20	3.64	4.03
	Combined	6.06	4.16	4.02	4.44
1974	Male	5.00	5.43	4.32	4.56
	Female	4.00	7.11	5.82	6.05
	Combined	4.83	6.09	4.84	5.07
1975	Male	4.65	4.00	4.96	4.62
	Female	7.42	6.73	4.85	6.38
	Combined	5.79	5.58	4.93	5.39

Table 8. Percentage sex composition of Vermont's black bear harvest by grouped age class 1968-1975.

YEAR	SEX AND AGE GROUP					
	Male		Female		Combined Sexes	
	1-5	6 & older	1-5	6 & older	1-5	6 & older
1968	78.6	21.4	42.9	57.1	60.7	39.3
1969	72.8	27.2	66.0	34.0	70.2	29.8
1970	75.0	25.0	54.2	45.8	66.1	33.9
1971	83.3	16.7	56.4	43.6	72.8	27.2
1972	88.3	11.7	50.8	49.2	71.1	28.9
1973	76.3	23.7	74.4	25.6	75.5	24.5
1974	74.1	25.9	55.8	44.2	67.7	32.3
1975	68.8	31.2	38.3	61.7	55.6	44.4

Table 10. 1 Vermont black bear reproductive data summary of female bears age class 3 and older 1968-1975.

YEAR	BEARS EXHIBITING CORPORA LUTEA		BEARS EXHIBITING PLACENTAL SCARS		BEARS EXHIBITING NEITHER CORPORA LUTEA NOR PLACENTAL SCARS
	Number Of Bears	Total Corpora Lutea	Number Of Bears	Total Placental Scars	
1968	6	15	1	2	1
1969	2	5	0	0	0
1970	2	4	3	7	1
1971	7	16	3	6	0
1972	7	15	3	6	0
1973	5	13	0	0	0
1974	5	14	1	3	0
1975	2	4	10	24	3
TOTALS	36	86	21	48	5

1. Observations limited to complete and readable reproductive tracts.

Table 11. Average Vermont black bear weights and weight extremes by verified sex and age class 1968-1975 combined.

AGE CLASS	SEX AND WEIGHT											
	Male						Female					
	(n)	Low	Mean	High	(n)	Low	Mean	High	(n)	Low	Mean	High
1	(8)	10	38.2	63	(3)	17	30.0	54				
2	(14)	50	91.6	138	(4)	62	86.2	115				
3	(19)	76	115.2	159	(8)	76	105.4	140				
4	(7)	93	134.1	186	(6)	101	123.0	145				
5	(6)	120	169.0	206	(11)	89	126.8	177				
6	(4)	142	212.2	355	(6)	85	118.2	142				
7	(2)	190	260.5	331	(4)	109	133.8	165				
8	(-)	-	-	-	(5)	106	122.6	161				
9	(2)	232	254.0	276	(-)	-	-	-				
11	(-)	-	-	-	(2)	108	112.0	116				

(n) = Number of bears in weight sample.

Table 12. Stomach contents of 62 black bears harvested during Vermont's September 1 through November 30 bear seasons 1968-1972.

FOOD ITEM *	MONTH AND OCCURRENCE											
	39 September Stomachs				18 October Stomachs				5 November Stomachs			
	Total Number Of Stomachs In Which Found	Number of Stomachs In Which Found As Trace Occurrences	Percent Frequency Of Occurrence	Percentage of Total Monthly Diet	Total Number Of Stomachs In Which Found	Number of Stomachs In Which Found As Trace Occurrences	Percent Frequency Of Occurrence	Percentage of Total Monthly Diet	Total Number Of Stomachs In Which Found	Number of Stomachs In Which Found As Trace Occurrences	Percent Frequency Of Occurrence	Percentage of Total Monthly Diet
Apples	20	0	51.3	31.7	11	0	61.1	40.8	4	0	80.0	44.8
Unknown carrion and butcher scraps	14	0	35.9	12.3	3	0	16.7	10.3	1	0	20.0	19.8
Beechnuts	4	0	10.3	4.3	8	0	44.4	30.3	--	--	--	--
Acorns	1	1	2.5	--	1	0	5.6	5.5	1	0	20.0	20.0
Unknown vegetative material, roots, & wood particles	16	6	41.0	3.8	2	1	11.1	2.8	2	0	40.0	11.0
Jewelweed	15	0	38.5	16.5	1	0	5.6	0.3	1	0	20.0	0.2
Unknown grasses	12	2	30.8	6.6	5	0	27.8	9.8	1	0	20.0	0.2
Chokecherry	13	4	33.3	14.3	--	--	--	--	--	--	--	--
Oats	2	0	5.1	4.6	--	--	--	--	--	--	--	--
Varying hare	1	0	2.6	0.1	--	--	--	--	1	0	20.0	4.0
Jack-in-the-pulpit	2	0	5.1	2.7	--	--	--	--	--	--	--	--
White-tailed deer	2	0	5.1	1.0	--	--	--	--	--	--	--	--
Viburnum	1	0	2.6	0.8	--	--	--	--	--	--	--	--
Meat wrapping paper and cotton cloth	2	0	5.1	0.7	--	--	--	--	--	--	--	--
Insects (bees, ants, fly larvae)	5	3	15.4	0.3	--	--	--	--	--	--	--	--
Unknown mammal	1	0	2.6	0.1	--	--	--	--	--	--	--	--
Evergreen needles	10	10	25.6	--	3	3	16.7	--	2	2	40.0	--
Blackberry	3	3	7.7	--	--	--	--	--	--	--	--	--
Ironwood leaf	1	1	2.5	--	--	--	--	--	--	--	--	--
Bedstraw	1	1	2.5	--	--	--	--	--	--	--	--	--
Pondweed	1	1	2.5	--	--	--	--	--	--	--	--	--
Bear hair	1	1	2.5	--	--	--	--	--	--	--	--	--

* Food items are listed in descending order of importance for the entire bear season.

Table 13. Vermont bear harvest numbers and percent according to methods of hunting 1968-1975.

YEAR	METHOD OF HUNT										TOTAL SEASON HARVEST
	Bait		Dogs		Other		Dogs		Other		
	Number Of Bears	Percent Of Harvest	Number Of Bears	Percent Of Harvest	Number Of Bears	Percent Of Harvest	Number Of Bears	Percent Of Harvest	Number Of Bears	Percent Of Harvest	
1968 ¹	4	2.6	32	18.7	135	78.7					171
1969 ²	9	2.4	42	11.4	317	86.2					368
1970 ³	3	1.3	33	13.4	207	85.3					243
1971 ⁴	2	0.6	23	7.2	297	92.2					322
1972	prohibited		26	11.0	211	89.0					237
1973	prohibited		17	9.9	154	90.1					171
1974	prohibited		19	8.4	208	91.6					227
1975	prohibited		32	21.5	117	78.5					149
Average	4.5	1.7	28	12.7	206	86.4					236

¹ Method of hunt data only available from 155 bear report cards.

² Method of hunt data only available from 342 bear report cards.

³ Method of hunt data only available from 239 bear report cards.

⁴ From 1971 on, all report card data were complete.

Table 14. Vermont bear harvest numbers and percent according to species hunted at the time of harvest 1968-1975.

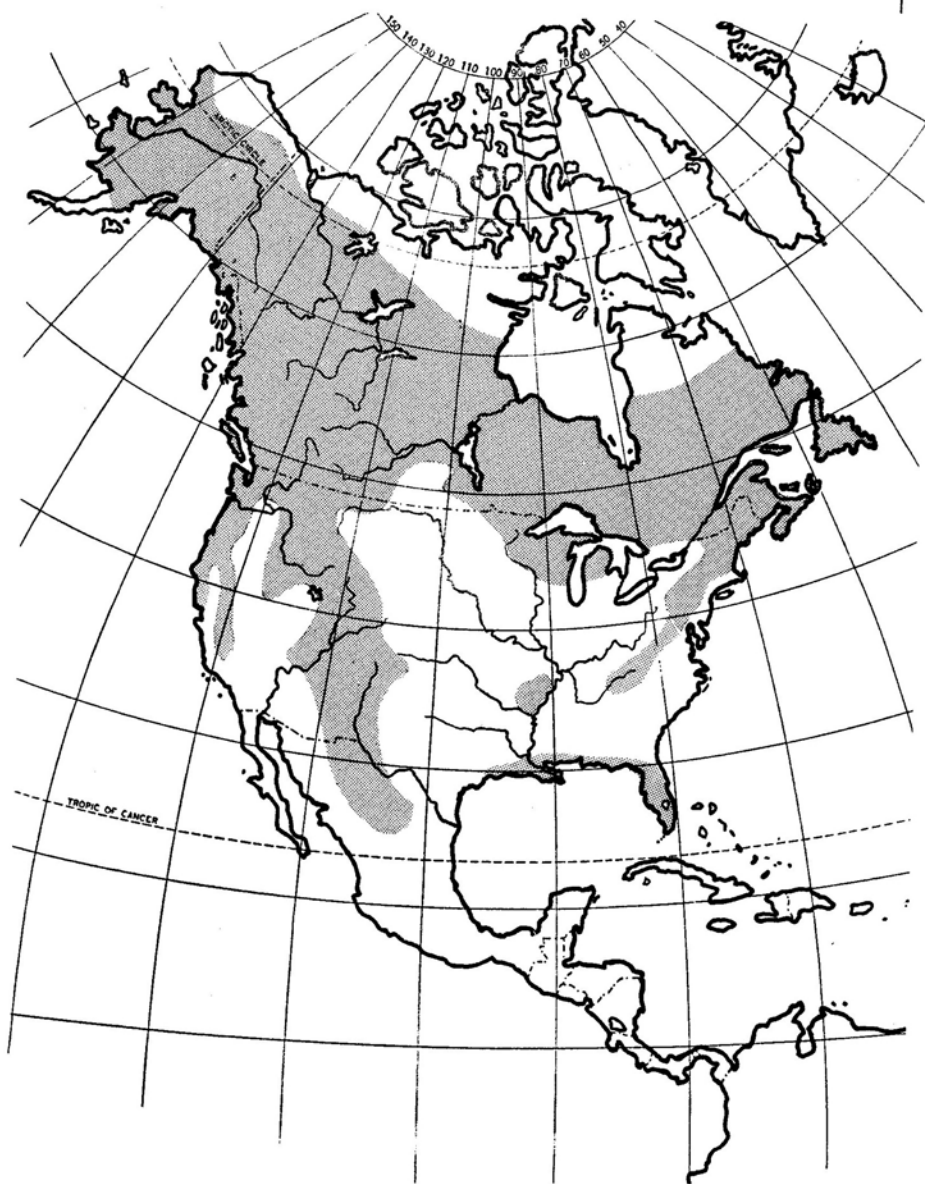
YEAR	SPECIES BEING HUNTED AT TIME OF HARVEST										TOTAL SEASON HARVEST
	Deer		Bear		Birds		Other				
	Number	Percent Of Harvest	Number	Percent Of Harvest	Number	Percent Of Harvest	Number	Percent Of Harvest	Number	Percent Of Harvest	
1968 ¹	50	29.1	117	68.4	3	1.9	1	0.6			171
1969 ²	236	64.0	128	34.8	4	1.2	0	0.0			368
1970 ³	124	51.0	116	47.7	3	1.3	0	0.0			243
1971 ⁴	240	74.6	79	24.5	2	0.6	1	0.3			322
1972	145	61.2	87	36.7	3	1.3	2	0.8			237
1973	82	48.0	83	48.5	1	0.6	5	2.9			171
1974	153	67.4	67	29.5	3	1.3	4	1.8			227
1975	57	38.3	84	56.4	6	4.0	2	1.3			149
Average	136	54.2	95	43.3	3	1.5	2	1.0			236

¹ Species hunting data only available from 155 bear report cards.

² Species hunting data only available from 342 bear report cards.

³ Species hunting data only available from 239 bear report cards.

⁴ From 1971 on, all report card data were complete.

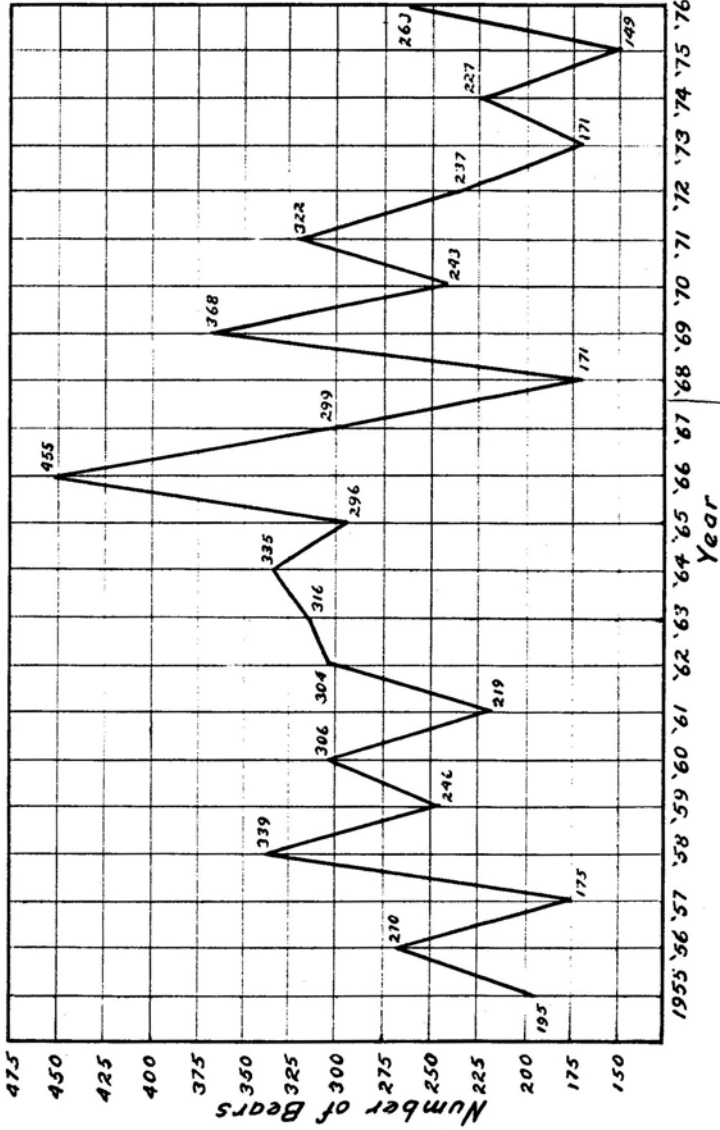


BLACK BEAR DISTRIBUTION IN NORTH AMERICA

 **Range of Black Bears^a**

^aRue, Leonard Lee III. 1968. Sportsman's Guide to Game Animals. Outdoor Life Books—Harper & Row, New York-London. 655 pp.

Figure 3. ANNUAL VERMONT BLACK BEAR HARVESTS 1955-1976.



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Figure 4. SAMPLED AGE COMPOSITION OF VERMONT'S 1972 BEAR HARVEST—by sex, age class, and number of bears.

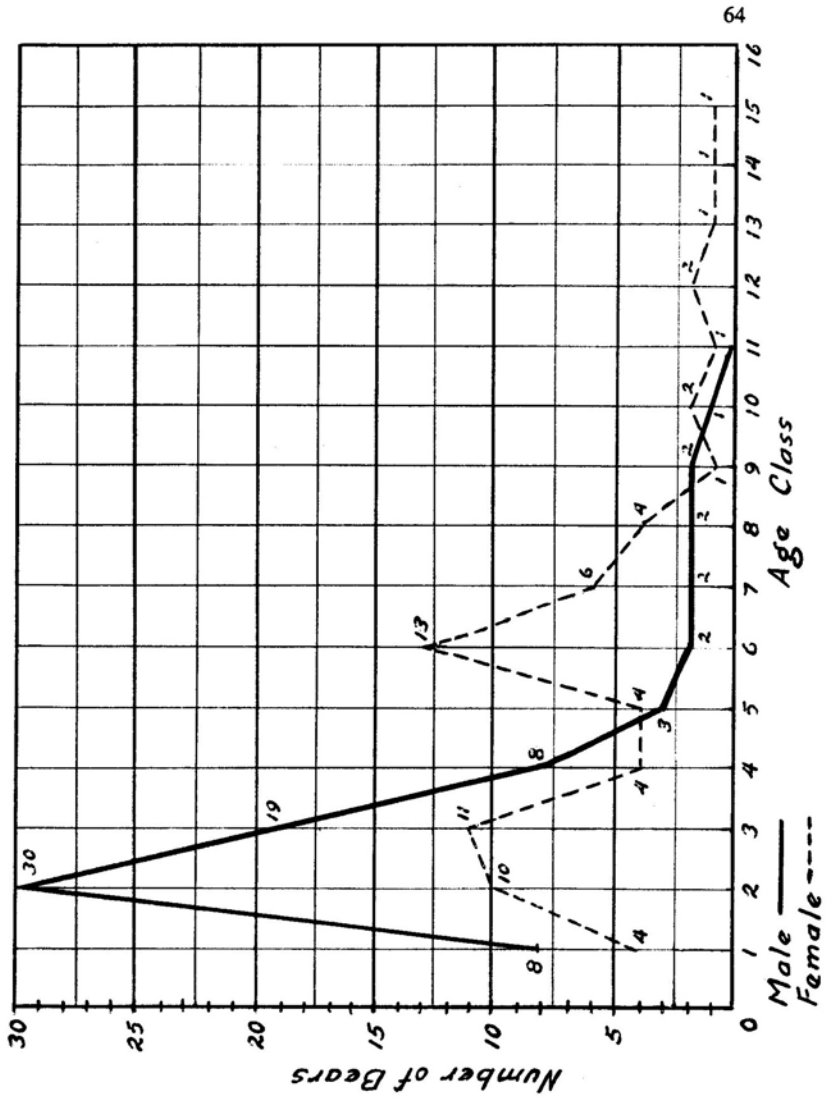
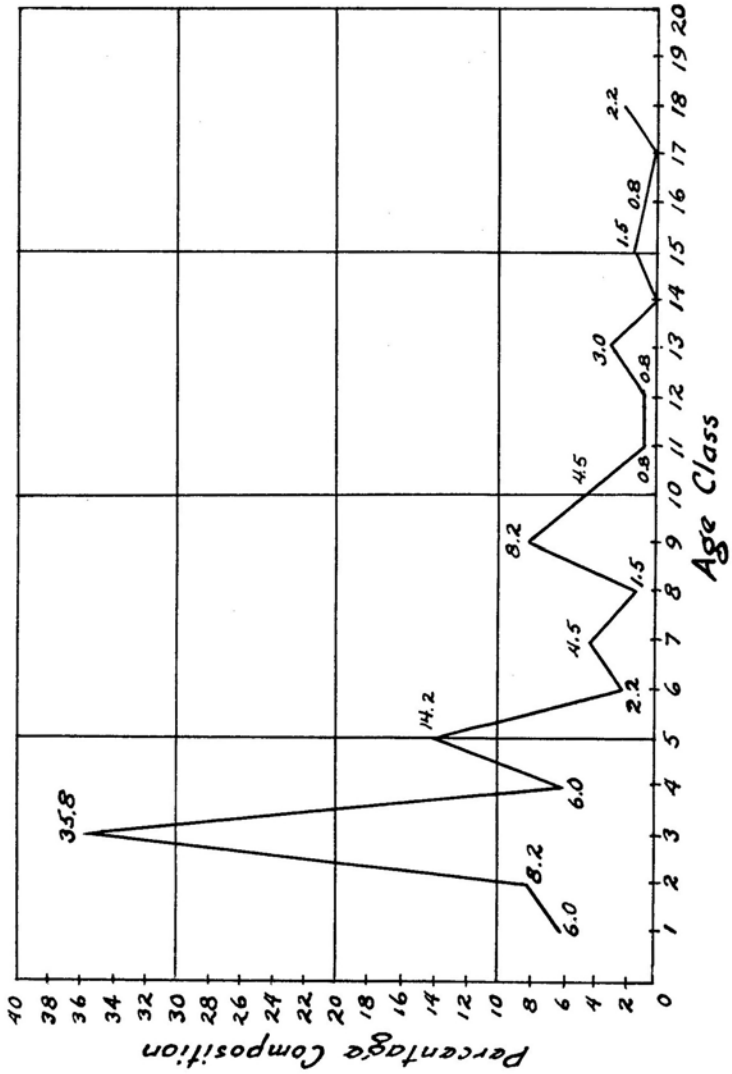


Figure 5. SAMPLED AGE COMPOSITION OF VERMONT'S 1969 BEAR HARVEST—by age class and percent composition.



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GRAPHICS CREDITS*Photographs*

Charles Willey: front cover; bear in tree - pg. i; bear dogs - pg. iii; warden with cub - pg. 3; beech tracks - pg. 6; (composite) apples, chokecherries, torn log, blueberries - pg. 10; (composite) field shot and Mt. Piscah - pg. 13; ledge den & tree den - pg. 14; tooth section - pg. 23.

Robert Candy: bear - pg. 1; (composite) jewelweed - pg. 10; scenic - pg. 12; (composite) woodland - pg. 13; bear in den - pg. 15; weighing bear - pg. 24; ovary sectioning - pg. 31; cubs - pg. 33; abandoned orchard - pg. 35; T. O'Brien's bear/deer - pg. 37.

John Hall: (composite) beechnuts - pg. 10; (composite) abandoned farm - pg. 13; L. Garland weighing bear - pg. 20.

Vermont Historical Society: log drive on White River from "Vermont Album," a collection of early Vermont photographs, edited by Ralph Nading Hill, © 1974 by Stephen Greene Press, used with permission.

Clyde Smith: aerial photograph of mountain development - pg. 73.

Drawings and layout: Robert Candy.

AN UPDATE

Vermont's black bear population has shown steady improvement since 1974. The shortening of the bear season in 1974 coupled with the years of early bear denning since '74 have increased Vermont's bear population to what may be record levels. Accordingly, it is likely that a record Vermont bear harvest will occur in the early 1980's.

Increased bear numbers, however, have presented some problems. Although partly due to changes in farming activities, bear damage to corn, bee hives, and camps increased during the late 1970's. In a 1980 attempt to reduce bear numbers and crop damage, the September 1 opening of bear season, similar to the 1960's and early 1970's, was reinstated.

Vermont started the live-bear capture phase of its bear research program in 1979. The 4-year project will provide needed data on cub sex-ratios, family behavior, bear travel, vulnerability to hunting, and more.

Live-bear capture methods were developed in Vermont during the summer of 1979. The technique utilizing contracted dog-men and trained bear dogs as an aid to bear capture is also being used by bear researchers nationwide and holds great promise. Capture of bear families or individual bears can be accomplished by its use. Basically, the technique involves the location, pursuit and treeing of bear(s) until a capture crew can get to the site. Then follows, placing the capture nets, tranquilizing the bear and performing the necessary biological studies on the immobilized bear before its release. Though much of 1979's capture effort was spent on development and refinement of the capture technique, 16 bears (including two bear families) were captured, tagged and set free. It is hoped that several times that number will be handled during each of the remaining three years of the live-bear research.

For those interested in bringing Vermont's bear harvest data up to date through 1979, the following tables are provided.

Table 1. Average ages of harvested Vermont black bears by year and sex 1976-1979.

Sex	Year			
	1976	1977	1978	1979
Male	4.51	4.85	4.90	4.28
Female	5.03	7.59	5.62	5.00
Combined	4.71	6.01	5.19	4.56

Table 2. Vermont bear harvest numbers and percent according to species hunting at the time of harvest 1976-1979.

Species Being Hunted at Time of Harvest

Year	No.	Deer	No.	Bear	No.	Birds	No.	Other	Total Season Harvest
		Percent of Harvest		Percent of Harvest		Percent of Harvest		Percent of Harvest	
1976	185	70.3	73	27.8	2	0.8	3	1.1	263
1977	53	39.0	78	57.3	3	2.2	2	1.5	136
1978	203	65.1	99	31.7	5	1.6	5	1.6	312
1979	123	50.8	106	43.8	12	5.0	1	0.4	242

Table 3. Vermont bear harvest numbers and percent according to methods of hunting 1976-1979.

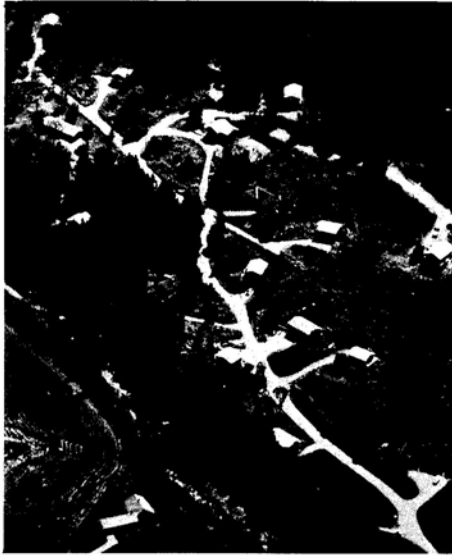
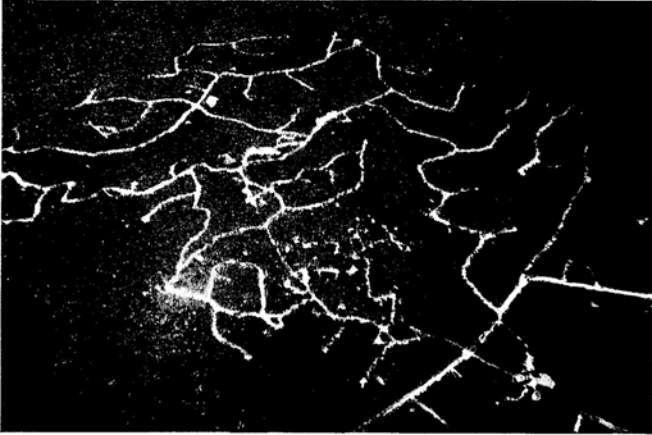
Method of Hunt

Year	With Dogs		Other	
	Number of Bears	Percent of Harvest	Number of Bears	Percent of Harvest
1976	15	5.7	248	94.3
1977	19	14.0	117	86.0
1978	33	10.6	279	89.4
1979	36	14.9	206	85.1

Table 4. Vermont's black bear harvest by month and sex 1976-1979.

Month and Sex

Year	September			October			November		
	Percent Male	Male	Female	Percent Male	Male	Female	Percent Male	Male	Female
1976	44.4	4	5	46.7	14	16	58.9	132	92
1977	57.1	24	18	59.5	22	15	57.9	33	24
1978	82.8	24	5	54.2	32	27	54.5	122	102
1979	52.9	27	24	57.1	40	30	67.8	82	39



Caution: Changing land-use patterns often destroy wildlife habitat and create the greatest single threat against the future for much wildlife, especially the black bear. Only a few years ago this development, carved out of the mountain forest in southern Vermont, was fine bear country.