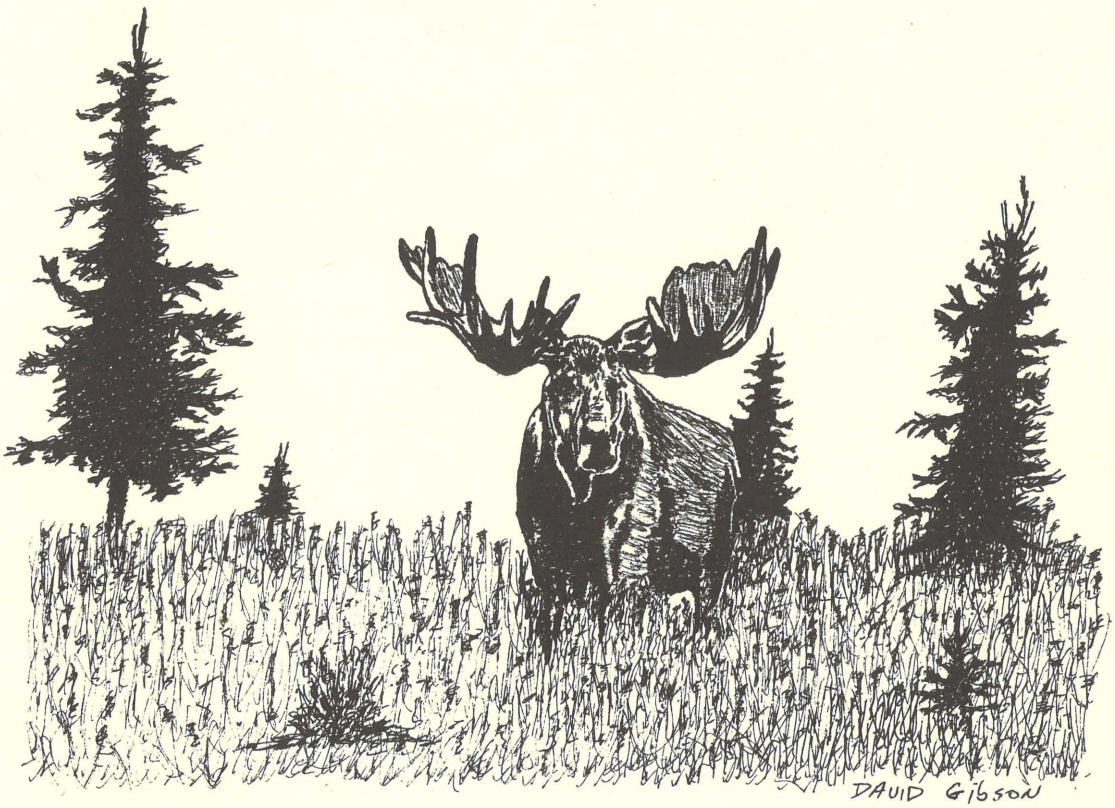
DRAFT
MOOSE MANAGEMENT PLAN
1992 - 1996



Vermont Department of Fish and Wildlife
1992

Prepared by:
Moose Management Team

Cedric E.Alexander, Chair
Lawrence E. Garland
Ronald J. Regan
Charles H. Willey

DRAFT MOOSE MANAGEMENT PLAN

TABLE OF CONTENTS

Page

I. Introduction....1
Schedule of Upcoming Public Meetings....2

II. Resource Analysis....2
A. Moose Population Growth and Distribution....2
B. Sex and Age Structure....5

III. Results of Public Input
A. Public Meetings....5
B. Written Comments....7
C. Moose Advisory Committee....7

IV. General Management Considerations
A. Biological Monitoring....10
B. Habitat Management....11
C. Highway Safety Management....12
D. Nuisance Moose Management....13
E. Interactions Between Deer and Moose....14
F. Moose Management Units....14
G. Harvest Strategies....16

V. Management Goal, Objectives, and Strategies
A. Moose Population....18
B. Recreation....19
C. Negative Human/Moose Interactions....19
D. Program Funding....19
D. Other Considerations....20

VI. Literature Cited....21

VII. Appendices....24

I .INTRODUCTION

Vermont's moose population has grown substantially over the past decade. Consequently, public awareness and interest in moose have also increased. In response to these increases in herd size and public interest, Vermont's Fish and Wildlife Department Moose Management Team has drafted this 5-year moose management plan.

This draft plan is but one stage of a moose management planning process which began early in 1991. Recognizing the need for public input, the Department developed a planning process which called for considerable public involvement. A "Scoping Committee" (See Appendix A), composed of two legislators and five representatives of local and statewide conservation groups, met in June to review and critique the planning process.

A moose brochure was prepared in an effort to inform the public about moose before soliciting public input. The Department published 30,000 copies of the brochure which included facts about moose biology, the current status of Vermont's moose population, moose issues of concern, and an invitation to all Vermonters to help plan the future of Vermont's moose. The brochures were distributed throughout the State in August.

A series of nine public involvement meetings was held during September 1991, at Brattleboro, Burlington, Gilman, Island Pond, Manchester, Montpelier, Newport, St. Albans, and St. Johnsbury. Total public attendance for the nine meetings exceeded 300 people. The objectives of the public meetings were to update Vermonters on the current status of moose, to identify the various benefits and problems Vermonters associate with moose, and to gather public input on desired regional moose population levels.

Following the series of public meetings, a citizens' Moose Advisory Committee (see Appendix B) was approved by the Fish and Wildlife Commissioner to help us both review the public input and develop management strategies for Vermont's moose herd. The nine-member advisory committee included representatives of hunting and non-hunting groups, environmental organizations, and forestry, agricultural, and business interests -- groups we believed to be most interested in and/or most likely to be affected by the moose plan.

The Fish and Wildlife Department has considered all of the public input to date in the drafting of this management plan. We have attempted to plan a course of action that provides for the needs of moose while accommodating the interests of Vermonters in this species. We would now like your review and comment on this draft plan and invite you to attend one of the following public meetings:

DATE *	TOWN	LOCATION
February 24, 1992	Island Pond	Brighton Elementary School
February 25, 1992	Montpelier	Montpelier High School
February 26, 1992	Newport	N. Country High School
February 27, 1992	St. Johnsbury	St. Johnsbury Academy
March 2, 1992	Lunenburg	Gilman Middle School
March 2, 1992	Springfield	Riverside Jr. High School
March 4, 1992	Richmond	Camel's Hump Middle School
March 4, 1992	Rutland	Rutland High School
March 5, 1992	Morrisville	Peoples Academy
* All meetings will begin at 7:00 p.m.		

We plan to make a record of public comments at the above meetings, but we also invite you to mail us written comments regarding this draft plan if you so desire. Comments must be received at 184 Portland Street, St. Johnsbury, Vermont 05819, before March 10, 1992 in order to be considered in the final plan.

A final moose management plan will be prepared for the Commissioner's approval and adoption in March 1992. The plan will cover the five-year period from 1992-1996. Near the end of this period, a process will begin to draft an updated plan for the subsequent five years. That process would once again provide a mechanism for assessing public attitudes and desires relating to management of Vermont's moose population.

II. RESOURCE ANALYSIS

In order to better understand this draft management plan, it is important that you have some basic knowledge of moose biology and the current status of moose and moose issues in Vermont. These subjects were presented in the brochure "Vermont's Moose Status 1991" which was distributed last fall. Appendix C, "Facts about Moose Biology", was reprinted from the brochure. The following sections on moose population trends and the sex and age structure of Vermonts moose population, also from the brochure, are abbreviated and updated.

A. Trends in Population Growth and Distribution

Historically, moose were plentiful in Vermont. Many early settlers relied heavily on moose meat for food. With the widespread clearing of forests and subsequent conversion to farmland, much of the moose habitat in Vermont was eliminated. By 1875, only 32% of the state remained forested. The loss of forest land had an additional, indirect impact on moose habitat -- the loss of beaver ponds and their shallow wetlands that provide moose with abundant and nutritious summer foods. Unregulated trapping and the loss of forest habitat combined to virtually exterminate beavers in Vermont during the nineteenth century.

Moose sightings became rare during the early 1900's, even though a law was passed in 1896 giving the animals complete protection. Sightings of moose remained very low throughout most of this century; it was not until the late 1970's that Vermont's moose population really began to expand.

Improving habitat conditions and lower deer numbers have probably had the greatest impact on the recent growth of the moose herd. Both the forested and wetland habitats used by moose increased in Vermont during the twentieth century to the point where today, nearly 80% of the state is forested. With maturing and matured forests, timber harvesting has increased, especially in northeastern Vermont, and moose browse has become much more available.

Wetland habitats favorable to moose began increasing in 1932, when beavers trapped in Maine were released in Caledonia County and eventually throughout the rest of Vermont.[1] Those restocking efforts, regrowth of the forest, and trapping regulations have resulted in the current widespread distribution of beaver ponds in Vermont.

Vermont's high deer population during the 1960's may have kept the moose population in check. Vermont's deer herd had grown to over 200,000 animals by the mid 1960's. At this time the chances of a Vermont moose contracting a fatal case of brainworm (see Appendix C) may have been relatively high. During the 1970's, however, the deer herd averaged only 120,000 animals thus possibly reducing the brainworm risk to moose. Larger timber harvesting operations which began during this time may have contributed to a separation of ranges used by moose and deer, which also may have allowed more moose to escape the disease.

The increase in the distribution and abundance of moose was very noticeable during the 1980's. Since 1980, moose report cards have been used to document mortalities, sightings of moose, or moose signs (tracks, droppings or bark-stripping). Moose have now been reported in nearly two- thirds of Vermont.

The numbers of moose mortalities that are found and documented provide valuable data on population growth and distribution. Figure 1 shows both the total number of known Vermont moose mortalities and losses by motor vehicles from 1980 through 1991.

You will note that there has been a steady increase in moose mortalities through the 1980's, and a sharp increase in 1991. The population size necessary to sustain such an increasing mortality is conservatively estimated to range between 1000 and 1300 moose in December 1991. These data also suggest that Vermont's moose herd is increasing by approximately 15 percent each year.

Fig.1: Vt Moose Mortalities 1980 - 1991
(469 Moose)

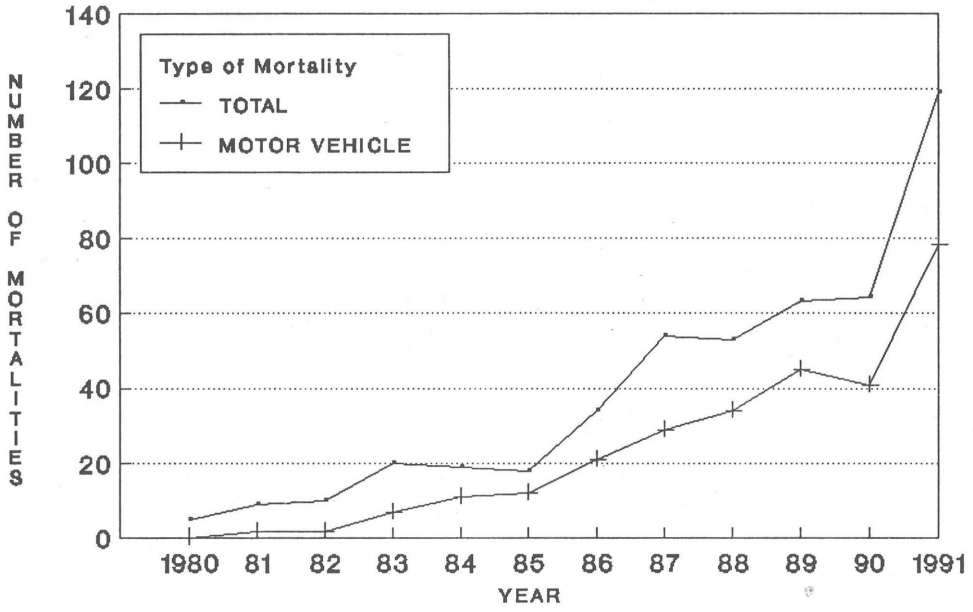
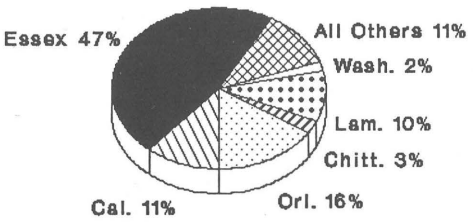


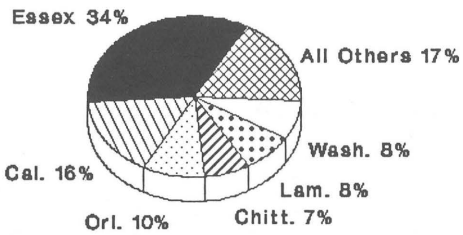
Fig.2: Distribution of Moose Mortality
Percentage of Total Deaths

115 Mortalities



1980 - 1986

346 Mortalities



1987 - 1991

As Vermont's moose herd has grown, it has expanded into new regions of the State. Whereas the majority of the herd resides in northeastern Vermont, the mountainous regions and adjacent areas are becoming increasingly populated by moose. Figure 2 compares the statewide distribution of moose mortalities for two time periods, 1980-1986 and 1987-1991. Whereas the greatest number of moose mortalities has occurred in the northeastern counties, the percentages contributed by other counties have increased over the past five years. It appears clear from the mortality data that Essex County has the largest moose population of any county. Furthermore, the annual mortality figures for Essex County suggest that the growth of its moose population is showing no signs of slowing down (see Figure 3).

B. Sex and Age Structure

Information on the sex and age structure of Vermont's moose population is also provided by sighting and mortality reports. Those data suggest that the male to female sex ratio is a normal, well-balanced 50:50.

The age of a moose may be estimated by visual examination of tooth wear. The most accurate method of aging moose, however, is to examine a cross section of an incisor tooth. A thin, stained section of the tooth is examined under a microscope, and concentric rings of annually-deposited cementum are counted. Since 1985, the Fish and Wildlife Department has attempted to collect incisor teeth from all moose carcasses. Figure 4 shows the age structure of Vermont's moose population as determined from the cementum annulation technique. The heavy representation of younger age classes suggests a productive moose population. Vermont biologists, however, were concerned until recently with the lack of older-aged moose in Vermont, particularly in light of Legislative bills recommending comparatively heavy harvests. Cow moose do not reach peak productivity until age four, and none of the 38 moose aged between 1980 and 1984 were older than four and one half years. Between 1985 and 1990, however, the percentage of animals older than four and one half (including a twelve and a thirteen year old) has gradually increased to a more secure level.

III. RESULTS OF PUBLIC INPUT

A. Public Meetings

In order to develop an overall goal and more specific objectives for Vermont's Moose Management Plan, public attitudes and desires had to be assessed. This needed input was obtained from nine public meetings held in September 1991.

At each meeting, the Department presented a short slide show on the current status of Vermont's moose, followed by a question and answer period. Next, meeting attendees were randomly divided into smaller working groups to discuss and record the benefits and problems they associated with moose. Groups were then asked to select their three most important benefits and problems and report these to a reassembly of all meeting attendees. Tables summarizing the group responses by meeting location are included in Appendices D and E.

Fig.3: Essex County Moose Mortality Caused by Motor Vehicles 1983 - 1991

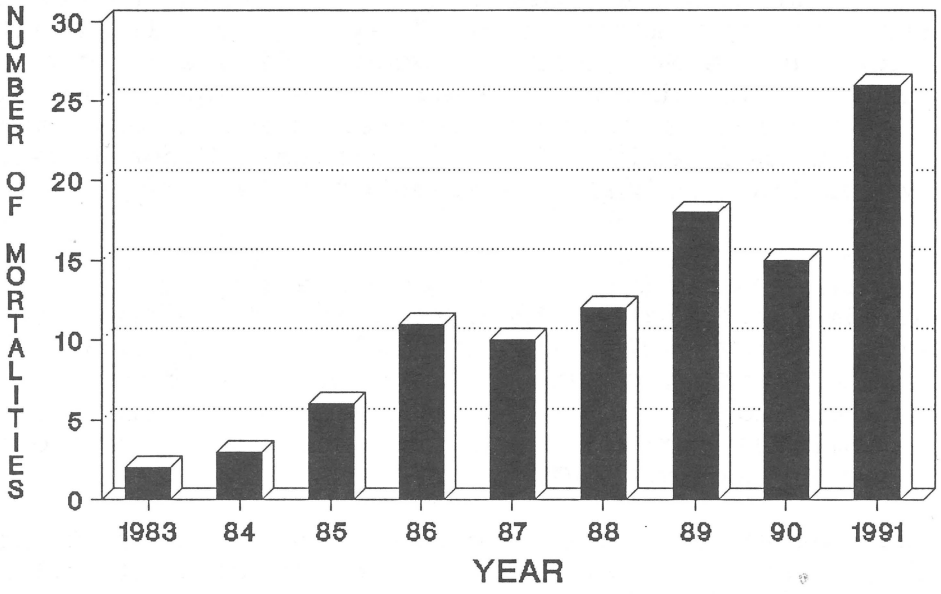
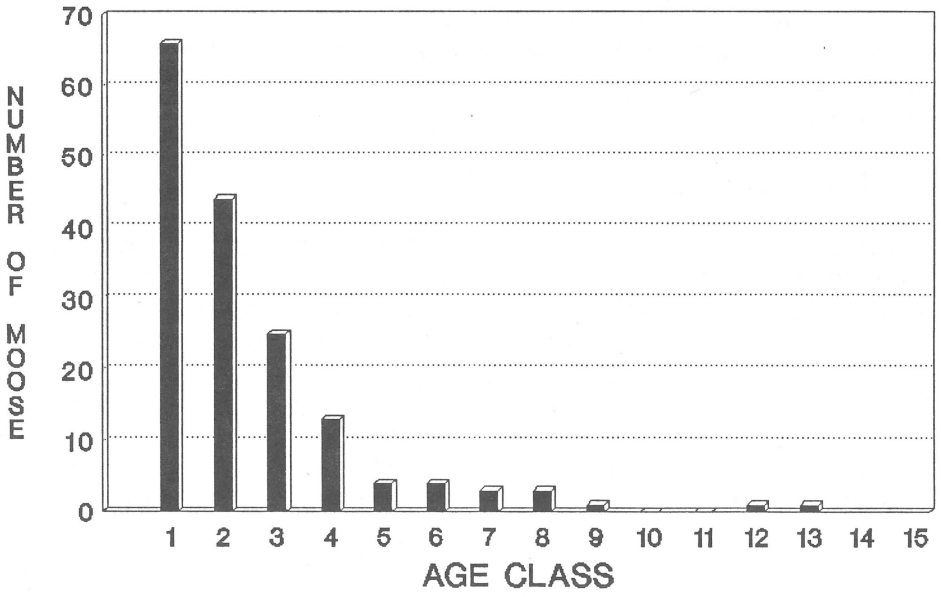


Fig.4: VT Moose Aged by Cementum Annuli 1985 - 1990



165 Moose Aged

The benefit most frequently identified by meeting attendees was the boost to local economics from both tourism and potential future hunting expenditures. The next most popular benefits were hunting (for its recreational and meat value) followed by the opportunity to observe and photograph moose. The most important problems identified were the rapid rise in moose/vehicle collisions and various forms of property damage caused by moose.

Each meeting attendee was also asked to complete a short questionnaire on how many moose they wanted in their area, statewide, and in the Northeast Kingdom. Figure 5 is a graph of responses for all counties combined. The graph shows that the majority of meeting attendees desired more moose statewide, however, the combined desires for the Northeast Kingdom were fairly equally divided between those who wanted more, the same, or less moose.

Essex County residents preferred more or the same number of moose statewide but fewer or the same number in their area (Figure 6). Orleans County residents desired more or about the same numbers of moose statewide but in their own area were fairly evenly divided between more, the same, or less. Caledonia County residents generally preferred more moose both statewide and locally. (see Appendices F,G, and H).

Most all other counties responded that they preferred more moose in their own area, with the exception of Chittenden County residents, who were fairly evenly divided between more, the same, or less moose.

B. Written Comments

The Fish and Wildlife Department also received written comments from meeting attendees and through the mail. A summary of the comments is shown in Appendix I. About half of the letters received came from people living in other states, some from as far away as the West Coast. As the summary shows, most of the letters received were from persons morally or otherwise opposed to hunting moose in Vermont.

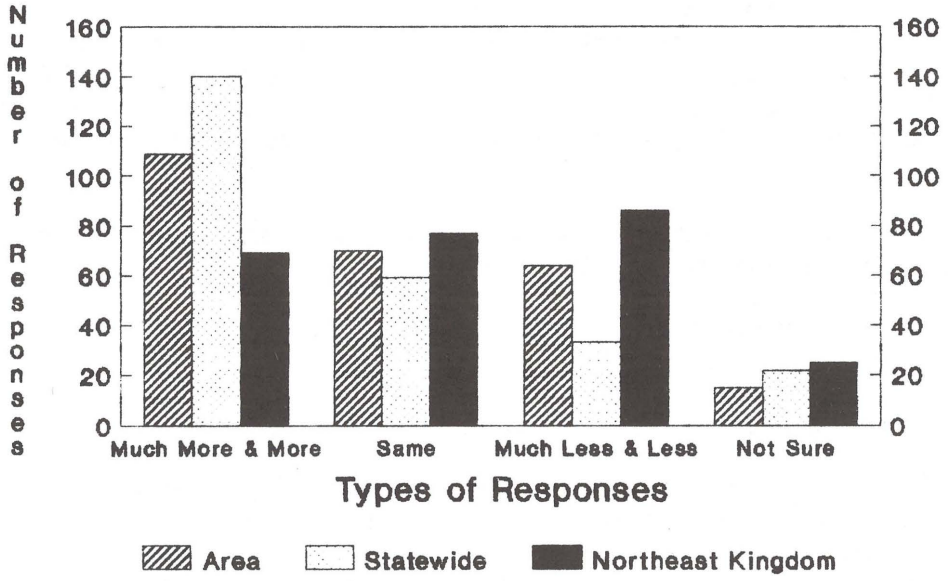
C. Moose Advisory Committee

The Moose Advisory Committee met on three occasions from October to December, 1991. Open and constructive debate of varying opinions and ideas regarding the management of Vermont's moose occurred during these meetings. Dozens of comments and ideas relating to the benefits and problems of moose were recorded for consideration during the drafting of this management plan. At their final meeting (for which one member was absent) the Moose Advisory Committee generated and submitted the following list of final recommendations to the Moose Management Team:

1. Moose may provide significant value both in terms of non-consumptive use and as a sought-after game animal. (agreed to by group).

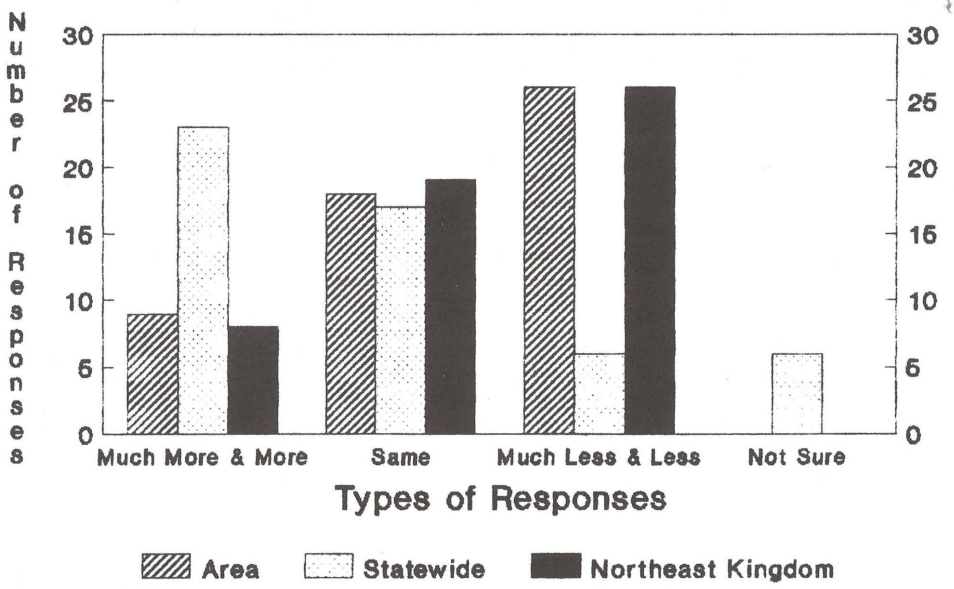
2. Moose are expanding their population numbers and range throughout much of Vermont due to favorable habitat and changes associated with land use practices. (agreed to by group).

Fig.5 Results of Moose Meeting Questions
All Counties Combined



261 Total Responses

Fig.6 Results of Moose Meeting Questions
Essex County Residents



54 Total Responses

3. It appears that the maximum numbers of moose that can co-exist compatibly with the local human population in Essex County has been reached or exceeded. The data appear to be less compelling for Orleans and Caledonia Counties, but there are concerns within these counties. Other parts of Vermont appear to have little or no problem at this time, although small pockets of moose such as in Bolton appear to contribute to localized increased highway collisions, public sightings, and undesirable public interaction. The Department should consider means of limiting the undesirable effects of these small, relatively dense pockets of moose. (agreed to by group).

4. Department should establish moose management zones identifying areas where the moose population may:

a. exceed cultural carrying capacity
b. exceed biological carrying capacity
c. be managed for growth
d. be managed for stability or reduction

(the above portion of #4 agreed to by the entire group)

Within each zone the Department should employ management techniques including but not limited to:

a. habitat management on public lands
b. habitat management recommendations for private landowners
c. hunting

(this second part of #4 agreed to by all but one member of group)

5. Consideration should be given to modifying the appropriate Vermont Statutes to include moose damage compensation for agricultural interests. Such interests should be well defined but might include documented damage to fencing, croplands, maple-sugaring equipment such as tubing, and orchard damage. (agreed to by group)

6. The Department should study the effects of moose browsing on forest regeneration and future timber. (agreed to by group)

7. The Department should study deer/moose relationships. (agreed to by group)

8. Public education about moose and its return to Vermont should be expanded. Efforts should be made to include its values in tourist promotion activities. People should also be educated about the potential dangers of interaction with moose, e.g. rutting season, sick animals, and vehicular collisions. (agreed to by group)

9. The management plan should recognize the contribution of private landowners to the moose resource. (agreed to by group)

10. Funding for habitat management, population monitoring, damage compensation, safety, research, and education related to Vermont's moose herd should be derived from the State's general fund for at least three years. The Department should investigate creative funding options, including a moose stamp during the interim. (agreed to by group)

If a hunt were to occur, a lottery system should be used to generate the funds needed to cover the costs of administration and biological monitoring of the hunt. (agreed to by all but one member of the group)

IV. GENERAL MANAGEMENT CONSIDERATIONS

A. Biological Monitoring

Information needed for managing moose populations includes knowledge of **biological carrying capacity, cultural carrying capacity, population size** and **distribution, age ratio, sex ratio,** and **rates-of-increase.**

Biological Carrying Capacity means the number of moose that can be supported on a sustained basis by the habitat. The actual number is hard to determine due to the difficulty of measuring food supplies and moose energetics. Moose managers will often monitor physical condition indices (such as body weight, antler development, or reproductive rate) of moose to determine if a population is in balance with it's habitat. The physical conditions of Vermont moose indicate that the herd is currently below the biological carrying capacity of its habitat throughout the State.

Cultural Carrying Capacity is defined as the maximum number of moose that can coexist compatibly with local human populations, and is often lower than biological carrying capacity. Examples of when carrying capacities for moose may be reached are when numbers of moose/vehicle collisions and/or damages to young forests caused by browsing moose reach intolerable levels[2,3,4]

Management of moose populations generally requires an estimate of **population size** and **distribution.** Unfortunately, an accurate census is virtually unattainable with most free-ranging animals on a statewide basis. Even though aerial surveys are used to estimate abundance and distribution of moose on flat, open terrain, such a technique is not well suited to heavily forested and mountainous states like Vermont.[5] Other methods of monitoring population density and distribution include surveys of deer and/or moose hunters, and recording various forms of incidental moose mortalities (vehicle kills, illegal kills) as in Vermont.

A knowledge of **age** and **sex ratios** of the population is useful in determining harvest strategies. Moose can live for about 20 years although most die before then due to various natural causes.[6] For most populations that have been regularly hunted, moose older than 10 years of age are uncommon and represent a small percentage of the herd.[7,8]

The age structure of productive moose populations is normally heavily represented by younger age classes. When an increasing moose population nears its biological carrying capacity, reproductive rates decline and average age increases. Age structure can therefore be a useful measure of the productivity and resiliency of the population.

Likewise, the adult **sex ratio** of a healthy population should be reasonably balanced. This ratio in the past was often heavily skewed towards females in several Canadian provinces due to bull-dominated harvests. In recent years biologists found that some cows were going unbred during the prime rutting season due to a lack of bulls.[9,10] Since then, moose managers in eastern North America strive to maintain a sex ratio of at least 40 bulls per 60 cows to maintain normal rates of reproduction.

The **rate-of-increase (RI)** of a moose population is the rate at which the number of animals in the population changes annually. For example, a RI of 1.25 means that a population of 100 moose will grow to 125 one year later. Stable populations have a RI of 1.0. Knowledge of RI enables moose managers to more accurately predict potential sustained yield (i.e. the number of moose that can be harvested each year on a sustained basis).

The RI for growing moose populations with adequate food and exposed to little or no hunting ranges from 1.15 to 1.30.[11] Rates-of-increase can be used to calculate the time required for a population to double in size. At a RI of 1.15, doubling time is 5.0 years; for a RI of 1.30, it is 2.6 years.

The RI for many wildlife species begins to decline when populations exceed two thirds of carrying capacity. This is due to lower reproductive rates in response to increased competition for food.

B. Habitat Management

Moose biologists in the midwest have described the optimum year-round moose habitat to consist of 40-50 percent feeding grounds (regenerating forest less than 20 years old), 5-15 percent winter cover (spruce/fir stands more than 20 years old), 35-55 percent of more mature hardwoods or mixed forests (providing both food and cover), and 5-10 percent wetlands (for summer feeding).[12]

Managing habitats specifically for moose is a very impractical concept because the species has such a large home range (4 to 10 square miles [12,13]). More often moose 'habitat management' is a by-product of commercial logging. Moose generally benefit from the abundant browse that occurs on recently logged or burned areas. Forested landscapes that are actively managed therefore contribute to productive moose range. Clearcutting over 50 percent of a moose home range within a few years, however, would result in an unfavorable balance of forest age classes, which may cause moose populations to decline.[14]

Special habitats which may be critical to moose survival or productivity include late-winter concentration areas, aquatic feeding areas, and salt licks. Moose are not as social as deer, and although it is not uncommon to encounter several moose together during the post-rut period, by late winter moose are usually either solitary or found in groups of two or three. These small individual groups of moose may each seek out shelter afforded by middle-aged to mature softwood stands to escape deep snows and severe winter weather.

Preservation of critical winter shelter stands is deemed especially important in areas such as Quebec, Ontario, and Idaho, where winters are more severe than in Vermont.[15,16,17] Land ownership patterns and the relatively flat topography of Quebec and Ontario also lead to large scale logging practices, the likes of which we are not likely to see in Vermont. In Ontario, some clearcuts have been as large as 10,000 acres (almost 15 square miles).[16]

Recent logging practices in Vermont have generally had a favorable impact on moose, especially in the Northeast Kingdom. Timber harvesting in this region increased significantly during the 1980s, and hardwood browse became abundant even in many of the former softwood stands.[18,19] A recent one-year study found that the average size of clearcuts in Vermont was 32 acres, although logging operations in general were 2.5 times larger in the northern half of the State when compared to the southern half.[20]

With no major changes in cutting practices expected, the quality of forested moose habitats in Vermont should remain suitable for many years. There may be isolated cases where the loss of small areas of older softwood trees could be detrimental to wintering moose. The Department of Fish and Wildlife has already obtained voluntary cooperation from two industrial forestland owners (Champion International Corp. and Rutland Plywood Corp.) in reserving important winter moose habitats from timber harvest.

Vermont also has a wetlands protection law which should afford necessary protection to important wetland habitats, and natural and roadside salt licks are not likely to disappear in the foreseeable future. Increasing human development, however, will continue to slowly erode the moose habitat base in Vermont. More important than the actual loss of a certain acreage of moose habitat will be the increase of human/moose conflicts expected with increased residential development and road systems.

In summary, current land use practices in Vermont are not limiting the statewide moose population. Consequently, habitat management considerations on anything but a very localized scale are not necessary at this time. Habitat conditions will be monitored and may warrant further attention in future plans.

C. Highway Safety Management

Moose can present a serious road hazard, especially when they occupy range which is densely populated by humans. Vermont's human population is relatively high compared to most moose ranges across North America. Many Vermonters have suffered extensive vehicle damage, and several people in Vermont and New Hampshire have lost their lives in collisions with moose. A rise in vehicle collisions with moose is a continual concern in both New Hampshire and Maine and was also a principal reason that moose population growth in Finland and Sweden was recently halted.[21,22] Control of moose populations through regulated hunting has been demonstrated to be a practical and effective way to control collision rates.

There may be promise in other techniques which affect moose and/or driver behavior. Ontario has tried to discourage moose from using roadside salt licks by spraying the area with a repugnant 'rotten egg' solution. They concluded that this technique may be effective under limited circumstances.[23] New Hampshire is currently experimenting with the creation of artificial salt licks away from roadside locations. Maine is also experimenting with various techniques to discourage use of roadside licks.[24] Conclusions on the effectiveness and economic feasibility of these other techniques are not yet available.

Another management possibility, suggested by a Moose Advisory Committee Member, is to erect roadside fencing near lick sites to funnel moose to one, well marked road crossing. With adequate warning signs, this technique might reduce the probability of collisions.

A driver education and awareness program has also been recently established in New Hampshire, via distribution of printed leaflets and bumper stickers. Whereas all of these other techniques may contribute towards a reduction of moose/vehicle collisions, they are not likely to prove a reasonable substitute for moose population control in areas of high moose density.

D. **Nuisance Moose Management**

The presence of Vermont moose in their natural environment appears to be desired by the majority of Vermonters. In some instances, however, moose can be considered a nuisance. The most significant nuisances caused by moose in Vermont are when they walk through cattle fencing or maple sugaring tubing or turn up in urbanized areas.

In Vermont, where dairy farming is an important occupation, conflicts between moose and agricultural interests are very real. The time and expense involved in repairing downed fence lines is not the greatest concern of the farmer. The main problem lies with the round-up of cattle which wander off when fences are down. While the cattle are "out", they may damage neighboring property (such as vegetable gardens), endanger motorists, and/or injure themselves. Similarly, maple sugar tubing severed by moose represents an obvious expense in labor and replacement materials, and when it occurs in March or April, part of the crop is also lost. Controlling moose populations in the more agricultural regions of the state would serve to control fence damage. Allowing a farmer to shoot a nuisance moose is another possible solution, however, such activity would need to be carefully regulated.

Moose that turn up in urban areas invariably attract a crowd of curious onlookers. Moose can then pose a physical threat to pedestrians or motorists, especially when the moose is frightened or agitated by a gathering crowd. To lessen the problem of moose becoming a nuisance in urban areas, population density goals may need to be lower in moose habitats that surround urban areas.

E. Interactions Between Deer and Moose

Moose and deer feed on many of the same plants. Concerns have been expressed by some Vermonters that the state's growing moose herd has reduced available deer foods, resulting in a decline of deer numbers. Scientific studies, however, have shown that competition for foods between the two species is minimal, especially during the winter.[25,26] Moose are able to winter in more open cover types than deer because they can travel through deep snow more easily. While a few Vermont moose have been observed wintering in deer winter range, the vast majority appear to winter at higher elevations.

There have been only a few studies of summer and fall range relationships of deer and moose. The results indicate that during non-snow months deer and moose have similar habitats. There is a tendency, however, for moose to be found in open hardwoods more frequently than deer and for deer to prefer mixed hardwood/softwood types.[27] In either case, there appears to be an abundance of browse for both deer and moose on non-wintering range at present population levels. New Hampshire biologists, however, are trying to determine if moose feeding during the summer in and around deer yards may be reducing browse needed by deer in the winter.

Several scientific studies have indicated that deer may be detrimental to moose and not vice versa.[28,29,30] The brainworm (see Appendix C) has been indicated by these studies as causing declines in moose populations, especially when deer densities were increasing. Other studies have suggested that a rise either in deer densities or the incidence of brainworm in deer has had no significant effect on some moose populations.[31,32] The reported evidence of brainworm in Vermont's moose is low, and both moose and deer populations have increased in recent years. Nonetheless, the potential exists that this disease may become a limiting factor, especially with further increases planned for Vermont's deer herd.

F. Moose Management Units

Although moose are becoming increasingly distributed throughout Vermont, various regions of the state have different biological and cultural carrying capacities for moose. The Fish and Wildlife Department has established a number of 'Deer or Wildlife Management Units' (WMU's) to aid in deer herd management (Figure 7). These WMU's (also known as 'zones') are a way to recognize regional differences in climate, topography, habitat, and land use, all of which affect the carrying capacity of an area for deer.

These same WMU's can be conveniently used for moose management, and moose populations that occur in individual WMU's can be managed differently from one another. For example, WMU'E' closely approximates the political boundaries that form Essex County. WMU'E' has extensive forestlands and many wetlands, and human development, including roads and agriculture, is low. The

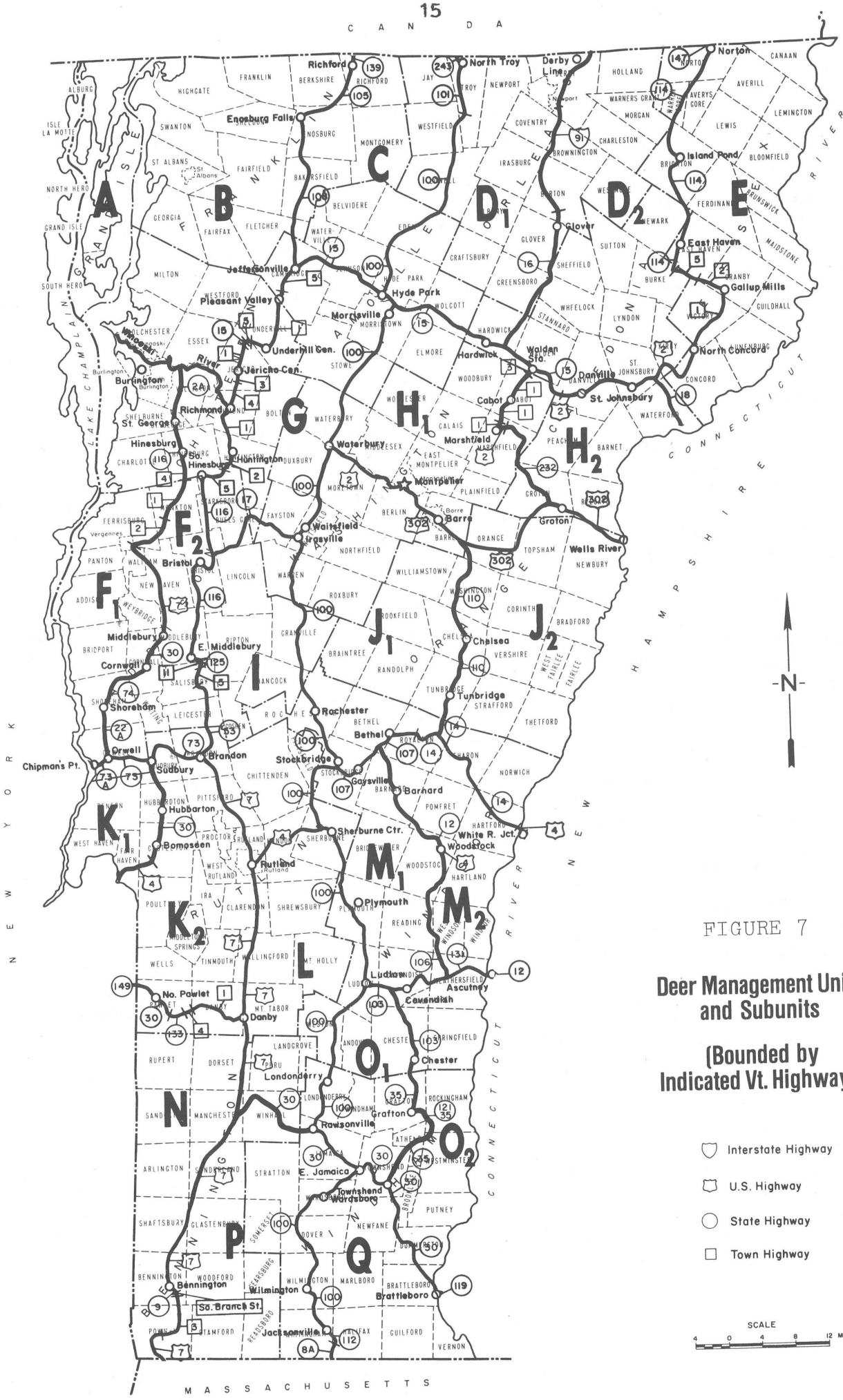


FIGURE 7

Deer Management Units and Subunits

(Bounded by Indicated Vt. Highways)

forest lands are largely owned by industrial forest landowners and are actively managed. Additionally, deer densities are relatively low due to the severe winter climate and thus the probability of moose contracting the brainworm disease may also be comparatively low. All of these factors contribute to making WMU'E' the unit which not only can biologically support the most moose, but probably also the unit in which the residents can tolerate the highest moose density.

All of the other WMU's in the State would likely have lower overall carrying capacities for moose. WMU'D1', for example, has plenty of good moose habitat, but has many more people, roads, and farms than WMU'E'.The cultural carrying capacity for moose in WMU'D1', therefore, may be lower than it is for WMU'E', even if differences in biological carrying capacity are only slight. On the other hand, a unit such as WMU'F1', which is highly agricultural and which includes the State's largest urban area, would likely have a much lower carrying capacity than WMU'E' due to both biological and cultural differences.

G. Harvest Strategies

Sport and/or subsistence hunting is an effective, efficient, and traditional tool that can be used to directly regulate moose populations. Legalized hunting of moose presently occurs in 10 states and 11 Canadian provinces and territories. Following decades of closure, hunting seasons have recently been reinstated in Maine (1980), Colorado (1985), and New Hampshire (1988). Most states and provinces use legal hunting to meet the goals of moose management policies. Across North America, over 70,000 moose are harvested annually by more than 400,000 hunters.[33]

Methods other than regulated hunting have been proposed to regulate moose populations in Vermont. Such methods, most of which have also been proposed for some deer populations in the northeastern United States, include restoration of major predators such as wolves and mountain lions; trap and transfer of excess animals to other locations; and use of fertility control drugs to reduce productivity. Many years of scientific research and management experience have shown that these other methods are not practical for use on free-ranging deer herds because they are limited in applicability, too costly, logistically impractical, or socially unaccepatable.[34] These methods would be even less practical for controlling moose populations.

Moose harvest strategies can be quite varied, depending on population goals and public desires. Stated harvest objectives generally relate to population growth, stability, or reduction; sustained yield; and recreational viewing and hunting opportunity.[33] These often inter-related objectives are achieved by using a combination of strategies to regulate harvests, the most common of which include **season length and timing** and **permit quotas.**

Variations in **season length** may control the total harvest. Longer seasons often increase hunter success rates and participation, thereby increasing the total harvest. The **timing** of hunting seasons can be used to influence age-specific harvest of males. Since the older, prime bulls come into rut earlier than

young bulls, and since rutting bulls are most vulnerable to hunting, seasons held at the peak of the rut will harvest more prime bulls.[35] Hunting seasons are often scheduled after the peak rut, when prime bulls are extremely wary and much less vulnerable, in order to leave more of these prime bulls in the population to ensure timely and successful breeding of cows.

Permit quota systems are employed by many states and provinces to achieve the desired harvest. A predetermined number of hunting permits is issued based on hunter success rates and population estimates. Permits are issued for any moose (they are not specific to age or sex) but may be specific to different management units. Wherever demand exceeds the quota of permits to be issued a lottery system is employed, as is the case currently in New Hampshire and Maine.

A refinement of the permit quota system is the **selective harvest system.** This system attempts to control both the total number and the sex and/or age composition of the harvest in order to improve herd productivity and maximize recreation.[21,36,37] Permits are issued specifically for a cow, calf, or bull. Prime breeding-age moose, especially cows, are usually afforded the highest protection. Hunting pressure is directed towards younger bulls and calves. This system is especially well suited for moose populations that experience winter mortality and wolf predation, where calves are the most expendable component of the population. By protecting most of the breeding-age cows while maintaining a satisfactory sex ratio, the maximum sustainable moose harvest can be achieved.

Vermont's harvest strategy for a moose season would include consideration of season location, season length, season timing and permit quotas. Essex County would be the recommended site for Vermont's initial moose season for several reasons: it is most prime moose range, moose population levels are clearly high enough to biologically support a limited season, and it is the area which the public input to date has identified as in need of population control. Other regions of the state could be added later as population control and season experience dictate.

It is further recommended that the moose season be a 3-day, mid-week season to avoid conflicts with weekend recreationists. The mid-to-late October timing will be after the peak rutting period but before the regular firearms season on deer. Also, the cool weather at this time of year will help protect meat from spoilage.

Even though regulations to set up a hunting season may be submitted to the Fish and Wildlife Board during 1992, it is likely that the first hunt would not occur until 1993. This is due to the time consuming process of passing the necessary rules and regulations, printing and distributing applications, notifying lottery winners, issuing permits, and conducting hunter training seminars.

Vermonts initial moose season should be extremely conservative until season experience provides tested data and known moose population responses. Based on current population estimates, the

removal of 51 moose of either sex from Essex County would be necessary for stabilization. Although the recommended goal is to stabilize moose numbers in Essex County, it is proposed to take no more than 50% of that area's estimated annual net growth until the effect of such a removal can be assessed. Therefore, we would propose to issue approximately 25 permits for moose of either sex for Vermont's initial hunt. The actual number of permits issued will depend on what year a season is initiated, current moose population levels and trends, and remaining input from the public involvement process.

V. MANAGEMENT GOAL, OBJECTIVES, AND STRATEGIES

The goal of moose management in Vermont is:

To manage Vermont's moose to sustain viable populations consistent with biological, social, and economic considerations.

In order to achieve the management goal, and considering the public input and recommendations of the Moose Advisory Committee, the following management objectives and strategies have been developed:

A. Moose Population:

Objective 1 To allow for the controlled growth of Vermont's statewide moose population in all Wildlife Management Units (WMU's) except for WMU'E' where population stabilization is desired.

Strategy 1: Implement a moose hunt in WMU'E' by 1993.

Strategy 2: Secure adoption of a Fish & Wildlife Board Regulation that:

a) Establishes WMU's as moose hunting areas.
b) Establishes a three (3) day, mid-week moose hunting season during mid to late October.
c) Establishes a bag limit of one (1) moose of any sex or age per moose hunting permit.
d) Provides that a permit holder may designate one (1) sub-permittee who may also hunt under the permit providing that only one (1) moose may be taken per permit.
e) Requires that permitees and sub-permitees must attend and complete a mandatory pre-hunt training seminar.
f) Establishes a random lottery system of selecting permittees in the event that applicants exceed authorized permit numbers in any open WMU.

Strategy 3: Secure passage of legislation authorizing the charging of moose hunting permit application fees and allowing for limited non-resident participation.

Objective 2: To monitor moose population levels and biological and cultural carrying capacity in all WMU's to determine when and if population stabilization or reduction may be necessary.

Strategy 1: Continue to monitor moose populations and health statewide.
Strategy 2: Continue to monitor public desires regarding local moose populations.

B. Recreation:

Objective: To maximize recreational benefits from Vermont's moose population within acceptable social and environmental limits.

Strategy 1: Implement a moose hunt in WMU'E' by 1993.
Strategy 2: Evaluate the potential for controlled moose hunting opportunities in other WMU's.
Strategy 3: Enhance non-hunting appreciation for the moose population by publishing a guide to moose viewing areas and conducting other promotional activities.

C. Negative Human/Moose Interactions:

Objective: To minimize negative interactions between humans and moose.

Strategy 1: Improve highway safety by:
a) working with the Vermont Agency of Transportation to erect warning signs at all habitual moose highway crossings.
b) publishing educational materials that aid drivers in avoiding moose collisions.
Strategy 2: Develop a protocol for Department response to complaints of moose in urban areas.
Strategy 3: Secure passage of legislation that allows persons engaged in agricultural activities, who can document moose damage, to shoot the offending animal(s) provided that they have obtained approval from a game warden.
Strategy 4: Encourage State's Attorneys to seek replacement values for moose taken illegally as provided under 10 V.S.A. Section 4514 (b) in addition to fines.
Strategy 5: Regularly inform the public on ways to avoid dangerous interactions with moose.

D. Program Funding:

Objective: Secure adequate funding for the Moose Management Program.

Strategy 1: Implement a moose hunt in WMU'E' by 1993 with a non-refundable fee charged for permit application.
Strategy 2: Encourage maximum participation in the application of permits by not charging any additional fee for the permit itself.
Strategy 3: Explore legislation to implement a moose conservation stamp.

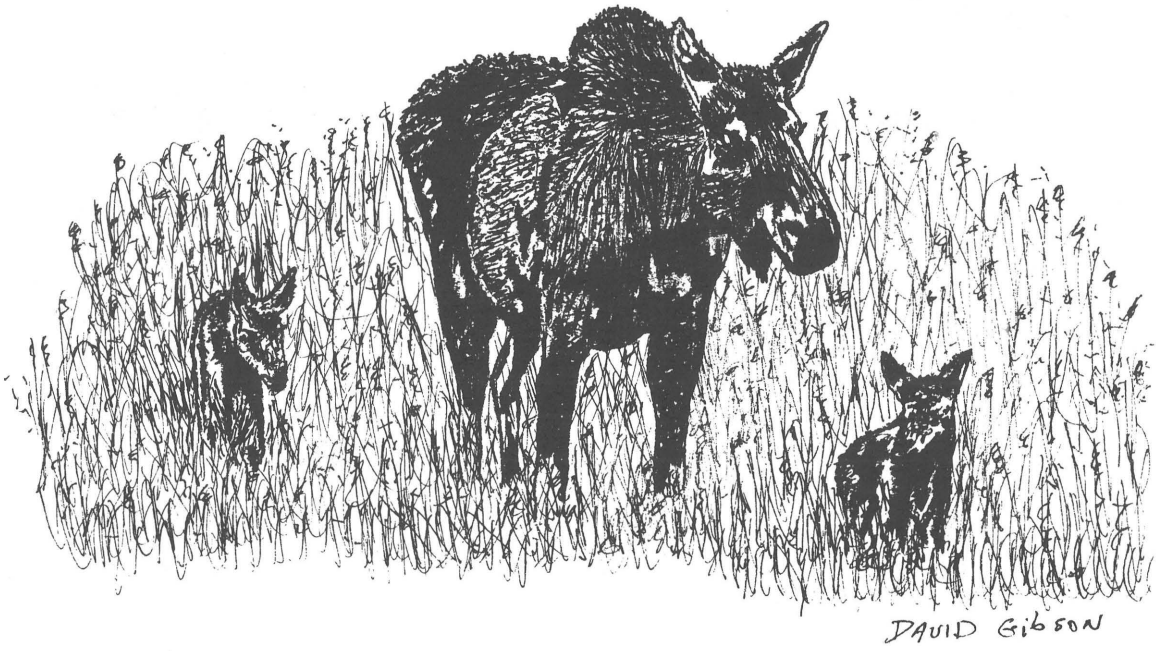
E. Other Considerations:

Objective: Stay current with the research findings of other state/provincial fish and wildlife agencies that may have application in Vermont.

Strategy 1: Monitor New Hampshire's and other research on deer/moose interactions.

Strategy 2: Monitor Maine's, New Hampshire's, Ontario's and other research on minimizing moose/vehicle collisions.

Strategy 3: Stay current with professional journals on moose biology and management.



VI. LITERATURE CITED

1. Foote, L.E. 1946. A history of wild game in Vermont. Vt. Fish & Game Service, Montpelier, VT 51 pp.

2. Child, K.N. and K.M. Stuart. 1987. Vehicle and train collision fatalities of moose: some management and socio-economic considerations. Swedish Wildlife Research, Suppl. 1:699-703

3. Lavsund, S. 1987. Moose relationships to forestry in Finland, Norway and Sweden. Swedish Wildlife Research, Suppl.1:229-244.

4. Bergerud, A.T., F. Manuel and H. Whalen. 1968. The harvest reduction of a moose population in Newfoundland. J. Wildl. Manage. 32(4):722-728.

5. Gasaway, W.C., S.D. DuBois, D.J. Reed and S.J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Biological Papers of University of Alaska. 22, 108 pp.

6. Berg, W.E. 1975. Management implications of natural mortality of moose in northwestern Minnesota. Proc. N. Am. Moose Conf. Workshop 11:332-342.

7. Paloheimo, J.E. and D. Fraser. 1981. Estimation of harvest rate and vulnerability from age and sex data. J. Wildl. Manage. 45:948-958.

8. Redmond, G. 1988. Moose harvest statistics 1988 New Brunswick. Dept. of Natural Resources and Energy. Fredericton, N.B. 13 pp.

9. Crete, M., R.J. Taylor and P.A. Jordon. 1981. Optimization of moose harvest in southwestern Quebec. J. Wildl. Manage. 45(3):598-611.

10. Babcock, W.H., J.F. Kimball, J.A. Rensel and M.L. Wolfe. 1982. Management alternatives for Utah moose. Alces 18:235-257.

11. Van Ballenberghe, V. 1983. Rate of increase in moose populations. Alces 19:98-117.

12. Allen, A.W., J.W. Terrell and P.A. Jordon. 1988. An overview of a habitat suitability index model for moose: Lake Superior Region. Alces 24:118-125.

13. Thompson, M.E. 1987. Seasonal home range and habitat use by moose in northern Maine. M.Sc. Thesis, Univ. of Maine, Orono. 57pp.

14. Girard, F. and Joyal, R. 1984. L'effet des coupes a blanc mecanisees sur l'orignal dans le Nord-ouest due Quebec. Alces 20:3-25.

15. Joyal, R. 1987. Moose habitats in Quebec and management implications. Swedish Wildlife Research, Suppl. 1:139-152.

16. Thompson, I. D. and D.L. Euler. 1987. Moose habitat in Ontario: a decade of change in perception. Swedish Wildlife Research, Suppl. 1:181-193.

17. Peek, J.M., D.J. Pierce, D.C. Graham and D.L. Davis. 1987. Moose habitat use and implications for forest management in north central Idaho. Swedish Wildlife Research, Suppl. 1:195-199.

18. Moulton, W., J. Horton and J. St. Arnauld. 1984. Northeast Kingdom regeneration cut survey. Vt. Dept. Forests, Parks and Recreation. St. Johnsbury, Vt. 18 pp.

19. DeGeus, R. 1990. Vermont forest: a decade of harvest. Vt. Dept. Forest, Parks and Recreation. Waterbury, Vt. 57 pp.

20. Newton, C.M., D.J. Brynn, D.E. Capen, J.C. Clausen, J.R. Donnelly, J.B. Shane, Jr., P.A. Thomas, T.L. Turner, and J.E. Vissering. 1990. Impact assessment of timber harvesting in Vermont. School of Natural Resources, University of Vermont. Burlington, Vt. 144 pp.

21. Nygren, T. 1984. Moose population census and planning of cropping in Finland. Suomen Riista 31:74-82.

22. Cederlaund, G. and G. Markgren. 1987. The development of the Swedish moose population, 1970-1983. Swedish Wildlife Research, Suppl. 1:55-62.

23. Fraser, D. and H. Hristienko. 1982. Moose-vehicle accidents in Ontario: a repugnant solution? Wildl. Soc. Bull. 10(3):266-270.

24. Anonymous. 1990. Wildlife division research & management report 1990. Maine Department of Inland Fisheries and Wildlife. 57 pp.

25. Telfer, E.S. 1970. Winter habitat selection by moose and white-tailed deer. J. Wildl. Manage. 34:553-559.

26. Monthey, R.W. 1984. Effects of timber harvesting on ungulates in northern Maine. J. Wildl. Manage. 48(1):279-285.

27. Kearney, S.R. and F.F. Gilbert. 1976. Habitat use by white-tailed deer and moose on sympathetic range. J. Wildl. Manage. 40:645-657.

28. Karns, P.D. 1967. Pneumostrongylus tenuis in deer in Minnesota and implications for moose. J. Wildl. Manage. 31(2):299-303.

29. Gilbert, F. 1974. Parelaphostrongylus tenuis in Maine: II-prevalence in moose. J. Wildl. Manage. 38(1):42-46.

30. Aho, R.W. and J. Hendrickson. 1989. Reproduction and mortality of moose tranlocated from Ontario to Michigan. Alces 25:75-80.

31. Bogaczyk, B.A., and W. B. Krohn. 1990. Increasing moose populations in relation to brainworm: a review of hypotheses. 46th N.E. Fish and Wildlife Conference Abstracts.

32. Nudds, T. D. 1990. Retroductive logic in retrospect: the ecological effects of meningeal worms. J. Wildl. Manage. 54(3):396-402.

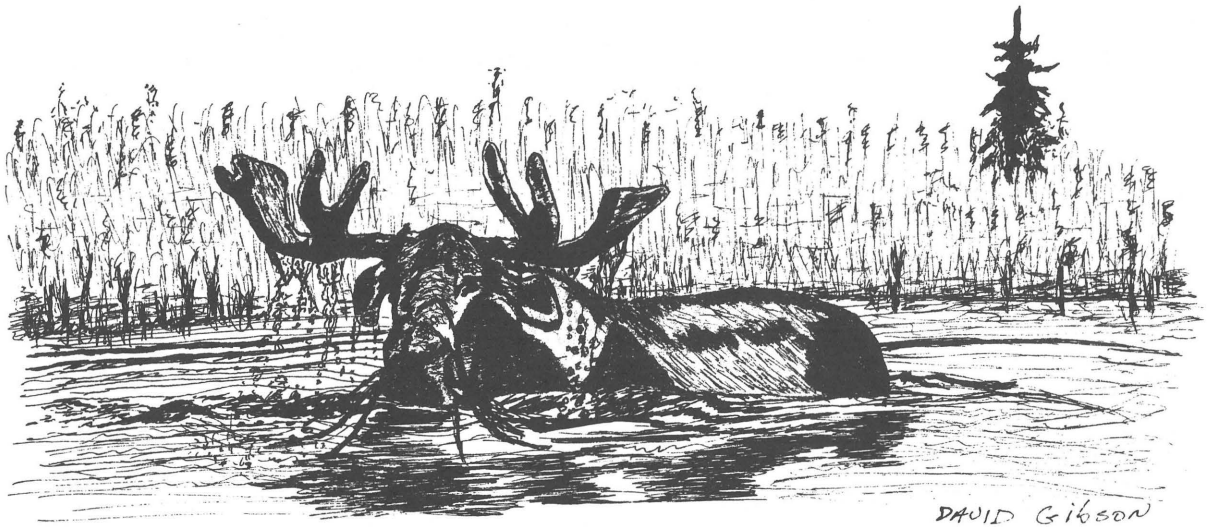
33. Timmerman, H.R. 1987. Moose harvest strategies in North America. Swedish Wildlife Research, Suppl. 1:565-579.

34. Ellingwood, M.R. and S.L Caturano. 1988. An evaluation of deer management options. CT Dept. of Env. Prot., Publication No. DR-11, 12pp.

35. Timmerman, H.R. and R. Gollat. 1982. Age and sex structure of harvested moose related to season manipulation and access. Alces 18:301-328.

36. Child, K.N. 1983. Selective harvest of moose in the Omineca: some preliminary results. Alces 19:162-177.

37. Timmerman, H.R. 1983. A selective harvest for moose in Ontario, Angler and Hunter, Ont. Outdoors, Publ. Ltd., Peterborough, Ont. 8(1):25-29.



APPENDIX A: Moose Management Planning Process Scoping Committee

Jim Chapman, VT. Federation of Sportsmen's Club's

Marc DesMueles, The Nature Conservancy

***Steve Herschenroder**, Sportsman's Alliance for VT's Environment

Moe Jacobs, Vermont Fish and Wildlife Conservation Group

Rep. Janice Peaslee, Legislator from Guildhall

Jim Shallow, Vermont Natural Resources Council

Warner Shedd, Conservation Writer

Rep. Nancy Sheltra, Legislator from Derby

***Steve Young**, Vermont Audubon Council

* = Invited parties that did not attend the meeting.

APPENDIX B: Moose Advisory Committee Members

Charlie Browne, Co-director, Fairbanks Museum and Planetarium; Vice President, Northeast Kingdom Audubon Society Chapter

Bert Dodson, Non-hunter

Kay Ellis, Member, Northeast Kingdom Chamber of Commerce and Business and Professional Women of St. Johnsbury

Pete Fay, Maidstone Dairy Farmer, Chairman Essex County Natural Resource Conservation District; Chairman, Essex County A.S.C.S.

Dick Furbush, Essex County deer hunter

Moe Jacobs, President, Vermont Fish and Wildlife Conservation Group

Jim Shallow, Forest Wildlife and Public Lands Program Director, Vermont Natural Resources Council

John Shottland, Coalition for Animal Rights and Ethics

Will Staats, Wildlife Forester, Champion International Corporation

Note: Anne Chynoweth substituted for John Shottland at the second meeting, and Janice Peaslee substituted for Pete Fay at the final meeting.

FACTS ABOUT MOOSE BIOLOGY

CHARACTERISTICS. Moose are tall animals with long legs. Adults may stand over 6 feet at the shoulder and weigh from 600 to 1200 pounds. On the average a moose's belly is 35 inches off the ground, twice as high as a deer's. A moose is built in such a way that its feet can be lifted nearly shoulder high, thus enabling it to move easily over fallen trees or through deep snow. Capable of trotting at 20 to 25 miles per hour, a moose can quickly cover a lot of ground. Antlers, which occur only on bulls, begin growing in March or April and harden by September. Antlers are shed each year, usually in November or December for older bulls but as late as March for young bulls.

FOOD HABITS. Moose are mainly browsers, eating the new leaves and twig growth of trees and shrubs. They also graze on grasses, forbs, lichens, and mushrooms. Tender shoots of waterlilies and other aquatic plants are preferred summer foods when available, but moose are not dependent on them. After the fall frosts and winter snows either kill or deeply bury herbaceous foods, moose must turn to woody twigs for food until the next spring.

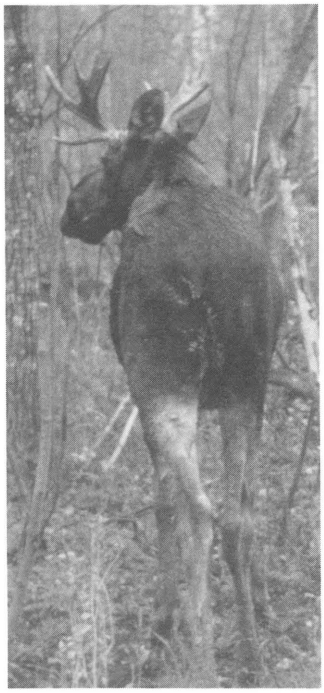
Foods consumed by wintering moose vary, depending on preference and availability. Moose in the Northeast often browse on aspens; red, mountain, and striped maple; grey and white birch; willow; ash; pin cherry; hobblebush; and balsam fir. Moose also will strip and eat the soft bark of red and striped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

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

HABITAT REQUIREMENTS. The moose is a northern forest species. However, moose use different habitats from summer to winter. Moose are frequently seen feeding on water plants in ponds during summer. During the hot months, moose can suffer from overheating and must have access to dense shade or cooling waters. For these reasons, lowland softwood forests, beaver ponds, and other shallow bodies of water are favorite spring and summer habitats for moose.

Moose generally use upland mixed or hardwood forests during fall and winter. These forest types usually provide more winter food, especially in recently cut-over areas. During severe winter weather moose use softwood stands for shelter, especially when snow depths in open areas are over 30 inches.

REPRODUCTION. The breeding or "rutting" season for moose occurs in September and October. Bulls in the rut will thrash trees and shrubs with their antlers and dig pits in the ground into which they urinate and spread scent. Cow moose are attracted to these pits, and bulls will constantly travel to their various pits checking for the presence of cows. Bulls are also aided in their search by the loud "bellowing" call of the cow in heat. Strenuous shoving matches between bulls may occur to establish dominance for breeding. If accepted by one or more cows, the dominant bull will stay with them for up to a week. Each bull may only breed a few cows during the rut.



The pregnancy period for moose is about 243 days, and most calves are born around June 1. Calves weigh 25 to 35 pounds at birth. They grow very rapidly, gaining one pound per day during the first month and 2–3 pounds per day during the second month. At one year of age, yearlings weigh from 400 to 600 pounds.

Moose are prolific. In healthy populations most adult cows (2½ and older) are bred, and 10% to 30% will give birth to twins. Up to 50% of yearling cows may also breed, especially on good habitat and at latitudes with longer growing seasons, but generally only one calf will be born.

CHANGES IN POPULATION SIZE. Healthy moose populations may expand by 20% to 25% annually, and dramatic increases have occurred when moose occupy new habitats, especially in the absence of major predators. For example, 31 moose stocked in one area of Colorado in 1978–1979 had increased to a herd of 170 by 1988, even with losses to poaching. Increased cutting of forests in Scandinavia contributed to moose population explosions in the 1970s. The moose population in Finland grew from 15,000 in 1969 to 100,000 in 1980. At the same time, hunter harvests increased from 5,000 to 50,000 moose.

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

BRAINWORM. Moose may have a number of parasitic diseases. The most important in Vermont is the moose brainworm. A 1980 study showed that roughly one-third of Vermont's deer were infected with the parasite.

The brain worm is commonly carried by white-tailed deer but usually with no apparent ill effects on deer. The life cycle of the brainworm includes several stages. The larval stage of the worm is expelled in deer droppings. Snails feeding on the droppings inadvertently ingest the worm larvae and become an intermediate host for the worm. The moose in turn becomes infected after unwittingly ingesting the snails while feeding on plants. The larvae migrate along the spinal cord to the moose's brain, sometimes destroying the spinal cord as well as brain tissue. The moose may then display symptoms such as loss of balance, circling, lack of fear, blindness, and paralysis. The disease will often cause the eventual death of the moose.

Brainworm may become a potentially serious problem for moose where deer occupy the same range. Deer population increases are believed to have brought about moose population declines in Minnesota and Ontario with brainworm as the cause of death in the moose.

APPENDIX D MOST IMPORTANT BENEFITS AT NINE INFORMATIONAL MEETINGS

Benefits	N=3 Bratt	N=6 Burl	N=5 Gilman	N=4 I.Pond	N=5 Manch	N=5 Montp	N=5 Newport	N=4 St.Albans	N=5 St.Jay	Total
Economics . revenue to general economy from tourism/ hunting . revenue to Fish & Wildlife Department from hunting	1	6	8	7	4	7	6	7	1	47
Hunting . food source . recreation	2	3	5	3	5	4	5	2	6	35
Non-Consumptive Recreation . viewing/esthetics . photography	2	3	1	1	3	4	3	2	3	22
Environmental Health and Biodiversity	2	2	--	1	2	--	--	2	2	11
Existence Values . to moose . to people . educational value to future generations	--	1	1	--	--	1	1	1	2	7
Habitat Management . enhanced opportunities	--	--	--	--	1	--	--	--	--	1
Public Involvement	1	--	--	--	--	--	--	--	--	1

N = Number of groups

APPENDIX E MOST IMPORTANT PROBLEMS AT NINE INFORMATIONAL MEETINGS

Problems	N=3 Bratt	N=6 Burl	N=5 Gilman	N=4 I.Pond	N=5 Manch	N=5 Montp	N=5 Newport	N=4 St.Albans	N=5 St.Jay	Total
Traffic Collisions . fatalities and injuries to humans and moose . vehicle damage . increased insurance rates	1	4	5	5	4	5	5	3	5	37
Property Damage . agricultural crops . livestock/pets . fences . sugar bushes . trees	1	6	5	3	2	3	5	5	5	35
Moose Negatively Impact Deer . browse competition . territorial displacement	--	4	3	--	3	--	5	--	1	16
Moose/Human Conflicts . urban disturbances . personal safety	--	2	1	--	2	3	--	1	1	10
Too many moose . now . in future . because of no predators	--	2	--	--	--	1	--	3	--	6
Poaching	--	--	--	--	--	2	--	1	2	5
Ecological Damage . negatively impacting plant species diversity . damage to habitats of other wildlife species	2	--	--	--	1	1	--	--	--	4
Public Perceptions about Moose . pro-hunt/anti-hunt conflicts . public education	1	--	--	2	1	--	--	--	--	4
Data Deficiency	2	1	--	--	--	--	--	--	--	3
Fish & Wildlife Management Costs . warden time . project costs	1	--	--	1	1	--	--	--	--	3
Deer Negatively Impact Moose . brainworm	--	1	--	--	--	--	--	--	--	1
Making Money Off Moose	--	--	--	--	--	--	--	--	1	1
Possible Restrictions to Land Use	--	--	--	--	1	--	--	--	--	1
Too few moose	1	--	--	--	--	--	--	--	--	1

N = Number of groups

APPENDIX F Moose Meeting Questionnaire Responses to "How many moose do you want in your area?"

County	Much More	More	Same	Less	Much Less	Not Sure	Amount Responses
Bennington	2	7	7	3	1	2	22
Caledonia	8	9	6	4	4	2	30
Chittenden	3	7	7	9	0	0	26
Essex	1	8	18	20	6	0	54
Franklin	2	6	3	1	2	4	19
Grand Isle	0	0	0	1	0	0	1
Lamoille	1	1	2	0	0	0	4
Orange	0	0	1	0	0	0	1
Orleans	6	10	15	10	2	5	49
Rutland	1	6	2	1	0	0	10
Washington	0	12	9	1	1	0	23
Windham	5	9	0	0	0	1	15
Windsor	0	2	0	0	0	0	2
Out of State	0	3	0	0	0	1	4
Unknown	0	0	0	1	0	0	1
Grand Total	29	80	70	51	13	15	261

APPENDIX G Moose Meeting Questionnaire Responses to "How many moose do you want Statewide?"

County	Much More	More	Same	Less	Much Less	Not Sure	Amount Responses
Bennington	2	11	2	5	1	1	22
Caledonia	7	9	6	2	1	4	30
Chittenden	6	10	6	3	0	1	26
Essex	4	19	17	4	2	6	54
Franklin	2	9	1	2	1	3	19
Grand Isle	0	0	0	1	0	0	1
Lamoille	1	1	2	0	0	0	4
Orange	0	0	1	0	0	0	1
Orleans	7	11	16	6	2	5	49
Rutland	1	7	1	1	0	0	10
Washington	1	12	7	2	0	1	23
Windham	6	9	0	0	0	0	15
Windsor	0	2	0	0	0	0	2
Out of State	0	3	0	0	0	1	4
Unknown	0	0	0	1	0	0	1
Grand Total	37	103	59	26	7	22	261

APPENDIX H Moose Meeting Questionnaire Responses to "How many moose do you want in the Northeast Kingdom?"

County	Much More	More	Same	Less	Much Less	Not Sure	Amount Responses
Bennington	2	7	5	3	4	1	22
Caledonia	7	7	8	2	4	2	30
Chittenden	2	1	9	7	6	1	26
Essex	2	6	19	22	4	0	54
Franklin	0	1	8	4	1	4	19
Grand Isle	0	1	0	0	0	0	1
Lamoille	0	0	2	2	0	0	4
Orange	0	0	1	0	0	0	1
Orleans	6	11	9	11	6	6	49
Rutland	1	2	1	4	1	0	10
Washington	0	5	8	4	0	5	23
Windham	1	7	4	0	0	3	15
Windsor	0	0	2	0	0	0	2
Out of State	0	0	1	0	0	3	4
Unknown	0	0	0	1	0	0	1
Grand Total	21	48	77	60	26	25	261

Appendix I. Summaries of Incidental Written Comments from September, 1991 Public Meetings and Mailed Correspondense

Written Comments from Public Meetings		Numbers
1.	Supports moose season/controls, limited moose harvest only real way to determine size and health of herd.	7
2.	More moose data needed before management decisions.	5
3.	Wants population managed in balance with habitat and people.	4
4.	Want moose population regulated by **natural** causes, not man.	4
5.	State not clear about when and if season is advisable and how many	3
6.	Opposed to moose hunt in Vermont.	1
7.	Moose season not warranted at this time.	1
8.	Anti-hunter.	1
9.	Want to see less moose in the Northeast Kingdom, more deer.	1
10.	If moose must be regulated, do so only in the Northeast Kingdom.	1
11.	Make sure moose project not a dollar drain in Fish & Wildlife.	1
12.	This public involvement process is flawed--favors hunting.	1

Mailed Correspondence Received through December 31, 1991		
1.	Against moose season	56
2.	Support moose season, but not yet	4
3.	Supports moose hunting	7