EASTERN COYOTE ASSESSMENT - 1999

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INTRODUCTION

Since 1968, the Maine Department of Inland Fisheries and Wildlife (MDIFW) has aggressively pursued development and refinement of wildlife species assessments and implementation of cost-effective comprehensive programs that support selected goals and objectives for the next 15 years. Assessments are based upon available information and the judgments of professional wildlife biologists responsible for individual species or groups of species. Precise data may not always be available or are too limited for meaningful statistical analysis; however, many trends and indications are sometimes clear and deserve management consideration.

The assessment has been organized to group information in a user-meaningful way. The Natural History section discusses biological characteristics of the species that are important to its management. The Management section contains history of regulations and regulatory authority, past management, past goals and objectives, and current management. The Habitat and Population sections address historic, current, and projected conditions for the species. The Use and Demand section addresses past, current, and projected use and demand of the species and its habitat. A Summary and Conclusions sections summarizes the major points of the assessment.

NATURAL HISTORY

Distribution and Taxonomy

The coyote (*Canis latrans*) is native to North America. Prior to the arrival of European settlers, coyotes ranged from northcentral Mexico, through the central prairie region of the United States, to southcentral Canada (Parker 1995). Coyotes spread from the prairie region, with the advent of European settlement, and today occur in Alaska, all 48 contiguous states, throughout Mexico, and in most of the Canadian provinces. In Maine, coyotes were noticed as early as 1936; however, it wasn't until the 1960's that people perceived that the coyote population was rapidly increasing (Richens and Hugie 1974, Parker 1995).

One of the most notable differences between the eastern coyote and their western counterpart is size. Maine coyotes average 30 lb. and 35 lb. (female and male, respectively) as compared to 21 lb. and 24 lb. for California coyotes (Richens and Hugie 1974, Parker 1995). Despite numerous anecdotal reports of coyotes in the 60-80 lb. range, coyotes exceeding 48 lb. in Maine are rare (Hilton 1978). Previously, the large size of Maine coyotes was attributed to hybridization with wolves and dogs (Hilton 1978, 1986). However, recent genetic studies do not support this explanation. If hybridization between coyotes and other canids was the reason for eastern coyotes having a larger body size than their counterparts in other states, then the genetic make-up of the eastern coyote should differ from coyotes in other regions. Instead, the genetic make-up of coyotes is very similar across the continent. Wolf genetic markers

(mitochondrial or nuclear) do not occur in eastern coyotes (Lehman et al. 1991, Roy et al. 1994, Pilgrim et al. 1998).

The lack of wolf genetic markers in coyotes does not mean that eastern wolves and coyotes do not mate. Male wolves have been known to mate opportunistically with female coyotes. However, the offspring from such wolf-coyote matings apparently do not mate with other coyotes (Lehman et al. 1991, Roy et al. 1994, Pilgrim et al. 1998). Instead, these offspring tend to form packs with other wolves and mate. Thus, wolf-coyote matings may not result in wolf genes being passed into the coyote population, but rather, have resulted in coyote genes being passed back into the wolf population. Genetic studies of eastern wolves indicate that coyote genes are very prevalent in wolves in southeastern Canada.

If the infusion of wolf genes into the coyote population does not explain the large size of eastern coyotes, what alternative explanations are there for the eastern coyote's larger size? One explanation might be that nutritional factors or natural selection might favor animals with a large body size. For example, a large bodied coyote may be more efficient at bringing down deer and defending a large territory. Both of these traits are important for Maine coyotes.

Food Habits

Coyote food habits vary seasonally, ranging from omnivore (i.e., opportunistically eating vegetative or animal matter) during the summer and fall, to strict carnivore (eating meat) in winter (Parker 1995). In Maine, common summer and autumn foods include fruit and berries (blueberry, raspberry, beechnuts, apples, serviceberry), white-

tailed deer, and snowshoe hare (Hilton 1976, Harrison and Harrison 1984, Parker 1995). Unlike coyotes in western states, eastern coyotes feed relatively little on small mammals, such as mice, voles, and squirrels (Parker 1995). Predominant foods of Maine coyotes in winter and spring are white-tailed deer and snowshoe hare (Hilton 1976, Harrison and Harrison 1984, Parker 1995).

Similar to coyotes in other areas of North America, Maine coyotes may hunt in packs (pack = 2 or more cooperating individuals), are capable of killing deer, and readily feed on deer carrion (Hilton 1976, Bowen 1981, Lavigne 1992, Gese and Grothe 1995). In Maine, the consumption of deer by coyotes increases in late winter (i.e., February and March; Hilton 1976, Lavigne 1992). During this time of year, deer are vulnerable to predation because their energy reserves are low and their escape may be hampered by deep snow or crust ice. White-tailed deer (adults and fawns) continue to be an important food item in spring and early summer, when coyotes are raising pups (Harrison and Harrison 1984).

Interactions with Other Species

Coyotes, as top predators in the food chain, influence many other animals in their ecological communities. This influence can be either positive or negative. Negative aspects of predation include competing with humans for game animals (e.g., deer) and opportunistic killing of prey species. When predators kill opportunistically, they may take healthy animals along with weaker individuals or they may kill more prey than they can consume. Beneficial aspects of predation include removing diseased or inferior animals that would normally compete with healthy individuals for food, preventing over

browsing of vegetation by limiting the population size of prey species, and strengthening survival characteristics (e.g., swiftness and keen senses) by removing individuals deficient in these traits from the gene pool.

Probably the most controversial interaction between coyotes and a wild prey species is predation on deer. In particular, the controversy is centered around whether or not coyotes limit the size of deer populations. Predators have their greatest influence on prey populations when mortality from predation is additive to other forms of mortality, such as starvation and disease. When predators remove individuals that would have normally died from other causes during the year, predation does not limit yearly population growth (Fig. 1).

Unfortunately, it is difficult to say for certain how many deer would die from other causes if they were not killed by coyotes. If predators were absent, starvation would be one of the most common causes of winter deer mortality. Consequently, natural losses can be estimated by determining the rate individual deer use their energy stores (e.g., stored fat) during winter. The more popular indices for measuring deer condition include snow urine assays for live deer and measuring femur marrow fat in deer that have died during the winter (e.g., Lavigne 1992, 1995, Parker 1995:55). Femur marrow fat is used to predict the total body fat of an animal, or in other words, the animal's energy stores. Watkins et al. (1991) demonstrated that femur fat levels above 80% are strongly associated with deer in good condition. Below 80% femur fat, a deer's body fat is low (<10%) and large differences in femur fat reflect only small differences in body fat (Watkins et al. 1991). Consequently, it is difficult to predict whether deer, with femur fat levels below 80%, would have survived the winter. Lavigne (1992), using the femur fat

index, determined that up to 46% of Maine deer killed by coyotes had femur fat levels below 80%. Although 46% of the deer may have been malnourished, the actual percentage of deer that would have died if coyotes were not present, probably lies between 15% and 46% of the total number of deer killed by coyotes. The lower of the two percentages reflects the proportion of the coyote kill that had extremely low levels of bone marrow fat (Lavigne 1992).

Predation is more likely to suppress deer or other ungulate populations when the ungulate population is low relative to carrying capacity[1] of the habitat (Gasaway et al. 1983, 1992, Messier 1994, Lavigne 1995). When deer populations are below 50% of the maximum population that the habitat will support, the growth rate of the population becomes limited by the number of does of reproductive age. Predation at these population levels tends to be additive to other forms of mortality and suppresses the prey population. At higher deer populations, other factors such as food, cover, and space may limit population size.

In addition to the effect that coyotes have on prey populations, coyotes may compete with or displace other predators that live in the same ecological community. The interactions between coyotes, fox, and bobcat have been the most thoroughly studied. Coyotes, fox, and bobcats all prey on snowshoe hare. When prey is limited, such as during winter and spring, coyotes may out-compete bobcat and fox for snowshoe hare along forest edges (Litvaitis and Harrison 1989, Theberge and Wedeles

[1]In this assessment carrying capacity refers to "ecological carrying capacity" as defined in Caughley and Sinclair (1994). These authors define carrying capacity as "... the natural limit of a population set by resources in a particular environment. It is one of the equilibrium points that a population tends towards through density-dependent effects from lack of food, space (e.g., territoriality), cover, or other resources." In essence, carrying capacity, or the number of animals the land can support, is determined by the resource that is in the most limited supply at a given time of year. These resources include food, water, cover, and space. In theory, an animal's population should increase until the most limited resource (e.g., food) is no longer available in sufficient quantities.

1989). This competition may limit the number of bobcats, which are dependent on hare, that can exist in an area (Litvaitis and Harrison 1989). Fox may be displaced from hunting along forest edges and other prime hare habitat, but they compensate by shifting their diet to other small mammals (Theberge and Wedeles 1989). Although coyotes will kill fox and bobcat, these three species can coexist by hunting in different habitats (Voigt and Earle 1983, Litvaitis and Harrison 1989). In general, fox tend to avoid coyote territories altogether (Voigt and Earle 1983, Major and Sherburne 1987), while bobcat may out-compete coyotes for hare in densely wooded areas (Litvaitis and Harrison 1989). In addition to competing with bobcat and fox for live prey, coyotes are efficient competitors for whatever carrion is available.

Reproduction

Coyotes become sexually mature usually the first breeding season; however, the proportion of juvenile animals (less than 1 year old) participating in breeding depends on environmental conditions, food availability, and population density. In general, 60% - 80% of adults and 20% - 25% of juvenile females breed and bear young each year (Parker 1995). Non-breeding females tend to be individuals that do not hold a territory (Parker 1995).

In Maine, female coyotes become sexually active as early as the first week in February (Hilton 1978). Females form a pair-bond with one male who assists her in raising the litter. Coyotes produce 1 litter per year. On average, about 7 young (average litter sizes ranges from 5 to 9 pups) are born from mid-April to May after a 61-66 day gestation period (Hilton 1978, Parker 1995). Litter size varies with food

availability and exploitation rates, and may increase by as much as 60% to compensate for high losses in the immediate coyote population.

Dispersal

Dispersal is the movement an animal makes from its place of birth to where it reproduces (Caughley and Sinclair 1994). It is the primary mechanism by which animals find and inhabit new areas and avoid inbreeding. It is also a time of high mortality as animals move through unfamiliar territory. For canids, the number of animals cooperatively hunting and the type of hunting behavior appear to be connected to the rate of juvenile dispersal (Kleiman and Brady 1978, Harrison 1992a).

In Maine, coyotes begin dispersing at about 5 months of age (i.e., late September; Harrison 1992b). Dispersal peaks during October-November and again during February-March. In Harrison's study, more than 80% of the pups dispersed during their first year, with 53%, 33%, and 14% of the juvenile coyotes emigrating during autumn, late winter, and after the first winter, respectively. Although there are many reasons why animals disperse, dispersal of coyotes in autumn may be primarily due to increased aggression among siblings, while late winter dispersal may be initiated by increased aggression from adult coyotes during pair bonding (Harrison 1992b). Coyotes dispersed an average of 64 mi., with the longest dispersal being 214 mi. Survival rates during dispersal were highly variable, but averaged 47% (annual survival), as compared to 74% for juveniles that remained in their original territory.

Social Behavior

Coyotes are monogamous (i.e., only have one mate at a time) and may maintain pair bonds for several years (Parker 1995). The primary social unit is the mated pair and their offspring under 1 year of age (i.e., family group) (Harrison 1992a). In addition, there may be late dispersing juveniles, nonrelated individuals, or extended family members cooperating in a pack (Harrison 1992a, and Harrison, personal communication). Family groups usually hold discrete territories. Outside the family group, there are transient individuals that normally range from 6 to 18 months of age (Harrison 1992a). These transients reside in territories of other coyotes, until they are able to establish territories of their own. In Maine, the number of adult transients is nearly equal to the number of adults holding territories (D. Harrison, personal communication).

Canids exhibit a wide range of social behavior, from solitary living, typical of small canids (e.g., fox), to pack living, typical of large canids (e.g.., wolves; Harrison 1992a). The degree of social interaction among coyotes is highly varied and dependent upon factors such as prey size, prey availability, and coyote densities in adjacent areas (Bowen 1981, Harrison 1992 a,b). Large prey, like deer or elk, are more efficiently killed and the carcass more easily defended as the number of coyotes that are cooperatively hunting increases (Bowen 1981, Gese et al. 1988, Harrison 1992a). Consequently, cooperative hunting is common in areas, such as Maine, where small mammal densities are low and large prey make up a major portion of the coyote's diet.

Pack size is largely dependent upon the number of juveniles that remain with the mated pair. Juvenile dispersal from the family group is influenced by the availability of

food, vacant territories, and/or the density of coyotes in the surrounding area (Bowen 1981, Harrison 1992a). In situations where competition for vacant territories is high, juveniles may be better off (i.e., higher survival and reproductive fitness) staying with their original family group than competing for their own territory. Therefore, it is possible to have large packs even in areas where large prey are uncommon, if few vacant territories exist (Bowen 1981, Harrison 1992a).

Mortality

Mortality rates (the number of individuals dying per unit of time) vary with the age of the coyote (Parker 1995) and are often calculated separately for juvenile and adult animals. For the western coyote, Parker (1995) reported that annual mortality rates for adults (> 1 yr.) averaged between 30% to 57% as compared to juveniles (< 1 yr.) which averaged between 58% to 77%. Human-related mortality (e.g., hunting, trapping, being struck by automobiles) is generally the highest source of mortality for coyotes. For example, human-caused mortalities in Iowa were distributed accordingly: for 63 out of 253 ear tagged coyotes that were recovered: 54% were shot, 30% trapped, 8% roadkilled, 7% killed by dogs, and 1% were snared (Parker 1995)[2]. In Maine, human-caused mortality among juvenile coyotes was nearly twice as high for dispersing animals as for resident individuals (Harrison 1992b). Harrison (1992b) found that 40% of all the radioed juveniles that dispersed, annually died from human-caused mortality (12% died from natural causes) while 22% of all the radioed juveniles that remained

[2]Natural mortality rates cannot be calculated from these data because the fate of the unrecovered tagged coyotes is not known. In order to accurately determine natural mortality rates for coyotes, a radiotelemetry study would have to be conducted.

residents, annually died from humnan-caused mortality (3% natural causes). Juvenile coyotes in Maine are much more susceptible to trapping than adults. Major (1983) reported that 83% of the coyotes trapped during the 1980 season were less than one year old. Even with the high susceptibility of Maine's juvenile coyotes to trapping, Maine's mortality rates for juvenile coyotes (<52%) is likely lower than their western counterparts.

The rate of occurrence of various diseases and their contribution to coyote mortality is not well documented for eastern coyotes (Parker 1995). Parasitism and other diseases generally influence coyote mortality to a greater extent as coyotes become stressed from poor nutrition or weather (Gier et al. 1978). Most diseases are density dependent, that is they become more prevalent and exert a greater effect on a population as the population increases in density. For example, a severe outbreak of sarcoptic mange may not occur until coyote densities become high, at which time it can easily be spread from animal to animal (e.g., Pence and Windberg 1994). At high coyote densities, severe outbreaks of sarcoptic mange can infect up to 70% of the coyote population and cause a high rate of mortality (Gier et al. 1978, Parker 1995). Some of the more common diseases for coyotes include: sarcoptic mange, distemper, canine parvovirus (Gese et al. 1991) , canine hepatitis, and various parasites (e.g., tapeworms and mites) (Gier et al. 1978, Parker 1995). Of these, the most serious diseases are sarcoptic mange, distemper, and canine parvovirus. Coyotes do not appear to be nearly as susceptible to rabies as fox, skunk, raccoons, or bats. Of the 9,943 confirmed cases of rabid animals reported in 1977 in North America, only two involved coyotes (Parker 1995). In 1997 and 1998, none confirmed cases of rabid

animals in Maine were coyotes (unpublished data, Maine Health and Environmental Testing Lab., Augusta).

MANAGEMENT

Regulatory Authority

Prior to 1971, coyotes were not classified as furbearers in Maine, and there was no formal hunting or trapping season on them. Wild animals not specifically listed in Maine's hunting and trapping regulations normally are considered protected. However, coyotes were routinely killed especially in the 1940's and 1950's (e.g., Letourneau 1984). In 1971, coyotes were classified as a furbearer, and trapping was allowed (Table 1). By the 1972-73 season, hunting and trapping of coyotes was allowed year-round. Under year-round trapping, the incidental catch of bobcat and fisher was unacceptable, and the Department was forced to limit the coyote trapping beginning with the 1976-77 season. Under these new restrictions, special permits were issued to licensed trappers to take coyotes at any time of year, if coyotes were causing problems. Following the shortening of the coyote trapping season in 1978-79, trapping season lengths on coyotes were relatively constant until 1989-90, when a special coyote/fox season was initiated (Table 1). This special season gave coyote trappers an additional 7 days of trapping prior to the regular trapping season. This special season was extended an additional week in 1997-98. Current trapping regulations are listed in Appendix 1.

There are two coyote hunting seasons in the state: one is a general hunting season, which has remained open year-round since it was initiated in 1972, and the other is a special night hunting season (Table 1). The special night hunting season for

coyotes was introduced by statute in 1983-84. The intent of the statute was to increase coyote hunting opportunities by allowing the public to hunt at night with predator calls. Initial restrictions, such as hunting only on snow or ice and only with a shotgun, were soon lifted as public interest in predator calling waned. Season length for night hunting increased in 1988-89 (Jan 1 to April 30) and has remained the same until present (Table 1). In an attempt to reduce the coyote population, the legislature enacted a one year coyote awards program in 1989-90. Cash awards were given for the most and largest coyote(s) under several categories. This program lasted only one year. Current hunting regulations are listed in Appendix 1.

In the winter of 1979-80, the Department initiated a coyote control policy in an effort to reduce the number of coyotes preying on deer and other wildlife (Appendix 2). From December through April, Department personnel and select licensed trappers, under supervision of the Warden Service, were allowed to remove coyotes by trapping with "steel-jawed" traps within and around deer wintering areas. Wardens were responsible for identifying areas where coyote control was necessary and for administering the coyote control program. The Warden Service, but not trappers, were allowed to set neck snares for coyotes under this control program (1979-1983).

The Department established a formal damage control program in 1983 and an Animal Damage Control (ADC) Coordinator position was created in the Wildlife Division. The Department's animal damage control policy was further refined in 1989 (Appendix 3). This new policy allowed registered and properly certified ADC cooperators to set neck snares for coyotes near deer yards where coyote predation was deemed to be a problem by Department officials and set snaring guidelines to safeguard against

accidental catches of non-target animals (e.g., bald eagles and deer). The 1989 policy was revised in 1998, to increase training and incentives for ADC snarers, modify equipment requirements, allow experienced snarers more snaring opportunities, and increase Department monitoring and control of snaring activities (Appendix 4).

Past Goals and Objectives

The overall goal, set by the public working group, for coyote management in the 1985 species assessment was to "Increase coyote harvest and increase coyote control activities." Specifically, the trapping harvest was to be increased to 1,500 - 2,000 coyotes, and the hunting harvest was to be increased to 500 animals (Hilton 1986). One objective the working group set for animal damage control was to increase the reporting rate of coyote complaints and the response to those complaints by ADC Agents by 100%. The working group suggested that the Department strongly encourage the public to report coyote nuisance problems. Furthermore, the 1985 assessment recommended that the Department make good use of the roster of ADC cooperators, in order to improve the Department's response to these complaints. While improving the department's ADC response appeared to be readily achievable, achieving a substantial increase in the coyote harvest was thought to be a difficult goal to reach. It was suggested that a moderate increase might be achieved if trapping and hunting opportunities were "vigorously" promoted (Hilton 1986).

Overall, the Department has been successful in meeting the goals set forth in the 1985 assessment. The goal to increase the coyote trapping harvest to 1500-2000 animals was achieved during the 1987-88, 1994-95, 1996-97, and 1997-98 trapping

seasons but fell slightly short of the 1500 mark other years (Table 2). Since 1985, the coyote trapping harvest has averaged about 1300 animals per year. The Department tracks the coyote harvest (and that of other furbearers) through pelt tagging records. If a coyote is shot as a nuisance animal or taken during a coyote hunt, it does not have to be tagged unless the person wants to keep the pelt. Consequently, many coyotes that are shot and trapped are not tagged, and the Department has no way to precisely determine the total number of coyotes taken or whether the 1985 hunting harvest goal was met. From public surveys, we estimate that over 20,000 hunters annually made trips to primarily hunt coyotes (see Use and Demand section). If at least 2.5% of these hunters were successful in shooting a coyote each year, the 1985 harvest goal would have been met. It seems likely that the Department met or exceeded the 1985 goal for hunting coyotes, especially since the above figures do not include coyotes that were shot by hunters pursuing other game animals.

To our knowledge, the Department has responded to coyote nuisance complaints, involving domestic animals, to the satisfaction of the public. Unfortunately, there was no way to determine whether the reporting rate for coyote nuisance complaints increased among those citizens having coyote nuisance problems. The Department continues to cooperate with the Legislature to provide coyote snaring opportunities to the public. The twofold objective of this snaring activity has been to lessen predation rates around select deer wintering areas and satisfy public demand for removing coyotes.

The goals of the 1976 and 1980 planning documents are described in the Past Management Section.

Past Management

The first Departmental position on coyotes in 1962 did not recognize their potential to prey on deer; thus the Department's credibility suffered with the public (Hilton and Lavigne, MDIFW personal communication). As coyotes rapidly expanded in the Northeast, we learned more about their food habits and it became evident that coyotes prey on deer and that the number of deer dying as a result of coyote predation was substantial (Hilton 1992). Efforts were made to learn more about coyote behavior in a series of predator studies funded by the Department in the late 1970's and early 1980's (e.g., Major 1980).

The first planning document (1976), addressed the expansion of Maine's coyote population and promoted increasing coyote harvest rates. Accordingly, the desired harvest was set at 1,500 coyotes, an objective that was never met during the first planning period. During the 1980 reassessment, the harvest objective was reduced to 1,000 animals. This reduction in harvest levels was explained accordingly, "As more people took up trapping in Maine, trapping regulations and season lengths were changed to protect "key" species - primarily fisher and bobcat - from over-utilization" (Coyote Management Plan, 1980, unpublished data). The Department's primary objective in managing coyotes in 1980 was to encourage more skilled trapping. Needs identified in the 1980 species assessment also called attention to the importance of ongoing studies on the behavioral interactions between coyotes, bobcat, and fox (see - Natural History - Interactions with Other Species).

The Department's ADC efforts initially focused on alleviating sheep depredation (see Regulatory Authority section for a history of animal damage control laws and policy). Historically, sheep farms in Maine were small, poorly maintained, and provided little protection against coyote predation (Hilton 1992). Consequently, coyotes readily utilized this available food source. By 1985, many of the marginal sheep operations had gone out of business and the remaining sheep farms tended to be well maintained -- often utilizing electric fences, guard animals, or other protective measures (Hilton 1992). This improved animal husbandry reduced the number of coyote depredation complaints. Therefore, most of the Department's ADC work has been directed at relieving coyote predation around deer wintering areas.

The Department's effort to educate the public on coyotes mainly occurred in the late 1970's through the 1980's. The focus of these efforts was to disseminate information on coyote hunting and trapping techniques, educate the public on the limits of coyote control and livestock protection, and to discuss the effects coyotes were having on Maine's deer population. Public education was accomplished through public meetings, magazine articles, and pamphlets.

Current Management

Current management efforts for coyotes are directed towards 3 principal concerns: (1) providing adequate hunting and trapping opportunities, (2) animal damage control, and (3) education.

Hunting and Trapping

Current coyote trapping and hunting seasons allow maximum opportunity for harvesting coyotes. However, a formal coyote management system has not been implemented to date. Coyote harvest rates are monitored using pelt tagging records. As mentioned earlier, coyotes taken by hunters and trappers are often not tagged. Given the large number of hunters targeting coyotes (20,000+), the untagged coyote harvest may be large, but probably not large enough to limit the statewide coyote population (i.e., the total harvest would have to be over 8,000 coyotes -- 70% of current fall population). Management of coyote trapping and hunting seasons has been fairly consistent the past 10 years, with the implementation of an early coyote/fox trapping season in 1989-90 and the extension of this season in 1997-98 being the major exceptions (Table 1).

Animal Damage Control

Coyote depredation complaints on livestock continue to be low since 1985. In the early 1990's, the Department annually received fewer than 35 complaints of sheep depredation by coyotes. The 1990 Food and Rural Resource Survey, by the Maine Dept. of Agriculture, indicated coyotes were blamed for 3% of the wildlife damage cases, while deer and bear were implicated in 75% and 8% of the cases, respectively (Hilton 1992). More recently, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS; now referred to as Wildlife Services), reported that only 7 of the 346 animal depredation complaints it received in 1995-96, in Maine, were caused by coyotes (APHIS, unpublished report). In 1994-95, 19 of the 435 depredation

complaints were attributed to coyotes. Notwithstanding the low incidence of coyote depredation, MDIFW continues to provide assistance to agricultural producers who sustain losses attributable to coyotes.

The Department's objectives for snaring coyotes around deer wintering areas have not been formalized. Ostensibly, the coyote snaring program has been directed at accommodating the sporting public's desire to do something about the "coyote problem" and increasing survival of local deer herds in winter. Since initiation of the formal coyote snaring policy (1979), the Department has recognized the following points: (1) large numbers of coyotes can be taken annually from an area without realizing a long term reduction in their population size (coyotes can withstand annual reductions of 70%); (2) that a long term reduction of coyote numbers is probably not attainable; and (3) a proportion of deer killed by coyotes would have died from other mortality factors during the winter (Perry and Hilton 1980).

The Department has endorsed the removal of coyotes from specific areas where high losses of deer are occurring and where deer populations are below the level their habitat can sustain. This approach was thought to be more socially acceptable and more biologically credible than intensive coyote suppression over large geographic areas (Perry and Hilton 1980). There are a number of examples in literature of predators limiting prey population numbers, and of predator removal enhancing prey populations. But in the context of coyote predation in deer wintering areas, we do not know whether our snaring program (1) reduces predation losses and increases the annual survival rate of deer, and (2) whether coyote removal is a cost effective way to increase deer survival rates.

Most recent education efforts center on coyote predation and deer mortality rates. In 1995, the State Legislature mandated the Department to "conduct a study to determine the impact that coyotes have on deer, and to propose recommendations to encourage the harvest of coyotes." A literature review was conducted and used to estimate the effect of coyote predation on deer numbers (Lavigne 1995). This report was widely circulated by private sporting groups (e.g., Sportsmen's Alliance of Maine).

Briefly, Lavigne concluded coyote predation accounted for 30% of the annual deer mortality in Maine. Coyote predation more likely limits the deer population in parts of the state where 1) wintering habitat quality has been severely reduced, 2) winters tend to be severe, and 3) alternate prey are less available. In northern, western, and eastern Maine, inadequate wintering habitat is the primary factor limiting deer populations. In these areas, coyote predation is the symptom not the cause of deer population problems. In many parts of Maine, the allowable deer harvest has been reduced, in part, to accommodate losses to coyote predation and other natural mortality factors.

Outside of the Department's snaring policy and program, there is no comprehensive plan for public education focused on coyotes or other large predators. Efforts have been made to help hunters and trappers more accurately identify the predators they are pursuing. These education efforts were conducted in conjunction with lynx and wolf investigations to help prevent the incidental taking of these species.

HABITAT ASSESSMENT

Habitat suitability is often measured to determine the density of wildlife a given habitat can support. The density of animals a given habitat can support is dependent upon the accessibility of food, water, space, and cover. By matching an animal's minimum requirements for each of these attributes to their availability in its environment, we can estimate the carrying capacity of the habitat for that species. Carrying capacity changes over time because habitats are dynamic; therefore, it only predicts the approximate density of animals a habitat can sustain.

Past Habitat

Coyotes do not appear to be closely associated with a particular habitat type in Maine. Productive habitats for coyotes are those that are most productive for their prey. For prey such as deer and snowshoe hare, the most productive habitats have an early successional component in them. Early successional habitats are characterized by vegetation that has grown back generally in less than 20 years following fire, insects, logging, or other natural disturbance. Dominant early successional vegetation typically consists of fast growing trees, shrubs, and grasses.

Before European settlement, the majority of early successional habitat was produced by fires, insects, floods, and wind. However, since settlement, large scale conversions of mature forests to early successional habitats have occurred in conjunction with wood harvesting and farming. Land clearing for agriculture peaked

around 1880, and thereafter, the number of farms and the acreage devoted to farming declined until present. Between 1880 and 1980, approximately 4.4 million acres of farmland was allowed to revert to less intensive land-uses and early successional habitats (Bureau of the Census 1994, Bill Krohn, University of Maine, unpublished data). During this same period, logging operations became more intensive as logging equipment improved. The growth of the pulp and paper industry created a market for younger trees and more spruce and fir. Consequently, more of Maine's forests were converted from mature closed canopy forests to early successional stands, that provided an abundance of deer food and snowshoe hare habitat. However, the increase in deer food from early successional stands was tempered by the loss of mature conifer stands necessary for deer winter shelter. The greatest amount of deer winter shelter occurred in the 1950's.

Current Habitat

Coyote habitat in Maine is generally considered to include all land area minus developed areas (Table 3; Chilelli 1998b). The flexibility in a coyote's food habits, allows it to successfully occupy a variety of habitats. Given current prey densities and composition, the number of coyotes in Maine appears to be determined by the coyotes space requirements and available land (Harrison 1992a; D. Harrison, University of Maine, personal communication). Adequate space is important to wildlife because it allows individuals to acquire the necessary resources they need to survive and reproduce with minimal conflict.

One measure of space requirements for coyotes is the size of a family group's territory. Territory size is determined, in part, by food availability and the amount of effort or risk involved in defending that food source from other animals. In Maine, coyote territory size was similar (i.e, 42 km^2 to 49 km^2 [16.2 mi^2 to 18.9 mi^2]) in 3 locations: Down East in Cherryfield, in the western mountains at Pierce Pond, and on Mount Desert Island (Harrison 1992a, D. Harrison, University of Maine, personal communication). For all of these areas, coyote territory size was among the largest recorded in literature. However, deer densities in all three areas were relatively low (<15 deer /mi^2). This raises the question, would coyote territory sizes be smaller if deer densities were higher in these areas? Higher food densities might allow coyotes to maintain a smaller territory and still acquire sufficient food. Brundige (1993) reported coyote territory sizes nearly equal to those in Maine (i.e., 38 km^2 [14.7 mi^2]) in the Adirondacks of New York, where deer densities were estimated at >20 deer /mi^2. We can conclude from the above studies, that in the northeast, coyote territory size appears to be relatively fixed. Consequently, the population size of coyotes in Maine can be determined by the number of territories that can be accommodated by the land area of Maine (or space) and the number of coyotes living in each territory.

The similarity of coyote territory size in different areas of Maine was not known when the 1985 coyote species assessment was written. Consequently, each Wildlife Management Unit was assigned a "relative food value", which adjusted the carrying capacity of that Unit's predominant habitat type by a prey availability index. To the best of our knowledge, this habitat suitability adjustment is not warranted, nor correct. Therefore, it was not computed for the current assessment.

The previous assessment projected that the "relative food value" would not change markedly on a statewide scale and made specific predictions for various Wildlife Management Units. Other than stating that deer and moose abundance has increased since the 1985 species assessment, we cannot determine whether the "relative food value" has changed in any of these areas. Consequently, differences in coyote habitat among Wildlife Management Districts are only attributable to differences in land area among districts (Table 3).

Habitat Projections

Since coyotes occupy most land types in Maine the amount of habitat suitable for coyotes is not expected to change in the next 15 years. The potential for change lies mainly with the quality of their habitat.

In the future, coyotes may become more accustomed to living around people, if people continue to seek rural settings in which to live. The degree to which human communities are attractive to coyotes is dependent upon human behavior and food availability. Food availability near human dwellings is contingent upon people's attitudes about leaving pet food outside, feeding other animals (e.g., deer), keeping trash secure, keeping pets indoors, and deer hunting restrictions. Human tolerance of coyotes may decrease the general wariness of coyotes for humans and lead to increased foraging by coyotes around dwellings. In the same vein, hunting and trapping around communities may decrease the attractiveness of these communities to coyotes, even if these activities do not limit coyote populations.

The quality of coyote habitat in forest lands is primarily determined by the amount of snowshoe hare and deer that can be produced on those lands. For snowshoe hare, their food supply is closely tied to the availability of early successional habitat. The amount and quality of early successional habitat is determined by the harvesting techniques used in commercial forests, the amount of timber cut, and natural disturbances. Partial harvesting is expected to become the dominant harvesting technique used in Maine's commercial forests. The effect of this harvest technique on snowshoe hare populations should be evaluated before changes in the quality of forested habitat is predicted for coyotes. Studies are currently in progress to determine prey densities in partial cut stands in northern Maine (A. Fuller, University of Maine, personal communication). Although these studies have not been completed, any positive benefits from partial harvesting would not likely be sufficient to increase the snowshoe hare population to the extent that coyotes could reduce their territory size. Over the next 20 years, harvesting in hardwood stands is expected to increase (Chilelli 1998a), thus possibly increasing the amount of early successional habitat. However, it is unlikely that the proposed increase in cutting would lead to a dramatic improvement of coyote habitat.

Although white-tailed deer use early successional habitat as feeding areas in the summer, deer densities are limited by the amount of winter cover available in much of northern Maine. Large, closed canopy stands of mature conifers make the best winter cover for deer, especially if some food is available in the stand or in surrounding areas. The acreage of conifer forests (e.g., spruce/fir) have declined in the past 15 years and are expected to remain at current levels in the near future (Chilelli 1998a). Given the

trend towards shorter rotation times (i.e., the amount of time a forest stand is allowed to mature before it is cut again) for conifer forests, the acreage of deer winter shelter or closed canopy stands may decrease the next 15 years (Lavigne in prep.). Therefore, the quality of forest habitat for coyotes, in terms of deer production, may decrease slightly in northern Maine over the next 15 years.

POPULATION ASSESSMENT

Past Populations

From the turn of the century, when wolves were extirpated, until the early 1960's, coyotes or coyote-like wild canids were only reported sporadically in Maine (Hilton 1992). Documentation of coyotes during this period was mostly anecdotal: for example, woodsmen who operated in northern Maine during the 1920's - 1950's recounted seeing wolf-like animals "*les loups*" (French term for wolves). In 1937, an animal trapped in Edinburg (Penobscot County) was identified as a coyote (Aldous 1939). Many of the early (1936-1953) specimens of coyote-like animals submitted to the Maine Cooperative Wildlife Research Unit were identified as dog or coydogs (Richens and Hugie 1974). Later researchers concluded that these animals likely were misidentified. This error delayed recognition of the distribution of coyotes in the northeast (Hamilton 1961, Richens and Hugie 1974, also see Roy et al. 1994). Contrary to early perceptions that coyotes suddenly appeared in Maine, the dispersal of coyotes from Minnesota to Maine was gradual (Moore and Parker 1992), occurring over a period of years (Richens and Hugie 1974).

During the 1960's, frequent reports of road killed, shot, and trapped coyotes indicated a substantial increase in coyote numbers. This increase was first noticed in the western sections of the state and spread eastward (Richens and Hugie 1974). By the early 1970's coyotes were well established in western and central Maine. In 1975, coyote numbers were estimated to be between 1,400 and 6,000 animals statewide. In

1985, biologists calculated that 8,000 coyotes may occur in Maine during the winter, and as many as 13,000 individuals may be present in the fall. These estimates were based on coyote densities obtained from the literature and adjusted for habitat types (see Current Habitat; Hilton 1986). The carrying capacity of the habitat for coyotes in 1985 was projected to increase slightly as the deer population increased.

Current Populations

Space apparently is the limiting factor for Maine's coyote population. As stated previously, one measure of space requirements for coyotes is the size of their territories. We can roughly estimate the size of Maine's coyote population by determining the average number of coyotes occupying a territory and the average territory size of coyotes in Maine. These calculations are complicated by the fact that coyote territories can be occupied by both cooperating individuals (usually family members) and nomadic individuals (may be unrelated to cooperating group; Parker 1995).

To estimate the size of Maine's coyote population we used the following figures and assumptions: (1) coyote territories are equal in size throughout Maine, (2) the average number of pups born to Maine coyotes is 7, (3) 41% of the pups survive until December 1, (4) adult annual survival is at least 74% (i.e., rate of survival for juvenile resident coyotes in Maine was used; adult survival rates were not available), (5) immigration is equal to emigration, (6) the number of cooperating adults is equal to the number of nomadic adults, (7) the average home range is 17 mi^2 (44.4 km^2), and (8) all

suitable habitat is filled with coyote territories (Harrison 1992b; D. Harrison, University of Maine, personal communication).

Using these assumptions, it was calculated that by December 1, the average family group would consist of 2.9 pups and between 1.5 - 2 adults. A December 1 survival rate was used for this calculation, because (1) it reflects the number of surviving animals after most fall trapping and hunting has occurred, and (2) the best information on coyote survival in Maine was based on survival to December 1. With this survival rate, a family group would have between 4.4 to 4.9 cooperating individuals per territory. Since it was assumed that emigration equals immigration, no deduction in coyote numbers was made for dispersing pups. Nomadic adults were assumed to be equal to the number of cooperating adults in a territory. In total, between 5.9 and 6.9 individuals may occupy a single coyote territory (17 mi^2) in Maine. Coyote densities were extrapolated to the entire state's usable coyote habitat (29,662 mi^2). From these figures, it was calculated that approximately 10,000 to 12,000 coyotes live in Maine around December 1 (Table 3). This estimate is slightly higher then the 1985 population estimate for coyotes. The higher population estimate reflects refinements in the assumptions used to calculate the population density of coyotes, rather than actual growth in the coyote population since 1985. The maximum population of coyotes would occur in the spring during the denning season. Coyote populations during that time of year may reach as high as 19,000 animals, but would quickly decrease because of the high pup mortality rate.

Population Projections

Trapping harvest and effort levels have been quite consistent since 1985, indicating that the coyote population has remained relatively stable (Tables 4-5). It is expected that the coyote population will remain stable the next 15 years, barring any disease epidemic (e.g., mange) or the recolonization of wolves into Maine. If wolves were to become established, the coyote population would likely decline and remain at a lower population level for as long as wolves were present in the state.

Limiting Factors

As stated above, the current limiting factor for coyotes in Maine is space. Other potential limiting factors include food, human exploitation, disease, and competition from other predators.

The sensitivity of Maine's coyote population to fluctuations in prey densities is difficult to predict because of the coyote's flexible and omnivorous diet. The importance of food supply in maintaining coyote populations was documented in long term studies in Alberta. These studies indicated coyote populations in boreal forests were directly related to densities of a preferred prey species (i.e., snowshoe hare; Todd et al. 1981). Specifically, coyote populations decreased 3-6 fold with a 20-40 fold decrease in hares (Todd et al. 1981). This decrease in the coyote population was delayed several years past the start of the hare decline. While the snowshoe hare population decreased 83% the first 2 years, the coyote population only decreased 23% (Todd et al. 1981). Coincidental with the decrease in hare population, coyotes switched to more readily available food items. Thus, in areas where abundant alternative foods were present,

such as around agricultural areas where farm carrion was available, coyotes switched to other foods and did not experience a decrease in their population numbers (Todd and Keith 1983, Todd 1985).

In Maine, white-tailed deer are a more prominent food item for coyotes than in Todd's Alberta studies. For comparison, ungulate material generally occurred in <10% of the coyote stomachs collected during winter in Alberta (Todd et al. 1981); while in Maine, deer material occurred in around 60% of the coyote scats collected during winter[3] (Parker 1995). If the importance of deer to coyotes in the spring and early summer (Harrison and Harrison 1984) is also considered, Maine coyotes should be less susceptible to periodic declines in the hare population.

Coyote populations are very resilient to mortality. It is estimated that coyote populations can withstand mortality rates over 70% before a reduction in the year to year population level occurs (Perry and Hilton 1980, Parker 1995). Consequently, it is difficult to limit coyote populations through human exploitation. Extensive coyote trapping and eradication measures in western states have failed to control coyote populations over large areas. The eastern coyote does not appear to be more vulnerable to human exploitation. Parker (1995) writes, "If decades of aerial gunning, poisons, traps, bounties, and sundry other attempts at coyote control have proven ineffective on the open prairies, why should anyone think a similar effort in the thick spruce-fir forests of the northeast would ever prove otherwise?" Therefore, human exploitation of eastern coyotes does not appear to be a likely limiting factor.

[3]Dietary analyses of scat and stomach contents may yield different results and may not be directly comparable.

Disease outbreaks in wild canids, such as coyotes, are usually associated with high population densities, and thus can serve to limit population size. The two diseases that would most likely limit the size of Maine's coyote population are canine distemper and sarcoptic mange. Distemper is a viral infection primarily transmitted through contact with nasal secretions and saliva. Distemper can become an important form of mortality in coyotes when malnutrition and parasitism are associated with it. Both of these accompanying factors are more prevalent when coyote densities are high. Sarcoptic mange is caused by the scabies mite and is usually transmitted from coyote to coyote by direct contact. As much as 70% of the population may be infected during severe outbreaks (Parker 1995). Given the large territory size of coyotes in Maine, coyote densities are assumed to be low. Because severe outbreaks of these diseases are usually associated with high animal densities, the likelihood of diseases limiting Maine's coyote population appears to be low.

Coyotes efficiently compete with Maine's other carnivores for prey and hunting areas (see Natural History). Among carnivores, the more similar two species are to each other the less tolerant they are of the other's presence. For wild canids, wolves will usually displace coyotes, and coyotes will displace fox. If wolves were to reestablish their population in Maine, they may limit the population size of coyotes. Wolves could limit coyote population size directly, by aggressive interference, or indirectly by competing with the coyote for food. As in other states where coyotes and wolves coexist, an equilibrium would likely develop between the two species, and coyotes would continue to occur in Maine at a lower population level.

USE AND DEMAND ASSESSMENT

Past Use and Demand

Since the coyote's arrival in Maine, a large segment of the public has viewed the coyote as a nuisance rather than as a natural component in Maine's ecosystems. This attitude stems from general anti-predator sentiments and from coyotes competing with man for deer (e.g., Letourneau 1984). Responding to this sentiment, the Department, along with the Maine Trapper's Association, held public forums in the 1970's and 1980's to encourage coyote trapping and to increase the skill of Maine trappers (Hilton 1986; Hilton, personal communication). Initial harvest rates increased from less than 100 in 1972 to over 1,000 by 1982.

In 1984, the Department estimated that 2,000 coyotes were taken. Of those, 68% (1,358) were registered. As is the case today, many trapped or hunted coyotes were not registered if the pelt was of low value or if the coyote was shot for animal damage control (Hilton 1986).

Current Use and Demand

Public use of wildlife can be divided into two categories - consumptive and nonconsumptive use. Consumptive uses include hunting, fishing, and trapping, while nonconsumptive uses include activities such as bird feeding, wildlife photography, and wildlife viewing.

Nonconsumptive Use

In Maine, 57% of residents 16 years or older participated in primary nonconsumptive wildlife activities (i.e., nonconsumptive activities not incidental to other activities), while 16% of the residents hunted, and less than 1% trapped (U.S. Dept. of Interior et al. 1993).

Nonconsumptive uses of coyotes might include viewing and listening to them howl. At this time there are no specific surveys of Maine residents indicating the percentage of people who enjoy seeing or hearing coyotes. In a survey of New England residents, 23% of the respondents were willing to pay for sustaining or protecting coyote populations (Stevens et al. 1994). Reasons for sustaining coyote populations were "(1) so more people might see or hear coyotes, (2) to increase the opportunity to hunt or trap coyotes, (3) to increase the probability that future generations might see or hear coyotes, and (4) because coyotes have a right to exist independent of any benefit or harm to humans." The most common reason for sustaining or protecting coyotes was #4 (Stevens et al. 1994). In contrast, 19% of the public were willing to pay for coyote control. The primary reasons for controlling coyotes were "that coyotes kill deer and other wildlife" and "coyotes spread diseases such as rabies and distemper."

Consumptive Use

For consumptive uses, coyote hunting is the most popular activity. Boyle and Roach (in prep.) questioned 1,193 resident hunters and found that 11.4% made a hunting trip primarily to hunt coyotes in 1996. If this percentage is applied to the total number of hunters in the state (approximately 184,000 hunters), we can assume that at

least 20,240 resident hunters pursued coyotes in 1996. In addition, 5.7% of nonresident hunters made at least one trip primarily to hunt coyotes (Boyle and Roach, in prep.). Resident and nonresident coyote hunters purchased 1,086 special night hunting permits in 1996-97. A large proportion of coyote hunting was done in conjunction with other types of hunting; therefore, the above percentages do not reflect all coyote hunting activity in 1996.

Trapping continues to be an important consumptive use of coyotes. In 1996-97 there were 2,687 licensed resident trappers (includes Junior resident, and over 70 complimentary) in the state. Of these trappers, 43% set at least one trap for coyotes, making coyotes one of the most popular furbearers to trap (Table 4).

The Department considers snaring to be a form of consumptive recreation in addition to a tool for reducing coyote predation on deer. During the winter of 1998-99 there were 477 registered ADC Cooperators certified to snare coyotes. Of these cooperators, 114 had full certification for snaring (see Appendix 4) and were eligible to be paid by the Department for snaring coyotes. The remainder of the participants were conditional snarers and were not eligible to be paid by the Department. A lower proportion of conditional snarers actively snare coyotes than fully certified snarers (H. Hilton, MDIFW, personal communication). This may be due to a wider variety of snaring experience and interest in snaring among conditional snarers as compared to fully certified snarers. Interest in snaring coyotes continues to be high under the 1998 Coyote Snaring Policy, with 172 people trained in coyote snaring procedures in 1998.

During the last 10 years, the coyote harvest has remained fairly stable. The average number of coyote pelts tagged (primarily trapped animals) from 1986 to 1997

was 1,282±73 pelts per year (Table 2). Despite the relatively low price for coyote pelts, coyotes were one of the most popular animals to trap throughout the 1990s (Table 4). Since 1990, an average of 45.6%±1.7 of the trappers annually set at least one trap for coyotes. In terms of effort (measured in trap nights; where trap nights = # of traps x # of nights traps were set), coyotes ranked 7th out of 10 commonly trapped furbearers for the amount of effort trappers spent pursuing them from 1990 to 1996 (Table 5). Like most furbearers, trapping effort for coyotes increases with pelt price (R^2 = 0.55, MDIFW unpublished data).

Nuisance Control

Coyote control continues to be controversial in Maine. Groups lobbying for coyote control have effectively used the state legislature to influence MDIFW policy towards coyotes. This segment of the public has repeatedly called for incentives to eradicate the coyote. Consequently, bills calling for coyote bounties or similar types of incentives are common during legislative sessions (Hilton 1992). Usually these bills are opposed by the Department, for biological reasons, and are defeated in committee. Other legislative initiatives to promote coyote control have included the designation of Department funds for coyote control. For example, in 1997 the State Legislature passed "An Act to Protect Deer" (H.P. 99 - L.D. 123). This Act transferred $10,000 from the Department's carrying balance, in 1997 and 1998, to supplement the Department's coyote control program. These funds were to be used specifically to control coyotes around deer yards in order to "rebuild" the deer herd (Appendix 5).

During the two year period "An Act to Protect Deer" was implemented, the Department spent $39,522 on its coyote control program. The majority of this money ($35,587) was used to compensate fully certified snarers acting as ADC cooperators for the Department, while the remainder was used to cover the cost of supplies. Statewide, a total of 613 coyotes were taken over 2 years, with the majority taken during the 1998-99 snaring season. During the 1998-99 snaring season 480 coyotes were caught, along with 6 deer, 4 red fox, 1 moose, and 5 miscellaneous birds and hare (H. Hilton, MDIFW, personal communication).

Although anti-coyote sentiment continues to be very vocal, several surveys indicate that the public is not overwhelmingly against the coyote. Boyle et al. (1990) surveyed heads of households in Maine and found that 53% of the respondents felt that coyote populations should be reduced in this state, while 47% did not favor a reduction in coyotes. Likewise, a survey of New England residents (52% of the respondents were from Maine) also found the public to be very divided on their attitudes towards coyote management (Stevens et al. 1994). In this survey, 70% of New Englanders did not agree that "coyotes are a menace and should be killed or driven away whenever possible." Most New Englanders (53%) agreed that coyote hunting should continue, while (33%) disagreed. On the issue of whether coyotes should be completely protected, the public was equally divided with 39% of the respondents agreeing and 40% disagreeing. Most people (54%) felt that "not enough is known about the coyote." Cumulatively, these surveys indicate that public opinion is polarized on coyotes and that a management program which satisfies both groups of people would be difficult without further public education.

Use and Demand Projections

Nonconsumptive use of coyotes is not expected to markedly change in the next 15 years. Most people see or hear coyotes while pursuing other outdoor activities. These incidental encounters may add enjoyment to a camping trip or a walk in the forest, but it is doubtful that more people will specifically seek out coyotes to listen to or watch.

Participation in coyote hunting may increase during the next 15 years, as the sport appears to be becoming more popular, especially among houndsmen. However, any increase in the popularity of coyote hunting has to be balanced against fewer new hunters being recruited into the general hunting public (as compared to earlier generations; Lavigne, in prep.).

Coyote trapping is expected to remain stable or decline in the next 15 years. Fur prices have been low the past 10 years, and eastern coyote pelts typically bring less money than pelts from western coyotes. Therefore, any increased monetary incentive to trap coyotes seems unlikely if current trends hold. Recent passage of anti-trapping initiatives in other states (i.e., Arizona, Colorado, Massachusetts, and California) are indicative of a growing anti-trapping sentiment among the general public (Muth et al. 1998). These anti-trapping sentiments are already evident among wildlife professionals currently entering the work force (Muth et al. 1998). Unless public education efforts on the positive aspects of trapping are increased in Maine, residents of this state will likely follow national trends and look more unfavorably upon trapping in the future. These

negative attitudes and increased urbanization of our society translates into fewer young trappers taking up trapping than in previous generations.

Coyote nuisance problems likely will increase in the future if Maine's human population continues to grow and expand into rural areas. This will put people closer to existing coyote territories, and coyotes will become accustomed to living close to humans. One negative outcome of these new human/coyote interactions is coyotes preying on pets. Problems with coyotes taking domestic pets will continue unless the general public is willing to make their communities less attractive to coyotes by not leaving pet food outside, bringing pets in at night and during twilight hours, and allowing hunting and trapping of coyotes. While hunting and trapping may not be able to reduce coyote populations over large areas, these activities may reinforce coyote avoidance of humans and their communities. The general public may turn to professional trappers for controlling local coyote problems; however, it is difficult to predict the constraints that the public will put on the methods used to remove nuisance animals (e.g., current trapping situation in Massachusetts[4]). Nuisance problems with agricultural livestock and crops will probably not increase in the future, if farmers continue to use good practices in animal husbandry and crop production.

[4]On 5 November 1996, a new law was enacted in Massachusetts by ballot referendum. The law restricts and prohibits the use, setting, placing, maintenance, manufacture, or possession of any trap for the purpose of capturing furbearing mammals, except for common type mouse and rat traps, nets, and box or cage traps. The law also prohibited the hunting of bobcat and black bear with dogs.

SUMMARY AND CONCLUSIONS

One of the most notable differences between the eastern and western coyotes is size. Maine coyotes average 30 lb. and 35 lb. (female and male, respectively) as compared to 21 lb. and 24 lb. for California coyotes. The large size of eastern coyotes was formerly thought to be the result of crossbreeding with wolves and dogs. However, recent genetic studies have not detected genetic markers from other canids in eastern coyotes nor shown that eastern coyotes are genetically different from coyotes in other areas of North America. Unlike coyotes in western states, eastern coyotes feed relatively little on small mammals. Predominant foods of Maine coyotes are white-tailed deer and snowshoe hare.

Coyotes, as top predators in the food chain, influence many other animals in their ecological communities. This influence can be either positive or negative. Negative aspects of predation include competing with humans for game animals (e.g., deer) and opportunistic killing of prey species. When predators kill opportunistically, they may take healthy animals along with weaker individuals or they may kill more prey than they can consume. Beneficial aspects of predation include removing diseased or inferior animals that would normally compete with healthy individuals for food, preventing over browsing of vegetation by limiting the population size of prey species, and strengthening survival characteristics (e.g., swiftness and keen senses) by removing individuals deficient in these traits from the gene pool.

Predation is more likely to suppress deer populations when they are low relative to the carrying capacity of the land. Therefore, deer populations in northern and downeast Maine have a greater likelihood of being limited by predation.

There was no formal hunting or trapping season on coyotes prior to 1971. The first two years coyotes were listed as furbearers their trapping season followed that of other furbearing animals. By the 1972-73 season, the coyote trapping and hunting season was opened for the entire year. Excessive incidental catches of fisher and bobcat forced the Department to limit the coyote trapping season in 1976-77. Thereafter, coyote trapping and seasons were relatively constant until 1989-90 when a special coyote/fox season was initiated. This special season was lengthened in 1997-98. The hunting season on coyotes has remained a yearlong season since its inception in 1972-73. In 1979, the Department initiated a coyote control policy to reduce coyote predation on deer around deer wintering areas. This eventually became the Department's coyote snaring policy, which has undergone several revisions, the most recent being in 1998.

Management objectives set in the 1985 coyote assessment included increasing the trapping harvest to 1,500-2,000 animals, raising the hunting harvest to 500 animals, and improving the Department's response to coyote nuisance complaints. The majority of these objectives were met, although direct measurements of particular objectives were not always possible.

The flexibility of the coyote's food habits allows them to occupy a variety of habitats. Therefore, coyote habitat in Maine is considered to be all of the state's mainland minus developed areas. Given current prey densities, the coyote's space

requirements appear to be limiting the size of Maine's coyote population. In the future, coyotes may become more accustomed to living around people, if people continue to seek rural settings to live in. The degree to which human communities are attractive to coyotes is dependent upon human behavior and food availability. This includes people's attitude towards keeping pet food outside, feeding animals (e.g., deer), keeping trash secure, keeping pets indoors, and restrictions on hunting and trapping. In Maine's woods, the quality of coyote habitat is expected to remain relatively constant over the next 15 years and have little effect on the size of the coyote population.

Maine's winter coyote population is estimated to be between 10,000 to 12,000 animals. The maximum coyote population occurs in the spring just after the pups are born. At that time there are probably close to 19,000 coyotes in the state, but that number quickly diminishes due to the low survival rate of coyote pups. Coyote population estimates were calculated using the average number of coyotes per coyote territory and the number of coyote territories in the state. It is estimated that the coyote population should remain relatively constant for the next 15 years, unless wolves reestablish themselves in the state. If that occurs, the coyote population may decrease dramatically. Hunting and trapping has little to no effect in determining statewide coyote population levels. It is estimated that coyote populations can withstand mortality rates of over 70% before a reduction in the population occurs.

Public use of wildlife can be divided into two categories - consumptive and nonconsumptive use. Consumptive uses include hunting, fishing, and trapping, while nonconsumptive uses include activities such as bird feeding, wildlife photography, and wildlife viewing. Seventy-three percent of the population over 16 years of age

participated in nonconsumptive activities, while 16% of the population hunted, and <1% of the people trapped. Of New England residents, 23% were willing to pay for sustaining or protecting coyote populations. Of Maine hunters, 11.4% said they made a hunting trip to primarily hunt coyotes. This percentage translates to around 20,000 resident hunters pursuing coyotes each year. Of the 2,687 licensed resident trappers in the state in 1996-97, 43% set at least one trap for coyotes, making coyotes one of the most popular furbearers to trap. Although anti-coyote sentiment continues to be very vocal, several surveys indicate the public is not overwhelmingly against the coyote. In 1990, 53% of the heads of households in Maine felt the coyote population should be reduced, while 47% of the same group did not favor a reduction in coyotes. Nonconsumptive use of coyotes and hunting is not expected to change much the next 15 years, while trapping of coyotes may decline slightly. Coyote nuisance problems likely will increase in the future if Maine's human population continues to grow and expand into rural areas. These nuisance problems may be alleviated to a degree if the public is willing to make their communities less attractive to coyotes by removing potential food sources and allowing hunting and trapping to continue where feasible.

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Figure 1. Illustration of the effect that seasonal carrying capacity has on the size of a deer population. Under this scenario 10 deer could be removed by predation without affecting the size of the spring deer population. In other words, the winter habitat can only support 90 deer; thus, 10 deer will die whether or not predators are present.

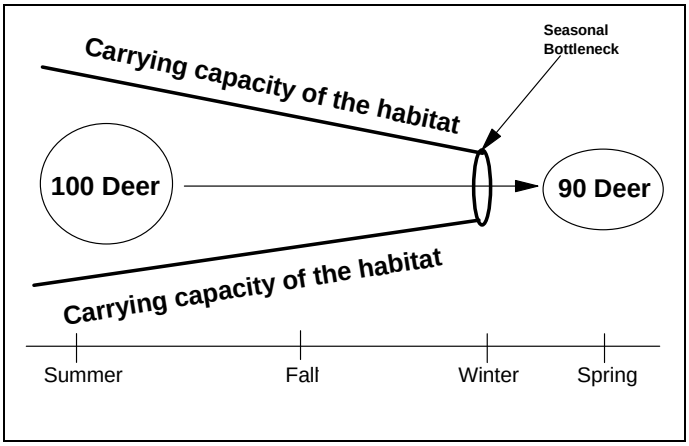


Table 1. History of coyote trapping and harvest seasons in Maine. Seasons are described using Wildlife Management Units (WMU) even though trapping zones (an earlier management unit) may have been in use at the time the season was set.

Year	Trapping Season	Hunting Season	Remarks
1971-72	Trapping allowed	No Hunting	
1972-73	No Closed Season	No Closed Season	First year coyotes were listed as furbearers
1973-74	No Closed Season	No Closed Season	
1974-75	No Closed Season	No Closed Season	
1975-76	No Closed Season	No Closed Season	
1976-77	Oct. 20 - Dec. 1	No Closed Season	Special permit issued to trappers to take coyotes any time of year
1977-78	Oct. 20 - Dec. 15	No Closed Season	As above, but pelt-tag required
1978-79	Oct. 20 - Nov. 25, WMU 1-6	No Closed Season	
1979-80	Oct. 20 - Nov. 25, WMU 1, 2, 3, 5, 6; Oct. 28 - Nov. 10, WMU 4, 7, 8	No Closed Season	Coyote control started (Dec. - April). Wardens & select trappers allowed to trap coyotes around deer yards. Wardens could use snares.
1980-81	Oct. 20 - Nov. 30, WMU 1-3; Oct. 28 - Nov. 30, WMU 4-8	No Closed Season	
1981-82	As above	No Closed Season	
1982-83	Oct. 20 - Nov. 30, WMU 1&2; Oct. 28 - Nov. 30, WMU 3-8	No Closed Season	
1983-84	Oct. 20 - Dec. 4, WMU 1&2; Oct. 28 - Dec. 4 WMU 3-8	No Closed Season Predator calling Jan. - Feb.	Special night hunting/predator calling season started New coyote damage control program started
1984-85	Oct. 28 - Dec. 15, WMU 1&2; Oct. 28 - Dec. 4, WMU 3-8	No Closed Season Predator calling Jan. - Feb.	
1985-86	Oct. 28 - Dec. 15, WMU 1&2; Oct. 28 - Dec. 4, WMU 3-8	No Closed Season Predator Calling Jan. - March	Restrictions on night hunting/predator calling lifted, to encourage

Year	Trapping Season	Hunting Season	Remarks
			hunter participation. Legislation enacted to allow trappers to snare coyotes in Jan. & Feb.
1986-87	Oct. 28 - Dec. 15, WMU 1&2; Oct. 28 - Dec. 4, WMU 3-8	No Closed Season Predator Calling Jan. - March	
1987-88	Oct. 24 - Dec. 4 Statewide	No Closed Season Predator Calling Jan. - March	
1988-89	Oct. 30 - Dec. 4	No Closed Season Predator Calling Jan. - April	Extra month of predator calling
1989-90	Oct. 29 - Dec. 9 & Special season Oct. 22 - Oct. 28 - Statewide	No Closed Season Predator Calling Jan. - April	Special coyote/fox trapping season started Coyote awards program enacted by legislature Policy regarding coyote snaring set
1990-91	Oct. 28 - Dec. 12 Special season Oct. 21 - Oct. 27	No Closed Season Predator Calling Jan. 1 - April 30	
1991-92	Nov. 3 - Dec. 31 Special season Oct. 27 - Nov. 2	No Closed Season Predator Calling Jan. 1 - April 30	
1992-93	Nov. 1 - Dec. 31 Special season Oct. 25 - Oct. 31	No Closed Season Predator Calling Jan. 1 - April 30	
1994-95	Oct. 30 - Dec. 31 Special season Oct. 23 - Oct. 29	No Closed Season Predator Calling Jan. 1 - April 30	
1995-96	Oct. 29 - Dec. 31 Special season Oct. 22 - Oct. 28	No Closed Season Predator Calling Jan. 1 - April 30	
1996-97	Nov. 3 - Dec. 31 Special season Oct. 27 - Nov. 2	No Closed Season Predator Calling Jan. 1 - April 30	
1997-98	Nov. 1 - Dec. 31 Special season Oct. 20 - Oct. 31	No Closed Season Predator Calling Jan. 1 - April 30	Special coyote trapping season lengthened

Table 2. Coyote pelt prices and harvest levels for the 1986-87 to 1997-98 trapping seasons.

Year	Coyote Pelts Tagged	Pelt Price
1986-87	1,151	$18
1987-88	1,631	$14
1988-89[1]	1,251	$8
1989-90[2]	1,215	$7
1990-91	944	$6
1991-92	1,222	$14
1992-93	1,356	$20
1993-94	1,410	$20
1994-95	1,647	$16
1995-96	1,440	$12
1996-97	1,587	$20
1997-98[3]	1,854	$17

[1] Predator calling/night hunting extended an extra month in the spring (i.e., until April).

[2] Special canine trapping season started; and one year coyote awards program enacted by legislature.

[3] Special canine trapping season extended from 7 days to 14 days and set one week earlier in October.

Table 3. Coyote habitat suitability and estimated coyote population size by Wildlife Management District (WMD). Coyote habitat was considered to be all land (mi^2) in a WMD minus developed areas (Chilelli 1998b). Coyote populations were estimated at 5.9 to 6.9 individuals per coyote territory (17 mi^2) and rounded to the nearest 100 individuals.

WMD	Total land area	Coyote habitat 1995	Estimated coyote population
1	1,420	1,420	500 to 600
2	1,190	1,190	400 to 500
3	966	932	300 to 400
4	1,963	1,963	700 to 800
5	1,549	1,549	500 to 600
6	1,417	1,392	500 to 600
7	1,393	1,379	500 to 600
8	2,054	2,054	700 to 800
9	979	961	300 to 400
10	898	897	300 to 400
11	1,700	1,700	600 to 700
12	996	973	300 to 400
13	575	567	200
14	798	798	300
15	1,038	1,005	300 to 400
16	826	766	300
17	1,430	1,380	500 to 600
18	1,367	1,347	500
19	1,176	1,176	400 to 500
20	646	610	200
21	629	526	200
22	576	523	200
23	1,035	955	300 to 400
24	374	276	100
25	550	509	200
26	654	647	200 to 300
27	896	833	300
28	831	831	300
29	513	503	200
30	not determined	not determined	not determined
Statewide (excluding WMD 30)	30,441	29,662	10,000 to 12,000

Table 4. Percent of all active trappers that set at least one trap for selected species of furbearers from the 1990-91 season until the 1997-98 trapping season.

Season	Coyote	Fox	Mink	Fisher	Marten	Beaver	Muskrat	Raccoon	Otter	Bobcat
1990-91	44	44	44	38	30	29	23	21	19	4
1991-92	41	45	50	49	30	37	37	24	16	6
1992-93	43	44	45	42	26	54	29	25	22	4
1993-94	45	44	45	38	24	37	29	29	26	8
1994-95	49	42	45	42	31	54	41	28	28	7
1995-96	54	45	34	49	35	43	26	39	23	11
1996-97	43	36	40	43	29	46	35	29	28	6
1997-98	49	45	39	53	49	36	45	33	24	12

Table 5. Average number of trap-nights per trapper spent pursuing a particular species. One trap night is equal to one trap set for one night.

Season	Coyote	Fox	Mink	Fisher	Marten	Beaver	Muskrat	Raccoon	Otter	Bobcat
1990-91	177	254	321	399	904	628	393	183	105	48
1991-92	286	373	356	298	674	708	373	136	85	329
1992-93	311	292	424	443	1,187	903	396	181	154	332
1993-94	311	206	517	563	785	562	441	588	193	197
1994-95	308	306	537	464	912	1,047	567	244	459	293
1995-96	350	242	153	323	421	925	273	325	102	180
1996-97	262	371	286	521	814	1,476	337	264	190	289
1997-98	263	269	312	370	682	1,670	383	334	153	153

APPENDICES

Appendix 1 - 1997-98 Coyote Trapping and Hunting Regulations

HUNTING SEASONS

All dates are inclusive unless they fall on a Sunday
(NO HUNTING ON SUNDAY)

DEER
- Firearms season ..... Nov. 3 - Nov. 29
- Maine residents only ..... Nov. 1
- Special archery season ..... Oct. 2-Oct. 31
- NEW Expanded Archery Season ..... Sept. 6-Sept. 30*
- Muzzle-loader season ..... Dec. 1-Dec. 6
- DMD's 7, 8, 10-15, & 18 ..... Dec. 1-Dec. 13

*Separate license required --See Page 16 for more information.
See Page 13 for information regarding hunting antlerless deer.

BEAR ..... SEE PAGE 11

RUFFED GROUSE, BOBWHITE QUAIL
- W.M.U's 1 & 2 ..... Oct. 1 - Nov. 30
- W.M.U's 3,4,5,6,7,8 ..... Oct. 1 - Dec. 10

PHEASANT (Stamp required to hunt/possess pheasant in York & Cumberland Counties) -- See Page 20.
- W.M.U's 1 & 2 ..... Oct. 1 - Nov. 30
- W.M.U's 3,4,5,6,7,8 ..... Oct. 1 - Dec. 10
- YORK & CUMBERLAND COUNTIES Oct. 1 - Dec. 31

WOODCOCK, WATERFOWL, SNIPE, GALLINULES , RAILS
(See Migratory Game Bird Schedule for season dates.) Duck stamp is not required to hunt/possess woodcock, snipe, gallinule and rails.

SPRUCE GROUSE ..... NO OPEN SEASON

RABBIT
- (Cottontail & Snowshoe Hare) ..... Oct. 1 - Mar. 31
- Season on Island of Vinalhaven ..... Oct. 1 - Feb. 28

GRAY SQUIRREL ..... Oct. 1 - Nov. 30
RACCOON ..... Oct. 1 - Dec. 31
SKUNK, OPOSSUM ..... Oct. 20 - Dec. 31
FOX ..... Oct. 20- Feb. 28
BOBCAT ..... Dec. 1 - Jan. 31
LYNX & CARIBOU ..... NO OPEN SEASON
COYOTE, WOODCHUCK, RED SQUIRREL & PORCUPINE ..... Jan. 1 - Dec. 31

CROW (Split Season) ..... Mar. 14 - Apr. 30
July 16 - Sept. 29

MOOSE: ..... Oct. 6 - Oct. 11
(Hunting by permit only. See Page 27)

TURKEY: (Hunting by permit only - See Page 17)

NOTE: Except for migratory game birds, there is no general hunting season on any species of bird or animal which is not listed in the above chart.

BAG LIMITS

SPECIES	DAILY BAG	POSSESSION
DEER	One* may be taken annually - *One additional deer may be taken by participants in the Expanded Archery Season. (See Page 16)	
BEAR	One may be taken annually (either by hunting or trapping)	
RUFFED GROUSE	4	8
BOBWHITE QUAIL	4	8
PHEASANT	2	4
RABBIT (Cottontail & Snowshoe Hare)	4	8
GRAY SQUIRREL	4	8
Other Legal Species	No limit on the number which may be taken	
Migratory Birds, Ducks, Geese, etc. - See Migratory Bird Regs.		

TRAPPING SEASONS
(ALL DATES INCLUSIVE)

There is no open trapping season on any species of animal which is not listed below.

SPECIES	FIRST DAY	LAST DAY
BEAR (2 trap limit)	Sept. 1	Oct. 31
Bobcat, Coyote[1], Fisher, Fox[1], Marten[2], Raccoon, Red Squirrel, Skunk, Weasel[3], Mink[4], Muskrat, Otter, Opossum	STATEWIDE 1997 Nov. 2	Dec. 31
	1998 Nov. 1	Dec. 31
BEAVER[5]		
WMU 1, 2*, 3, & 5	Dec. 1	Mar. 31
WMU 4*, 6, & 7	Dec. 15	Feb. 28
WMU 8	Jan. 1, '98	Feb. 28, '98
* Portions of WMU's 2 & 4 are open under special regulations - please refer to Trapper Information Book for more information.		

1 See section on special Fox and Coyote Trapping Season on Page 12
2 The harvest of marten will be limited to 25 marten per trapper statewide
3 In addition to the regular muskrat trapping season, muskrats may be trapped during the beaver trapping season only in areas which are open to beaver trapping
4 Licensed trappers may lawfully possess any otter taken by accident in a legal beaver or muskrat set
5 Beaver trapping seasons are set by wildlife management unit. A complete list of areas closed to the trapping of beaver is available upon request

NOTE: With the exception of beaver and bear trapping, the entire portions of T4R11 WELS and T5R11 WELS are closed to trapping from October 19 - December 31, 1997.

Appendix 1 (cont.')

SPECIAL FOX & COYOTE TRAPPING SEASON (STATEWIDE)

During the special season (Oct. 19 - Nov. 1, 1997) it is unlawful to take or possess any furbearing animal other than fox, coyote, raccoon , skunk and opossum. Any raccoon, skunk or opossum taken incidental to fox and coyote trapping may be lawfully possessed. Any other furbearing animal caught incidentally in a fox or coyote set must be immediately released alive, or, if found dead in the trap, must be reported to a game warden as soon as possible and prior to removal of the animal from the trap and trap site location. Any such incidental catch found dead in the trap must be turned over to an agent of the Commissioner within 48 hours from the time it was discovered.

During this special season, in addition to Department rules and State laws which affect trapping in general, the following restrictions apply:

a. All traps must be set at or below ground level.
b. Killer-type traps are prohibited.
c. Traps may not be set in the water.
d. The use of exposed bait or visible attractor at any trap site location is prohibited.

***In WMU's 1 and 2,** there shall also be a special muskrat trapping season (Oct. 26 - Nov. 1, 1997). All regulations above apply with the following exceptions.

a. All traps must be set at or below ground or water level.
b. Killer-type traps may be used for muskrat trapping and must have a jaw spread no greater than 5 inches.
c. The maximum foothold trap size for muskrat sets shall be No. 1-1/2 during this special season.
d. The use of exposed bait or visible attractor at any trap site location is prohibited.

Any raccoon or mink taken incidental to muskrat trapping may be lawfully possessed.

It is the intent of the Department to revoke (pursuant to Title 12, § 7077) the trapping license of any person convicted of a violation of any provision in this section.

SPECIAL COYOTE SEASON

Licensed hunters may obtain, at a fee of $2.00, a permit from the Department to hunt coyotes at night from January 1st to April 30th under the following conditions:

a. Hunting is limited to the hours between 1/2 hour after sunset and 1/2 hour before sunrise and shall cease at midnight each Saturday and resume at 12:01 a.m. each Monday.

b. Hunters must be in possession of an electronic, hand-held or mouth-operated predator calling device.

Appendix 2 - 1979 Coyote Control Policy

From Perry and Hilton 1980.

In an effort to reduce the number of coyotes preying on deer and other wildlife the Fish and Wildlife Department has adopted the following policy:

> *During the months of December, January, February, March, and April, Department personnel and selected licensed trappers under the supervision of Warden Service personnel will be allowed to remove coyotes within and around wintering areas where there is evidence that coyotes are a threat to deer or other wildlife in that area.*

Department wardens will be responsible for the implementation of this policy. Upon request, wildlife biologists will assist Warden Service personnel in the investigation and evaluation of coyote complaints. Warden Service responsibilities include:

1. Identification of areas in which control is necessary.
2. Investigation of coyote complaints to determine:
   a) if coyotes are involved; and
   b) if control is warranted.
3. Implementation of coyote control work:
   a) by identifying, contacting and issuing special trapping permits to trappers; and
   b) by personally setting traps or snares.
4. Maintenance of records of all authorized coyote control activities.
5. Surveillance of trappers to judge the effectiveness of control activities and techniques and to insure compliance with conditions of the permit.

To reduce the potential for killing non-target species, certain conditions shall apply to any trapper receiving a permit to take coyotes:

1. A steel, leghold trap of sufficient size and strength to hold a coyote shall be the only legal method to be used by trappers. (Snares will be used only by trained Department personnel.)
2. The district game warden shall be notified where traps are to be set.
3. Traps shall be tended on a regular basis and in accordance with state law.
4. All coyotes, except those taken by Department personnel, may be retained by the permittee. All other wildlife shall be released in the wild, or if dead in the trap, shall be forfeited to the Department.
5. Traps shall be placed at least 50 feet from any carcass or bait, except for water sets.
6. Use of any trap with teeth on the jaws shall be unlawful.
7. All wild animals taken or killed under authority of the permit shall be reported to the issuing warden within 12 hours of the killing. The report shall include the kind of animal(s), the number, and the time and place of taking.
8. The permit and a completed report of all animals taken shall be presented to the issuing warden within 10 days of the last effective date of the permit; or upon completion of trapping, whichever occurs first.
9. Permits shall be removed if the trapper does not comply with all provisions of this policy.

Appendix 3 - 1989 Coyote and Animal Damage Control Policy

DP - E.5.(b)

Revised December, 1989

ADMINISTRATIVE POLICY REGARDING COYOTE SNARING

Pursuant to Title 12 MRSA §7013 and §7035, sub-§3, the use of snares to trap coyotes will be allowed under the followiong conditions:

(A) Directed Animal Damage Control Activity: As directed by a MDIF&W warden or wildlife biologist, registered and property certified ADC cooperators may use snares to remove coyotes from specific depredation sites when it is deemed necessary by that official. If snarer is being paid for snaring by the Department, coyote pelts must be surrendered to the Department or rendered valueless.

See also DP. E.5. Nuisance Wildlife Administrative Policy.

See also special eagle safeguards, following (B) ¶11.

(B) Winter snaring opportunity as provided by Title 12 MRSA §7035, ¶B: Registered and properly certified ADC cooperators may use snares during the months of January and February in unorganized towns to remove coyotes. Snaring must be conducted with the full knowledge and/or direction of Department officials, and must be associated with a deer depredation problem.

Unless otherwise directed by a Department official, the following procedures and restrictions shall apply:

1. The snare person must seek the advise and direction of the district warden or regional biologist prior to setting snares.

2. The location of snaring activity must be provided to the regional warden headquarters and the district warden before the snares are activated.

3. The area containing snares must be adequately posted.

4. The following trapping laws (Title 12 MRSA §7432) shall be observed: Sub-§4, 5 and 6 relating to trapping consent and trapping near built up portions of town; sub-§7 -disturbing traps (snares); sub-§9 - labeling traps (snares); sub-§10 - abuse of property.

5. Snares must be tended at least once every 72 hours.

6. A maximum of 30 snares may be deployed by one person.

Appendix 3 (cont.')

7. A maximum of two (2) locations may be set at one time. A location may be up to a 5 square mile area definable by physical features such as roads, streams, mountains, etc.

8. Snarer must be able to account for all snares at any time, including following snow storms.

9. All snares must be remvoed by the last day of February.

10. All nontarget animals taken alive must be released; if dead they must be reported/submitted to the Department within 72 hours. All coyotes must be tagged.

11. Special precautions against accidental eagle capture: A determination should be made of eagle occurrence in the area to be snared. Wildlife biologists will assist in this determination. If that possibility exists the following provisions shall apply:

    A. Snares must be fitted with a stop device to limit closure to be no less thatn 3" diameter.

    B. The use of bait should be avoided, but when used never to be placed within 50 yards of a snare. Snares must be relocated if bait is scattered nearby by scavengers.

    C. Bait is to be placed in the open, exposed to view. Snares are then to be set more than 50 yards behind the edge of the opening.

    D. In towns associated with eagle nests by MDIF&W snaring must be closely supervised by a Department Biologist in consultation with the district warden, and snares may not be placed within 1 mile of an eagle nest.

12. No snares may be set so as to unreasonably jeopardize any nontarget animal.

Failure to comply with any of these provisions may result in loss of snaring certification or prosecution under Department regulations or Maine statutes.

William J. Vail, Commissioner

Appendix 4 - 1998 Coyote Snaring Policy

Authorization to Snare: The use of wire snares to capture coyotes is provided by ***Title 12 MRSA §7013, sub-§7-A, and §7035 ¶B,*** and is guided by this Administrative Policy. This policy also establishes the Department's responsibilities and the procedures to be followed by Animal Damage Control Cooperators while performing coyote control duties as Agents of the Department.

Advisory Committee. A 3 member snaring advisory committee shall be established in each wildlife region for the purpose of coordinating snaring activities in that region, resolving disputes that may arise, and assisting in the certification of snarers. The regional wildlife biologist, a game warden, and a representative of the snaring/trapping community will serve on the committee.

Snare Certification: Certification by the Department is required to use snares to capture coyotes and may be granted to any person who 1) is Registered as an Animal Damage Control (ADC) Cooperator and 2) satisfies training requirements established by the Department. Certification is valid only with a valid trapping license.

Initial Snare Certification is conditional. A person with a conditional certification may snare under the general supervision of a Department Official to gain snaring experience and skill.

Full Certification is optional, but is required to set snares without department supervision, and to be deployed for payment by the Department. Full certification is subject to a determination by the Commissioner that the person:

- has demonstrated a high degree of coyote snaring experience and proficiency;
- has satisfactorily completed a Trapper Safety and Snaring Education Course, or approved equivalent training;
- has a history of successfully capturing coyotes by snare.
- has demonstrated good judgment and compliance with the Snaring Policy and all fish and wildlife laws and rules.

Full certification upgrades may be considered jointly by Regional wildlife and warden officials, or an advisory committee.

Grandfather Clause: Snare persons who have held full certification prior to December 1, 1998, and have remained active during that time, shall retain their full certification until such time that certification is lapsed or revoked by the Commissioner.

Expiration: Snaring certification shall be valid for a period indicated on a certification card, or unless or until otherwise lapsed or revoked by the Commissioner.

Revocation: The Commissioner may revoke Snaring Certification for failure to comply with any of the provisions or conditions of this policy, or upon determination that the criteria for certification are no longer being met.

Appendix 4 (cont.')

Training: Periodic Training will be offered by the Department Animal Damage Control Program, and is required of all Registered ADC Cooperators to satisfy training requirements for snaring certification. In addition snaring training will be offered by the Trapper Education Program for all new trapper-snarers. Warden Service and Wildlife Division in-service training in the use of snares shall be provided regularly to all Wardens and Wildlife field personnel.

Approved Types of Snares: Conventional wire snares meeting minimum closure or breakaway criteria set forth in the snaring policy, may be used.

Deployment for Financial Compensation: The Department may provide financial remuneration to Fully Certified snarers. Any provision to pay for coyote snaring must be coordinated by a Regional Wildlife Biologist and is subject to the availability of funds and priority of needs. The snarer, even when being paid, may retain the pelts of coyotes taken.

GENERAL SNARING PROVISIONS

The following Provisions shall apply to all Conditionally Certified snare persons; and to all Fully Certified snare persons unless directed by the Department and specifically waived by a Regional Wildlife Biologist in writing. Appropriate trapping regulations shall apply to the practice of snaring.

1. Department Notification: All snare persons must 1)discuss with the regional wildlife biologist their intention to snare before setting snares, and 2) provide a description of the location of snaring activity to the respective Warden Division Headquarters as soon as possible following the setting of snares.

2. Posting. The area containing snares must be adequately posted. Signs must be placed at all access points, such as car, jeep, skidder, snowmobile, or ATV roads or trails, cross-country ski or hiking trails, or other obvious travel ways. Signs must contain the warning that snares are being used, and the name and telephone number of snarer.

3. Tending: Snares must be tended every 24 hours in organized towns and every 3 days in unorganized towns, except that under special circumstances, the tend provision may be extended up to 7 days *in writing* by the regional wildlife biologist if the snarer:

- is formally deployed by a regional wildlife biologist **or**
- the snarer is not formally deployed, but has full certification, **and**
- deer breakaway devices are used.

In the case of any dispute regarding the tending provision, the snarer may seek a resolution from the regional advisory committee.

4. Snare Tags: Snares must be identified by a metal tag in the same manner as the trap tagging requirement.

5. Snare Location and Number: Snares may be set in Unorganized Towns. A maximum of 30 snares may be deployed by one person in no more than 2 locations at one time. A location may be up to a 5 sq. mile area definable by physical features such as roads, streams, mountains, etc. A regional wildlife biologist may modify this provision if necessary.

6. Accountability: Snarer must be able to account for all snares at any time.

7. Time Limit: The use of snares is limited to the months of January and February unless otherwise deployed..

Appendix 4 (cont.')

8. Reporting: All coyotes taken by snare must be reported monthly on department ADC reporting forms. (Recertification may not be approved unless reports are submitted)

9. Non-Target Protection No snares may be set so as to unreasonably jeopardize any non-target species. Any non-target species captured alive must be released and reported; otherwise any non-targets must be reported and submitted to the Department.

A. Lynx Avoidance: Lynx occur sporadically in several areas of the State. They are of special concern because of their low numbers and federal "threatened " status, and every effort must be made to protect them. In Maine this concern must be balanced against the legislatively mandated effort to harvest coyotes. Therefore, to closely monitor snaring activity that may affect lynx, coyote snaring in **WMDs 1-8 and 13** (see map in hunting/trapping rules), may be conducted only if directed by a Regional Wildlife Biologist. The following criteria shall be used for directing snaring in WMDs 1-8 and 13.

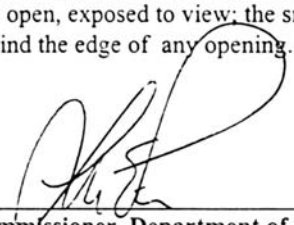
1. Snaring shall not occur within a 4 mile radius of any lynx sign/observation which has been documented within the last 10 years unless specifically deployed by the Regional Wildlife Biologist in response to a specific coyote/deer depredation problem.

2. In the remaining portions of those WMDs (1-8 and 13), areas where lynx have not been documented, snaring will be allowed under the conditions set forth in this policy, and all snarers shall be advised by the Regional Wildlife Biologist:

- of the special concern for lynx and bobcat
- that special care and caution must be used when using snares
- that snares shall not be set in any location where the snarer observes bobcat or lynx sign, **and** immediately advise the Regional Wildlife Biologist of the presence of lynx or bobcat activity, and
- for the snarer to **notify** the Regional Wildlife Biologist immediately if a cat is snared.

B. Deer Stops and Breakaways: Upon recommendation by a Department official, a snare stop device must be installed to limit snare closure to no less than 2 inches diameter. Deer "breakaway" devices of an accepted design must be installed on snares set within deer concentration areas.

C. Use of Bait: (a) The use of bait should be avoided, but when used never to be placed within 50 yards of a snare. (b) Snares must be relocated if bait is scattered nearby by scavengers. (c) Bait is to be placed in the open, exposed to view; the snares are then to be set more than 50 yards from the bait and 10 yards behind the edge of any opening.



Date 12-7-98

Commissioner, Department of Inland Fisheries and Wildlife

Appendix 5 An Act to Protect Deer H.P. 99 - L.D. 123

Be it enacted by the People of the State of Maine as follows:

Sec. 1. Transfer. Ten thousand dollars in fiscal year 1997-98 and $10,000 in fiscal year 1998-99 are transferred from the Bureau of Resource Management in the Department of Inland Fisheries and Wildlife for coyote control. These funds are provided to supplement existing resources budgeted by the department for coyote control and must be used to control coyotes in and around deer yards. The commissioner shall submit a report to the joint standing committee of the Legislature having jurisdiction over inland fisheries and wildlife matters no later than April 1, 1999 on the total expenditures in the fiscal years 1997-98 and 1998-99 on coyote control and the effectiveness of those expenditures on rebuilding the deer herd.

Approved June 11, 1997 by the Governor.