Appendices to interim report by Bar Harbor Deer Herd Control Task Force
Presented to Bar Harbor Town Council, May 21, 2013

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Appendix 1

Actions to Remedy Nuisance Problems Resulting from Locally High Deer Densities

2009 policy of Maine Inland Fisheries and Wildlife.

Actions to Remedy Nuisance Problems Resulting from Locally High Deer Densities

The Problem: Locally High Deer Densities

The white-tailed deer is an economically important species in Maine. Each year, nearly 180,000 people hunt deer, expending more than 2 million days afield while contributing more than $200 million to Maine's economy. Deer occupy all Maine towns except Matinicus and Monhegan Plantations, and observing deer is important to many Maine people.

Nuisance problems associated with locally high deer densities are becoming more prevalent, especially where deer are not actively managed. As deer and human populations have increased, so have the number of deer-related conflicts.

Maine varies greatly in its ability to support deer. Factors such as winter climate, forest type, availability of wintering habitat, land-use, human development, predation, hunting pressure, posted property, and motor vehicle traffic volume all interact to affect deer abundance. Because of their high reproductive rate, particularly where natural predators are insufficient, deer are capable of increasing to levels that conflict with various land uses or cause habitat degradation.

Over-abundant deer become a liability due to excessive costs resulting from damage to crops, orchards, ornamentals and forest habitats; increased risk to humans from Lyme disease; and property damage and loss of human life from vehicle collisions with deer. For example, from 1996 to 1998 the number of reported deer-vehicle collisions in Maine was 12,158, causing an estimated economic impact exceeding $41 million.

Locally over-abundant deer typically occur where 1) landowners post land that could be safely hunted, 2) areas are statutorily closed to deer hunting, and 3) developed parts of cities and towns are not accessible to hunters because of municipal ordinances prohibiting discharge of firearms. All create obstacles to effective regulation and management of deer populations.

MDIFW Has the Management Authority to Address the Problem

As with all wildlife in Maine, white-tailed deer are a publicly owned resource that is held in trust for the benefit of all Maine people. The Maine Legislature has charged the Maine Department of Inland Fisheries and Wildlife (hereinafter MDIFW or Department) with the responsibility to "preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources, and to provide for effective management of these resources." The Wildlife Division within the

Bureau of Resource Management is responsible for the Department's wildlife management programs. The Maine Legislature has defined "Wildlife Management" as "the art and science of producing wild animals and birds and/or improving wildlife conditions in the State". According to the State's definition of wildlife management, it specifically includes the regulation of hunting.

The Department uses strategic planning to establish deer population objectives for each of 30 Wildlife Management Districts (WMDs). The most recent update of that plan was completed in 1999, with input generated from a public working group representing a wide array of stakeholders (landowners, farmers, forest industry, sportsmen, environmentalists, health care providers, motorists, etc.) affected by deer. Deer population objectives represent a balance between managing for high hunting yields and the desire to minimize public conflicts with deer.

Deer Management Options

During the past 30 years, the Maine Legislature has provided the Department with a comprehensive array of statutes authorizing various deer hunting seasons, special permits, or authority to vary bag limits, hunter participation, and hunting implements. These tools provide great flexibility for the Department to effectively manage deer at a variety of landscape scales, ranging from groups of WMDs to single land ownerships.

The management options described below are available to the Department to control high deer densities. They are presented **in order of preference**. The Department will not consider other options to regulate deer unless it can be demonstrated that recreational hunting (Options 1 and 2 below) is not likely to achieve deer population goals or cannot be implemented safely.

1. Standard Recreational Hunting Seasons

Regulated recreational hunting (using any-deer permits in conjunction with recreational archery, firearms, and muzzleloader seasons) is the most effective, least costly, and preferred means to control deer throughout Maine. Participation in these seasons is open to any licensed deer hunter, although the opportunity to take antlerless deer is regulated during the firearms and muzzleloader season.

Regulated recreational hunting is an extension of natural predation, a normal and necessary element in the ecology of white-tailed deer. It is the policy of the Department to utilize recreational hunting seasons to regulate deer populations wherever these seasons 1) are likely to achieve deer population goals and 2) can be implemented safely.

Heavily developed areas may not be accessible to firearms hunters because of laws and municipal ordinances governing safe discharge of firearms. However, some urban areas may be safely hunted using archery equipment. Archery

hunting will be the primary means of controlling deer where feasible and where firearms hunting is not possible.

2. Authority to Create Special Hunting Seasons for the Taking of Deer

This law authorizes the commissioner to create special hunting seasons for the taking of deer in any part of the State in order to maintain deer populations in balance with available habitat. This authority is intended for use where the recreational hunting seasons are limited, nonexistent, or are inadequate to meet deer management needs. It is best applied on a larger landscape (town, multiple towns, portion of a WMD or WMDs, entire WMD, multiple WMDs) and in areas where it is appropriate for the general public to participate in the deer reduction effort. The Department has the authority to regulate the number of participants, season timing and length, bag limit, sex and age of deer taken, and hunting implement.

An example of this authority includes the Expanded Archery Season which opens on the first Saturday following Labor Day and runs through the last day of the Muzzleloading Season, and is intended to provide additional deer hunting opportunity in areas where firearm discharge ordinances preclude recreational hunting with firearms, and where there are high deer densities.

3. Authority to Take and Destroy Wildlife

Under this law the commissioner may issue permits (Deer Management Permits) authorizing persons to assist the Department in the taking and destruction of wildlife. This management option has its greatest application in small geographic areas (landowner, multiple landowners, portion of a town or towns, or entire towns) or in areas where it is deemed appropriate to restrict participation in the deer reduction effort to landowners, landowner-designees, or to local residents.

4. Depredation Permits

Any person may lawfully kill deer, or other wild animals, that are observed in the act of damaging their property, and must report it to a game warden within 12 hours. A game warden may also issue a written permit to qualified landowners (or their agent) to take deer that are destroying certain crops. The game warden may determine if the animal(s) was taken for the purpose provided and authorize the landowner to keep the deer carcass(es), or to distribute it to an appropriate person, group or organization. There is no legal requirement of the landowner to allow recreational hunting or take prudent steps to avoid damage. By statute the Department may assist orchardists and other landowners with the installation of deer fence, the purchase and use of repellents, or use of other conservation practices to alleviate damage.

Authority for issuing depredation permits is currently limited to Game Wardens. Depredation permits are authorized for single landownerships.

Options #3 and #4 provide short-term, local relief but are not long-term options to regulate deer.

5. Non-traditional Methods of Deer Population Reduction

Intensive development and extreme deer density may necessitate the use of other, non-traditional means of deer population reduction. These practices will only be authorized in locations where the aforementioned deer reduction measures cannot be safely employed. Because such locations will likely be within the urban compact portions of towns and cities, all costs of administering and implementing non-traditional means of deer population reduction will be borne by the affected town or city.

a) Sharpshooting

The use of a trained, experienced sharpshooter is a humane and efficient method of reducing deer populations. It is especially useful as a technique to transition from excessive deer numbers to populations that can be maintained preferably by some form of recreational hunting. The sharpshooter kills individual deer, usually without causing alarm to other deer a few feet away. Large numbers of deer can be removed in a very short time while minimizing disturbance to people. The method is unobtrusive, and few deer find sanctuary.

Sharpshooting is costly. A professional sharpshooter typically possesses a great deal of specialized equipment such as night scopes and firearms with silencers. Considerable time is devoted to meeting with community leaders, site preparation, and baiting. Costs are reduced when deer are extremely abundant and obstacles to success are few. Deer killed as part of these programs are typically donated to programs such as Hunters for the Hungry.

b) Trap and Transfer

Trap and transfer of deer is not recommended. It requires the use of traps, nets, and/or chemical immobilization to restrain deer, and shipping crates to transfer captured animals. Trap and transfer is usually impractical, laborious, expensive, stressful to deer, and of limited value in managing free-ranging deer. Capture myopathy is a stress-related condition of immobilized deer that may result in delayed mortality rates as high as 26% in relocated deer. If a deer survives relocation, survival in a new habitat is frequently low, resulting in overall losses to relocated deer exceeding 60%. Deer that die as a result of trap and transfer programs

should not be used for human or animal consumption if the meat contains immobilizing drugs and/or antibiotics. A 45-day waiting period is recommended for animals that have been chemically immobilized before they can be killed for consumption. Furthermore, it is very difficult to find areas appropriate to move deer to, as there are concerns about introducing parasites and other health-related concerns into new areas.

c) Deer Fertility Control

The use of deer fertility control (e.g., immunocontraception) is not yet a safe and effective means of controlling wild populations of deer. Consequently, the Department will not authorize deer fertility control at this time. If this technology ever proves effective and safe, the Department will consider its use only where deer populations cannot safely be reduced by lethal removal.

Conclusions

Nuisance problems associated with locally high deer densities are becoming more prevalent, especially where deer are not actively managed. Regulated recreational hunting is the most effective, least costly, and preferred means to control deer throughout Maine. The Department will consider other options to regulate deer only where regulated recreational hunting 1) is not likely to achieve deer population goals or 2) cannot be implemented safely.

As the permitting agency, the MDIFW is ultimately responsible for authorizing deer reduction in Maine. Municipalities are not authorized by statute to regulate deer hunting seasons or initiate deer reduction programs. The Department will provide technical assistance to town or city officials. Deer reduction measures will be permitted only after successful completion of a management plan for that site. In each management plan, the Department will require documentation of:

1) public input and substantial agreement that there is a problem,
2) public input and substantial agreement to the proposed management practice(s),
3) sufficient personnel commitment and funding to implement the practice(s), and
4) a long-term commitment to maintain deer at compatible levels.

Appendix 2

Studies of the deer herd in Acadia National Park

Recent Important ANP Deer Related Studies

Saeki, 1991

Influence of browsing by white-tailed deer and snowshoe hare on vegetation at Acadia National Park, Maine

"Conducted a browse survey and studied browsing relationships, post-fire succession, and habitat selection of deer and hare. Notes herbivore abundance on Mount Desert Island and Isle au Haut. Also studied dietary quality using fecal crude protein. Inventoried vegetation within exclosures on Mount Desert Island and Isle au Haut. Notes that neither area is experiencing extensive browsing by hare or deer, and that deer browsing has decreased on Mount Desert Island and Isle au Haut since the last survey conducted in 1980-81 (Gilbert and Harrison, 1982a, 1982b)" Retrieved: irma.nps.gov

Long, Harrison, and O'Connell, 1997

Annual survival and cause-specific mortality of white-tailed deer fawns on Mount Desert Island, Maine

"Studies elsewhere have suggested that low recruitment, associated with high mortality rates of fawns, may contribute to declines in deer populations. Thus, we monitored cause-specific mortality of fawns (n=29) from birth to 1 year of age during 1991-1995. 'Annual rate of fawn survival was 0.26. Rate of predator-caused mortality was 0.52, with coyote (Canis latrans predation (n=8) accounting for at least 47% of mortalities from all causes (n=17). Mortality rate from drowning was 0.24 (n=3), and mortality rate associated with deaths from vehicles was 0.14 (n=3). An index to home-range area (MINDIST) was not different between a sample of fawns that died prior to 60 days of age (n=6) and fawns that survived (n=12). Of fawns radio-collared as neonates, 10 of 14 mortalities occurred during the first 2 months of life. Survival rate from 6 months to 1 year was 0.65; 4 mortalities (2 predation, 2 drowning) were observed during this interval. A subgroup of fawns (n=11) captured near the Sand Beach area had a higher rate of survival to 1 year of age (S=0.67) than did fawns from all other areas (n=18, S=0.00). Recruitment to 1 year of age was lower than has been observed in other northeastern deer populations. Low recruitment associated with multiple causes of fawn mortality may be limiting deer populations in some areas on MDI; however, different rates of fawn survival throughout MDI may explain an apparent patchy distribution of deer." Retrieved: irma.nps.gov

Fuller and Harrison, 2009

Home Range, Habitat Use, Edge Relationships, Mortality Sources, Age Structure, and Survival of White-Tailed Deer on Mount Desert Island, Maine 1992-1994

"Deer populations were studied in Acadia National Park during 1992-1994 to evaluate causes of mortality, fecundity rates, yearling and adult survival rates, fawn survival rates, movements, habitat selection, and spatial interactions with roads, developed areas, and coyote territories. Twenty-seven fawns and sixteen adult deer were equipped with radio collared and monitored during the course of this study... These results suggest a high potential for interaction of deer with vehicles, humans, and coyotes within the eastern portion of ANP. We make several recommendations for future monitoring of deer population within ANP and for the increased management of deer-vehicle interactions in MDI." "Our research suggests, that with our observed estimates of fawn and adult doe survival, the deer population on MDI would be predicted to exhibit a decreasing population trajectory... not attributable to a lack of high quality forage, as documented by Saeki (1991). Our results suggest that the deer population was likely declining because of low fawn survival and low survival of yearling and adult does." Retrieved: irma.nps.gov

Recent Important ANP Deer Related Studies

Findings for Sampled Populations of Deer :

•The females are older than the males (average)
•Average age of captured females – 7 years; oldest was 14
•Average age of captured males – 5 years; oldest was 14.5
•More male than female fawns, but equal number of males & females by one year
•Population models using these numbers suggested adult female suggested survival needed to be greater than 80% to maintain stable population
•Only 59% survival was documented in adult female deer, suggesting reproduction would have to increase by 43% to offset the low survival rates of adult females
•Deer reproduction on MDI matches deer reproduction for area management unit (downeast), see Figure "18" next page.

Findings of Deer Home Ranges

(More than 1200 locations were used to delineate the home ranges of these deer)
(Deer in about 10% of the ANP were studied, in the town of Bar Harbor)
•Females spent 80% of their time in the park (caught in the park; n=6)
•Males spent > 70% of their time in the park (caught in the park, n=4)
•Both females and males had bigger winter ranges than summer ranges
•Approximately 90% of home range of deer (both sexes) fell within coyote home range (See Figures "6" and "12" next page)

Findings about Mortality:

•Mortality sources are vehicles, predation (including dogs), and drowning
•Mortality varies by year and is very difficult to track
•The highest periods of vehicle related mortality are in spring, summer, and fall, and can exceed > 120 cases per year for the island
•Poaching occurs but actual numbers unknown
•Depredation Permits are issued by Maine Warden Service, see later pages for details

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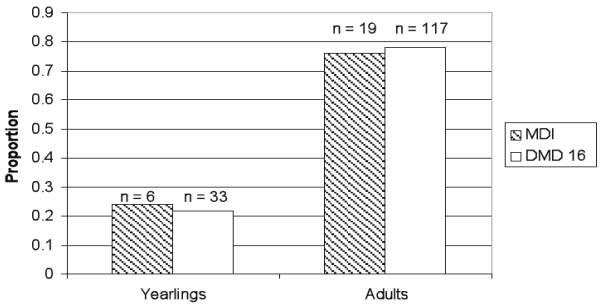


Figure 18. Proportion of yearling and adult does on Mount Desert Island (MDI) (1991 – 1994) and Deer Management District 16 (DMD 16) (1986 – 1993), Maine.

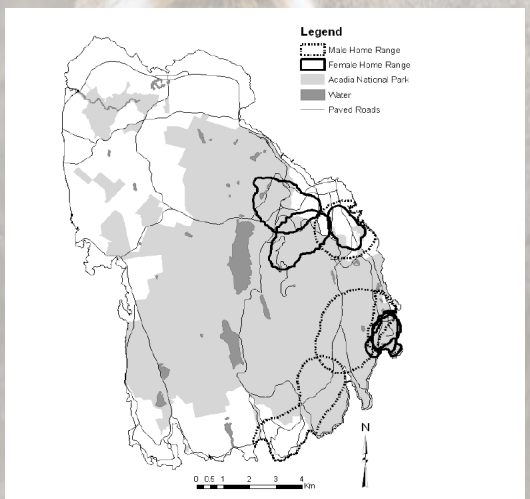


Figure 6. Yearly home ranges (95% adaptive kernel) of male (n = 3) and female (n = 6) white-tailed deer, on the eastern portion of Mount Desert Island, Maine, 1992 – 1994.

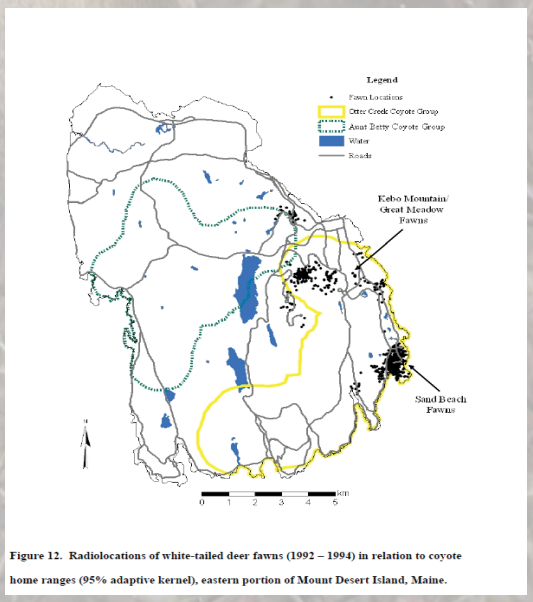


Figure 12. Radiolocations of white-tailed deer fawns (1992 – 1994) in relation to coyote home ranges (95% adaptive kernel), eastern portion of Mount Desert Island, Maine.

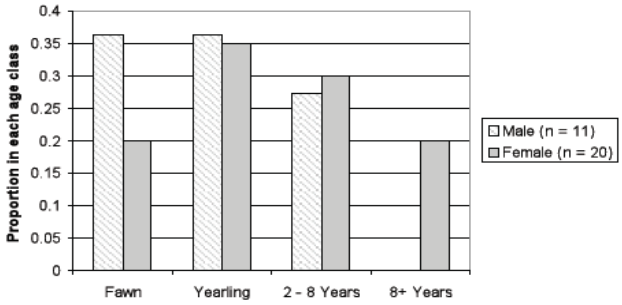


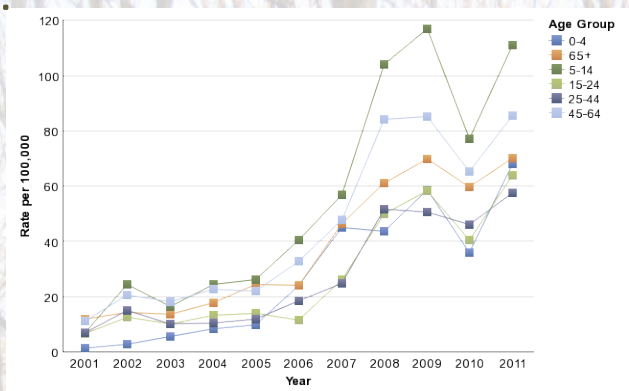
Figure 17. Age structure of road-killed deer on Mount Desert Island, Maine, 1991 – 1994.

Appendix 3

Incidence of Lyme disease is Maine and Hancock County, 2001-2011

Lyme Disease

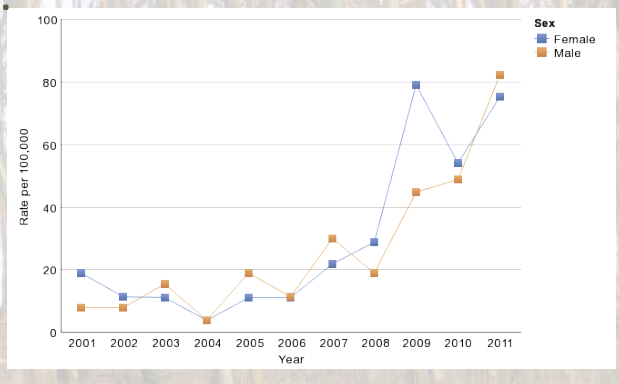
Lyme Disease By Age Group Rate per 100,000 people Maine, 2001-2011



The incident rate of Hancock County, Maine male and female residents reported to have Lyme disease for the period 2001-2011 per 100,000 people. The information is managed by the Infectious Disease Epidemiology Program of the Maine Center of Disease Control and is based upon reports from laboratories, healthcare providers and other health care partners. Revised: November 2012

Lyme Disease For Males and Females Hancock County, Maine, 2001-2011

The number of reported cases of Lyme disease per 100,000 Maine residents for the period 2001-2011. The information is collected and prepared by the Infectious Disease Epidemiology Program of the Maine Center of Disease Control from reports provided by health care providers, laboratories, and other health care partners. Revised: November 2012



Lyme Disease and Pets

For the last several years, Acadia Veterinary Clinic has tested approximately 500 dogs a year for Lyme Disease. The percent of dogs testing positive for Lyme disease averages about 10%, although Dr. Fine suspects the level ranged between 8 and 12% over these years. Approximately five years ago, a vaccine for Lyme disease became available for dogs and an increasing number of owners have had their dogs vaccinated. Dr. Marc Fine of the Acadia Veterinary Clinic noted the following observations:

a) an increased number of dog owners are finding more ticks on their dogs than in previous years
b) b) the number of vaccinations has increased while the incidence rate of Lyme Disease has remained about 10%
c) c) While the percentage of Lyme disease cases in dogs appears unchanged, the percentage of anaplasmosis cases has increased to between 2-3% in dogs. Anaplasmosis is carried and transmitted by deer and dog ticks.
d) Cats rarely contract Lyme disease, and regular testing is unnecessicary and not normally advised.

Image: en.wikipedia.com

Appendix 4

Deer Control:
A Basic Element in the Integrated Management of Ticks That Carry Lyme Disease
A Community Guide

Vector-borne Disease Laboratory,
Maine Medical Center
October, 2012

Deer Control:
A Basic Element in the Integrated Management of Ticks That Carry Lyme Disease

A Community Guide

Vector-borne Disease Laboratory
Maine Medical Center Research Institute
October, 2012

Introduction

Deer ticks (*Ixodes scapularis/dammini*), also known as black-legged ticks, transmit the agents of Lyme disease, anaplasmosis and babesiosis from small mammals in the wild to man and domestic animals. They were first reported in Maine on a deer killed in Jackman in 1986 (1) and from vegetation on Mt. Desert Island in 1987 (2). Since then, these ticks have become well-established in coastal counties and throughout the southern half of the state to the western foothills (3) (Fig 1). Before 1990, only eight cases of Lyme disease had been reported to the state Bureau of health. In 2011, 1002 were reported (4) (Fig. 2). It is estimated that only one in six cases of Lyme disease is reported (5), which suggests that the true number of people infected that year was around 6000. At the local level, in the early 1990s we found that about 10% of the year-round residents on Monhegan Island had been exposed the to bacterium (6), and on Islesboro, the number of cases diagnosed by the Island Health Clinic increased from less than ten in the five years 2003- 2007 to more than 27 in 2011 (7).

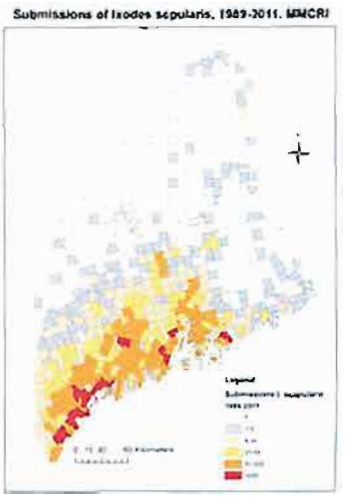


Figure 1. Current distribution of *Ixodes scapularis* submissions to MMCRI, 1989-2011.

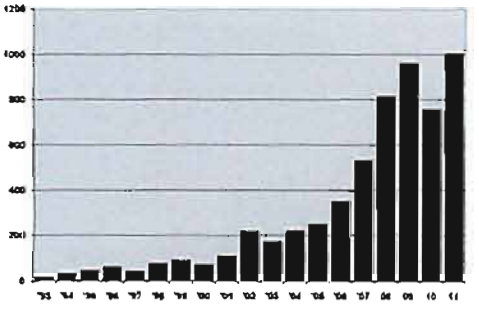


Figure 2. Cases of Maine-acquired Lyme disease through 2011. Courtesy of MECDC.

Lyme disease has become a serious public health risk in Maine. The spiral-shaped bacterium that causes this illness is maintained in nature in small mammals -- primarily mice, chipmunks and squirrels -- that are continually re-infected by deer tick nymphs that were themselves infected when feeding as larvae the previous year. Human Lyme disease results primarily from the bite of these nymphs during the peak of their season in early summer. People, but particularly dogs and horses, are again at risk in the fall and early spring when infected adults seek a blood meal. These adults, however, primarily seek white-tailed deer -- males to find females and mated females to obtain the blood meal that will nourish egg development. White-tailed deer, then, are the primary amplifiers of the deer tick life cycle: one deer-fed female will produce up to ~3000 eggs in the spring. (Fig 3.)

This results in a direct relationship between the abundance of deer and the abundance of deer ticks. For example, in southern Maine where we estimated the deer presence by counting fecal pellet groups and tick abundance by sweeping vegetation with corduroy "flags", we found few ticks when estimated deer numbers dropped below 15 per square mile (8)(Fig 4). Others have suggested that deer number may have to drop below 10 per square mile before the tick life cycle can be broken.

Figure 3. Eggs deposited by an adult deer tick.

The effectiveness of reducing deer populations to reduce both ticks and Lyme disease has been documented by several field studies:

- Following a reduction in deer from 30 to a maintained 6/mi^2 on a coastal Cape Cod island, the number of deer ticks feeding on small mammal hosts dropped 10-fold and the number of human Lyme cases, previously 30% of the island's 220 residents dropped to a total of three tick-borne diseases over the following 16 years (9).
- Two years following a reduction in deer density from 77/mi^2 to 10/mi^2 the incidence of Lyme disease among residents of Mumford Cove, Connecticut, decreased by 83% (10).
- On Monhegan Island, adult ticks collected from vegetation per hour dropped from ~17 to less than 2 within 3 years following removal of a deer herd that had reached 113 per square mile (11).(Fig. 5) Only one case of Lyme disease was reported over the following decade.

On the other hand, one study (12) found no change in deer ticks or Lyme disease following a reduction in deer density from ~118 to ~63 per square mile. Note, from Figure 4 (at right), that deer density has to be lowered far below 68/mi^2 to effectively lower tick abundance.

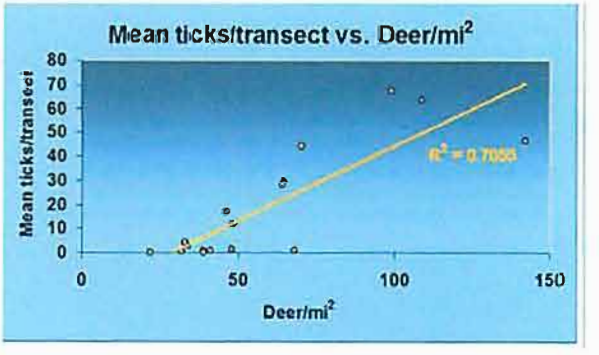


Figure 4. Abundance of *Ixodes scapularis* ticks versus estimated deer densities at several sites in southern Maine, 1998-2000.

Where it can be accomplished, therefore, deer reduction should be included as a base for an integrated program to reduce the abundance of disease-carrying ticks at the community level.

At the individual level, several effective approaches are available to prevent tick bites: repellents containing DEET or Picaradin, tick-killing clothing sprays containing permethrin, and (most importantly) post-exposure tick checks. Other ways to control ticks on residential property are to remove tick-friendly habitats, to lure tick hosts into devices that coat them with tick-killing pesticides (acaricides), and, principally, to treat tick habitat with either spray or granular acaricides. Synthetic or botanical acaricides professionally applied by high pressure spray into the leaf litter can be very effective (9). In most cases, however, the application of an acaricide over an entire community will be prohibitive technically, financially and politically.

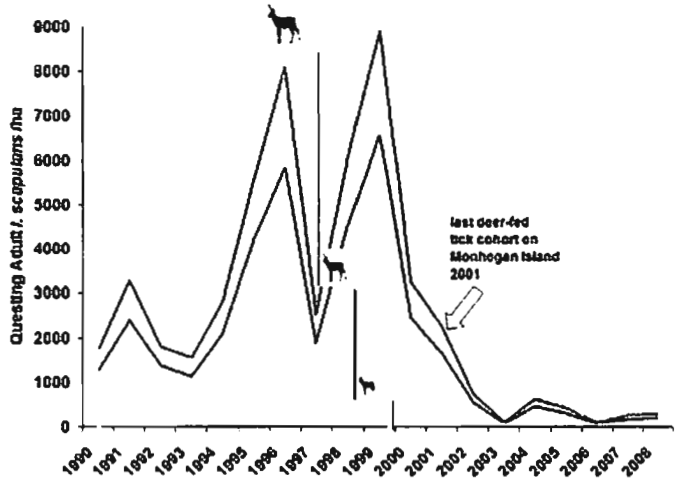


Figure 5. Abundance of Ixodes scapularis after removal of deer from Monhegan Island, ME. 1990-2008.

Deer reduction, while effective where it can be carried out, has caveats.

- Access to offsite deer has to be limited. The studies referred to above were conducted either on islands or inside an effective deer barrier. Where practical, deer fencing has been shown to lower tick abundance. Small mammals, however, may deposit infected, sub-adult ticks well within the fence line which will then represent a risk when molted to nymphs or adults.

- Where deer access cannot be completely restricted, and depending on deer reproductive success, an annual maintenance deer control program will be needed once the initial population is reduced.

- Because it takes at least two years for completion of the deer tick's life cycle, tick control will not be immediate. Indeed, in the fall of the first year after a

substantial deer reduction, when not finding deer to feed on, exposure to questing adult deer ticks may increase.(11)

Therefore, communities with the greatest chance of success in lowering deer herd density are those with overabundant deer (over-browsing, deer/vehicle crashes, tick-borne diseases) where access to outside deer is, or can be, limited (islands, peninsulas, or areas that can be excluded by fencing), and a **motivated citizenry**. In those cases where adjacent islands or communities also support over-abundant deer populations, collaboration might result in a more effective deer reduction program.

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Steps to lowering a community's deer density to control disease-carrying ticks.

This process involves focusing the community's concern, educating the residents and town officials, and collaborating with the biologists from the Maine Department of Inland Fisheries and Wildlife to develop an appropriate deer control program. After presentation to the public and acceptance by the select board or council, this is submitted to IF&W for approval.

1. After preliminary meetings by concerned citizens, establish a **tick control committee**. Additional members might include local health care providers (both human and veterinary), hunters, school representatives, select board members. To speed communication and action, the committee should eventually, if not initially, be town-appointed and advisory to the town's governing body. Its purposes should to be to:
   - Establish the risk, by consulting with healthcare providers, tick experts, and wildlife biologists
   - Educate the property owners, town administrators, stakeholders (hunters, lobstermen)
   - Involve supporting partners (Maine Department of Inland Fisheries & Wildlife Fisheries and Wildlife, local health providers, MMC Vector-borne Disease Lab, wildlife surveyors)
2. Obtain and review two excellent and comprehensive publications, Tick Management Handbook (14), and Managing Urban Deer in Connecticut (10). Copies of the

Frequently asked questions

Q. ***Isn't the problem the mice and small mammals the ticks feed on?***

A. Certainly small mammals play a major role in supporting deer ticks as they both feed (and infect) both larvae and nymphs. But to stop the tick cycle you've got to stop reproduction, and that happens when the ticks mate on deer, and the females feed on the blood that they will use to create thousands of eggs. Besides, it would be ecologically disastrous, indeed impossible, to kill off all mice, squirrels, voles....

Q. ***Aren't there other ways of reducing deer numbers without killing them?***

A. Yes, there are two: trapping and moving, and immunocontraception. Trapping deer is very stressful and carries a high fatality risk. It is extremely labor-intensive and involves high transportation costs. It is not a method to reduce deer herds. Immunocontraception, a birth control method involving gathering, tranquilizing and vaccinating the female half of the deer population, is not practical. It does diminish reproduction but does nothing to reduce current deer density. Maine IF&W considers this method neither safe nor effective.

Q. ***Are there ways to kill the ticks on deer?***

A. Yes, there's a device called a "4-poster. (Fig. 6) It consist of a box from which twice-washed, whole kernel corn is supplied to a feeding tray which sits between two pairs of permethrin-saturated vertical rollers. To reach the corn, a deer has to place its head through the rollers, which apply the acaricide to its neck. In initial trials, when distributed at one unit per 52 acres, these devices achieved 60-82% tick reduction within three years. But there are problems. Where deer are abundant and natural feed is limited, 4-posters may need refilling 3 times weekly. Where natural feed is abundant, deer don't visit the devices. The corn, although twice washed, may still mold and clog the feeders, particularly when they are invaded by chipmunks and squirrels. The initial package of four 4-posters with accessories is sold by Dandux Outdoors, Ellicot City, MD for $914 per unit (x4 = ~$3600)(via A. Zulinski, 800-033-2638, ext. 8). Wildlife agencies, concerned that clustering deer at feeders may increase the risk of spreading other deer-prone diseases such as chronic wasting

Figure 6: A "4-poster' deer baiting device designed to apply an acaricide to the necks of feeding deer.

Handbook, which can be downloaded from the internet, www.gov.ct/caes should also be provided for the public in the community's library.

3. Determine the current risk:

What is the annual number of Lyme disease cases? Has it increased? Maine CDC may be willing to release these data only on a county basis, but area health clinics or local physicians may have useful estimates. Where collaboration is gained with a local clinic, their staff will need to establish criteria for diagnosing Lyme disease and other tick-borne diseases that can be applied realistically in an island setting. Because the classical signs and symptoms of the disease are not always present, differentiation needs to be made between "true" cases (likely exposure followed by a characteristic rash or appropriate symptoms and positive laboratory findings (15), and "suspected" cases (those with no rash but appropriate symptoms in which treatment was initiated without laboratory testing).

How abundant are local deer ticks and how infected are they? Baseline data will be needed to gauge the success of any tick control approach. Tick abundance is best measured by the number of ticks collected per hour by dragging a $1 m^2$ corduroy or flannel "flag" over vegetation at the height of the nymphal tick season in July or the adult tick season in October-November. The percentage of ticks infected can then be determined microscopically in the laboratory. These services are available at the Maine Medical Center's Vector-borne Disease Laboratory (see Resources). In many instances, participation in tick surveillance activities such as vegetation flagging can be incorporated into school curricula for programs such as high school or college-level biology, health, or environmental science. Such programs have been used in some Maine communities, with the protocol available for public use (see 'Resources').

4. Estimate the deer population:

Despite the inherent inaccuracy of all methods of counting deer, it is important to adopt at least one in order to follow the progress of the deer control program. They include:

- **Browse surveys**: As deer populations reach carrying capacity, the animals will forage more intensively on preferred, and then on less preferred, vegetation, providing a very rough index of their overabundance.

- **Annual deer harvest:** Variations in the number of hunters, weather limitations (i.e., no snow, high winds and rain), and deer that are checked remotely all confound the accuracy of this method; but long-term trends will support other evidence of shifts in the deer population.

- **Automated camera and image capture:** used as a method for mark-recapture estimates. Motion-sensor cameras may be placed at key locations to monitor the number of deer active in an area continuously.

- **Night spotting:** this involves driving along standard road transects at night sweeping the woods with high- intensity searchlights and counting reflections from deer's eyes.

- **Pellet group count surveys:** A count of the number of deer pellet groups along measured transects through deer habitat, when multiplied by a standard assumption of defecations per day, provides an estimate of deer density which can be expressed as deer per square mile. This should be conducted by a qualified biologist.

- **Aerial surveys:** Typically conducted from fixed wing aircraft, perhaps aided by infrared sensors, but more recently and more accurately carried out in specially modified helicopters with independent observers in the front and back counting deer over transects of specified width (16). Aerial surveys are confounded by thick canopy and are best carried out in early winter when

leaves are off deciduous trees and the ground is snow-covered, or in the spring when there is still residual snow on the ground.

Deer density estimates from sighting or browsing damage can be very misleading. For example, year-round Monhegan residents thought there were ~40 deer on their island prior to the deer cull which put the number at 113. The two last methods, which are systematic surveys, provide numerical indices which, though prone to errors, are still valuable for planning what kind of control is needed and for providing an index of progress.

5. Evaluate deer reduction options

   Deer are the property of the State of Maine and are managed by the Department of Inland Fisheries and Wildlife. The advice and collaboration of representatives of that agency, usually your area's wildlife biologist (see Resources), with input from the state's deer and moose biologist, Lee Kantar, should be an early order of business for the committee. They will explain the steps involved in seeking permits for any modification of present deer management regulations that would fit your town and your plan's specific needs. For a list of IF&W regional biologists, see Resources

6. Determine the public's concern:

   The community's perception of the risk of being bitten by infected ticks and its attitudes toward deer removal will guide the committee's educational priorities and focus. The task of relating to, educating, and guiding a group of independent individuals, some with entrenched perceptions, contrary agendas and strong passions, is likely to be the committee's greatest challenge. Community surveys can be designed to provide helpful input. They may also be helpful in identifying valuable new members or supporters.

disease and bovine tuberculosis, have banned 4-posters in four northeastern states. Maine is reviewing the issue currently.

Q. ***What happens to the deer that are shot?***

A. It will depend on what management plan is put together. Where overabundance is so intense that an initial sharpshooter may be contracted, the venison will go via IF&W to the Maine Department of Agriculture's Hunters for the Hungry Program. Otherwise, unless other arrangements are made, it will go to the hunter.

Deer and ticks and tick-borne diseases have evolved together over millenia, but Lyme disease is a problem that did not exist in Maine before the 1980s. A combination of changing land use (abandoned farms, rural expansion), loss of predators (including humans where excluded), and perhaps changing climate, has resulted in very high deer densities in some areas, followed by burgeoning populations of vector deer ticks.

Integrated pest management – the use of more than one strategy to address a problem, has become accepted practice in agriculture and is now by far the most effective approach to controlling ticks around homes, farms, and broader communities. Bringing deer to a more natural balance is a fundamental first step in reducing the risk of tick-borne diseases.

Resources

Tick Management Handbook: www.gov.ct/caes

Managing Urban Deer in Connecticut: www.ct.gov/dph/lib/dph/urbandeer07.pdf

IF&W Regional biologists: http://www.maine.gov/ifw/contactus.htm#regionalheadquarters

Maine Deer and moose biologist: Lee.Kantar@maine.gov

Maine Medical Center Vector-borne Disease Laboratory: (207) 662-7142; ticklab@mmc.org; www.mmcri.org/lyme

Tick-borne Diseases on Islesboro: the Problem, the Causes, the Solutions: http://townofislesboro.com/fileadmin/Committees/TickBDPC

Deer population estimators: Stantec, Inc, Scarborough, ME: www.stantec.com
Biodiversity Institute, Gorham, ME: www.briloon.org

Lyme disease in Maine: www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/

Protocol for Collecting Ticks: ticklab@mmc.org

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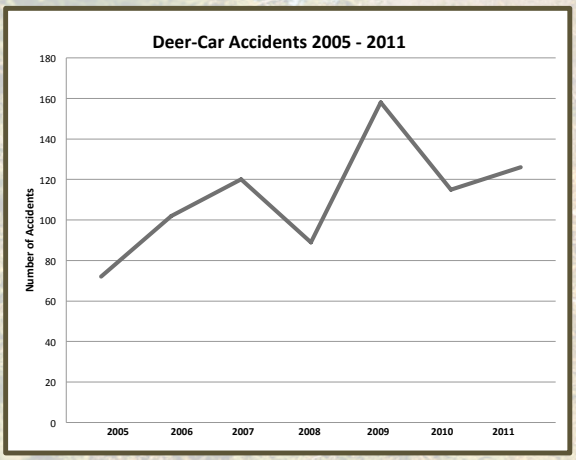
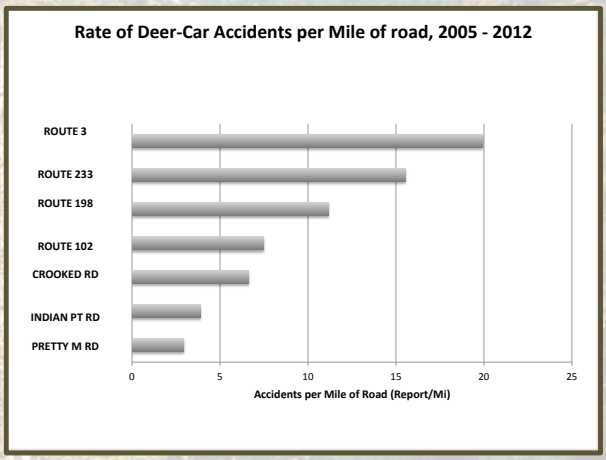
Appendix 5

Incidence of car-deer accidents on Mount Desert Island, 2005-2011

Deer-Car Accidents

Between 1987 and 1992, an average of 50 deer-car accidents were reported on MDI annually (Vinck 1993). Between 2005 and 2011, an average of 112 deer were hit on the island annually (unpublished data).





The above charts show the number of reported deer – car accidents and their distribution on roads on Mount Desert Island for the years 2005 - 2012. Between January 2005 and November 2012, there were 879 reported accidents. The roads with the most accidents are Route 3 with 2.5 accidents per mile, followed by Route 233 with 1.9 accidents per mile. Roads with fewer than 10 total accidents since 2005 are not shown in the chart on the right. Information for the charts came from ME DOT and the towns of Bar Harbor and Southwest Harbor records and was analyzed and prepared by COA student E. Georgaklis.

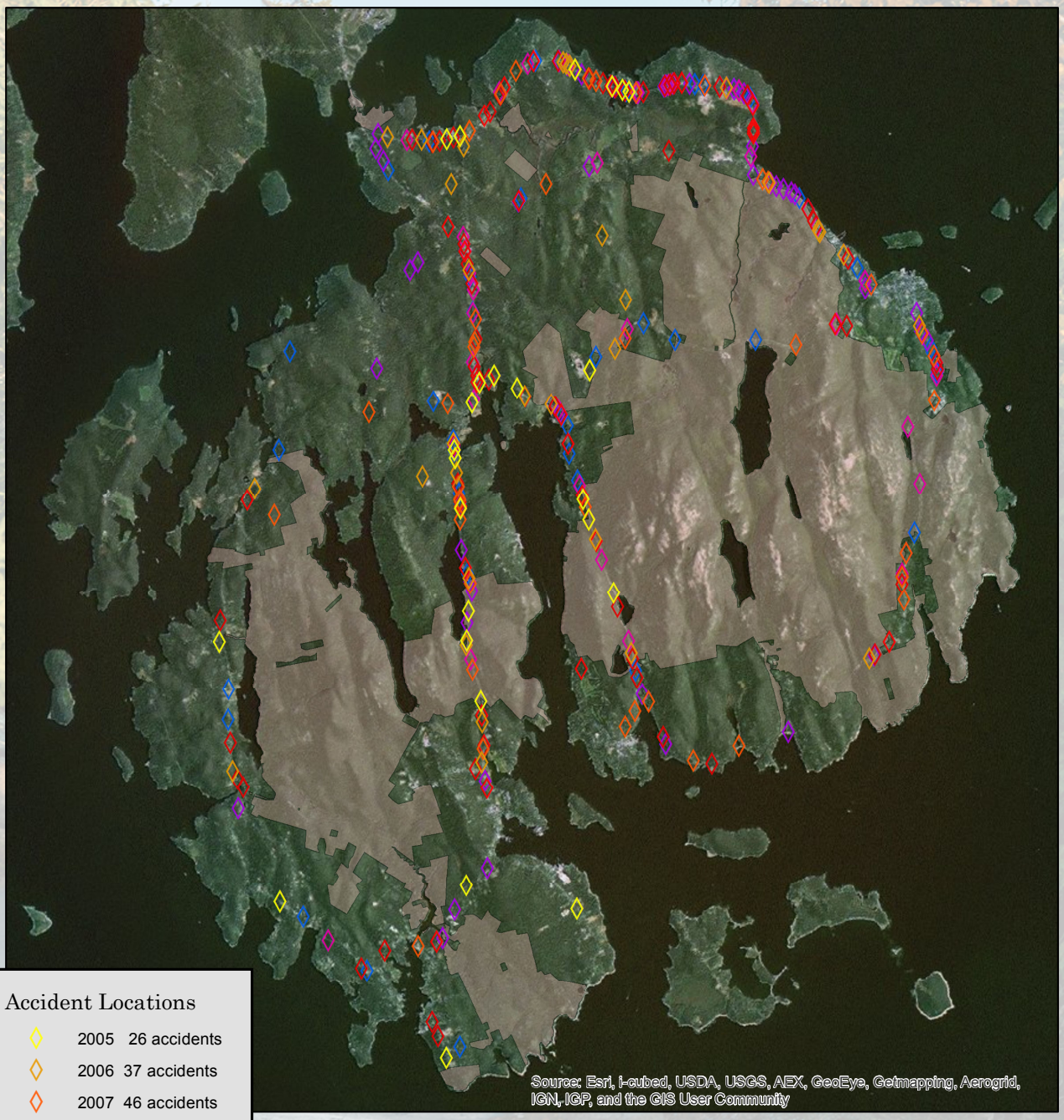
The towns of Tremont, Southwest Harbor, and Mount Desert have had 243 reported accidents since 2004, an average of 27 accidents per year. For these years, the highest number of accidents (35) occurred in 2009 and while the lowest reported number of accidents (17) occurred in 2010. In 221 (90.5%) accidents, deer died on impact or were euthanized in 152 (69%) accidents, deer ran from the accident scene in 60 (27%) accidents, and the remaining 9 (4%) deer were not hit but the car was damaged by efforts to avoid hitting the deer. From this information, deer have less than a 30% chance of surviving an accident with a car.

Deer-car accidents happen around the clock with no statistical difference between times of the day, yet the hour with the most accidents is 7am. The higher number of accidents at this time may be attributed to higher commuter traffic, low-light conditions from November through March, deer moving from forage areas to resting areas, and to other unknown factors.

In two years (2011 – '12), the towns of Mount Desert, Southwest Harbor, and Tremont had and average of 16 deer-car accidents annually, (with a total of 31 accidents) that were reported to have more than $1000 worth of damage to the vehicle. For the same years, Bar Harbor had an average of 28 deer-car accidents annually, (with a total of 54 accidents), that reported more than $1000 worth of damages estimated to vehicles in deer-car accidents.

image: lightcentric.wordpress.com

Deer - Car Accidents with over $1000 Damage, 2005 - 2012



Accident Locations

- 2005 26 accidents
- 2006 37 accidents
- 2007 46 accidents
- 2008 36 accidents
- 2009 53 accidents
- 2010 50 accidents
- 2011 56 accidents
- 2012 45+ accidents
- Acadia National Park

Between 2005 and 2012, there were 348 accidents were reported on MDI. All accidents involved one or more deer and caused over $1000 property or bodily damage. The accidents shown are those that were reported to DOT and DOT located the sites usinga combination of nodes and streets.

0 0.5 1 2 3 4 Miles

MaineDOT

College of the Atlantic
Erica Georgaklis 2013

Appendix 6

Depredation permits issued by Maine Inland Fisheries and Wildlife on MDI, 2010-2012

Depredation Permits

Maine statue authorizes IFW (Warden) to issue a depredation permit to a qualified individual landowner (or their designated agent) to take no more than two deer that are damaging crops, gardens, or orchards. The practice is a one-time management tool not to be used for the long-term management of deer.

Phil Richter, ME IFW Game Warden, provided that Park volunteer Shannon Wiggin used to prepare these graphs.

Over the past three years, the number of permits requested and the number of deer harvested have increased dramatically in both Bar Harbor and Mount Desert. Current as of January 2013.

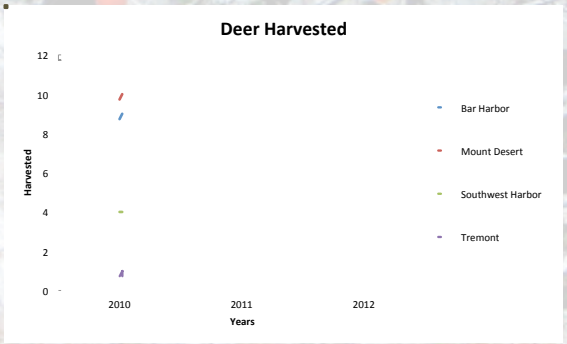


Image: loadpaper.com

Appendix 7

Executive Summary of Harrison and Fuller, 2009.

Home Range, Habitat Use, Edge Relationships, Mortality Sources, Age Structure, and Survival of White-Tailed Deer on Mount Desert Island, Maine, 1992-1994.

Home Range, Habitat Use, Edge Relationships, Mortality Sources, Age Structure, and Survival of White-Tailed Deer on Mount Desert Island, Maine, 1992-1994.

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Daniel J. Harrison, Ph.D.
Department of Wildlife Ecology
The University of Maine

Final Contract Report to:
Resource Management Division
Acadia National Park
and
Natural Resource Stewardship Science Office
Northeast Region
U. S. Department of Interior
National Park Service

October 2009

EXECUTIVE SUMMARY

Deer populations were studied in Acadia National Park during 1992-1994 to evaluate causes of mortality, fecundity rates, yearling and adult survival rates, fawn survival rates, movements, habitat selection, and spatial interactions with roads, developed areas, and coyote territories. Twenty-seven fawns and sixteen adult deer were equipped with radio collared and monitored during the course of this study. The age structure of yearling and adult deer on MDI was comparable to an adjacent mainland population. However, survival rates of juvenile and older deer suggested that both recruitment and survival were likely insufficient to maintain the deer population at levels observed during the 1990's, despite that populations were already lower than reported in the 1960's. Both predation of coyotes on deer fawns and vehicular collisions with juvenile and adult deer were identified as likely factors limiting population growth of the deer herd within the eastern half of Acadia National Park. Home ranges of doe-fawns groups overlapped coyote territories extensively and there were high densities of coyote locations observed within the home ranges of radio collared fawns. Movement analyses indicated that home range areas of yearling and adult does on MDI were relatively large, and that home range and individual radio locations of collared deer occurred primarily within the park. Home range areas were larger during winter, but we observed neither seasonal shifts to lowland conifer habitats nor seasonal movement to wintering areas during the relatively mild winters which occurred during our study. Deer selected home ranges with disproportionately greater amounts of birch-aspen forest than occurred on the island suggesting an affinity for habitats burned during the 1947 fire. Within their home ranges, deer preferred deciduous forest stands based on higher browse availability. Positioning of deer home ranges did not appear to be influenced by road density, and within their home ranges deer movement did not appear to be affected by proximity to roads. Deer showed a weak attraction for areas of human development within their home

ranges. These results suggest a high potential for interaction of deer with vehicles, humans, and coyotes within the eastern portion of ANP. We make several recommendations for future monitoring of deer population within ANP and for the increased management of deer-vehicle interactions on MDI.