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AN ASSESSMENT OF DEER HUNTING
IN NEW JERSEY

Prepared By

~~THE~~ DEER RESEARCH PROJECT

New Jersey Division of Fish, Game and Shellfisheries

Bureau of Wildlife Management

P.O. Box 1809

Trenton, New Jersey 08625

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Prepared By

THE DEER RESEARCH PROJECT

David Burke, Project Leader

Anne Deatly, Research Assistant

Robert E. Eriksen, Asst. Project Leader

Robert C. Lund, Research Supervisor

Patricia A. McConnell, Asst. Project Leader

Robert P. Winkel, Research Assistant

New Jersey Division of Fish, Game and Shellfisheries

Bureau of Wildlife Management

P.O. Box 1809

Trenton, New Jersey 08625

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Chapter 1.

DESCRIPTION OF THE PROPOSAL

The Proposal

The Division of Fish, Game and Shellfisheries proposes to continue issuing annual regulations which establish open seasons, season lengths, daily bag and possession limits, shooting hours, methods of take and other special management provisions, thus permitting the sport hunting of white-tailed deer (Odocoileus virginianus), which will help maintain population levels compatible with the perpetuation of the species while maximizing the recreational use of the resource by the citizens of the State of New Jersey.

The 1976-77 hunting regulations are set forth in Appendix A, as an example of typical annual regulations. Annual regulations may vary from this example as the harvest of a particular species is regulated to achieve a desired population level or goal. In those species in which sport hunting can significantly affect population levels, regulations generally become restrictive as population levels decrease and more liberal as populations increase. In species where sport hunting has no significant effect on population levels, regulations remain relatively unchanged on an annual basis.

Objectives

Recreational

The maximum number of recreation days should be provided to the largest number of resource users, while keeping the other objectives in perspective. In 1975, over one million man days of recreation were provided to more than 135,000 deer hunters. Recreation was also provided to nonconsumptive resource users such as photographers, students and people interested in watching deer.

Population Control

The deer population should be kept at or below the carrying capacity of the land, and at a level which is compatible with other legitimate land uses.

Damage Control

Land uses such as farming, commercial nursery operations, gardening and landscaping are often adversely affected by deer. (392 deer complaints were received by the Division of Fish, Game and Shellfisheries in 1975.)

Population control reduces deer damage to vegetation and the number of deer-auto collisions. In the absence of population control, man-deer conflicts would increase as the deer population increased.

Economic

The economic objective of the proposed action is to reduce the negative impact of deer damage and auto-deer collisions, and to maintain the positive impact.

The positive economic impact of sport hunting on the recreation industry and government is significant. Deer hunters spent over \$28,000,000 in New Jersey in 1975 based on information from the 1975 National Survey of Hunting, Fishing and Wildlife Associated Recreation. Expenditures for nonconsumptive activities relating to deer such as photography or observation were also significant.

The value of venison from the 1975 harvest was over \$700,000 using the system for determining the market value of deer meat from a total deer kill developed by Wilcox (1976).

Reduction of the negative economic impact of deer damage is another important economic consideration.

Research

The harvest of white-tailed deer on an annual basis provides an opportunity for wildlife biologists to collect large quantities of valuable information on the condition and productivity of the deer herd, statewide. For example, since implementation of the mandatory deer check station system in 1972, over 400,000 items of information have been collected each year during the hunting seasons (Burke et.al. 1975). Without the annual harvest, the deer research project would be limited to collecting information from road kills, illegal kills, damage control

killed deer, dead deer searches and other sources which are also currently utilized. The loss of information from hunter harvests would impair research and subsequently the management of the resource.

Authority For Regulatory Actions

The Fish and Game Council of the Division of Fish, Game and Shellfisheries in the Department of Environmental Protection, adopts the Game Code under authority of the New Jersey State Statutes set forth in Title 23, Chapter 2, Article V, Paragraph 13:1B-29 et seq. "The Council (Fish and Game Council) is hereby authorized and empowered to determine under what circumstances, when and in what localities, by what means and in what amounts and numbers such fresh water fish, game birds, game animals and furbearing animals, or any of them, may be pursued, taken, killed or had in possession so as to maintain an adequate and proper supply thereof and may adopt from time to time amend and repeal such appropriate and reasonable regulations concerning the same "

The procedure for establishing regulations is set forth in Title 23, Chapter 2, Article V, Paragraphs 13:1B-31 through 13:1B-34. The procedure is as follows: Recommendations for regulations are made by Division Personnel "on the basis of scientific investigation and research" to the Fish and Game Council for consideration. Prior to adoption of a regulation by the Council, a public hearing is held. After the hearing the Council will vote to refuse, accept or amend each regulation.

The authority for the adoption of specific sections directly related to deer is found in the New Jersey State Statutes. (See appendix A.).

Note: A question was raised in 1974 by several special interest groups which oppose sport hunting, regarding the constitutionality of the make-up of the Fish and Game Council. The council in accordance with Title 23, Chapter 2, Article IV, Paragraph 13:1B-24, is made up of eleven members. The Governor, with the advice and consent of the Senate, appoints the members. Membership of the council consists of three farmer representatives, six sportsmen representatives and two commercial fishermen representatives. (The Supreme Court of the State of New Jersey ruled in case A-136, September Term 1975, that the make-up of the council was legal and within the limits of the Constitution of the State of New Jersey.)

History and Formulation of Regulatory Action

The right to hunt was first established by the concessions and agreements of 1678. This Act extended hunting rights on "All the lands of the Province, not surveyed or planted" (Brewster 1911). In 1679, the General Assembly of the Province of New Jersey enacted a law prohibiting the export of Indian dressed hides (Brewster 1911). This was the first statute relating to game in New Jersey and the first law prohibiting the export of skins in the colonies. The first seasonal restriction on killing deer was established in 1722 (Brewster 1911). In 1771, a deer season was established, September 1st through December 31st, by action of the General Assembly (Brewster 1911). Regulations prohibiting the trapping of deer, the use of set guns and trespassing on private land for the purpose of hunting were enacted the same year (Brewster 1911).

The first prohibition of deer hunting on a local basis was made by the General Assembly in 1772; the Act forbade hunting in the Township of Morris and in the "Great Swamp" for five years (Brewster 1911).

In 1776, deer hunting was restricted to "one's own land," and the season was set for September 1st through December 31st (Brewster 1911). "An Act for suppressing immorality" was passed in 1798 which prohibited hunting and fishing on Sunday (Brewster 1911). Deer hunting was closed in Bergen, Atlantic and Ocean Counties for five years beginning in 1853 (Brewster 1911).

In 1870, the Board of Fish and Game Commissioners was created, having two members (Musick 1974). The deer season was reduced to 2½ months in 1874, running from October 15th through January 1st. Burlington and Ocean Counties were closed for five years (Brewster 1911). In 1881, the entire State was closed to deer hunting for three years (Brewster 1911). Similar closings took place in 1889 and 1899 (Brewster 1911).

In 1894, the New Jersey State Board of Fish and Game Commissioners was increased to four members (Brewster 1911). The Commission was maintained in this status for 23 years. Deer hunting in the entire State was closed again in 1902 and remained closed through 1908 (Brewster 1911). The next year, legislation was passed requiring residents to purchase hunting licenses and establishing an annual deer season which has been held every year to date. Also, laws prohibiting the use of dogs and night hunting and permitting the harvest of bucks with visible antlers only were passed at the same session. A one hundred dollar fine was established for a violation of any of these restrictions (Brewster 1911). At the time, this fine represented a man's salary for three or four months.

A law passed in 1913 made the export of deer hides illegal (Board of Fish & Game Committee 1914). In 1928 the number of Board of Fish and Game Commissioners was increased to nine (Board of Fish & Game Comm. 1929).

In 1945, many governmental changes occurred in New Jersey. The Division of Fish and Game was created with an advisory Fish and Game Council (Musick 1974). The then-existing nine member Board of Fish and Game Commissioners, who had all been appointed by the Governor, became the first Council members (Musick 1974). In 1948, the organization was changed to the Department of Conservation and Economic Development and provided for a Fish and Game Council with eleven members (Musick 1974). Three members were designated to be farmers, recommended to the Governor by the agricultural convention, six to be sportsmen recommended by the New Jersey State Federation of Sportsmen's Clubs, and two commercial fishermen to be selected by the Governor. The members of the Council serve four-year terms. The law stipulated that a Director be appointed by the Council to supervise the Division, and administer the work under the direction and supervision of the Council (Musick 1974).

The Department of Environmental Protection replaced the Department of Conservation and Economic Development in April of 1970. The units consolidated on this new agency included the present Division of Fish, Game and Shellfisheries (Musick 1974). The Council remained as it was under the Department of Conservation and Economic Development and has through the present day.

Current Regulation Procedure

The deer research project of the Bureau of Game Management is the principal unit charged with conducting field investigations and data analysis relating to white-tailed deer. After pertinent data is collected and analyzed by the deer research project, specific recommendations are made to the Bureau of Game Management. The Bureau reviews and may make recommendations prior to submitting them to the Fish and Game Council. The Council considers these recommendations and the views and opinions of interested citizens in promulgation of the proposed regulations each fiscal year. Interested persons present statements orally or in writing relevant to the proposed action at the public hearing where final adoption of the code by the Fish and Game Council under authority of the New Jersey State Statutes 13:16-29 et seq and the provisions of the New Jersey Statutes 23:1-1 et seq is made in June. The final draft of the Game Code for the fiscal year is then published and distributed to the public.

Scope of the Regulations

The New Jersey State law provides the procedures to be followed in the development of the fish and game regulations. The Fish and Game Council of the Division of Fish, Game and Shellfisheries is authorized to establish, extend, shorten or abolish seasons, change bag limits and prescribe manner and means of pursuing, taking or killing any species of game or fish. The four proposed deer seasons are established and regulated according to the requirements of New Jersey State law.

The white-tailed deer is the only big game animal present in New Jersey in significant numbers. They have no natural predators in this State which would help maintain the deer in balance with their habitat. Consequently, it is essential to have some of these animals removed by sport hunting. White-tailed deer provide the only opportunity to hunt a big game animal in New Jersey; the recreational and economic impact is significant.

The four proposed deer seasons will provide an estimated 762,810 recreation days afield to 135,062 licensed deer hunters. When pre-season preparation for deer hunting is considered, over one million man days will be provided. Additional mandays of recreation will also be provided to unlicensed deer hunters (farmers) and juvenile license holders. The number of hunters and recreation days afield by season was estimated as follows: six-day, firearm season (126,250 licensed hunters - 424,200 recreation days), fall bow and arrow season (35,250 licensed hunters - 293,632 recreation days), one-day, either sex season (19,978 special permit holders) and winter bow and arrow season (14,000 licensed hunters - 30,000 recreation days). A total of 2,048,000 potential recreation days will be available to deer hunters in 1976-77.

1976-77 Regulations

Regulations pertaining to deer in New Jersey are included in the following supplements: "New Jersey Summary of 1976-77 Hunting and Trapping Laws" (Appendix B), "1976 New Jersey Deer Season Guide" (Appendix C), "Game Code Regulations 1976-77" (Appendix D) and applicable portions of N.J.S.A. Title 23 (Appendix A).

Chapter 2.

DESCRIPTION OF THE ENVIRONMENT

The Resource

Taxonomy

The white-tailed deer is a member of the order Artiodactyla. The members of this order have an even number of well-developed digits (with the exception of the family Tayassuidae) with the main axis of the limb passing between the median digits. The weight of the body is supported by the median digits (Walker 1968).

The nine families and 82 genera of the order are found throughout the world except Australia, Antarctica and some isolated islands. The nine families are the Suidae (hogs), Hippopotamidae (hippopotamuses), Camelidae (camels, guanacos, llamas, alpacas and vicunas), Tayassuidae (peccaries), Tragulidae (mouse deer), Giraffidae (giraffes and okapis), Antilocapridae (pronghorn antelopes), Bovidae (bushbucks, kudus, elands, buffalos, cattle, durkers, antelope, wildebeests, gazelles, goats, sheep, bosbaks, nilgais, waterbucks, oryines bison, bongos), and Cervidae (deer) (Walker 1968).

The family Cervidae contains 17 genera and 53 species distributed throughout North America, South America (to 40° latitude), northwestern Africa, Eurasia, Japan, the Phillipines and Indonesia. The recent genera

of the family are Moschus (musk deer), Muntiacus (barking deer), Elaphodus (tufted deer), Dama (fallow deer), Axis (spotted deer), Cervus (red deer, wapiti), Elaphurus (Pere David's deer), Odocoileus (mule and white-tailed deer), Blastocerus (swamp deer), Blastoceros (pampas deer), Hippocamelus (andean deer), Mazama (brocket deer), Pudu (pudus), Alces (moose), Rangifer (caribou), Hydropotes (Chinese water deer), and Capreolus (roe deer).

The Cervidae are best characterized by the presence of antlers. The white-tailed deer belongs to the genus Odocoileus which contains two species, O. virginianus white-tailed deer and O. hemionus mule deer (Walker 1968). The two species are separated by the form of the antlers, form and color of the tail, shape and position of metatarsal glands, cranial characteristics and the form of the lower incisors (Taylor 1956).

There are thirty recognized subspecies of white-tailed deer occupying almost all of South, Central and the North American continents with the exception of the Arctic and sub-arctic, most of California and part of the Great Basin area (Taylor 1956).

An intergradation of subspecies may exist in New Jersey due to early stocking programs, when deer were obtained from other states such as Michigan and Pennsylvania. Historically, O. virginianus borealis, the northern woodland white-tailed deer, was the subspecies present in New Jersey. Its original range extended from western Ontario, south to the Potomac and Ohio Rivers. The western boundary of this subspecies was the Mississippi and Red Rivers (Taylor 1956). O. v. borealis attains a large size, having a possible height at the shoulder of 104.1 cm and a length of 240 cm. The winter pelage is a grizzled pattern of Brussels Brown with a medium longitudinal streak darker than the remainder of the coat following

the spinal column. The color of the top of the tail is similar and is broadly fringed with white above and pure white to the tip below (Taylor 1956). The summer pelage is a clear tawny color, giving a reddish appearance (Barbour 1922).

Life History

Unbroken forests, though sometimes associated with wildlife populations, are not optimum white-tailed deer habitat. White-tailed deer develop their largest populations in areas where "edges" are abundant and in areas of mixed vegetation types. Townsend and Smith (1933) stressed the importance of an open canopy, through which light can penetrate. Foote (1945a) stated that deer were originally found in greater numbers in the southern portions of Vermont. Lightning fires in that area created openings which soon supported growth of preferred forage for white-tailed deer. The importance of burned areas in southern New Jersey was highlighted by Little et.al. (1958).

McCaffery and Creed (1969) found deer activity to be significantly higher in forest openings. It appeared that this difference was related to forage preferences. Leopold (1950) stated that the shrub and tree reproduction, which constitute staple items of a deer's diet, are characteristic of sub-climax ecological conditions. In other words, disturbed areas are the most productive as far as deer are concerned.

Much of New Jersey's potential deer habitat has been disturbed at one time or another. Many areas are in various stages of secondary succession, as abandoned farmland reverts to woodland. Fires, timber operations, and power line maintenance serve to maintain vegetation communities in early successional stages.

Summer range, though threatened by human expansion and development, is not a serious limiting factor to white-tailed deer populations in New Jersey at this time. Even small woodlots produce enough growth to be of some value to deer. In general, during the summer months white-tails inhabit nearly all available range when an abundance of good forage exists. The growing season provides a more than adequate food supply and provides cover for adults and fawns alike.

Farming provides open fields in the northern zones which are used by does with newborn fawns. Disturbed areas such as burns and power line cuts provide fawning areas in southern New Jersey. Again the importance of edges can be seen. Agricultural operations exert a substantial effect on white-tail populations. It should be noted, that New Jersey's heavily farmed counties consistently produce large numbers of deer. Hunterdon, Warren, and Sussex Counties in the north are examples, as is Salem in the south. Agricultural activities in these prime counties provide deer with large quantities of quality foods and maintain open space.

Southern New Jersey summer range includes both upland and lowland areas. Lowland areas are preferred because of the type of forage found there (Little, et.al. 1958). Disturbed upland sites also produce ample forage and cover for white-tails in summer.

Probably the best range exists in the northern and central zones where extensive agricultural operations persist. Interspersed woodlots, second growth, and cropland provide deer with the necessary combination of food and cover.

The outer coastal plain soils of the south, are highly leached, quite acid, and less fertile than those in the northern and central regions.

The high quality browse, Atlantic white cedar (Chamaecyparis thyoides), is being depleted by the activities of both deer and man, and will undoubtedly become a limiting factor on deer populations in future years.

As colder weather approaches, white-tails concentrate in "wintering areas." These sites are characteristically sheltered coves and hollows; areas where the topography and patches of evergreens such as hemlock (Tsuga canadensis), mountain laurel (Kalmia latifolia), and rhododendron (Rhododendron maximum) afford protection from the elements (Gerstell 1938a) (Ruff 1938a). Frequently these concentrations are located on south facing slopes (Webb 1948).

As a result of topographical and cover requirements, only a percentage of the summer range can be used by deer in winter. Severinghaus (1915a) found that only 12 to 13 percent of the fall range was used in winter in the Adirondacks. In Pennsylvania, McDowell (1950) found that all the deer using an area of good range were crowded into 10 percent of that area during bad weather. Even in southern climates, deer move to winter ranges. Swan and Swift (1941) found range capacity in winter to be one third that of summer in Pisgah National Game Preserve in North Carolina.

In northern states, deer "yard" during periods of severe weather conditions. Yards are located in conifer swamps where heavy cover and food are available (Bartlett 1950). Deep snow is the primary determinant of yarding behavior (Taylor 1956). Winter concentrations of deer occur in New Jersey, though yarding is usually limited to periods of heavy snowfall, sustained low temperatures and high winds.

Webb (1948) found that north facing slopes produced the greatest amount of food and the least amount of cover. Level land and south facing slopes produced a greater quantity of cover. Cover is the factor which

determines the areas in which deer concentrate during the winter months (Taylor 1956). In general, sites used as winter range are warmer than surrounding areas, the shelter is better, the snow not so deep, and are generally located on the sunny side of the slope (Taylor 1956).

Cook and Hamilton (1942) found that many deer winter in young hardwoods, overgrown land, and orchards where the topography affords protection from the north and west winds. Many such sites exist on abandoned farmlands of northern New Jersey.

Wintering areas in northern New Jersey generally contain evergreen cover such as hemlock (Tsuga canadensis), rhododendron (Rhododendron maximum), and laurel (Kalmia latifolia). Further south, where hemlocks and rhododendron are not as abundant, young hardwood stands and dense tangles of honeysuckle (Lonicera japonica) and grape (Vitis spp.) are utilized; as are abandoned orchards on south-facing slopes. Young hardwoods and red cedar (Juniperus virginiana) stands are also important in central New Jersey. In southern New Jersey, aerial and ground surveys indicate that wintering areas are found in lowland sites. These areas are primarily Atlantic white cedar swamps, hardwood swamps and pitch pine lowlands (Burke 1975).

History of White-tailed in New Jersey

The history of deer in New Jersey begins with New Jersey's first known human inhabitants, the Indians. Although there is some evidence that "Paleo Indians" hunted and traveled through the East (Weslager 1968), Lenape Indians were believed to inhabit what is now New Jersey, approximately 7,000 years before the first European colonization (Robichaud and Buell 1973). The deer was an important animal to the Indian; the venison was used for food, the hides for clothing and shelter, the bones for tools and weapons and, the deer skin thongs for tying, securing and fastening (Sweet and Wright 1954). Day (1953) stated that the Indians studied

animal-plant relationships and perpetuated an equilibrium by rotating hunting activities within established territories.

The early colonists also found the deer useful as a source of food and clothing. As a result of lumbering, fire and agricultural activities, the colonists improved food and cover for deer by setting back succession and diversifying the habitat. However, the deer did not flourish under these improved conditions due to over exploitation by white settlers and Indians, who began trading in venison hams and deer skins. Many colonists realized the plight of the white-tailed deer and attempted to establish laws which would protect them. As early as 1679, an act was passed to prohibit the export of skins from deer killed by Indians (Brewster 1911). Beginning in 1722, a series of laws was established to control harvest. Specific seasons were set, hunting methods were restricted and penalties established to punish those who violated the provisions of the various acts (Sweet and Wright 1954). Despite efforts to protect the deer, the population continued to decline as the human population grew and man's exploitation of the land intensified. Cook (1968) stated that deer were found only in a circumscribed locality in the southern portion of the state. From 1853 through 1902, various laws prohibited killing of deer on a county or statewide basis (Brewster 1911). By 1902, ineffectiveness of hunting restrictions and law enforcement resulted in reduction of the deer population to a few family groups in the pine-oak woodlands of South Jersey (Howard 1972).

From 1902 through 1908, an Act of the General Assembly closed the entire State to deer hunting (Brewster 1911). During this period, the New Jersey Board of Fish and Game Commissioners decided to restock New Jersey with deer (Sweet and Wright 1954). In 1904, nineteen Virginia white-tailed

deer and eight fallow deer (Dama dama) were released from Worthington Game Preserve in Warren County (Board of Fish and Game Comm. 1905). In 1905, eight-three deer from the same preserve were released (Tillett 1963) and additional deer were purchased and released from Pennsylvania and Michigan (Howard 1972). In 1909, the General Assembly established an annual open season on deer which has been held every year henceforth (Brewster 1911). Any violation of the deer regulations was punishable by a \$100.00 fine (Brewster 1911). The reported deer kill in 1909 was 86 deer and in 1910 increased to 127 deer (Board of Fish and Game Comm. 1911).

In 1911, forty-seven deer were purchased from the Cleveland Cliffs Iron Company in Michigan and released in the southern part of the State (Board of Fish and Game Comm. 1912). Fifty more deer were obtained in 1913 from the same company and released throughout the State (Board of Fish and Game Comm. 1914). Soon after the importation of deer from Michigan, Mr. Worthington, owner of the Worthington Preserve, Warren County, released his deer by removing the fences (Warren 1937). In addition, several hundred deer of different species and subspecies were released from parks such as Allamuchy State Park in Warren County and Bordentown Park in Burlington County (Wright 1949). Restocking efforts proved successful and the deer population increased rapidly. As early as 1912, deer damage to agricultural crops was reported (Board of Fish and Game Comm. 1913).

Law enforcement had a major effect on the restoration of the deer population. Without control, the hunting restrictions and the restocking efforts would probably have been futile. Another early regulation which aided in restoring deer numbers was the restriction of shooting only antlered males. With the exception of a state-wide either-sex deer season in 1915, harvests were restricted to bucks. The "buck law", modified in 1928 to

permit killing of male deer with antlers at least three inches long, was designed to allow the population to increase. Although this law did contribute to population increases in many areas, it established a philosophy which would later hinder management and which still prevails in portions of southern New Jersey today.

Due to restocking efforts, favorable habitat, effective legislation and law enforcement, the deer population reached carrying capacity in the "pine barrens" of southern New Jersey by 1935 and in much of northern New Jersey by the late 1950s (Howard 1972). The minimum fall, pre-hunting deer population was estimated at over 75,000 animals in 1972 (Burke 1973). With a few exceptions, the State is presently supporting a deer herd either at or in excess of carrying capacity (Howard 1972).

Deer Management in New Jersey

Deer were re-established in New Jersey by sportsmen-conservationists for the purpose of sport hunting. Since the "restocking period" the responsible agency, now the Division of Fish, Game and Shellfisheries, has been managing the deer resource for this purpose. Between 1909 and 1976, 292,301 white-tailed deer have been reported harvested by legal means. The non-reported harvest, illegal kill and accidental kill (primarily due to auto-deer collisions) has also been substantial.

The first report of deer damage to agricultural crops was made in 1912 (Board of Fish and Game Comm. 1913). In 1917, a regulation was approved allowing farmers who had valid deer damage to acquire a permit to shoot any deer damaging crops (Board of Fish and Game Comm. 1918). In southern New Jersey, extensive deer damage to cranberry, blueberry and other crops was reported in 1937 (Board of Fish and Game Comm. 1938).

Officials relied on the use of chemical repellents, fencing and the establishment of diversionary food patches in the hope that they would divert deer from farm crops (MacNamara 1940), instead of recognizing the need to control deer numbers. The policy of issuing permits to shoot nuisance deer was also continued in extreme cases (MacNamara 1940). Between 1940 and 1949, three deer research projects were conducted dealing with deer damage, deer movement and means of reducing deer damage to agricultural crops. Again, wildlife officials failed to recognize the fact that the deer population had reached carrying capacity in many areas and that population control through a more extensive harvest such as instituting a hunting season for deer of either-sex was warranted. Where deer damage to agricultural crops occurred, the established policy of dealing with deer damage was continued. In 1950, pressure from farmers and landowners in Morris, Somerset, Essex and Union Counties forced the Fish and Game Council to change their policy. In January of 1951, a limited deer of either-sex season was held and 472 deer were reported killed during a two day season (MacNamara and Sweet 1951). Resistance to the season was apparent due to low hunter participation and posting of private lands (MacNamara and Sweet 1951). Population control through either-sex hunting was temporarily abandoned.

By 1958, the deer population of northern counties in New Jersey had reached carrying capacity and extensive damage to agricultural crops was occurring (Howard 1972). Due to the outcry of the farmers in this area and the fact that either-sex deer hunting had become an established management tool in other states, the Division of Fish and Game conducted investigations in 1958 and 1959 to assess the deer damage problem and the possibility of having an antlerless deer season. The conclusion was that the deer population of New Jersey was at or above carrying capacity and that control

measures should be taken to relieve deer damage and better utilize the resource (Mangold 1967). In 1959, a permit season based on a first-come, first-serve basis was instituted in the following North Jersey Counties: Bergen, Essex, Hunterdon, Mercer, Middlesex, Passaic, Somerset, Sussex, Union and Warren. 10,868 permits were issued and 3,571 deer were harvested (Div. Fish and Game 1960). To determine the impact of the season, no antlerless season was held in 1960. However, on January 31, 1962, the first statewide either-sex season since 1915, was held (Tillett 1963). Although there was opposition to either-sex deer hunting by organized sportsmen, statewide either-sex seasons were continued through 1968 with the exception of 1965. Since 1968, the antlerless season has not received Fish and Game Council approval in several South Jersey counties, despite the recommendation to have a season by the Bureau of Wildlife Management. The organized sportsmen of the New Jersey State Federation of Sportsmen's Clubs in South Jersey contend that the harvest of antlerless deer has been and would be detrimental to the deer resource (six members of the eleven man Fish and Game Council represent the Federation of Sportsmen's Clubs).

The Deer Seasons

As stated earlier, the deer resource in New Jersey has been managed, primarily, for the purpose of sport hunting. From 1909 through 1946, hunting was generally restricted to hunting antlered bucks with shotguns. Beginning in 1947, the Fish and Game Council expanded sport hunting by allowing the use of bow and arrow to hunt deer. In 1949, a separate season was held for antlered bucks, and deer of either-sex were made legal game in 1952. Archery deer seasons have been held each year henceforth.

The need to control deer numbers through either-sex firearm hunting or "doe days" resulted in experimentation with a variety of seasons. In 1951, a two day, antlerless deer season was open to all willing participants in a limited area in North Jersey. In 1959, a three day permit season was held, and the number of hunters was limited by a permit quota. In 1961, a one day, state-wide season was open to all deer hunters. During 1962, a "party permit" season was held. Four hunters could obtain one permit and harvest one antlerless or either-sex deer during the regular firearm buck season. This system was continued in 1963. Since 1964, either-sex seasons have been held on a permit basis. This system limits the number of hunters and the harvest of antlerless deer. By utilizing a quota system for issuing permits based on minimum population estimates and past hunter success harvests are controlled with a high degree of accuracy. Appendix F. gives the dates of the various deer seasons.

Another significant aspect of the deer seasons has been the continuation of the concept of "hunter's choice" in the developed areas of the State. Beginning in 1962, firearm deer hunters were allowed to kill deer of either-sex during the regular, six-day, firearm deer season in specific developed areas of the northeastern section of New Jersey. The objective of this program was to minimize conflicts between deer and man in areas where remaining open space is being lost or is too small to support a deer population (Burke et.al. 1976). The program was expanded in 1974 to the northern shore area.

More recent changes in the seasons include addition of a winter bow season in 1976, legalization of the muzzle loading rifle and rifled slug for firearm deer hunting, and the deer management zone concept to be discussed in greater detail in the next section.

The Current Deer Management Program

Mandatory Deer Checking System

In 1968, the Bureau of Wildlife Management increased its research effort on white-tailed deer. One important aspect of the intensified research program involved changing the method of monitoring the deer harvest. Biologists were aware from field checks that significant number of deer were not being reported through the pre-paid, post card system which had been employed for many years (Lund 1974). Deer project personnel decided to look for an alternative means to elicit harvest information and to monitor the non-reporting to determine if a change in the reporting system was justified. A survey of other states by Lund (1968) indicated that a mandatory deer checking system would provide more accurate harvest information. Although the post card system of reporting deer kills was convenient for both the hunter and the deer biologist, field checks between 1968 and 1971 indicated that at least 26.0 percent of the successful deer hunters were not reporting their deer (Burke 1975). Based on the experience of other states, the Bureau's dissatisfaction with the post card reporting method and a need for biological information statewide, a decision was made to recommend adoption of the mandatory deer checking system to the Fish and Game Council (Lund 1974).

The Council agreed with the proposed change and a network of mandatory deer checking stations was established for the 1972 deer hunting seasons. Implementation of the system in New Jersey resulted in a 42.2 percent increase in the 1972 firearm buck harvest (6,972) over the 1971 total (4,904) and a 31.0 percent increase over the prior ten year average (5,333) (Lund 1974). Surveys of gun clubs, cold storage lockers, etc. indicated a high level of compliance with the new regulations. The system also enabled Division personnel to increase collection of information on the deer resource.

The Deer Management Zone Concept

At the time the mandatory deer check station system went into effect, a new method of recording the exact location of each deer killed and related information was established. The state was divided into 637 deer management units, each containing 14.16 square miles. The exact location of kills and related condition and productivity data was recorded at the check station by management unit.

Over 400,000 information items were collected at mandatory deer check stations in 1972 and in 1973 (Howard 1975). Utilizing a computer, biologists combined data collected at the check stations with information obtained from other research projects. The result was the first meaningful change in deer management since the establishment of either-sex harvests as a management tool in the late 1950s (Burke et.al. 1975). Areas with similar herd characteristics, land ownership patterns, land use, land use trends, soils and vegetation were consolidated to form thirty-six deer management zones varying in size from 90 to 344 square miles bounded by highways and rivers. Application of the zone concept was made in 1974 during the special deer season (Howard 1975). Permit quotas for the either-sex deer season and all management factors related to the season were regulated on a zone basis rather than by county. One of the advantages of this system was population control dictated by the needs and characteristics of the deer and their respective ranges (Burke et.al. 1975). Prior to implementation of the zone concept, either-sex permit quotas were made on a county basis where vast differences in deer population and range conditions existed, and county boundaries were often indistinct to a hunter in the field. Desired either-sex permit harvests were much harder to control by area under the county system because, hunting pressure could not be directed to specific areas.

The deer management zone system is an important aspect of this management plan and will be discussed in the following chapters.

Public Education Program

Another important aspect of the deer management program has involved gaining public acceptance. Beginning in 1970, the Division of Fish, Game and Shellfisheries increased its efforts to reach sportsmen and the general public with information which was designed to gain support for programs, particularly the program for the harvest of antlerless deer in southern New Jersey. Information was made available through public forums, field trips, meetings, news releases, magazine articles, personal contact and a variety of information leaflets which were distributed statewide. The result has been the gradual acceptance of either-sex deer hunting in areas of South Jersey. Specific information and education efforts have also been directed to the non-hunting public to gain general acceptance of the Division's deer management program and to refute growing anti-hunting propoganda which has been generated by groups opposed to sport hunting.

Wildlife Control Policy

Resolution of man-wildlife problems is an aspect of wildlife management that has been increasing. Each year the Division of Fish, Game and Shellfisheries receives numerous animal complaints. Division personnel from the Bureau of Wildlife Management and the Bureau of Law Enforcement investigate and assist in resolving man-wildlife problems. For example, in 1975, a total of 313 deer complaints was received from agriculturalists and homeowners, and investigated by the Division (Div. Fish and Game 1975). The most frequently employed remedy for deer damage is liquid deer repellent (Burke et.al. 1975). Fencing is available to qualified farmers in limited

amounts and, in extreme cases, a permit to shoot is issued (Burek et.al. 1975). Fortunately, most farmers tolerate limited deer damage, and the harvest of deer of either-sex in recent years has controlled deer numbers at levels compatible with land use in general and agricultural land use in particular in most areas.

The Division's wildlife control program involves another aspect of the deer management program. In spite of laws and various public education campaigns, people persist in removing newborn fawns and other wildlife from the wild (Burke et.al. 1976). It is the policy of the Division to discourage individuals from removing wildlife from its natural habitat (Howard 1975). Wildlife, especially deer, do not make good pets, and the average citizen can seldom provide for the deer's basic requirements (Burke et.al. 1976). A formal "wildlife control policy" was adopted by the Division in 1975 (Toth and Howard).

Law Enforcement

The Bureau of Law Enforcement in the Division of Fish, Game and Shellfisheries is responsible for enforcement of regulations designed to protect the deer resource. Unpaid, civilian deputy conservation officers, concerned citizens, local police officers and other Division employees assist Conservation Officers in the enforcement of fish and game regulations. Enforcement efforts have resulted in a high level of compliance with the laws which protect wildlife. Although poaching and illegal activities persist and are important management considerations, the deer population has been maintained at a level which has allowed for the annual harvest of deer through legal hunting since 1909.

Conservation Officers are also involved in picking up road killed deer, investigation of deer complaints and various public education programs.

Habitat Development

Habitat manipulation to benefit deer is conducted on State-owned Fish and Wildlife Management Areas and encouraged on other public and private lands through cooperative programs. Controlled burning, wood harvest and planting of various agricultural crops favored by deer increase the carrying capacity by increasing the quality and quantity of food available. For example, in 1975, 1,500 acres were planted in rye, hay mixtures, food patch mix, soy beans, wheat, corn, oats, buckwheat and lespedeza; 1,558 acres of permanent plantings were maintained; 22,012 tree seedlings and 94,420 shrubs were planted; 320,900 square feet of hedgerows were maintained; and, 31 acres of woodlands were selectively cut by the Bureau of Wildlife Management on over 135,000 acres assigned to the Division (Div. of Fish and Game 1975). Cooperative programs were conducted with Fort Dix Military Reservation, Lakehurst Naval Air Station, Earle Naval Weapons Depot, the National Park Service and various private land owners.

Cooperative Research and Management

As indicated above, the Division cooperates with other governmental agencies and private individuals in programs to manage deer populations. In addition to assisting in development of wildlife management plans or programs, the Division designs special controlled deer hunts to meet the specific needs of an area. Programs have been developed and implemented at Fort Dix Military Reservation, Earle Naval Weapons Depot, Great Swamp National Wildlife Refuge and the Atlantic County Game Preserve (a private club).

Cooperative research programs have been conducted with Rutgers University on the management of scrub oak and estimation of the carrying

capacity of deer in the pine barrens region. Another program has involved Oakcrest High School and Stockton State College in Atlantic County. Research was conducted by Oakcrest and Stockton to monitor deer movement and mortality, utilizing telemetry equipment.

In addition to this research, many college students from throughout the State assist in check station operations, dead deer surveys and fawn capture activities (Burke et.al. 1975).

Phases of Deer Research in New Jersey

Between 1909 and 1945, the Board of Fish and Game Commissioners maintained records of deer harvests, deer related law violations, deer complaints, license sales, expenditures and other Board activities. These records were published in an annual report. In 1945, many State agencies were reorganized, and the Division of Fish and Game replaced the Board of Fish and Game Commissioners. The Division continued similar record keeping activities and publication of an annual report.

The first significant research on white-tailed deer in New Jersey began in 1940 and was jointly funded by the State and Federal Governments. The 1940 research project and two subsequent projects, started in 1945 and 1949, dealt with deer damage to agricultural crops. The project initiated in 1949, entitled "A Survey of White-tailed Deer Damage, Damage Control Methods and Population Characteristics" also included historical, economic, biological and general information on the deer resource.

In the early 1950s, collection of age, condition, reproduction and census information increased under another jointly funded project entitled "A Population Evaluation of White-tailed Deer."

During August of 1955, a highly fatal disease of deer appeared in Morris, western Essex and northern Somerset Counties (Shope et.al. 1955).

Several hundred deer died from the disease, which occurred in the summer and early fall (Shope et. al. 1955). Joint research conducted by the Division and the Rockefeller Institute for Medical Research resulted in the discovery of a previously undescribed viral disease of deer (Shope et. al. 1955).

As the deer population of northern New Jersey increased during the 1950's, damage complaints increased and the need to control the deer population became more apparent. In 1958, the Division began investigating the possibility of having an antlerless deer season. A census of the deer population was made in 1959, and wildlife managers concluded that the deer population was at or above carrying capacity in most areas of the State (Mangold 1967).

Collection of biological information continued through 1963. In 1964, the current project was initiated entitled "A Study of the New Jersey Deer Herd." The project is jointly funded by State license fees and Federal taxes on sporting arms and ammunition. Through the years, this project has included a wide variety of research programs on white-tailed deer and is the basis of present management decisions.

Appendix G. contains a list of jobs included in the deer research project in 1976-77.

Additional research on white-tailed deer has been conducted by the Northeastern Forest Experiment Station. Little and Somes (1965) found that excessive deer browsing was eliminating Atlantic white-cedar from many swamps in the New Jersey pine region. Another study discussed the effect of deer on forestry practices in the pine region of New Jersey (Little et. al. 1958).

Cooperative research programs between the Division and Rutgers University are included in project W-45-R "A Study of the New Jersey Deer Herd."

Appendix H. lists deer research projects and expenditures by year and study conducted by the Division of Fish, Game and Shellfisheries.

Food Habits

Estimates of requirements of browse by mature white-tailed deer range from two pounds per day (wet weight) per hundred weight (Gerstell 1938) (Smith et.al. 1956) to as high as seven pounds (wet weight) per hundred weight per day (Swift 1946) (Trippensee 1948). These requirements must be met to maintain good condition. It is especially critical that these needs be met in the winter months when extremes of weather, temperature and the requirements of pregnancy place additional stresses on the animal.

Quality and quantity of browse items varies greatly according to season. Composition of forests in different areas of the State determines the composition of preferred browse species. The late spring and summer months produce ample growths of the various preferred browse species throughout the state. However, in winter the abundance of quality browse is reduced considerably.

Accessibility of browse is an important factor in nutrition of white-tails. In areas of chronic overpopulation, the large numbers of browsing deer gradually crop the available browse back beyond reach or eliminate it. Sprouts and seedlings are nipped off close to ground level and an obvious browse line develops at the maximum height to which the animal can reach. Not only must browse exist in an area, but it must be accessible to the deer.

During the spring and summer months, white-tails consume herbaceous growth as well as woody stems. Numerous herbaceous plants are sought after by deer in the northern and central areas including golden rod (Solidago spp.), timothy (Phleum pratense), Bracken fern (Pteridium aquilinum), and sensitive fern (Onoclea sensibilis) (Sauer et.al. 1969). Sweet clover (Melilotus spp.) and jewelweed (Impatiens spp.) are also utilized.

Sauer (1969) found herbaceous growth to be important on plots in New York during the summer months. Herbaceous species may also be important in areas of New Jersey during the summer. Those areas under cultivation or recently abandoned produce numerous preferred herbaceous species. The counties of Hunterdon and Middlesex include locations where herbaceous plants form an important staple food item.

Woody plants have been shown to be of greater importance than herbaceous plants in the white-tails' summer diet (Weob 1959). Sotala and Kirkpatrick (1972) found poison ivy (Rhus radicans), greenbrier (Smilax spp.), and Japanese honeysuckle (Lonicera japonica) to be important summer food items.

White-tailed deer heavily utilize shrubs such as smooth and staghorn sumac (Rhus glabra and Rhus typhina), thornapple (Crataegus spp.), shadbush (Amelanchier spp.), and dogwood (Cornus spp.) as summer browse. Leaves and succulent stems and twigs of these species are consumed (Cook 1946) (Stegeman 1937). These shrubs are commonly found in stands of second growth hardwoods; lands which have been abandoned as farmland.

As a result of the availability of browse items in summer, deer tend to be selective in their feeding habits. With the profusion of plant growth, the animals can afford to choose favored items. Stegeman (1937) found red maple (Acer rubrum) to be preferred summer browse. Cook (1946)

found sprouts of grey birch (Betula populifolia), sugar maple (Acer saccharum), and white ash (Fraxinus americana) to be among the species most utilized in summer in an area which had been clear cut. These species are found also in northern New Jersey forests.

Sprouts have been shown to be much preferred over seedlings. Moore and Johnson (1966) found sprouts to be highly preferred over the more abundant seedlings of yellow poplar (Liriodendron tulipifera), red oak (Quercus rubra), chestnut oak (Quercus prinus), white oak (Quercus alba), and red maple.

The soils of northern and central New Jersey not only support growths of forest, but provide an excellent substrate for agricultural operations as well. Crops such as corn (Zeamays), soybeans (Glycine max), wheat (Triticum), oats (Avena), and rye (Secale cereale), raised to feed cattle, are utilized by resident white-tails. Alfalfa and clover grown for hay are also consumed by deer as summer forage. These crops as well as strawberries, tomatoes, potatoes, pumpkins, cabbage, and orchard grown fruits supplement the diets of deer in northern New Jersey. They may, in localized areas, comprise a major portion of the diet.

The southern region of New Jersey in general is heavily forested by oak-pine woodlands. Soils are, for the most part, less fertile and more acid than those in the northern part of the state. A result of these soil differences is a species composition of vegetation which differs from the northern areas. Because of the species composition of the forest, preferred browse species differ.

Agricultural crops are not as abundant. Where farms do exist, white-tails feed upon the crops produced (Sweet and Wright 1952).

Lowland sites provide most of the available browse. Deer consume woody plants such as greenbrier, grape (Vitis spp.), shadbush, sassafras (Sassafras albidum), Virginia creeper (Parthenocissus quinquefolia), sweet fern (Comptonia peregrina), spicebush (Lindera benzoin), huckleberry (Gaylussacia spp.), blackberry (Rubus spp.), wild rose (Rosa spp.), bear oak (Quercus ilicifolia), dwarf sumac (Rhus copallina), and blueberry (Vaccinium spp.). Sprouts of hardwoods such as tree oaks (Quercus spp.) and black gum (Nyssa silvatica) are utilized during the growing season (Little et.al. 1958).

Lowland vegetation fed upon by white-tailed deer includes blue-flag (Iris prismatica), turkey beard (Xerophyllum asphodeloides), and numerous grasses, sedges, and ferns. Tree growth is rarely browsed except in newly burned areas or recently cutover sites where woody growth is succulent (Little et.al. 1958).

As winter approaches, the high quality, accessible browse of the summer months becomes less available to foraging deer. Early in the winter, a marked increase in intake of food has been observed in white-tails (Ozoga and Verme 1970). Following the increase, there is a subsequent decline in consumption and a change in feeding habits. Deer begin to use the warmer hours of the day for feeding and reduce browsing during the night and early morning hours. Quality browse is of the utmost importance in these months when survival depends on an adequate food supply.

Japanese honey suckle (Lonicera japonica), greenbrier leaves, red cedar (Juniperus virginiana), and fruit and browse of sumacs have been found to be on the white-tail's list of preferred winter foods (Sotala and Kirkpatrick 1972). Where available, apple fruit is much sought after, even when it must be dug from under snow (Taylor 1956). Red maple, sugar

maple, and striped maple (Acer pensylvanicum) are used heavily as winter forage in the northern areas. Eastern hemlock (Tsuga canadensis), mountain ash (Sorbus americana), and both black and yellow birch (Betula spp.) are consumed as winter foods (Taylor 1956).

Shrubs such as shadbush, rhododendron (Rhododendron maximum), mountain laurel (Kalmia latifolia), willows (Salix spp.), sweet fern (Comptonia peregrina), and witch hazel (Hamamelis virginiana) make up a portion of the important winter browse items. A small percentage of the total quantity of winter foods is comprised of various grasses (Sotala and Kirkpatrick 1972).

Oak mast is heavily utilized in areas where it is available. Duvendeck (1972) stated that acorns were extremely important to white-tails. Deer fed a starvation diet of pitch-pine and oak browse could not survive without supplemental feeding of acorns.

In Southern New Jersey, Atlantic white cedar (Chamaecyparis thoides) has been rated as the most important winter food. Lowland sites where Atlantic white cedar is found are heavily used by white-tailed deer (Little et.al. 1957). A nutritional comparison of Atlantic white cedar with northern white cedar (Thuja occidentalis), a preferred winter food in more northern forests, showed that Atlantic white cedar compared favorably with the northern type (Gould and Brown 1961).

Although lowland sites provide a small portion of the total area of southern New Jersey deer range, they provide the major source of winter food (Little et.al. 1958). In addition to white cedar, pitch pine (Pinus rigida) sprouts and seedlings, red maple (Acer rubrum) and black gum (Nyssa silvatica) are used by deer in the southern region. Shrub species appear to be of little importance (Little et.al. 1958).

Bramble and Goddard (1953) found scarlet oak (*Quercus coccinea*), white oak, black oak (*Q. velutina*), and chestnut oak (*Q. prinus*) to be more heavily browsed in Pennsylvania during the winter than scrub oak (*Q. ilicifolia*). The same observations have been made on upland sites in southern New Jersey. Oak mast is important in the autumn, permitting the deer to build fat reserves to carry them into the winter months (Little et.al. 1958). Acorns, when available, during the winter period are an important source of food in southern New Jersey. Total mast production, insects and fall climatic conditions affect winter acorn availability.

Quantity of available browse has been mentioned as a limiting factor to white-tail populations (Gerstell 1938) (Swift 1946) (Dasmann 1964). Amman et.al. (1973) pointed out the importance of high quality food to wintering white-tails.

During the winter, the requirements for maintenance become a critical factor as the digestibility of the available forage decreases. In general, deer survive the winter on an intake of close to or below the maintenance level required for the animal to survive. If the quality of available browse is low; large quantities must be consumed to sustain the animal. The capacity of the digestive system becomes an important factor. In low nutrient diets, the quantity of food needed to fill the animal's energy requirements is larger than the digestive system can handle. Consequently, when deer are forced to eat a diet which is low in quality or digestibility, their energy intake is below maintenance level. It may be said that the deer are in negative energy balance (Amman et.al. 1973).

Survival under these conditions is dependent on three factors: the magnitude of the negative energy balance, the length of time on the diet, and the extent of accumulated body stores and high metabolic rate (Amman et.al. 1973). Because of their smaller body stores, fawns are at a great disadvantage.

Torgerson and Pfander (1971) studied digestibility of various food items and found the cellulose of herbaceous species to be highly digestible. Crude protein and crude fat levels were found to be important determinants of food quality. Robbins et.al. (1975) found that nutritive value of a feed is dependent upon its chemical and structural composition interacting with the digestive and metabolic capacities of an animal. Short (1975) found mature grasses and twigs to be of low nutritional value because of their low digestibility.

Digestibility and nutrient content determine the quality of browse (Torgerson & Pfander 1971) (Amman et.al. 1973) (Robbins & Moen 1975). Minerals such as calcium and phosphorous and crude protein and crude fat content have been found to be requirements for white-tails (McEwen et.al. 1957) (Dietz 1965) (Smith et.al. 1956) (Torgerson & Pfander 1971).

In essence, white-tails require an adequate supply of high quality, digestible browse for survival. These requirements are major determinants of range carrying capacity.

Movements and Home Range

The movements and the home range of the white-tailed deer are determined by a variety of factors. Among these are the size of the animal, distribution of the essential requirements, the effect of stimuli from the environment on the spacing of the animal (Moen 1973), bodies of

water, streams, vegetation, social behavior, geographic and man-made barriers, weather, sex, and age (Michael 1965). Although the deer is a large animal its home range is one of the smallest among wild ruminants (Moen 1973).

Compilation of data from capture and marking studies in Hunterdon County (January 1970 to July 1976) indicate the main home range size to be one mile or less. In this study, the largest percentage of both males and females, 68.2 percent (122/179) were recovered within one mile of their original capture locations. Of the remaining 57 deer, 26.8 percent (48) ranged from one to eight miles and 4.5 percent (8) ranged from ten to nineteen miles. One deer (0.6 percent) was captured 30 miles from the original release site.

The general range size is the same for males and females; however, there is a greater tendency for bucks to disperse long distances. Studies of white-tailed deer in Texas show that bucks move further and range over larger areas than does (Michael 1965). Of the 179 deer which were recovered in Hunterdon County from January 1970 to July 1976, 107 were males, and 72 were females; 57.0 percent of the bucks were recovered within a mile, 35.5 percent were recovered from one to eight miles, and 6.4 percent were recovered from ten to nineteen miles from capture site. However, out of the 72 females, 84.8 percent were recovered within one mile, 14.0 percent were recovered from one to eight miles, and 1.4 percent were recovered between thirteen and fourteen miles from original capture sites.

Radio tracking studies by the cooperative Wildlife Research Lab in Illinois found November to be the principal month for dispersal (Hawkins et.al. 1971). This is the period of rut and may influence the extent of

movement of bucks. In addition, the buck is a larger animal than the doe and may need a slightly larger area for feeding and spacing.

Does appear to be more reluctant to leave the regular feeding areas and remain close to home even during the fawning season. Their movements during the rutting season tend to be in large circles within their range rather than dispersal out of the range (Michael 1965).

Weather also has an effect on the movement of deer. Studies in other states show that the summer range is one square mile. During the winter months, however, the white-tails' range becomes reduced. A consequence to the reduction of the home range in the winter, is rapid depletion of the available food supply. As soon as the weather gets warmer, the deer disperse (Moen 1973).

Age also influences the extent of movement of deer. Until the age of two months, fawns barely leave the bedding area. They begin to accompany their mother at approximately two months. They remain within their home range, with their mother, at least until six months of age. The age for dispersal, if any, is from six to eighteen months (Michael 1965).

Studies at the Crab Orchard Refuge in Illinois indicated that dispersal is highest among yearlings, especially males. Their data showed that 22 percent of all the marked yearling bucks were killed outside the study area. Only 3 percent of marked yearling does were killed outside the study area. Comparatively, only 8 percent of the marked two year old bucks were killed off the study area. (Each deer included in this section of the Crab Orchard Refuge study was observed on the study area the same year it was killed off the area) (Hawkins et.al. 1971). The reasons for high dispersal rates in some age classes was not clear; however, it was certain that lack of food or deteriorating habitat were not factors (Hawkins et.al. 1971).

Population Trends

Reproduction

Studies in New York indicate that the cycle of testicle growth in the adult male deer begins in June and reaches a peak at the end of September. Sperm are present from September to February and 25 percent of the deer examined exhibited the greatest testicular volume in November (Cheatum & Morton 1946). Testosterone levels reach their peak during the last two weeks in November (Jackson & Hesselton 1973). The highest incidence of successful mating occurred during November 10-30 in these studies (Cheatum & Morton 1946). Examination of embryos collected through the 1951-1961 hunting seasons in New Jersey indicates that the peak of mating in this state falls during the first three weeks of November in northern counties and during the last three weeks in November in the south. Appendix I.

New York did not find sperm present in the fawn males examined; however, a study in New Hampshire with penned deer reported a successful servicing of a doe fawn by a 202 day-old fawn male (Silver 1965). Workers at the Crab Orchard National Wildlife Refuge in Illinois found evidence that male fawns may be fertile. Of 130 male fawns examined, 98.5 percent showed some spermatogenic activity. However, it is probable that the majority of these would never have reached full activity. Spermatozoa were present in the cauda epididymides of 36.9 percent of the fawns and these fawns were presumed fertile. Only 2/130 fawns had spermatozoa in the testicles indicating maximum spermatogenesis.

The presence of fertile males was attributed to the high nutritional level of the refuge area. The variation in the stages of fertility was attributed mainly to the age of the fawn. It appeared that those fawns

born before June 25 in this study were able to mature and reach the spermatozoan state and possibly be fertile by January. Later maturation and the dominance of adult males would most likely reduce the possibility of fertile male fawns playing a major role in reproduction (Follmann & Klemstra 1969).

Studies on the behavior of penned female fawns in New Hampshire indicated that 73.3 percent had ovulated in their first year but seldom earlier than January (Silver 1965). An examination of harvested females in Ohio indicated that 75 percent of the 335 fawns had ovulated. Ohio supports large areas of productive farmlands (Nixon 1971). The period of receptiveness in all females lasts approximately 24 hours (Taylor 1956). If the deer is not bred successfully, the estrus periods reoccur at four-week intervals until the breeding season ends (Cheatum & Morton 1946).

Although most are capable of breeding at the onset of estrus, the actual reproductive (conception rate) capacity in adults and especially fawns appears to be influenced by several factors including quality of habitat (Cheatum & Severinghaus 1950). The nutritional value of food is particularly important (Verme 1967). Studies in New York contrasted the Adirondack region and the southern area of the state. The south has a longer growing season and is more diversified than the Adirondacks. The percentage of successfully developing eggs was much higher in this more diverse southern area and the number of adult does pregnant (92.3 percent) in the south was significantly greater than those in the Adirondacks (79.9 percent) (Cheatum & Morton 1946). Nutritional studies of penned animals showed that productivity increased from .79 fawns per doe in deer receiving inadequate rations to 1.55 in those on excellent rations. Yearling females were particularly affected by inadequate rations in these studies (Verme 1967).

Early studies in New Jersey indicated that differences existed in the reproduction rate of deer in north Jersey and that of south Jersey deer (Sweet and Wright 1953). Deer herds in some areas of the south reached the carrying capacity of the range as early as 1935, whereas North Jersey experienced its peak later in the 1950's (Howard 1972). Data collected in the early 50's showed that northern adult does had an average reproductive rate of 1.90 embryos whereas southern adult does averaged 1.57 embryos (Mangold 1959). The incidence of pregnancy in northern fawn does was 47 percent in the period of 1952-54.

During 1952-62, 1,184 adult does from northern counties were examined and found to have a reproductive rate of 1.79 embryos per doe. An examination of 468 northern female fawns gave a rate of .41 embryos per deer. In comparison, 395 adult southern does had a rate of 1.54 embryos per deer and 109 southern fawns had a rate of .31 embryos/deer (Mangold 1962).

At the present time, differences still exist between areas of the state. In 1975 reproductive capacity, as determined by examination of harvested females, ranged from 1.60 embryos per doe (all age classes included) in Zone 12 to .78 embryos per doe in Zone 6 (Winkel and Burke 1976). This is a reflection of range conditions. Zone 12 is an important agricultural area and diversified in cover and food available. Zone 6 is becoming heavily urbanized and the predominant cover is mature forest. Sample sizes from southern zones have been too small for comparison.

One of the most dramatic examples of the effect of improvement of habitat or food availability on reproductive capacity occurred in the Earle Naval Ammunition Depot in Monmouth County. Range conditions were

improved in this case by an annual removal of deer by hunting. Since 1966, 228 male and 195 female deer have been removed.

Between 1968 and 1973 the reproductive rate almost doubled, an indication that the herd was in much healthier condition. The estimated fawn crop in 1969 was 116 fawns produced by 122 females, a reproductive rate of .95 fawns per doe, compared to 1974 when 78 does produced 133 fawns, 1.70 fawns per doe (Burke et.al. 1975).

New York reports similar improvement. In the western area of the state a 1.60 fawn/doe ratio existed in 1939-43. Following antlerless seasons, the reproductive rate increased to 1.90 embryos per doe in 1947-49. In areas where no antlerless seasons were held and the population density remained unchanged, fertility declined. Allegeny State Park had a reproductive rate of 1.36 cl/doe in 1944 following overbrowsing and severe winter losses. Balancing the population increased the rate to 2.0 cl/doe by 1948 (Cheatum & Severinghaus 1950).

Productivity

Studies in Ohio indicate that there is an 11.5 percent ova and embryo loss for all ages of white-tailed deer during the first three months of gestation. Precocial fawns experience the highest mortality of ova and yearling does lose the least. Apparently few embryos are lost after the first three months of gestation (Nixon 1971).

The average gestation period of the white-tail is 199.4 days and the majority of fawns are dropped in the last week of May and the first two weeks of June (Taylor 1956). One study has shown that most adult does, including 75 percent of the yearlings in good range, bear twins (Nixon 1971). The sex ratio at birth, as indicated by literature from eleven states, is 117.2 males to 100 females (Taylor 1956). However, it

has been found that fawn and yearling does carry significantly more male than female fetuses (Nixon 1971) and that highly productive prime-age does usually bear both sexes in fairly equal numbers or bear an excess of females (Verme 1967).

It is estimated that there is a 10-20 percent early postpartum loss of fawns primarily as a result of nutritive failures (Verme 1962). Studies in Ohio indicated a 21.9 percent decline from the prepartum fetus:doe ratio as determined from accidental kills. It also appeared from these studies that more postnatal male fawns die than females (Nixon 1971).

Three criteria are currently used to determine the annual productivity in New Jersey's deer herd; corpora lutea counts, embryo counts, and fawns/adult does in the annual either-sex harvest.

The first method studies the solid bodies (corpora/lutea) formed in the empty follicles created when the egg ruptures spontaneously toward the end of heat or estrus. The corpora lutea secrete hormones which play a role in subsequent follicle development and pregnancy. If the deer remains unbred, the corpora lutea begin degeneration 14-15 days following estrus.

A count of the corpora lutea scars gives a measure of ovulation; however, they may not represent the number of fawns produced. Additionally, unruptured luteinizing follicles may be confused with the true corpora lutea of pregnancy. Studies have indicated that if ovulation incidence equals 2.5 corpora lutea per doe, the actual conception rate (embryos) is 1.87 embryos per doe (Cheatum 1949). The utilization of corpora lutea counts alone may therefore give an inflated estimate of annual increment.

The second method consists of an actual count of embryos in utero. The period of collection of reproductive tracts is during the second week of December (one day either-sex hunting season). Some embryos may be too small to detect at this time. A more important source of under estimation utilizing this method may occur in the doe fawn class due to the delay in this age class in the onset of heat and breeding.

A third method, used for the establishment of the either-sex quotas in New Jersey, derives a minimum increment number based on the number of fawns that actually appear in the either-sex harvest. The juvenile or fawn population is calculated from the ratio of fawns to adult females in the harvest. This provides a minimum estimate of both the annual increment and surplus population. Those deer lost to accidents, illegal kill, disease and starvation do not enter either the minimum increment or the harvestable surplus figure. The annual increment as estimated in 1976 by this method was 20,678 fawns produced in 35 management zones. The minimum increment per zone varied from an estimate of 29 fawns in Zone 30 (Cumberland County) to 2,207 fawns in Zone 8 (Warren, Hunterdon, Somerset and Morris). A certain degree of selectivity towards larger and therefore older deer may be present in the hunting population. There may also be zones within the state where selectivity plays a greater role in the number of fawns entering the harvest than in others.

Census and Index

Hunter Harvest - Prior to 1972, all successful hunters were required to report their kill by a prepaid postcard provided with the hunting license.

The kill was recorded by season, sex, antler points, township and county. Samples of biological data were obtained by biologists and other workers from packing houses and gun clubs. In 1972, mandatory deer check station system was initiated statewide. All successful hunters in all seasons are now required to transport their deer on the same day it is killed to a check station to receive a possession tag. Information is collected relative to season, sex, age, antler development, weight, reproductive condition and locations (county, township, management unit and zone) and hunter related information.

Aerial Census - Aerial census by aircraft was used as part of an experimental comparison between aerial count and roadside track counts in the spring of 1951 and 1952. A Piper clipper flown at an elevation of 150' was used in Ocean and Burlington Counties. The plane followed 16 parallel line courses three miles long and 1/4 mile apart. A total of 5.17 square miles was censused in 1951, with 68 deer observed. The population was estimated to be 151 deer on 11.48 square miles. In 1952, 5.43 square miles were flown giving an estimate of 160 deer on 12 square miles (Wright 1954).

Practical use of aircraft began in 1961 and is still used. The first census in 1961 was taken with a Hiller 12-E helicopter and utilized the same random sample plots designed for the drive methods of 1959-60 (Wright 1961). In 1962 the number of plots was expanded to 166 (Wright 1962). Later censuses utilized the Bell G2A2 helicopter, which is the type of aircraft currently in use. Sample plots are covered systematically at an elevation of 100-150' at speeds ranging from 5-20 miles per hour, during periods of adequate snow cover (3-6 inches minimum). Two observers record the deer seen to each side and beneath the helicopter taking care not to overlap and count the same deer twice (Lund 1971).

Censuses of most of the 166 random plots were carried out in 1962, 1963, 1966 and 1971. In 1968, only Hunterdon County was surveyed. In 1970, new census plot photos and plot location maps were prepared for the six north Jersey counties censused in prior years. Plot photos and locations were also prepared for Passaic County raising the total number of plots to 177. Passaic County was censused for the first time in 1971 (Lund 1971). Since 1971, the census areas have been reduced to several plots in Hunterdon and special areas in Warren, Morris, Monmouth, Ocean and Burlington Counties.

Roadside Track Census - The roadside track census method was designed and initiated in southern New Jersey (Camden and Burlington Counties) in the winter of 1950-51. Roads in the area were divided into a total of 158 mile lengths called base-lines and 64 were chosen randomly for the track counts. All trails crossing the sample base-lines were swept clean of tracks the evening previous to the count. Tracks were counted the following morning and the trail followed to gain sight of the deer and to determine the distance of the point of observation from the relative base-line (Wright 1954).

Practical application of the technique was begun in 1951 in seven southern counties. Trails were not followed; instead, the population was estimated statistically (Wright 1954). The method was used almost annually through 1966.

Drive System - One of the first areas where drives were used as a method of censusing deer was Lebanon State Forest, Burlington County. The drive method consisted of 16 sample block areas ranging from 90 to 366 acres in size. Four CCC crews consisting of 67-74 men each censused 3500 acres or

16 percent of the State forest area. Counters were placed completely around the sample block area and the rest of the crew advanced through the block driving the deer out past the counters.

The Division first utilized the deer drive system for estimation of deer populations in April of 1959. The northern area of the state was stratified into six sections based on the 1958 legal deer harvest. Drives were made on 1/2 square mile study areas selected at random. Standers surrounded the outside perimeter of the area while drivers, 50 yards apart, moved the deer out of the area past the standers who counted them. The ratio of deer to the area driven was obtained and formed the sample base for the estimation of the population.

Today the Bureau utilizes the data collected at the deer check stations to calculate the population. The estimate is based on the age and sex structure of the harvest and the reproductive rate of the females harvested.

Effect of Hunting on Sex Ratio

Studies from eleven states indicate that the sex ratio of the white-tailed deer is 117.2 males per 100 females at birth (Taylor 1956). The fetal sex ratio in New Jersey has been found to be about 105.4 males per 100 females or about 51.4 percent males (Mangold 1963). Hunting can influence the postpartum sex ratio considerably. In many states, including New Jersey, the male deer is subjected to more intensive hunting pressure than the female. Females may be legally taken throughout the bow seasons statewide and are taken in approximately 60 percent of the state during the one-day either sex season. Males, however, are taken statewide during the bow seasons, in 60 percent of the state on the one-day season and statewide during the six-day firearm (adults only) season. In 1975 males composed 72 percent of the overall harvest, 61.6 percent were adults (McConnell 1976a).

In areas of the state where intensive antlerless seasons have been held over a period of years, females enter the harvest figures in ratios approaching the sex ratio at birth. In Zone 10, Hunterdon County, males were harvested at a rate of 1.67 times that of the females in the 1975 hunting season which included an either sex season. Zone 26, Atlantic and Ocean County, had no either sex season in 1975, and males were harvested at a rate of 14.3 times the females (McConnell 1976a). Although a greater number of females per total population are left as propagators in these southern zones, the rate of increase in the northern areas is greater due to the higher reproductive rate.

Effect of Hunting on Densities

The most obvious effect of hunting is reduction in the numbers of deer that will be held over the critical winter period in any one area. Winter ranges are more limited in food supply than are summer ranges and will support less deer. Reduction of the herd before the wintering period, helps to protect the winter range from overbrowsing and reduces losses to malnutrition.

Management programs that include removal of does as well as bucks can effect an overall reduction in the size of the herd if the rate of removal is adequate. Reduction is not possible through removal of males only, due to the polygamous nature of the male white-tail (Taylor 1956) and the fact that the majority of the adult males are removed after the breeding season in New Jersey.

There are deer management zones in New Jersey that have been placed on a deer reduction program due to the intense conflict that exists with other land uses such as farming and urbanization. Through the use of antlerless deer quotas established for the annual either-sex season, adult

does in Zone 10 (Hunterdon County) have been removed at a rate of .50 adult does per adult buck or greater for the 1974 and 1975 seasons. This has resulted in an apparent limited reduction of the herd numbers as indicated by the 1975 firearm buck harvest of 544 deer, a decrease from the harvest of 598 bucks in 1974 (McConnell 1976). Additionally, the success ratio of hunters participating in the 1975 either sex hunt declined from 39.4 percent in 1974 to 31.8 percent in 1975 (McConnell 1976b).

Effect of Hunting on Deer Age Structure

Data collected during the 1975 hunting season in New Jersey indicated that 84 percent of the adult males taken in the northern counties (Warren, Sussex, Passaic, Morris, Hunterdon, Middlesex, Mercer) were yearling animals. All individual counties in the north had yearling increments greater than 70 percent with several counties approaching 90 percent (McConnell 1976b). This yearling increment was an increase from the early 1950's when the yearling harvest ranged from 64 percent in 1950 to 74 percent in 1953 for the northern counties (Mangold 1962a).

The increase of younger deer in the population is the result of both intensified hunting pressure resulting in the escape of few older males, and the balancing of populations with food supplies by antlerless hunting, thereby increasing the number of yearling males bearing antlers.

The southern counties had a significantly lower number of yearlings in the harvest than the north during the early 50's. The percentage of yearlings ranged from 28 percent in 1950 to 40 percent in 1952. It was assumed that the difference between north and south was due in part to the inaccessible regions of the south, such as the cedar

swamps and pine thickets, and in part due to the poor antler development in the yearling age class (Sweet and Wright 1954).

An increase in the percentage of yearlings has occurred in some southern counties. Atlantic County reported 50.3 percent yearlings in the 1975 harvest (McConnell 1976b) as compared to 25.5 percent in 1952. The increase in the southern counties can probably be attributed to increased hunting pressure and slightly improved range conditions. However, the pressure is apparently not as intense as experienced in the northern areas. The southern counties are still significantly lower than the north with all southern counties except Salem running below 65 percent yearlings in their 1975 harvests.

The contrast of the northern and southern areas age structure is further exemplified by current zone data. The highly agricultural and heavily harvested Zones 5, 7, 10 and 11 have yearling increments in their harvest of 87 percent or greater. In comparison, Zones 21, 23, 24, 26 fall in the "pine barrens" area of the state and have yearling increments ranging from 49.1 percent in Zone 26 to 25.5 in Zone 21. With the exception of Zones 16, 25, 27, 29 and 30, the southern zones all had yearling increments below 70 percent in their 1975 harvest (McConnell 1976).

Data collected at Allamuchy State Park in 1974 and 1975 demonstrates the effect of hunting on age structure further. The park was opened to public hunting for the first time in 1974. The firearm buck harvest in that year consisted of 36.4 percent (16/44) yearling males and 45.5 percent (20/44) 2½ year old males. This contrasted sharply with the 86.3 percent yearling males and 12.6 percent 2½ males taken in the same season in Zone 8 (McConnell 1975a). The 1975 firearm buck

harvest illustrated that the initial hunt had removed the majority of older males in the park. The yearling males comprised 81.3 percent of the harvest and the 2½'s were 19.2 percent. These figures were comparable to the age composition of the herd in the remainder of Zone 8, with 88.6 percent yearling males and 10.2 percent 2½'s in the Zone 8 1975 harvest (McConnell 1976b).

Predation

Although man is the only important deer predator in New Jersey, dogs, both feral and free-running domestic, may have some effect on the deer population. Deer mortalities involving dogs are common in New Jersey; however, the total number of fawn and adult deer lost each year is unknown.

Deer floundering in deep snow are quickly exhausted and may fall prey to dogs. Does carrying fawns and young fawns may be particularly susceptible to dogs, although large does have been known to be successful in driving a single dog away from its fawns. Dogs may also cause losses indirectly by driving deer into automobiles, trains or bodies of water where exhausted deer may drown (Foote 1945). Pennsylvania estimates its losses to dogs are between 500-1,000 annually; and, Vermont considers dogs its fourth most important cause of mortality (Foote 1945). It is known that losses are intensified during periods of snow accumulation.

Malnutrition

Deer mortalities due to malnutrition vary according to weather conditions and density of populations as related to food supplies. In periods of high wind, low temperature, sleet or snow, deer tend to concentrate in protected areas such as valleys, on slopes with southern exposures and in sites offering coniferous cover (white cedar, hemlock,

rhododendron and laurel). If weather conditions remain unfavorable, competition for the available food at these sites becomes intense and some deer, especially the younger animals, may starve. In the winter of 1971-72, deer concentrated in Dunnfield Hollow and Rattlesnake Swamp wintering areas in Warren County, succumbed to malnutrition (Burke 1972).

Losses occur even during mild winters with no snow in areas where herds have exceeded the carrying capacity of the winter range. In 1973, 13 deer were found dead of malnutrition in known wintering areas in Atlantic, Burlington, Cape May and Ocean Counties; Deer Management Zones 23, 24, 26, 33 and 34 (Burke 1973). In 1974 deer died of malnutrition in the Great Swamp National Wildlife Refuge in Morris County (Burke 1974). In February 1975, two female fawns were box trapped in the west plains of Burlington County's pine barrens (Deer Management Zone 24). Radio transmitter collars were attached to the fawns and they were released. They were monitored daily until movement ceased in April. The dead fawns were located and examined, extreme malnutrition was determined as the cause of death (Burke 1975).

Accidental Losses

Based on available data, losses due to vehicle-deer collisions rank second only to the legal kill. In fiscal 1976, 2,537 deer were recovered from New Jersey's highways, and an additional 765 reported killed were missing from the reported location for a total of 3,302 (Eriksen 1976). This is considered a minimal figure. There are undoubtedly many deer that are able to move off the road and die elsewhere, or are never reported to authorities. Losses peak in October, November and December due to the increased activity of deer during the rutting period and

possibly as a response to hunter activity in November and early December. A second peak occurs in May and June corresponding to the fawning period (Lund & McConnell 1974).

An annual average of 2,201 white-tails were killed and recovered in New Jersey roadways between fiscal 1964 and fiscal 1976. An average of 671 deer were reported stolen, annually, during this period.

Appendix J. lists highway mortalities by year. Only known mortalities are included.

Disease and Parasites

Deer are hosts to several internal and external parasites. Ticks, lice, keds and nose bots have been found on deer examined from several habitat types. Ordinarily, these external parasites occur in low numbers causing only minimal irritation. However, herds in poor condition may harbor external parasites in numbers sufficient to cause constant irritation and dermatitis.

Internal parasites found in Jersey deer include: tapeworms (Taenia sp., Moniezia sp.), stomach worms (Ostertagia sp., Skrjabinagia sp.), brainworms (Pneumostrongylus sp.), lungworms (Dictyocaulus sp.), gullet worms (Gongylonema sp.), filarial worms (Setaria sp.), muscle worms (Parelaphostrongylus sp.), intestinal worms (Capillaria sp., Oesophogostomum sp.) and whipworms (Trichuris sp.) (McConnell 1974).

The cecal fluke (Zygotyle sp.) and protozoan parasites (Eimeria sp. and Sarcocystis sp.) have also been recorded for New Jersey deer (Mills 1975, 1977).

Most of these parasites cause irritation to the lining of organs and surrounding tissues, and the larval stages may cause slight damage as they migrate through various organs. The parasites are usually held at

tolerable levels by the body defenses; however, they can build to high numbers during stress periods, causing debilitation and secondary infections such as pneumonia.

Deer are susceptible to many viral and bacterial diseases, only a few of which have been recorded from New Jersey. The most important viral disease is Epizootic Hemorrhagic Disease (EHD). It can be a serious threat to local deer populations because mortality can be as high as 90 percent in affected animals. The virus interferes with the blood clotting mechanism and appears to cause degenerative changes in the vessel walls resulting in extensive hemorrhaging throughout the body (Davis et.al. 1970).

Two outbreaks of EHD have been reported in New Jersey. In 1955, Shope identified EHD as the agent that caused the death of an estimated 700 deer in Morris, Essex, and Somerset Counties (Shope 1955). In 1975, EHD was again identified as the agent responsible for the death of an estimated 1,000 deer in Warren, Sussex, Hunterdon and Morris Counties (McConnell et.al. 1976).

All documented outbreaks have occurred in late summer and early fall and ceased with the onset of heavy frost indicating involvement of an insect vector. It has been shown that the biting gnat Culicoides transmits blue tongue virus and is possibly the principle vector involved in transmission of EHD (Prestwood et.al. 1974).

Deer develop symptoms 5-10 days following experimental injection of the EHD virus. Experimental deer, during the 1975 epidemic became depressed, went off feed, and exhibited edematous and hemorrhagic conjunctivitis. The deer had elevated temperatures accompanied by mucoid diarrhea. Necropsy revealed both petechial and ecchymotic hemorrhages

throughout the internal organs and excesses of fluid in the body cavities and pericardial sac (Erickson personal communication).

Cutaneous fibroma is a infectious viral disease characterized by warty growths on the skin surface. The growths can vary in diameter from .5 to 20.0 cm. and be single or multiple. They are usually found on the neck, face, shoulders and legs. The tumors are ordinarily not malignant, however, metastases to the lungs has been recorded in Wisconsin (Koller & Olson 1971).

Experiments have indicated that the tumors have a rapid regression rate and that probably only an occasional deer develops progressive and persisting fibromatosis which may interfere with eating and breathing, eventually causing death (Shope et.al. 1958).

Leptospirosis, caused by the spirochete Leptospira sp. has been recorded in New Jersey and is one disease in deer that can be transmitted to man. The disease can be chronic, causing nephritis, or acute. The acute form in experimental deer causes abortion, anorexia, weakness, anemia, hemoglobunuria, fever and death (Davis et.al. 1970). Chronic leptospirosis was identified in a white-tailed fawn from Morris County in 1975 which was removed during the Great Swamp National Wildlife Refuge hunt (Mills 1977). Leptospirosis in man causes fever, vomiting, headache, meningitis and, in severe cases, renal failure.

Habitat

New Jersey is divided into two geological regions by a line running from Perth Amboy to Trenton. The Coastal Plain lies south of the line and the Appalachian province lies to the north (Sweet & Wright 1954).

The Appalachian area varies considerably in relief, soil type and drainage (Robichaud & Buell 1973), and is composed of three physiographic sections: the Ridge and Valley, the Highlands and the Piedmont sections. Deer Management Zones 1-14 and part of Zone 36 fall into these sections. The landscape of the ridge and valley section, (Sussex and Warren Counties; Zones 1, 2, 4 and northern Zone 5) is one of ridges of resistant rock shales and sandstone paralleled by valleys formed on softer limestone based rock and constitutes seven percent of the total land area of New Jersey (Robichaud & Buell 1973). The soils on the ridge areas, Callaraugus-Swartswood, are acid and have low moisture retention powers. Higher ridges are particularly stony and thin, and droughty. However, on the lower ridges the gravel is covered by stronger and deeper finer texture types (Quackenbush 1955). The Kittatinny and Vernon valley soils (Palmyra-squares), derived from limestone, are deep, well drained, and fertile and are among the most productive in the state.

The Highlands province occupies 12 percent of the total land area (Robichaud & Buell 1973) (Morris, Passaic, south Warren, east Sussex, west Hunterdon, west Bergen Counties; Zones 2, 3, 5, 6, 7, 8, 9 and the northern part of Zone 10). The Highlands area also contains parallel ridges and valleys, but the ridges are more massive while valleys have steeper slopes and are more narrow (Robichaud & Buell 1973). Most of the northern highlands is forested. Large outcroppings of hard bedrock are prevalent (Zone 2 and north 6) (Quackenbush 1955). Marshy hollows are common in this area. The acid and well drained Rockaway soils predominant in this area. Although the soil can be cultivated for certain crops, such as hay and corn, the high presence of gravel, due to its gneiss derivation, is a disadvantage. The better quality southern highlands soils are derived

from limestone. The deep and well drained Washington soils found in Zones 10, 8 and 7 are among the best in north Jersey. The Annandale soils (Zone 5 and western parts of 8 and 9) are excellent but tend to be stony on steep terrain (Robichaud & Buell 1973). Excellent production is obtained along the river valleys of the highlands section, particularly, the Musconetcong and Pohatcong valleys (Quackenbush 1955).

The Piedmont province occupies approximately 21 percent of the land area and is basically a gently rolling lowland region. Although there are several ridge formations on the northeast section (Bergen, Essex, Union, Hudson, eastern Passaic, Somerset, southeastern Morris, south Hunterdon, Mercer, north Middlesex; Zones 10, 11, 12, 13, 14 and small sections of 8, 9 and 36).

The eastern section of the piedmont contains the Westersfield soils (Robichaud & Buell 1973). These soils are soft, mellow, easily worked and productive, however, they occur in Zone 36 where industrialization and urbanization has occurred to such an extent that few agricultural areas exist (Quackenbush 1955). Soils in the central section are Whippany soils, poorly drained silts (Zones 6 and 9). The most common associated soils of the western Piedmont are the Penn soils, shallow well drained and loamy and the higher quality Norton soils which are deep well-drained loams. The Norton soils occur in sections of Hunterdon and Somerset Counties (sections of Zones 8, 10 and 12).

The coastal plain comprises approximately 60 percent of the total land area of New Jersey and contains two physiographic sections: the inner coastal plain (Mercer, Middlesex, Monmouth, Burlington, Camden, Gloucester, Salem, Cumberland Counties; Zones 14, 15, 17, 19, 20,

western 25, 27, 29 and 35), and the outer coastal plain (small sections of Middlesex, Monmouth, Ocean, Burlington, Atlantic, Cape May, small sections of Cumberland and Camden, Gloucester and Salem; Zones 15, section of 17, 20, 29, 27 and 35) (Robichaud & Buell 1973).

The topography of the coastal plain is of low relief. Marshes, bogs and swamps are supported on lowland areas with high water tables. The inner plain has some slightly elevated areas and the associated soils are much more fertile than the sandy ones of the outer plain (Gleason & Cronquist 1964). The dominant soil types of the inner coastal plain are the Freehold-Collington soils. These are excellent deep, well-drained soils (Robichaud & Buell 1973) supporting extensive truck and orchard agricultural practices (Zones 15, northwestern 20, northern 17, western 25 and 35) (Sweet & Wright 1954). Other soils important to the inner plain are the well drained and aerated Sassafras (Zones 14, 16, northwestern 18), the well-drained Greenwich soils (Zones 27, 29 and 35) and the Sassafras-Keypcrt soils (Zone 28). The latter are sandy and well drained in some areas but are slow draining where high in clay and silt.

The outer coastal plain has a much lower percentage of clay in its soils and is very high in sand. Almost 2,000 square miles are made up of very sandy soils of low fertility (Robichaud & Buell 1973). The dominant soil types are the Lakewood soils; sandy, acid and highly leached (Zone 21, 22, 23, 26 and 32). Other acid and sandy soils in this region are St. Johns soils occupying (Zones 22,23) Sassafras-Hammonton, usually sandy, (Zones 24, 26, 32 and 33) and Sassafras-Cape May, (Zone 34), well-drained at the top with the water table close to the surface. There are limited areas containing the well-drained acid, Aura sands and silts (Zone 31).

The considerable variation in relief, soil type and drainage of the Appalachian region (Robichaud & Buell 1973), and the activities of man has affected the development of several forest types. It is estimated that 1,000,000 acres of forest land exist in northern New Jersey and nearly all of this forest had been cut over at least once and in some areas several times by the civil war. Much of the area has been burned repeatedly (Buell et.al. 1966). Oaks have persisted through the periods of fire and cutting and now dominate the forests of this region (Buell 1966).

There are three distinct forest types found in the area. The mixed oak forest with its red, white and black oaks and occasional scarlet and chestnut oak, is the most common type. Maple, ash, elm, birch and dogwood are common associates. The understory contains abundant shrubs such as blueberry, huckleberry and viburnum.

The hemlock-mixed hardwoods forest type occurs on the cooler and moister sites and on steep northfacing slopes leading to ravines and valleys. More than half of the large trees are hemlocks. The hardwoods associated with hemlock include basswood, sugar maple, sweet and yellow birch. This forest type supports a scanty undergrowth due to the acid soil conditions produced by the dropped hemlock needles.

The most diverse and richest forest is the sugar maple-mixed hardwoods type, found mostly in Ridge and Valley province in the Kittatinny area. Again, white, red and black oaks are commonly found associated with the sugar maple as well as beech, basswood, hickories, sweet and yellow birch, white ash, tulip and red maple. Hophornbeam is the most frequent understory tree. This type supports a lush undergrowth of spicebush, witch hazel, maple-leaved viburnums and beaked hazel.

A fourth type, the Chestnut oak forest, occurs on the ridgetops, slopes and rock outcroppings of high elevations. Red, white and scarlet oak, sweet birch or pitch pine are associates. The most common shrubs are the heaths, blueberries, huckleberry and laurel. The highest elevations support a sparse growth of pitch pine, with scattered thickets of scrub oak.

The coastal plains area is characterized by pitch pine, a species dependent on repeated fires. In areas that are slightly elevated such as the inner pine barrens, the lack of natural firebreaks burns out the humus (Gleason & Cronquist 1964) and litter and the exposed surfaces creates the ideal conditions for pine seedlings (Robichaud & Buell 1973). Pitch pines and less frequently, shortleaf pine, are found with post, blackjack or bear oak. Heaths particularly are common understory plants (Robichaud & Buell 1973).

In contrast to the sandy areas of the pine barrens, are the lowland areas of high water table along the coast lines. These areas support extensive marshes, bogs and swamps. The swamp areas contain some nearly pure stands of sweet gum with willow and Spanish oak. The bog areas are dominated by white cedar and are found mostly in the outer plain in the pine barrens area and on the Cape May Peninsula (Robichaud & Buell 1973).

Median areas between the wet lowland sites and the dry sandy areas of the pine barrens exist mainly in the inner coastal plain surrounding the barrens area. Oaks are the dominant vegetative type of these areas and the oak species and associates are influenced by the soil composition. The western and southwestern coastal plains area, containing more fertile soils, supports white, red and black oaks and beech. The understory consists of dogwood, ironwood and sassafras.

The northeastern areas bordering the pine barrens and containing sandier soils than the western areas, support white, black, red, chestnut and scarlet oak. Heaths, laurel, blueberries, huckleberry and swamp azealea compose the understory. On very sandy sites, the american holly, spanish oak and sweetbay are found as part of the mixed oak forest (Gleson & Cronquist 1964) (Robichaud & Buell 1973).

The coastal dune areas support shrub thicket communities (Gleason & Cronquist 1964) composed of bayberry, shadbush, blueberry, sumac, american holly, black cherry and scrub oak. Sheltered moist areas of the sand dunes contain american holly, black cherry, red maple, red cedar, pitch pine, hackberry and sassafras (Robichaud & Buell 1973).

Land Use Changes

Our discussion of land use begins with New Jersey's first human inhabitants, the Indians. Estimates of the number of Indians present in New Jersey at the time of colonization range between 2,000 and 10,000. Although their numbers were low by today's standards, the Indians significantly altered forest composition. Land was cleared for villages and cultivation, and fire was used to aid in hunting, travel and warfare (Day 1953). By the time that the first white settlers arrived in 1620, the Indians had cleared or burned many areas, especially the accessible river valleys (Robichaud & Buell 1973).

The Dutch and Swedes, and those that followed, did not find a vast expanse of virgin woodland as once believed (Robichaud & Buell 1973). However, the colonists soon intensified modification of the environment by clearing for settlement and agriculture, cutting timber for various wood products and burning (Robichaud & Buell 1973).

Disturbance of the land accelerated with increase in habitation. For example, in 1726, the year of the first census, New Jersey population was 32,442 and by 1784, had jumped to 149,435. Demand for wood fuel, lumber and farmland increased proportionately. Through the middle of the nineteenth century, wood was the only source of fuel and demand resulted in the forests being cut over at twenty to twenty-five-year intervals (Robichaud & Buell 1973). Fortunately, the introduction of coal resulted in a reduced demand for wood fuel. Between 1860 and 1900, the forests began to recover, despite a rapidly increasing population (Robichaud & Buell 1973).

Population growth between 1850 and the present resulted in a population density which is the highest for any State (Appendix K). Much of the population increase was centered in areas of traditional growth such as the northeast counties (Appendix L). However, recent trends have resulted in the loss of prime agricultural lands and woodland. Since 1870, the total acreage of agricultural land has declined steadily through loss to development or abandonment (Appendix M). Total acreage of land in farm production was nearly three million acres in 1870 and had declined to just over one million acres by 1975 (NJ Agricultural Statistics 1975). In contrast, the total acreage of woodland has changed little since 1860 (Robichaud & Buell 1973) (Appendix N). Reduction in the demand for wood products resulted in an increase in forest age and stand size. The total acreage of forest land was approximately 2,120,000 acres in 1956 compared to 2,069,819 acres in 1899. Abandonment of farmland has offset the loss of woodland to development (Robichaud & Buell 1973). A more recent trend indicates a decrease in forest land to 1,928,400 acres in 1972; however, 2,163,000 acres (54 percent of the land area) still has tree cover (Ferguson & Mayer 1974).

In general, the present land use trend is toward development (industry, commercial and residential) with a corresponding reduction in open space. Appendix O. illustrates the loss of potential deer range in New Jersey between 1958 and 1972. During this period, an average of 45 square miles of open space was lost to development each year. Appendix P. indicates that there are 1,928,400 acres of forest land, 650,500 acres of farmland and 171,300 acres of non-developed open land with tree cover which is potential deer range in New Jersey; however, these figures do not include areas of low density suburban housing which may contain some deer range and some swampland which is classified as water by Forest Survey Standards. Excluding the marginal lands, there are 2,750,200 acres of potential deer range in New Jersey (57.05 percent of the total land area).

Past public land acquisitions under Green Acres Bond Issues I & II, have preserved some open space, and the "Coastal Area Facilities Review Act" and "Wetlands Act" have slowed development in coastal areas. However, new concepts such as "transfer of development rights," strengthening of water and air quality standards, and regional planning must be developed if, open space is to be preserved. To date, the majority of land use decisions have been determined at the local level through the local planning process. This process seldom calls for limited growth or preservation of open space. Change in land use regulations or another economic crisis are two factors which could reduce the trend toward total development of the once "Garden State."

Social Aspects

Consumptive Users

The Hunter

The reasons that men hunt are as wide and varied as the backgrounds of those who participate in the sport. One thing remains constant, however, a compelling urge within a percentage of the population to engage in hunting activities. This drive has been studied by many authors, but a basic reason for its existence has yet to be found.

Many theories have been forwarded on the subject of hunting. Ortega (1942) maintained that hunting is a deep and permanent yearning in the human condition. It is not an urge to kill, but to once again be united with the natural world. Man maintains a certain disadvantage in the hunt, not fully utilizing all the methods at his disposal for obtaining prey. Instead of doing all that he could do as a man, he restrains his excessive endowments and begins to imitate Nature - that is, for pleasure he returns to Nature and re-enters it (Ortega 1942).

According to some authors, hunting is a basic part of the composition of human behavior. W.S. Laughlin (1968) stated that hunting is the master behavior pattern of the human species. Hunting has been cited as one of the primary bases for the evolution of cooperation and sharing in humans (Froam 1973) (Shepard 1973). Undoubtedly, the activity had a profound effect on human evolution (Shepard 1973).

Hunting is a complex affair with roots too deep to be pulled up and examined. If a hunter is asked to explain his sport, he can no

more rationalize hunting than he can describe emotion. His hunting is and has always been a conditioned instinct that is largely emotional (Madson & Kozicky 1963).

Among the reasons given for hunting, enjoyment of the outdoors consistently appears. This was found to be a major reason for hunting among hunters in Wisconsin (Klessig & Hale 1972) and Colorado (Schole et.al. 1973).

Of secondary importance is the challenge and suspense of the hunt. Kennedy (1970) found the challenge to be a primary motivation for deer hunters in Maryland. Other studies have shown the challenge to be second or third most important reason for hunting (Klessig & Hale 1972) (Schole et.al. 1973).

Surveys in several states have indicated that success is not a necessity for satisfactory hunts. Kennedy (1970) found this to be so in New Hampshire, where the success ratio is only 3 bucks per 100 hunters. A similar result was obtained in Ohio (Peterle 1967) and Massachusetts (More 1970). These findings are comparable with studies which showed that procurement of food was not a primary objective for hunting (Sendak & Bond 1970) (Bevins et.al. 1968).

At any rate, hunting is still a motivating force for a large number of people throughout the country. Perhaps Ortega (1942) summed it up most accurately when he said, "When you are fed up with the present . . . you take your gun, whistle for your dog, and go to the mountain . . ."

Of the 173,713 licensed firearm hunters in New Jersey in 1975, 125,768 or 72 percent hunted deer. Some 34,645 hunters were licensed to pursue deer with bow and arrow - approximately 75 percent of the

bow hunters also hunted deer with firearms (Appendix Q). Another 4,000 unlicensed farmers and juveniles hunted deer in 1975 (U.S.D.I. 1975). Hunting was ranked fifteenth as a recreational activity in New Jersey (Dept. Env. Prot. 1973).

Although the number of hunters represents only a portion of New Jersey's 7,168,164 residents (1970 census), 762,367 recreation days of deer hunting were provided to licensed hunters in 1975. When pre-season preparation and unlicensed hunters are considered, over one million recreation days are provided to deer hunters. The recreational potential of the 1976-77 season is 2,048,000 days afield (see page 9 for season estimates).

Research has also been completed on the composition of hunter populations. Generally, it has been found that the firearm hunter is a male, with a high school education and some training in a profession (BSFW 1972). It is also likely that he was introduced to hunting by a member of his family prior to 21 years of age (Schole 1973) (Applegate unpublished data). Men in their thirties are usually established in a profession and have few outside commitments such as school or military service to keep them from hunting (Nobe and Gilbert 1970). Older age group participation may be lower because of the physical stresses involved in the sport (Schole et.al. 1973).

A majority of hunters are married (Klessig 1970) (Peterle 1961) and are employed in skilled or semi-skilled professions (Schole 1973). A large percentage of firearm hunters fall into the \$5,000 - \$15,000 income bracket (BSFW 1972) and are between 30 and 49 years of age (Schole 1973).

The statistics for bowhunters in New Jersey compiled by McDowell (unpublished data) closely follow some of those for firearm hunters. A large percentage fall into the \$10,000 - \$20,000 income group. New Jersey archers tend to be younger than their firearm hunter counterparts. Some eighty percent of the bowhunting population is less than 36 years of age. More than 50 percent of New Jersey's archers are less than 30. Information on employment suggests that men employed in the trades comprise a large portion of the bow hunting population. Educational experience is generally at least complete through high school, with some 20 percent indicating some college training. An interesting fact to note is that almost all archers hold a firearms license in addition to their archery license.

A substantial proportion of New Jersey hunters have a relatively transient interest in the sport. Some 43 percent of those who begin hunting quit within ten years of initiation (Applegate, unpublished data). Hunters from rural areas are more likely to remain in the hunting population than their urban counterparts (ORRRC 1962). Also, blue collar workers are more apt to continue hunting than white collar workers (Applegate, unpublished data). This may be a result of the free time available to people in various professions.

An inverse relationship exists between the size of a community and the percent of participation in hunting by members of that community (BSFW 1972). It is felt that inaccessibility to hunting areas is a major determinant in this relationship.

Violations and Illegal Kill

Associated with the existence of any deer herd is the possibility of unlawful action by a certain percentage of the human population. Title 23, the New Jersey Fish and Game Laws, expressly prohibits taking of deer outside the regular seasons and provides the enforcement officer with criteria on which to prosecute violators.

Conservation officers spend many hours patrolling at night to apprehend violators, as much of the illegal harvest is attributed to night hunting. For the past nine years, an average of 273 convictions for violations of laws pertaining to deer took place annually. A trend of increasing apprehensions may be attributed to a stepped up enforcement effort and more personnel.

The largest number of prosecutions involved possession of an uncased weapon after the hours of darkness, followed by charges of hunting deer during a closed season. Possession of a deer out of season was the third most prevalent violation. An average of 24 apprehensions for possession of a loaded firearm in a vehicle were made per year over the past eight years. A listing of convictions from 1966 to 1975 can be found in Appendix R.

The known illegal kill for fiscal 1974-75 was 266 animals. This represents only those animals which were recovered by Division personnel. No data is available on the extent of the total illegal kill.

Crippling Loss

* Associated with harvests of big game animals is a loss from crippling of animals which are unrecovered by hunters. Animals which are not legal because of sex or antler development may be taken accidentally or intentionally and abandoned by hunters. Such animals must be considered in any study of crippling loss (Losch & Samuel 1976).

The extent of crippling and illegal losses has been studied by many authors. Estimates of losses range from 5 percent (Welch 1975) to over 100 percent of the take home harvest (Deboer 1957) (Welch 1975).

Tully and Gilbert (1957) cited five factors which were important to crippling and illegal losses. One of the most important determinants was the type of season, i.e. bucks only, either-sex, or two deer. The terrain and cover in the hunting area and number of hunters also enter into the picture. In the category of hunters was included their attitude and the type of weapon used. Existence of snow cover or adverse weather conditions influences the crippling loss. Strong law enforcement efforts may affect this loss.

Losses sustained during a bucks-only season tend to be higher than those in an either-sex season (Costley 1948) (Tully & Gilbert 1957) (Deboer 1957) (Welch 1975) (Losch & Samuels 1976). Reasons for this are associated with accidental or intentional killing and abandonment of illegal does and fawns in a bucks-only situation (Deboer 1957) (Welch 1975) (Losch & Samuels 1976).

Terrain which makes tracking difficult may affect recovery of wounded animals. Tracking snow aids considerably in recovery of injured deer (Robinette 1975). Adverse weather conditions could conceivably deter a hunter engaged in tracking a wounded animal (Tully & Gilbert 1957).

Hunter density is sometimes considered to be inversely related to crippling (Robinette 1947) (Downing 1971). Indications are the high hunter density increases the probability of one hunter finding another's crippled deer (Downing 1971).

Legal weapons for deer hunting in New Jersey include shotguns loaded with rifled slugs or buckshot, muzzle-loading rifles, and re-curve or compound bows. Crippling loss with shotguns was assessed by Downing (1971) for buckshot and slugs. Losses were listed with buckshot appearing to be lower in areas of dense vegetation than in open areas (Downing 1971). High density of hunters may also influence the crippling losses (Downing 1971).

High archery losses were cited by Tully and Gilbert (1957) and Downing (1971). These results are subject to question because of small sample sizes and methods (Losch & Samuel 1976). On the other hand, Deboer (1958) and Severinghaus (1963) found archery losses to be less than 10 percent. Losch and Samuels (1976) estimate archery losses at 20 percent. Much research on archery losses is needed before concrete statements can be made (Losch & Samuels 1976).

Under the heading of crippling loss may be included animals which are wounded, are unrecovered by hunters, and subsequently die; animals killed and abandoned as illegal; and animals which are crippled but which may recover from their injuries.

Methods used to determine crippling loss by most authors are personal observation, field interviews of hunters and intensive field searches (Tully & Gilbert 1957). Interviews and field searches appear to be the more accurate estimators of mortality (Hardin & Roseberry 1975). A post-hunt questionnaire sent to hunters indicated a 32 percent loss on the Crab Orchard National Wildlife Refuge (Hardin & Roseberry 1975). Searches carried out on the refuge revealed a 20 percent loss (Hardin & Roseberry 1975). Batholomew (1965) also believed hunters overestimated losses. Wood et.al. (1970) found actual crippling losses to be higher than indicated by hunter interviews.

Field investigations by Robinette (1947) over an eight year period indicated losses of 17 percent of Fishlake National Forest. Losses of mule deer in Utah during a bucks-only hunt ran as high as 42 percent while losses in an either-sex hunt were 25 percent (Costley 1948). A questionnaire and interview project by Hunter (1954) indicated that losses of 11.5 percent were sustained in Colorado. Taber and Dassmann (1957) cite losses of 40 percent or more of the take-home kill. VanEtten et.al. (1965) observed losses of 10-15 percent in a square mile enclosure.

Losch and Samuel (1976) in a review of the state-of-the-art in crippling loss studies observed that techniques and findings varied widely among authors. Losses vary depending on cover type, weapons used, and type of season (Losch & Samuel 1976). Heavy hunting pressure may reduce cripple loss of bucks in a bucks-only season (Losch & Samuel 1976). A deer crippled by one hunter may be recovered by another (Hunter 1954). Studies are in progress to determine extent of the loss in New Jersey during the various seasons (Lohfeld, personal communication 1976).

Observations by Nettles et.al. (1975) showed that traumatic injuries due to gunshot wounds and highway collisions are usually fatal and result in little chronic debilitation. Data was taken from necropsy records of 1,002 white-tails. Evidence of previous injury was present in 76 deer or 7.6 percent (Nettles et.al. 1975). Percentages of injured deer did not vary significantly according to sex, physical condition, or six month period associated with high or low hunting pressure (Nettles et.al. 1975). Thirty percent of the injuries observed were due to gunshot or arrow wounds (Nettles et.al. 1975).

Losses associated with deer harvests may be of considerable importance to deer management (Whitlock & Eberhardt 1956). Studies and observations on this subject are a necessary part of sound management programs.

Hunting Pressure

The number of deer in New Jersey and their visibility to the hunting public, make them one of the most sought after game species in the State. As the only legal big game animal in New Jersey, all the big game hunting pressure is exerted on white-tailed deer. Because of the limited amount of space available and the large number of hunters, heavy hunting pressure does occur. This is especially evident on lands open to public hunting. In some areas, the aesthetic quality of the hunt may be adversely affected by crowded conditions.

Intense hunting pressure is the most efficient means of obtaining a satisfactory harvest. The largest harvests generally occur on days of highest hunter concentrations such as holidays and weekends (Laramie & White 1964). Distribution of New Jersey hunter harvests for the fall 1974 bow and arrow season and firearm season are presented in Appendixes S and T.

Lund et.al. (1975) showed Saturdays and holidays to be the days of highest kill during the fall archery season. A distribution of the firearm harvest showed the greatest number of animals harvested on the opening day of the season. It is likely that the largest number of hunters were afield on that day. The last day of the season, a Saturday, showed an increased harvest, possibly associated with the number of hunters afield on that day, Appendix T.

It should be noted, however, that the harvest during the firearm season in southern zones is more evenly distributed over the course of the week than in the north. Hunting pressure, number of deer, and habitat types are reasons for this difference in distribution (Lund et.al. 1975).

Non-Consumptive Users

White-tailed deer are of value to hunters and non-hunters alike. There are undetermined numbers of recreation days provided to photographers, students and deer watchers, both those who hunt and those who don't.

A recent survey of 3,600 Michigan residents indicated that deer were of some importance to a majority of the respondents (Langenau 1976). From the results of the survey, it was estimated that 2.6 million people actively sought to observe or photograph deer during a given year. Of this total, 25 percent had hunted deer during the previous season.

There is every reason to believe that deer are also important to non-consumptive users in New Jersey. The visibility of the animals prompts people to engage in observation and attempts at photography. The aesthetic appeal of the New Jersey white-tail may be very high.

For many New Jersey residents, seeing a deer is a rare occasion. Urban dwellers sometimes drive many miles to observe the rural landscape and animal life which exists there. Glimpsing a deer enhances a trip in the country and just the knowledge that there are deer to be seen gives such people satisfaction.

A good deal of money is spent in pursuit of photographing wildlife in New Jersey. Equipment and film are of course the major expenses, but transportation and time also run up the expenditure.

It is interesting to note that of all the users of the Michigan deer herd, 27 percent were opposed to hunting while among the non-users, the number opposed to hunting was 41 percent. The non-users were those respondents who had no contact at all with deer during the year (Langenau 1976).

As urbanization encroaches on deer habitat, the carrying capacity of New Jersey's deer range will undoubtedly diminish. The result of this encroachment will be a reduction in the deer herd. With increasing human population and a decreasing deer population, the value of an individual animal will rise. No longer will large numbers of deer be available for the enjoyment of the public. Consequently, a smaller number of deer will have to fill the recreational potential now filled by several animals, resulting in the increased value of individuals.

Economic Aspect

Economic Value of the Meat and Hides

The economic value of the meat from the anticipated harvest of deer during the proposed hunting seasons would be between \$589,950 and \$879,175, utilizing the system for determining the market value of venison developed by Wilcox (1976). These figures were determined from a harvest range of 11,400 to 13,900 and each animal providing 45 to 55 pounds of boneless meat. The value of each pound of venison was determined to be equal to the average price of ground chuck during the deer seasons (\$1.15). The value of deer hides at the 1975 Central Jersey Fur Auction was \$1.50 (low) to \$3.50 (high); however, only a small percentage of deer hides are sold annually. The potential value of hides ranges between \$17,100 and \$48,650.

Taxidermy

Information obtained from the New Jersey Taxidermist's Association indicates that the average (member) taxidermist in the State mounts 140 deer heads per year. Between 30 to 50 percent of the mounts are New Jersey whitetails. Price range of mounts ranges between \$90 and \$130 depending on size. An estimated \$94,600 in net income is generated to the sixty members of the association for mounting approximately 860 New Jersey deer heads. This total does not include net income generated to over 40 other taxidermists that are not members of the New Jersey Taxidermist's Association. An estimated minimum of \$100,000 is generated to the New Jersey economy from mounting heads, antlers and hoofs. The income to individual taxidermists is substantial and varies by geographic location and specialization (Barone personal communication).

Protein Value

One of the motivating factors of an individual hunting deer is to kill one for consumption. Since the average deer harvested in New Jersey provides sixty to seventy pounds of meat, the diet of many families could be supplemented by the consumption of a single deer. Some families would eat the meat because they prefer it to commercially purchased meat. Others would eat it out of need. Whatever the case, sportsmen and their families do utilize the deer meat and it does help fill their protein requirements. A survey in 1975 indicated that 80 percent of the successful bow and arrow hunters and their families consumed their deer (Burke et.al. 1976).

Incidental Utilization

Many fishermen and companies dealing in fishing supplies utilize hair from deer tails in the construction of fishing lures such as "buck tails". Antlers and bones are sometimes made into jewelry and knife handles. Meat scraps and bone are also used as pet food in the home.

Deer Damage

Depredation of farm crops, nursery stock and ornamental shrubs around private homes is a very serious and expensive problem in some areas of New Jersey. The major problems usually occur in agricultural areas where concentrations of deer exist. A substantial harvest of the herd by sport hunting will help keep the problem at a minimum.

When a deer damage problem is reported to the Bureau of Wildlife Management's Wildlife Control Section, a standard procedure is followed. The situation is investigated by a Wildlife Control Representative and repellents or fencing is recommended. If the problem cannot be handled by the repellent or fencing, and the damage is extensive and appears that it will continue, a permit is issued to the farmer to shoot any deer he sees in the act of damaging his crop by the local Conservation Officer (Howard 1975). This policy has been necessary in some areas even though the deer are subject to an annual hunt. If the deer seasons were closed, the problem would expand and increased number of shooting permits would have to be issued to complaining farmers with legitimate problems.

The relationship of the deer population to the habitat is important from other standpoints. For example, where deer populations have been high, over utilization of preferred food species has occurred. The

result has been severe damage or loss of vegetative types in these areas. When vegetation is significantly modified, other wildlife species are affected by increased competition or loss of food and cover. Various examples of habitat deterioration due to deer overpopulation have been noted including: the Seneca Army Depot in New York (Hesselton et.al. 1965), the Kaibab North Plateau in Arizona (Tretethen 1967) and the Great Swamp of New Jersey (Vogt 1976).

The Division of Fish, Game and Shellfisheries handled 392 deer damage complaints for the fiscal year ending in July 31, 1976. The same number or a slightly higher figure is anticipated for the 1977 fiscal year.

In response to the deer damage problem in fiscal 1976, repellent was issued to individuals with authentic complaints and wire mesh and barbed wire distributed to qualified applicants. Four hundred and twenty gallons of Magic Circle Repellent and one hundred and twenty-two gallons of Tat-go Repellent were distributed at a cost of \$3,927.40 and \$1,464.00 respectively. One hundred seventy rolls of wire mesh at a cost of \$6,840 and twenty-two spools of barbed wire at a cost of \$440 were distributed to qualified applicants. The total expense for the material used in handling deer damage complaints (wages and transportation excluded) for fiscal 1976 was \$11,671.40. Estimates of total expenditure for processing damage complaints range as high as \$30,000 annually (Toth personal communication). Appendix U. summarizes deer complaints and materials distribution (1966-76).

Deer-Vehicle Collisions

The number of deer-auto collisions on the highways of New Jersey are estimated at five thousand per year. This figure is a conservative estimate as it is felt that many of these accidents go unreported. The value of the meat and hides lost through road kills is approximately \$115,000.

Insurance companies surveyed in 1975 reported that property damage resulting from deer-auto collisions cost between \$600,000 and \$1,000,000 per year (McDowell unpublished data). The deer/vehicle conflict has two peaks, the first being in November during the "rut" and the second in May and early June when the "family" unit breaks up prior to the birth of new fawns (McConnell 1975). Disregarding the economic loss, the danger to man and deer is considerable. Many human deaths have resulted from deer-car collisions. Without a controlling agent, the number of accidents would increase considerably.

Division Expenditures

The deer research project budget for fiscal 1976-77 will be \$85,000. Other costs, projected from prior years were estimated as follows: administration \$51,708, law enforcement \$160,098 and deer management \$154,132. The total estimated Division expenditures for fiscal 1977 is \$370,938.

The Division will receive approximately \$805,650 from deer hunters for licenses in 1976. This includes the total of monies received for special deer permits and bow licenses which are used almost exclusively for deer hunting, and sixteen percent of the

revenue from firearm license monies based on the fact that sixteen percent of the total man days spent firearm hunting are devoted to deer hunting.

Hunter Expenditures

Mangold (1964) determined that deer hunters spent nearly \$6,000,000 on their sport in 1964. The 1970 Survey of Fishing and Hunting listed the average expenditure per big game hunter in the northeastern United States at \$122.53. Projecting this information, all New Jersey deer hunters spent over \$16,000,000 in 1970. Since 1970, the number of hunters has increased, and inflation has increased hunter expenditures. The 1975 National Survey of Hunting, Fishing and Wildlife Associated Recreation indicated that average deer hunter expenditures ranged between \$204.00 and \$228.00. Projecting this information, 134,429 licensed deer hunters spent between \$27,423,516 and \$30,649,812 in New Jersey in 1975. Utilizing a total deer hunting related expenditure of \$27,540,000; the average expenditure per deer harvested in 1975 was \$2,170; and, \$36 was spent per recreation day deer hunting.

CHAPTER 3.

ENVIRONMENTAL IMPACT OF THE PROPOSED ACTIONS

Harvest Impact

Estimated Harvest

The total harvest for the four proposed deer hunting seasons in New Jersey will range from 11,300 - 13,900 deer. Range in harvest for the four seasons is anticipated as follows:

1. fall, bow and arrow deer season (1,700 - 2,000)
2. six-day, firearm deer season (6,000 - 7,500)
3. special permit deer season (3,500 - 4,000)
4. winter, bow and arrow deer season (100-400)

Season Framework

Four deer seasons have been proposed for the harvest of white-tailed deer during 1976-77 as follows:

1. fall, bow and arrow (October 2, 1976 - November 4, 1976)
2. six-day, firearm (December 6, 1976 - December 11, 1976)
3. special permit (December 15, 1976)
4. winter, bow and arrow (January 8, 1977 - January 15, 1977)

Bag Limit and Hunting Hours

The season bag limit is one deer per season for the four seasons. (Refer to Appendix B for notes, exceptions, limitations and details).

1. During the fall bow and arrow deer season, one deer of either sex may be taken.
2. During the six-day, firearm season, one deer having antler at least three inches long may be taken. The exception is the "hunter choice" area (Zone 36) in which one deer of either sex may be taken.
3. During the special permit deer season one deer of either sex may be taken.
4. During the winter bow and arrow deer season one deer of either sex may be taken.

The legal hunting hours during both archery seasons are 1/2 hours before sunrise to 1/2 after sunset; and for both the six-day firearm season and the special permit season are 7:00 a.m. E.S.T. 5:00 p.m. E.S.T.

Overall Impact

The Bureau of Wildlife Management recommendations combined with all other non-hunting mortality factors including highway kills, illegal kills, accidental death, dog kills, damage control and other types of mortality will maintain the population at or below the carrying capacity and, at a density compatible with other land uses within the deer range.

By keeping the deer herd in balance with the habitat, the health and productivity of the deer population and quality of the range will be maintained. An annual harvest of the deer herd will reduce the depredation of farm crops, gardens and ornamental shrubs. The number of deer-

auto collisions will decline as will the expense of the associated property damage.

Some crippling of deer will occur during the proposed seasons; however, available information indicates that incidence is very low. Examination of deer for arrow wounds on December 9, 1974 indicated that only 0.7 percent of 1,173 deer had been injured by arrows (Appendix V.). Injury from deer-auto collisions was noted more often in many areas.

Impact on Endangered and other Protected Species

There is no evidence indicating deer hunters have been involved with the killing or wounding of any protected or endangered species in the course of the deer seasons; however, the possibility must be considered in this statement. Since white-tailed deer have no similarity in size or appearance with any endangered or nongame species in New Jersey, the possibility of mistaking another animal for a deer is remote. The probability of a stray shot encountering an endangered or protected species is infinitesimal after considering the number of animals involved, habitats occupied, season and probability. The danger of deliberate shooting of wildlife other than deer during the season is a possibility; however, no instance of a rare or endangered species being shot has been recorded.

The benefits from the proposed hunting seasons to a large number of people outweighs the remote possibility of killing or wounding an endangered or protected species. Continued strict law enforcement and the sportsman education program will further reduce the possibility of such a violation taking place.

Impact on Habitat

The proposed action will have some impact on the vegetation. Breakage of twigs and trampling of vegetation will occur as hunters move through woods and fields. Since the hunting seasons occur during the months in which annual plants have expired and perennial plants are in a state of dormancy, the physical impact of the hunters will be minimal. Visual damage will be short term and physical impact is not expected to extend into the following growing seasons. Construction of deer stands or elevated platforms in trees could damage some trees and be esthetically undesirable to some individuals. This problem will be reduced by use of portable non-permanent tree stands and enforcement of existing laws where necessary. Impact on agricultural crops will be minimal since, most crops will have been harvested by the hunting seasons or will be cover crops in early stages of development. Posting of property and enforcement of trespass laws have in the past minimized problems or conflicts in land use.

There is a potential problem with lead shot since lead pellets have been shown to be detrimental to some game birds causing lead poisoning when ingested. Lead poisoning can occur in upland wildlife but there is no evidence available to substantiate this possibility. Waterfowl are recognized as the victims of this problem, where hunter density is so high that the density of pellets is one per square foot (Smith 1972). The density of lead shot due to the proposed hunting would be insignificant. Most of the buckshot pellets and all of the rifled slugs could be eliminated from consideration due to their size.

The harvest of 11,300 to 13,900 deer by hunters will reduce the depredation to farm crops, nurseries and ornamental shrubs. This will result in fewer deer complaints and reduce the expense of handling the additional problems.

Competition for food, and cover increases when several wildlife species depend upon or utilize vegetation that has been browsed by deer. The deer can eliminate most or all of the vegetation growing close to the ground when they become too numerous.

The reduction in the deer herd will ease the competitive pressure among the different species and provide the habitat with an opportunity to improve or at least maintain its present level of production.

Impact on Hunters

The proposed action would have a positive impact on the deer hunting public. The four proposed seasons would make 2,048,000 potential hunting days available. These days would provide ample time for all interested sportsmen to enjoy the recreation and relaxation that is associated with an outdoor hunting experience. There are many people who look forward to such opportunities as well as the possibility of having a successful hunt which means taking a deer home for consumption. The food value is a motivating factor to some since a deer can supply up to one third of the meat required by a family of three for a year (Wilcox 1976). The proposed action would create a favorable psychological impact on those who believe that hunting is a wise use of a natural resource.

The risk of injury must also be considered. A hunter could be shot accidentally or shoot himself through negligence. Overexertion on the part of some hunters could result in heart attack. Although there is risk of serious accident, hunting is ranked below many contact sports such as football in terms of safety or the number of accidents involved compared to participant time. A continued hunter education program and good law enforcement should minimize the possibility of accident or injury. Appendix W. illustrates the recorded accidents from 1914 through 1975.

Impact on the Non-Hunting Public

The proposed action may cause some people to avoid open space areas during the hunting season. Although these individuals fear injury, there is no evidence to substantiate these fears. In fact, many parks are utilized by fishermen, hunters and campers at the same time and with no conflict.

Those individuals in our society who find the killing of wildlife species morally or emotionally disturbing and are opposed to hunting may view the proposed deer seasons as a violation of their personal values and as a result, suffer mental anguish.

The hunting seasons will also temporarily reduce the visibility of deer through herd reduction and behavior modification.

Impact on the Economy

As indicated in Chapter 2, deer hunters make substantial expenditures on ammunition, firearms, archery equipment, transportation, clothing and other special hunting items. In the course of the deer seasons, hunters do business with stores and restaurants located in the vicinity of their hunting area. These expenditures are especially important to the economy of small towns such as Chatsworth and Greenbank. If the proposed hunting seasons were not held sporting goods and recreation businesses would suffer loss of revenue.

The Federal Pitman-Robertson Tax of eleven percent on firearms, ammunition and archery equipment is returned to the state to support approved research projects, habitat management and land purchases. For fiscal 1974, \$749,359 was collected under the Pitman-Robertson Act in New Jersey (U.S. Fish and Wildlife 1974). If no action is taken, the recreation and sport hunting related industries will suffer severe losses, and the Division will have less money from the Pitman-Robertson tax to fund its programs.

Impact on State Administration

The cost of deer management in New Jersey was estimated to be \$132,837 between July 1, 1964 and June 30, 1965 (Mangold 1965). This total included: \$51,675 for the Deer Management Project; \$68,607 for law enforcement; \$11,555 for deer research and \$1,000 for administration. The total was approximately 7 percent of the Division's budget.

The projected cost for deer management in New Jersey for the period July 1, 1976 through June 30, 1977, is estimated at approximately \$370,938. This total includes: \$85,000 for deer research; \$160,098 for

law enforcement, \$154,132 for deer management and \$51,708 for administration. The total represents 7.46 percent of the total budget.

Impact on Energy Consumption

The deer hunter in New Jersey drives an average of 210 miles a year in the course of his hunting effort (Bureau of Sport Fisheries & Wildlife 1972). If, the average gas mileage of cars and light trucks is 10 miles per gallon, the deer hunters of New Jersey will use an estimated 3,360,000 gallons of gasoline.

State agents and law enforcement personnel drive approximately 300,000 miles per year on deer related assignments. The gasoline consumption would be about 30,000 gallons.

The consumption of energy would not be reduced by channeling people to other forms of outdoor recreation. New Jersey is the most densely populated state, with over 950 people per square mile and 85 percent of the people live on only 15 percent of the land. The open recreational areas are located a considerable distance from the densely populated areas because of the demand for the land and the high cost. Consequently people have to drive quite some distance to reach these recreation areas. Another possibility is that New Jersey hunters, if deer hunting is not permitted in this state, will drive to other states where hunting is permitted. The obvious conclusion is that it is necessary to drive a reasonable distance in New Jersey to participate in most outdoor recreation activities and very little energy could be conserved by discontinuing deer hunting.

Impact on Neighboring States

The proposed deer seasons for 1976 will have no adverse effect on the deer herds of the neighboring states of Pennsylvania, New York, and Delaware as the white-tailed deer is nonmigratory in habit (Lund 1975). Records show that some white-tailed deer tagged in New Jersey have turned up in Pennsylvania; however, the incidents are isolated cases and insignificant.

Approximately 2,500 to 3,000 non-resident firearm licenses and 350 to 400 non-resident bow and arrow licenses will be sold for the proposed 1976 hunting seasons. This will bring an additional \$114,000 to \$136,000 to the Division of Fish, Game and Shellfisheries.

Chapter 4.

MITIGATING MEASURES INCLUDED IN THE ACTION

Measures which help reduce the adverse environmental impacts of deer hunting include the hunter education program, the law enforcement effort, and the Wildlife Education Section of the Division of Fish, Game and Shellfisheries.

New Jersey hunting regulations require that all eligible individuals applying for a hunting license must provide proof of a previous license or complete one of the hunter education courses offered by the Division. In fiscal year 1975-76, 14,526 students certified for fire-arm licenses and 4,714 for bow and arrow.

Evaluation of the volunteer hunter education instructors and instructors training seminars are held annually.

The success of the Hunter Education and Safety program is substantiated by the continued reduction of hunting accidents and adverse incidents. This is in spite of the continued loss of open hunting lands while hunter numbers continue to increase.

The law enforcement effort under Title 23 of the New Jersey Fish and Game laws helps to reduce the safety hazard and destruction of the habitat and minimized the possibilities of any violations associated with hunting.

The Wildlife Education Section of the Division of Fish, Game and Shellfisheries conducts a program of deer management education directed at the hunting and general public. The basic concepts of

population dynamics are the foundation of the educational effort. Through publications, articles, news releases, seminars, and radio and TV programs these concepts are illustrated to the target publics. In addition, the economic and recreational importance of the deer resource to the citizens of the state is emphasized. Also highlighted in the education program is the importance of habitat and the effects of man's activities on the environment of deer.

The role hunting plays in the management of deer is also an important part of the educational program. The beneficial effects of keeping the deer herd below the carrying capacity of the habitat and the wildlife conservation accomplishments provided by funds from hunting licenses and taxes on sportsmen's equipment are explained.

Chapter 5.

UNAVOIDABLE ADVERSE EFFECTS

A loss will be incurred during the legal harvest through unavoidable crippling loss and illegal kills. In the past four years the known illegal kill has averaged 288 deer.

Other species may be taken accidentally or intentionally as a result of deer hunting activity. The only other large mammal which might be encountered in New Jersey is the black bear; however, bears are unlikely to be confused with white-tails.

Because there are few species present in New Jersey which might be mistaken for deer, incidence of accidental harvest of non-target species is probably slight. A concerted law enforcement effort would handle the low incidence of intentional taking of other species.

There may be some lead shot accumulation in areas subjected to intensive hunting pressure. There is no evidence that deer ingest lead to any significant degree; however, birds, particularly waterfowl and gallinaceous species, may ingest the lead. Ingested pellets could conceivably cause lead poisoning in individual animals. For this to occur, the number of pellets per acre must be extremely high. The possibility is so unlikely as to be negligible.

Contact will be increased between man and deer thereby increasing the potential for transmission of communicable disease from deer to

man. The probability that a deer will be carrying a disease of any danger to man, however, is so small as to be considered insignificant.

Hunting activities will temporarily reduce the deer population in certain areas thereby making location of deer difficult for those who wish to observe and/or photograph them. Activities of hunters may cause deer to be more cautious and wary, exposing themselves less to the view of the public. This effect will probably be short lived (Behrend & Lubeck 1968).

Certain members of the human population may be disturbed by the sights, sounds, and knowledge of the hunting activities due to their moral objections to hunting, killing and/or their fear of firearms.

Lands that are usually open to members of the non-hunting public may be inaccessible during the hunting seasons causing distress and inconvenience. Isolated cases of trespass and/or violation of landowners rights by hunters may cause some properties to be closed entirely to public use.

Hunting activities may result in trespassing and acts of vandalism. Landowners will incur expenses due to vandalism and necessary posting of lands.

Segments of the population may be disturbed by the noise associated with the seven days of firearm seasons. Some individuals may be disturbed by automobile noises at early hours as hunters drive to the field. These disturbances are expected to be of minor consequence.

Hunting activities carry inherent risks to both hunter and non-hunter alike. There may be accidents involving firearms or bow and arrow and accidents caused by overexertion, stumbling and overheating. Regulations governing hunting activities will reduce the potential for accidents.

Hunting activities may increase the volume of litter in streams, woodlands and other areas. The quantity of trash on state owned lands and rural areas undoubtedly will increase with the influx of hunters. Additional expenses will be incurred in removal of this trash.

Some damage to farm crops may result from hunting activities. Hunting seasons fall after most crops have been harvested so that the damage should be minimal. Natural vegetation may be trampled or destroyed in localized areas due to heavy hunter concentrations or dragging of carcasses. It is expected that most areas will recover in the following growing season and lasting effects will be minimal. Some trees may be damaged or killed by the cutting of limbs, building of tree stands and gunshots by hunters. Most trees will recover from these injuries and lasting damage is likely to be insignificant.

Chapter 6.

RELATIONSHIP BETWEEN SHORT-TERM USE OF MAN'S ENVIRONMENT AND LONG-TERM MAINTENANCE AND ENHANCEMENT OF ENVIRONMENTAL PRODUCTIVITY

Sustained Yield and Harvest

A total of 279,312 white-tailed deer were legally harvested between 1909 and January 15, 1975. The harvest of deer in New Jersey has generally been limited to taking adult males and, in recent years, numbers of surplus antlerless deer. The concept of limiting the harvest to a portion of the surplus allows for harvests to occur annually or on a sustained yield basis. Dasmann (1964) refers to the excess of game above the carrying capacity of the environment as the "shootable surplus." This surplus, if not taken by hunters, would inevitably be removed by some other means, such as deer-auto collisions, illegal shooting, disease or malnutrition. The short-term use of the deer herd by sport hunters will enhance the long-term maintenance of the deer herd by keeping it in balance with the range.

Expenditures by Hunters

Deer hunters in New Jersey spend over twenty seven million dollars in their hunting effort, as discussed in the economic section of this assessment. The harvest of deer for consumption may ease the financial burden of providing food for some families. Although many hunters do

obtain meat for their effort and investment, deer hunter expenditures are far greater than the value of meat obtained. A survey made in 1965 indicated that for each deer harvested, the hunters of New Jersey spent seven hundred thirty six dollars and fifty cents (Mangold 1965). The expenditure per deer harvested in 1975 was \$2,170.00 (See Chapter 2.).

Pitman-Robertson Tax

The Pitman-Robertson tax on firearms, ammunition, and archery equipment provides money to the State for support of their wildlife research project. In New Jersey, the funds from the Pitman-Robertson tax have been used by the Deer Research Project in the investigation of the Epizootic Hemorrhagic Disease outbreak in 1975, herd population studies, herd condition and reproductive research, habitat development, mapping the extent of the remaining deer range in New Jersey and the capture and tagging of deer for age and movement studies. Monies from this source have also been used to develop habitat for various species including deer. Other monies have been used to acquire open space.

Expenditures by the State

The State's expense of enforcing game laws, maintaining wildlife management areas, administration, handling deer complaints and 25 percent of the cost of deer research comes strictly from the sale of hunting licenses and special permits. The general public does not contribute funds to the support of the Division of Fish, Game and Shellfisheries.

Health and Productivity of the Deer Herd

The basic short-term principle to be followed in the proposed action is the reduction of the deer herd prior to the winter stress period, to a level below the carrying capacity of the range.

The short-term procedure, conducted annually, will insure health and productivity of the deer herd and vegetative habitat upon which it depends.

Local Benefits

Landowners will benefit from the income of land leased to hunting clubs.

Local economies benefit from the money deer hunters spend on food, supplies and gas. Many small communities have come to depend on this seasonal income.

Many deer clubs throughout the State own their own land and pay property taxes. This land is generally utilized during the hunting seasons and a few weeks prior to and directly after them. The remainder of the year, much of this land is open to the public. If the proposed deer seasons were closed, land would be sold to developers and lost as wildlife habitat or open space.

Chapter 7.

INVESTMENT AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Deer Harvest

The irretrievable commitment of the resource from the proposed action will be 11,400 to 13,900 deer. This loss will be temporary since, these deer will be replaced by the fawns born during the following spring. It will be necessary to remove approximately eleven to fourteen thousand deer each year through sport hunting to maintain a balance between the deer population and their habitat. Should no action be taken, many of these deer would inevitably die from other means such as automobile collisions, illegal hunting, disease or malnutrition; and, the habitat could be severely damaged due to overpopulation of a limited deer range.

The total deer population in the State has fluctuated slightly in recent years. Some deer management zones have experienced significant increases of deer while others, such as Ocean County, have had declining deer populations due to loss of open space to human encroachment. The loss of open land and deer habitat to development has been at the rate of 45 square miles per year; this is very significant when one considers that New Jersey contains only 7,489 square miles (Dept. Trans. 1974).

Commitment of Time, Money, Personnel, Gas by Hunters and State
Administrators

Approximately 1,050 man days a year are spent on the deer project by two part-time and two full-time biologists and one full-time technician. In addition, approximately 150 Division personnel are assigned to mandatory deer check stations during the firearm buck and either-sex seasons. (Monday, Tuesday and Saturday of the firearm buck season and the Wednesday of the either-sex season).

The deer research project budget for the fiscal year July 1, 1976 to June 30, 1977 will be \$85,000 (Appendix H.). The federal share will provide \$63,250, funded with Pittman-Robertson taxes. \$48,000 will cover salaries and approximately \$5,500 will be used for transportation, at a rate of eleven cents per mile. Gas consumption will be approximately 5,000 gallons. The law enforcement section, in their activities involving deer, will consume approximately 30,000 gallons of gasoline and total expenditures are estimated at \$160,098. Other projected costs of deer management include: \$154,132 for deer management and \$51,708 for administration.

The deer hunters in the course of their hunting effort during the four proposed seasons will use approximately 21 gallons per hunter or 3,360,000 gallons totally (National Hunting and Fishing Survey 1970).

Chapter 8.

ALTERNATIVES TO THE PROPOSED ACTION

Total Protection of Deer Except Under Damage Complaints

The total protection of the deer herd in New Jersey, except for damage complaints, would essentially mean no management. The results of no management have been well documented in wildlife literature, such as the situations in the Seneca Army Depot (Hesselton et.al. 1965) and the Kaibab North Plateau (Trefethen 1967). The problems which existed in and around the Great Swamp National Wildlife Refuge would be expanded throughout the entire State (Vogt 1976). The white-tailed deer has no natural predators in the State of New Jersey. With the complete protection alternative, the deer population would continue to expand and habitat conditions would deteriorate in a manner similar to the classic examples of protected deer populations.

Crop Damage

If no management effort is made to reduce the population, deer damage to farmer's crops, commercial nurseries, and private ornamental shrubs would increase considerably. Consequently the expense of handling the deer damage complaints would increase as more materials and personnel for handling complaints were required. Shooting permits, issued to farmers with substantial evidence of crop damage, would

increase (51 permits were issued in 1976). At the present time, most farmers rely on the hunting season to limit deer numbers and minimize crop damage.

Deer-Vehicle Collisions

Deer vehicle collisions would increase considerably, particularly in areas of high deer density such as Hunterdon, Warren and Sussex Counties. Property damage, danger to human life and the complete waste of the deer would increase proportionally to the number of accidents, making this one of the most significant impacts of the complete protection alternative.

Impact on Hunting Public

The complete protection of the deer herd alternative would have a serious adverse effect on the deer hunting public. There has been an open season on deer in New Jersey every year since 1909. Some individuals who have been hunting within the game laws may find the new restriction hard to accept and consequently become a violator. The law enforcement effort and costs would increase drastically. Hunters that accept the new restrictions may be distressed and suffer mental anguish at the loss of a life-long enjoyment and source of recreation.

Economic Impact

Private enterprise would suffer significant economic losses if the proposed deer seasons in New Jersey were not held. Sale of firearms, ammunition, archery equipment, special hunting clothes and equipment would be far below previous years. The numerous small

establishments which benefit each year from the hunters who flow into their vicinity during the deer seasons would also suffer considerable economic loss. An estimated \$27,423,516 to \$30,648,812 was spent by deer hunters in New Jersey during 1975.

The Division of Fish, Game and Shellfisheries would lose a potential \$805,650 if the proposed deer seasons are not held (See Chapter 2.). The New Jersey Division of Taxation would also lose significant tax revenues (sales taxes).

The reduction in the sale of hunting related equipment would also create a shortage of funds now available through the Pitman-Robertson Tax Federal Aid to Wildlife Restoration Program resulting in a cutback in wildlife research and management programs.

Non-hunters

Should an alternative to the proposed action be adopted, the impact on the non-hunting public would be negligible. Many individuals would be unaware of the change in policy, unless they were directly affected by deer damage, such as a farmer or someone who lived in an agricultural area. The non-hunters who feel the killing of wildlife for sport is unjust and an infringement on their rights would be relieved and experience a sense of accomplishment of attaining their goal to stop hunting.

Habitat Damage

If no effort was made to control the deer population, the habitat would deteriorate as the population increased beyond carrying capacity. Preferred foods would be selectively eliminated or damaged and the deer would increasingly have to depend upon plants with low

nutritive value and poor digestibility. The deer herd would eventually reflect this negative impact in physical condition and reproduction. Size, weight and antler development would decline. The incidence of disease, parasitism and starvation of deer during the winter stress period would increase.

Maintaining a balance between the deer and its range is important from standpoints other than the deer themselves. An over-utilized range can have a general detrimental effect on other species. Competition for food and cover becomes greater for other wildlife species that are dependent on vegetation that has been over-browsed by deer. For example, structural changes in shrubs and small trees can lead to the altering of habitat conditions for many small birds that are ground and shrub nesters (Hooper 1969).

Capture and Move

Capture and relocation of the annual surplus of deer is an unfeasible alternative to the proposed action for the following reasons: the number of deer to be removed on a Statewide basis is too large for any known capture method(s), the financial expense would be too great; and, there are no known areas to relocate large numbers of deer.

Between 11,400 and 13,900 deer would have to be removed on a Statewide basis. Although deer are captured utilizing box traps, immobilizer guns and other methods, attempts at controlling big game populations by capture and relocation methods have not met with much success. Capture-transfer operations on relatively small, fenced-in areas such as Seneca Army Depot in New York and Plumb Brook Station (N.A.S.A.) in Ohio proved to be an inefficient and costly alternative to hunting.

For example, it cost \$9,000 in 1954-55 to remove 318 deer from the Seneca enclosure by trapping two successive years under ideal conditions. During this period, the deer population at Seneca actually increased (Hesselton et.al. 1965).

In New Jersey between 1947 and 1968, 1,777 problem deer were captured and moved as part of the State's wildlife control program. Utilizing box traps, the animals were captured from fenced-in estates, military installations, industrial complexes and parks. The majority of animals were moved to areas which were "believed" to have low deer populations. The practice was phased out in 1968, for several reasons which are applicable here. First, cost of box trapping and relocating deer became prohibitive. (For example, the cost of capturing a deer under ideal conditions for the deer research project in 1973 was \$57 per deer (Burke 1973). This does not reflect depreciation or loss of box trapping equipment; and, all deer were released at the tagging site - requiring no relocation expense). Another reason for discontinuing the practice was that deer problems and complaints increasingly occurred in agricultural areas or areas with good quality range where trapping success is very low (Lund 1975). Third, nearly all of the deer range remaining in New Jersey is presently at carrying capacity (Howard 1972).

Other techniques such as immobilizing deer with "cap chur" guns, cannon netting and herding into fenced areas would be equally inefficient and costly for removing over 11,000 deer annually and on a Statewide basis. The problem of transporting and relocating deer would also prohibit these alternatives, since there are no areas in or near New Jersey which could accept a large number of deer annually.

Birth Control

The use of chemical reproductive inhibitors has been suggested as an alternative to the proposed hunting seasons. Reproductive inhibitors have been used with some success on domestic animals, but only experimentally on wildlife. The use of chemosterilants has not been field tested on deer and its indirect effect on humans or other fauna has not been determined (Linhart 1963). A controlled deer reproductive study in Ohio showed poor results using oral dosages of diethylstilbestrol due to rejection by the deer. Injections proved successful but a practical means of application to wild populations still remains to be developed (Ohio 1969).

The deer herd of New Jersey is free roaming throughout the State. Application of the inhibitor on a full scale effort would be extremely difficult and in most areas impossible.

The use of chemical reproductive inhibitors may be applicable in the future of deer management, but the development of more efficient techniques is necessary. At the present time, with the limited information available, the use of chemical reproductive inhibitors is impractical. The alternative, however unreliable and untested, would be favorable to many individuals who oppose hunting.

Expert Marksman

The use of a small group of expert marksmen to reduce the deer population in the State has been suggested as an alternative to a public open season.

The precise number of hunters and the length of time required to accomplish the desired harvest is not known; but, an estimate has

been made so that the financial burden can be interpreted. A group of one hundred marksmen would require six to seven months to harvest the 11,400 to 13,900 deer if each individual managed to kill one deer a day, which is a very high success ratio. The cost of salaries, equipment and transportation would probably approach \$750,000.

The disposal of the harvested deer would create another problem. One solution would be to donate the carcasses to charity organizations. The processing of meats would be approximately \$25 per deer or \$250,000 to \$300,000 for the total harvest. Another alternative would be to dispose of carcasses through a rendering plant; however, there would be a wasteful use of the resource.

Bucks Only Law

The adoption of a bucks only regulation, applicable to all deer hunting seasons, would be a step backward in the field of deer management. The bucks only regulation would not be in the best interest of the deer herd. There are a certain number of antlerless deer which must be removed each year in order to control deer numbers and to keep the herd in balance with the habitat. This alternative would meet resistance from both the non-hunters and hunters.

Either Sex

An either-sex regulation for all deer hunting seasons would not be a sound deer management practice. The harvest of antlerless deer is an important tool in deer management, but the number harvested must be regulated to maintain the population at desirable levels. This is why

the permit system is utilized in the administration of the proposed antlerless season. The implementation of the permit system provides the Bureau of Wildlife Management with a tool to scientifically limit the number of antlerless deer by deer management zone. An open season on all deer would lead to an unnecessary reduction in the total population. Some areas of the State could tolerate such a reduction; for other areas, it would be against the present goals of the deer management program.

This alternative would not be met favorably by many of the concerned interest groups. Those opposed to public hunting would strongly resist this alternative and the hunters would oppose reducing deer populations below present levels in most areas.

Shorter or Longer Season

The adoption of a shorter hunting season as an alternative action is unnecessary and purposeless. It would cause a loss of recreation days and make it difficult to attain the required harvest figures. On the other hand, the lengthening of the firearm buck or bow and arrow seasons would provide additional recreation time without jeopardizing the welfare of the deer herd. It would provide ample time to assure the harvest of the desired number of deer. The only serious problem would be a possible conflict with the other hunting seasons which are normally closed during the firearm deer seasons. There is no biological reason to prevent longer bow and arrow season running simultaneously with the small game seasons. It was done last year during the 1977 winter bow season, and has been conducted in other states for several years.

Persons opposed to public hunting would strongly oppose any extension of the hunting seasons; on the other hand, they would probably favor a shortening of the season, feeling that this might be a step toward complete abolition of hunting. The hunters would oppose the shortening of the season because of the loss of recreation time. The extension of seasons would probably be favored by many of the hunters although some might oppose it because it would interfere with their other types of hunting or long standing philosophies.

Reintroduction of Natural Predators

Reintroduction of natural predators, such as wolves and mountain lions, as an alternative to hunting has been suggested. Although wolves or mountain lions could possibly reestablish themselves over a period of several years in limited areas, the cost of purchasing the predators from a State willing to live-trap them and then the transportation to the release points would make this alternative extremely expensive (Weise 1975). Also, the reintroduction of these large predators in a State as densely populated as New Jersey could result in many undesirable repercussions. The animals would be reintroduced into an area and terrain with which they were completely unfamiliar. Their behavior could be quite abnormal and they may react aggressively in any encounter with domestic animals or humans. Because of the expense, the unknown reaction of the predators as an introduced species and the inability of predators such as the wolf and cougar to control deer numbers; the reintroduction of natural predators as an alternative to the proposed action is not recommended.

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Article 7. Deer

23:4-42. (Subject to change under Code.) Season; size of horns and number; killing on cultivated land. (As amended July 13, 1967.) Except as provided in the second paragraph of this section, no person shall hunt for, pursue, shoot at, take, kill, wound or attempt to take, kill or wound a deer of any description prohibited by the provisions of the State Fish and Game Code, or hunt for, pursue, shoot at, take, kill, wound or attempt to take, kill or wound any wild deer at any time except during the period permitted by the State Fish and Game Code, or, kill in any one year more than the number of deer permitted by the State Fish and Game Code.

The owner or lessee of any land, a portion of which is under cultivation, or the authorized agents of the owner or lessee having on their person a written permit issued by the division and countersigned by the owner or lessee, may kill any deer that may be found on that land during the period covered by the permit. The carcass of a deer killed under such permit shall become the property of the division and may be removed and disposed of in the manner it directs. For the purpose of this section, land under cultivation shall be construed to mean pasture fields seeded with cultivated grass or land on which planted crops are growing.

23:4-43. (Subject to change under Code.) Possession of wild deer prohibited; exceptions; possession deemed unlawful. (As amended June 30, 1971.) Except as provided by this section, no person shall have in possession in this State any wild deer other than during the open season

for hunting deer as established in the State Fish and Game Code and such deer in possession must have been killed in the manner prescribed by the State Fish and Game Code for that particular open season. A legally killed deer and parts of a legally killed deer may be possessed until June 1 immediately following the season in which it was killed, provided the deer was properly registered and bears the possession tag affixed at the deer checking station, and any parts that have been separated from legally killed deer are clearly marked as prescribed in R.S. 23:4-47. A person desiring to retain a legally killed deer or parts thereof after June 1 may do so by contacting the nearest Conservation Officer, who may authorize such retention in a manner prescribed by the division. No person shall have in possession any deer of any description, except as provided in the State Fish and Game Code or as provided in this section.

Except as herein provided, the having in possession of any wild deer or parts thereof during the time and periods prohibited in the State Fish and Game Code, or the having in possession of any deer of any description, except during such time and periods and of such description as permitted by the State Fish and Game Code, shall be prima facie evidence in all courts that such wild deer is in possession unlawfully.

This article shall not apply to a deer killed on game preserves, the owners or lessees of which are licensed by the division, or to deer coming from another state, which is properly tagged, showing where the same was killed.

23:4-44. (Subject to change under Code.) Weapons permissible in hunting deer; kinds enumerated. (As amended Dec. 11, 1957.) Unless otherwise prescribed by the State Fish and Game Code, no person engaged in hunting for wild deer shall use or carry a rifle of any kind or description, or any firearm or shotgun of a smaller caliber than 12 gauge, or load such firearm or shotgun with a bullet or other missile

larger than that commonly known as buckshot, or have in possession while engaged in hunting for deer during the open season for killing deer any missile except buckshot or, while engaged in hunting, have any missile larger than number 4 fine shot in possession at anytime other than during the open season for killing deer; provided, however, that nothing in this section shall prevent the hunting of deer with a bow and arrow as stated in this section and as otherwise provided by law and the State Fish and Game Code; provided, that it shall be unlawful, unless otherwise prescribed by the State Fish and Game Code, for any person to have in his possession or under his control any gun or firearm at any time while hunting deer with bow and arrow, and no person shall use or have in his possession or under his control while hunting any poison arrow, arrow with explosive tips, or any bow drawn, held or released by mechanical means.

23:4-45. (Subject to change under Code.) (As amended June 4, 1959) Hunting by daylight only. No person shall hunt for pursue, stalk, or shoot at a wild deer, except by daylight on the days designated by the State Fish and Game Code. No person or persons shall throw or cast the rays of any illuminating device which is affixed to a vehicle or which is portable, on any highway, road, field, woods or marsh wherein deer may reasonably be expected to be found, while having in his or their possession or control any firearm, weapon or other instrument which may be used to kill deer unless such firearm, weapon or other instrument is contained in a closed and fastened case, securely tied package, or carried in the luggage compartment of a vehicle; provided, however, the foregoing shall not apply to a duly constituted law enforcement officer while in the actual performance of his duties as such officer.

23:4-46. Dogs not to be used. (As amended July 2, 1957.) No person shall at any time, or for any reason, hunt for, pursue, track, trail, search for, seek, capture or kill a wild deer with a dog.

23:4-47. Deer transportation tag; report of killing; affixation of legal possession tag; possession of deer or parts; penalties. (As amended June 30, 1971.) A person who kills a deer in this State at any time during the legal seasons shall immediately attach thereto the deer transportation tag supplied with the hunting license and shall transport the deer to a deer checking station before 7:00 p.m. on the day said deer was killed, for registering the kill and having a legal possession tag affixed, which possession tag shall remain attached until carcass has been consumed.

A person not required to purchase a hunting license under provisions of section 23:3-1 of the Revised Statutes, who kills a deer in this State at any time during the legal seasons, or a person who has lost the transportation tag supplied with the hunting license, shall make and attach a transportation tag immediately after killing the animal, clearly stating his or her name and address, and if holding a license to hunt, the license number, with the date, township if known, and county in which the deer was killed and shall transport the deer to a checking station for registration as herein prescribed.

The division shall designate such checking stations as it deems necessary and shall prescribe regulations for their operation.

All deer killed during prescribed seasons shall be presented for registration at the nearest deer checking station by the person who killed the same, and it shall be registered in his name. No person shall present a deer for registration, or permit to be registered in

his name, any deer which he himself did not kill. No person shall at any time in any manner transport any deer unless open to view and there is securely attached thereto a legal tag. If deer is being transported by other than the licensee, written permission signed by the licensee killing the deer must be in possession of the driver.

No person shall have in possession at any time any deer, or parts of a deer, which has not been legally registered. The owner of a legally registered deer may give away parts of such deer provided each separate part is plainly labeled with the name and address of the person to whom it was given.

Any person who shall fail to properly tag a deer and transport it to a checking station, or who borrows, loans, transfers, buys, sells, or purloins any deer tag of another, shall be liable to the penalty prescribed by section 23:4-48 of this Title.

23:4-47.1. Transportation of deer. (Approved January 19, 1970.) No person shall at any time in any manner move or transport any deer, or part thereof, unless it is open to view and there is securely attached thereto at all times the deer tag portion of the hunting license bearing the name and address of the person who killed said deer. If deer is being transported by other than the licensee, written permission signed by the licensee killing the deer must be in possession of the driver.

23:4-48. (Subject to change under Code.) Penalties. (As amended June 30, 1971.) Except as otherwise specifically permitted by this article: any person hunting for, pursuing, shooting at, taking, killing, wounding, having in possession in this State or attempting to take, kill or wound deer of any description other than as permitted by the State Fish and Game Code, hunting for, pursuing, shooting at, taking, killing, wounding, having in possession in this State or attempting to take, kill, wound or possess any wild deer at any time, except during the period

designated therefor in this article; or killing in any one year more than the number of deer permitted by the State Fish and Game Code, or hunting for, pursuing, stalking or shooting at a wild deer, except by daylight on the days designated therefor by the State Fish and Game Code, or killing a deer in this State at any time and failing to report the same in the manner prescribed by the division, or killing a deer in this State at any time and failing to properly tag and transport the deer to a checking station for registration as provided in section 23:4-47 of the Revised Statutes, or using or carrying a rifle of any kind or description for the purpose of hunting or pursuing deer or violating any of the other provisions of this article or of the Fish and Game Code promulgated thereunder, or violating any other provisions of this Title or the Fish and Game Code pertaining to the taking of deer of either sex, shall be liable to a penalty of not less than \$100.00 nor more than \$300.00 for the first offense and not less than \$300.00 nor more than \$500.00 for the second and each subsequent offense.

New Jersey

Summary of 1976-77

Hunting and Trapping Laws

Aug. 1, 1976 to July 31, 1977



Department of Environmental Protection
Division of Fish, Game and Shellfisheries

This is not the full law. Consult the division for further details. All persons are reminded that the statutes, the code, and regulations are the legal authority.

1976 N. J. DEER SEASON GUIDE



(ONE-DAY EITHER SEX)
SEASON

MAP & INFORMATION
(Including Deer Management
Zone locations and permit quotas)



NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION



DIVISION OF
FISH, GAME AND
SHELLFISHERIES
BUREAU OF WILDLIFE
MANAGEMENT

Appendix D. Game Code Regulations 1976-77 (selected sections)

Subscribed before me this
day of June, 1976

Notary Public of
New Jersey

I hereby certify that the following regulations were adopted by the New Jersey Fish and Game Council on June 8, 1976 and pursuant to the adoption thereof, said regulations shall become part of the Fish and Game Code and previous Code regulations respecting hunting are rescinded as herein provided.

Al L. Toth, Chairman
New Jersey Fish and Game Council

Following public hearing held at the State Museum Auditorium on June 8, 1976 the Fish and Game Council, of the New Jersey Department of Environmental Protection, adopted the following regulations for 1976-77 hunting. As provided by R.S. 13:1B-34, these regulations are known as the Fish and Game Code and supersede the statute laws insofar as these items are concerned on the effective date hereof, except the woodchuck season, which continues through September 30, 1976. Code regulations are effective until amended or repealed.

1976-77 GAME CODE
Adopted June 8, 1976 - Effective August 1, 1976

THE HOURS LISTED ARE EST OR EDT, AT TRENTON, WHICHEVER IS IN EFFECT ON GIVEN DATE, EXCEPT AS OTHERWISE NOTED FOR DEER.

NJAC

7:25-5.0 General Provisions

- (a) Authority. This Code is adopted pursuant to the provisions of N.J.S.A. 13:1B-29 et seq. and the provisions of N.J.S.A. 23:1-1 et seq.
- (b) Judicial Notice. N.J.S.A. 13:1B-34 provides in pertinent part, "(C)opies of the State Fish and Game Code, and its amendments, duly certified by the Chairman of the council shall be received in evidence in all court or other judicial proceedings in the State".
- (c) Time. The hours listed in this Code are EST or EDT at date.
- (d) This Code, when adopted and when effective, shall supersede the provisions of 1975-76 Game Code.

NJAC

7:25-5.16 Firearms and Missiles, etc.

- (a) Except during the firearm deer seasons no person shall have in his possession in woods, fields, marshlands or on the water any shell or cartridge with missiles of any kind larger than #4 fine shot. However, waterfowl hunters may possess and use shells loaded with #2 or smaller fine shot.

- (b) At all times no person shall have in possession any shotgun shell which has been cut or the loaded pellets therein strung, held together with wax or joined in any manner with any substance or material.
- (c) No person shall use in hunting fowl or animals of any kind, any shotgun capable of holding more than three shells at any one time, or than may be fired more than thrice without reloading. Persons hunting woodchuck under a woodchuck rifle permit may not load the rifle with more than three cartridges at one time.

- (d) From December 6-11, inclusive, and December 15, 1976 and any extra Special Permit Deer Season Day if declared open, it shall be illegal to use any firearm of any kind other than a shotgun. Persons hunting deer shall use a shotgun not smaller than 20 gauge or larger than 10 gauge with the rifled slug shotgun shell or a shotgun not smaller than 12 gauge nor larger than 10 gauge with the buckshot shell. It shall be illegal to have in possession any firearm missile except the 20, 16, 12 or 10 gauge rifled slug shotgun shell or the 12 or 10 gauge buckshot shell. It shall be illegal to hunt between 5:00 P.M. and 7:00 A.M. EST or to hunt deer with a dog. (This does not preclude a person legally engaged in hunting on semi-wild or commercial preserves for the species under license from being possessed solely of shotgun and nothing larger than No. 4 fine shot, nor a person engaged in hunting waterfowl only from being possessed solely of shotgun and nothing larger than No. 2 fine shot.)
1. Persons who are properly licensed may hunt for deer with a muzzle loading rifle during the 1976 firearm deer season and the either sex deer season on Deer Management Zones Number 1 and 4 and during the firearm deer season only in Deer Management Zones 18 and 23.
 2. Muzzle loading rifles are restricted to flintlock or percussion actions, shall not be less than .44 caliber and shall fire a single missile or projectile that is propelled by not less than 50 grains of black powder. No telescopic sights shall be attached or fixed to the muzzle loading rifle while engaged in hunting for deer.
 3. Properly licensed persons engaged in hunting for deer with a muzzle loading rifle must have in possession a certificate showing successful completion of the New Jersey Hunter Safety Rifle Course.
- (e) No person shall hunt, hunt for, or attempt to capture, kill, injure or destroy game birds or animals except at the time and in the manner provided by fish and game regulations.
- (f) The prohibition against shooting waterfowl or placing a boat or other structure at a greater distance than one hundred feet from shore shall not apply in all tidal areas north of the Thomas A. Mathis bridge on Rt. 37 in Ocean County and in the Atlantic Ocean. (Sinkook prohibited by U. S. Regulations).

- (g) Wild waterfowl, migratory game birds, rabbits, hares, jack rabbits, squirrels, grouse, chukar partridge, pheasants, and quail shall not be hunted for or taken on Sunday. However, pheasants, quail and chukar partridge may be hunted for or taken on Sunday on semi-wild and commercial shooting preserve lands that are properly licensed for the taking thereof.
- (h) No person shall carry a bow and arrow, shotgun or rifle within the limits of a state game refuge unless authorized by the Division.
- (i) Deer shall not be hunted for or taken on Sunday except on wholly enclosed preserves that are properly licensed for the propagation thereof.
- (j) No person shall, for the purpose of hunting for, pursuing, taking or killing, or attempting to hunt, pursue, take or kill any bird or animal, have in an automobile or vehicle of any kind, any firearm loaded with missiles of any kind, under a penalty of not less than \$20.00 nor more than \$50.00.
- (k) The Division may issue special permits without fee, to shoot or hunt from a standing vehicle that is parked off the road, to licensed hunters who after investigations, are found to be paraplegics. Permittees are subject to all Fish and Game laws and regulations.
- (l) No person shall have both a firearm and a bow and arrow in his possession or under his control in the woods or fields or on the water while hunting any wild bird or animal.
- (m) It shall not be necessary for a nonresident, who is removing small game or game birds from the State, to have them exposed to open view. Any deer, however, shall be exposed to open view and properly tagged.
- (n) Authority: The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-1, 23:4-12, 23:4-13, 23:4-16, 23:4-18, 23:4-19, 23:4-24.1, 23:4-29, 23:4-42, 23:4-44, and 23:8-10 and other applicable statutes.

NJAC

7:25-5.17 Bow and Arrow, General Provisions

- (a) Bow and arrow means long bow only (straight limb, reflex, recurve and compound bow). All mechanical holding and releasing devices are prohibited. All crossbows or variations thereof are prohibited.

(b) No person shall use a long bow and arrow for hunting on December 15 or on any extra Special Permit Deer Season Day if declared open, or between 1/2 hour after sunset and 1/2 hour before sunrise during the Long Bow and Arrow Deer Seasons or between 5:00 P.M. EST and 7:00 A.M. EST during the Firearm Deer Season, or between 1/2 hour after sunset and sunrise during other seasons.

(c) During the Long Bow and Arrow Seasons for taking deer, October 2, to November 4 and December 6 to December 11, 1976 or any other time bow and arrow deer hunting is permitted, all arrows carried in the woods and fields must be fitted with an edged head of the following specifications:

Minimum width shall be 3/4"
Minimum length shall be 1 3/8" on main cutting edge.
Cutting edges shall be of well-sharpened metal only.

All bows, except compounds, must have a minimum draw pull weight of 35 pounds at the archers' draw length. Compound bows must have a minimum peak weight of 35 pounds. Bow must cast a legal hunting arrow 125 yards to a point of similar elevation.

(d) No person shall cast an arrow or discharge a firearm from or across a state or county or municipal highway or roadway, or, any law to the contrary notwithstanding, to have in possession a loaded gun or nocked arrow within 450 feet of any occupied dwelling or of a school playground. No person shall use a bow and arrow from any vehicle moving or stationary.

(e) Authority: The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-1, 23:4-12, 23:4-16, 23:4-43, 23:4-44, 23:4-45 and other applicable statutes.

NJAC

7.25-5.18 White-tailed Deer (Odocoileus virginianus) Long Bow and Arrow Exclusively

(a) Deer of either sex and any age may be taken by long bow and arrow exclusively from 1/2 hour before sunrise on October 2 to 1/2 hour after sunset November 4, 1976 inclusive.

(b) Bag Limit: One deer of either sex. Kill with transportation tag completely filled in must be transported to a deer checking station before 8:00 P.M. EST on day killed.

Any legally killed deer which is recovered too late to be brought to the deer check station by closing time must be immediately reported by telephone to the nearest Division of Fish, Game and Shellfisheries law enforcement district headquarters. Said deer must be brought to a checking station on the next open day to receive a legal possession seal.

(c) This season shall be open only to holders of a valid 1976 bow and arrow hunting license which contains an attached fall bow and arrow deer transportation tag. If the anticipated harvest of deer has not been accomplished during this season additional days of long bow and arrow deer hunting may be authorized by the Director with the approval of the Council. Such authorization and dates thereof shall be announced by press and radio.

(d) Authority: The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-42, 23:4-43, 23:4-45, 23:4-47 and other applicable statutes.

NJAC

7.25-5.19 White-tailed Deer (Odocoileus virginianus) Special Winter Bow and Arrow, Exclusively (Either Sex)

(a) Deer of either sex and any age may be taken by long bow and arrow exclusively from 1/2 hour before sunrise on January 8 to 1/2 hour after sunset on January 15, 1977.

(b) Bag Limit: One deer of either sex. Deer, with transportation tag appropriate for the season (special winter bow and arrow) completely filled in, must be transported to a deer checking station before 7:00 P.M. EST on day killed. Any legally killed deer which is recovered too late to be brought to a check station by closing time must be immediately reported by telephone to the nearest Division of Fish, Game and Shellfisheries law enforcement district headquarters. Said deer must be brought to a checking station on the next open day to receive a legal possession tag.

(c) This season will be open only to holders of a valid 1977 bow and arrow hunting license which contains an attached winter bow season transportation tag, in addition to the regular fall bow season transportation tag. If the anticipated harvest of deer has not been accomplished during this season additional days of special winter bow and arrow deer hunting may be authorized by the Director with the approval of the Council. Such authorization and dates thereof shall be announced by press and radio.

(d) Authority: The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-45, 23:4-42, 23:4-43, 23:4-47 and other applicable statutes.

NJAC

7.25-5.20 White-tailed Deer (Odocoileus virginianus) Firearm or Long Bow and Arrow

(a) Duration for this season will be December 6-11, 1976 inclusive.

(b) Bag Limit: One deer, antlered only, except in those areas designated as "hunters choice" indicated in subsection (d) under Section .20. One deer for the season, with antler at least three inches in length, whether taken by gun or long bow. Kill with completely filled in transportation tag attached must be transported to a deer checking station before 7:00 P.M. EST on day killed. Any legally killed deer which is recovered too late to be brought to the check station by closing time must be immediately reported by telephone to the nearest Division of Fish, Game and Shellfisheries law enforcement district headquarters. Said deer must be brought to a checking station on the next day to receive a legal possession seal.

- (c) A person who has legally taken a deer during the special long bow and arrow season can legally take an antlered deer with a shotgun during the interval of December if he possesses his valid firearm license, but he may not take another deer with a bow. Only one deer may be taken during this season whether by gun or bow. If the anticipated harvest of deer has not been accomplished during this season additional days of firearm or long bow and arrow deer hunting may be authorized by the Director, with the approval of the Council. Such authorization and dates thereof shall be announced by press and radio.
- (d) Hunter's Choice Area. Hunter's choice area is described as follows: That portion of Bergen, Passaic, Hudson, Essex, Morris, Union, Somerset, Middlesex, Monmouth, and Ocean counties lying within a continuous line beginning at the intersection of Route 202 and the New York State line near Suffern; then south on Route 202 to its intersection with Route 23 near Wayne; then south on Route 23 to intersection with Route 80; then southwest on Route 80 to its intersection with 511, then south on 511 to its intersection with Route 510; then west on Route 510 to its intersection with Route 24 at Morristown; then southeast on Route 24 to its intersection with Route 82; then southeast along Route 82 to its intersection with Route 22, then southwest on Route 22 to intersection with Route 287 near Scerville; then southeast on Route 287 to its intersection with Route 18 near South Bound Brook; then southeast on Route 18 to its intersection with Route 9; then south on Route 9 to its intersection with Route 520. then east on Route 520 to its intersection with the Garden State Parkway; then south on the Garden State Parkway to its intersection with Route 37 near Toms River; then east on Route 37 to the Atlantic coast line; then northwest on the Atlantic coast line and the New Jersey-New York border to the point of the beginning near Suffern.
- (e) Hunting Hours. December 6 - December 11, 1976 inclusive, 7:00 A.M. EST to 5:00 P.M. EST, with gun or long bow.
- (f) No person shall take, attempt to take, hunt or attempt to hunt, kill or attempt to kill, shoot at or attempt to shoot at, in any one year more than the number of deer permitted by this Code.
- (g) Authority. The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-42, 23:4-43, 23:4-45, 23:4-47, 23:4-48 and other applicable statutes.

NJAC

7 25-5.21 White-tailed Deer (Odocoileus virginianus) Special Permit Season, Firearms Only, Either Sex

- (a) The Director with the approval of the Council may authorize the issuance of special deer permits for the taking of deer anywhere within this state or at any state or federal installation.
- (b) If the anticipated harvest of deer has not been accomplished during this season, one additional day of special permit deer hunting may be authorized by the Director with the approval of the Council. Such authorization and date thereof shall be announced by press and radio.

- (c) One deer of either sex, any age, may be taken with a special deer permit.
- (d) Duration of the special deer permit season shall be from 7:00 A.M. EST to 5:00 P.M. EST on Wednesday, December 15, 1976 or any other time as determined by the Director.
- (e) Special deer permits are valid only in the designated deer management zones or other designated areas and are not transferable.
- (f) Method: The taking of one deer of either sex with a firearm under a special deer permit or a farmer deer permit, in addition to the legal antlered deer allowed under statewide buck season and buck-doe allowed under the statewide long bow and arrow season and buck doe allowed during the winter bow season, will be permitted in designated deer management zones by holders of a special deer permit and on their own property by holders of a farmer deer permit.

Special deer permits will be issued on an individual basis to holders of valid 1976 firearm licenses. Only one application per person may be submitted for the special season whether as a farmer or a license holder. Farmer deer permits will be issued on an individual basis to owners or lessees of farms who reside thereon, or the immediate members of their families over 14 years of age who also reside thereon, upon receipt of a notarized application form.

- (g) Special permits consist of back tag and a transportation tag. The back tag portion of the permit will be conspicuously displayed on the outer clothing in addition to the valid firearm license in the case of a special deer permit, and without the license in the case of the farmer deer permit. Any deer killed must be tagged immediately with the completed transportation tag. This completely filled in transportation tag allows legal transportation of the deer of either sex to an authorized checking station only. Personnel at the checking station will issue a possession seal. Any permit holder killing a deer of either sex on December 15, 1976 must transport this deer to an authorized checking station by 7:00 P.M. EST on December 15 to secure the legal possession tag. The possession of a deer of either sex after 7:00 P.M. EST on December 15 without a legal possession tag shall be deemed illegal possession. Any legally killed deer which is recovered too late to be brought to the check station by closing time must be immediately reported by telephone to the nearest Division of Fish, Game and Shellfisheries law enforcement district headquarters. Said deer must be brought to a checking station on the next open day to receive a legal possession seal.

(h) Applying for a Special Deer Permit

1. Only holders of valid 1976 firearm hunting licenses may apply by detaching from their hunting license the stub marked "Special Deer Season 1976," signing as provided on the back, and sending the stub, together with a computer card application form which has been properly completed in accordance with instructions. Application cards may be obtained from

- A. Division of Fish, Game and Shellfisheries, P.O. Box 1809, Trenton, New Jersey 08625
 - B. License issuing agents
 - C. Conservation Officers
2. No bow and arrow or juvenile license holders are eligible.
 3. Only one application, accompanied by the hunting license stub, may be submitted by any one individual.
 4. Fill in the application form to include. Name, address, 1976 firearm hunting license number, deer management zone applied for, name of license issuing agent where 1976 hunting license was purchased, and any other information requested. Only those applications will be accepted for participation in random selection by card sorting machine which are received in the Trenton Office during the period of September 1 to September 10, 1976 inclusive. Applications arriving premature or after the 10th will not be considered. **DO NOT SEND FEE WITH THE APPLICATION.** Selection of permittees will be made on the basis of a random selection of computer cards.
 5. Unsuccessful applicants will not be notified. Any permit obtained by fraud will be void.
 6. Successful applicants will be notified by mail. The computer card and the permit fee of \$5.00 in the form of a money order, made payable to "Division of Fish, Game and Shellfisheries" must be returned by mail before October 11, 1976. The Special Deer Permit will then be issued. Permits not claimed by October 11 will be immediately reallocated in the same random manner as the original selection and be returnable two weeks thereafter.

(i) Applying for the Special Farmer Deer Permit

1. Only the owner or lessee of a farm, who resides thereon, or the immediate members of his family over 14 years of age who also reside thereon, may apply on forms provided for a special farmer deer permit. Under this section a farm is an area of five acres or more and producing a gross income in excess of \$500.00 and is tax assessed as farmland. Special Farmer Permits will be issued only in those deer management zones where a special deer season is prescribed.
2. Application forms may be obtained from the County Agricultural Agent, the Division of Fish, Game and Shellfisheries, P.O. Box 1809, Trenton, N.J. 08625, or the Conservation Officers.

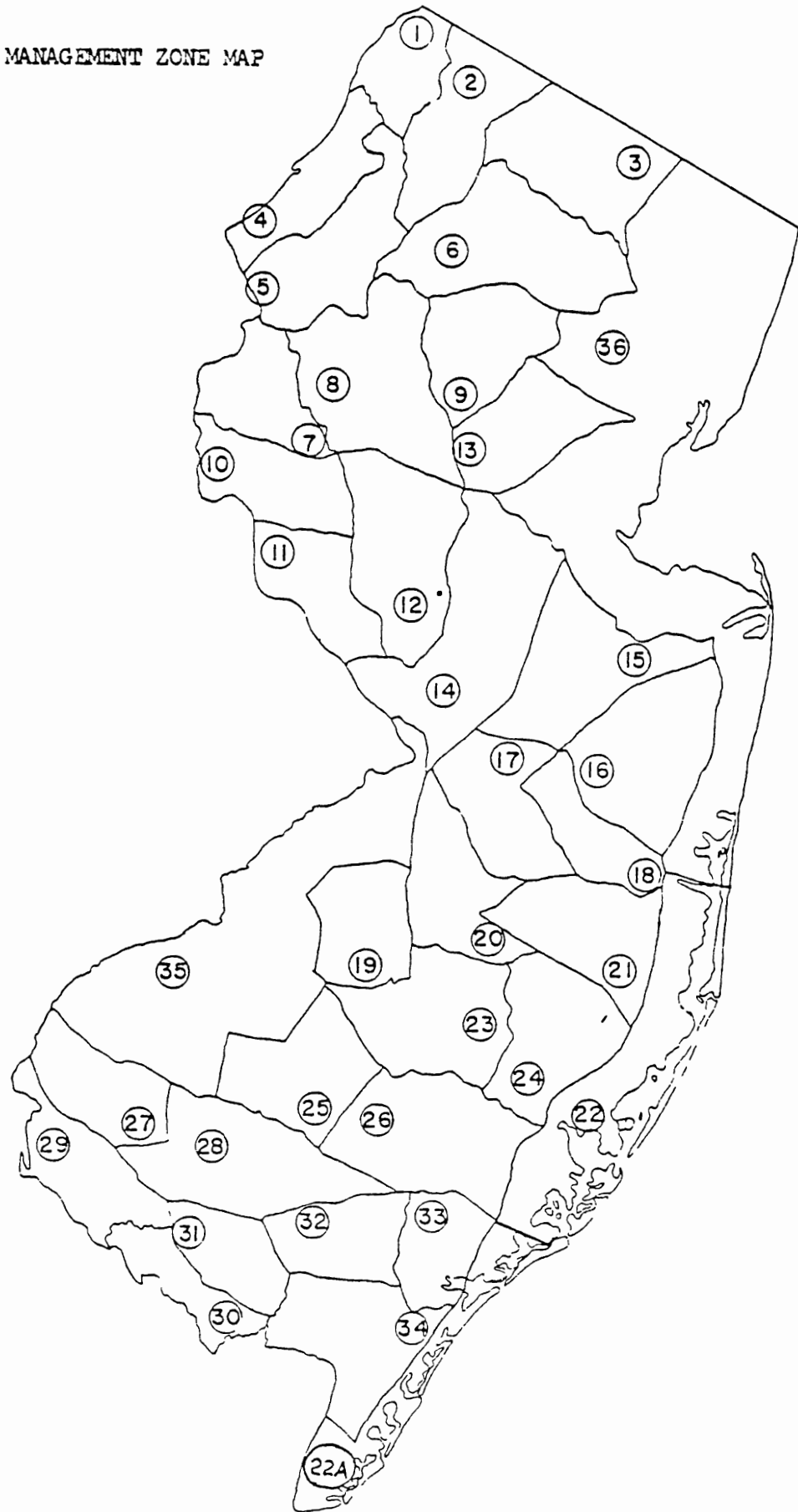
3. Fill in the application form to include Name, age, size of farm, address, and any other information requested thereon. **THIS APPLICATION MUST BE NOTARIZED.** Properly completed application forms will be accepted in the Trenton Office only during the period of September 13 to 22, 1976. There is no fee required, and all qualified applicants will receive a special farmer deer permit, delivered by mail.

(j) Use of Special Deer Permit and Special Farmer Deer Permit

The special deer permit is valid only in the deer management zone (DMZ) designated and is not transferable. The special farmer deer permit is valid only on the farm occupied and designated in the application and is not transferable. The DMZ quota and DMZ map follow. The special permit hunter is responsible for hunting in the correct DMZ or farm as indicated and in ascertaining the boundaries.

(k)

DEER MANAGEMENT ZONE MAP



(1)

1976 EITHER SEX SEASON

Deer Mgt. Zone No.	Anticipated Harvest	Permit Quota	Portions of Counties Involved
1	167	1113	Sussex
2	44	293	Sussex
3	125	833	Sussex, Passaic, Bergen
4	410	1863	Sussex, Warren
5	128	512	Sussex, Warren
6	227	1335	Sussex, Morris, Passaic, Essex
7	166	638	Warren, Hunterdon
8	483	2012	Warren, Hunterdon, Morris Somerset
9	161	805	Morris, Somerset
10	507	1179	Warren, Hunterdon
11	445	1271	Mercer, Hunterdon
12	325	1413	Mercer, Hunterdon, Somerset
13	82	482	Morris, Somerset
14	107	713	Mercer, Somerset, Middlesex
15	45	300	Mercer, Monmouth, Middlesex
16	73	486	Ocean, Monmouth
17	36	240	Ocean, Monmouth, Burlington
18	31	206	Ocean
19	21	140	Camden, Burlington
20	16	106	Burlington
21	66	440	Burlington, Ocean
22	42	280	Burlington, Ocean, Atlantic
22A	0	0	Atlantic, Cape May
23	0	0	Burlington, Camden, Atlantic
24	93	620	Burlington, Ocean
25	0	0	Gloucester, Camden, Atlantic
26	0	0	Atlantic
27	24	160	Salem, Cumberland
28	0	0	Salem, Cumberland, Gloucester Atlantic
29	89	330	Salem, Cumberland
30	0	0	Cumberland
31	0*	0	Cumberland
32	0*	0	Cumberland, Atlantic
33	0	0	Cape May, Atlantic
34	0*	0	Cape May, Cumberland
35	0*	0	Mercer, Camden, Burlington, Gloucester, Salem
36	0	0	Morris, Passaic, Middlesex, Somerset, Ocean, Essex, Bergen, Union, Hudson
Totals	3,913	17,770	

(*No permits authorized)

(m) Authority: The authority for the adoption of the foregoing section is found in N.J.S.A. 23:4-42, 23 4-43, 23 4-47, 23.4-48 and all other applicable statutes.

- (a) This section applies only to the Great Swamp National Wildlife Refuge.
- (b) Nothing in this section shall effect the validity or operation of any other section of this Code.
- (c) Duration of the Great Swamp Special Permit Season shall be from 7:00 A.M. EST to 5:00 P.M. EST on the following dates December 7-11 and December 15, 1976 or as may otherwise be designated by the U. S. Fish and Wildlife Service
- (d) Bag Limit: One deer of either sex, any age, may be taken with a Great Swamp Special Deer Permit.
- (e) Great Swamp Special Deer Permits are valid only in designated portions of the Great Swamp National Wildlife Refuge and are not transferable.
- (f) Method: The taking of one deer of either sex with a firearm under a Great Swamp Special Deer Permit, in addition to the legal antlered deer allowed under statewide buck season and buck-doe allowed under the statewide long bow and arrow season and buck-doe allowed under the winter bow season, will be permitted in designated areas of the Great Swamp National Wildlife Refuge by holders of a Great Swamp Special Deer Permit. A total of 400 Great Swamp Special Deer Permits will be issued with 150 hunters being permitted on the refuge at any one time.
- (g) Procedures for applying for a Great Swamp Special Deer Permit will be the same as outlined for the Special Deer Permit, .21 (n) of this Code, with the exception that applicants for a Great Swamp Special Deer Permit must indicate "Great Swamp" on the application card in the space reserved for deer management zone number. Successful applicants will be notified to attend a hunter certification and hunter orientation session prior to the hunt.
- (h) Hunting methods in this area shall be provided by the U. S. Fish and Wildlife Service.
- (i) All hunters shall comply with the instructions of State Conservation Officers, State Deputy Conservation Officers, other Division personnel and instructions of U. S. Fish and Wildlife Service personnel.
- (j) Authority The authority for the adoption of the foregoing section is found in N.J.S.A. 23:10-5, 23:4-42, 23:4-43, 23:4-47, 23:4-48, 13:1B-30 et seq. and other applicable statutes

- 1675 The first statutes of the Province of New Jersey, known as the "Concessions and Agreements," provided for a bounty of 15 shillings for each grown wolf killed in the province (Brewster 1911). This was the first wildlife regulation in New Jersey's history.
- 1678 The "Concessions and Agreements" granted officially, the privilege to hunt and fish on unsurveyed land, through 1722 (Brewster 1911).
- 1679 The General Assembly prohibited the export of dressed skins from deer killed by Indians (Brewster 1911).
- 1722 An Act of the General Assembly established a season for the killing of deer (Brewster 1911). This was the first regulation which provided for the protection of game.
- 1757 A regulation was passed preventing the setting of deer traps within the Province of New Jersey (Brewster 1911).
- 1765 An Act was passed by the General Assembly to prohibit deer hunting at night (Brewster 1911).
- 1771 An Act was passed by the General Assembly which set the open season for deer hunting from September 1 to December 31. The regulation also made it unlawful to trespass while carrying a gun or to hunt deer with the aid of a dog (Brewster 1911).
- 1772 Deer hunting was prohibited in the Township of Morris (Morris County) for five years by an Act of the General Assembly (Brewster 1911).
- 1776 Deer hunting was restricted to an individual's own land between September 1 and January 1 by an Act of the General Assembly (Brewster 1911).
- 1798 An Act of the General Assembly "suppressing immorality," made it unlawful to shoot, hunt or gun, or make use of any seine or net to take fish on Sunday (Brewster 1911).
- 1853 An Act of the General Assembly protected deer in Bergen, Ocean, and Atlantic Counties for five years (Brewster 1911).
- 1862 The General Assembly passed an Act which prohibited deer hunting for five years throughout the State (Brewster 1911).
- 1874 The deer season was reduced to 2½ months (October 15 to December 31) and prohibited in Burlington and Ocean Counties for five years (Brewster 1911).

- 1876 County wardens were appointed (Musick 1974).
- 1881
- 1883 The State was closed to deer hunting by Acts of the General
1889 Assembly (Brewster 1911).
1899
- 1892 The commission form of wildlife administration was initiated in
New Jersey. Three Commissioners were appointed, and the first
salaried Fish and Game Protector and County Wardens were hired
(Brewster 1911).
- 1900 The deer population reached its lowest level in New Jersey.
- 1901 The total deer harvest was 20 deer.
- 1902- An Act of the General Assembly closed the State to deer hunting
1908 (Brewster 1911).
- 1904- This was the period of deer restocking in New Jersey. Deer were
1913 obtained from private preserves and parks, and from other states
including Pennsylvania and Michigan (Board of Fish and Game Comm.
1904-1913).
- 1909 An Act of the General Assembly established an annual open season
on deer which has been held every year henceforth. The first
seasons were four days long (every Wednesday in November). Other
restrictions prohibited hunting deer with dogs, night hunting and
killing deer without visible antlers (bucks only). Violations
called for a \$100.00 fine (Brewster 1911).
- 1912 The first reports of crop damage from deer were recorded (Board
of Fish and Game Comm. 1912).
- 1915 The first statewide, either-sex season was held. The season was
four days long and 481 deer including 291 bucks and 190 antlerless
deer were harvested (Board of Fish and Game Comm. 1915).
- 1917 A regulation was passed allowing farmers who had valid deer com-
plaints to acquire a permit to shoot any deer observed damaging
his crops (Board of Fish and Game Comm. 1917).
- 1928 A regulation was passed requiring deer killed during the prescribed
season to have antlers at least three inches long (Board of Fish
and Game Comm. 1928).
- 1933 An antlerless season was held in the Counties of Sussex, Morris,
1934 Bergen and Burlington where crop depredation was a serious
1935 problem (Board of Fish and Game Comm. 1933-35).
- 1935 This was the peak year for the deer of the pine barrens region of
South Jersey (Howard 1972).

- 1947 A regulation was passed permitting the hunting of deer with bow
and arrow during the regular firearm deer season (Div. Fish and
Game 1947).
- 1948 Bow and arrow licenses were required (Div. Fish and Game 1948).
- 1949 A bow and arrow season was established (December 5 through 10)
and the legal hunting hours were 7:00 a.m. to 5:00 p.m. (Div.
Fish and Game 1949).
- 1950 Only one deer (antlered buck) could be taken by bow or gun per
year (Div. Fish and Game 1950).
- 1951 A regulation was passed permitting an antlerless deer season in
Essex, Somerset, Morris and Union Counties. A special season
was held on January 19 and 20, 1952 (Div. Fish and Game 1951).
- 1952 A regulation was passed allowing bow and arrow hunters to harvest
a deer of either-sex. The bow and arrow season was held with the
small game season (Div. Fish and Game 1952).
- 1954 The bow and arrow season preceded the small game season (Div. Fish
and Game 1954).
- 1957 The North Jersey deer population reached its peak (Howard 1972).
A limit of one deer per season was established (Div. Fish and Game
1957).
- 1959 A three day antlerless deer season was held in the following North
Jersey Counties: Bergen, Essex, Mercer, Middlesex, Morris, Passaic,
Somerset, Sussex, Union and Warren. 10,868 permits were issued on
a first come - first serve basis, and 3,571 deer were harvested.
The post card reporting system was initiated (Div. Fish and Game
1959).
- 1961 A statewide, one day "hunter's choice" season was held on January
31, 1962. A total of 12,406 deer were killed during the 1961
seasons (Div. Fish and Game 1961).
- 1962 A "party permit" system was instituted. Four hunters could obtain
1963 one permit to kill one antlerless deer during the six-day firearm
season. 3,525 permits were issued in 1962 and 3,700 permits were
issued in 1963. The "hunter's choice" concept was continued during
the six-day firearm season in the developed area of northeastern
New Jersey (Div. Fish and Game 1962-63).
- 1964 A either-sex, permit deer season was established (Div. Fish and Game
1964).
- 1965 No special deer of either-sex season was held (Div. Fish and Game
1965).
- 1966- Either-sex, permit deer seasons have been held on a county or zone
1976 basis.

- 1971 A regulation was passed prohibiting the practice of hunting over bait. The law forbids hunting while elevated in a standing tree or in a structure of any kind within 300 feet of a baited area (Div. Fish and Game 1971).
- 1972 The deer check station system replaced the pre-paid, post card system for reporting legal deer kills (Div. Fish and Game 1972).
- 1974 The special, either-sex, permit deer season marked implementation of the deer management zone concept as a management tool. Political subdivisions were replaced as management units (Howard et.al. 1974).
- 1975 Rifled slugs were legalized for deer hunting. The first winter bow and arrow season was held (January 3 through 10, 1976) (Burke et.al. 1976).
- 1976 Muzzle loading rifles were authorized for deer hunting in deer management zones 1, 4, 18 and 23 during the six-day firearm season and in zones 1 and 4 during the either-sex, permit deer seasons.

A total of 292,330 deer have been reported legally harvested since 1909. 175,935 deer, 60.2 percent of the total deer harvest, were killed since 1959, the year that either-sex hunting was established as a management tool in New Jersey.

Appendix F. Dates of the Deer Seasons in New Jersey (1909-1976)

<u>Year</u>	<u>Firearm Buck Season</u>	<u>Bow & Arrow Season</u>	<u>Special Season</u>
1909			
1910	Every Wednesday in Nov.		
1911			
1912			
1913	Nov. 1 to 5		
1914			
1915			
1916	Last 3 Wednesdays in Oct.		
1917	and first one in Nov.		
1918			
1919	Dec. 16 to 20		
1920	Dec. 16 to 25		
1921	Dec. 16 to 20		
1922	Last 2 Wednesdays in Dec. and first 2 in Jan.		
1923 thru 1946	Dec. 17 to 21		
1947 1948	Dec. 12 to 16, if Sunday intervenes, to the 17th		
1949	Dec. 12 to 17	Dec. 5 to 10	
1950	Dec. 11 to 16	Nov. 27 to Dec. 9	
1951	Dec. 10 to 15	Nov. 28 to Dec. 8	Jan. 19 & 20
1952	Dec. 11 to 20	Nov. 29 to Dec. 13	
1953	Dec. 11 to 19	Nov. 21 to Dec. 12	
1954	Dec. 13 to 18	Oct. 16 to Nov. 5	
1955	Dec. 12 to 17	Oct. 15 to Nov. 4	
1956	Dec. 10 to 15	Oct. 12 to Nov. 2	
1957	Dec. 9 to 14	Oct. 19 to Nov. 8	
1958	Dec. 8 to 13	Oct. 11 to Nov. 7	

1959	Dec. 7 to 12	Oct. 10 to Nov. 6	Dec. 17, 18 & 19
1960	Dec. 12 to 17	Oct. 8 to Nov. 11	
1961	Dec. 11 to 16	Oct. 7 to Nov. 10	Jan. 31
1962	Dec. 10 to 15*, including party permit system	Oct. 6 to Nov. 9	
1963	Dec. 9 to 14*, including party permit system	Oct. 5 to Nov. 7	
1964	Dec. 7 to 12*	Oct. 3 to Nov. 5	Dec. 19
1965	Dec. 6 to 11*	Oct. 2 to Nov. 4	
1966	Dec. 5 to 10*	Oct. 1 to Nov. 3	Dec. 17
1967	Dec. 4 to 9*	Oct. 2 to Nov. 9	Dec. 16
1968	Dec. 9 to 14*	Oct. 5 to Nov. 7	Dec. 21
1969	Dec. 8 to 13*	Oct. 4 to Nov. 6	Dec. 20
1970	Dec. 7 to 12*	Oct. 3 to Nov. 5	Dec. 19
1971	Dec. 6 to 11*	Oct. 9 to Nov. 11	Dec. 15
1972	Dec. 4 to 9*	Oct. 7 to Nov. 9	Dec. 13
1973	Dec. 10 to 15*	Oct. 6 to Nov. 8	Dec. 19
1974	Dec. 9 to 14*	Oct. 5 to Nov. 7	Dec. 18
1975	Dec. 8 to 13*	Oct. 4 to Nov. 6	Dec. 17
		Jan. 3 to 10, first winter bow and arrow season	
1976	Dec. 6 to 11*	Oct. 2 to Nov. 4	Dec. 15
		Jan. 8 to 15, winter bow and arrow	

*Includes Hunter's Choice Area.

Sources: 1909 to 1945 "Annual Report" Board of Fish and Game Comm.
1946 to 1970 "Annual Report" Division of Fish and Game
1971 to 1976 "Annual Report" Division of Fish, Game &
Shellfisheries

Appendix G. Project Outline for: "A Study of the New Jersey Deer Herd"
(Project No. W-45-R-13, 1977) Division of Fish, Game and
Shellfisheries

Work Plan I: Annual Deer Harvest

Job I-A - Determination of the Size and Distribution of the Annual Legal
Deer Harvest

Job I-B - Summation of the Extent of Deer Mortality Other than Legal
Harvest, Principal Causes and Possible Methods of Prevention

Job I-C - Determination of the Extent and Importance of Cripple Loss
and Illegal Kill During the Fall Deer Seasons.

Job I-E - Determination of Family Attitudes Towards Firearm Hunting

Work Plan II: Condition and Productivity of the New Jersey Deer Herd

Job II-A - Collection and Evaluation of Age, Sex, Weight, Antler Beam and
Antler Point Information

Job II-B - Collection and Evaluation of Reproduction and Condition Data
Throughout the Winter Period

Job II-C - Incidence of Disease and Parasites

Work Plan IV: Location, Evaluation and Classification of Deer Range
with Emphasis on Winter Range

Job IV-A - Map the Extent and Quality of Deer Range Present in New Jersey

Job IV-B - Locate, Evaluate and Classify Major Wintering Areas

Job IV-C - Capture and Marking of Wild Deer

Work Plan V: Population Inventory

Job V-A - Calculation of Fall (pre-hunting) Populations and Comparison
of Calculating Methods

Job V-B - Helicopter Count of Sample Plots in North Jersey Counties
(inactive)

Work Plan VI: Statewide Deer Management Plan and Annual Deer Publication

Job VI-A - Collection and Summation of Data for Inclusion in Statewide
Management Plan

Job VI-B - Preparation of an Annual Deer Publication

Appendix H. Summary of Deer Research Project Expenditures by Year and Study (1940-1977)

Project Number	Project Duration	Project Costs			Study Title
		Federal Funds	State Funds	Total Cost	
5-D	1940-42	\$ 3,055.86	\$ 1,018.62	\$ 4,074.48	"Planting Food Plots to Deflect Seasonal Movements From Agricultural Areas."
10-R	1945	2,055.86	743.35	2,973.39	"Investigating of Extent of Annual Deer Ranges, Tendency of Deer to Travel and Population Density of Deer in the Pine Region of New Jersey."
4-L	1949	689.09	229.70	918.79	"Food Plots to Deflect Seasonal Deer Movements From Agricultural Areas."
21-R	1948-49	5,370.75	1,790.25	7,161.00	"Survey of White-tailed Deer in New Jersey."
W-21-R	1949-49	4,300.00	1,433.35	5,733.41	"Survey of White-tailed Deer in New Jersey."
W-25-R	1950-53	34,072.28	11,357.43	45,429.71	"Survey of White-tailed Deer in New Jersey."
W-32-R	1953	5,676.00	1,892.00	7,568.00	"Statistical Evaluation of Wildlife Data."
W45R-1	1964-65	20,140.00	6,860.00	27,000.00	"A Study of the NJ Deer Herd."
W-45R-2	1965-66	14,850.00	4,950.00	19,800.00	"A Study of the NJ Deer Herd."
W-45R-3	1966-67	4,650.00	1,550.00	6,200.00	"A Study of the NJ Deer Herd."
W-45R-4	1967-68	7,875.00	2,625.00	10,500.00	"A Study of the NJ Deer Herd."

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W-45R-5	1968-69	33,000.00	11,000.00	44,000.00	"A Study of the NJ Deer Herd."
W-45R-6	1969-70	33,750.00	11,250.00	45,000.00	"A Study of the NJ Deer Herd."
W-45R-7	1970-71	39,750.00	13,250.00	53,000.00	"A Study of the NJ Deer Herd."
W-45R-8	1971-72	37,702.00	12,567.50	50,270.00	"A Study of the NJ Deer Herd."
W-45R-9	1972-73	26,737.50	8,912.50	35,640.00	"A Study of the NJ Deer Herd."
W-45R-10	1973-74	54,900.00	15,000.00	60,000.00	"A Study of the NJ Deer Herd."
W-45R-11	1974-75	52,500.00	17,500.00	70,000.00	"A Study of the NJ Deer Herd."
W-45R-12	1975-76	73,500.00	24,500.00	98,000.00	"A Study of the NJ Deer Herd."
W-45R-13	1976-77	<u>63,500.00</u>	<u>23,250.00</u>	<u>85,000.00</u> ¹	"A Study of the NJ Deer Herd."
TOTAL		\$518,499.08	\$159,779.70	\$678,278.78	

¹Cost per project agreement for 1976-77.

Appendix I. Periods of Rut, as Determined by Aging Fetuses

<u>Age and Location</u>	<u>Number of Pregnant Deer</u>					<u>Peak</u>
	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Total</u>	
Northern Adults	6	138	3	0	147	Nov. 2-17
Southern Adults	1	39	10	0	50	Nov. 15-30
Northern Fawns	0	11	14	1	26	Nov.-Dec. ¹⁹⁵¹⁻⁵⁴
Southern Fawns	0	2	4	1	7	Dec.
Northern Adults	4	119	6	0	129	Nov. 3-23
Northern Fawns	0	7	6	1	14	Nov. 17-Dec. 7 ^{1957*}
Northern Adults	5	404	27	10	446	Nov. 3-23
Southern Adults	0	240	16	5	261	Nov. 10-30
Northern Fawns	0	17	13	3	33	Nov. 17-Dec. 7 ^{1961*}
Southern Fawns	0	2	9	2	13	Dec. 1-21

*Collected February 24 - March 27, 1958, at Harbourton.

**Collected January 31, 1962, statewide Hunter's Choice season.

Appendix J. New Jersey Deer Highway Mortalities (1964-1976)

<u>Fiscal Year</u>	<u>Accidental Kill</u>	<u>Missing or Stolen</u>	<u>Month of Highest Mortality</u>
1964-65	1964	—	November
1965-66	1982	—	November
1966-67	1982	—	November
1967-68	1970	—	November
1968-69	1895	—	November
1969-70	2212	—	November
1970-71	2452	604	November
1971-72	2248	584	November
1972-73	2833	776	November
1973-74	2210	626	October
1974-75	2133	671	November
1975-76	2537	765	November
Average	2201	671	
1976-77	2686	619	November
1977-78			

Appendix K. Population of New Jersey from 1800 to 1970 and Average Number of Persons per Square Mile

<u>Year</u>	<u>Population</u>	<u>No. of Persons per Square Mile</u>
1800	211,949	28.1
1810	245,555	32.7
1820	277,426	36.9
1830	320,823	42.7
1840	373,306	49.7
1850	489,555	65.2
1860	672,035	89.4
1870	906,096	120.6
1880	1,131,116	150.5
1890	1,444,933	192.3
1900	1,883,669	250.7
1910	2,537,167	337.7
1920	3,155,900	420.0
1930	4,041,334	537.3
1940	4,148,562	553.1
1950	4,835,329	643.9
1960	6,066,782	807.9
1970	7,168,164	954.6
1980*	8,095,020	1078.0

*Projected

Appendix L. Population of New Jersey Counties from 1840 to 1970 and Projected Population for 1980

<u>County</u>	<u>1840</u>	<u>1885</u>	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>
Atlantic	8,726	22,356	124,079	132,399	160,880	175,043	193,460
Bergen	13,223	39,880	408,507	539,139	780,255	898,012	1,015,260
Burlington	32,831	57,558	96,836	135,910	224,499	323,132	382,110
Camden	—	76,685	255,867	300,743	392,035	456,291	519,130
Cape May	5,324	10,744	28,566	37,131	48,555	49,554	68,090
Cumberland	14,374	41,982	72,850	88,597	106,850	121,374	139,100
Essex	44,621	213,764	835,272	905,949	923,545	929,986	971,060
Gloucester	25,438	27,603	71,928	91,727	134,840	172,681	202,590
Hudson	9,483	24,342	649,798	647,437	610,734	609,266	616,100
Hunterdon	24,787	37,420	36,706	42,736	54,107	69,718	85,990
Mercer	21,502	66,785	197,124	229,781	266,392	303,968	344,550
Middlesex	21,893	56,180	216,909	264,872	433,856	583,813	677,750
Monmouth	32,909	62,324	160,212	225,327	334,401	459,379	544,000
Morris	25,844	50,675	125,268	164,371	261,620	383,454	449,110
Ocean	—	15,586	37,401	56,622	108,241	208,470	289,860
Passaic	16,734	88,374	309,270	337,093	406,618	460,782	516,650
Salem	16,024	25,373	41,704	49,508	58,711	60,346	68,250
Somerset	17,455	27,425	73,941	99,052	143,913	198,372	231,220
Sussex	21,770	22,401	29,506	34,423	49,255	77,528	92,460
Union	—	61,839	326,720	398,138	543,116	543,116	608,450
Warren	20,366	37,737	50,098	54,374	73,879	73,879	79,830
TOTAL	373,306	1,278,033	4,835,329	4,835,329	6,066,782	7,168,164	8,095,020

Appendix M. Total Number of Farms and Total Acreage in Farmland in New Jersey 1850 to 1975

<u>Year</u>	<u>Number of Farms</u>	<u>Total Acreage in Farmland</u>
1850		2,752,946
1860		2,983,525
1870		2,989,511
1880		2,929,773
1890		2,662,009
1910	33,487	1,803,336
1920	29,702	1,555,607
1930	25,378	1,758,027
1935		1,914,110
1940	25,835	1,874,402
1945	26,226	1,818,103
1956	20,200	1,600,000
1960	15,800	1,460,000
1965	11,000	1,220,000
1970	8,600	1,060,000
1975	7,900	1,025,000

*From: New Jersey Agricultural Statistics, August 1975.
New Jersey Department of Agriculture, Circular 476, 56 pp.

Appendix N. Area of Forest, and the Percentage of Land Surface Forested, in Each County in New Jersey in 1899, 1947 and 1972

<u>County</u>	<u>Total Land Surface</u> <u>Thousand</u> <u>Acres</u>	<u>1899¹</u>		<u>1947</u>		<u>Used</u> <u>1972²</u>	
		<u>Thousand</u> <u>Acres</u>	<u>%</u>	<u>Thousand</u> <u>Acres</u>	<u>%</u>	<u>Thousand</u> <u>Acres</u>	<u>%</u>
Atlantic	364.2	271.6	75.0	247.0	67.8	199.1	54.7
Bergen	149.8	57.6	38.4	55.0	36.7	--	--
Burlington	524.0	303.8	58.0	324.0	61.8	288.4	55.0
Camden	141.3	66.6	47.0	58.0	41.0	49.4	34.9
Cape May	170.7	80.8	47.3	88.0	51.5	67.1	39.3
Cumberland	319.7	166.3	51.9	155.0	48.4	125.2	39.2
Essex	82.9	24.3	29.3	21.0	25.3	--	--
Gloucester	210.8	74.8	35.5	70.0	33.2	55.6	26.4
Hudson	30.3	.71	2.3	0.0	0.0	--	--
Hunterdon	277.5	39.5	14.2	67.0	24.1	89.5	32.3
Mercer	145.8	15.8	10.8	32.0	21.9	31.5	21.6
Middlesex	199.9	60.2	30.1	63.0	31.5	47.0	23.5
Monmouth	304.6	89.7	29.4	113.0	37.1	100.7	33.0
Morris	299.8	140.1	46.7	184.0	61.4	149.6	49.8
Ocean	411.0	313.0	76.1	322.0	78.3	260.1	63.2
Passaic	123.5	75.2	60.8	79.0	63.9	49.5	40.0
Salem	233.8	50.0	21.3	65.0	27.8	61.7	26.4
Somerset	196.3	28.6	14.6	52.0	26.5	60.2	30.6
Sussex	337.5	136.5	48.4	217.0	64.2	195.0	57.7
Union	65.7	14.4	21.9	10.0	15.2	--	--
Warren	231.4	60.2	26.0	107.0	46.2	98.8	42.7
TOTAL	4,809,218	2,069,819	43.0	2,348,000	48.8	1,928.4	38.6

¹From: Vermeule, C.C. 1899. "The Forests of New Jersey".

²From: (Ferguson & Mayer 1974)

Appendix O. Loss of Potential Deer Range in New Jersey by County
(1958-67 and 1957-72)

County	1958-67		1958-72	
	Square Mile Lost	% of Deer Range Lost	Square Mile Lost	% of Deer Range Lost
Atlantic	24	4.0	36	6.0
Bergen	26	11.0	40	17.0
Burlington	15	2.0	25	3.0
Camden	8	4.0	12	5.0
Cape May	8	3.0	13	5.0
Cumberland	8	2.0	13	3.0
Essex	9	7.0	14	11.0
Gloucester	2	1.0	3	1.0
Hudson	0.8	2.0	1.9	4.0
Hunterdon	28	7.0	42	10.0
Mercer	15	7.0	22	10.0
Middlesex	34	11.0	47	15.0
Monmouth	60	13.0	90	19.0
Morris	75	16.0	118	25.0
Ocean	33	5.0	48	7.0
Passaic	37	19.0	55	28.0
Salem	No loss (1% increase in potential deer range) 93% in 1958 - 94% in 1972			
Somerset	74	24.0	110	36.0
Sussex	8	1.5	15	3.0
Union	3	3.0	4	4.0
Warren	12	3.0	19	5.0
TOTAL			681	9.1

Total land area of New Jersey - 7515 square miles
 Developed land (1972) - 1890 square miles
 Potential deer range (1972) - 5625 square miles

Appendix P. Area by Land Classes, New Jersey, 1972*

Land Classes	Area	
	Thousand Acres	Percent
Forest Land:		
Commercial	1,856.8	38
Productive-reserved	34.0	1
Unproductive	37.6	1
Total Forest Land	1,928.4	40
Urban and Other:		
Land with tree cover ¹	685.0	14
Land with tree cover ²	1,556.6	32
Cropland ³	573.0	12
Pasture ³	77.5	2
Total nonforest Land	2,892.1	60
Total land area ⁴	4,820.5	100

¹These are lands where the principal use for the immediate future precludes planning or management for timber production but which are partially in tree cover. In New Jersey 75 percent of the land in this category is devoted to urban and suburban uses.

²Includes swampland, industrial and urban areas, other nonforest land, and 48,600 acres classed as water by Forest Survey standards, but defined by the Bureau of the Census as land.

³Source: 1969 Census of Agriculture. Total cropland includes cropland used for pasture. Data extrapolated to 1972.

⁴Source: United States Bureau of the Census, Areas of New Jersey: 1960 (January 1967).

*From: (Ferguson & Mayer 1974).

Appendix Q. Hunting License Sales and Deer Harvest by Season (1909-75)

Year	DEER HARVEST				HUNTING LICENSES SOLD			
	Firearm Buck Harvest	Special Harvest	Bow Harvest	Total Deer Harvest	Resident Firearm	Non-Resident Firearm	Resident Bow	Non-Resident Bow
1909	86	-	-	86	62,702	-	-	-
1910	127	-	-	127	61,920	-	-	-
1911	141	-	-	141	64,000	-	-	-
1912	109	-	-	109	67,411	-	-	-
1913	149	-	-	149	71,078	-	-	-
1914	180	-	-	180	72,692	-	-	-
1915	291	190	-	481	91,199	-	-	-
1916	255	-	-	255	100,584	-	-	-
1917	327	-	-	327	104,684	-	-	-
1918	353	-	-	353	107,481	-	-	-
1919	522	-	-	522	128,339	-	-	-
1920	834	-	-	834	139,453	-	-	-
1921	771	-	-	771	146,800	-	-	-
1922	890	-	-	890	133,417	-	-	-
1923	1,219	-	-	1,219	143,366	-	-	-
1924	1,063	-	-	1,063	137,756	-	-	-
1925	1,209	40	-	1,249	153,960	-	-	-
1926	1,730	-	-	1,730	167,415	-	-	-
1927	1,790	-	-	1,790	180,926	-	-	-
1928	1,415	-	-	1,415	187,968	-	-	-
1929	1,331	-	-	1,331	195,121	-	-	-
1930	1,484	-	-	1,484	195,710	1,762 ²	-	-
1931	1,702	-	-	1,702	189,736	1,404	-	-
1932	1,575	-	-	1,575	118,698	1,118	-	-
1933	1,761	114	-	1,875	78,730	877	-	-
1934	2,340	126	-	2,466	82,742	940	-	-
1935	2,206	181	-	2,387	86,370	982	-	-
1936	2,034	-	-	2,034	86,435	1,090	-	-
1937	2,173	-	-	2,173	93,061	1,172	-	-
1938	2,339	-	-	2,339	96,421	1,200	-	-
1939	2,336	-	-	2,336	96,312	1,199	-	-
1940	2,662	-	-	2,662	94,993	1,170	-	-
1941	2,182	-	-	2,182	103,855	1,376	-	-
1942	2,532	-	-	2,532	92,789	1,264	-	-
1943	2,458	-	-	2,458	83,537	1,357	-	-

Year	DEER HARVEST				HUNTING LICENSES SOLD			
	Firearm Buck Harvest	Special Harvest	Bow Harvest	Total Deer Harvest	Resident Firearm	Non-Resident Firearm	Resident Bow	Non-Resident Bow
1944	2,633	-	-	2,633	88,388	1,657	-	-
1945	2,704	-	-	2,704	105,466	1,951	-	-
1946	3,043	-	-	3,043	123,671	2,598	-	-
1947	3,932	-	6	3,938	115,576 ³	2,294 ³	-	-
1948	3,248	-	1	3,249	141,791 ³	1,510 ³	801 ⁴	-
1949	3,618	-	9	3,627	138,555	1,304	936	1
1950	3,777	-	12	3,789	140,252	1,451	1,224	2
1951	4,533	472	14	5,019	143,680	1,447	1,632	2
1952	4,514	-	140	4,654	141,059	1,564	6,070	28
1953	4,824	-	287	5,111	149,028	1,635	10,915	37
1954	4,767	-	319	5,086	154,594 ⁵	1,742	15,135 ⁵	71
1955	6,114	-	368	6,482	145,280 ⁵	1,607	15,755 ⁵	101
1956	6,070	-	690	6,760	147,737	1,719	21,103	185
1957	6,643	-	1,104	7,747	153,600	1,821	25,681	225
1958	6,115	-	1,252	7,367	160,589	2,044	26,501	188
1959	6,041	3,571	1,230	10,842	154,468	1,861	23,625	198
1960	6,072	-	1,298	7,370	158,635 ⁶	1,930	23,216 ⁶	177
1961	5,255	6,070 ⁹	1,081	12,406	150,703 ⁶	2,151	21,505 ⁶	254
1962	5,158	2,061 ⁹	978	8,197	156,559	2,450	20,578	241
1963	5,836	2,032	952	8,820	150,619	2,054	21,628	233
1964	5,057	1,876	1,116	8,049	151,399	2,291	21,244	232
1965	5,091	118	1,106	6,315	150,701	2,306	21,925	256
1966	5,938	2,579	1,327	9,844	151,549	2,412	23,615	286
1967	5,587	2,900	1,456	9,943	156,312	2,591	25,356	295
1968	4,984	2,197	1,501	8,682	159,950	2,788	26,670	331
1969	4,795	2,326	1,356	8,477	165,066	3,110	27,819	318
1970	4,879	1,987	1,387	8,253	171,959 ⁷	3,266 ⁷	29,026 ⁷	381 ⁷
1971	4,904	1,207	1,434	7,545	186,774 ⁷	3,644 ⁷	30,408 ⁷	387 ⁷
1972	6,961	2,596	1,464	11,021	171,369	2,779 ⁸	30,327	328 ⁸
1973	6,802	2,827	1,689	11,318	171,379	2,785 ⁸	33,323	354 ⁸
1974	6,806	4,630	1,710 ¹⁰	13,146	170,905	1,837	34,208	208
1975	6,790	3,885	2,013 ¹⁰	12,688	170,936	2,777	34,288	357

Footnotes:

- ¹1909 to 1948 Resident Firearm Hunting License \$2.00; Non-Resident Firearm License \$10.00
- ²Non-resident license sales information prior to 1930 is unavailable.
- ³1948, Resident Firearm and Bow License raised to \$3.00; Non-Resident License raised to \$15.00
- ⁴First bow and arrow license required
- ⁵1955, Resident Licenses raised to \$4.00
- ⁶1961, Resident Licenses raised to \$5.00
- ⁷1971, Resident Licenses raised to \$7.00; Non-Resident Licenses raised to \$25.00
- ⁸Non-Resident Licenses raised to \$40.00
- ⁹1962 to 1975 Special Harvest includes deer killed in hunter's choice area during six-day firearm season.
- ¹⁰Total includes 190 deer killed during special winter bow and arrow season (January 3-10, 1976).

Sources: 1909 to 1945 "Annual Report" Board of Fish and Game Commissioners
 1946 to 1970 "Annual Report" Division of Fish and Game
 1971 to 1975 "Annual Report" Division of Fish, Game and Shellfisheries

Appendix R. Number and Types of Deer Convictions 1960-1975

<u>Date</u>	<u>Loaded Firearm In Vehicle</u>	<u>Uncased Weapon</u>	<u>Hunting at Night</u>	<u>Hunting Closed Season</u>	<u>Possession of Deer</u>	<u>Illegal Missile</u>	<u>Other</u>	<u>Total</u>
1960-61								139
1961-62								178
1962-63								205
1963-64								271
1964-65			72					202
1965-66								244
1966-67	20	94		63	30	16		233
1967-68	19	60		40	43	29	12	193
1968-69	18	76		62	51	30		237
1969-70	16	86		72	58	31		263
1970-71	10	82		52	55	21		220
1971-72	13	73		64	73	32		255
1972-73	38	88		59	60	52		297
1973-74	43	132		91	86	41		393
1974-75	29	131		78	104	33		375

Appendix S. Distribution of Hunter Harvest for Bow and Arrow Season 1974

<u>Date</u>	<u>No. of Animals Harvested</u>	<u>Percent</u>	<u>Cumulative Percent</u>	<u>% of State Harvest</u>	<u>Histogram of Harvest Period</u>
Sat. Oct. 5	221	13.1	13.1	13.1	XXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
Mon. Oct. 7	56	3.3	16.4	3.3	XXXXXXXXXXXX
Tues. Oct. 8	48	2.8	19.2	2.8	XXXXXXXXXXXX
Wed. Oct. 9	36	2.1	21.3	2.1	XXXXXXX
Thur. Oct.10	31	1.8	23.2	1.8	XXXXXX
Fri. Oct. 11	28	1.7	24.8	1.7	XXXXXX
Sat. Oct. 12	87	5.1	29.9	5.1	XXXXXXXXXXXXXXXXXXXX
Mon. Oct. 14	53	3.1	33.1	3.1	XXXXXXXXXXXX
Tues. Oct.15	29	1.7	34.8	1.7	XXXXXX
Wed. Oct. 16	7	0.4	35.2	0.4	X
Thur. Oct.17	26	1.5	36.7	1.5	XXXXXX
Fri. Oct. 18	31	1.8	38.6	1.8	XXXXXX
Sat. Oct. 19	118	7.0	45.5	7.0	XXXXXXXXXXXXXXXXXXXX
Mon. Oct. 21	18	1.1	46.6	1.1	XXXX
Tues. Oct.22	37	2.2	48.8	2.2	XXXXXXX
Wed. Oct. 23	37	2.2	51.0	2.2	XXXXXXX
Thur. Oct.24	41	2.4	53.4	2.4	XXXXXXX
Fri. Oct. 25	37	2.2	55.6	2.2	XXXXXXX
Sat. Oct. 26	101	6.0	61.5	6.0	XXXXXXXXXXXXXXXXXXXX
Mon. Oct. 28	80	4.7	66.3	4.7	XXXXXXXXXXXXXXXXXXXX
Tues. Oct.29	30	1.8	68.0	1.8	XXXXXX
Wed. Oct. 30	36	2.1	70.2	2.1	XXXXXXX
Thur. Oct.31	31	1.8	72.0	1.8	XXXXXX
Fri. Nov. 1	46	2.7	74.7	2.7	XXXXXXXX

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Sat. Nov. 2	126	7.4	82.2	7.4	XXXXXXXXXXXXXXXXXXXX
Mon. Nov. 4	37	2.2	84.3	2.2	XXXXXXX
Tues. Nov. 5	65	3.8	88.2	3.8	XXXXXXXXXXXX
Wed. Nov. 6	69	4.1	92.3	4.1	XXXXXXXXXXXX
Thur. Nov. 7	<u>131</u>	<u>7.7</u>	<u>100.0</u>	<u>7.7</u>	XXXXXXXXXXXXXXXXXXXX
TOTAL	1,693*	100.0	100.0	100.0	NOTE: Each 'X' represents 5 individuals

*Actual total is 1717; due to recording problems, 24 deer could not be included in this summation.

Appendix T. Distribution of Firearm Harvest 1974

<u>Date</u>	<u>No. of Animals Harvested</u>	<u>Percent</u>	<u>Cumulative Percent</u>	<u>% of State Harvest</u>	<u>Histogram of Harvest Period</u>
Mon. Dec. 9	4,164	59.9	59.9	59.9	XXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX
Tues. Dec. 10	896	12.9	72.8	12.9	XXXXXXXXXX
Wed. Dec. 11	537	7.7	80.6	7.7	XXXXX
Thur. Dec. 12	393	5.7	86.2	5.7	XXXX
Fri. Dec. 13	332	4.8	91.0	4.8	XXX
Sat. Dec. 14	<u>626</u>	<u>9.0</u>	<u>100.0</u>	<u>9.0</u>	XXXXXX
TOTAL	6,948*	100.0	100.0	100.0	NOTE: Each 'X' represents 100 individuals

*The actual total is 6,995. Reports of 47 deer could not be used. This figure includes all deer taken during the six-day period and includes some antlerless animals from hunter's choice and special areas permitting the harvest of either sex.

Appendix U. Deer Damage Complainants (Fiscal 1966-1976)

<u>Fiscal Year</u>	<u>Number of Complainants</u>	<u>Gallons of Repellent</u>	<u>Rolls of Wire Mesh</u>	<u>Spools of Barbed Wire</u>
1966	180	520	561	97
1967	259	226	574	66
1968	164	186	555	87
1969	155	239	420	64
1970	137	480	337	54
1971	75	170	243	31
1972	108	163	213	23
1973	187	256	274	37
1974	475	345	301	36
1975	359	258	171	22
1976	392	542	170	22

Appendix V. Incidence of Arrow Wounds from Deer Examined on December 9, 1974

Check Station	No. of Deer Examined	% of Total Deer Checked on Dec. 9	No. of Deer Found with Arrow Wounds	% Wounded of Number Checked
Atsion	37	100.0 (37)	0	0.0
Bedminster	70	48.6 (144)	0	0.0
Branchville	121	100.0 (121)	0	0.0
Bridgeton	37	52.1 (71)	0	0.0
Budd Lake	51	100.0 (51)	0	0.0
Clinton	100	33.9 (295)	3	3.0
Croton	90	62.1 (145)	1	1.0
Hope	100	78.1 (128)	0	0.0
Lakemurst	19	65.5 (20)	0	0.0
Long Valley	90	63.4 (142)	1	1.0
Mauricetown	26	96.3 (27)	0	0.0
Mays Landing	31	100.0 (31)	1	3.2
Millford	145	100.0 (145)	1	0.7
Quinton	96	100.0 (96)	0	0.0
Stillwater	60	75.0 (80)	0	0.0
Walnut Valley	100	68.0 (147)	1	1.0
TOTAL	1,173	69.5 (1,689)	8	0.7

Appendix X
Deer harvest by county and season (1909-1975)

County ²	1909 ¹	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Atlantic		23	31	31	45	34	101	47	87	105	99	236	174	157	184	125	158	175
Bergen		-	5	3	-	4	23	5	11	6	20	23	16	60	42	29	31	66
Burlington	-	20	14	15	17	24	59	52	77	77	144	273	248	253	455	439	470	627
Camden	-	-	-	-	-	-	-	-	1	1	5	14	9	10	10	19	11	13
Cape May	-	4	15	8	12	17	17	20	15	6	10	19	10	17	8	10	2	7
Cumberland	-	33	32	23	41	39	90	79	63	42	46	77	74	58	65	54	51	62
Essex	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	4	4
Gloucester	-	-	-	-	-	-	-	-	-	-3	2	-	2	2	8	-	5	2
Hudson	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hunterdon	-	-	-	-	-	-	1	-	-	-	-	1	-	3	4	4	3	4
Mercer	-	-	-	-	-	1	6	-	2	5	14	6	1	5	7	5	4	6
Middlesex	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	1	-	-
Monmouth	-	-	-	-	-	-	-	-	-	-	1	1	2	3	4	5	9	12
Morris	-	-	1	-	1	4	8	3	9	3	20	16	18	41	77	56	54	100
Ocean	-	7	15	8	8	17	76	21	29	45	76	93	121	148	225	214	267	415
Pascale	-	2	-	1	-	-	9	-	5	6	9	5	19	33	26	33	29	55
Salem	-	2	1	2	1	5	12	-	-	1	-	2	-	-	-	-	-	-
Somerset	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	1	4	19
Sussex	-	12	10	2	3	2	8	2	6	17	23	21	33	49	45	47	77	100
Union	-	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-	-	-
Warren	-	24	17	15	21	32	72	25	20	36	52	47	44	43	54	39	30	63
Total Buck Harvest	86	127	141	109	149	180	481*	255	327	353	522	834	771	890	1216	1063	1209	1730
Total Antlerless Harvest	-	-	-	-	-	-	190	-	-	-	-	-	-	-	-	-	40	-
Total Kill	86	127	141	109	149	180	481	255	327	353	522	834	771	890	1216	1063	1249	1730

1 Only the total firearm buck harvest is available
 2 County harvests for 1910 through 1946 are for the firearm buck harvest only
 The total harvest of antlerless deer is given for years in which a season was held
 * (190 antlerless deer) included in total

Appendix W. Summary of Hunting Accidents and Fatalities (1914-1975)

Period	Fatalities	Accidents	Period	Fatalities	Accidents
1914-15		3	1944-45	2	3
1915-16			1945-46	1	1
1916-17			1946-47		
1917-18	3		1947-48		
1918-19			1948-49	4	14
1919-20			1949-50	1	9
1920-21			1950-51	3	10
1921-22			1951-52		
1922-23		2	1952-53	8	14
1923-24			1953-54		
1924-25		2	1954-55	6	7
1925-26	2	3	1955-56		
1926-27			1956-57		
1927-28		4	1957-58		22
1928-29	1	4	1958-59		
1929-30	3	8	1959-60		10
1930-31			1960-61		25
1931-32	1	5	1961-62	2	12
1932-33			1962-63		16
1933-34			1963-64		4
1934-35			1964-65	1	9
1935-36			1965-66		9
1936-37			1966-67	2	17
1937-38			1967-68	2	26
1938-39			1968-69		8
1939-40			1969-70		10
1940-41		4	1970-71	3	16
1941-42		2	1971-72	2	4
1942-43		6	1972-73		5
1943-44			1973-74	1	6
			1974-75	4	8

*From Division Annual Reports

Appendix X
Deer harvest by county, all seasons (1909 - 1975)

County	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Atlantic	185	112	125	149	189	144	113	185	145	140	260	246	229	265	278	282	274	189
Bergen	69	54	35	27	56	68	44	21	15	14	21	25	39	64	31	70	57	70
Burlington	634	473	448	527	500	338	535	709	712	692	713	676	662	629	503	545	695	495
Camden	8	25	6	12	14	20	19	19	16	24	47	57	48	69	62	53	85	89
Cape May	5	5	2	2	3	10	7	5	9	8	16	25	30	22	44	25	15	24
Cumberland	73	51	64	49	45	52	30	29	16	34	26	48	38	64	59	66	66	73
Essex	4	12	22	14	16	8	17	13	14	17	15	10	13	18	10	31	24	31
Gloucester	2	-	4	2	5	15	19	13	9	11	14	19	19	17	18	11	12	16
Hudson	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hunterdon	6	3	3	11	8	15	2	8	16	5	13	17	23	26	19	47	30	73
Mercer	7	8	3	6	21	9	13	15	11	17	21	20	13	22	16	23	25	63
Middlesex	-	-	-	1	3	3	-	-	4	-	7	4	1	10	4	15	3	10
Monmouth	18	23	17	28	40	57	56	55	58	40	70	70	64	83	60	50	46	43
Morris	120	103	106	131	139	152	145	270	129	112	111	160	194	263	194	313	262	372
Ocean	450	329	327	279	322	268	385	579	567	555	433	478	426	410	270	273	350	299
Passaic	61	61	31	71	71	85	89	88	98	74	80	88	104	131	100	125	107	138
Salem	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Somerset	10	18	23	21	42	42	29	31	41	37	30	44	35	33	27	62	39	120
Sussex	73	82	70	108	163	210	180	178	209	157	192	198	258	298	284	265	218	315
Union	-	1	-	-	1	2	1	-	2	-	-	2	-	3	1	12	4	14
Warren	64	55	45	46	64	77	77	122	105	97	104	152	140	193	202	264	146	199
Total Buck Harvest	1790	1415	1331	1484	1702	1575	1761	2340	2206	2034	2173	2339	2336	2622	2182	2532	2458	2633
Total Antlerless Harvest	-	-	-	-	-	-	114	126	181	-	-	-	-	-	-	-	-	-
Total Kill	1790	1415	1331	1484	1702	1575	1875	2466	2387	2034	2173	2339	2336	2622	2182	2532	2458	2633

Appendix X
Deer harvest by county and season (1945 - 1975)

County	1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		1956			
	F	B&A	F	B&A	F	B&A	F	B&A	F	B&A	F	B&A	F	Ant.	F	B&A	F	B&A	F	B&A	F	B&A	F	B&A		
Atlantic	225		252		299	2	195		321	4	295		294		329	4	346	6	283	5	418	12	325	39		
Bergen	66		67		69		72		57		62		48		41	3	47	6	66	10	77	5	82	7		
Burlington	591		609		699	3	467	1	456	1	547	3	648	1	675	11	632	30	445	4	720	11	760	69		
Camden	55		75		80		51		68		57		72		63	1	96	3	69		89		66	10		
Cape May	40		41		63		44		63		81		58		89	1	72	3	46	1	129	2	89	9		
Cumberland	135		112		180	1	114		160		172	1	195		246	5	223	4	176		291	11	185	21		
Essex	36		49		54		47		52		58		78		57	10	81	8	63	6	48	9	67	13		
Gloucester	19		13		25		14		16		13		25		27		18	1	32	5	27	1	30	3		
Hudson	-		-		-		-		-		-		-		-		-		-		-		-			
Hunterdon	99		111		179		210		249	1	314	1	371	3	467	16	478	30	516	40	747	32	752	69		
Mercer	30		61		88		82		94		115		152		145	13	132	26	130	36	214	47	225	52		
Middlesex	5		7		3		21		16		19		32		19	2	26	4	24	2	44	2	70	9		
Monmouth	65		56		79		83		58		97	1	129		100	7	133	9	98	18	135	15	149	35		
Morris	397		358		492		504		557		588	2	648	6	649	25	748	62	889	81	701	100	816	87		
Ocean	240		442		510		371		310		314	1	446	1	360	7	369	20	289	10	380	10	463	60		
Passaic	120		152		217		157		161		137		162		144	4	122	9	172	8	237	14	226	15		
Salem	-		-		1		-		-		-		3		-		3		2		5		8	0		
Somerset	143		119		217		215		240	1	286	2	318	1	374	15	489	32	506	57	543	59	633	101		
Sussex	288		328		459		358		483	2	381	1	440	1	432	7	439	17	532	16	737	24	593	43		
Union	4		12		12		11		9		24		19		8	2	4	1	2	1	4	2	5	2		
Warren	146		179		206		232		248		236		365	1	289	8	366	16	427	19	568	12	526	46		
Total Buck Harvest	2704		3043		3932	6	3248	1	3618	9	4726	12	4533	14	472		4514	142	4824	287	4767	319	6114	368	6070	690
Total Kill	2704		3043		3938		3249		3627		4803		5019				4655		5111		5086		6482		6760	

F - Firearm Buck Harvest
B&A - Fall Bow and Arrow Harvest
Ant - Antlerless Harvest

Appendix X
Deer harvest by county and season (1971 - 1975)

County	1971				1972				1973				1974 ⁽⁴⁾			1975 ⁽⁴⁾			
	F	B&A	J	H C	F	B&A	P	H C	F	B&A	P	H C	F	B&A	P	F	B&A	P	W B
Atlantic	365	87	-	-	486	63	-	-	386	76	-	-	399	63	-	388	73	6	9
Bergen	-	4	-	29	-	3	-	15	-	-	-	22	36	4	6	49	8	10	-
Burlington	311	94	6	-	560	106	-	-	511	98	-	-	502	129	9	417	105	88	10
Camden	52	6	-	-	87	15	-	-	66	20	-	-	70	23	-	60	15	-	2
Cape May	105	31	-	-	121	17	-	-	107	23	-	-	89	21	-	102	25	-	3
Cumberland	239	67	-	-	407	70	-	-	296	58	-	-	298	62	-	315	53	47	11
Essex	-	-	-	16	-	1	-	6	-	-	-	10	4	2	-	9	2	-	-
Gloucester	62	19	-	-	70	10	-	-	49	19	-	-	52	20	-	72	26	-	3
Hudson	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Hunterdon	878	341	471	-	1320	385	787	-	1407	499	788	-	1408	505	1781	1388	500	1335	47
Mercer	161	71	82	-	242	74	104	-	208	100	194	-	225	84	182	217	83	167	9
Middlesex	82	28	10	3	110	29	61	-	121	40	65	-	146	48	52	113	69	49	4
Monmouth	125	34	-	-	136	41	43	-	112	37	43	-	155	28	38	145	35	59	6
Morris	446	141	136	-	519	140	348	-	532	153	356	-	551	160	425	646	148	447	22
Ocean	297	53	4	-	448	77	-	-	318	48	49	-	391	67	219	325	45	158	3
Passaic	142	37	23	3	157	18	62	-	206	35	65	-	171	33	100	209	56	58	13
Salem	139	47	-	-	190	53	-	-	193	60	-	-	217	56	-	223	86	75	2
Somerset	251	105	113	-	338	76	219	-	359	106	343	-	353	100	238	376	122	269	13
Sussex	591	88	81	-	775	96	283	-	866	109	354	-	854	107	465	891	150	455	12
Union	-	1	-	-	-	-	-	5	-	-	-	3	-	-	-	-	-	-	-
Warren	658	175	230	-	982	190	649	-	1067	208	547	-	1074	203	649	846	225	662	21
Total Buck Harvest	4904	1434	1156	51	6948	1464	2555	27	6801	1689	2792	35	6995	1715	4434	6790	1825	3885	190
Total Kill		7,545			10,995	3			11,300				13,144			12,691			

F - Firearm Buck Harvest
B&A - Fall Bow and Arrow Harvest
H C - Hunters Choice
P - Permit Harvest
W B - Winter Bow and Arrow Harvest

(3) Includes (13-F), (7-P), and (6-H C) from unknown counties

(4) Hunter's choice area harvest included in firearm buck kill in 1974 (101) and 1975 (104)

Appendix X
Deer harvest by county and season (1909 - 1975)

County	1957		1958		1959			1960		1961			1962			1963				1964				
	F	B&A	F	B&A	F	B&A	Ant	F	B&A	F	B&A	H C	F	B&A	P P	H C	F	B&A	P P	H C	F	B&A	P	H C
Atlantic	434	54	339	38	312	34		518	76	363	49	144	400	62	82	-	515	69	96	-	472	86	202	-
Bergen	85	14	67	13	45	5	3	52	11	16	4	39	-	3	-	-	-	-	-	-	-	-	-	-
Burlington	562	61	540	67	560	63		645	102	690	102	327	608	98	167	205	-	-	-	-	-	-	-	-
Camden	56	9	65	16	70	7		72	12	44	10	16	62	7	-	-	-	-	-	-	625	150	224	24
Cape May	90	11	74	6	67	7		142	14	80	7	45	87	8	-	-	-	-	-	-	50	20	12	-
Cumberland	183	15	167	12	185	20		261	20	184	13	100	148	10	25	-	121	9	60	-	88	12	58	-
Essex	30	8	41	13	27	14	12	30	3	30	3	33	-	3	-	-	271	20	-	-	250	33	97	-
Gloucester	32	4	28	3	26	2		39	9	28	5	15	34	5	-	122	-	4	-	-	60	10	5	60
Hudson	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hunterdon	1025	178	1007	236	950	263	1099	987	247	964	253	1861	885	213	490	-	52	4	-	-	-	-	-	-
Mercer	286	123	291	110	264	84	346	222	87	230	91	514	213	76	79	-	849	190	414	-	756	228	258	-
Middlesex	91	15	57	23	61	8	29	84	16	68	14	26	68	18	-	203	71	99	-	193	83	64	-	
Monmouth	164	28	138	39	121	34		161	35	106	33	64	105	21	41	22	60	12	-	15	65	18	11	8
Morris	920	166	868	247	759	218	656	614	204	494	152	507	545	148	106	-	135	20	34	-	121	18	16	-
Ocean	407	47	338	41	370	56		315	56	330	43	174	388	40	87	-	526	108	157	-	427	117	185	-
Passaic	258	31	205	35	215	36	82	169	38	127	17	142	92	12	-	524	51	112	-	476	97	122	-	
Salem	19	-	17	3	21	3		40	1	28	5	2	29	6	-	-	-	-	-	-	114	12	14	6
Somerset	681	130	563	179	624	190	582	435	154	453	133	919	391	104	143	-	52	11	-	-	58	14	9	-
Sussex	744	116	647	82	670	80	291	542	80	441	62	604	495	50	232	-	301	80	165	-	319	90	93	-
Union	4	2	2	3	2	1		2	1	-	-	-	-	-	-	-	507	40	207	-	449	35	111	-
Warren	592	92	661	86	652	105	451	682	132	579	85	538	608	94	219	-	-	-	-	-	-	-	-	-
Total Buck Harvest	6643	1104	6115	1252	6041	1230	3591	6072	1298	5255	1081	6070	5158	902	1709	352	5836	952	1807	225	5057	1116	1777	92
Total Kill	7,747		7,367		10,822			1,370		12,406			0,272				8,820				8,049			

F - Firearm Duck Harvest
B&A - Fall Bow and Arrow Harvest
Ant - Antlerless Harvest
H C - Hunters Choice Harvest
P P - Party Permit Harvest
P - Permit Harvest

Appendix X
Deer harvest by county and season (1909 - 1975)

County	1965			1966				1967				1968			1969				1970					
	F	B&A	H C	F	B&A	P	H C	F	B&A	P	H C	F	B&A	P	H C	F	B&A	P	H C	F	B&A	P	H C	
Atlantic	452	78		525	116	217	-	471	121	190	-	401	152	4	356	119	-	-	333	92	-	-	-	
Bergen	-	-	26	-	2	-	31	-	5	-	37	-	2	-	-	5	-	57	-	2	-	-	25	
Burlington	531	95	-	667	172	229	-	471	165	244	-	355	174	17	330	114	-	-	378	137	-	-	-	
Camden	58	12	-	65	20	22	-	41	15	9	-	42	17	-	42	18	-	-	66	16	-	-	-	
Cape May	95	14	-	169	24	53	-	89	28	31	-	126	32	-	77	40	-	-	82	25	-	-	-	
Cumberland	259	27	-	326	57	124	-	226	43	82	-	245	73	-	213	70	-	-	218	43	-	-	-	
Essex	-	1	79	-	1	-	36	-	3	-	32	-	-	-	-	-	-	14	-	-	-	11	-	
Gloucester	41	6	-	59	13	18	-	45	11	9	-	39	10	-	51	9	-	-	45	11	-	-	-	
Hudson	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hunterdon	796	271	-	862	272	500	-	918	320	932	-	848	316	710	883	298	671	-	927	289	650	-	-	
Mercer	173	97	-	192	91	97	-	180	84	189	-	166	74	140	156	55	113	-	174	77	109	-	-	
Middlesex	8	23	9	101	30	25	6	92	30	25	7	70	25	50	73	21	43	6	85	25	35	5	-	
Monmouth	137	36	-	141	40	18	-	135	59	77	-	100	39	80	108	29	76	-	106	20	51	-	-	
Morris	482	108	-	507	118	228	-	537	132	196	-	419	134	176	435	146	171	-	432	110	174	-	-	
Ocean	397	46	-	482	63	164	-	461	80	162	-	320	90	15	323	77	-	-	344	126	-	-	-	
Passaic	86	8	3	160	15	21	-	175	17	11	6	107	16	70	99	20	78	7	127	31	46	4	-	
Salem	69	14	-	84	21	29	-	90	31	32	-	103	33	-	93	35	-	-	119	35	-	-	-	
Somerset	299	81	-	289	85	192	-	283	113	144	-	260	86	131	268	60	146	-	246	105	185	-	-	
Sussex	532	77	-	634	70	259	-	611	81	199	-	638	73	149	552	79	237	-	506	91	228	-	-	
Union	-	1	-	-	2	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Warren	604	114	-	675	117	308	-	742	177	286	-	745	155	514	736	161	707	-	691	152	464	-	-	
Total Buck Harvest	5019	1109	117	5938	1329	2504	75	5567	1456	2818	82	4984	1501	2116	4795	1356	2242	84	4879	1387	1942	45	-	
Total Kill		6,245		9,846				9,923				8,601			8,477				8,253					

F - Firearm Buck Harvest
B&A - Fall Bow and Arrow Harvest
H C - Hunters Choice
P - Permit Harvest