Delaware Deer Management Plan
2010 – 2019

A Guide to How and Why Deer are Managed in The First State

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This publication was funded in part by funds provided by Pittman-Robertson Federal Aid to Wildlife Restoration Project-W35R.

Copies of this publication may be obtained from the Delaware Division of Fish and Wildlife, 89 Kings Highway, Dover, DE 19901, or from the Division's website www.fw.delaware.gov

EXECUTIVE SUMMARY

The Delaware Deer Management Plan is intended to guide and direct the Delaware Division of Fish and Wildlife's efforts concerning deer management over the next 10 years. Like all wildlife, deer are held as a public trust resource and are managed for the public. In an effort to represent the interests of all Delawareans concerning deer management, the plan was created with input from a 22-member stakeholder advisory group, a public phone attitude survey, a mail survey to hunters, and from comments solicited from the general public at three countywide public meetings. Deer experts outside the division provided a technical review of the draft plan. The 2010 – 2019 Delaware Deer Management Plan provides the framework for deer management activities and decisions over the next 10 years. The foundation of this plan was built from the Mission and Vision of the Delaware Division of Fish and Wildlife (pages V and VI).

White-tailed deer (*Odocoileus virginianus*) are arguably the most important wildlife species managed in Delaware. Wildlife-watchers, photographers, and hunters contribute millions of dollars each year to the state's economy while pursuing deer. At the same time, deer are responsible for Delaware's agricultural producers and other citizens suffering millions of dollars worth of damage to crops, landscaping, and vehicles annually. Managing the deer population to satisfy recreational interests while at the same time reducing damage concerns, is a challenging and controversial process. Annually, the white-tailed deer is the most commonly pursued game species by Delaware sportsman. Surveys indicate that more hunters pursue deer than all other game species combined. Deer are both challenging to hunt and offer a bountiful supply of venison.

White-tailed deer were plentiful in Delaware at the time of settlement in the 1600s. However, market-hunting and habitat destruction nearly extirpated deer from the state by the mid-1800s. Because of this, the harvest of deer was banned in 1841 and it remained illegal to harvest deer in Delaware until 1954, when the state's first hunting season occurred. Unlike in many states, no deer were imported into Delaware for restocking purposes. Through protection, deer were able to reproduce and rebound on their own. By the 1980s, management philosophies across much of the state had changed from increasing the deer population to stabilizing and in some areas reducing deer numbers.

Active management of deer is a necessity in Delaware today to maintain populations at levels compatible with the varied interests of the citizens of the state as well as ecological concerns. As an evolutionary prey species, deer exhibit a high fecundity rate, enabling them to rapidly increase in number. Presently, non-lethal management techniques such as contraceptives and non-hunting mortality (i.e. disease, injuries, predation, and roadkills) are not sufficient in maintaining deer populations at satisfactory levels. Lethal control of deer via the regulated deer hunting season is required to effectively regulate the deer population.

Lethal control of deer via hunting is a controversial management practice in some parts of Delaware. However, hunting is not always compatible nor feasible in more densely populated urban and suburban sections of the state. As a result, the Delaware Deer Management Plan addresses non-lethal deer management concepts and promotes their investigation and use to

complement hunting and other lethal strategies so that the Delaware Division of Fish & Wildlife may implement a full suite of management options statewide.

Along with addressing the use of lethal and non-lethal practices for deer management, the Deer Plan documents the history of white-tailed deer and white-tailed deer management in Delaware. It describes the current population status of white-tailed deer and white-tailed deer hunters in the state, and the positive and negative impacts of deer. Finally, the Deer Plan documents the responsibilities of the Division's deer management program and outlines six major goals it hopes to achieve, and the underlying strategies and objectives for achieving those goals.

MISSION OF THE DELAWARE DIVISION OF FISH & WILDLIFE

The Mission of the Wildlife Section is to conserve our native wildlife populations, promote responsible resource management and provide wildlife related recreational and educational opportunities for all.

Guiding Principles/ideas:

1. We will manage populations of flora and fauna at socially acceptable levels.
2. We will maximize biodiversity
3. We will protect, improve, and restore native habitat.
4. We will provide and promote safe and enjoyable hunting and other wildlife related activities.
5. We will provide guidance to resolve human-wildlife conflicts.
6. We will educate all users about the value of wildlife and their benefits.
7. Decisions will be based upon science.
8. We will develop partnerships to develop and implement programs.
9. We will perform all activities in a professional manner in accordance with the Code of Ethics established by the Wildlife Society.
10. We will Incorporate public opinion into our decision making process.
11. Will manage wildlife as a Public Trust Resource.

Guiding Principles/Philosophical Tenets – Defined:

Conserve Native Wildlife

1. Science must serve as the foundation for all our decisions.
2. We are committed to conserving biodiversity and the integrity of biological functions. We will manage native wildlife species as viable free ranging populations.
3. We will protect, improve and restore habitats and natural communities to preserve biodiversity.
4. We will restore native extirpated species.

Responsible Management/Recreation

5. We recognize that wildlife is a Public Trust Resource and fulfilling our mission requires public support and partnerships.
6. We will manage wildlife areas with a priority for wildlife and wildlife related activities.
7. We will provide assistance to resolve human-wildlife conflicts related to health, safety and economic impacts.
8. We recognize hunting and trapping as safe and legitimate management tools and outdoor pursuits.
9. We recognize that some land uses are inevitable and have negative impacts on wildlife populations. We will promote mitigation activities to offset these impacts and educate the public regarding trade-offs.
10. We will educate people about the benefits of wildlife benefits and instill a sense of responsibility and stewardship towards wildlife.

VISION OF THE DELAWARE DIVISION OF FISH & WILDLIFE

The Wildlife Section of the Division of Fish and Wildlife, envisions a Delaware in which our native wildlife populations and habitats are robust, self sustaining and in an appreciably better condition tomorrow than they are today;

That all Delawareans understand the relationship and value of wildlife and natural communities to our health, social and economic well being;

As Delaware's leader in wildlife conservation, the Wildlife Section will continue to foster partnerships with citizens, Non-government organizations and government agencies to conserve our native wildlife populations and promote responsible resource management for the recreation, enjoyment, education and benefit of all Delawareans and visitors to our state.

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INTRODUCTION

White-tailed deer are one of the most recognizable and controversial wildlife species in Delaware. They are admired by wildlife watchers who enjoy their gracefulness, and by hunters, who enjoy their wariness and ways of the woods. At the same time, deer negatively impact the economic livelihood of Delaware agriculturists, arborists, and motorists who are unfortunate enough to strike one with their vehicle. While they are a wildlife management textbook example of bringing a species back from the brink of extinction, their abundance now poses threats to natural forest ecosystems and to other wildlife species due to over-browsing of habitat.

Divergent citizen opinions and interests concerning white-tailed deer pose significant management challenges to the Division of Fish and Wildlife, which is responsible for managing Delaware's wildlife. Establishing deer population goals to satisfy a myriad of division constituents, and finding a balance between lethal and non-lethal deer control methods are the most challenging aspects of managing deer in Delaware today. This 10-year plan establishes goals, objectives, and strategies to address these and other pertinent issues.

What the Delaware Deer Management Plan is

The Deer Plan documents the history of white-tailed deer and white-tailed deer management in Delaware (information on basic white-tailed deer biology can be found in Appendix 1). It also describes the current status of white-tailed deer in Delaware, and the positive and negative impacts of deer. Finally, the Plan documents the responsibilities of the Division of Fish & Wildlife as they relate to deer management, and outlines the goals and objectives for Delaware deer management through 2019. It is important to note that this plan is both a strategic (e.g., the use hunting as the primary tool for deer management) and operational plan (e.g., how hunting seasons are established and amended).

Plan History and Development

While DFW always had a "plan" for deer management in Delaware, there was never a formal document that outlined this process. During the late 1980s Delaware's deer population began to exceed its cultural carrying capacity. The combination of a growing deer herd and a shift from an agricultural-based society to an urban/suburban society resulted in significant deer management issues and elevated the need for a comprehensive deer management plan. Due to the ever increasing demands and obstacles faced when managing deer, the DFW realized the need for a structured and guiding deer management document. To create this plan, comments, suggestions, and opinions were collected from three stakeholder meetings, three public meetings across the State, and via the telephone, the Internet, email, and U.S. Postal mail. Furthermore, in 2005 a public survey of nearly 1,000 Delaware residents (409 from the general public, 400 deer hunters, and 203 agricultural producers) was conducted by Responsive Management (a Harrisonburg, Va.-based public opinion polling outfit), to solicit opinions on current deer management issues. Additionally, in 2004 DFW contracted Dr. Jacob L. Bowman, Associate Professor with the University of Delaware, to conduct an external review of DFW's efforts regarding deer management and provide recommendations for improvement. In 2005, Dr. Bowman submitted his evaluation in a comprehensive report, titled "An Evaluation of Deer Management in Delaware". Finally, expert opinion from DFW staff was vital in crafting the final Plan.

Delaware Wildlife Action Plan 2007 – 2017. This document represented the state's first attempt at developing a comprehensive strategy for conserving the full array of native wildlife and habitats – common and uncommon – as vital components of the state's natural resources. It was intended not only to be comprehensive in terms of the species, habitats, issues and actions it addresses, but also comprehensive in terms of those responsible for implementing it. Habitat management, creation, enhancement, and restoration were all common themes throughout the plan. Unless deer harvest was adequate to prevent an overpopulous deer herd, herbivory from deer was recognized as a key factor that could hinder wildlife habitat restoration throughout the state.

Stakeholder Group - The deer plan stakeholder group, or Delaware Deer Management Stakeholder Advisory Committee (DMSAC), was comprised of 20 individuals who represented various interests across Delaware and two Fish and Wildlife Advisory Council members. Representation was present from a multitude of interest groups and not just hunters. A list of the stakeholders can be found in Appendix 2.

Public Meetings and Comments – Four public meetings, one in New Castle, two in Kent, and one in Sussex County, were held to obtain public feedback concerning deer management in Delaware. Attendance ranged from 13 to 56 people, with a total attendance of 164 people. Additionally, the DFW received comments via the internet, email, telephone, and U.S. Postal mail regarding deer management in the state. Nearly 600 individual comments were received in all (Appendix 3).

Public Opinion Survey - The public opinion survey "The Opinions of the General Population, Hunters, and Farmers Regarding Deer Management in Delaware" conducted by Responsive Management (2005) provided valuable information concerning how Delaware residents perceive deer and deer management in the State. Data from the survey were used extensively in the development of the Plan. The Executive Summary from the survey is available in Appendix 4. The entire report is available online at the DFW website.

An Evaluation of Deer Management in Delaware - In January 2004, Dr. Jacob Bowman was contracted to evaluate deer management in Delaware. Dr. Bowman evaluated historical records of deer regulations, harvest data, deer hunter numbers, human attitude survey data, crop damage records, deer-vehicle collision data, and information about urban conflicts provided by the DFW. In order to better understand the management challenges and deer-human conflicts, he met regularly with biologists from the Division of Fish & Wildlife and also attended meetings of the Deer Technical Committee and Southeastern Deer Study Group. His evaluation and recommendations were based on the best available science, and his training and experiences as a deer biologist. He provided his recommendations as an independent third party. The intended audience for his plan was the deer management staff within the division. His three main objectives were:

1) Summarize history of deer management in Delaware
2) Evaluate the current data on deer management in Delaware
3) Recommend changes to deer management in Delaware

Current Structure of the DFW Game Species Management Program – Compared to surrounding states, the size of the staff largely responsible for managing deer and other game species is relatively small. Currently, seven biologists directly oversee game species population and/or habitat management. A hierarchical breakdown of DFW's game species management program can be found in Figure 1. Current employee names and contact information are also listed.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to all members of the stakeholder group and public who took the time to provide comments, suggestions, and guidance in development of the Deer Plan. We also thank Doug Hotton, retired Maryland Deer Project Leader, for his expertise and wisdom as our stakeholder group meeting facilitator. We also appreciate the many constructive comments received from the Fish and Wildlife Advisory Council and the wildlife professionals who took the time to review this plan, making it a stronger guiding document. Special thanks go to the Deer Program staff with the Maryland Department of Natural Resources and the Virginia Department of Game and Inland Fisheries for providing resources used in the development of our plan. We would also like to thank Margaret Pepper and Anna Shovers for their artwork submissions which are displayed on the front and back covers, respectively.

HISTORY OF WHITE-TAILED DEER AND THEIR MANAGEMENT IN DELAWARE

Colonial Era

When the European colonists arrived on Delaware's shores centuries ago, they found numerous white-tailed deer within the fertile North American landscape. Native Americans and large predators, such as wolves and mountain lions, hunted white-tailed deer throughout the year. White-tailed deer provided the eastern Native American tribes with food, clothing and tools.

Delaware's early colonists soon relied on white-tailed deer for food and clothing as well. The demand for deer meat and buckskin increased substantially over time as Great Britain imported white-tailed deer hides to support the thriving leather industry. The demand was magnified when the European cattle industry suffered an epidemic thought to be hoof and mouth disease.

At the same time that deer were being exploited for meat and hide, expansive tracts of woodlands continued to be cleared to make way for agricultural lands and to supply Delaware's growing population with wood for shelter, heating and other products. Deer habitat was being destroyed at an astounding rate, and as towns sprouted across the colonial landscape, unregulated market deer hunting helped to supply the food requirements of the growing Delaware population. Early Delawareans had the foresight to recognize that unregulated hunting had nearly resulted in deer being lost from the landscape, so in 1841 it became unlawful to harvest a deer in the state.

Modern Era

Early deer conservation in Delaware and other eastern states proved inadequate because there was little effort to enforce the few conservation laws. By the beginning of the 20th century, the few remaining deer found in Delaware were scattered across the landscape. But Delaware's deer habitat was improving at the same time that white-tailed deer populations were responding to initial wildlife management efforts. Lands that had been cleared of forests through the 1800s were returning to woodlands. During the Great Depression modern forestry practices and soil conservation activities encouraged the planting of trees on marginal farmlands, which created more deer habitat.

Delaware reopened deer hunting in 1954 statewide. Unlike most states, when Delaware held its first hunting season hunters were allowed to harvest both bucks and does. The initial seasons in many other states were open to buck harvest only. During that first season, 505 deer were harvested with an equal number being bucks and does. With the opening of the first deer season and continuing to this day, it became mandatory for hunters to register their harvests within 24 hours of the kill. Trends in deer harvests would be used to track deer population growth or decline. This system, which was used through the 2004 deer-hunting season, provided useful information for DFW to manage Delaware deer populations. Along with maintaining check stations, in 2003, the division instituted a phone and Internet registration system to more easily allow hunters to register their deer. Since the first deer season, state wildlife researchers initiated studies on white-tailed deer biology. Personnel examined deer that were brought to check stations, recorded weights and estimated ages by examining the teeth. Researches wanted to learn about the health and density of the deer population across Delaware.

After the initial three-day season, the deer season was shortened to two days in 1955 and remained this length for nine years. In 1964, the shotgun season was increased to five days and 27 separate archery days were added. The first muzzleloader season was added in 1972. It included three days in November south of the Canal in New Castle and Kent counties. The same year the shotgun season was lengthened to eight days and the archery season was increased to 60 days. The next year, the muzzleloader season was moved to October and increased to a six-day season. The season bag limit was also increased to two deer in 1973. One deer could be harvested during the archery or muzzleloader seasons and one could be harvested during the shotgun season. In 1975, a two-day January muzzleloader season was added. Additional adjustments were made to the season structure over the next 24 years until, by 1989, there were 10 days of shotgun, six days of muzzleloader, and 113 days of archery hunting.

By the late 1980s, deer damage complaints from agricultural producers were increasing and changes to season structure were directed toward reducing deer abundance. In 1990, a limited number of antlerless deer tags were available. In an attempt to further reduce deer abundance, a special two day December antlerless season was added in 1992. This season was not statewide and was only available along the coast and hunters had to pay $10 to receive a permit in order to hunt during the season. Furthermore in 1992, hunters were permitted to harvest two deer during any season and the state was divided into 17 deer management zones. Over the years complaints from agricultural producers continued to increase, so the Deer Damage Assistance Program was initiated in 1996. Farms enrolled in the program were given free antlerless deer damage tags. The antlerless season was extended to six days and the bag limit for antlered deer was reduced to one. The next year, a Quality Buck Tag was added to the license, which allowed the harvest of a second antlered deer with a minimum outside spread of 15 inches. This additional tag allowed hunters to harvest an additional buck without overharvesting yearling antlered males. In 1999, baiting was permitted on private lands because of political pressure from the agricultural community. The license structure was changed in 2002 so that each license came with two antlerless tags and a hunter had to purchase a Hunter's Choice Tag, which permitted the harvest of one either-sex deer. In a continuing effort to reduce deer damage to agricultural crops, antlerless only hunting days were added to October and included every Friday, Saturday, and Monday outside the muzzleloader season. The reasoning behind this change was that increased gun hunting opportunities before the November shotgun season might encourage hunters to harvest more antlerless deer. In 2005, a seven-day handgun season was added in January and 2 years later the use of handguns was expanded to during any shotgun deer season.

Excessive Deer

Rapid changes in deer management actions occurred from the late 1980s through the present. By this time the well-recovered deer population was causing concern and complaints from citizens living in the rapidly growing suburbs such as Newark and Wilmington. Deer began to damage ornamental landscaping planted by residents of Delaware's new housing developments, which shortly before had been agricultural fields and woodlands. Deer vehicle collisions began to increase due to two reasons: more motorists on the roadways and more deer in the woods. Deer also were associated, perhaps too strongly, with the increased prevalence of Lyme disease. Deer managers soon realized that the cultural carrying capacity of deer (the deer density that the general public can tolerate) often was lower than the biological carrying capacity (the number of

deer the habitat can support before the health of the deer begins to diminish) and that deer must be managed at the former threshold.

Along with causing problems in urban and suburban areas, high deer numbers were causing significant damage to agricultural crops and too many of Delaware's forested ecosystems. Browse damage impacts forest regeneration and promotes the spread of invasive species and if left unchecked could alter our forest composition for years to come (Allen et al. 2006).

A combination of factors resulted in deer returning from near extinction to population levels that exceeded cultural carrying capacity. At the same time that deer were expanding throughout Delaware during the 1960s and 1970s, the human population also began rapid expansion and relocation. Developers created suburban communities out of productive cropland. Homeowners planted trees and shrubs into these open areas to landscape new homes while builders converted large forested tracts into wooded developments. Deer populations in the remaining agricultural and wooded areas continued to grow higher. Eventually their numbers reached levels that lead them into backyard gardens and onto beautifully landscaped lawns. With the loss of their natural forage, deer turned to feeding on the newly planted flowers, shrubs, and trees around houses.

Open space programs around suburban neighborhoods also aided white-tailed deer population growth. People who moved out of the city wanted to enjoy natural areas near their homes. City, county and state natural recreational areas were created and preserved. Developments were designed with parks and woodlots intermixed. Along with creating prime deer habitat, developments and open space restrictions also resulted in reduced hunting opportunities for deer due to safety zone restrictions related top hunting around houses. As hunting was eliminated due to these new housing developments that occupied what once had been deer habitat, white-tailed deer population growth accelerated. Deer hunting on natural lands adjacent to the new communities was also frequently impacted as a result of changing land use in the surrounding areas. In response to perceived safety issues of neighbors and other outdoor recreationists, many public land managers closed the nearby natural areas to hunting. No broad-based public input was obtained prior to these hunting prohibitions. And the natural areas began to function as "deer refuges." Deer populations protected from regulated hunting grew at rapid rates and spread into the surrounding communities.

At the same time that the Delaware landscape was being transformed, Delaware's farmers began employing modern farming practices on the remaining agricultural lands across the State. Crop yields climbed, aided by advances in improved crop varieties, herbicides, and fertilization methods. These superior plants containing added nutrients provided higher yields and excellent food for Delaware's deer herd.

Alternative Management Tools

Recognizing that hunting is not always the preferred or most acceptable problem-abatement technique, other non-lethal deer management options were used effectively in small areas or where deer numbers were not yet overly abundant. For example, fencing was shown to be effective for backyard gardens and in some situations repellents provided effective deterrents when regularly applied to ornamental shrubs.

DFW is closely monitoring deer contraception and other experimental methods of deer management that may show potential efficacy. Currently, DFW has approved one contraceptive deer study at a facility near Newark, Del. The majority of this facility is located in Maryland, but a portion of the property is located in Delaware. Many experts in the field of deer contraception currently feel that the best chance for effective deer management through contraception lies in small, closed populations such as large fenced areas or island situations. Effective and economical management of large, open rural deer populations occurs primarily through use of regulated hunting programs.

DFW will continue to investigate all new and experimental deer management options for Delaware landscapes. Delaware citizens who inhabit growing suburban areas will receive increased assistance with white-tailed deer issues. The most effective process for improved deer management across Delaware's diverse landscapes is for DFW to work with counties, municipalities, other government entities, and landowners in order to develop deer management objectives.

CURRENT STATUS OF WHITE-TAILED DEER AND WHITE-TAILED DEER HUNTERS IN DELAWARE

White-tailed Deer Population Status

In December 2005 and February 2009, the Division of Fish & Wildlife contracted Vision Air Research Inc. to conduct aerial forward-looking infrared (FLIR) deer population surveys (Bernatas 2006 and Bernatas 2009). Prior to the 2005 survey, the actual deer population size was largely unknown. While DFW didn't know exactly how many deer lived in Delaware, based on the number of complaints received relative to crop and landscape damage, deer-vehicle collisions, and Lyme disease, it was presumed that the deer population had exceeded the cultural carrying capacity and needed to be reduced. To determine how the deer population had changed in response to various harvest regimens designed to reduce the population, DFW conducted a second survey in March 2009 (Bernatas 2009).

To conduct each survey, DFW established an 8x2 mile (16 mi^2) survey block in each of the 17 Delaware Deer Management Zones (Figure 2). Prior to the survey, the percentage of each land cover type for each of the 17 deer management zones was calculated. Land cover classifications were based on 2002 (2005 survey) and 2007 (2009 survey) Delaware aerial photography and included the following major land cover types: developed, agriculture, forest, wetlands, rangeland, open water, and beach/other. Once land cover percentages were calculated for each zone, a survey block was situated in the zone so that the percentage of each land cover type classification was similar for the deer management zone and the survey block (Figure 3). Nearly all blocks were situated so that the percentage of each land cover type didn't deviate from the zone's calculated average by +/- 5%. This placement allowed DFW to develop a population estimate for the survey block from the FLIR survey and expand that estimate to the area of the entire zone. Due to changes in land cover composition (e.g., agricultural lands becoming a housing development) between surveys the survey blocks occurred in different locations within each zone. In 2005, the survey blocks were determined by manually moving the block around the zone until our placement criteria was met. However, for the 2009 survey, DFW contracted with GeoDecisions to develop a tool to be used with ArcMAP, which would select the survey blocks placement. This tool not only saved time but also generally allowed for more precise survey block placement. Often the percentage of land cover types within the computer-generated survey blocks were +/- 3% instead of 5%. As a result of the surveys, DFW was able to estimate and compare the deer population size between the post 2005/06 and 2008/09 hunting seasons (Table 1).

The total post-hunting season statewide deer population in 2005 was 37,563 deer, while in 2009 it was 25,730 deer, a 31.5% statewide reduction between 2005 and 2009. Along with the overall population size, DFW was able to estimate deer densities for each of the 17 deer management zones and see how densities changes between surveys (Table 1). Deer density was calculated as the number of deer/square mile of deer habitat. Deer habitat was considered as forest, rangeland, and wetlands, as calculated from the 2002 and 2007 aerial photography for the 2005 and 2009 surveys, respectively. The developed, agricultural lands, open water, and beaches/other land cover types were excluded from deer habitat classification due to the inability of deer to adequately inhabit these areas. While agricultural lands certainly serve as deer habitat during the summer and fall, once the crops are harvested, deer are forced to inhabit the other habitat types

described. Thus, our density estimates are based on available deer habitat during the winter months, specifically after all the crops have been harvested. The total available statewide deer habitat (forests, wetlands, and rangelands) in 2005 was 714.1 mi^2, while in 2009 it was 701.8 mi^2. This indicates 12.3 mi^2 of deer habitat was lost over that time. Agricultural lands are not included in available deer habitat estimates.

Table 1. Estimated Deer Density in 2005 and 2009 within each of Delaware's 17 Deer Management Zones. Deer densities were estimated via aerial infrared surveys.

Deer Management Zone	2005 Deer Density*	2009 Deer Density*
1	134.8**	46.7**
2	59.7	85.4
3	33.2	22.0
4	42.1	34.8
5	42.1	14.5
6	15.2	37.6
7	72.4	65.4
8	57.9	59.4
9	39.2	22.5
10	37.7	108.7
11	43.5	21.1
12	36.0	16.8
13	16.3	53.6
14	73.2	114.4
15	70.8	29.8
16	74.6	51.8
17	11.3	53.8
Statewide Average	**52.2**	**44.3 (-15.1%)**

* Deer Density is calculated as the number of deer per square mile of deer habitat. Due to detection variability with this survey technique, estimates have a variability of +/- 20.75%

The total statewide post-hunting season deer population in 2005 was estimated at 37,563 deer, while in 2009 it was estimated at 31,071 deer, a 17.3% statewide reduction.

County-wide deer population changes between 2005 and 2009 were:
Sussex County - reduced 5.8% County density – 50.3 deer mi^2
Kent County - reduced 11.4 % County density – 30.8 deer mi^2
****New Castle County** - County density – 47.9 deer mi^2

**We were unable to calculate the population change due to extreme variability between surveys in northern and southern portions of Zone 1.

White-tailed Deer Hunter Population Status

White-tailed deer are the most popular game species and one of the most recognizable wildlife species in the State of Delaware. Nearly seven in 10 Delaware hunters hunt deer, and hunters spend more days afield each year pursuing deer than all other game species combined (N=710). According to the 2006/07 DFW Hunter Mail Survey, approximately 16,000 licensed hunters (resident and non-resident) spent 257,000 man-days hunting deer in Delaware during one or more of the deer seasons. A man-day was defined as one day of hunting by an individual hunter. An estimated 14,500 licensed hunters pursued deer for 106,500 man-days with a firearm, 9,000 hunted deer with a muzzleloader for 45,000 man-days, and 7,000 hunters spent 105,500 man-days pursuing deer with archery equipment.

Like many other states, the number of hunters in Delaware has declined as the hunter population ages, a younger generation doesn't share their elders' enthusiasm for the sport, and other activities demand or attract more of the hunting public's time. Total license sales (resident and non-resident) peaked in 1975 at 29,994 licenses sold and have declined to 18,746 in 2007 (Figure 4).

A telephone survey conducted by Responsive Management (2005) found that 9% of the Delaware's general population had hunted deer within the previous two years. Whereas only 13% of the respondents who said they hunted during the previous two years also had another household family member who had hunted deer during that same time period. Essentially, very few Delawareans partake in hunting and for those who did, most did not have another family member in their household who also hunted. Hunter recruitment is a serious concern for deer managers in all states. Deer hunting is the primary tool for effective deer management (i.e., population control) (Brown et al. 2000). As hunter numbers decline, hunting seasons and bag limits must be manipulated to encourage the remaining hunters to take more deer. However, hunters soon reach a saturation point and are unable or unwilling to fill their allotted bag limit. As hunter numbers continue to decline, the Division of Fish & Wildlife will continue to pursue alternative population control measures.

RELATIONSHIP BETWEEN WHITE-TAILED DEER AND HUMANS

White-tailed deer are one of the most popular wildlife species in Delaware. In 2005, 81% of the Delaware general public liked having deer around. However, half of the respondents worry about the problems that deer cause (Responsive Management 2005).

Positive Impacts of Deer

While deer overabundance does cause negative economic impacts, the positive impacts are extensive and cannot be ignored (Wywialowski 1994, Fagerstone and Clay 1997). Deer are a major resource in Delaware's and the nation's recreational economy. In addition to direct expenditures on hunting licenses, equipment, transportation, and gear, there are many collateral economic benefits to individuals and businesses in Delaware derived from both hunting and non-hunting related deer activities. Conover (1997) estimated that deer had an annual net positive economic value of $14 billion nationally, which included hunting and wildlife watching. Delaware's diverse wildlife, including white-tailed deer, is popular among non-hunters and hunters alike. Wildlife watchers enjoy the solace found in observing deer in their natural settings, and hunters enjoy the camaraderie and sport of pursuing deer during the annual hunting seasons. In a 2006 survey by the U.S. Fish & Wildlife Service and U.S. Census Bureau (U.S. Department of the Interior et al. 2006), it was estimated that 285,000 people aged 16 and older, participated in non-consumptive wildlife watching activities such as observing, feeding, or photographing wildlife such as deer in Delaware. Total expenditures in Delaware for wildlife watching were estimated at over $131 million in 2006. Likewise, it was estimated that Delaware deer hunters spent $39 million in 2006 on hunting-related expenditures; with a total multiplier effect to the economy of nearly $55 million (Southwick Associates 2007). The multiplier effect includes those purchases the result from hunting but are not directly related (e.g., gasoline purchased to reach hunting destination, soda, sandwiches, etc.).

The primary funding for all of Delaware's wildlife management programs is made possible through two sources: (1) the sale of hunting licenses, tags, and associated stamps, and (2) reimbursements to the State from the Federal Aid to Wildlife Restoration Act, more commonly known as the Pittman-Robertson Act. Pittman-Robertson funds are generated by an 11% excise tax on sporting arms and ammunition, including handguns and archery equipment. Approximately 60% of Delaware's 2008 state budget for wildlife programs (hunting and non-hunting) comes from these two sources, while the remaining 40% of funding comes from the State of Delaware's general tax funds. Hunter dollars (most of which are from deer hunters) are to be used for hunter education programs, wildlife-related education programs, and conservation programs.

While it is possible to estimate how much money is generated through deer-related hunting and non-hunting activities, the monetary value of regulated hunting in preventing deer-related damage has not been estimated. Without hunting, deer populations would be much higher and losses to the agricultural, forest products, and automobile insurance industries would be far greater. The International Association of Fish and Wildlife Agencies (now known as the Association of Fish and Wildlife Agencies, or 'AFWA') reported in 2005 that an estimated $934.2 million to $9.3 billion of taxpayers' money would be required to manage the deer that deer hunters currently harvest (International Association of Fish and Wildlife Agencies 2005).

The AFWA also states that more money would be needed to control habitat damage by deer not relocated or culled.

Negative Impacts of Deer

While there are numerous positive impacts related to white-tailed deer, there are also many associated negative impacts, including agricultural and landscape damage, habitat degradation and destruction, and deer-vehicle collisions. Deer numbers are at an all-time high and deer overabundance is causing severe human-wildlife conflicts (McCabe and McCabe 1997). Due to the increased deer population, deer-human conflicts have risen drastically over recent years (Conover 2002). Conover (1997) estimated that deer had an annual negative economic value of $2 billion, which included deer/vehicle collisions, damage to agricultural and timber productivity, damage to common household shrubs and gardens, and as a reservoir for Lyme disease.

The International Association of Fish and Wildlife Agencies (2005) reported that the General Accounting Office estimated that deer-vehicle collisions cost over $1 billion in damage annually across the nation in 2001. Drake et al. (2005) estimated the 2001 economic impact of Delaware deer-vehicle collisions at $462,000. In a recent survey, 4.3% of Delaware citizens reported striking a deer with a vehicle during the prior 12 months (Responsive Management 2005).

White-tailed deer also cause significant damage to agricultural crops. Responsive Management (2005) found that 75% of Delaware farmers surveyed experienced some form of damage related to deer. When asked what the damage incurred was, 95% responded that it was depredation to their crops (Responsive Management 2005). A recent estimate of crop damage related to deer in Delaware has not been calculated but one such estimate has been completed in Maryland. The U.S. Department of Agriculture (USDA) National Agricultural Statistics Service estimated that Maryland growers suffered approximately $9.0 million in wildlife-related crop damage during 2007 and spent over $600,000 on crop damage preventative measures (U.S. Department of Agriculture 2008). Deer were responsible for an estimated 84% ($7.6 million) of the damage. Damaged crops included common agricultural crops like corn and soybeans, but also trees and landscaping plants at nurseries and plantations. Even though Delaware is one-fifth the size of Maryland, it is easy to see that the negative economic impact of deer on crop yields is staggering.

Along with agricultural crop damage, excessive numbers of white-tailed deer also damage the native flora and fauna of Delaware. Numerous studies have indicated that intensive deer browsing related to overabundant deer populations can change the forest species composition and the associated wildlife (DeCaleasta 1994, Alverson and Waller 1997). Researchers at the Manassas National Battlefield Park (MNBP) concluded, “White-tailed deer may be modifying the structure of the forest interior to the extent that it adversely affects wildlife species dependent on a dense understory to thrive.” They predicted that the future composition of forests in MNBP would shift towards stands with fewer species and a greater dominance of ash, black cherry, and hackberry, particularly in the oak-hickory and bottomland hardwood forests (Rossell et al. 2005). This change would not only affect the forest composition but would also negatively affect the wildlife species that live within these forest communities.

High deer populations can also increase the density of exotic plants in many natural areas. Exotics are those plants that have been imported (purposefully and by accident) from places other than Delaware. Delaware's natural ecosystems are often threatened by exotic plants that find the habitat and climatic conditions favorable. Excessive deer browsing on native plants reduces the production and distribution of native species and allows exotic species to thrive. In addition, deer may spread exotic plants through their feces (Williams and Ward 2006; Myers et al. 2004).

Lyme Disease and Deer – Lyme disease is caused by the spirochete *Borrelia burgdorferi* that is carried by the black-legged tick (*Ixodes scapularis*). Lyme disease has affected thousands of people in the United States and is a serious human health concern. Because white-tailed deer serve as a host for the black-legged tick, there is public concern regarding white-tailed deer and their densities. Deer and other mammals such as raccoons and foxes serve as hosts for the adult stage of the tick while small rodents such as mice serve as hosts for the immature stages.

A direct relationship between numbers of deer and the incidence of Lyme disease remains to be resolved. There is evidence that Lyme disease can be controlled through the management of deer populations or the elimination of deer (Ostfeld et al. 2006). A recent article in The New England Journal of Medicine recommends the following strategies for decreasing the risk of Lyme disease and other tick borne illnesses: (1) area wide application of acaricides (mite and tick pesticides), (2) landscaping to provide desiccating barriers between tick-infested areas and lawns, (3) in some settings exclusion or removal of deer (Hayes and Piesman 2003). However, other recent studies regarding Lyme disease and the relationship to deer suggest that controlling deer populations may not effectively control Lyme disease. Ostfeld et al. (2006) concluded the interannual variation in entomological risk of exposure to Lyme disease was correlated positively with prior abundance of key hosts (e.g. mice and other small mammals) for the immature stages of the tick vector and with critical food resources for those hosts. They suggested that once deer abundance exceeded a low threshold value, further increases in deer density had little if any affect on tick densities. Current best estimates suggest that deer densities must be maintained at < $10/mi^2$ for a reduction in tick densities and associated Lyme disease cases which would likely be below the general public's cultural carrying capacity and is likely unattainable through hunting alone.

The Division of Fish & Wildlife will continue to monitor further research and developments concerning Lyme disease. However, given the numerous negative impacts associated with high deer densities, deer populations must be controlled whether or not there is a direct relationship between deer and Lyme disease. Currently the best prevention of Lyme disease appears to be through education and encouraging people to use repellents and to check themselves regularly for ticks.

Biological and Cultural Carrying Capacities – The number of a species that a given parcel of habitat can support in good physical condition over an extended period of time is defined as "Biological Carrying Capacity" (BCC). White-tailed deer have high productivity due to their evolution as a prey species. Deer reproduction causes populations to exceed BCC, unless productivity is balanced by mortality. When BCC is exceeded, habitat quality decreases and herd health and physical condition decline (McCullough 1979, McShea et al. 1997). Biologists use

herd health indices (i.e. age, weight, reproductive condition, antler development) and population density indices to assess the status of a herd relative to BCC.

The importance of compatibility between land-use practices and deer populations in Delaware justifies consideration of another aspect of carrying capacity. “Cultural Carrying Capacity” (CCC) is the maximum number of deer that can coexist compatibly with local human populations. CCC is a function of the sensitivity of local human populations to the presence of deer and may be higher or lower than BCC. This sensitivity is dependent on local land-use practices, local deer density and the attitudes and priorities of local human populations. Numerous deer-vehicle collisions, agricultural damage complaints, and home garden complaints all are indicators that CCC has been exceeded. It is important to note that even low densities can exceed CCC; a single deer residing in an airport-landing zone is too many deer for that situation.

Effective deer management aims for a deer population level that will allow our environment to be healthy and to strike an acceptable balance between people and deer. It's a complex challenge that requires balancing biological and social demands as varying groups often differ on what they consider acceptable deer population levels. Agricultural producers often desire deer densities to be kept at far lower levels than hunters and wildlife watchers would desire.

DELAWARE DEER MANAGEMENT PROGRAM

A century ago the basics of deer management entailed protecting deer, and creating and protecting their associated habitat. As deer populations rebounded through the middle part of the 20th century, management became more complex as managers found themselves dealing with as many social issues with deer as biological issues. Deer-vehicle collisions, agricultural crop depredation, disease concerns, and forest regeneration impacts are just a few of the current issues that involve managing deer. Balancing deer populations with the desires of various constituent groups is a challenging and often controversial process. On a scale of 1 to 10, with 10 being the highest, the general population's opinion on the Division of Fish & Wildlife's deer management program were fairly positive: 41% gave a rating of 8 or higher, and a majority (60%) gave a rating of 7 or better; the mean was 6.6 (Responsive Management 2007). Appendix 5 lists common deer management practices and their advantages and disadvantages that are typically thought of as options for managing deer numbers. DFW utilizes a suite of these options. Today, the primary responsibilities of DFW can be grouped into five main categories: (1) deer population regulation; (2) deer population monitoring; (3) information and education; (4) addressing constituent demands; and (5) other management activities.

Deer management objectives can generally be categorized into one of three general categories: Traditional; Quality; and Trophy Deer Management. Under a Traditional Deer Management regiment, bucks of any age or antler quality may be harvested and doe harvest is regulated to produce an abundant deer herd and/or to maximize total buck harvest. Under this philosophy there is generally not an emphasis placed on harvesting older-aged bucks but to simply maximize the harvest of these individuals regardless of age. Problems with this approach are that the harvest of female deer (does), which ultimately affects population growth, is not generally of great emphasis. As a result, deer populations can sometimes exceed population goals when managed under this approach. Conversely, Quality Deer Management (QDM) is a management philosophy that attempts to produce a healthy deer population with balanced adult sex ratios and age structures. This approach typically involves protecting young bucks while harvesting an appropriate number of does to maintain herds within existing environmental and social constraints. Often confused with QDM, the primary focus of Trophy Deer Management is to harvest fully mature bucks with high-scoring antlers. Whitetail bucks typically attain maximum antler size between 5.5 and 8.5 years of age. While the two approaches share several objectives, they also differ in many ways, the primary difference being that the desired age of bucks harvested is much older under a trophy deer management philosophy than that of QDM's. Producing older bucks that exhibit maximum antler potential requires many ingredients not available to most hunters. Because some adult bucks have home ranges that could exceed 1,000 acres, large tracts of land, often 5,000 acres or more are required to implement this strategy, which is far less than the average property size in Delaware.

Currently, DFW's deer management philosophy would be categorized as a blend of Traditional Deer Management and QDM, with an emphasis towards QDM. The current season structure and tag allotment is geared towards promoting the harvest of antlerless deer, specifically does. This accomplishes two things: it helps to regulate the deer population size, as well as the sex ratio (number of bucks per doe). In addition to emphasizing doe harvest, which is a cornerstone of QDM, hunters are also able to harvest two bucks each season. However, at least one of them

must have an outside antler spread of at least 15 inches, whereas one of the bucks may have antlers of any size. This spread restriction prevents hunters from harvesting two yearling bucks each season because nearly none of the yearling bucks in Delaware exhibit an antler spread of 15 inches. This tagging structure is a blend of Traditional Deer Management and QDM, in that hunters can harvest a buck that has any size antlers and thus can be any age (Traditional Deer Management) but in order to harvest a second buck, it must meet a minimum spread size which is generally not met until a buck is 2.5 years or older.

Recent survey data and feedback from hunters suggests that a growing number of hunters in Delaware would like DFW to impose further restrictions that would allow more bucks to reach older age classes, which is a primary tenet of QDM. However, other survey data from the general public in Delaware indicates that the public supports hunting for managing the deer population and for providing meat for one's family, but they overwhelmingly do not support hunting for trophies. The division plans to conduct opinion surveys in the near future to determine the level of support amongst hunters for such a change, but it must also be very cognizant of the general public's perception relative to hunting.

Deer Population Regulation

Deer Harvest – The annual deer harvest, particularly of antlerless deer, is one cornerstone of the Delaware's deer management program. No other method available is as effective or economical as deer hunting for regulating deer populations, and hunting is necessary to keep deer populations from growing beyond their ecological and biological carrying capacities (McCullough 1979 and Brown et al. 2000). Delaware enjoys a rich hunting heritage, and a majority of the public supports deer hunting and recognizes its importance. In a telephone survey conducted by Responsive Management (2007), 87% of Delaware's general population felt that deer populations should be managed properly in Delaware and 70% felt that hunters should have the opportunity to hunt deer.

Deer hunters harvested 505 deer in 1954 in the first regulated Delaware hunting season of the modern era. Today, deer hunters annually remove approximately 14,000 deer from the Delaware landscape at little to no financial burden to the general public (Figure 5). The deer harvest peaked during the 2004/05 hunting season, during which 14,669 deer were harvested. Since then, the annual statewide harvest has declined slightly. Based on the 2006-2007 Delaware Department of Natural Resources annual Hunter Mail Survey, approximately 55% of Delaware deer hunters are successful in bagging a deer each year. Of those hunters who are successful, approximately 70% harvest two or less deer each year.

Traditionally, deer seasons were only a few days long to prevent the overharvest of the still relatively small deer population. However, as deer populations increased, it was recognized that antlerless harvest was needed to regulate population growth. Removing antlerless deer from the population primarily removes female deer and the multiple offspring they could have produced in future years. Removing antlered deer is not as effective for population control because one male deer can breed numerous females.

For hunters who were indoctrinated in hunting bucks only and conversely for protecting antlerless deer, to be persuaded to begin harvesting does and antlerless deer has been a challenge

for all states, including Delaware. However, the majority of Delaware deer hunters have recognized the need for deer population control and have demonstrated their willingness to harvest antlerless deer. In a recent report put together by the Quality Deer Management Association, it was determined that Delaware led the nation in the percentage of antlerless deer in the overall harvest (70%) in 2005 (Adams et al. 2009).

Shotgun hunting remains the most effective method for harvesting deer in Delaware. Deer harvested with a shotgun have comprised approximately 65-80% of the total harvest since 1992. As technology has improved and seasons expanded, the muzzleloader harvest has increased in recent years and is routinely 15-20% of the harvest while the archery harvest comprises the remaining 10% of deer taken in Delaware. While archery hunters do not contribute a large proportion to the annual harvest, their harvests are very important as they often occur in areas where hunting with a firearm may not be desired (i.e. urban areas). Hunters were allowed to use a handgun to harvest deer during the 2005/06 season though harvest with this method comprises < 1% of the overall harvest. Regarding the seasons in which deer are harvested, the November Shotgun season is most productive. Even though the deer hunting season runs from September 1 – January 31 (archery) and the November shotgun season is only eight days, approximately 50% of Delaware's annual harvest occurs during that one week period (Figure 6).

Deer Harvest Regulations – Deer harvest regulations provide the framework for the DFW to accomplish its objectives. Additions/modifications to deer regulations most often are spurred by: 1) the need to alter deer population trends via season and bag limit changes; 2) the need to accommodate new potential recreational opportunities for hunters and wildlife-watchers; or 3) the need to minimize risks of disease introduction/transmission into the Delaware deer herd. Altering seasons and bag limits via regulation changes is the primary method used by the DFW to manage the Delaware deer population. Lengthening or shortening antlerless seasons and increasing or decreasing antlerless bag limits to increase or decrease harvest opportunities enables deer managers to regulate how many antlerless deer are taken each year (generally, reducing the antlerless harvest results in population growth while increasing the antlerless harvest results in population decline). The previous years' deer harvest data (mandatory hunter harvest check-in data and deer age data collected at processors) weighs heavily in determining future season and bag limit regulation changes.

Historically, deer harvest regulations were evaluated and amended on an as needed basis. However, in recent years as the deer population has grown, changes have been more frequently (often annually) and have often been instigated through political pressure. The process to change and/or add regulations represents a major investment of staff time. Furthermore, frequent changes make it impossible for biologists to determine how effective each change was. Biologists need at least three years after a change is implemented to determine the effect of the change. Changes made more frequently cloud data analyses and make it impossible to determine the actual effect of each change.

Regulation changes or amendments can be submitted by DFW staff, the general public, the Fish and Wildlife Advisory Council and/or political officials throughout the year. The regulatory process (DNREC Administrative Policy D1006) is a long 23 step process that usually takes around nine months to complete. Included in the process are public hearings in which the public

is able to comment, the regulation changes are posted on the DFW website and advertised in state newspapers all in attempt to solicit feedback from the public. Once all feedback is received, the proposed regulations must then be approved by the DNREC Secretary before they take effect.

Crop Damage Assistance - In situations where agricultural producers believe the established deer hunting seasons do not provide adequate deer population regulation for commercial farming operations, growers can apply for the Deer Damage Assistance Program (DDAP) and the Severe Deer Damage Assistance Program (SDDAP). The DDAP and SDDAP were created in 1996 and 2006, respectively. Individuals enrolled in the DDAP receive free antlerless deer damage tags from DFW to use in conjunction with the regular license tags received with each hunting license. Furthermore, enrollees are able to harvest antlerless deer during the archery season with a crossbow and a shotgun during the muzzleloader seasons.

Agricultural producers enrolled in the SDDAP also receive additional antlerless deer damage tags from the DFW but unlike the DDAP are able to harvest antlerless deer outside of the regular hunting season, specifically August 15 - May 15. With the addition of the second program, the two programs are a stepwise process. Applicants must first go through the DDAP for at least a year and if deemed necessary may be able to "upgrade" to the SDDAP. There are five requirements and tasks that must be completed for individuals to enroll in the SDDAP:

1. In an effort to facilitate regulated hunting, require at least one individual to harvest deer that is not an immediate family member or employee of the enrolled property.
2. Develop a white-tailed deer harvest objective/plan for the enrolled farm. This plan will help to establish harvest goals. These goals would include a target total harvest as well as a target percentage of female deer in the total harvest.
3. Records must be kept for every deer harvested on the enrolled property. The recorded information must include, but is not limited to:
    a. Hunter's name
    b. Harvest date
    c. Type of deer harvested
4. The name of all individuals that will be harvesting deer must be submitted to DFW. This information is requested to assist Fish & Wildlife Enforcement Agents identify and distinguish legal individuals (have a permit) from those pursuing deer illegally (don't have a permit).
5. Tax Parcel numbers for all properties enrolled in the program must be submitted to the Division of Fish and Wildlife. This information is also requested to assist Fish & Wildlife Enforcement Agents identify which properties are authorized to have an extended season.

Once the above requirements have been met, then there are two ways that a farm can be enrolled:

Automatic Enrollment: The white-tailed deer density in the Deer Management Zone in which the farm is located exceeds a target/goal population density as determined by the Division of Fish and Wildlife. This density is to be determined by an approved population estimation technique.

Criteria-Based Enrollment: A site visit by a DFW staff member is required to establish a need for this program if the applying farm is located within a Deer Management Zone that has a deer density below the target/goal population density as set by the Division of Fish and Wildlife. An enrolling farm under this criteria must meet both of the following requirements:

1. Experience substantial monetary loss due to white-tailed deer browsing as estimated by a DFW biologist.
2. Experience a substantial percentage of crop loss due to white-tailed deer browsing as estimated by a DFW biologist.

Recently, the Division of Fish & Wildlife has heard from a growing number of individuals who do not like the current structure of the SDDAP. Therefore, the division plans to investigate how it can improve the SDDAP to both meet the needs of farmers, hunters, and surrounding property owners. Some of the common complaints received by DFW include:

- The SDDAP is detrimental to the deer population and management goals.
- The harvest of deer on a farm is negatively impacting the deer population on surrounding properties.
- The harvest that occurs from February 1- May 15, which is after most bucks have shed their antlers, is negatively impacting QDM efforts. Bucks that were not harvested during the hunting season are mistakenly harvested when a hunter thinks they are does.
- Early season harvest is negatively impacting harvest later in the season because the deer are over pressured and become nocturnal.
- Properties are enrolling in this program not because they have damage but because they want increased hunting opportunities. There needs to be some type of criteria based enrollment that assesses damage.

Managed Hunts – DFW authorizes various managed deer hunting programs in Delaware. Managed deer hunts are highly regulated deer hunts designed to be used in suburban and urban areas. Hunters must apply and be selected for these hunts. During the hunt, hunters have specified stand locations and shooting directions, and are not allowed to move from their location unless permission has been granted by a hunt coordinator. Managed hunts often occur outside the regular hunting seasons and deer taken might not count against the hunters regular bag limit. Currently, managed hunts are coordinated by both DFW and the Division of Parks and Recreation on county-owned and State Park lands, respectively.

Sharpshooting – In other states sharpshooting has proven to be a very effective tool in reducing deer populations in urban and suburban areas. However, its use in Delaware has been limited, as the only time sharpshooting was implemented was during a reproductive study conducted by DFW during March and April 2006. Sharpshooting with suppressed firearms is limited to Delaware Enforcement Agents, and state and federal wildlife biologists for disease surveillance and population reduction efforts. In order for state and federal biologists to participate in sharpshooting exercises, individuals must become certified in the use of suppressed firearms by completing firearms safety and suppressor training courses. Even though individuals can be sanctioned to use suppressed firearms and conduct sharpshooting exercises, its potential use in Delaware can be limited due to firearms discharge restrictions. This management practice is most effective if conducted inside urban and suburban areas. Northern New Castle County is the area

in the state that would be the typical area in which this practice would be utilized. The New Castle County Code states that it illegal to discharge a firearm within 200 yard of a dwelling. Thus, there are very few places inside these urban areas in which sharpshooting can lawfully occur. Until the New Castle County firearm discharge law is amended, sharpshooting will have a very limited use in Delaware.

Deer Contraceptive Studies – The use of contraceptives to regulate white-tailed deer populations is currently in an experimental phase. Deer contraception could offer a valuable management alternative for areas where lethal control is not feasible or socially acceptable. However, contraceptive technology presently does not exist to effectively treat a wide spread, free-ranging deer population. Currently a long-term, one-shot treatment does not exist, and treating a large enough proportion of the female deer population to alter population size is impossible.

With hopes that technology can be developed that will make contraception a viable alternative in small, confined areas where other control methods are not feasible, DFW has permitted one white-tailed deer contraception study in Delaware at the DuPont's Stine-Haskell Research Center. The study, conducted by Anthony DeNicola with White Buffalo, Inc., is evaluating the contraceptive agent GonaCon™. The study is being conducted to determine if densities can be maintained using contraception after they have been reduced to desired levels. To date, this study and other similar studies found that approximately 50% of the treated females become fertile again after one year and must be retreated. Thus, GonaCon™ does not appear to inhibit reproduction and subsequently prevent continued population growth. It is unknown at this point how long retreated females will remain infertile.

Delaware Sportsmen Against Hunger Program (Delaware SAH) – Venison donation programs indirectly contribute to deer population regulation by providing a way for hunters to make use of more deer than they normally would utilize in a given year, thus encouraging them to harvest more deer. Throughout the country hunters are sharing their harvest with the hungry and less fortunate. Although this sharing has been a tradition since pioneer days, in recent years the practice has become more organized. The idea is being sponsored on a national basis by Safari Club International's project, "Sportsmen Against Hunger Program" and BUCKMASTERS' "Project Venison" program. In Delaware a coalition of sporting groups and charities joined forces forces to feed hungry people in 1992 and created the Delaware Sportsmen Against Hunger Program (Delaware SAH). Hunters can donate legally taken deer to local food banks through a network of participating deer processors and walk-in refrigerated coolers maintained by DFW. Butcher shops will wrap the meat in two pound packages without any additives of fat, spices, seasonings, etc. and these packages will then be distributed to various charitable groups for distribution to the general public. To date, over 154 tons of nutritious venison has been distributed to Delawareans in need through the Delaware SAH program.

Delaware has had liberal deer bag limits for many years. The implementation of a venison donation program allows hunters to take advantage of the liberal bag limits and donate deer to local food banks. It is hoped that the availability of such a program will further encourage hunters to kill more deer, resulting in reduced deer populations and more food for the needy. In general, this program has been very successful at providing nutritious meals to needing individuals and as a result receives a great deal of support from the general public.

Deer Population Monitoring

Mandatory Deer Harvest Check-in – The mandatory check-in of harvested deer in Delaware provides the primary data DFW uses to monitor deer population status. The tradition of check stations began during the first deer season in 1954. Unlike most states, all deer harvested in Delaware were checked at state run check stations where biologists collected important biological data (e.g., sex, age, weight, antler measurements). During the next 33 years, all harvested deer were required to be checked at these state run check stations. In 1988, Delaware permitted eight private check stations to check deer during the archery season. As in many states, these check stations were located at local stores. The number of private check stations was increased to 12 in 1992 and these stations checked deer harvested during archery season and the January muzzleloader season. In 1994, private check stations were also permitted to check deer during the December antlerless season. Private check stations were permitted to check during all seasons starting in 1999. In 2003, the telephone and internet checking system was initiated, but private check stations were still permitted to check deer. These three options were permissible until the 2009/10 hunting season. Before the 2009/10 season, the DFW eliminated the check station option for hunters to register their deer and subsequently required all deer to be registered via telephone or the Internet.

Data collected include: type of deer (e.g. antlered buck, adult doe, button buck, etc…) weapon, date, county, deer management zone, land type (public or private), hunting license number, and type of tag used. Data are used to monitor harvest rates by location and season for each of the sex classes (antlered and antlerless). Trends of the percentage of bucks and does in the annual harvest serve as indices that are invaluable for determining overall population trends for the species (Figure 7).

Telephone/Internet check-in has provided the same quality data as the previous check station system. However, unlike the past when much of the data from check stations had to be hand-entered into a computer, telephone/Internet data are already in digital format when the division receives it. Data are typically available to DFW on a monthly basis, which enables biologists to summarize harvest results in a more timely fashion in preparation for public dissemination and regulation updates.

Biological Data Collection (Butcher Shop Surveys) – Historically, DFW personnel and volunteers annually examined and collected biological data from all of the deer that were brought into the state run check stations. However, as funding for such work decreased and budgets shrank these collections ceased up until 2007. At check stations, biologists would collect weights, antler measurements, monitor for diseases and age the deer brought in. Under the old data collection system staff would collect this information at its state run check stations. Now that DFW doesn't run its own stations, DFW staff and volunteers visit private deer processors across the state to collect data. Since many hunters take their deer to a processor for butchering, these shops are ideal places for the division to examine deer. Typically, staff will visit these shops on peak hunter harvest days so that we are able to examine as many deer as possible in a short period of time. Recently these days have been the opening and closing weekends of the October Muzzleloader and November Shotgun seasons. Depending on how much or what type of

data is to be collected in a given year, the Division of Fish & Wildlife will examine between 700 and 1,300 deer annually.

Along with mandatory deer check-in, collecting biological data each year is critical for monitoring Delaware's deer population. Deer age, sex, weight, and antler measurement data are indicative of herd health and habitat quality. Collecting biological data statewide also is an important outreach effort and gives DFW the opportunity to meet one-on-one with its constituents.

Annual Hunter Mail Survey – DFW has conducted an annual Hunter Mail Survey (HMS) for 40+ years. Along with collecting harvest information on deer, this survey also collects information on small game and migratory bird harvests. The type of information collected includes, the number of days spent afield pursuing various game species, the total harvested, etc. In the past, approximately 10% of the individuals who purchased a license would receive a survey. However, in an attempt to increase our sample size, beginning with the 2008/09 HMS 25% of the licensed hunters received a survey. Surveys are mailed each year to randomly chosen hunters and are usually mailed in March after all of the hunting seasons have closed. Historically, the survey typically has around a 35% return rate. Along with specific questions concerning current hunting topics or issues, hunters are asked what species they hunted, how many days they hunted each species, and how many of each species they harvested.

The annual Hunter Mail Survey provides important trend data for how many hunters pursue deer and other game species each year in the various seasons, how many days they invest to deer hunting and how many deer they harvest. The DFW uses these data when making management and regulation decisions, and as a comparison to data collected from other sources (i.e., hunter harvest data, license sales data, etc.).

FLIR Surveys – Forward Looking Infrared Radar (FLIR) has been used by DFW to monitor and assess deer population levels across the State. The technique involves using fixed-wing aircraft equipped with FLIR that fly a prescribed course over certain areas. To achieve adequate detection probabilities, flights must occur at dusk or at night and when leaf cover is minimal (i.e. winter). The FLIR detects the heat sources of deer and other animals and records the images on videotape. Trained observers review the tape and count the number of deer recorded during the flight. Deer populations can then be estimated in that particular area. Currently, FLIR surveys have been the primary technique used by the DFW to estimate deer population size and density.

Spotlight Surveys – The DFW routinely conducts spotlight surveys on its Wildlife Areas on the nights preceding the November shotgun season. Many of these surveys have been conducted for years and provide a good source for population trend information over time. Through these surveys DFW is able to collect sex ratio, fawns per doe ratios, and population size. Furthermore, on the Cedar Swamp and Woodland Beach Wildlife Areas a legal buck must have antlers at least 15 inches wide. These surveys allow biologists to monitor what affect this restriction has made on the buck populations.

Parking Lot Surveys – Delaware's public hunting areas are utilized by many deer hunters. DFW staff annually primarily in Sussex County survey the larger public hunting areas in Delaware

(primarily in Sussex County) in an effort to determine deer hunting pressure. On peak hunting days, DFW staff count the number of vehicles in hunter parking lots to determine hunter pressure. Some of these areas have been surveyed for over 30 years. Comparing hunting pressure over long periods identifies trends in hunter use that DFW can utilize in future management decisions.

Public Land Deer Hunting Permit Cards – Many of the State's Wildlife Area's are only open to a lottery type drawing system during the peak deer firearms seasons. The drawings have been put in place to prevent conflicts with hunters, reduce the number of hunters on a given Wildlife Area and prevent overharvest of deer. Successful hunters in the drawing receive an assigned stand location and may only hunt out of that stand. They are also given a hunting permit card in which they must fill out and turn-in at the conclusion of their hunt. Along with name, date, hunting license number and stand number, hunters are also asked how many deer they harvested and what sex they were. They are also asked how many deer (antlered, antlerless, or uncertain) they observed. Finally, they are asked how many hours they hunted. All of this information allows the DFW to monitor and track the average number of hours hunted/deer harvested and observed. This trend information is invaluable when attempting to monitor the population over time.

External Scientific Research Studies Conducted in Delaware – Researchers with the University of Delaware, with assistance from DFW, have conducted several recent research studies relative to deer in Delaware. The impacts of deer browsing on soybean and winter wheat yield have been evaluated. Furthermore, the impacts of varying deer densities on forest songbird species richness and abundance has been evaluated and a spatially explicit model to help the DFW track deer population changes and predict harvest was created.

Disease Surveillance – White-tailed deer, like other wildlife, can carry diseases and parasites. Most of these are not fatal to deer or infectious to humans but are part of the deer's natural life history. Two of the more prominent diseases currently associated with white-tailed deer, Hemorrhagic Disease (found in Delaware and also known as "blue tongue") and Chronic Wasting Disease (not found in Delaware), are monitored closely by DFW. Effective disease monitoring is critical to ensure the well-being of white-tailed deer, other wildlife, and Delaware's human population. DFW collects tissue samples from hunter harvested deer at private deer processors while it is also collecting biological data. Samples are collected so that adequate numbers are taken from each of Delaware's three counties, thus ensuring adequate coverage across the state. To be better prepared if CWD is detected in Delaware, the Division of Fish & Wildlife is currently working on a response plan. Currently, this response plan has been written but has not yet been finalized. Final preparations will be made in the near future. Detailed information on HD, CWD, and other common diseases and ailments that afflict white-tailed deer can be found in Appendix 6.

Wildlife Response – DFW staff often respond to calls from citizens regarding sick or injured deer or "deer situations." Timely response to sick deer calls enables DFW to track any potential disease outbreaks in Delaware deer. It also enables the division to monitor certain areas for repeated calls that may indicate an emerging disease issue on the landscape.

Currently, injured or sick adult deer are not rehabilitated because none of the permitted Wildlife Rehabilitators are set up to handle and rehab animals of this size. Standard DFW policy for these animals is to let nature take its course unless the animal is severely injured and appears to be suffering. In these cases, DFW employs humane euthanasia methods. In some instances, the division may permit wildlife rehabilitators to take care of sick or injured fawns. Once rehabilitated and old enough, these deer are returned to the wild.

Occasionally, DFW receives calls from concerned citizens about unique situations involving deer. These have included deer trapped or confined in areas where they cannot extricate themselves, deer that have gotten "lost" within a city, or caught in fences, etc. DFW staff respond to these calls and are often successful in resolving these issues.

Information and Education

Maintaining a current knowledge base concerning white-tailed deer biology and management and disseminating it to the public is one of the primary functions and goals of the Division of Fish & Wildlife. The division is a member of the Northeast and Southeast Deer Technical Committees and Southeast Deer Study Group. DFW's deer biologist annually attends committee meetings for all three organizations to learn about and discuss relevant deer topics on the East Coast. Likewise, deer program staff participates in various technical working groups involving deer and are members of professional groups including The Wildlife Society. Information gleaned from these groups can be forwarded on to our constituents.

Effective dissemination of deer information and data is critical to the success of DFW given the popularity of white-tailed deer with the hunting and non-hunting public alike. Deer program staff routinely communicate with the public via telephone, email, at public speaking events or in conveying information to other DFW staff for dissemination.The primary avenue of written communication with the public is through press releases. Press releases are used to report deer harvest results, upcoming hunting seasons, disease prevalence and testing results, and other current topics that arise. Likewise, staff members provide updated information to DFW's website, and write popular articles for various media outlets, including Outdoor Delaware and numerous other popular hunting magazines.

Addressing Constituent Demands

Provide Recreational Deer Opportunities - White-tailed deer are one of the most popular wildlife species in Delaware, and the most popular game species pursued by hunters. Wildlife watchers enjoy seeing deer, and hunters desire adequate deer population numbers for enjoyable and successful hunting opportunities. The Department of Natural Resources and Environmental Control's Division of Fish & Wildlife recognizes the value of white-tailed deer to the Delaware public and is committed to maintaining white-tailed deer at levels that provide adequate recreational opportunities while ensuring populations do not negatively impact the environment, commercial crops, or health and safety of Delawareans.

The Division of Fish & Wildlife invests substantial funding in deer-related management activities to ensure healthy deer populations exist. DFW employs one staff member who is largely dedicated to deer management activities and invests heavily in public lands that can be used for deer watching and hunting. Likewise, DFW attempts to ensure the decision-making

process related to deer management includes all facets of public participation, including stakeholder and public meetings, public opinion surveys, and extensive information and education outreach.

While DFW is committed to providing recreational opportunities related to deer, it is also committed to reducing negative impacts associated with high deer numbers. It is a sometimes challenging and controversial process to define what population level is needed to reduce negative deer impacts but still provide adequate recreation.

Hunting on Public Lands – There are four types of publicly-owned lands that deer hunters may hunt in Delaware: Wildlife Management Areas (WMAs), which are owned and maintained by the Division of Fish & Wildlife; State Parks, which are owned and operated by the Division of Parks and Recreation; State Forests, which are owned and operated by the DDA's Forestry Section; and National Wildlife Refuges which are owned and operated by the US Fish and Wildlife Service (USFWS). Each of these property owners has different primary objectives on how their lands are managed and operated. Typically, WMAs are primarily managed for wildlife and hunting opportunities, State Parks are typically managed for non-consumptive outdoor opportunities (e.g. hiking, mountain biking, camping, etc.), State Forests are primarily managed for timber production, and National Wildlife Refuges are managed to meet the needs of both hunters and non-consumptive users. The various primary management objectives often result in varying degrees of deer hunting opportunities and strategies for hunters. Not all primary objectives can cater to deer hunting the same way as a particular hunting practice on one property may interfere with a separate practice on another. Even amongst the various public land types, there may be differences in how properties are hunted and/or managed. While taking all of this into consideration, DFW will strive to work with all of these landowners to provide a quality and diverse hunting experience across the state that will meet the needs and desires of a majority of the hunters.

Reduce Deer Crop Damage – White-tailed deer feed on a wide variety of vegetation including many Delaware agricultural crops (i.e., corn and soybeans). Deer also browse on woody vegetation found in forests and in nurseries. Deer damage to crops and nurseries often cause significant economic losses. As a result, Delaware farmers commonly call for a reduction in the local deer population.

Farm operations without hunting programs often have high deer populations and increased crop damage. DFW has liberalized antlerless seasons and bag limits in an effort to reduce the deer population and aid commercial producers in controlling deer. Furthermore, to better assist agricultural producers, DFW administers two crop damage assistance programs that are experiencing crop damage. The division will continue to work with Delaware agricultural producers to minimize losses due to deer.

Reduce Deer-vehicle Collisions – Deer-vehicle collisions (DVCs) are hazardous to travelers of Delaware roadways and can cause personal injury and even death. Other problems that result from DVCs include damage to personal property, lost wages, and car repair expenses. According to the U.S. Census Bureau (2008), at 448 people/mi^2 Delaware is the sixth most densely populated state in the country. A combination of high human and deer densities have

made DVCs in Delaware a big problem. Not surprisingly, reducing the number of DVCs via deer population reduction is a common demand made to DFW.

Deer-vehicle collisions are reported to DFW by a broad spectrum of agencies, including the state police, DFW Enforcement Agents, deer check stations, Delaware Department of Transportation (DelDOT), and State Farm Insurance Company. DFW annually tabulates data on DVCs via totals provided by DelDOT, and through the return of Vehicle-Killed Deer Tags that are issued by various agencies that recover deer carcasses or report DVCs on Delaware's roadways.

The exact number of DVCs that occur in Delaware is not known, though thousands of them occur annually. Many DVCs go unreported by motorists, and an unknown number of struck deer travel away from roadways and are unreported. Using data from claims, it has been projected by the insurance industry that an average of 3,500 DVCs occurs annually in Delaware. In 2007 and 2008, 666 and 758 deer were removed from Delaware's roadways, respectively. It is important to note that DelDOT normally only removes deer from Delaware's major interstates and highways. Thus, deer killed on many of the secondary roads go unreported. Furthermore, deer that die off of the roadway are also unreported.

DFW informs the public about DVCs and the methods that can be used to avoid collisions through the media, via news releases and the DNREC website, especially in emphasizing when DVCs are the most prevalent. This peak usually occurs during the deer breeding season, or "rut," that takes place in November. During this time of the year, deer are most active while seeking out potential mates.

Presently, roadside fencing, constructing overpasses or underpasses for direct passage, and deer population reduction are most productive for reducing deer-vehicle collisions. Various wildlife reflectors have also been marketed in an effort to deter DVCs. Reflectors are most commonly mounted on posts along roadsides and redirect light from automobile headlights through colored lenses. The theory is that the redirected beams of light form a "fence" or optical barrier that deters deer from running into the path of the passing automobile.

Thorough studies with sound experimental designs of wildlife reflectors are limited. Most recently and most convincingly, D'Angelo et al. (2007) used FLIR video to investigate the effects of wildlife reflectors on deer and found that the reflectors were ineffective in changing deer behavior such that deer-vehicle collisions would be prevented. Similarly, Reeve and Anderson (1993) concluded that roadside reflectors were not effective in reducing vehicle collisions with mule deer in Wyoming. However, there was some question as to whether the reflectors were properly maintained. Schafer and Penland (1985) documented a decrease in deer-vehicle collisions with white-tailed deer and mule deer when reflectors were used along roadsides in Washington. Due to small sample sizes, though, it is unclear whether the decrease in deer-vehicle collisions when using reflectors was a result of altered deer behavior or increased driver awareness due to the reflectors being present. The Division of Fish & Wildlife continues to monitor developments of deterrents for deer-vehicle collisions and will actively promote any advances in technology.

Wildlife warning whistles (deer whistles) attached to cars also have been used in an attempt to reduce deer/vehicle collisions. These whistles operate at frequencies of 16 to 20 kHz and are intended to warn animals of approaching vehicles. There is no research, however, that indicates that deer are frightened by a particular frequency or decibel level of sound, and in a Utah study, whistles did not alter deer behavior or prevent them from crossing highways. It appears wildlife warning whistles are not alarming to deer and are not loud enough to be heard above the engine noise associated with moving vehicles (Romin and Dalton 1992). Therefore, cars equipped with warning whistles will not prevent deer from crossing roads or reduce deer-vehicle collisions.

Reduce Urban/Suburban Deer Conflicts – Urban and suburban deer management is a significant challenge to deer managers across the U.S. Deer-human conflicts are one of the fastest growing deer management issues in Delaware and increased complaints from urban and suburban residents require increased attention by DFW. In response to this demand, the division is dedicated to assisting Delawareans with the resolution of human-deer conflicts. Staff regularly communicate with Delaware residents and provide them with written and verbal information on methods that exist to reduce deer damage and the problems that deer can cause. Upon request, staff has met with individual communities to present information on the various deer management options in more detail and to answer residents' specific questions about deer management issues.

Informing and educating the concerned public and their elected officials of the available deer management options is vital to proceeding with any deer management effort. To better provide that information to the public, the Northeast Deer Technical Committee, which Delaware is a part of, has created a document titled, "An Evaluation of Deer Management Options" which is posted and available to the public on the Division of Fish & Wildlife's website. This comprehensive document provides information on the non-lethal and lethal deer management options that are available to assist Delaware's residents with the resolution of deer issues. It lists deer management options by category, with each category providing links that contain suggestions on ways to handle the various problems that deer can cause.

The public can visit the website to get information, and can print out the various pages that contain deer management information or they can print only the information that is pertinent to them. Staff can also provide the information in hard copy to residents who do not have Internet access. In many cases, individual landowners or homeowners can utilize the various deer management methods on their own properties to reduce the problems caused by deer. In contrast, deer management at the community level often must be carried out with consensus from the members of the community.

The Division of Fish & Wildlife advises that no single deer management option can alleviate all deer problems. Land managers, homeowners and suburban residents experiencing deer problems should consider using a combination of options when managing deer and deer problems. DFW will continue to investigate, promote, and implement effective non-lethal deer control methods as they become available, are appropriate, and have a suitable funding source. It is the division's responsibility to provide the most accurate information available regarding deer management and to offer professional guidance on deer control methods that work and do not work in specific settings. In some instances, non-lethal control methods may be the most effective measures

available and will be promoted. The Division of Fish & Wildlife will continue to promote hunting as an effective management tool in controlling deer numbers in concert with non-lethal methods where they may be effective and when appropriate funding exists.

Other Management Activities

Captive Deer – Unlike some states, the regulatory authority over captive Cervids (deer) is split between two Delaware state agencies. The Delaware Department of Agriculture (DDA) is responsible for regulating all nonnative animals and DNREC's Division of Fish & Wildlife is responsible for regulating native wildlife. Currently, it is unlawful to possess a captive white-tailed deer in the state of Delaware. However, DFW has grandfathered three individuals the right to possess white-tailed deer. Each of these individuals is only permitted to possess one deer. Due to potential disease threats to native free-ranging deer, livestock, and humans, DFW will no longer issue permits and once the remaining captive deer perish, these individuals will no longer be permitted to possess a deer. In regards to nonnative Cervids, the DDA has permitted four individuals to possess cervids not native to Delaware, two of whom possess fallow deer (*Dama dama*), with the other two possessing sika deer (*Cervus nippon*) and red deer (*Cervus elaphus*), respectively. Similar to DFW's stance, due to potential disease threats the DDA is no longer issuing permits to individuals to possess captive Cervids.

Because captive deer are often kept in confined areas at high densities, the risk of disease and disease transmission is increased. Likewise, the buying, selling, and moving of deer can result in diseases being introduced into areas that otherwise would not be exposed. Bovine tuberculosis (TB) and Chronic Wasting Disease (CWD) are thought to have infected wild populations of deer and elk in several areas of the United States and Canada through the release or escape of diseased captive deer, and potentially through contact of diseased captive deer with wild deer through perimeter fences.

To reduce the potential for disease threats from captive deer, particularly CWD, the Division of Fish & Wildlife has developed a Chronic Wasting Disease Response Plan (Rogerson 2010) and has enacted regulations to reduce the risk of exposure to diseases via captive deer. Permittees are not allowed to move deer among other permittees in the state, but may, upon permission from another state, move the deer from Delaware. Both DFW and DDA perform regular inspections of captive deer facilities to check for compliance of permit requirements.

The possession of captive deer in Delaware without a permit is a violation of Delaware regulation and is enforced. Owners of illegally held deer are given the opportunity to relocate their deer out of state. If owners choose not to or cannot comply, the deer are confiscated, euthanized, and tested for disease.

Delaware citizens are advised on the reasons it is illegal to keep deer captive without a permit. DFW also does outreach through periodic press releases and information on the DFW website to inform the public about the problems that can result from keeping deer in captivity.

Fawn Rehabilitation – Spotted deer fawns are probably the most well-recognized "baby" animals known to Delawareans. The Disney movie "Bambi" popularized deer, especially fawns,

making them an instantly recognizable wildlife species to countless people. The helpless appearance of fawns makes them one of the most appealing sights in nature.

Unfortunately, every year Delaware residents find fawns that they believe have been abandoned or orphaned. In most cases, the fawns do not need human assistance as they have been intentionally left alone by the doe, often for extended periods of time.

Contrary to popular belief, does do not provide constant attention to their fawns. A doe will leave its fawns alone while it forages or ruminates, so it can produce the milk necessary to feed the fawns. The doe will return periodically to nurse and preen the fawns and to relocate them to new secluded habitat, if danger threatens.

Newborn fawns have almost no body odor and their reddish brown coat with white spots make young fawns almost invisible to predators. Fawns lie motionless on the ground surrounded by low vegetation. The fawn's natural instinct is to freeze even when approached by another animal. As fawns grow and mature, they will initially freeze, but then jump up and bound away.

To prevent attracting predators to the defenseless fawns, does intentionally separate themselves from their fawns, until the fawns become more physically developed and capable of outrunning their pursuers. Once fawns can elude predators, they will follow the doe during its daily activities.

As more wild areas of Delaware become developed, deer increasingly become accustomed to humans and fawns are found near houses, in backyards, and in the 'green spaces' near housing developments. People out enjoying nature often encounter fawns. Sometimes wandering pets encounter fawns and bring them home to unsuspecting homeowners. In these situations people should leave the fawn alone, or try to put the fawn back in the location where it was found, so that the doe can find it and care for it. If the fawn tries to follow, people are advised to gently push down on the fawn's shoulders to make it lay down - does do this to keep fawns hidden while they forage, to prevent them from following.

To assist the public in these situations, DFW annually does outreach through seasonal press releases and via website information that informs the public about what to do if encountering a fawn. The public is also informed that it is illegal to remove deer and other native wild animals from the wild and that raising them and keeping them in captivity without the approval of DFW is against the law, as well as a threat to the well-being of the animal. The unnatural conditions of life in captivity can cause malnutrition, injury and stress which could lead to sickness and death for the fawn. Wild animals such as adult deer that become accustomed to humans can also pose a threat to people.

Individuals who find injured or orphaned fawns are advised to contact the DFW for advice. In cases where fawns are known to be orphaned, the DFW will attempt to make arrangements with a wildlife rehabilitator for the fawn to be transferred over for care. Delaware wildlife rehabilitators are permitted to care for fawns until they are healthy enough to be released back to the wild.

Only qualified individuals should care for injured or orphaned fawns to insure the humane welfare of the fawn. Citizens are informed that the specific action taken will address both their concerns and the future welfare of the animal.

Delaware Master Hunter Program – To better promote sound hunter ethics, conservation stewardship, and basic knowledge of wildlife management concepts, the DFW Hunter Education Program created the Delaware Master Hunter Program in 2005. The information covered in this program goes beyond what is taught in basic hunter education and is geared towards those hunters who have several years of hunting experience.Participants in this program must pass a basic hunter education class, the core Master Hunter education class, two additional hunter education offered programs of his/her choice, a shooting proficiency test, and a criminal background check. Due to the advanced training received by individuals who have successfully completed the program, the Division of Fish & Wildlife has used Master Hunters in one of its managed urban deer hunts. Furthermore, when deer population reduction is requested (i.e. inside urban areas, agricultural damage abatement) by the general public, the division will often recommend Master Hunters for the assignment.

GOALS, OBJECTIVES, AND STRATEGIES

Section Overview

This section outlines and describes the goals for managing deer in Delaware through 2019. The Deer Management Stakeholder Advisory Committee (DMSAC) developed goals with technical feedback from DFW staff. These goals reflect the values of a diverse public and are broad statements of principles and ideals about *what* should be accomplished with deer management in Delaware. As the underpinning for deer management direction, these guiding public values should be relatively stable over time. These goals will be reconsidered during the next revision of the Delaware Deer Management Plan in 2020.

Following each goal statement are a number of objectives and strategies. The objectives describe, with specific milestones, the various procedures for meeting goals, while the strategies describe how the various objectives and subsequent goals will be met. Prioritization of objectives by the DFW will help direct limited deer program resources toward the most important tasks. While it is impossible to predict all the strategies that will be needed over the next 10 years to meet our goals and objectives, these strategies represent some of the approaches, techniques, and programs that will be considered to accomplish these tasks. As with objectives, decisions about what strategies to use are largely the technical realm of wildlife professionals (but replete with input and considerations about what techniques are most acceptable to the public). Educational strategies will be important components of accomplishing virtually every objective in the Delawre Deer Management Plan.

Public goals are much less likely to need amending between plan revisions than objectives and strategies. While goals should remain relatively constant over time, specific objectives and strategies will need flexibility to respond to changing social, environmental, technical, and administrative conditions. To keep the plan relevant and responsive, specific objectives and strategies may be added, deleted, or amended by DFW as new information or circumstances demand.

All of the following goals, objectives, and strategies fall within the guiding principles and philosophical tenets as defined by DFW (pages v and vi). The division strives to adhere to these philosophies with all of its wildlife management activities and deer management shall be no different. DFW's mission statement entails those aims: *"The Mission of the Wildlife Section is to conserve our native wildlife populations, promote responsible resource management and provide wildlife related recreational and educational opportunities for all."* A basic tenet of deer management in Delaware is that white-tailed deer are a public resource that should never be privately owned. Deer, like all other native wildlife, are managed in trust by DFW for all citizens.

Making Changes

Changes in deer management harvest regimes, seasons, bag limits, etc., are made possible via three techniques: statute changes, regulation changes, and Division policies. Statutes normally provide specific authority to an agency for accomplishing an action, whereas a regulation is created by the agency and describes how that particular action will be instituted by the general public. Furthermore, DNREC policies are created when a specific protocol is needed by DFW

staff to handle repetitive issues. For example, DFW has statutory authority to manage deer in Delaware and thus has created various regulations on how deer will be managed.

Statute changes are initiated and completed by the state legislature and while DFW input is often sought, the Division of Fish & Wildlife does not have control over the final outcome of the changes. Regulation changes, however, are promulgated by DFW directly and do not require legislative input. In short, a statue is changed or created after a bill is introduced into either the State Senate or House of Representatives. It must then be voted on and passed in the chamber where it was introduced; after that, it is sent to the other chamber where it is debated and voted on. If it passes the second chamber, the bill is sent to the Governor where, if it is signed, becomes law.

As stated previously, the regulatory process does not necessarily incorporate the State Legislature. The regulatory process is 23 steps and takes seven to nine months to complete. In summary, regulations are drafted by DFW and advertised on the division's website and in local newspapers where public opinion is sought. Public hearings are held where further public comment is solicited. If still deemed appropriate, the regulations are sent to the DNREC Secretary where he/she signs and adopts them into law.

In some instances, the Division of Fish & Wildlife may opt to adopt a policy concerning certain matters rather than develop a regulation. Often this is done when circumstances are not controversial and a standard protocol is needed for DFW to follow. A policy becomes effective after it is drafted and approved by the director of the Division of Fish & Wildlife and the Secretary of the Department of Natural Resources and Enviromental Control.

For most changes made relative to deer management, DFW plans to utilize the regulatory process as this has been the standard procedure in recent years. However, unlike in recent years, DFW will develop a standard rotation for making and amending regulations. Unless extremely unusual circumstances occur, the division will evaluate and initiate the regulatory process concerning deer management on a three-year rotation. Recently, changes have been on an annual basis and DFW has been unable to effectively evaluate the impact of each change. The division needs at least three years to accurately examine the impact made by a change on the deer population. Furthermore, the time commitment required by DFW staff to go through the process is intense and thus the need to implement changes on a standardized basis.

Summary List of Goals and Primary Objectives
The following section of the Deer Plan outlines the Division of Fish & Wildlife's six primary goals and describes the objectives and strategies it will use in an attempt to achieve them. The overall list of goals, objectives, and strategies is expansive. To provide a more user friendly and searchable list, the goals and objectives are simply listed below. To view a more detailed description and to see the implementation strategies see the complete list following this section.

Population Goal
Manage local deer populations as a public resource using innovative, flexible, publicly accepted, and technically sound practices that balance all of the following: the varied needs and expectations of a diverse human population (cultural carrying capacity); the requirements to maintain a biologically diverse Delaware ecosystem; the anticipated future social and ecosystem demands; and the recreational demands both consumptive and non-consumptive users.

Objectives
1. Monitor and estimate the overall size, density, and composition of the deer population across the state.
2. To update deer population management objectives within each Deer Management Zone every five years.
3. Once deer population objectives are established, create the protocol for adjusting the harvest to meet population goals.
4. To meet deer population management objectives within 10 years after they were updated in May 2009.
5. When considering the population objectives of the public, DFW will not recommend any actions that will negatively impact the viability of the white-tailed deer resource.
6. To develop or continue management programs for local deer management areas within the larger deer management zones.
7. Evaluate Delaware's current deer management zone boundaries.

Habitat Goal
Manage deer habitats compatible with deer population, recreation, and damage goals using sound science, while still working within the constraints of diverse land ownerships

Objectives
1. To regularly update the amount of deer habitat within each deer management zone.
2. Develop a quantifiable protocol for evaluating habitat quality.
3. To manage deer ecosystem impacts within limits that permit functioning of a biologically diverse ecosystem.
4. To promote deer habitat management compatible with the needs of diverse native wildlife species and humans on private and public lands.

Damage Goal
Proactively manage deer impacts on a local basis consistent with deer population objectives and acceptable levels of damage. Using diverse techniques, manage agricultural, urban, vehicular, forestry, animal health, human health and safety, and other impacts caused by deer.

Objectives

1. To quantify agricultural, urban, vehicular, forestry, human safety, and other deer impacts.
2. To reduce agricultural damage, as measured by the demand for enrollment in crop damage assistance programs to < 200 permits annually.
3. To continue a management program for urban deer.
4. To implement a program to manage deer-vehicle collision.
5. To minimize deer-related diseases that impact humans and domestic animals.

Recreation Goal

Provide opportunities for all citizens to safely and ethically enjoy diverse deer-related recreational experiences and traditions (including observation and hunting) consistent with deer population and damage goals.

Objectives

1. To manage deer-related recreation to yield current levels of deer viewing opportunities.
2. To reduce deer hunting related accidents by 50% by January 1, 2019.
3. Consistent with deer population management objectives, maintain our current annual average of at least 18,000 licensed hunters.
4. To ensure that deer hunting methods in Delaware are safe and ethical.
5. To ensure that deer-related recreational activities respect the rights of private property owners and other Delaware citizens.

Education Goal

Educate Delaware citizens on all aspects of deer biology, including management tools, disease issues, economic aspects, and recreational opportunities.

Objectives

1. Increase the public's understanding of deer biology and the impacts deer have on habitat and people.
2. Provide technical assistance to community groups or other organizations in managing specific deer populations and provide staff support to accomplish shared goals when appropriate.
3. Increase the public's understanding and acceptance of regulated deer hunting and its need as a management tool.
4. Increase the public's understanding of non-lethal deer management techniques in a manner that allows them to make informed decisions on the applicability of these techniques in a given situation.
5. Develop an outreach program that focuses on the impacts deer have on the ecosystem, to include the deleterious effects on other species of wildlife and plant communities.
6. Develop an outreach effort to educate Delaware deer hunters on the concepts and outcomes associated with various deer management philosophies such as traditional deer management, Quality Deer Management (QDM), and Trophy Deer Management.

Resources Goal

Ensure that all necessary resources (i.e., funding, supplies, training, personnel) are available to support the proper management of white-tailed deer in Delaware.

Objectives

1. Maintain a staff of well trained, properly equipped staff to conduct deer related research and population monitoring in Delaware.
2. Continue to conduct research across the state concerning deer population impacts, size, health, and condition.
3. Maintain and/or increase revenue through the sale of hunting licenses and permits.
4. Identify alternative sources of funding and support to conduct deer management in Delaware.

The following is a detailed description of Goals, Objectives, and implementation Strategies the Division of Fish & Wildlife will use over the next 10 years when managing deer.

Population Goal

Manage local deer populations as a public resource using innovative, flexible, publicly accepted, and technically sound practices that balance all of the following:

1. **The varied needs and expectations of a diverse human population (cultural carrying capacity)**
2. **The requirements to maintain a biologically diverse Delaware ecosystem**
3. **The anticipated future social and ecosystem demands**
4. **The recreational demands both consumptive and non-consumptive users**

Cultural carrying capacity (CCC) is defined as the number of deer that can coexist compatibly with humans. At CCC, the deer population is in balance with positive demands for deer (i.e., recreation) with the negative demands (i.e., damage). CCC is a function of the tolerance levels of human populations to deer and the effects of deer. CCC can vary widely within and among communities. Development of CCC deer management objectives are subjective and must take into account the combination of social, economic, political, and biological perspectives of the community. The CCC for deer generally occurs well below the ecological carrying capacity (ECC) - the maximum number of deer that a habitat can sustain over time

Even at population levels below CCC and ECC, deer can cause significant impacts to natural ecosystems. Deer populations are to be managed not only to meet the desires of constituents, but also to protect ecosystem integrity and biodiversity.

Proactive population management entails anticipating changes in CCC and ecosystem requirements in the future. Deer population objectives and strategies will accommodate expected future demands.

An effective public information effort is critical to the future success of Delaware's deer management programs. Public attitudes and perceptions often determine the success or failure of deer management. In the future, emphasis will need to be placed on public education to achieve deer management objectives.

Objective 1. Monitor and estimate the overall size, density, and composition of the deer population across the landscape.

Recent surveys have indicated that the density of deer across Delaware's landscape is variable. Thus, continued surveys are needed so DFW doesn't allow for the overharvest of deer in one area, nor under harvest in another. Population data will be one of the many factors considered when the DFW regulates seasons and bag limits.

Strategies

a) As funding permits, the division may conduct aerial FLIR population surveys to estimate deer population size. If this monitoring technique is used, surveys will be conducted in the year immediately following Delaware's statewide land cover classification surveys. Since these population surveys are largely based on the current land cover distribution in Delaware, surveys conducted soon after land cover classification will provide the most accurate data possible. Statewide land cover classifications are usually recalculated every five years.

b) In the years between FLIR surveys and in the event that funding precludes completing a survey, a spatially explicit model and/or catch per unit hunter mail survey will be used to monitor population size and impacts of harvest. Furthermore, DFW will incorporate additional surveys to estimate harvest/amount of hunter effort exerted. This data will allow the division to evaluate whether the deer population is increasing, staying the same, or decreasing. This data will also allow DFW to estimate the deer population size via the DeLury Method (Roseberry and Woolf 1991).

c) Assess the deer population and establish trend objectives at the deer management zone level through population index surveys, population modeling, GIS mapping, environmental and agricultural impact studies and public input.

d) Where necessary, use unique or experimental techniques to monitor the deer population, for example in suburban areas where traditional data collection methods are inadequate.

e) Explore and possibly institute other deer population size estimating techniques.

f) Along with overall population size and density, DFW will monitor herd health (e.g., pregnancy rate, fat index, antler size, indicators of disease, etc…) and composition (e.g., age structure, sex ratio, etc…).

Objective 2. To update deer population management objectives within each Deer Management Zone every 5 years.

A deer management plan must have defined management units and contain four components:

1. A measure or index of current deer population status
2. A population management objective
3. A management strategy to attain the population management objective
4. A method to monitor population response (i.e., management success or failure).

For deer population management purposes, there are only three possible population objectives; increase, decrease, or stabilize the population. In Delaware, deer harvest objectives/regulations are set on a deer management zone basis. Currently, there are 17 deer management zones in Delaware ranging in size from 80 to 243 square miles in area. Development of deer population management objectives integrates social, economic, political, administrative, and biological perspectives. Population management objectives based on assessments of cultural carrying capacity, environmental impacts, and anticipated future changes in habitat and human population

growth. As a result, deer population management objectives, as well as hunting regulations, have been differentiated between some public (e.g., state Wildlife Management Areas, State Forests) and private lands due to differences in public demands, habitats, and accessibility. Knowledge of local human-deer conflicts and constituent desires for deer is important in establishing deer population management objectives. Human population and development trends are used to forecast future human/deer conflicts. DFW staff routinely interact with diverse stakeholders (e.g., agricultural producers, homeowners, hunters, environmental organizations) regarding local deer populations and human/deer conflicts.

The challenge in establishing population management objectives is balancing social and ecosystem demands while being mindful of future trends of each. Methods/processes used to determine local CCCs should consider all deer interests (i.e., stakeholders) in the management unit. Ideally, the community and/or stakeholders should reach a consensus on the desired deer population level and objective (increase, stabilize, or decrease). In addition to stakeholder input, managers should incorporate information on ecosystem impacts of deer in each management zone. Until all of this information has been gathered, the DFW will attempt to stabilize the deer population at 40 deer/square mile of deer habitat. Once biological and sociological surveys have been completed the population goal may be adjusted.

Strategies

a) Employ surveys and other public input methods to establish cultural carrying capacity across the state
b) Define and monitor appropriate measures of biodiversity or deer impacts to ecosystems at the deer management zone level.
c) Predict future social/ecosystem trends using best available information.
d) Develop and implement an adaptive procedure for balancing CCC, ecosystem, and future considerations in setting deer population management objectives.

Objective 3. Once deer population objectives are established, create the protocol for adjusting the harvest to meet population goals.

Depending on the estimated deer population density and the population goals for that same area, the deer population will either need to be reduced, stabilized, or increased. Depending on the action needed, DFW will establish the protocol for adjusting the harvest to meet management objectives. This will help to alleviate any surprises when DFW adds an additional, or removes a current deer season in an attempt to alter the harvest.

Strategies

a) Continue to analyze annual deer harvest data to determine the level of impact each of the current seasons have on the overall harvest. Certain seasons may be better suited for adjustment to meet management goals.
b) Survey constituents to determine what changes they would prefer when trying to meet management objectives.
c) Monitor and evaluate the approaches of other state fish and wildlife agencies in respect to adjusting the deer harvest.
d) As more information is learned the following is a current procedural list for decreasing or increasing the harvest. Each option will be implemented and evaluated over a three-year time. After three years, additional actions will be taken if necessary. The following lists

may be modified as more information becomes available. Many things, including the deer population goal, will be considered before implementing these changes. The DFW will consider the management unit size, variability in data, the ECC and BCC, the opinions and attitudes of the public, etc. The ultimate goal is to stabilize the population around the targeted goal and to avoid flip-flopping between over and under harvesting the deer herd.

Actions taken to reduce the deer harvest in a management unit*

Step 1	Convert current SDDAP members into DDAP members unless a site visit by a DFW staff member reveals that crop damage is substantial enough to warrant the SDDAP program AND eliminate the October Antlerless season.
Step 2	Eliminate the December Antlerless and January Muzzleloader seasons
Step 3	Disallow the harvest of antlerless deer, specifically females
Step 4	Eliminate the October Muzzleloader and January Shotgun seasons
Step 5	Reduce the November Shotgun season to a 3-day season
Step 6	Eliminate the November Shotgun season
Step 7	Close all deer hunting

* These actions would be taken in an attempt to increase the deer population or to scale back the harvest so that too many deer aren't harvested.

Actions taken to increase the deer harvest in a management unit*

Step 1	Convert the December Antlerless season to an either sex season
Step 2	Convert the October Muzzleloader season to a shotgun season
Step 3	Create a September Antlerless season in which the antlerless deer could be harvested during the last week of September
Step 4	Add a second week of either sex hunting to the end of the November Shotgun season
Step 5	Allow antlerless deer to be harvested with a shotgun throughout the month of September
Step 6	Antlerless deer may be harvested with a shotgun from September 1 – January 31.

* These actions would be taken in an attempt to decrease the deer population. These actions would not occur in the area of New Castle County north of I-95 and I-295, until the safety zone restriction is reduced from 200 yards to the state mandated restriction (currently 100 yards).

Objective 4. To meet deer population management objectives within 10 years after they were updated in May 2009.

Although there are a number of techniques for managing deer populations in different circumstances, tradition, management efficiency, and cost effectiveness necessitate the use of hunting as the primary deer population management strategy for deer across most of Delaware. Deer management in Delaware is predicated on the fact that herd density and health are best controlled by regulating antlerless deer harvests levels. Management objectives are accomplished by increasing or decreasing the number of either-sex or antlerless only deer hunting days during the hunting season. Deer hunting is a viable, cost-efficient management tool that not only maintains a healthy deer resource, but also diminishes deer crop damage levels, deer/vehicle collision rates, and deer-ecosystem impacts. The existence of the Sportsmen Against Hunger Program encourages hunters to harvest deer they may not otherwise take and donate excess deer meat to food banks.

Diseases that have the potential to impact deer populations need to be prevented or managed if deer population objectives are to be met. Hemorrhagic Disease (HD), an endemic midge-borne disease of deer, is present in the Southeastern states each summer and fall. Its prevalence and significance in impacting deer populations are cyclic. The worst HD year on record in the Eastern U.S., including Delaware, occurred in 2007. Chronic Wasting Disease (CWD) is a transmissible spongiform encephalopathy known to affect white-tailed deer, mule deer, elk and moose. The closest CWD has been found to Delaware is in Hampshire County, W. Va., which is approximately 170 miles from Delaware's boarder. If introduced, CWD could have a significant deer population impact unless it is quickly and effectively controlled.

Strategies

a) Educate the public about the need for and methods for deer population management.
b) Determine social acceptability of various deer population management options using surveys and other methods.
c) Use hunting as the primary deer population management strategy where appropriate.
d) Monitor effects of regulation changes.
e) Ensure a future for deer hunting as a management tool, where appropriate:
    1. Educate hunters and public to improve awareness and sportsmanship.
    2. Develop hunter recruitment programs.
    3. Ensure that laws and ordinances do not unnecessarily restrict hunting.
    4. Improve hunter access.
    5. Foster cooperation between hunters and landowners who experience deer damage.
    6. Support programs like the Sportsman Against Hunger Program that promote a positive image for hunters and help meet other management objectives.
f) Where hunting is deemed inappropriate or unacceptable, a combination of other management practices will be used.
g) Manage diseases, with an emphasis on prevention, which can impact deer populations:
    1. Discourage supplemental feeding and other activities which unnaturally concentrate deer.
    2. Regulate captive deer, including rehabilitated wild deer, to minimize risk for disease transmission to wild deer populations.
    3. Remove and test illegally-held captive deer for CWD, bovine tuberculosis, and other diseases as appropriate.
    4. Prevent introduction of infectious diseases using regulations and policies.
    5. If a disease is introduced, develop a coordinated and flexible response so that it can be quickly maintained, or controlled.
    6. Manage endemic diseases to prevent deer population impacts when possible.
    7. Develop and update disease surveillance and response plans as needed.
    8. Educate public regarding biology and management of deer diseases.
h) Monitor population status (size, trends, condition, etc.) annually using harvest data, hunter surveys, and other methods.
i) Incorporate measures of hunter effort in monitoring deer population trends.
j) Develop procedures for monitoring those deer populations where traditional deer hunting and harvest data is not available or not representative.
k) Determine limiting factors to meeting population objectives (e.g., predation, mast availability, fawn recruitment, human attitudes, lack of hunting, hunter access)

Objective 5. When considering the population objectives of the public, the Division of Fish & Wildlife will not recommend any actions that will negatively impact the viability of the white-tailed deer resource.

Deer management decisions have often been made with personal or political interests in mind and these decisions may not have been in the best interest of the resource. While keeping the interests and needs of all Delawareans in mind, we must also consider the impacts on the deer population.

Strategies

a) In an attempt to monitor herd health and age, DFW will continue to collect biological harvest data at deer processors during the hunting season. Trained staff will collect sex, age, weight, reproductive status, and antler measurements from hunter harvested deer to complete this monitoring requirement.
b) The game species management program staff will work closely with the Natural Heritage and Endangered Species program biologists to better address deer impacts to Delaware's plant and nongame species.
c) DFW will attempt to conduct research on white-tailed deer that will allow for more informed management decisions. Current issues facing the division are impacts of deer on crop yields, forest understory regeneration, small mammal, herp, and avian communities, and deer-vehicle collisions.
d) Monitor the threats created by trends in deer management, such as feeding/baiting, the use of natural deer lures, the development of tick control apparatus or other potentially hazardous practices. When warranted, these activities will be addressed via the regulatory process.
e) The idea of allowing Sunday hunting is a very controversial issue. Allowing hunters to harvest deer on Sundays will undoubtedly provide additional opportunities for hunters and will increase the overall harvest. However, many non-consumptive outdoor recreationalists use Sundays during the hunting season as a day of recreation. Therefore, the Division of Fish & Wildlife will continue to monitor the opinions of all Delawareans concerning Sunday hunting and will respond accordingly. Ultimately, Sunday hunting will come down to the approval of the legislature and the governor, as it requires legislative action to be changed.

Objective 6. To develop or continue management programs for local deer management areas within the larger deer management zones.

Regulations on deer hunting are designed purposefully to apply to large areas (i.e., counties or deer management zones), be as simple and uniform as possible, and avoid confusion. When setting regulations on this basis, one assumes that deer habitats, deer densities, hunter pressures, and public demands are similar over the entire affected area. However, these factors often vary within a management zone. As a result, regulations in some areas may be too conservative, whereas in other areas, they may be too liberal. To meet the unique management needs and challenges in such areas, alternative site-specific management regulations and programs must be developed and implemented (e.g. managed deer hunts in urban areas, DDAP, SDDAP, etc.).

Local deer management areas may include: state parks and forests; regional, county, and city parks; cities, towns, and developed sections of counties; resorts and planned communities;

industrial or utility developments; military installations; government research facilities; airports; and any other areas deemed by DFW to merit deer management assistance beyond that provided for by state hunting regulations pertaining to the larger management unit.

Owners or managers of local deer management areas generally set deer population management objectives within their respective areas. For most cities and other highly urbanized areas, the objective is almost always to decrease the deer population. DFW's role is to provide assistance to local managers to achieve these objectives and not physically implement the entire program.

Strategies

a) Provide technical assistance to communities and landowners implementing deer management programs.
b) Provide site-specific deer management programs (e.g. managed deer hunts, DDAP, SDDAP, sharpshooting, etc…)
c) When feasible, develop procedures for monitoring those deer populations where traditional deer hunting and harvest data are not available or not adequate.
d) When available, use new techniques and monitor their effectiveness. If deemed successful, expand their use.
e) Cooperate with traditional and non-traditional partners to identify feasible new techniques and apply them as appropriate.

Objective 7. Evaluate Delaware's current deer management zone boundaries.

To obtain a more detailed distribution of where deer were being harvested in Delaware, the state was divided into 17 deer management zones in 1993. So that hunters could easily determine which zone they harvested their deer in, major roadways were used as boundaries. While this change gave DFW much-needed fine scale harvest location information, the original zones were not created with deer density, human density, landscape composition or current land use management practices in mind. Thus, an examination of our current zone locations is needed with the idea that boundaries may need to be redefined.

Strategies

a) Incorporate current and proposed land use practices, deer density, herd health, hunter distribution and CCC and BCC information when redefining new deer management zones.
b) If a change is needed, establish deer management zone boundaries so that hunters and the public can easily determine which zone they are in.
c) Incorporate all factors that could dictate zone boundary locations in a comprehensive GIS database so that many factors can be examined at the same time.
d) Revaluate zone boundaries every 5 years and make any necessary revisions.

Habitat Goal

Manage deer habitats compatible with deer population, recreation, and damage goals using sound science, while still working within the constraints of diverse land ownerships

White-tailed deer have specific habitat requirements, which include food, water, cover, and space. Of these four habitat components, food typically is the most critical or important. Further, habitat quality for deer is significantly correlated with soil quality, and soil fertility directly

affects the quality of deer habitat. In addition to soil quality, habitat type and size, successional stage, and amount of habitat interspersion or edge all play large roles in determining the quality of deer habitat. In general, habitat management practices that improve soil fertility, increase the number of habitat types, revert habitat back to an earlier successional stage, or increase the interspersion of habitat types will increase biological carrying capacity for deer.

Objective 1. To regularly update the amount of deer habitat within each deer management zone.

Available deer habitat is estimated on a management area basis (county/city). The quantity of deer habitat per management unit is estimated as the sum of forested, open, and wetland areas. This equals the total land area in the deer management zone minus developed and agricultural land areas and open water. Land cover habitat data used in this plan was taken from U.S. Geological Survey's National Land Cover Dataset (NLCD), derived from 2007 satellite imagery. Deer habitat data will be updated when the new dataset becomes available statewide (usually every five years).

Strategies

a) Obtain and incorporate the most recent deer habitat inventory data.
b) Monitor changes in habitat status on a deer management zone basis. Incorporate attributes of forest age, type and quality, tree stocking rate (i.e., density), habitat interspersion, in addition to basic estimates of total forest cover.

Objective 2. Develop a quantifiable protocol for evaluating habitat quality.

Land cover habitat data is calculated using the U.S. Geological Survey's NLCD. While this dataset provides the DFW with an estimate of the amount of deer habitat in Delaware it does not provide any quality information. For instance, the NLCD may categorize a forest stand type as "mixed hardwoods." This would be considered deer habitat but upon closer inspection via a site visit it may be revealed that the forest canopy is so dense that little to no understory exists. Thus, forage available to deer would be minimal. Therefore, a way not only to assess the amount of deer habitat but also the quality is needed.

Strategies

a) Develop a quantifiable approach to assessing habitat quality so that multiple individuals conduct assessments and derive the same habitat quality score.
b) Periodically assess the quality of identified deer habitat across the state.
c) Incorporate habitat quality measures when developing deer density goals.

Objective 3. To manage deer ecosystem impacts within limits that permit functioning of a biologically diverse ecosystem.

Deer ecosystem impacts have become more of a management concern in Delaware as the population density of deer has increased and forests and agricultural lands have been cleared for developments. Heavy deer browsing can diminish nutritive value of habitats for deer, displace wildlife communities that are dependent upon understory vegetation (e.g., neotropical migrant songbirds, small mammals), prevent the regeneration of valuable forest tree species (e.g., oaks), and damage certain unique or sensitive plant communities. Even at low population levels, deer may cause some measurable impact to natural ecosystems. However, removing deer completely would reduce animal diversity and deplete the ecosystem of a keystone herbivore. The challenge

is to manage deer impacts within limits that permit functioning of a biologically diverse ecosystem.

Strategies

a) Conduct research on the effects of deer on ecosystem structure and diversity.
b) Determine levels of deer impacts and the associated influences on ecosystem function and diversity.
c) Develop and use efficient methods to assess deer ecosystem impacts on a deer management zone basis.
d) Develop ecosystem impact objectives by deer management zone.
e) Implement deer population control, deer exclusion, or other techniques to manage against negative impacts.
f) Educate hunters and the general public about deer ecosystem impacts.

Objective 4. To promote deer habitat management compatible with the needs of diverse native wildlife species and humans on private and public lands.

Any activity that alters deer habitats – either intentionally (e.g., silvicultural practices) or unintentionally (e.g., residential development, agriculture) – has implications for managing deer populations, deer impacts to humans, and other wildlife species. Arguably, the most important deer management issue in Delaware has been the decline in deer habitat due to development. Given that nearly 80% of land in Delaware is privately owned, management practices that impact private land habitat greatly influence deer density, distribution, and condition. Actions that impact deer habitat on private lands often can increase human/deer conflicts, particularly in residential or urban areas. Habitat management practices designed primarily for deer can positively or negatively impact other wildlife species and ecosystems.

The amount of timber harvesting – which provides deer with ground level forage and cover – has been reduced over the past 20 years due to public opposition and the lack of an adequate timber market in Delaware. The management emphasis on what little forest remains in Delaware has largely been of the preservation mindset rather than management. Furthermore, the use of prescribed fire has been generally frowned upon by the general public. The success of prescribed fire in improving deer habitat depends on many factors, including site quality, stand conditions and fire prescriptions but when used appropriately can provide exceptional deer habitat quality improvement. Management activities that produce forage for deer can also reduce deer browse pressure on sensitive plant species, regenerating forest trees, and agricultural crops.

Strategies

a) Provide technical assistance to landowners for managing wildlife habitat.
b) Support varied habitat management objectives on public lands which seek to manipulate some vegetation for early successional wildlife.
c) Promote habitat management practices that provide long-term benefits to a diversity of wildlife species:
    1. Emphasize manipulation of natural vegetation (e.g., burning, disking, timber management) rather than promote more artificial methods (e.g., establishment of food plots, mineral blocks, or feeding stations).
    2. Promote restoration, regeneration, and productivity of native plant species important to wildlife, particularly those that provide hard and soft mast (e.g., hickory nuts, acorns, grapes, berries).

3. Discourage supplemental feeding of deer.

d) Cooperate with local governments, developers, and communities to ensure that impacts to deer and other wildlife are considered during development.
e) Educate public about the relationship between deer population densities and deer habitat quality and deer damage.

Damage Goal

Use diverse techniques, proactively manage deer impacts on a local basis consistent with deer population objectives and tolerable levels of damage. Manage agricultural, urban, vehicular, forestry, animal health, human health and safety, and other impacts caused by deer.

Deer management demands in Delaware can be categorized as positive demands (e.g., wildlife observation or hunting) or negative demands (e.g., agricultural damage, Lyme disease). Most of the pressure for the change in deer management direction that has taken place over the past half century can be attributed to deer damage demands. The original objective from establishing and allowing deer herd expansion has shifted to controlling population growth. Examples of damage demands commonly associated with deer management in Delaware include crop depredation, deer-vehicle collisions, urban deer conflicts, and deer ecosystem impacts.

Citizens, communities, the Division of Fish & Wildlife, and other agencies share responsibility for managing deer damage. By providing opportunities and programs to control deer populations, the division has primary responsibility for managing deer populations (and therefore deer impacts), the decisions and actions of landowners and community leaders directly influence the occurrence of local deer damage and the effectiveness of programs developed to address damage. While DFW provides the tools for local managers to control deer problems, it is up to local managers to implement those tools effective and adequately. Citizens' decisions about planting gardens or ornamental plants, feeding deer or other wildlife, hunting deer or allowing deer to be hunted, erecting barriers to exclude deer, participating in community planning processes, etc… impact local deer movements and abundance, with consequences for themselves and their neighbors. Community leaders can influence human-deer conflicts with their decisions whether or not to use deer control programs, enact ordinances, involve and/or educate citizens, etc. An effective public education effort is critical to the future success of Delaware's deer management programs, as public attitudes and perceptions often determine the success or failure of deer management.

Objective 1. To quantify agricultural, urban, vehicular, forestry, human safety, and other deer impacts.

A reliable estimate of deer damage to Delaware's agricultural producers has been lacking in the past. However, recent scientific research conducted by the University of Delaware in this area has been largely overlooked. Traditionally, issuance of out-of-season antlerless deer damage tags have been used to address deer agricultural damage demands on a county and statewide basis over time. Reliable data on deer-vehicle collisions, urban deer conflicts, and other deer damage is also lacking.

Strategies

a) Conduct surveys and research studies that attempt to quantify and monitor deer damage levels.
b) Determine acceptable levels of human tolerance to deer damage.
c) Conduct research to assess the effects of nonhunted lands (refugia) on the incidence of deer damage.

Objective 2. To reduce agricultural damage, as measured by the demand for enrollment in crop damage assistance programs to < 200 permits annually.

As provided by Delaware State Statutes §113, Protected wildlife injuring agriculture or other community interests and §114, Protected wildlife injuring private property, the Division of Fish & Wildlife is authorized to permit owners or lessees of land where deer are causing commercial or personal property damage to harvest antlerless deer. The frequency of crop damage permit issuance for agricultural and urban/residential damage has increased over the last decade. As local deer populations are reduced to sociological acceptable levels, the number of complaints and subsequently the number of damage permits should also diminish in Delaware.

Strategies

a) Use traditional hunting seasons as the primary deer population damage management strategy and liberalize seasons in areas where damage is prevalent and widespread.
b) Foster cooperation between hunters and landowners who experience deer damage.
c) Provide site-specific management programs (e.g. DDAP, SDDAP, managed hunts, sharpshooting, etc.).
d) Currently, some individuals are enrolling in crop damage assistance programs for the primary purpose of having flexibility in their hunting regiment. Readdress current enrollment requirements so that participants are only enrolled for economic crop damage concerns.
e) Require participants to submit harvest information to the Division of Fish & Wildlife. If the division staff are to be able to better assist landowners experiencing crop damage, a relationship will have to be fostered so that appropriate management recommendations can be made. Harvest data will help foster this dialogue.
f) Once the deer density reaches the predetermined goal in an area, the issuance of crop damage permits in that area will be scaled back. Potential permit holders in these areas will be reviewed and evaluated to determine if there is significant enough damage to warrant the issuance of a permit.
g) Provide technical assistance to communities and landowners implementing deer management programs.
h) Develop educational materials for agricultural producers regarding deer damage abatement programs and techniques.

Objective 3. To continue a management program for urban deer.

Unhunted areas or refuges have become increasingly common over the last several decades, especially in recently created developments that incorporate open space areas. While these areas may benefit many other wildlife species they also create unintended problems. In these areas, traditional regulated deer hunting is often deemed inappropriate, unacceptable, or even unlawful due to safety zone restrictions. To meet deer management demands in these areas, alternative management strategies and/or management programs must often be implemented. Urban deer

management issues are expected to increase significantly throughout Delaware as human populations continue to expand.

Strategies

a) Provide site-specific deer management programs (e.g. managed hunts, sharpshooting, etc.)
b) Foster cooperation between hunters and landowners who experience deer damage.
c) Provide technical assistance to communities and landowners implementing deer management programs.
d) Develop educational materials for the public regarding deer damage prevention and abatement techniques.
e) Develop a guide for creating and implementing a managed hunt program in which DFW will provide technical assistance but will not actually conduct the hunt.
f) Attempt to decrease safety zone restrictions, specifically for archery hunting. This change will reduce the amount of non-hunted refugia (areas that have escaped ecological changes) that can be found in Delaware.

Objective 4. To implement a program to manage deer-vehicle collision.

Although reliable, consistent data on deer-vehicle collisions in Delaware is lacking, it is currently assumed that the economic loss associated with deer-vehicle collisions and resulting damage is equal to or exceeds deer crop damage. Given that many accidents are not reported, the total property damage from deer-vehicle collisions actually is much higher. In addition to property damage, deer-vehicle collisions cause human injuries and fatalities.

Strategies

a) Continue to work in cooperation with the Delaware Department of Transportation (DelDOT) to accurately monitor deer/vehicle collisions on a monthly and annual basis.
b) Develop objectives for deer/vehicle collisions at the deer management zone level.
c) Educate community leaders and citizens, especially drivers, on techniques to reduce deer/vehicle collisions (e.g., news releases during the fall breeding season).
d) Ensure that development and road construction projects consider deer/vehicle collisions.
e) Support research on incidence and prevention of deer vehicle collisions in Delaware.
f) Assist DelDOT with the development and implementation of deer/vehicle collision abatement techniques that have proven to be effective.

Objective 5. To minimize deer-related diseases that impact humans and domestic animals.

Deer-related diseases known to affect humans include Lyme disease, erhlichiosis, babesiosis, rabies, brucellosis, and bovine tuberculosis (TB). The first three diseases listed above are tick-borne diseases that do not harm deer directly. As a host species for ticks, deer play a role in the maintenance of these diseases. Evidence indicates that higher deer densities promote higher incidences of these tick-borne diseases. Rabies is very rare in deer, but caution is warranted for anyone handling a suspect animal. TB, which also impacts cattle, has not been known to occur in Delaware.

Hemorrhagic Disease (HD) does not affect humans. Cattle demonstrate resistance to the HD virus and only rarely show ill effects from infection. The “blue tongue virus,” the rarer form of HD, can cause a disease in domestic sheep similar to that in deer.

Chronic Wasting Disease (CWD) is in the same class of prion diseases as scrapie in sheep and bovine spongiform encephalopathy ("mad cow disease") in cattle. However, there is no evidence at this time that humans have contracted such an illness from consuming venison, and CWD has not been shown to transmit to livestock in natural conditions. The susceptibility of exotic species of deer held in captivity (i.e. fallow deer, red deer, and sika deer) is currently unknown.

Brucellosis and foot-and-mouth disease are serious infectious livestock diseases that can infect deer and be transmitted by deer. Fortunately, neither disease has been found in Delaware in deer or livestock.

Strategies

a) Educate public about human and animal health relating to deer in coordination with Delaware Department of Health and other appropriate agencies. There are currently many misconceptions concerning Lyme disease so educational outreach in this area is essential.
b) Discourage supplemental feeding, baiting, and other activities which unnaturally concentrate deer to reduce risk of disease transmission.
c) Conduct annual, statewide surveillance of hunter harvested deer for CWD.
d) Remove and test illegally-held captive deer for CWD, bovine tuberculosis, and other diseases as appropriate.
e) Regulate captive deer, including rehabilitated wild deer, to minimize risk of disease transmission to wild deer.
f) Prevent introduction and spread of infectious diseases using management techniques supported by regulations and policies.
g) Develop and update disease surveillance and response plans (i.e. Delaware Chronic Wasting Disease Response Plan) as needed.

Recreation Goal

Provide opportunities for all citizens to safely and ethically enjoy diverse deer-related recreational experiences and traditions (including observation and hunting) consistent with deer population and damage goals.

White-tailed deer are popular among wildlife watchers, hunters, and the general public. During the 2006-07 deer season, more than 36,000 Delaware deer hunters spent 492,000 days afield in pursuit of deer. Deer hunting traditions include archery hunting, muzzleloader hunting, and firearms hunting.

Recreational hunting demands have led to the development of programs designed to achieve hunter satisfaction while also achieving population management objectives. Public and hunter awareness of this important dual role of regulated hunting will be critical to successful deer management in the future.

Objective 1. To manage deer-related recreation to yield current levels of deer viewing opportunities through January 1, 2019.

According to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, total wildlife-related recreation expenditures contributed over $309 million to Delaware's economy.

Strategies

a) Identify nonhunting deer-related recreational demands using surveys and other methods.
b) Develop quantifiable objectives for nonhunting deer-related recreation.
c) Maximize recreational opportunities when feasible and acceptable.
d) Ensure that deer viewing and photography activities do not facilitate human/deer conflicts. Discourage feeding of deer.
e) Educate public about nonhunting deer-related recreational opportunities.

Objective 2. To reduce deer hunting related accidents by 50% by January 1, 2019.

In an ideal season, Delaware deer hunters have consistently ranked feeling safe in the field as their most important hunting satisfaction component. Existing programs can be evaluated and enhanced to improve hunter safety. Since the 2001-02 hunting season there have been 10 hunting-related accidents (eight were deer-related) in which an individual was shot while hunting, two were self-inflicted and eight involved a hunter shooting another hunter. Only one of the hunting accidents resulted in a fatality and in none of the instances was a nonhunter shot by a hunter.

Strategies

a) Continue to promote mandatory hunter safety certification for all hunters.
b) Evaluate current hunter education programs.
c) Cooperate with other agencies and organizations to deliver hunter safety information.
d) Emphasize safe use of tree stands which are often the single greatest accident related statistic annually.

Objective 3. Consistent with deer population management objectives, maintain our current annual average of at least 18,000 licensed hunters.

Traditionally, deer hunter numbers and days spent afield hunting have provided the most common measures of demand for deer management programs. Overall, hunter survey results indicate that the number of deer hunters has declined over the past 20 years. At a minimum, current deer hunter numbers and effort levels will be required to meet population management objectives specified in this plan.

Strategies

a) Identify recreational demands for deer hunting through hunter surveys.
b) Maximize recreational opportunities when feasible and acceptable.
c) Foster cooperation between hunters and landowners who experience deer damage.
d) Maintain hunting recreation quality by preserving diverse types of hunting opportunities.
e) Manage the allocation of recreational opportunities among users.
f) If feasible, safe, and not detrimental to the resource, allow additional or expand on the currently allowed hunting implements for deer hunting.
g) Promote deer hunting among nontraditional groups.
h) Promote deer hunting among youth.
i) Educate public about deer hunting recreational opportunities.
j) Support programs that provide additional incentives for hunters to continue hunting (i.e. Sportsmen Against Hunger Program).

k) Foster partnerships with private landowners so that hunters can gain access to these lands.
l) Simplify and make regulations clearer so that new hunters can easily understand the rules.

Objective 4. To ensure that deer hunting methods in Delaware are safe and ethical.
The future of deer hunting will be affected significantly by public perception of deer hunters and deer hunting activities. Therefore, guidelines, regulations, and education pertaining to deer hunting should address concerns for ethics and fair chase.
Strategies

a) Develop and implement educational programs, regulations, guidelines, and recognition programs to encourage hunter ethics.
b) Maintain prohibition on deer hunting enclosures.
c) Educate hunters and the general public about ethics in deer hunting.
d) Convey to deer hunters which hunting activities are not considered fair or sportsmanlike by the general public and why their practice may be detrimental to the continued existence of the sport.

Objective 5. To ensure that deer-related recreational activities respect the rights of private property owners and other Delaware citizens.
Under some circumstances, deer hunting or nonhunting deer-related recreational activities may create conflicts with landowners, other hunters, other outdoor recreationists, motorists, and other citizens. Public concerns about hunting on or near roadways or residences, and other issues related to hunting deer have increased in recent decades. Furthermore, certain forms of deer hunting may not be acceptable in or near urban areas due to concerns for human safety and privacy. The future of deer hunting for population management, damage control, and recreational benefits depends on its compatibility with Delaware's citizens. Therefore, it is important that deer hunting activities be conducted in a manner that respects concerns of landowners and other Delaware citizens.
Strategies

a) Using surveys and other methods, identify and describe deer hunting activities (e.g. when, where, type of hunting) that result in conflicts with landowners and other Delaware citizens.
b) Develop and implement educational programs, regulations, and guidelines to reduce conflicts between deer hunters and other Delaware citizens.
c) Educate hunters about the effect hunting has on other citizens.
d) Educate nonhunting deer recreationists about trespassing, feeding of deer, and other potential conflicts with landowners and other citizens.
e) Educate nonhunting constituents about the benefits of hunting and how safe it is.

Education Goal

Educate Delaware citizens on all aspects of deer biology, including management tools, disease issues, economic aspects, and recreational opportunities.

This goal is intended to increase the public's understanding of deer biology and their impacts on landscapes and people. A number of outreach mechanisms exist and these should be carefully

selected to enable the DFW to reach a diverse set of customers. An emphasis should be placed on providing information on the realities of deer population dynamics and the impacts too many deer can have on cultural interests, habitat and other wildlife species. Concurrent with this emphasis should be a focus on non-lethal and lethal management tools. Additionally, information on the recreational opportunities provided by deer should be included.

Objective 1. Increase the public's understanding of deer biology and the impacts deer have on habitat and people.

Through magazines and television programs, hunters tend to be more educated regarding deer biology and ecology compared to the general public. However, these media outlets often report misinformation, thus the Division of Fish & Wildlife will strive to relay scientifically proven information to both hunters and the general public.

Strategies

a) Continue to provide current and useful information on the DFW website in a way that is easy to navigate. This information should be diverse in order to appeal to the general public, not just specific user groups (i.e. hunters).
b) Continue to provide useful and accurate press releases, media interviews and popular articles covering diverse subjects related to deer.
c) Partner with other organizations to conduct deer related outreach on topics compatible with DFW's message.
d) Attempt to develop educational programs that could be used to teach students about the need for deer management.

Objective 2. Provide technical assistance to community groups or other organizations in managing specific deer populations and provide staff support to accomplish shared goals when appropriate.

A quick search of the Internet will yield a multitude of options that are supposed to reduce human-deer conflicts, some of which are effective though many are not. The division will provide technical advice on conflict resolution techniques and the pros and cons of each option. DFW staff will stay abreast of new research so that they can communicate new effective options as they become developed.

Strategies

a) Make presentations to organized groups to provide the different management options available to address problems in specific situations, such as communities, local government tracts, corporate holdings, military bases or school campuses.
b) Advise these groups how they can use public hunting as the preferred management option and, where feasible, consider enrolling any resulting program in a DFW-operated managed hunt program.

Objective 3. Increase the public's understanding and acceptance of regulated deer hunting and its need as a management tool.

Currently, deer hunting is the most effective and cost efficient tool for reducing human/deer conflicts. The Division of Fish & Wildlife will educate the public of hunting's usefulness and necessity.

Strategies

a) Provide timely and focused information on the role deer hunting has in managing the white-tailed population in Delaware.
b) Proactively provide information on the safety of deer hunting for participants and non-participants.
c) Establish deer hunting regulations that promote the safe, fair and ethical pursuit of this species in order to remain compatible with the values of the majority of Delaware citizens.
d) Train hunters on the best way to convey to nonhunters the benefits and safety aspects of hunting.

Objective 4. Increase the public's understanding of non-lethal deer management techniques in a manner that allows them to make informed decisions on the applicability of these techniques in a given situation.

While regulated hunting is often considered the best option for reducing human/deer conflicts, it is not always feasible in some areas and/or using other nonlethal options in conjunction with a hunting program can further reduce conflict.

Strategies

a) Provide timely and focused information on new and existing non-lethal deer management options and the likely outcomes they would produce in common circumstances.
b) Proactively provide information to correct common misunderstandings on non-lethal options.

Objective 5. Develop an outreach program that focuses on the impacts deer have on the ecosystem, to include the deleterious effects on other species of wildlife and plant communities.

Due to an overabundant deer population over the last 20 years, many Delawareans feel that our wooded areas should be clear of understory and easy to walk through. Little do they realize that deer have caused the lack of herbaceous growth from the forest floor up to 4 ½ feet off the ground. This zone is often called the browse line and encompasses the total area that a deer can reach and subsequently feed.

Strategies

a) Provide timely and focused information on the impacts deer have on plant communities and forest regeneration.
b) Provide information on the negative impacts that deer can have on small mammal, avian, and herp communities.

Objective 6. Develop an outreach effort to educate Delaware deer hunters on the concepts and outcomes associated with various deer management philosophies such as traditional deer management, Quality Deer Management (QDM), and Trophy Deer Management.

These concepts and outcomes are attractive to a certain core percentage of deer hunters and are compatible with sound deer management. However, the constraints of the various management regimes may not be acceptable to all hunters. QDM is arguably the most desired management regime by Delaware hunters at this time. Not all hunters desire a QDM focused harvest regime, thus voluntary compliance with QDM constraints will be encouraged through education and technical assistance programs. When asked, many hunters believe that QDM is only about

shooting bigger bucks. They often do not realize that harvesting does and habitat improvement are equally or often time more important that older aged bucks.

Strategies

a) Partner with non-governmental organizations (NGOs) to develop a progressive and complete technical assistance program to guide landowners, clubs and hunters on voluntary adherence to QDM standards.
b) Provide information concerning QDM on the DFW website and keep this information current and user friendly.
c) Convey to hunters what the QDM concept actually is. It's not simply about harvesting large bucks.
d) Train selected staff on the application of QDM and have these staff members available to assist landowners, clubs or hunters in applying this approach where they hunt deer.
e) Promote QDM on some of our Wildlife Management Areas so that hunters that do not have access to private property can practice this management concept. This will also allow the Division of Fish & Wildlife to demonstrate to non-practicing QDM hunters the benefits of this management option.
f) Provide hunting opportunities on some Wildlife Areas to those hunters that do not subscribe to the ODM philosophy.

Resources Goal

Ensure that all necessary resources (i.e. funding, supplies, training, personnel) are available to support the proper management of white-tailed deer in Delaware.

A variety of resources will be required in order to complete all desired tasks related to managing white-tailed deer in Delaware. These tasks are addressed in this management plan but the desired outcomes won't be achieved if the resources aren't available to complete them. Funding is the most critical of these resources and has traditionally been obtained via a variety of fees and taxes placed on primarily the consumptive user groups (i.e. hunters). However, other sources of revenue need to be explored due to a long term declining trend in hunter participation. The most efficient means to collect good data and/or satisfactorily complete projects is to use well trained/equipped staff from within the DFW. Thus, having trained staff able to dedicate time to deer management tasks is equally critical.

Objective 1: Maintain a staff of well trained, properly equipped staff to conduct deer related research and population monitoring in Delaware.

The Game Species Management Section consists of two primary species biologists and two program managers, and only one of the biologists is primarily responsible for deer. Thus, additional staff needs to be properly trained to help collect data and conduct surveys.

Strategies

a) Provide periodic training and certification of staff so they are current on proper techniques (e.g., deer jaw removal and aging, antler measuring, disease monitoring, deer immobilization, etc.). This would include refresher training to avoid the continuation of improper techniques by otherwise well-meaning staff.
b) Communicate with health officials in the State to proactively inform staff on the health risks associated with handling deer and equip them with the proper protective gear so that the risk of disease transmission from deer to staff is minimized.

c) When feasible, attempt to increase staff size relative to the deer management program. This will help DFW provide additional services to the public and conduct additional research.

Objective 2. Continue to conduct research across the state concerning deer population impacts, size, health, and condition.

Monitoring the deer herd will allow DFW to make timely and accurate management decisions. When feasible and pertinent, research shall be conducted on both publicly and privately owned lands.

Strategies

a) The Division of Fish & Wildlife will implement research projects to help answer management questions as needed.
b) Some research projects need to be conducted on publicly owned lands. In some instances, these projects may impact the hunting activities on those lands. Specifically, the division will be able to distribute bait on publicly owned lands during the hunting season for the purpose of research. DFW will make an effort to minimize these impacts while still allowing hunting to occur.

Objective 3. Maintain and/or increase revenue through the sale of hunting licenses and permits.

The sale of hunting license and permits is the primary funding mechanism for which game species are managed in Delaware. If revenue from these fees continues to decline so will the division's ability to properly and effectively manage deer.

Strategies

a) Develop a standing committee of DFW staff (e.g., game section and hunter education staff) charged with maintaining a national-level understanding of hunter recruitment and retention trends, and the programs in place to address these issues. This committee would gain familiarity with what other states are doing in this area and the outcomes of the various programs.
b) Pending the conclusions of the committee, initiate and conduct programs intended to address hunter recruitment and retention that are related to deer.

Objective 4. Identify alternative sources of funding and support to administrate deer management in Delaware.

Along with hunting license and permit sales, the Division of Fish & Wildlife should attempt to obtain funding from alternative sources. Furthermore, qualified and properly trained volunteers will be used to also help with data collection and surveys.

Strategies

a) A variety of grants are available for natural resources management. Identify and apply for those grant opportunities that pertain to deer research, management and public education.
b) Develop a program to enlist volunteers to conduct certain management activities. These volunteers should be well trained and offered incentives to assist in the DFW's deer management efforts.
c) Investigate the applicability of successful efforts elsewhere in the nation to obtain funding that is not tied to the consumptive user groups. Seek to enact any of these programs or innovative new programs that would apply in Delaware.

d) Investigate the applicability of requiring nonconsumptive users of state Wildlife Areas the requirement to pay for their recreational opportunities. Currently, hunters are the only user group that contributes funds for Wildlife Area improvement and maintenance.

Figure 1. Hierarchical structure of scientific staff within the Delaware Division of Fish and Wildlife's, Game Species Management Section. Current employees and contact information are listed.

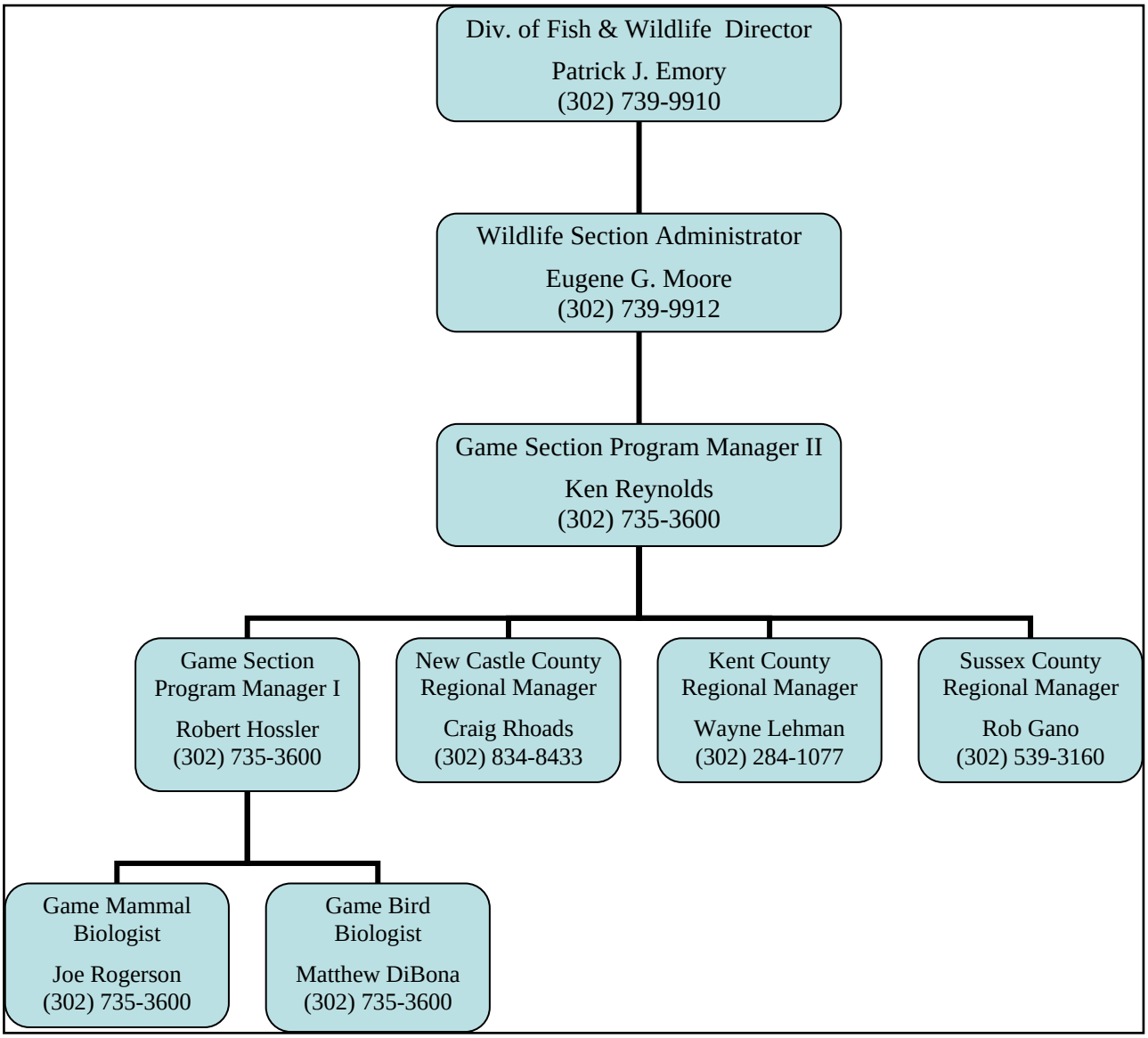


Figure 2. White-tailed Deer Management Zones in Delaware

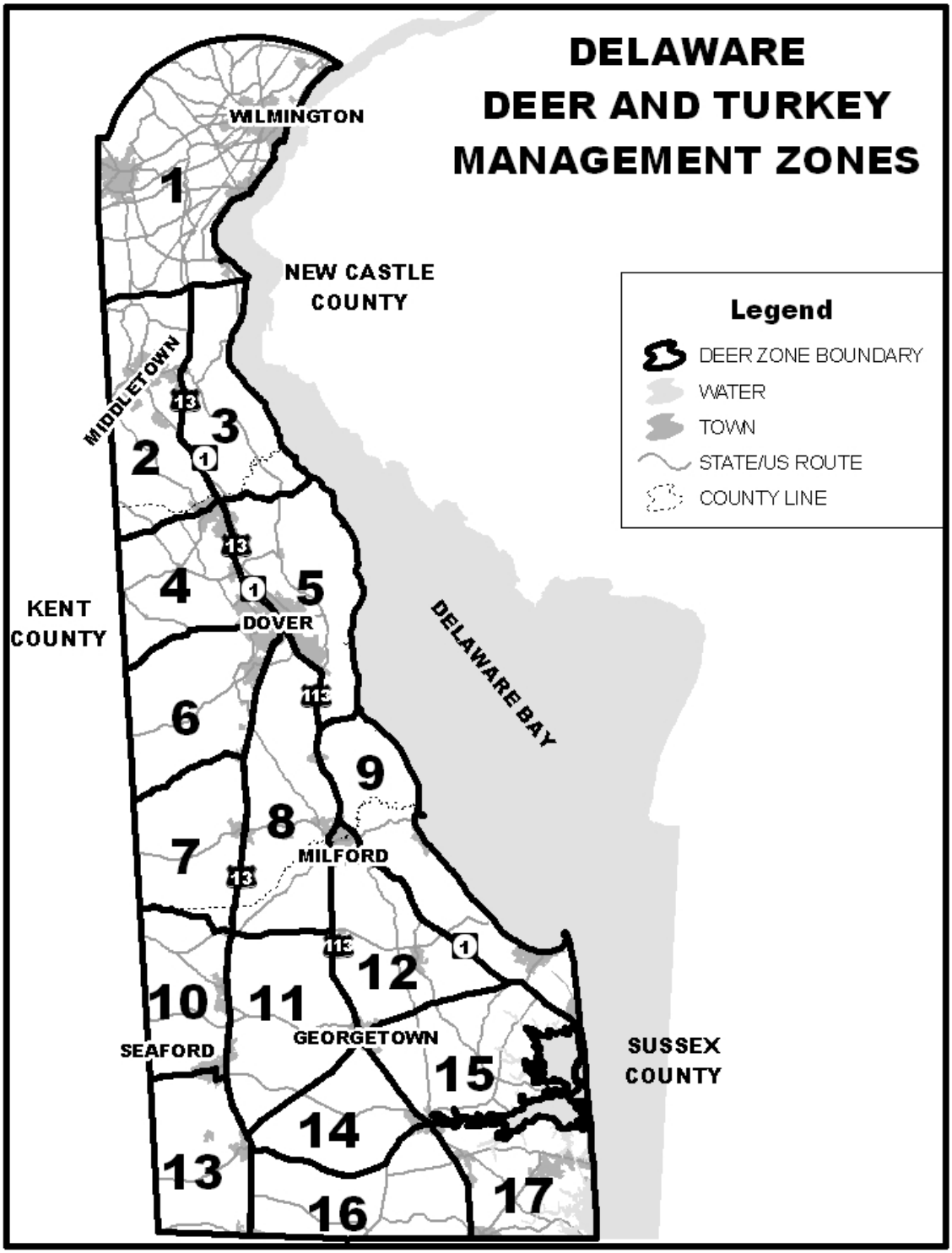


Figure 3. Example of the land cover composition for a survey block and deer management zone during a 2005 aerial FLIR deer population survey. Land cover classifications were derived from aerial photography of Delaware taken in 2002 and 2007 for the 2005 and 2009 deer population surveys, respectively.

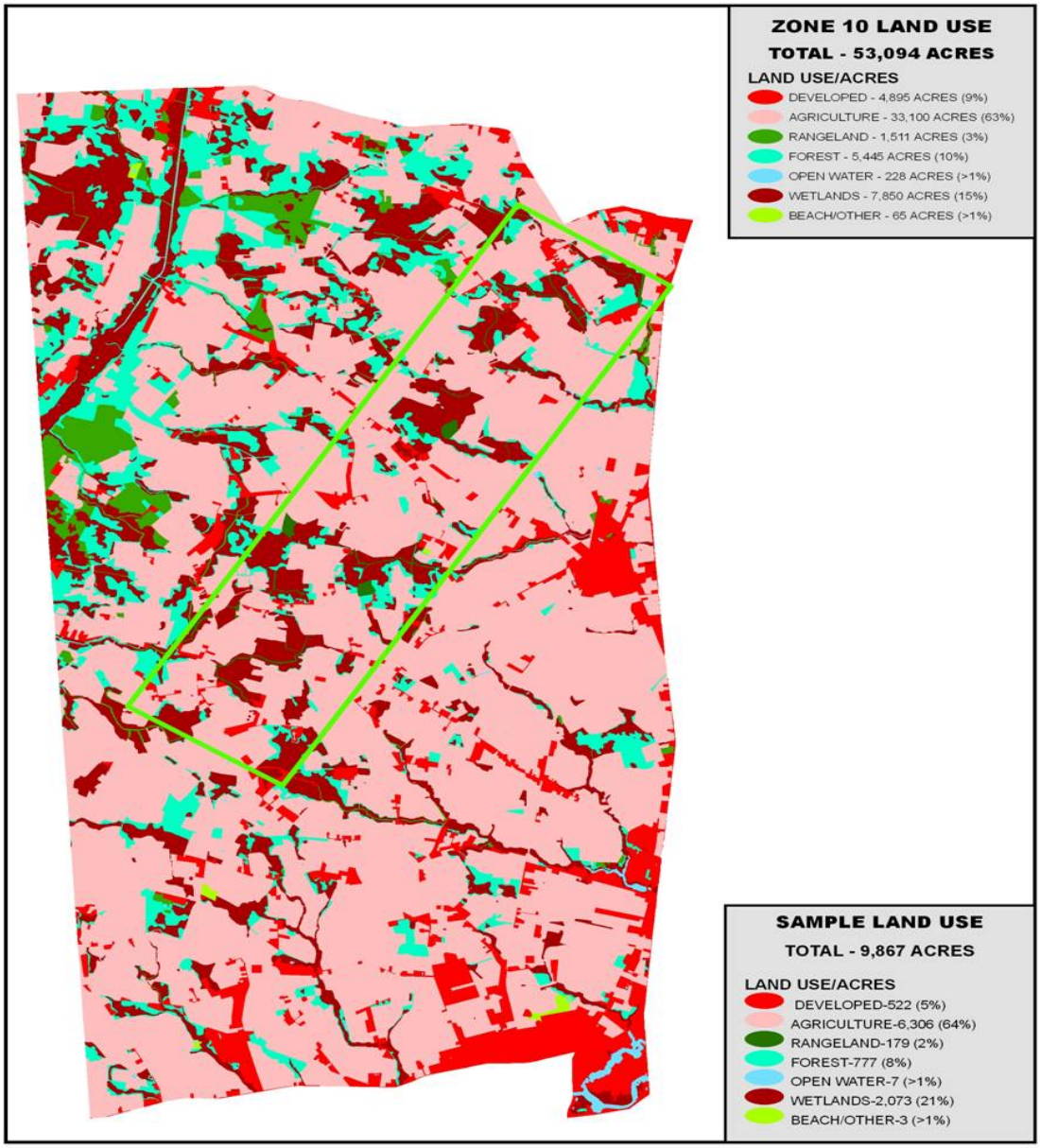


Figure 4. Delaware resident and non-resident hunting license sales, 1972 – 2007.

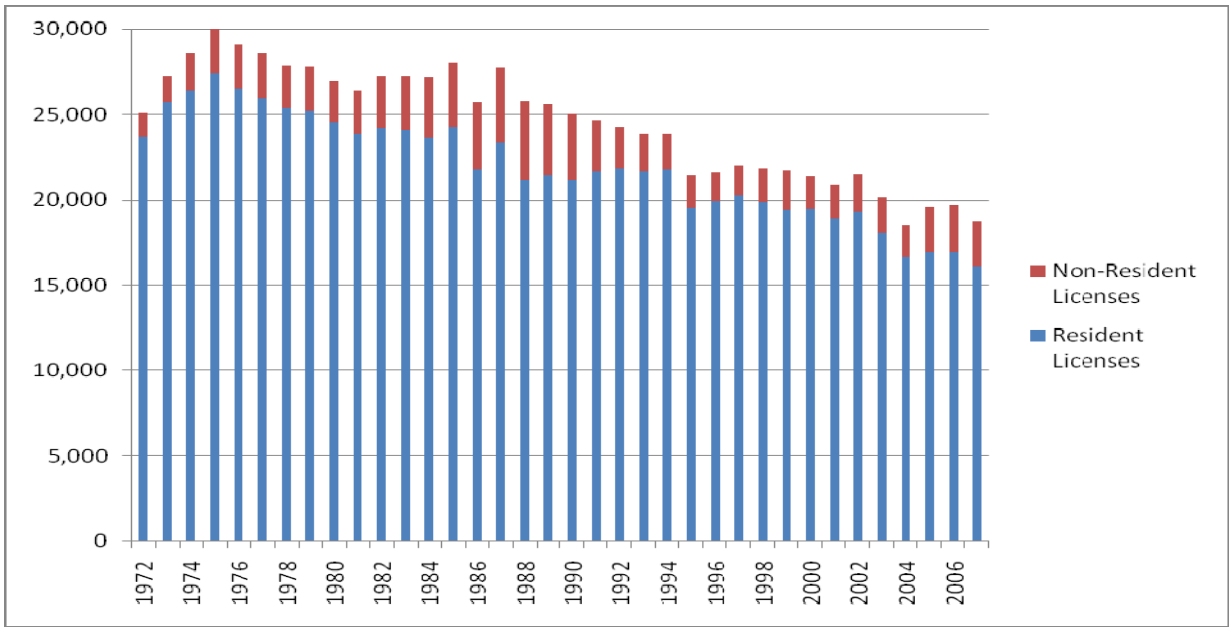


Figure 5. Delaware annual deer harvest, 1954 – 2008/09 seasons.

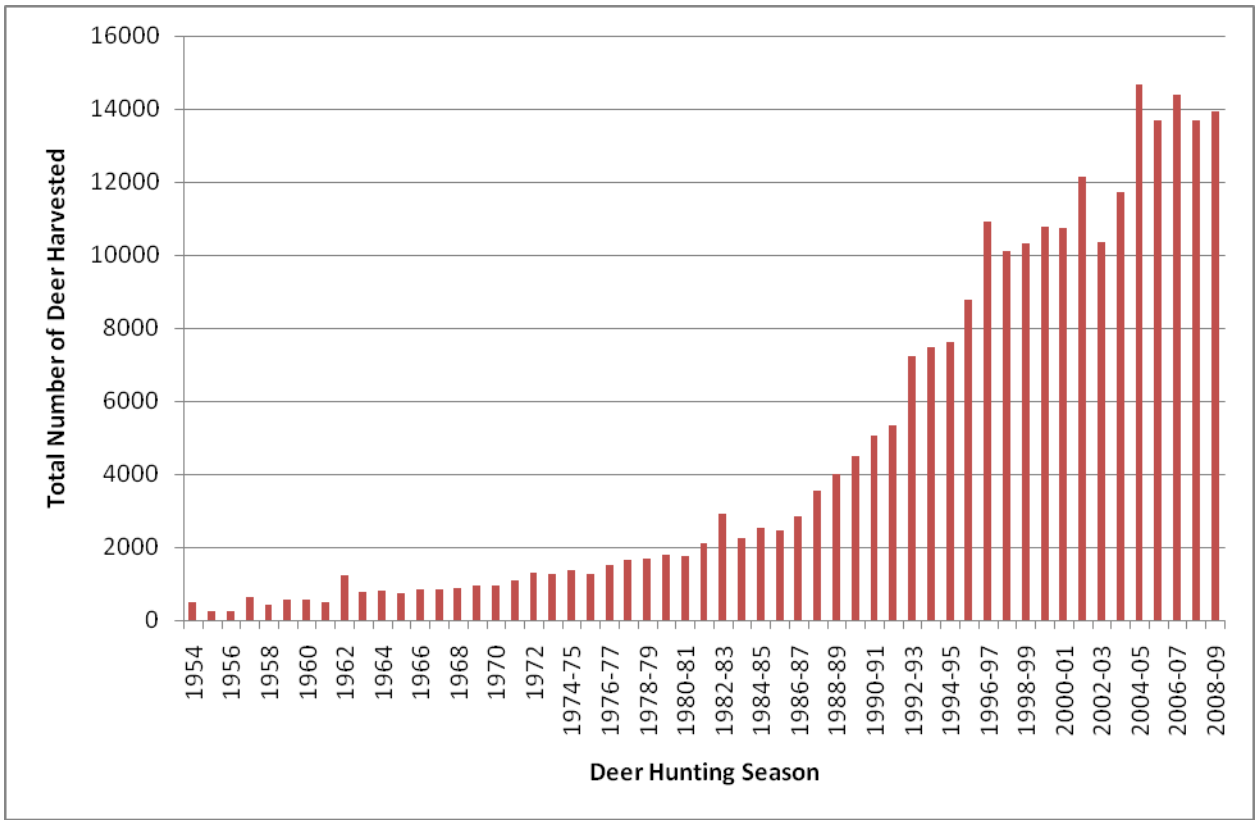


Figure 6. Percentage of deer harvested during each hunting season segment in Delaware during the 2008/09 hunting season.

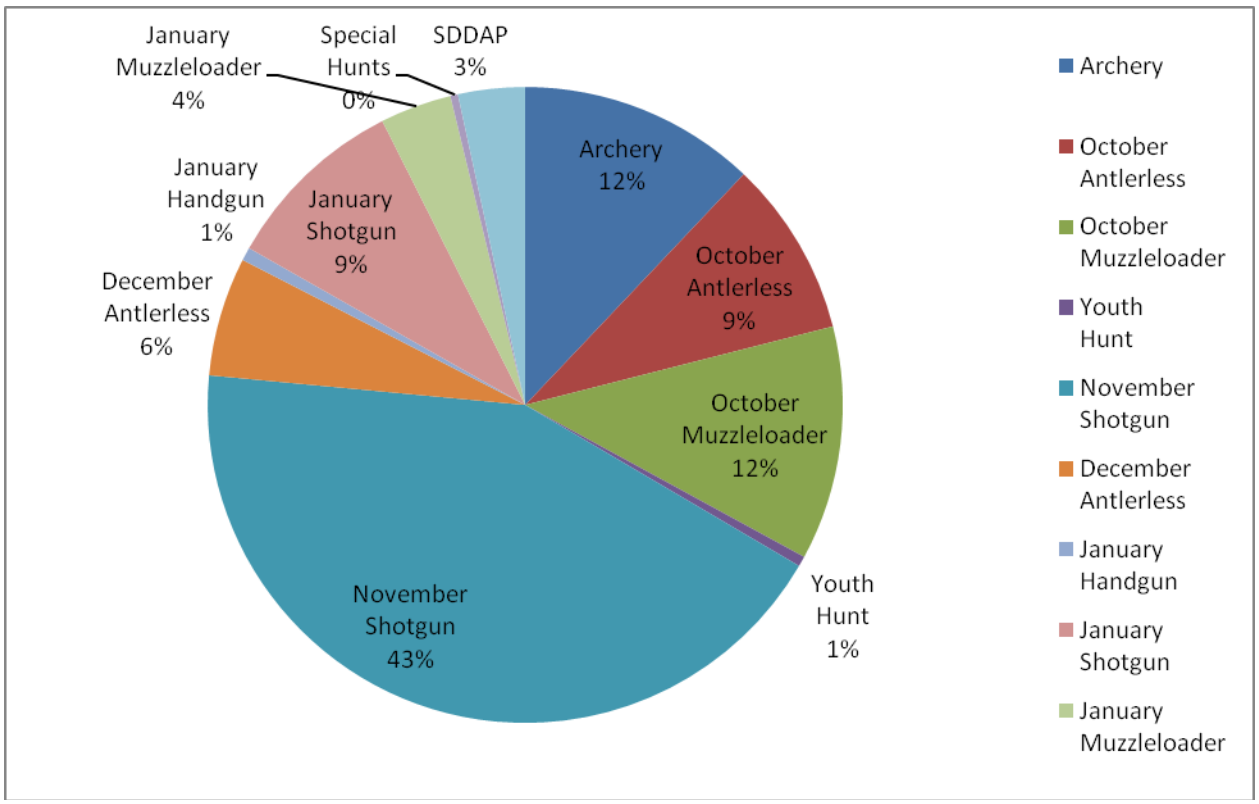
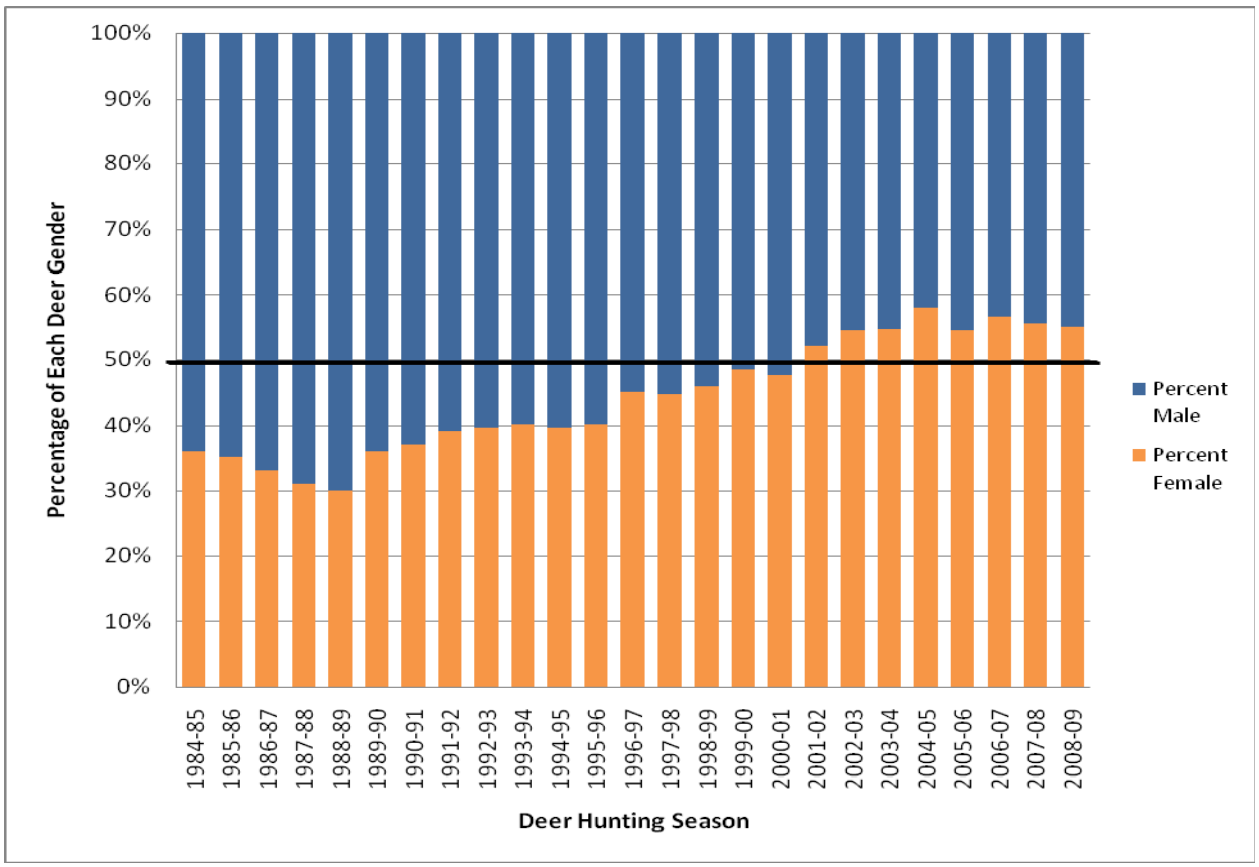


Figure 7. The male and female harvest composition of white-tailed deer harvested in Delaware, 1984/85 – 2008/09 seasons.



Appendix 1. Basic white-tailed deer ecology and biology

Physical Description - Native white-tailed deer live in all three Delaware counties across a wide range of landscapes. The white-tailed deer's distinctive white tail and white rump patch are readily visible when they bound away from real or perceived danger. White-tailed deer can sprint up to 35 miles per hour and are able to vertically leap over eight feet.

Adult white-tailed deer are about three feet tall at the front shoulder.Yearling whitetail bucks (1.5 year old males) weigh an average of 135 pounds and yearling does (females) average 120 pounds in Delaware. During the warm months, deer possess reddish-brown hair. A grayish-brown coat with a thick undercoat replaces the reddish hair during the colder time periods.

Whitetail bucks grow and shed antlers each year. On rare occasions females may exhibit antlers. Bucks use their hard antlers to establish dominance over other bucks during breeding season. Antlers, which are composed of true bone, begin to grow in late March and early April. The growing antlers are covered with skin and blood vessels called velvet. As testosterone levels increase for the fall breeding season, the antlers harden and the velvet is rubbed off in August. Antlers typically are shed in January and February. Bucks in poor physical condition tend to drop their antlers first.

Habitat - Delaware white-tailed deer habitat includes most parts of the State except for open water and the intensely developed urban areas (i.e., downtown Wilmington). Deer thrive in landscapes intermixed with wooded/brush sections and open areas such as cropland, pasture or landscaped yards. Deer use the wooded areas for food and cover, and open areas provide food. Landscapes with a bountiful interface of the forest and open areas provide prime deer habitats.

Suburban sprawl and exurban growth creates ideal habitat conditions for white-tailed deer. When forested areas are converted into housing developments, portions are cleared for roads and home sites, while other sections remain forested. When open farmland is transformed into residential areas, new homeowners plant trees, shrubs and perennials. Both of these types of residential conversions provide excellent deer habitat.

Home Range - The typical annual average home range for white-tailed deer is considered no larger than one square mile (640 acres). However, the sex and age of deer and habitat quality will influence varying size home ranges. Yearling males will move many miles while adult females usually have smaller stable annual home ranges. Deer in quality habitat will need to travel less than deer in poorer habitat.

Food Habits - Deer are categorized as browsers meaning they feed on a variety of foods such as nuts and berries, leaves, woody shoots and stems, grasses and cultivated crops. Some of their preferred foods include acorns, honeysuckle, poison ivy, greenbrier, young tree seedlings and mushrooms. Soybeans, corn, and ornamental shrubs are several of their favorite foods planted by man.

Deer have a four-chambered stomach that is required to digest the vegetation they eat. Food first travels to the rumen where bacteria and protozoas begin the digestive process. The reticulum

then circulates food back to the mouth so deer can chew it again. The omasum functions as a pump and directs the partially digested food from the reticulum to the abomasum. This final chamber functions as a true stomach and completes the digestive process.

Reproduction - The white-tailed deer breeding season in Delaware begins in October and continues until about mid December. The shortening of day length (photo period) triggers the breeding season. Most does become pregnant during the middle of November. Any receptive doe that does not become pregnant will recycle back into estrous in about 28 days and will mate again.

Fawns are born during May and June after a gestation period of about 200 days. Nearly all does 1.5 years old or older are bred each year in Delaware while fawns (six months old) usually do not breed during their first fall. The fawns that do breed their first year usually only give birth to a single fawn while all of those older than a fawn give birth to two more fawns. Newborn spotted fawns remain hidden and solitary for about three weeks. The doe visits its young only two to three times per day in order to nurse and groom the offspring. When the fawn is strong enough to run with the doe, it will follow the doe and begin to sample foods eaten by the doe. Fawns can live independently of the doe at about two months old.

Mortality - Hunting is the primary cause of mortality of white-tailed deer in most rural sections of Delaware. Other deer mortality factors include collisions with vehicles, diseases and parasites, malnutrition and accidental injuries. Where hunting is limited or not possible (i.e., some suburban and urban locales), vehicle collisions, diseases, and malnutrition often become primary mortality factors.

In pre-Colonial Delaware, bears, wolves, mountain lions and man (Native Americans) served as effective predators of white-tailed deer. All were capable of taking any age class of healthy deer (fawns, adults). Due to the extirpation of all of Delaware's natural deer predators man remains the primary cause of mortality. However a recent immigrant to Delaware, the coyote, may become another source of predation, primarily preying on young fawns or sick/injured adults. Even as coyotes expand their range and numbers increase, man will remain the most effective modern era predator.

Appendix 2. 2010 – 2019 Delaware Deer Management Stakeholder Advisory Committee

Stakeholder Groups and Members

Agricultural Community
- Delaware Department of Agriculture – Steven Connors *(Michael Scuse)**
- Delaware Farm Bureau – Guy Phillips

Animal Welfare
- Delaware Action for Animals – Cathy Rash
- University of Delaware – Dr. Jacob L. Bowman

Landuse Planning
- Delaware State Planning Office – Bryan Hall
- Coastal Properties Consulting – Merritt Burke

Natural Communities & Environmental Impacts
- Delaware Department of Agriculture, Forestry Section – Austin Short
- Delaware Nature Society – David Pro

Non-Consumptive Recreational Users
- Delmarva Ornithological Society – Mike Weaver
- Delaware Equine Council – Stan Vonasek

Private Lands Management
- Delaware Wild Lands Inc. – Pete Martin
- Mt. Cuba Center Inc. – Jim Subach

Public Health & Safety
- Delaware Department of Transportation – Subin George *(Randall Grunden)*
- Delaware Division of Public Health – Paula Eggers

Public Owned Lands Management
- Delaware Division of Fish and Wildlife Regional Biologist – Craig Rhoads
- Delaware Division of Parks and Recreation – Rob Line

Sportsmen – Deer Hunters
- Delaware Master Hunter Representative – Richard Hahn Jr.
- Quality Deer Management Association – Charles "Chip" West II

Sportsmen – Non-Deer hunters
- Delmar Waterfowl Club – Drew Smith
- First State Beagle Club – John Hayes

Other Members

Moderator/Facilitator
- Doug Hotton – Maryland Deer Project Leader (*Retired*)

Wildlife Advisory Council
- Division of F&W Advisory Council Member – Neal Dukes *(Dr. Terry Higgins)*
- Division of F&W Advisory Council Member – Ted Palmer

*Names in italics indicate original DMSAC members but were later replaced

Appendix 3. Summary of comments received from the general public during the development of the Deer Management Plan.

The following is a summary of the nearly 600 comments received by the DFW regarding the Deer Plan and other deer management related topics. Comments were received at four public workshops, electronically through the Deer Plan webpage on the DFW website, through the mail, or over the phone. Comments have been separated in general categories. Numbers in parentheses indicate the number of times that particular comment was received.

Population Size and Deer Management Zones

- Deer population is too low where I live (5)
- The deer population has declined (1)
- Too many deer where I live (2)
- Current deer population size is just about right (1)
- Don't set deer density goals too low (2)
- Manage the deer population at half of Maximum Sustained Yield level to maximize recruitment and minimize damage (1)
- I am concerned that the deer harvest is down (1)
- Have different hunting seasons in zones depending on if the population is too high or too low (zone management) (3)
- Continue to use regulated hunting as a management tool (3)
- Dislike managed deer hunts (1)
- Like managed deer hunts (1)
- Utilize archery hunting over nonlethal techniques (1)
- Aerial surveys do not provide accurate population estimates (1)
- Only mature does should be harvested, not doe fawns or button bucks (1)

Seasons

- Establish an earlier handgun season (5)
- Lengthen the November Shotgun season (12)
- Remove the October Antlerless season (21)
- Delaware does not have too many deer, it has too many people; you should not be adding any more gun seasons, you should be removing them. (1)
- Bow season should not be opened until the end of Sept or 1st of Oct (1)
- I worry that controlling the deer population in the options and steps provided could cut into archery opportunities or enjoyment.(1)
- The hunting season should be extended and started earlier in the fall in October with a short period set aside for muzzleloaders and, the balance for shotgun. This will give the average hunter more time to get to the woods therefore giving them the opportunity to take advantage of the license they have paid for. (1)
- Please keep the muzzleloader season as is. (1)
- Retain the archery season as is. Archers are entitled to their opportunities as well (1)
- Start the November Shotgun season later to promote population growth as needed (1)
- Start bow season on 8/15 so that hunters have an opportunity at a buck in velvet. Bucks only from 8/15 – 8/31 (1)
- Make shotguns legal through the deer season (Sept – Jan) (1)

- Allow handguns to be carried in addition to a shotgun during a shotgun season (1)
- Move January seasons earlier in the month (2)
- Allow muzzleloader pistols (1)
- Eliminate January season and make shotgun, muzzleloader season longer, handgun season in September or October (1)

Safety Zones

- Reduce safety zones in northern New Castle County (4)

Alternative Population Control Techniques

- Fertility control should not be used to control deer populations (5)
- Sharpshooting should not be used to control deer populations (5)
- Tax dollars and/or monies generated by hunters (e.g. Pittman-Robertson funds) should not be used to fund nonhunting deer control practices (3)
- Do not introduce coyotes or other predators to control deer (1)

Hunter Effort Survey

- Include whether hunters were hunting on public or private land for the hunter mail survey
- All surveys need an internet option but still ensure a random component
- Hunter mail survey may underestimate the deer population

Quality Deer Management

- Need to better educate hunters so that they don't mistakenly harvest button bucks and small spikes (2)
- Expand QDM to other wildlife areas (1)
- Their club is trying to do QDM on 165 acres and they are having trouble with adjacent landowners not practicing QDM. (1)
- Eliminate a buck tag (1)
- Implement antler restrictions statewide (make both buck tags Quality Buck Tags) (1)
- Require hunters to harvest a doe before a buck (earn-a-buck) (2)

Quality Buck Size

- Keep the quality buck tag size the same at 15" (34)
- Reduce the quality buck size restriction to 14" (19)
- Make the quality buck size larger (2)
- Indifferent on changing the size restriction for the quality buck tag (1)
- Use an antler point restriction instead of spread (3)
- Make both buck tags Quality Buck Tags. Eliminate the Hunter's Choice tag (2)
- Provide hunters with only one buck tag (3)
- Provide hunters with only one buck tag and make it a Quality buck tag (1)
- Switch to an earn-a-buck system and require hunters to harvest two does before they harvest a buck (2)
- Do not like the term "quality" for the quality buck tag (1)

Crop Damage Assistance Programs (DDAP and SDDAP)

- Educate farmers to leave some habitat for the wildlife this in turn will help to alleviate crop loss as the deer will primarily feed in these areas instead of the fields. (1)
- Support the DDAP and SDDAP (1)
- The crop damage programs negatively impact the archery season (1)
- Don't like that farmers can kill deer at will (1)

- The division should work collaboratively with the crop insurance companies. Do not allow crop insurance claims to be made if an individual enrolled in the DDAP or SDDAP does not fulfill their tags
- Farms should be investigated to determine if there is enough damage to warrant being enrolled in a program (4)
- Utilize Master Hunters to help reduce deer densities on enrolled farms (1)
- Don't allow SDDAP harvest after January 31st because bucks have shed their antlers and are misidentified and shot mistakenly for does (13)
- Shorten the SDDAP program on the front and back end. Possibly allow some Sunday hunting instead (1)
- Eliminate the SDDAP but keep the DDAP. Cost saving measure (2)
- Allow SDDAP enrollees to report their harvest electronically when they register their deer (3)
- Farmers are going to complain until all of the deer are gone (1)
- Give deer damage tags to individuals as needed. This will cut down on the number of tags returned that were unused. Also, if an individual does not use their prescribed allotment than they receive fewer tags next year until ultimately they are not longer enrolled in the program (7)
- Eliminate the crop damage programs since it is unfair to licensed hunters because farmers can hunt when hunters can't. Entire zones should be open so everyone can participate. (1)
- Create deer harvest cooperatives with landowners that adjoin enrollees (1)
- Support the DDAP (1)
- Need a separate program to assist individuals in northern New Castle County (1)
- Charge SDDAP applicants an application fee (1)
- Hunters need better access to enrolled lands (2)
- Farmers are killing deer and not retrieving them or reporting them to us (4)
- License tags should be used during the hunting season and antlerless deer damage tags should only be used outside of the regular season (1)
- Allow handguns to be used within the crop damage programs (3)

Hunting Licenses and Deer Tags

- Current fees are acceptable (1)
- License fees and/or tags are too expensive (3)
- Implement a lifetime license (1)
- Nonresidents who own land in Delaware but reside in another state should be able to purchase a resident hunting license (1)
- Develop an alternative funding source for the Division as hunting license sales are declining and funds may need to be generated from an alternative means (1)
- Instead of the current license structure, switch so that hunters need to purchase separate shotgun, muzzleloader, and/or archery stamps depending on how they plan to hunt (like Maryland)
- Hard to find additional $10 antlerless deer tags. Allow them to be purchased electronically (3)
- Get rid of back tag (1)

- Nonresident license fees should be reciprocal with what the individuals state of residence charges nonresidents (5)

Sunday Hunting

- The Division of Fish & Wildlife should support Sunday hunting instead of being neutral on the issue (1)
- Each county should decide whether to allow Sunday hunting (4)
- Allow Sunday hunting all throughout the entire season (45)
- Allow a limited number of Sundays during the season (2)
- Allow Sunday hunting only in the afternoon (2)
- Allow Sunday hunting but exclude State Parks (1)
- Allow Sunday hunting for residents only (1)
- Allow Sunday hunting on private land only and only for a few days during the season (4)
- Neutral on Sunday hunting (1)
- Do not allow Sunday hunting (13)

Hunting on Public Lands

- Public lands are crowded and I'm often disturbed by other hunters while archery hunting (1)
- Allow nonresidents to participate in deer drives (1)
- No deer drives on public lands (1)
- Lotteries should favor residents over nonresidents. Residents should get first option (1)
- Make more public areas open during the October Antlerless season (3)
- Allow better access to public lands (e.g. open gates) (3)
- Allow vehicles or ATV's to retrieve harvested deer on public lands (2)
- Clarify who can use a crossbow on public land (1)
- Rules on wildlife area maps are confusing (1)
- Why do you need a boat to hunt on the Gray Farm/Holleger tracts of the Milford Neck Wildlife Management Area? (1)
- Milford Neck WMA needs a sign-in board like the Ted Harvey WMA (1)
- Our state areas that are QDM areas should be called antler restricted areas because we do not focus on the other aspects of QDM. (1)
- There are parking problems at our state areas. (1)
- Expand QDM to other state areas. (1)
- Check Wildlife Area maps for errors (Milford Neck, Petersburg) (1)
- Respect property boundaries, particularly between public and private lands (1)
- Restrict access to public lands. I like to walk-in far so that I can get away from other hunters. Opening gates does not allow me the opportunity to find more secluded hunting spots (1)
- The October Antlerless season should be eliminated on some or all public lands (2)

Hunting on National Wildlife Refuges

- Deer management on National Wildlife Refuges should be included in plan (1)
- Due to EHD outbreak and subsequent deer population decline several years ago, deer hunting should be closed at Bombay Hook NWR. (1)

Hunting in State Parks

- Stands at White Clay Creek SP are getting too thick and need shooting lanes cut

- Allow hunters at Brandywine Creek State Park to keep more than one deer
- Parks should follow state hunting regulations (4)
- Upset about new restrictions at Cape Henlopen and they should not be allowed to use sharpshooters there.
- More days should be open to hunting (3)
- More areas should be open to hunting (reduce the number of refuge areas and/or archery only areas (2)
- All parks should operate under the quality deer management philosophy
- Establish a muzzleloader season
- Work with surrounding landowners to increase hunting opportunities by hunting on these lands as well

Crossbows

- Allow crossbows throughout the archery season (52)
- Do not expand the use of crossbows (10)
- Allow seniors to use a crossbow (6)
- Create a separate/shorter season for crossbows (2)
- Indifferent on expanding crossbow use (2)
- Expand crossbow use for antlerless deer only (2)
- Allow crossbows during the archery season for licensed exempt hunters and youth only (2)

Licensed Exempt Hunter Identification Number

- Licensed exempt hunters should obtain a free annual identification number (22)
- Licensed exempt hunters should receive a permanent identification number that does not need to be renewed annually (2)
- Expand the current voluntary program in which deer tags and license identification cards are distributed (1)
- Require licensed exempt hunters to obtain a license instead of a identification number (2)

Master Hunter Program

- Master Hunters should get more involved and give back to the community and assist with conservation programs (e.g. disabled fishing assistance and youth hunting) (5)
- The ultimate guiding principles of any sub-group of licensed hunters such as the Certified Master Hunter Program should be ethics, stewardship and conservation (1)
- The Master Hunter program has declined in quality so some hunters just use the program for a free deer hunt (1)
- Manage public and private land with the Master Hunter Program (3)
- Utilize Master Hunters to resolve urban deer issues (2)
- Instead of the Master Hunter Program, a general archery proficiency program should be created (1)
- The course needs to be offered more frequently (1)

Sportsman Against Hunger Program

- The Sportsman Against Hunger Program is a good program and should be continued (4)
- Provide hunters with a Sportsman Against Hunger Program deer tag that if utilized by a hunter than the deer must be donated. (1)

Deer Registration Process

- Hunters are providing false information when they register their deer. As a result, the harvest data is inaccurate (3)
- Need to include managed hunt areas (i.e. Deer Field golf course) in public land option (1)
- Bring back check stations (5)
- Why did the Division stop using check stations?
- Make it easier to register deer on the phone (5)

Baiting

- Continue to allow baiting (13)
- Allow baiting on public land (1)
- Eliminate baiting (2)
- Do not allow baiting on public land (1)
- Indifferent on baiting (2)
- Do not allow baiting in urban areas as it concentrates deer on surrounding properties in which they are not wanted (1)
- Require bait to be distributed via a feeder (disease concerns) (2)

Education

- Need to educate the public on benefits of hunters/hunting, especially the economic benefits (1)
- I agree that lethal control via hunting is a controversial management practice. I believe that the key to addressing this issue is education and outreach for landowners as well as hunters. (1)
- A compelling statement is made that a phone survey showed that 70 percent of the general population feel that hunters should have the opportunity to hunt deer. Data of this nature should be included in landowner outreach programs and educational materials. (1)
- It is of the utmost importance to ensure that hunters respect the rights of private property owners. “Slob hunters” are the demise of modern hunting efforts. Education to hunters of all ages should stress ethics, regulations, and respect. (1)

Meeting Notices

- Need to publicize meetings better (3)

Deer Management Plan

- Allow more time for input before the plan is implemented (3)
- The plan is terrible and you should start over (1)
- Editing-related comments (e.g. grammar, word choice, punctuation, etc…) (40)
- Easy to read and understand (4)
- Consider reordering objectives so that hunting-related activities are closer to the top (1)
- The document is very inclusive but implementing the plan may be difficult (1)
- How will nonlethal control techniques be funded? (1)
- A 10-year deer management is too long (1)
- Need to more clearly promote habitat management (2)
- Need to include opinions and views of everyone in Delaware, not just farmers and hunters (1)

Other

- If you have a negative interaction with a deer (e.g. landscape damage or deer-vehicle collision), you should not receive any assistance. You should deal with it on your own (2)

- The Division needs to conduct more deer management public meetings, particularly in Northern New Castle County (1)
- The Division should use volunteers for data collection projects (2)
- Sell additional antlerless tags at two for $5
- Allow hunters to use unfilled Hunter's Choice or Quality Buck tag during the December Antlerless season
- Vehicles need to slow down
- More should be known about EHD and CWD
- Need to educate citizens that using insect repellent on one's person is better than applying insecticides to deer when trying to prevent Lyme disease.
- Increase fines and revoke licenses of trespassers
- The National Bowhunter Association has a qualification program for hunters that the Division should use
- Allow pistol-cartridge rifles (e.g. .375 mag, .41 mag, .44 mag, .45 long colt, etc…) during the shotgun season. This would promote youth hunting as the recoil from these firearms is less than that of a shotgun
- Do not require bowhunters, even if they are hunting during a deer firearms season, to wear hunter orange as it makes you easily detected by non-hunters which will often harass you.
- I know hunters love hunting season, but for the rest of us taxpaying citizens, hunting season is a time of unrest and makes living in the country not so relaxing.

KUDOS

- Nice job on the Delaware Deer Management Plan (7)

Appendix 4. Responsive Management, Inc. Public Opinion Survey, "Opinions of the General Population, Hunters, and Farmers Regarding Deer Management in Delaware – Executive Summary".

KNOWLEDGE OF THE DELAWARE DIVISION OF FISH AND WILDLIFE AND ITS PROGRAMS

- Not quite a majority of the general population (44%) indicated that they knew, prior to the survey, a great deal or a moderate amount about the activities of the division. Knowledge specifically of the division's deer management program is lower: 25% of the general population know a great deal or a moderate amount about the Division's deer management program.
    - Hunters were more knowledgeable than were the general population: 76% of hunters indicated that they knew a great deal or a moderate amount about the activities of the Division. Regarding the deer management program specifically, 67% of hunters know a great deal or a moderate amount about the deer management program.
    - Farmers were more knowledgeable than were the general population, but not as knowledgeable as hunters, about the activities of the Division: 64% of farmers indicated that they knew a great deal or a moderate amount about the activities of the Division. Regarding the deer management program specifically, a slight majority (52%) of farmers know a great deal or a moderate amount about the deer management program.
- Respondents were asked about knowledge specifically of the Deer Damage Assistance Program: 10% of the general population knew, prior to the survey, a great deal or a moderate amount about it.
    - Knowledge levels were higher among hunters and farmers: 43% of hunters and 47% of farmers knew a great deal or a moderate amount about the Deer Damage Assistance Program prior to the survey.

RATINGS OF THE PERFORMANCE OF THE DIVISION

- Among the general population, the ratings of the division in carrying out its mission are highly positive: the majority (51%) gave a rating of 8 or higher; the mean was 7.0.
    - Hunters gave higher ratings than did the general population: 63% of hunters gave a rating of 8 or higher; their mean was 7.6.
    - Farmers gave lower ratings than did the general population: 45% of farmers gave a rating of 8 or higher; their mean was 6.6.
- Among the general population, ratings specifically of the division's deer management program were fairly positive: 41% gave a rating of 8 or higher; the mean was 6.6.
    - Hunters gave higher ratings than did the general population: 53% of hunters gave a rating of 8 or higher; their mean was 7.3.
    - Farmers gave lower ratings than did the general population: 28% of farmers gave a rating of 8 or higher; their mean was 6.0.

FEELINGS ABOUT AND VALUES ASSOCIATED WITH DEER IN DELAWARE

- Although the vast majority of the general population say that they like having deer around (81%), half of those worry about the problems that deer cause; a low percentage (4%) regard deer as a nuisance.

  - Hunters are less likely to worry about problems that deer cause: 93% like having deer around, and only a third of those worry about problems that deer cause.
  - A substantial percentage of farmers (28%) regard deer as a nuisance. Furthermore, although a majority (66%) like having deer around, most of those who indicated this position worry about problems that deer cause.
- The survey elicited information about the values people associate with deer by asking respondents to rate the importance of five statements. Among the general population, the top ranked *very* important statements was that deer populations are being properly managed in Delaware, which was higher ranked than knowing that deer exist. Two statements had notably lower percentages saying they were very or somewhat important: that people have the opportunity to hunt deer in Delaware, and that the respondent has deer around his or her home.
  - Among hunters, the top-ranked *very* important statement was that people have the opportunity to hunt deer in Delaware, followed by that deer populations are properly managed. The lowest in hunters' ranking is that they have deer around their home.
  - Among farmers, two statements stood out with much higher percentages saying that they were very important: that people have the opportunity to hunt deer in Delaware and that deer populations are being properly managed. Notably lower than any other statement as being very important is that the farmer has deer around his or her home.

OPINIONS ON THE DIVISION'S DEER MANAGEMENT PROGRAM AND DEER HUNTING IN DELAWARE

- Among the general population, ratings specifically of the Division's deer management program were fairly positive: 41% gave a rating of 8 or higher; the mean was 6.6.
  - Hunters gave higher ratings than did the general population: 53% of hunters gave a rating of 8 or higher; their mean was 7.3.
  - Farmers gave lower ratings than did the general population: 28% of farmers gave a rating of 8 or higher; their mean was 6.0.
- Among the hunter sample, 82% had hunted deer and were, therefore, asked the question about the current deer season structure. The majority of deer hunters (77%) were satisfied with the current deer season structure; 20% were dissatisfied.
- Hunters were overwhelmingly satisfied (84%) with how well the Division incorporates hunters' wants and needs into the management of Delaware's deer population, about evenly divided between very and somewhat satisfied.
- About a third of the hunter sample had attempted to use the Division's deer checking telephone system and were then asked to rate the system. Those who had used the system overwhelmingly were satisfied with it: 83% were satisfied, with most of those very satisfied.
- The Internet checking system received positive ratings similar to the ratings of the telephone checking system, although fewer hunters had used the Internet system than had used the telephone system. A tenth of the hunter sample had attempted to use the Internet checking system; nonetheless, they were overwhelmingly satisfied (84%), mostly very satisfied.
- The farmers who owned all or part of the land they farmed were asked if they had experienced damage from deer, and 75% had. Those farmers who had experienced damage were asked to rate the Division in responding to homeowner and landowner requests for assistance to reduce damage caused by wildlife, and they were split: 35% of them rated the Division as excellent or good, 40% as fair or poor, and 26% didn't know.

OPINIONS ON MANAGEMENT OF DEER

- All groups in the survey were split on agreement and disagreement regarding whether landowners properly manage deer on their land in Delaware: among the general population, 33% agreed, and 25% disagreed (a large percentage didn't know); among hunters, 45% agreed, and 38% disagreed; among farmers, 45% agreed, and 34% disagreed.
- Agreement led disagreement that the State of Delaware properly managed deer on its land, with hunters the most likely to agree and farmers the most likely to disagree; among the general population, 57% agreed, and 12% disagreed; among hunters, 78% agreed, and 13% disagreed; among farmers, 54% agreed, but 29% disagreed.
- Support is high for legal, regulated hunting as a way to manage deer populations: 82% of the general population expressed support.
    - Hunters and farmers are almost universal in their support for legal, regulated hunting as a way to manage deer populations: 97% of hunters and 94% of farmers expressed support.
- The general population wants deer management decisions to be based on the professional judgment of DFW biologists and scientific information such as hunter harvest and population surveys. Of less importance, although still important, are social concerns and hunters' concerns. The least important bases for decisions on deer management are the economic impact of hunting on Delaware and, lastly, political concerns.
    - Among hunters, the top-ranked bases for decisions about deer management are hunters' concerns, scientific information, and the professional judgment of Division biologists. Social concerns and political concerns are the lowest ranked bases.
    - Among farmers, scientific information, hunters' concerns, and professional judgment of division biologists are the top-ranked bases for deer management decisions.
- Respondents were asked about their perceptions of Quality Deer Management. Most commonly, respondents (both the general population and hunters) said that Quality Deer Management means increased size of deer/bigger bucks.
- Support far exceeds opposition to having the division manage the deer herd for quality deer: 82% of deer hunters expressed support. Similarly, support was high for management for large-antlered deer: 78% of hunters expressed support.
- When restrictions are applied to harvesting deer, support for Quality Deer Management goes down slightly. When deer hunters were asked if they supported or opposed limiting the size of bucks that can be harvested through antler-spread restrictions, support was at 64%; opposition was at 27%.
- Deer hunters were split on support or opposition to the general idea of having hunters harvest does before they can qualify to shoot an antlered buck: 46% of deer hunters support, but 49% oppose.
- Farmers who own all or a portion of the land they farm and landowners within the general population were asked to indicate how well the Division incorporates landowners' wants and needs into the management of the state's deer population: they were split, with 41% of farmers giving a rating of excellent or good, and 37% of farmers giving a rating of fair or poor.
- When asked if the Division should provide more, the same, or less assistance to private landowners to manage deer, farmers who own the land they farm and landowners within the general population sample more commonly said more assistance should be given than said

that less assistance should be given: 59% of farmers said more assistance should be given, while only 3% of them said less assistance should be given.
- Those farmers who think DFW should provide more assistance to private landowners to manage deer most commonly named deer depredation permits as a way to assist landowners in managing deer.

OPINIONS ON QUALITY DEER MANAGEMENT

- Most commonly, respondents (both the general population and hunters) said that quality deer management means increased size of deer/bigger bucks.
- Support far exceeds opposition to having the Division manage the deer herd for quality deer: 82% of deer hunters expressed support. Similarly, support was high for management for large-antlered deer: 78% of hunters expressed support.
- When restrictions are applied to harvesting deer, support for quality deer management goes down slightly. When deer hunters were asked if they supported or opposed limiting the size of bucks that can be harvested through antler-spread restrictions, support was at 64%; opposition was at 27%, with similar results among deer hunters in the general population sample.
- Deer hunters most commonly said that their hunting strategy is to shoot the first legal deer that offers a good shot (41%). A substantial percentage said they hunt for quality bucks early in the season but then shoot any legal deer toward the end of the season (21%); meanwhile, 16% hunt only for quality bucks all season.
- Deer hunters were split on support or opposition to the general idea of having hunters kill does before they can qualify to shoot an antlered buck: 46% of deer hunters support, but 49% oppose.

OPINIONS ON THE HEALTH AND SIZE OF THE DEER HERD

- A majority of the general population (58%) think the overall health of the deer herd in Delaware is healthy; higher percentages of hunters (94%) and farmers (88%) think the overall deer herd is healthy. Regarding the overall health of the deer herd within the respondent's county of residence, results were nearly the same.
- The perception is that the deer herd has grown over the past five years: 43% of the general population think there are more deer in their county, while 20% think there are fewer deer.
    - Hunters and farmers particularly think the deer herd has grown: 62% of hunters and 81% of farmers think there are more deer than five years ago in their county.
- While majorities of the general population (55%) and hunters (53%) think the deer population in their county should remain the same, a majority of farmers (63%) want the deer population decreased.
- Regardless of other opinions that may be held regarding the size of the deer herd and whether it should be increased or decreased, majorities of the general population (76%), hunters (77%), and farmers (79%) support controlling deer populations in urban and suburban areas.

OPINIONS REGARDING INCREASING THE DEER HERD

- Those among the general population who said that the deer population in their county should be increased (6% of them thought the deer population should be increased) most commonly wanted an increase to improve hunter success rate.

    - A majority of hunters who wanted an increased deer population said their reasoning was to improve hunter success rate.
- It appears that support for a deer population increase erodes if harm would come to the deer or to habitat for wildlife, as well as if vehicle-deer collisions would increase. On the other hand, the general population seems somewhat willing to sacrifice their own landscaping or farmers' crops for an increase in deer.
    - Hunters mirror the opinions of the general population (among those wanting an increase in the deer population).

OPINIONS REGARDING DECREASING THE DEER HERD

- Those among the general population who said that the deer population in their county should be decreased most commonly said their reasoning was to reduce vehicle collisions with deer or to reduce deer-human conflicts.
    - Among hunters, the most common reasons for decreasing the deer population was to reduce vehicle collisions with deer, to reduce agricultural/timber losses, and to improve the overall health of the herd.
    - Among farmers, the top reason by far for decreasing the deer population was to reduce agricultural/timber losses.
- Support for decreasing the deer population remains strong, even when potentially negative consequences are mentioned. Majorities of those who wanted to see a deer population decrease said they would still support a decrease, even if fewer people would be able to see a deer, even if fewer hunters would spend money in their county while hunting deer, and even if fewer hunters would be able to harvest a deer. Nearly half would still support a decrease in the deer population even if fewer wildlife watchers would spend money in their county.
    - Among hunters, support for decreasing the deer population remained strong under all circumstances: for each circumstance mentioned, a majority of hunters still supported a decrease in the deer population in their county.
    - Among farmers, support for decreasing the deer population remained very strong under all circumstances: for each circumstance mentioned, an overwhelming majority of farmers still supported a decrease in the deer population in their county.

OPINIONS ON CONTROLLING THE DEER POPULATION

- Support is high for legal, regulated hunting as a way to manage deer populations: 82% of the general population expressed support.
    - Hunters and farmers are almost universal in their support for legal, regulated hunting as a way to manage deer populations: 97% of hunters and 94% of farmers expressed support.
- Regardless of other opinions that may be held regarding the size of the deer herd and whether it should be increased or decreased, majorities of the general population (76%), hunters (77%), and farmers (79%) support controlling deer populations in urban and suburban areas.
- Those who said that they supported controlling deer in urban and suburban areas most commonly said that the method of control should be hunting (42%), followed by biological birth control (19%) and trapping and relocation (15%).
- In general, opposition led support for use of professionals or sharpshooters to control deer in urban and suburban environments: among the general population, 40% supported, but 47%

opposed; among hunters, 36% supported, but 57% opposed; among farmers, 46% supported, and 45% opposed.

- Regulated archery had much more support than opposition as a way to control deer in urban and suburban environments, particularly among hunters and farmers: among the general population, 66% supported, while 23% opposed; among hunters, 85% supported, and 9% opposed; among farmers, 77% supported, and 11% opposed.
- There was much more support than opposition for having the Division of Fish & Wildlife institute a voluntary Certified Deer Hunter program to help control deer populations: 78% of the general population, 84% of hunters, and 74% of farmers supported.
- Support led opposition for use of regulated hunting to control deer in parks and other recreation lands that have been closed to deer hunting: 68% of the general population, 90% of hunters, and 83% of farmers supported.
- Use of professionals or sharpshooters to control deer in parks or on other recreation lands closed to deer hunting has much opposition: among the general population, 44% supported, but 47% opposed; among hunters, 28% supported, but 67% opposed; and among farmers, 47% supported, while 41% opposed.
- Regulated archery to control deer in parks and other recreation lands closed to deer hunting has much support, particularly among hunters and farmers: among the general population, 58% supported, while 31% opposed; among hunters, 90% supported, and only 8% opposed; and among farmers, 80% supported, while only 10% opposed.

OPINIONS ON THE USE OF PROFESSIONALS OR SHARPSHOOTERS TO CONTROL DEER POPULATIONS

- In general, opposition led support for use of professionals or sharpshooters to control deer in urban and suburban environments: among the general population, 40% supported, but 47% opposed; among hunters, 36% supported, but 57% opposed; among farmers, 46% supported, and 45% opposed.
- Use of professionals or sharpshooters to control deer in parks or on other recreation lands closed to deer hunting has much opposition: among the general population, 44% supported, but 47% opposed; among hunters, 28% supported, but 67% opposed; and among farmers, 47% supported, while 41% opposed.

OPINIONS ON THE USE OF REGULATED ARCHERY HUNTING TO CONTROL DEER POPULATIONS

- Regulated archery had much more support than opposition as a way to control deer in urban and suburban environments, particularly among hunters and farmers: among the general population, 66% supported, while 23% opposed; among hunters, 85% supported, and 9% opposed; among farmers, 77% supported, and 11% opposed.
- Regulated archery to control deer in parks and other recreation lands closed to deer hunting has much support, particularly among hunters and farmers: among the general population,58% supported, while 31% opposed; among hunters, 90% supported, and only 8% opposed; and among farmers, 80% supported, while only 10% opposed.

OPINIONS ON MITIGATING DEER-HUMAN CONFLICTS

- Agreement led disagreement by far that cities and towns that pass firearms ordinances that prevent deer hunting should be required to help with reducing deer damage: among the

general population, 63% agreed, and only 16% disagreed; among hunters, 79% agreed, while 11% disagreed; and among farmers, 76% agreed, while 8% disagreed.

- Majorities of all groups think that the responsibility to manage deer-human conflicts should change in areas where deer hunting access is closed because of development: among the general population, 51% answered yes, and 30% answered no regarding whether responsibility should change; among hunters, 53% answered yes, and 33% answered no; and among farmers, 54% answered yes, and 23% answered no. In follow-up, respondents who think the responsibility should change were asked which group or agency should assume responsibility; the most common answer among all groups was the State government or the Division, whether or not this represents an actual change in the responsibility for managing deer-human conflicts.

OPINIONS ON DEER HUNTING REGULATIONS

- The support or opposition of legal hunting of does was asked two ways because there was concern that opposition would arise if the hunting of does was thought to orphan fawns. Nonetheless, regardless of how the question was asked, hunters and farmers overwhelmingly supported the legal hunting of does.
- Deer hunters overwhelmingly support the increase in the bag limit from two to four deer that was implemented in 2004: 85% of deer hunters support; only 11% oppose.
    - The most common reason for support is that the bag limit increase allows for better deer management. Reasons for opposing (among the few who opposed) include that the bag limit increase will cause a deer decline or that it is wasteful/not sporting to harvest so many deer.
- Deer hunters overwhelmingly support adding one any-deer day to the October muzzleloader season: 74% of deer hunters support.
    - Among hunters, the most common reasons for supporting the addition of an any-deer day are because it allows more hunting, it allows for better deer management, and because it increases hunter success and satisfaction. Very few opposed; their most common reasons for opposing are that it would lead to a decline in deer populations or that enough deer are already harvested.
- Support led opposition regarding the addition of eight days of antlerless firearms hunting that were added to the hunting season in October: 79% of deer hunters support, most of that being strong support, with similar responses from deer hunters within the general population sample.
    - Common reasons for support include that it allows for better management of deer, it allows for more hunting, and it increases hunter success. Common reasons for opposition include that it is a bad, unnecessary idea, that enough deer are harvested already, and that it does not give the deer any rest/it runs the deer too much.
- Hunters (not only deer hunters, but hunters of other species, as well) are split on their support for or opposition to allowing squirrel hunting on the new antlerless deer firearms days in October, provided that the squirrel hunters wear hunter orange: 51% of hunters support, but 38% oppose.
    - Support was expressed for allowing the aforementioned squirrel hunting most commonly because doing so allows more hunting, increases hunter success and satisfaction, and allows for better squirrel management. Opposition was expressed for reasons pertaining to hunter safety: it would result in conflicts between deer and

squirrel hunters, there would be too many hunters in the field, and that it would be dangerous having simultaneous seasons. There was some concern expressed that the additional hunting would spook the deer and decrease deer hunter success.

- All respondents, not just hunters, were asked if they would support or oppose Sunday hunting. While support (43%) and opposition (45%) were about even in the general population sample, most of the opposition was strong opposition. Hunters gave much more support (67%) than opposition (31%), most of that strong support; farmers were the opposite of hunters in that farmers gave more opposition (59%) than support (38%), with most opposition being strong opposition.
- Opposition led support among the general population and among farmers for Sunday hunting with a bow only in Delaware during the legal hunting season, and among hunters, support led opposition: 47% of the general population opposed, while 41% supported; among farmers, 64% opposed, while 31% supported. In contrast, among hunters, 39% opposed, but 57% supported.
- Support led opposition to opening a day of crossbow hunting during archery season, although opposition was substantial. Among hunters, 68% supported, but 20% opposed; among farmers, 66% supported, but 17% opposed; and among the general population, 52% supported, but 28% opposed.
- Support led opposition to a zone system to regulate hunting, although opposition was substantial. Among hunters, 54% supported, but 35% opposed; among farmers, 57% supported, but 25% opposed; and among the general population, 59% supported, but 20% opposed.
- Majorities of all groups, including hunters, oppose allowing hunters to hunt for deer using handguns, and most of that is strong opposition: 55% of hunters, 68% of farmers, and 81% of the general population oppose.

SUPPORT OR OPPOSITION TO HUNTING AND REASONS FOR HUNTING

- Support is overwhelming for legal, regulated hunting: 81% of the general population, 97% of hunters, and 95% of farmers support it.
- Support is high for legal, regulated hunting as a way to manage deer populations: 82% of the general population expressed support.
    - Hunters and farmers are almost universal in their support for legal, regulated hunting as a way to manage deer populations: 97% of hunters and 94% of farmers expressed support.
- The most common reasons that deer hunters hunted deer in the past two years were for the meat and for the sport and recreation. The lowest ranked reason was for a trophy.

PARTICIPATION IN HUNTING

- Among the general population, 13% have a household member (not including themselves) who hunted deer in Delaware in the past two years. That percentage among hunters is higher (37%).
- The general population and hunters were asked if they had hunted any species in Delaware in the past two years: 10% of the general population had; 89% of hunters had. Respondents were also asked about deer hunting: 9% of the general population and 82% of hunters had deer hunted in Delaware in the past two years.

HUNTING LOCATIONS AND FREQUENCY

- Most hunting of deer in Delaware in the past two years was on private land: among deer hunters in the hunter sample, 83% hunted private land half their time or more. In fact, most of those who said that they hunted private land *mostly* had hunted private land *exclusively*.
    - Those who had hunted public land at all most commonly hunted in State Parks; next on the list of lands was Wildlife Management Areas.
- Sussex County was the most popular for deer hunting, followed by Kent County.
- Deer hunters were asked how many days they had hunted deer in Delaware in the past two years (total of both years): 48% had hunted for less than 20 days in two years; the mean number of days was 30.9 days.
- While deer hunters most commonly said, when asked about constraints to hunting or hunting enjoyment, that nothing takes away from their deer hunting quality or frequency, substantial percentages said lack of time (generally because of work), lack of access to places to hunt, and lack of places to hunt all took away from hunting quality or reduced the amount of time spent hunting. Very few said that cost was a constraint; those who did most often cited cost of licenses and permits.

HUNTING STRATEGIES AND EQUIPMENT

- Deer hunters most commonly said that their hunting strategy is to shoot the first legal deer that offers a good shot (41%). A substantial percentage said they hunt for quality bucks early in the season but then shoot any legal deer toward the end of the season (21%); meanwhile, 16% hunt only for quality bucks all season. Hunters' most popular sporting device over the past two years was a shotgun (90% used a shotgun to hunt), followed by muzzleloader (52%) and archery equipment (43%).

HUNTING HARVESTS AND CHECKING DEER

- More than two-thirds (70%) of deer hunters had personally harvested a deer in the past two years in Delaware. Those who had harvested a deer had typically harvested more than one; indeed, 33% had harvested five or more deer in the past two years in Delaware. The mean was 5.1 deer harvested in the past two years.
- About a third (32%) of the hunter sample had attempted to use the Division of Fish & Wildlife's deer checking telephone system and were then asked to rate the system. Those who had used the system overwhelmingly were satisfied with it: 83% were satisfied, with most of those very satisfied.
- Use of the Internet deer-checking system was lower than for the telephone checking system: 10% of the hunter sample had attempted to use the Internet deer-checking system. The Internet checking system received positive ratings similar to the ratings for the telephone checking system: hunters were overwhelmingly satisfied (84%), mostly very satisfied.

SATISFACTION WITH HUNTING

- Among the hunter sample, 82% had hunted deer and were, therefore, asked the question about the current deer season structure. The majority of deer hunters (77%) were satisfied with the current deer season structure; 20% were dissatisfied.
- Hunters were overwhelmingly satisfied (84%) with how well the Division of Fish & Wildlife incorporates hunters' wants and needs into the management of Delaware's deer population, and about evenly divided between very and somewhat satisfied.

LAND OWNERSHIP AND USE OF LAND

- About half (52%) of the general population sample owned land in Delaware. The rate of land ownership among hunters was higher (59%). Finally, and not surprisingly, farmers overwhelmingly (90%) owned land in Delaware (some farmers lease the land they farm).
- The general population most commonly owned land in New Castle County; hunters and farmers most commonly owned land in Sussex County.
- Among the general population and hunters, the most common use of their land is residential; among farmers, agriculture is the most common use.

ALLOWING HUNTING ON LAND

- Respondents who own land were asked if they allow deer hunting on their land. Among the general population and hunters, the rate of allowing deer hunting was not anticipated to be high (only 8% of the general population and 34% of hunters allow deer hunting on their land). This question, rather, was mainly aimed at farmers: 91% of farmers allow deer hunting on their land.
    - Questions were included to find landowners who do not currently allow deer hunting but who previously did. A small percentage of farmers who do not currently allow deer hunting previously allowed it (7%). Typical reasons for ceasing to allow deer hunting included too many people on the land, loss of privacy, concern for personal safety, and agricultural damage.
- Those who allow deer hunting on their land typically allow friends or family to hunt deer on their land; a low percentage of any group allows other people not considered friends or family to hunt their land.
- A low percentage of those who allow deer hunting on their land charge a fee for hunting.
- Landowners were asked if they would be likely or unlikely to allow deer hunting on their land if they knew that the deer hunter had been certified through a deer hunter certification program: those likely to allow deer hunting exceeded those unlikely to allow deer hunting among farmers. Among hunters and the general population, “unlikely” exceeded “likely” as an answer, but recall that most of hunters and the general population said their land was for residential use and, therefore, may not be suitable for hunting.
- Among landowners, legal liability is a major concern when considering whether to allow deer hunting.
- The survey asked respondents whether they agreed or disagreed with three statements about allowing hunting access on their land.
    - Among hunters who own land, the most agreement was that they would allow hunting access (or more access) if they did not have to worry about legal liability.
    - Among farmers, agreement led disagreement that they would allow hunting access (or more access) if they did not have to worry about legal liability: 50% of farmers agree with that statement.

PROBLEMS WITH HUNTERS ON LAND

- Among those who allow deer hunting on their land, low percentages had problems with the behavior of legal deer hunters on their land. The most common problem was trespassing.
- Substantial percentages of landowners (5% of the general population, 9% of hunters who own land, but 25% of farmers who own their land) said that they knew that somebody had hunted deer illegally on their land.

- Nearly half of those who knew of illegal deer hunting on their land said that the deer hunters caused problems in addition to simply hunting illegally. Typical problems included trespassing, unsafe behavior, damaging structure, littering, and being rude or discourteous.

REGULATIONS SPECIFIC TO FARMERS

- Landowners were asked if they supported or opposed allowing farmers who are experiencing crop damage to obtain a permit to shoot the deer that are causing damage, including out-of season, if necessary. While the general population was split on this (50% supported, but 35% opposed), hunters supported more than opposed (60% of hunters supported, and 32% opposed), and farmers overwhelmingly supported (82% of farmers supported, while only 13% opposed). This same question was asked with the caveat that the farmers could shoot the deer only during hunting season (but still without a license), with similar results among the general population and hunters. Farmers on this latter question were less supportive than if they are allowed to shoot the deer out-of-season (72% supported, and 20% opposed).
- Respondents were asked about knowledge specifically of the Deer Damage Assistance Program: 10% of the general population knew, prior to the survey, a great deal or a moderate amount about it.
    - Knowledge levels were higher among hunters and farmers: 43% of hunters and 47% of farmers knew a great deal or a moderate amount about the Deer Damage Assistance Program prior to the survey.
- About half of hunters (49%) indicated interest in hunting on lands enrolled in the Deer Damage Assistance program; another 14% indicated current participation. Farmers were asked about their interest in enrolling their land; about a third (32%) are interested in enrolling their land, while 16% already have their land enrolled.
- Farmers were asked if they supported or opposed having the Division institute a cost-share electric fencing program for specialty crops like melons and berries that are commonly damaged by wildlife; they were nearly evenly split, with 43% in support and 40% in opposition.

DAMAGE CAUSED BY DEER AND VEHICLE-DEER COLLISIONS

- Landowners, including farmers who own all or a portion of the land they farm, were asked if they had experienced damage from deer to their land and/or vehicle: 19% of the general population who own land and of hunters who own land had experienced damage; 75% of farmers who own their land experienced damage caused by deer.
    - Typical damage among the general population and hunters include damage to landscaping or personal gardens, and a few indicated damage caused by a deer-vehicle collision. Farmers overwhelmingly cited agricultural damage caused by deer.
- Those farmers who had experienced damage were asked to rate the Division of Fish & Wildlife in responding to homeowner and landowner requests for assistance to reduce damage caused by wildlife, and they were split: 35% of them rated the division as excellent or good, 40% as fair or poor, and 26% didn't know.
- All respondents were asked if they had experienced a deer-vehicle collision, either as a driver or passenger; most had not: 5% of the general population, 4% of hunters, and 7% of farmers had experienced a deer-vehicle collision while driving.

- Deer are seen as a road hazard: the majority of the general population (55%) consider them a minor road hazard; the majority of farmers (59%) consider them a major road hazard. Two hazards are seen as more important than deer: careless/reckless/bad drivers and drunk/ drugged drivers.

SOURCES OF INFORMATION ON DEER AND CREDIBILITY OF THOSE SOURCES

- Respondents were asked about the credibility of nine potential sources of information about deer. Among the general population, state and federal government sources were seen as more credible than not-for-profit organizations with the exception of the National Wildlife Federation. Four sources were seen as *very* credible by notably more respondents than the other sources: a Division of Fish & Wildlife enforcement officer, the U.S. Fish and Wildlife Service, the National Wildlife Federation, and a DFW biologist. The source perceived as credible by the lowest percentage of the general population was the Fund for Animals. The sources seen as *not at all* credible by the highest percent of the general population were the American Society for the Prevention of Cruelty to Animals (ASPCA) and local sportsmen's organizations.
    - Hunter's perceptions of credibility match the general population in that they perceive government sources, as well as the National Wildlife Federation, as credible. However, unlike the general population, hunters also perceive local sportsmen's organizations as credible. Like the general population, they attribute the least credibility to the Fund for Animals, ASPCA, and local environmental organizations.
    - Farmers' perceptions match hunters' perceptions almost exactly, with one minor exception: farmers attribute slightly less credibility to the ASPCA than the Fund for Animals, although both are quite low in credibility.
- The general population most commonly looks for information on wildlife-related outdoor recreation on the Internet and in newspapers and magazines. Hunters look in magazines, on the Internet, and in DFW publications. Farmers look for information in magazines, DFW publications, and newspapers.
- When asked what medium would be the best to provide information to them, the general population most commonly said direct mail, followed closely by newspapers. Hunters most commonly said direct mail, brochures/pamphlets, and the Internet. Farmers most commonly said direct mail, newspapers, and brochures/pamphlets.

Appendix 5. Deer management options and their advantages and disadvantages

The following deer management actions are often proposed as options that should be considered when managing white-tailed deer in Delaware. Several of the options are viable in Delaware while others are not practical or feasible within the state. Information in this section was adapted from the publication "An Evaluation of Deer Management Options" originally produced in 1996 and revised in 2009 by the Northeast Deer Technical Committee and the New England Chapter of The Wildlife Society (Ellingwood and Caturano 1996).

No Action (Allow Nature to Take Its Course) - Settlers and Native Americans in North America altered many natural ecosystems. Some native plants and animals have been eliminated while exotic plants and animals have been introduced as civilization spread across the continent. Wolves and mountain lions, the large native predators of Delaware white-tailed deer, disappeared with the expansion of settlements. Delaware settlers removed and degraded deer habitat through extensive timber harvest in order to build homes and to heat their dwellings.

Modern man, who was responsible for the near extinction of deer, relocated white-tailed deer back into its original range of Delaware. With man's protection and management, deer numbers in some locations now are at levels that negatively impact native habitats and other wildlife such as forest dwelling birds (Bates and Dawson 2005).

White-tailed deer at high densities often are in poorer condition than deer at lower densities due to competition for limited resources. High-density deer herds also increase the potential for spreading diseases and parasites (Davidson and Doster 1997).

Man has been involved in the survival, demise, and return of the white-tailed deer from precolonial times to the computer age. To suggest that man now remove himself from the deer's world could be interpreted as ecologically irresponsible.

Relocation - Relocating deer requires the existence of habitat lacking suitable deer numbers. Most traditional white-tailed deer habitat in North America already contains adequate white-tailed deer densities. Deer released from problem areas into new areas may contribute to crop and ornamental plant damage within the new range.

Relocating excess deer requires baiting, capturing, handling and transporting deer over substantial distances. The capture of deer, as with any wild animal, contains risks. Deer relocation projects often experience significant deer mortality related to the stress of capture and to human activity at the release sites (Beringer et al. 2002). When wildlife is being relocated to vacant habitat, mortality rates resulting from capture must be accounted for in the wildlife restoration project.

Relocation of white-tailed deer and other animals may contribute to the spread of disease. Once thought to be a western state deer and elk disease, Chronic Wasting Disease (CWD), a fatal disease of deer and elk, has been found in white-tailed deer east of the Mississippi River in Wisconsin, Illinois, New York and West Virginia. Most states, including Delaware, have imposed bans on the importation of live deer and elk in order to help stop the spread of this

serious wildlife health threat. Delaware also bans the movement of live white-tailed deer within the state borders. Furthermore, relocating deer incurs substantial financial burdens.

Repellents - Repellents deter deer from feeding on plants (DeNicola et al. 2000). 'Contact' repellents are placed directly on the plant and discourage deer feeding by producing an unpleasant taste. "Area" repellents are placed in the vicinity of the vegetation and repel deer by an unpleasant odor.

Repellents provide the best protection when used in small areas such as gardens or landscaping ornamentals and when regularly applied after rainfall. Commercial croplands require large amounts of repellents and make their use cost prohibitive.

Repellents fail to address the growing deer population. The effectiveness of repellents declines as deer numbers rise. Competition for food can force deer to eat previously less palatable vegetation.

Fences - Fences create a barrier between deer and the protected vegetation. Fences may be an 8-feet tall barrier or a shorter electric fence (Miller et al. 2001). The barrier fence is more costly than the electric fence. Both require regular inspection and maintenance to ensure their effectiveness. Small fenced enclosures can protect small backyard garden plots and some high value commercial agricultural crops.

Contraceptives - Interest in fertility control of deer populations continues to grow rapidly within the scientific and private communities. As research has progressed, questions remain regarding public health implications, percentage of does requiring treatment, methods of treating each doe, effects on deer social structure and overall long-term health of the deer population.

Deer management through contraception remains experimental. Deer contraception researchers believe that small isolated populations, such as found on islands or in large fenced areas, have the greatest potential for success. Managing free ranging white-tailed deer populations over large landscapes with contraceptives would present tremendous challenges.

In an effort to learn more about contraceptives as a potential management tool, DFW has approved and supported one contraceptive study near Newark, Del. Results of the studies are pending.

DFW and other state wildlife agencies are consulting with the Association of Fish and Wildlife Agencies (AFWA) to prepare appropriate guidelines for the potential future use of deer contraceptives. These procedures and guidelines will ensure that this new deer management tool is applied in appropriate situations.

Supplemental Feed - Supplemental feeding programs are most often designed to attempt to attract deer away from ornamental vegetation and gardens to minimize damage. Advocates of supplemental feeding believe that deer will eat the supplemental forage and stop damaging crops or ornamental plants.

Unfortunately, deer-feeding programs can cause deer damage to increase over the long term. By providing an artificial food source, available deer food is enhanced and deer numbers can continue to climb and potential for damage worsens.

Wildlife biologists discourage long term supplemental feeding of deer (Williamson 2000). By concentrating deer at food sources for extended periods of time, the transmission of diseases and parasites are elevated. Likewise, the surrounding natural vegetation often is over-browsed by the large concentration of deer attracted to the artificial food source.

Predator Reintroduction **-** The white-tailed deer's ability to leap over objects and run at high speed evolved from their need to escape large predators such as wolves and mountain lions. Some groups have suggested that large predators could be reintroduced to their historical ranges in Delaware to control deer. The urban and suburban locations, which harbor some of the most dense deer populations in Delaware, could not supply suitable habitat for these wide ranging predators. The safety of humans and domesticated animals would obviously hamper the release of mountain lions and wolves as well.

Existing Delaware predators, such as coyotes are not effective predators of white-tailed deer. While they do take fawns and sick or injured adult deer, deer productivity data in other states with long-term coyote and even, bear and bobcat populations do not suggest that these animals are affecting deer productivity. In instances where predators can affect deer populations, poor habitat, particularly fawning habitat, tends to be the primary cause as to why predation rates can be elevated.

Sharpshooting **-** Facilities or areas that have high densities of homes or may have security concerns are often conducive to deer sharpshooting operations (DeNicola et al. 2000). Narrow stream valley public parklands with residences lining the woodlands are other typical landscapes where sharpshooting could provide deer population control.

Sharpshooting provides a tightly controlled method for removing deer. Deer are often baited to specific shooting locations that offer safe shooting conditions and also enable shooters to choose specific deer to harvest (i.e., females). While sharpshooting is very effective, it is also expensive. Cost estimates per deer can be greater than $500.

Regulated Hunting **-** Research conducted by wildlife professionals indicates that deer numbers can be managed by regulated hunting. Deer hunting continues to be ecologically correct and fiscally responsible.

Hunting affects deer numbers by removing bucks and does from the population. Uncontrolled hunting from colonial times until the mid 1800's, in conjunction with habitat losses, resulted in the near extermination of white-tailed deer in Delaware and other eastern states. As a result, the harvest of deer was outlawed until 1954 when deer populations had rebounded enough to allow Delaware's first regulated hunting season. As deer numbers continued to grow, bag limits increased, specifically in regards to taking antlerless deer.

Current Delaware deer bag limits encourage the harvest of does and discourage the taking of antlered bucks. This deer management technique is described as Quality Deer Management, which manages deer numbers and increases the age structure of antlered bucks. Some public land managed hunts place even greater emphasis on the harvest of does.

Hunting provides the most economical method of deer management. Most hunters must buy hunting licenses to deer hunt. Total Delaware hunting license sales and the corresponding Federal Pittman Robertson excise tax provides approximately 80% of the 2008 DFW budget.

Appendix 6. Common white-tailed deer diseases and ailments

Hemorrhagic Disease – White-tailed deer hemorrhagic disease (HD) is the most common deer disease in Delaware and across many of the southeastern states. There are two types of HD caused by two different viruses: epizootic hemorrhagic disease (EHD) and blue- tongue (BT) (Davidson and Nettles 2006).

Biting midges in the genus *Culicoides* spread the HD virus among animals. Cattle may become infected and spread the virus but they rarely exhibit clinical symptoms of HD. Humans, dogs, and cats are not infected. Infected deer that develop secondary bacterial infections or abscesses may not be suitable for human consumption.

Deer infected with HD lose their appetite and often their fear of man. As the disease progresses, deer grow weaker, salivate excessively and are short of breath. Lesions on the tongue and upper front palate may appear. High fever associated with the disease drives deer to water for relief and sick or dead deer are often found near ponds and streams. Farmers may find groups of deer carcasses near farm ponds or in their crop fields during the harvest season.

Deer that survive the initial onslaught of HD may exhibit sloughing tissue on the hooves. DFW staff routinely checks the hooves of harvested deer for signs of HD while collecting biological data from deer at deer processors. These data are reported to the Southeast Cooperative Wildlife Disease Study (SCWDS) at the University of Georgia. SCWDS discovered HD and has extensive research experience with this deer disease.

There are no preventative measures available to control HD. DFW staff collects suspected HD deer and when able collects blood samples for HD confirmation and virus isolation.

The impact HD has on white-tailed deer populations is difficult to determine. Localized outbreaks in West Virginia and Missouri had estimated infection rates of 29% and 24% and estimated overall fatality rates of 20% and 8% (Davidson and Nettles 2006).

Delaware experienced possibly its worst HD outbreak ever in 2007. Actual estimates of mortality are not available, but 123 deer were reported to DFW that were either confirmed or suspected to have HD. During the 2007/08 hunting season some hunters reported seeing fewer deer which may have been the result of HD mortality but across Delaware the population impacts were minor. During the 2007/08 season, hunters still managed to harvest the third most deer in Delaware's history at the time. Local deer populations in areas where HD mortality may have been high normally rebound to previous levels within several years of an outbreak.

Chronic Wasting Disease - Chronic Wasting Disease (CWD) is <u>not</u> currently found in Delaware. It is a fatal disease that attacks the brain and spinal cord of deer and other cervids, specifically white-tailed deer, moose, mule deer, and Rocky Mountain elk. While the exact cause is not known, it is believed to be a prion disease. A prion is an altered protein that causes other normal proteins to change and cause sponge-like holes in the brain. The origin of these prions is currently unknown.

CWD is related to, but different from, scrapie in sheep, Bovine Spongiform Encephalopathy (BSE or mad cow disease) in cattle, and Creutzfelt-Jacob Disease (CJD) in humans. These diseases also attack the brain and cause deterioration and eventual death. CWD was first identified in the 1960s in a Colorado research facility and since that time it has been found in Illinois, Kansas, Minnesota, Montana, Nebraska, New Mexico, New York, Oklahoma, South Dakota, Utah, West Virginia, Wisconsin, Wyoming and Canada. CWD has **not** been found in white-tailed deer in Delaware.

In the early stages of CWD, affected animals may not show signs of the disease. As the disease progresses infected animals will show signs of weight loss, generally accompanied by behavioral changes. In later stages of the disease, affected animals may show emaciation, excessive drooling, increased drinking and urination, listlessness, stumbling, trembling, loss of fear of humans and nervousness.

CWD appears to be passed between animals via saliva, feces or urine. Transmission between females and their fetuses (maternal transmission) does not seem to be a factor although indirect transfer, from contaminated soil for example, may occur. CWD may be transmitted more readily within overpopulated herds and at deer or elk feeding stations where direct physical contact among individuals is more likely. Prion diseases, like CWD, do not move easily between species. There is no scientific evidence that CWD has been transmitted to animals other than deer, elk and moose.

Research has not demonstrated transmission of CWD between deer or elk and humans. Scrapie, a similar prion disease in sheep has been studied for centuries and has not been shown to be transmissible to humans. However, in Great Britain, BSE ("Mad Cow Disease") was found to be transmissible to humans through the consumption of contaminated meat; the human form of this disorder is known as New Variant Creutzfelt-Jacob Disease (vCJD). As a precaution, people who handle deer and elk from areas where CWD is known to occur are being instructed to take special measures to avoid possible infection. As a general precaution it is recommended that people avoid all wild animals that appear sick and to not eat the meat from sick acting deer.

The Delaware Department of Agriculture (DDA), Delaware Department of Health & Social Services (DHSS) and the United States Department of Agriculture (USDA) are integral partners in all CWD surveillance plans to assist in monitoring wild deer populations, and protect domestic animals and health. DFW, working in conjunction with these partners has conducted targeted CWD surveillance of sick deer and random surveillance of hunter harvested deer since 2002. Each year a sample of hunter harvested deer from each county are examined. The brain stem and lymph nodes are collected at deer processors and submitted to a lab for testing. To date, over 2,000 free ranging Delaware deer have been tested for CWD with none testing positive for the disease.

DFW staff meet on a regular basis with their peers from the northeastern and southeastern states to discuss new information regarding CWD. Soon after CWD was identified in West Virginia in 2005, DFW staff attended regional CWD and public meetings held in West Virginia. DFW's CWD Response Plan will guide Delaware's response should CWD be detected within the State or within another adjacent state.

DFW has implemented several measures to prevent CWD from infecting Delaware deer. Hunters hunting outside of Delaware and in areas where CWD has been detected may only bring certain parts of cervids back into the state. Furthermore, hunters must immediately contact DFW if they are notified that the cervid they harvested in another state tests positive for CWD.

Cutaneous Fibroma **-** Cutaneous fibromas are warty hairless growths on the skin of white-tailed deer caused by viruses and are believed to be spread by biting insects. The nonfatal tumors vary in size from less than an inch to more than eight inches in diameter. The tumors may be smooth or warty and vary from black to gray in color. Transmission to other animals such as livestock does not occur. Human consumption of infected deer would only be compromised by extremely large tumors with secondary infections. Deer managers have no method of preventing or controlling the spread of this condition.

Nasal Bot Fly Larvae **-** Fly larvae of the genus *Cephenemyia* live in the nasal passages and retropharyngeal pouches of deer. The adult fly lays an egg packet on the deer's skin around the nose or mouth. The deer licks the egg packet and the larvae are released into the deer's mouth. The larvae grow within the deer's nasal passages. Mature larvae drop on the ground to pupate in the soil. Nasal bots are not harmful to deer and do not make the meat unsuitable for consumption. When hunters are dressing deer, they may observe these bots exiting the nasal passages. The transmission of this larva cannot be prevented through deer management techniques.

Brain Abscess – Brain abscesses are a fatal deer disease caused by bacterial infections of the brain (a primary bacteria agent is *Actinomyces pyogenes)*. Bacteria typically enters the brain through skin infections near the antlers; therefore antlered bucks are more prone to having this malady due to antler rubbing and sparring. This disease usually occurs during the time period immediately following velvet shedding through antler drop (September through March). Infected deer exhibit neurological problems, such as circling and lack of coordination, and some deer may exhibit strange behavior such as walking toward humans. Deer may be in poor physical condition. Total mortality in the deer population is probably low with adult antlered bucks being at higher risk than females and yearling bucks. Deer with brain abscesses should not be consumed. There is no deer management remedy for the spread of these bacteria.

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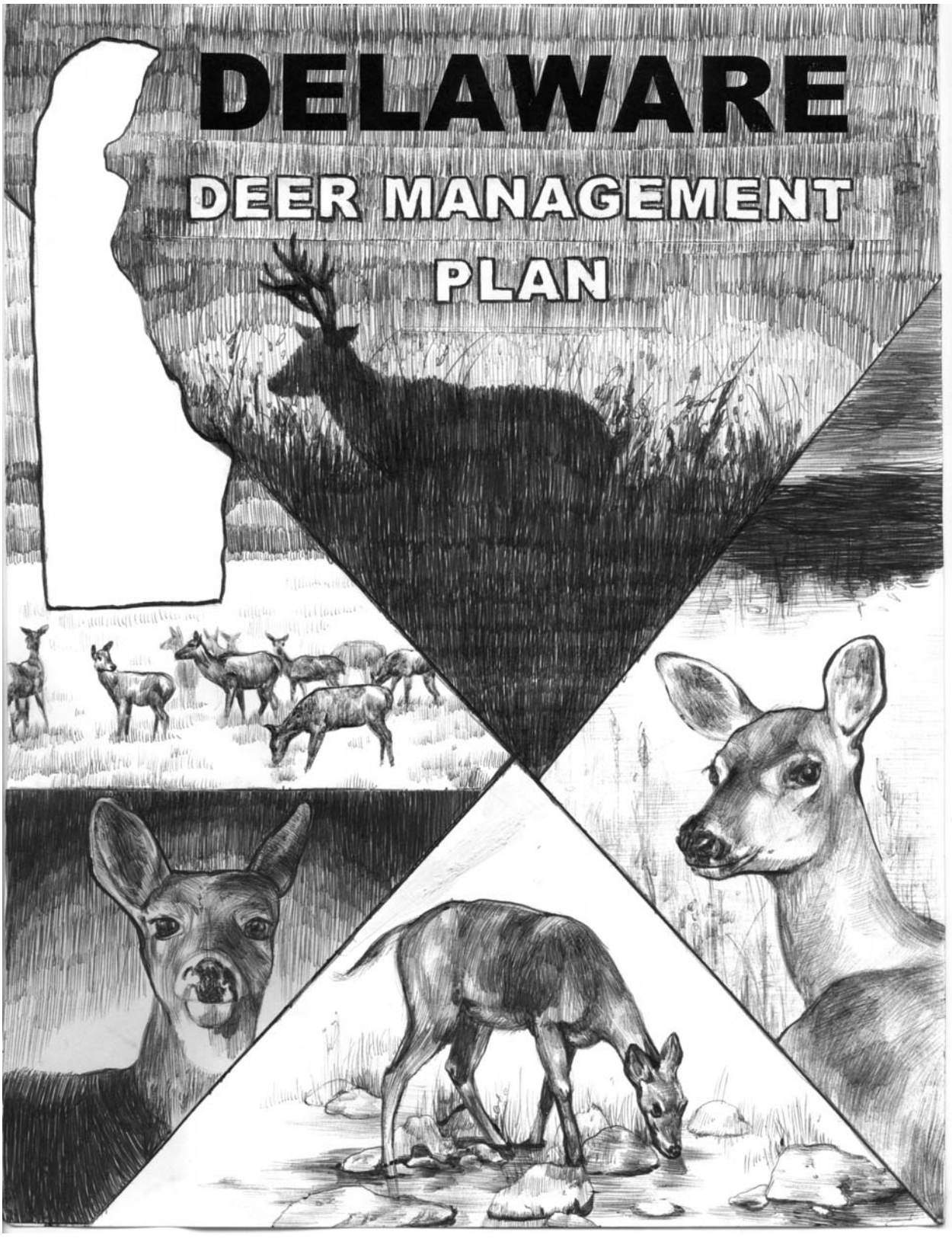
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