Massachusetts Wildlife

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Stellwagen Sanctuary Seabirds,
Deer Winter Survival,
Crappie Tactics

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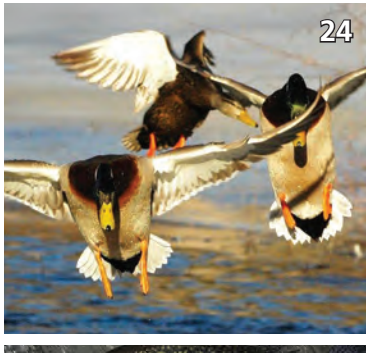

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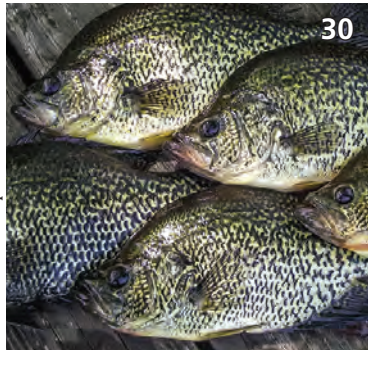

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MASSACHUSETTS WILDLIFE

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FEATURES

On the Cover: Skittering over the waves to take flight, Great Shearwaters (*Ardenna gravis*) migrate north to New England coastal waters each summer to feed. Shearwaters are currently being studied in Stellwagen Bank National Marine Sanctuary in Cape Cod Bay, and elsewhere in the Gulf of Maine as part of a broader project to survey bird life numbers and their food supply in the sanctuary. Photo © Mark Wilson

Deer Winter Survival

by David Stainbrook

The harsh conditions of the historic winter of 2014–2015 and citizen questions about the possibility of high deer mortality led MassWildlife biologists to delve into deer deaths and hunting harvest data for answers.

The winter of 2014–2015 was a record breaking season for snowfall across much of the Commonwealth—with snow in excess of 110 inches blanketing most of central and eastern Massachusetts. As the deep snow and frigid temperatures locked up the landscape, MassWildlife began to receive calls and inquiries from citizens concerned about the possibility of large-scale deer die-offs due to starvation. I received the first of these calls in mid-February from a Boylston resident who found a dead young male deer by his house. A few days earlier, he had seen the deer alive and close to his home. Wildlife biologist Susan McCarthy and I went to investigate. We immediately noted that the deer was emaciated, but there was also a large amount of feces surrounding the deer. It appeared that the deer had been browsing on nearby rhododendron and possibly mountain laurel. We checked the nearby woods and saw deep deer trails in the snow and numerous deer tracks and droppings (likely from other deer), but there was no evidence of other dead or emaciated deer in the area. We also noted evidence of long-term impacts to the forest habitat consistent with years of high deer density (e.g. heavy browsing). We headed back with the dead deer to the lab at our Field Headquarters in Westborough to conduct a gross necropsy in an attempt to determine its cause of death.

First we looked for external injuries that may have impaired the deer's mobility, such as those caused by a collision with an automobile or stemming from an infection. There was no obvious evidence of injury or broken bones, but we couldn't rule out "hidden" issues, like a bacterial infection. We examined the deer's mouth, throat, and esophagus for obstructions that could have prevented it from eating but there were none to be found. The deer's tongue showed a healed laceration, but it likely had little to no effect on the deer's ability to eat. We opened the deer's four-chambered stomach and found the rumen (the first stomach chamber) about one quarter full of woody browse of what appeared to be rhododendron. The next and most critical step in determining

Photo © Bill Byrne

whether or not a deer has succumbed to starvation is to assess the fat content present in the deer. The last reserves of fat are found around the kidneys and in the bone marrow. We discovered little to no fat around the kidneys and the bone marrow fat content was less than 10 percent and dark red in color. A healthy deer's bone marrow fat content in the winter is typically greater than 80 percent and the marrow color is pale white to pink. Given the depleted fat reserves, we determined this deer had succumbed to starvation, but its condition may have been exacerbated by an undetected issue or by ingesting high quantities of rhododendron and mountain laurel plants that when consumed in large quantities can have a toxic effect. However, we were mystified that other deer in the area were not showing similar signs of starvation.

The next call came in mid-March, when a Massachusetts Environmental Police Officer (EPO) was investigating the death of six deer found in a North Shore community backyard by a groundskeeper. The local EPO, David Wright, conducted a thorough investigation, searching for any potential human-caused poisoning or any other obvious mortality causes. The dead deer were surrounded by black diarrhea (evidence of internal bleeding) but showed no signs of starvation. The

officer noted several dead fish in a small, backyard Koi fish pond, which may have exposed the deer to some type of bacteria or toxin. He also discovered that two neighbors were feeding deer—one using a corn pellet mix and the other whole kernel corn. The neighbors told EPO Wright, that the food had not been provided for the few days prior to the death of these deer. We brought the deer to Westborough for further examination. There were no external injuries and their body condition appeared relatively healthy. We performed a gross necropsy on one of the deer and found a full stomach with the contents appearing to be from ornamental shrubs, plants, and vines, including rhododendron, all of which were noted to be growing in and around the yard where the deer were found. We didn't see any supplemental food in the rumen, but took into account that the neighbors said that they had not put out food for a few days. There were plenty of fat reserves around the kidneys and the bone marrow fat content and color was normal for winter. We also noticed black fluid-like stool in the colon, similar to the diarrhea found around the deer. Because we couldn't verify the cause of death, we sent another deer to the Pathology Lab at the Cummings School of Veterinary Medicine at Tufts University in North Grafton for a more detailed necropsy. The results of the necropsy were inconclusive, but the pathologist noted rumenitis (inflammation of the rumen).

MassWildlife biologists evaluate the bone marrow fat content of a dead White-tailed deer during a field investigation.

Photos © Jeff Breton

The supplemental feeding of these deer most likely impacted their digestive system, leading to the bloody diarrhea. When the supplemental food was not replenished, the deer probably began browsing on rhododendron and other ornamental plants for a day or two before dying. Tufts staff advised us that in order to determine if specific bacteria or toxins were the cause of mortality additional tests were needed but would be expensive and likely inconclusive. We decided not to order the tests. Based on the available evidence and Tufts' necropsy report, our consensus was that the cause of death for these six deer was likely a combination of supplemental feeding and build-up of toxins related to rhododendron ingestion (see page 20).

For the remainder of the long winter of 2014–2015, we received a handful of calls from hunters, law enforcement officers, and other members of the public who found dead deer. Many speculated the deaths were due to starvation. We worked to confirm and investigate each of these reports. We also looked for, but did not find, evidence of deer carcasses in historic wintering areas and on a number of public lands. We heard through the "grapevine" and from newspaper articles of a few more unconfirmed reports and

Photo © Marion Larson

MassWildlife wildlife biologists (L to R) Susan McCarthy, Erik Amati, and David Stainbrook conduct a gross necropsy on a White-tailed deer that was found dead by a homeowner during the winter of 2014–2015. The team examined the deer's stomach contents, looked for signs of disease and injury, and evaluated the fat content in the bone marrow to determine if the deer's demise was the result of the harsh winter conditions.

tried to follow up on these as well. Fewer than 10 deer deaths were reported and confirmed due to possible starvation, most of which were found in areas of high deer population densities and over-browsed habitat. We also documented about 10 deer deaths likely caused by supplemental feeding.

Evidence in Data

These individual mortalities provided some insight into the potential effects of that historic winter of 2014–2015. However, to properly investigate and assess the true impact on the deer population, we decided to conduct an in-depth analysis of the biological data collected by our staff from deer harvested during the following 2015 shotgun deer hunting season. Given that there are approximately 100,000 deer across the Commonwealth, the biological data and subsequent analysis would put the handful of reported cases and potential unreported cases into perspective. For instance, were the cases we investigated just a drop in the bucket, or were we just scratching the surface of a larger issue? If there were significant die-offs in the winter of 2014–2015, the harvest data would reflect that occurrence.

Typically, the first deer to succumb to harsh winter conditions are likely to be injured, sick, or otherwise compromised. Secondly, fawns are less likely to survive the winter than healthy adults due to their smaller body size, less fat reserves, and inexperience. It's reasonable to assume that if a significant number of fawns died during the 2014–2015 winter (whether due to starvation or predation), there would be fewer yearlings (1.5 year olds)

Large groups of White-tailed deer congregating at unnatural feeding sites can lead to conflict, stress, injury, and increased movement across roads.

available to hunt in the following 2015 fall hunting season. If there was significant fawn mortality, the data would show a precipitous drop in the yearling age class in the harvest, especially in regions hardest hit by the winter.

The 2015 harvest data analysis (p. 19, Figure 1) showed there was no significant drop in the proportion of yearling males harvested across the state, suggesting that just as many fawns from 2014 survived that historic winter as in any average year. Based on these data, there was no evidence of large-scale die-offs in the deer population.

Deer Health and Reproduction

Another important question we asked while reviewing the harvest data was "Did the winter of 2014–2015 impact deer reproduction or health?" Yearling male antler beam diameter (ABD), the antler width measured just above the base, is an indicator of both deer health and habitat quality. This measurement is also used as an index to reproductive rates. Typically, a diameter less than 15mm is considered the threshold measurement which indicates physical stress or poor habitat quality. The male fawns' energy resources are directed primarily at body growth, with development of their first set of antlers being secondary. The better the health of their mother and the better the habitat quality, the more resources they can devote to both body and antler growth. If fawns are in poor physical condition following the winter, they won't put much energy into antler growth as yearlings, and the data would show a drop in yearling antler beam diameters. The 2015 ABD data (p. 19, Figure 2) didn't show a major drop and indicated antler beam diameters were well above the 15mm threshold.

Examining the 2015 harvest data can also show us if reproduction was impacted due to rough winter conditions. If does produced fewer fawns and their young

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Figure 1 – Percent of Yearling Males in Adult Male Harvest

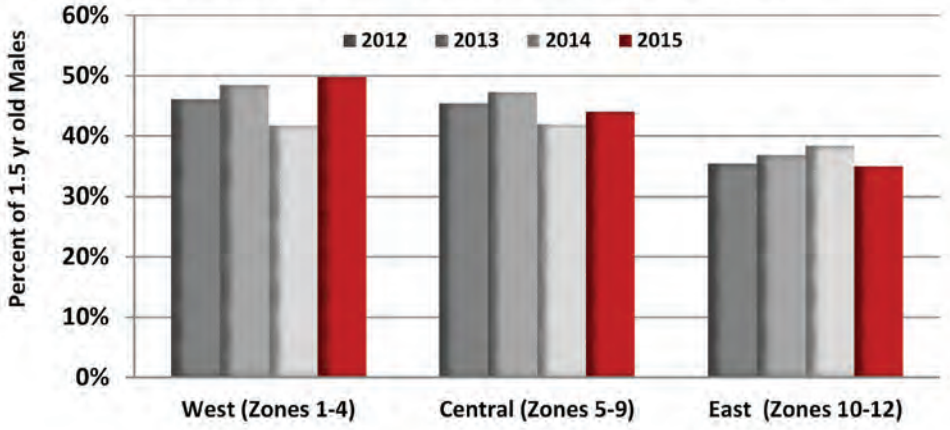


Figure 2 – Average Yearling Male Antler Beam Diameter

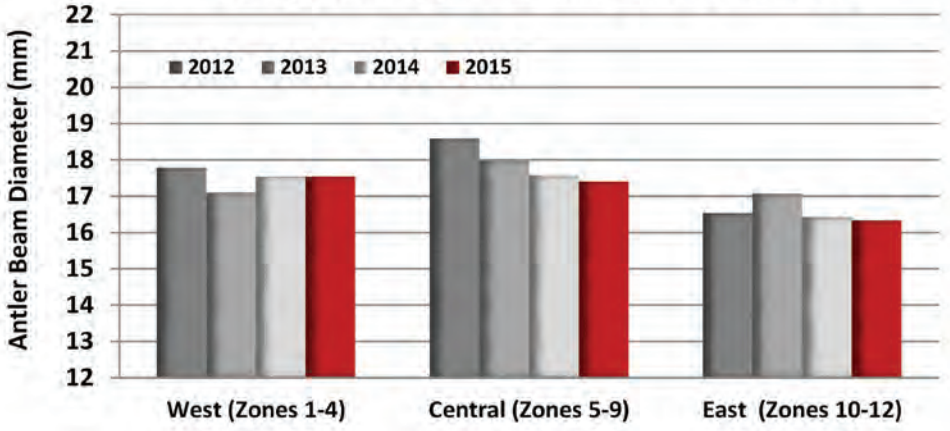
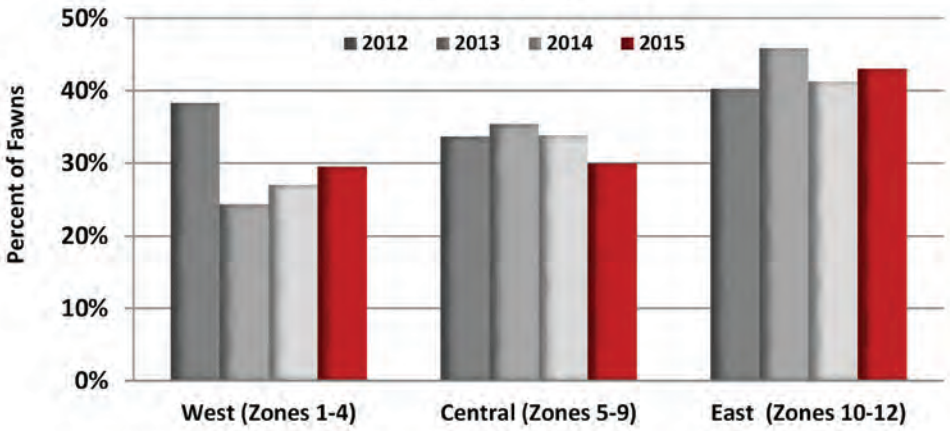


Figure 3 – Percent of Fawns in Antlerless Harvest



Digestive Systems Matter – Don't Feed Deer

Although well-intentioned, people who feed deer in the winter may not understand the negative unintended consequences of this seemingly benign activity. A host of microorganisms (bacteria, protozoa and fungi) and enzymes in the deer's digestive system enables the breakdown of plant material into a form that allows for proper digestion and nutrient absorption. The composition of this digestive microflora actually changes during the year to help deer digest the different types of seasonally available foods. As warm weather foods, such as green, soft vegetation, die off in the fall, deer gradually shift to browse, woody plant material such as twigs and buds. Accordingly, the deer's digestive microflora slowly adjusts to this dietary change over a period of weeks.

During the winter months, if abrupt changes in diet occur with introduced high carbohydrate foods like corn, apples, and deer pellets, it can disrupt the deer's stomach chemistry, triggering bloat, diarrhea, damage to the rumen (the first of four stomach chambers), and even death. High levels of lactic acid produced as a by-product of the carbohydrate-digesting bacteria overwhelm other microflora, reduce the rumen's pH (rumen acidosis), and damage the rumen lining. This lactic acid can also be absorbed into the bloodstream and can rise to potentially fatal levels. Even if a deer survives the initial issues, damage to the rumen lining can be permanent, potentially leading to future digestive problems.

Feeding deer can also cause deer to congregate in larger numbers, increasing disease transmission risks, and causing deer to adjust travel patterns that increase vehicle collision risk. A healthier, safer way to support deer through particularly rough winters is to improve existing natural habitat. Creating areas of young hardwood and shrub-dominated understory forests (e.g., recently cut), especially near coniferous covers of hemlocks, pines and firs, is very beneficial. In locales where deer numbers are much higher than what the natural habitat can support (evidenced by over-browsing), opening large blocks of land to regulated hunting can reduce deer densities, benefiting the remaining deer and the local ecosystem.

Private landowners, land trusts, and cities and towns can provide winter food and cover for deer and other wildlife by including selective forest cutting in their habitat management plans.

Winter Adaptation Strategies

While cases of winter die-offs have been documented at the northern extent of the White-tailed deer's range, Massachusetts' climate and habitat is more suitable for deer. White-tailed deer have survived harsh winters in Massachusetts for thousands of years with remarkable resiliency. Deer spend the fall months putting on weight, ensuring they have extra fat reserves to make it through a rough winter. While much of a deer's fat reserves are depleted during the winter months, they typically recover fully in the spring when seasonal food sources become available. Prior to the winter of 2014–2015, in most of the state, there was an abundance of food, so deer had plenty of opportunity to build up reserves. Additional fat reserves aren't the only defense deer have against frigid conditions. Like most mammals, deer grow a winter coat for further protection. Not only is the fur dense, but more importantly, each individual hair is hollow, allowing for air, warmed from the animal's body temperature, to be trapped close to the body. Thanks to this excellent insulation, low temperatures do not seem to be detrimental to deer; in fact, snow will accumulate on their back without melting. Deep snows that persist for months can be a significant winter stress factor. However, during the cold months, deer adapt and change their travel pattern spending less time moving about and more time in coniferous areas or other thick vegetation. In these areas, snow depth is shallow, food is more accessible and precious energy is conserved.

Photo © Bill Byrne

White-tailed deer are well-adapted to handle Massachusetts' winters.

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were less likely to survive the winter, the 2015 data would show a large drop in the proportion of fawns in the harvest. The 2015 data presented in Figure 3 on page 19, showed no significant decrease in fawns in the harvest, meaning reproduction was not greatly impacted by the stress of the winter and heavy snows. Finally, recorded deer weights for 2015 showed no significant differences, providing more evidence of population stability.

Massachusetts Deer are in Good Shape

In summary, although there may have been localized situations with deer mortality, particularly in areas with the greatest snowfall and those with over-browsed habitat from high numbers of deer, it's safe to say that the historic winter of 2014–2015 did not result in any significant statewide die-off in the deer population. Below average harvests for 2015 may have led to notions that the harsh winter killed a lot of deer, but the 2015 harvest was likely down because of above average temperatures, a lack of snow (for tracking), and an abundance of natural food, such that deer did not have to move very far or often during legal hunting hours. Furthermore, the deer harvest in 2016—the third highest on record at 12,249—is even stronger evidence that the deer population is doing well (see statewide harvest graph below).

About the Author

David Stainbrook is the Moose and Deer Project Biologist for MassWildlife.

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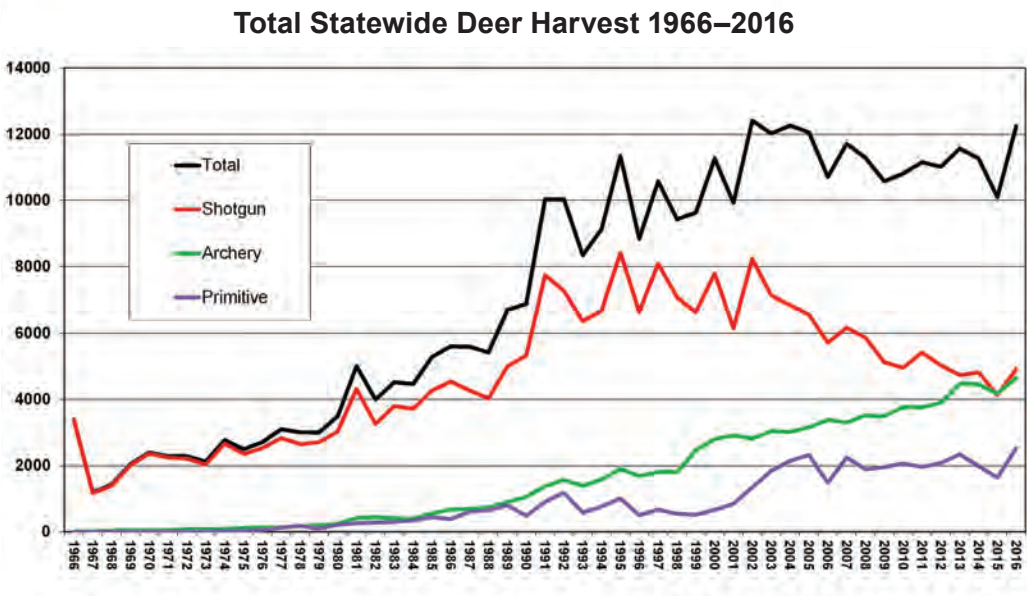

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