Living ON THE EDGE

How Deer Survive Winter

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The white-tailed deer has developed a remarkable set of adaptations that enable the species to survive the deep snow and cold temperatures that occur in Maine, the northern limit of their range in North America. The white-tailed deer found here in the Northeast is one of the three northernmost of 16 subspecies. It is also the largest of the white-tail subspecies. Deer do not occur in viable numbers north of the St. Lawrence River.

Northern deer have larger body size than deer further south. This is true of all mammals, in that body size increases as you progress northward. Large body size conserves energy better because of a lower surface to mass ratio.

Programs

The Maine Department of Inland Fisheries and Wildlife works with Small Woodlot Owners Association of Maine to offer deer wintering area managing programs through SWOAM chapter events.

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Deer shed their hair coat in the spring and fall. The red summer hair has solid shafts and lacks an undercoat, but the gray-brown winter coat has hollow hair shafts and a dense, wool-like under fur, providing effective insulation. Deer have special muscles that can adjust the angle of their hair shafts to obtain maximum insulation.

During the fall, deer accumulate and store body fat under their skin and around internal organs. This serves both as insulation and energy reserve for the rigors of the winter ahead. Fat reserves can be up to 30 percent of body mass of adult does in the fall. The natural winter diet is lower in protein and less digestible than the summer diet, requiring more energy to digest and resulting in fewer calories. This translates into a "voluntary" reduction of feed intake through the winter, particularly in late winter. The stored fat is burned during winter to partially compensate for the lack of energy in the winter diet. Deer normally lose weight during the winter even when fed a free choice, high protein diet.

These adaptations are designed for the conservation of energy. Deer go into the winter with a full tank of gas (fat reserves) not knowing how long the journey will be. If deep snow and bitter winds start early or persist late into spring, some deer will run out of gas (fat reserves) and die.

The greatest mortality is experienced by fawns, followed by adult bucks and then does. Severe winters can significantly deplete the fawn crop, resulting in drastically reduced recruitment into the population. These effects can be seen for many years in reduced numbers in the age class data. Consecutive severe winters can reduce recruitment by 90 percent, resulting in drastically reduced summer densities.

Deer behavior also changes in the fall, as family groups of deer congregate into larger groups made up of mostly adult does and fawns born the previous June (kin groups). These groups seek protection from wind and reduced snow depths by moving to sheltered areas, which comprise 5 to 15 percent of their summer range. These movements occur in late November through December. Northern deer are known to travel up to 40 miles between their summer range and winter range, but 5 to 10 miles is more typical. Mature bucks seek out these areas after mid-December when their testosterone levels start to drop after the rut.

This important winter habitat provides several benefits, such as dense softwood canopies that intercept more snow, providing reduced snow depths. Congregating in these areas also allow many deer to share the energy cost of maintaining a trail network to access cover and food and to escape predation.

These and other benefits provide critical "deer yard" habitat deer need to survive Maine's winters.

WHAT IS A DEER WINTERING AREA?

Deer Wintering Areas (DWAs) or "deer yards" are a critical habitat for white-tailed deer living at the northern end of their range. A DWA is the habitat where deer go to avoid harsh winter winds and deep snow. During a winter of average severity, a deer living in southern Maine will require this shelter for 20-60 days. In far northern Maine dependency is usually 90-125 days.

Quality winter shelter occurs where certain landforms and forest stands meet. The former is less understood and underappreciated, but equally important as the type of conifer trees growing on a site. Let's look at each separately.

Photo by Thomas Long, via Flickr; Used with permission.

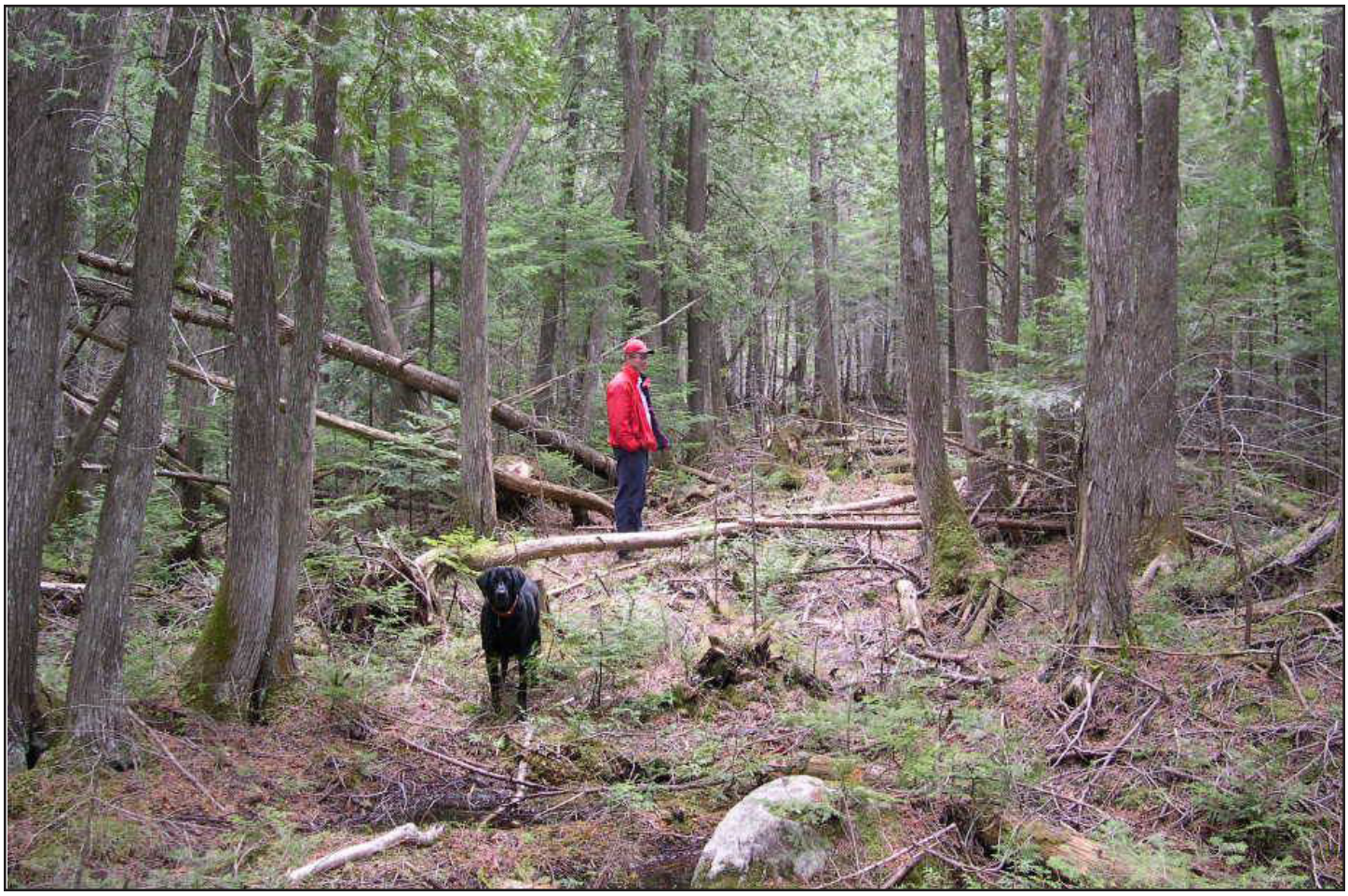
THE VALUE OF LANDFORM

Most DWAs are within or near the riparian areas associated with lakes, ponds, rivers, or streams. A 'Reader's Digest' definition of a riparian area is an upland or wetland type associated with a watercourse that is affected by the hydrology of that watercourse. Keep in mind that there are many wetland classifications, including forested wetlands where not only could a duck not swim, but you might not even get your sneakers muddy in the summer.

Valley bottoms, landscape depressions, aspect, and lower side-slopes provide protection from cold winds. You've experienced firsthand the relief of standing behind a building or big tree when the temperature is low and the wind is blowing. Warm bodies exposed to cold wind lose heat rapidly. Subsequently, like adding wood to a fireplace in a drafty camp, more calories are burned to maintain a deer's core temperature when exposed to wind. In the north the most daunting challenge for deer survival is to make it through the wintering period with enough fuel left in the tank. Protection from cold wind equates to reducing the rate at which calories are burned.

In the northern half of Maine, soils associated with riparian areas are often shallow, stony, poorly drained; or all three. Trees are aggressive life-forms that have evolved to exploit specific conditions associated with soils (site), water, and sunlight. Success is not measured just in rings of growth per inch, but more important to the species, the ability to occupy and dominate a site.

Regenerating one's own kind may be the ultimate measure of a tree's success. Cedar, spruce, fir, and to a lesser degree hemlock, are species that are very successful competitors on poorer soils often occurring in and adjacent to riparian habitat. The foliage structure of these trees is also superior to others in intercepting wind and snowfall.



(Above) Photo by Chuck Hulsey

Former Plum Creek forester Kirk MacDonald walking in a cedar-dominated Primary Winter Shelter stand within the Pierce Pond Stream DWA. This stand was lightly commercially thinned about 12 years before this picture was taken. In the foreground are stumps from a much older harvest.

THE CONTRIBUTION OF FOREST COVER

A forest stand is a group of trees of same or similar species, age, height, or canopy closure. Stands dominated by cedar, spruce, fir, or hemlock are by far the best at intercepting snow, when they are over 35 feet tall and have canopy or crown closure over 50 percent. Snow depths under such stands can be 40 percent lower than under hardwood stands with similar characteristics. This is because their leaves (needles) intercept falling snowflakes. Three things can happen to snow caught in the treetops. Some snow will still come down to the ground. Some snow will melt, coming down as a liquid and reduce the snow profile. Last, some snow held in the canopy goes directly back to the atmosphere as a vapor.

The behavior of "yarding" or congregating in large overwintering groups results in each deer contributing towards the development of a network of trails. Using a trail vs. traversing alone through the snow is a major energy savings. Think back to when you have trudged or snowshoed solo through deep snow. It can range from tough to exhausting, depending on your condition. Compare that to when you were with a group, at the back of the line and easing along a trail beaten down by others. For deer, this is the difference between life and death. In addition to conserving energy, adult deer know their network of trails like you know the streets in your neighborhood. So in addition to energy conservation, the network of beaten trails helps deer access browse and avoid predators. Probably because of the value of trails, larger DWAs with inherent higher number of winter inhabitants equates to a higher rate of survival.

The best DWAs have a minimum of half their area in stands providing high quality conifer shelter for the tough months of January and February. Some of the DWA should be in younger stands to replace older shelter stands through time. A representation of mixed softwood-hardwood stands provides a winter food source by way of hardwood browse. During the start and end of the wintering period (December and March) these stands can meet minimal shelter requirements, and at the same time be a source of natural food.

Managing the spatial relationship of these stands over time is vital, as deer cannot survive if they use more calories in transit than they gain in the meal.

MANAGING DEER WINTERING AREAS

Maintaining sufficient winter shelter for deer is primarily an exercise in forest management. A deer wintering area is the habitat where deer go to find protection from deep snow and cold wind. When the right landform meets the right assemblage of forest stands, the majority of deer can survive a typical Maine winter. Landowners large and small can and do play an essential role in providing, maintaining, and managing this critical winter wildlife habitat.

Before jumping into *"Forestry-For-Deer 101,"* let's acknowledge that Maine is a geographical mixing zone for our two members of the deer family. We sit where the southern end of the moose's range and the northern end of the white-tail's meet. There are biological, environmental, even evolutionary reasons why the range of these species does not extend farther. A basic ecological principle comes into play in that similar species will not compete for the exact same resource. Because Maine happens to be near the terminus of each range, moose are a bit over-engineered and deer under-engineered for Maine winters. They generally do not coexist over the majority of each other's range.

To cope with winter, deer assemble in groups (yarding) within forests dominated by stands of spruce, fir, cedar or hemlock. Such stands must be tall enough and dense enough to intercept the snowfall and wind. The best DWAs include sufficient quality conifer cover and a component of mixed hardwood-softwood stands, either as inclusions among cover stands or adjacent to cover stands. Hardwood browse and canopy litterfall are important natural foods, however they are low in nutritional value compared to food available during the spring, summer, and fall.

Deer cannot increase or even maintain body weights throughout a typical Maine winter. Browse intake is important to survival and serves to slow down the rate of weight loss. Shelter and the use of trails created and maintained by numbers of deer serve to conserve calories. The juxtaposition of cover and food is important simply because deer cannot burn more calories getting to food than the calories provided by that food. To that end, the spatial relationship of new harvests, current shelter, future shelter, and browse availability are important considerations in long-term forest management planning.

The best DWAs have at least 50 percent of the acreage in stands comprised of what we call Primary Winter Shelter (PWS) and Secondary Winter Shelter (SWS). PWS stands are dominated by spruce, fir, cedar, or hemlock and are ≥35 feet in height with crown closures ≥ 70 percent. Crown closure is the percentage of the sky blotted out by limbs and leaves when you look up through the canopy. These stands provide shelter during the most severe winter conditions. Unless overmature, a common stand treatment would be a light commercial thinning, applied as an improvement cut to increase stand growth, quality, and vigor.

SWS stands are similar except the crown closure is 50 percent to 70 percent. They provide shelter for all but the most severe conditions typical of the early and latter part of the wintering period. A PWS stand may become a SWS stand after a light commercial thinning, solely because the crown closure falls below 70 percent. If applied as an improvement cut, these stands can return to a PWS stand during the course of a typical cutting interval of 15 years. There is also the opportunity to maintain a high conifer component or increase the percentage of conifers over time.

With at least 50 percent of a DWA in PWS and SWS stands, the remaining stands can be in younger age-classes and/or stands with a mixture of hardwoods. Young stands may be the product of past land use or a prescribed regeneration treatment. These Non-Mature/Future Shelter Stands provide a source of winter browse. They can be managed to increase their shelter attributes if the soil type favors conifers. Thinning over time can increase the softwood component of such stands. It is generally more challenging to regenerate conifers within a mixed-wood stand because conifers can only reproduce by seed (except pitch pine), whereas hardwood species reproduce both by seed and vegetatively by sprouting off stumps and root systems. In my experience managing DWAs I find that hardwood browse is a nearly automatic by-product any time a deciduous tree is cut, whereas regenerating species like spruce, cedar, and hemlock requires close attention to details, such as the timing of cone crops, volume removals, and some good luck.

There is no one-size-fits-all harvest prescription for DWAs. The starting point should be to assess what percentage of your land within the DWA provides PWS and SWS. Stand age, vigor, composition, and condition are important considerations. It is desirable to have a broad representation of stand age-classes, however the options available to an owner of 50 acres are different than an owner of 500 acres. If at the lower acreage end it would be good to know the condition of the DWA beyond your ownership. If less than half the DWA has PWS and SWS stands, maintaining such stands on your property longer via light thinnings, might be best.

If a DWA has a lot more than 50 percent in older PWS or SWS, a harvest geared towards regenerating new stands would ensure that sufficient shelter comes on line in the near future. About one foot of growth per year of sites typical of DWAs is common, so it requires about 35 years for trees to reach the shelter stage.

Travel corridors serve to connect cover stands within a DWA, and often occur along watercourses. Check your municipal rules for harvesting near these areas. Generally, light thinning or using the single-tree or group selection method to 1) maintain the overstory, and 2) establishing conifer regeneration, is desirable as long as connectivity values are maintained.

Learn More!

Due to many factors, Maine has experienced a decline in the amount and quality of DWA habitat, especially in northern, western and eastern Maine. It has become difficult to achieve deer population levels desired by the public.

To that end, MDIF&W, the Maine Forest Products Council and SWOAM have collaborated to develop DWA management guidelines and make them available to all forest landowners.

The 9-page publication *Guidelines for Wildlife: Managing Deer Wintering Areas in Northern, Western, and Eastern Maine* is available on our website at www.mefishwildlife.com or by writing to us at:

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