Ontario

Ministry of Natural Resources

Guidelines for Winter Feeding of Deer in Ontario

Why, When, What, and How of Winter Feeding

Endorsed by:

Wildlife Winter Feeding Program Inc.

ONTARIO FEDERATION OF ANGLERS & HUNTERS

The winter ecology of deer is important to understand for those interested in sustaining Ontario's deer herd. White-tailed Deer in Ontario are at the northern limit of their continental range because of our winter conditions. Fortunately, deer have learned to survive periods of snow and cold by adapting their behaviour. These adaptations and good winter habitat enable deer to survive most winters but under severe conditions emergency feeding of deer may be necessary to maintain populations of deer and prevent massive die-offs.

This bulletin provides guidelines for the emergency winter feeding of deer and notes on supplementary feeding. It describes the winter behaviour of deer and the Why, When, What and How of winter feeding. These guidelines include technical information for MNR managers and information about deer and feeding facts for persons interested in helping deer during severe winters.

Winter Behaviour of Deer

In much of Ontario, deer annually migrate from summer range to winter concentration areas that have suitable winter cover and food. These areas are called "yards" and MNR research has shown deer may travel as far as 95 kilometres to reach them.

Yards provide conifer cover and food.

Yarding is an important behaviour that has evolved because it helps deer survive winter conditions. Yarding is only prevalent where snow persists during the winter. Yards may vary from a few hectares to 500 kilometres in size.

Yards are areas that provide physical comfort to deer. First and foremost is coniferous forest cover that helps intercept snow and allows deer to move about. Conifers such as cedar and hemlock are especially useful as they can provide both food and shelter. Spruce, balsam and pine forests are also used for shelter.

One of the advantages of concentration for deer is the establishment of trails. Deer use trails throughout the year but winter trails are especially important for conserving energy as they move between food and shelter. However, once the sinking depth in snow reaches 50 cm, deer are restricted to trails and this can severely limit access to food.

Yarding behaviour also acts as a "defence" against predators. Trails provide runways to help escape predators. The groups of deer provide many eyes, ears and noses to help detect predators.

Winter concentrations help deer survive

An interesting characteristic of deer use of yards is that they will continue to use them even when food supplies become low. It seems that the use of yards is a very traditional event and given the choice deer will seek cover over food. However this doesn't mean that natural winter food isn't important. . .it may only mean that deer have learned that the ability to move around in a winter with deep snow is the most important.

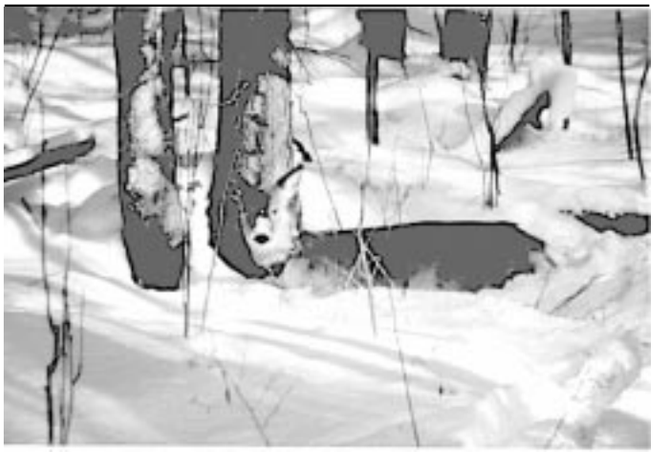
Deer seek conifer cover such as hemlock stands, even when food supplies are low.

Natural food of deer consists primarily of woody browse from hardwood twigs or conifer needles from white cedar and hemlock. Although deer will devour twigs from many species of tree and shrub they will also avoid some species. Some of the 'last resort' species are black and white spruce, balsam fir, red and jack pine and beech. Favourite species include sugar,

red, mountain and striped maple, yellow birch, dogwood, hazel, red oak, ground yew and white cedar. Unfortunately, even the best browse is not very digestible and it does not provide adequate protein and energy to prevent weight loss. Cedar and mountain maple rank very highly but it seems that the best browse is a mixture of 3-4 species including conifer and hardwood. It's not uncommon to see deer seeking to supplement their diet with acorns, ferns and other ground plants by pawing through the snow. Of course, deep snow reduces their success.

Conservation of energy by deer is a key to their survival in the winter. A large part of the energy required to survive winter is brought with them in the form of fat reserves. Deer populations in Ontario are generally at low levels with respect to the carrying capacity of their summer range and therefore should be capable of storing more than enough fat to survive at least until the beginning of February without artificial feeding. In late winter, deer begin to become more active and increase their food intake. The increased activity results in increased utilization of their fat reserves. However, it's quite normal for deer to lose over 20% of their body weight in a normal winter as their fat reserves become depleted. Special insulated winter coats and ability to seek good resting spots helps to conserve energy of deer but the natural system of weight and fat loss continues even with supplementary feeding of deer. Deer are exceptionally good at using the topography, stumps, logs, hummocks and clumps of trees for bedding shelter. They also learn to seek south facing slopes for sunning. Deer reduce their activity during January and voluntarily reduce food intake. All of this acts like turning the thermostat down to save energy.

In an ideal winter yard, the mixture of food and shelter both provides and conserves energy. In normal winters, yarding behaviour by deer coupled with good habitat is all that is needed by deer to thrive in southern and central Ontario. Consequently, winter feeding of deer is rarely if ever required in the farmland of southern Ontario. Severe winters with long periods of deep snow and cold temperatures create a precarious situation for deer.



Deer save energy by choosing special bedding sites

Exhaustion of fat reserves and lack of accessible food can result in starvation and eventually death. Such conditions require special winter management operations in our deer yards. The timing, location and methods used will affect success. The wrong methods can do more harm than good!

The Question of Feeding Deer

Winter feeding of deer can be controversial. Some people feel that deer are less wild when their natural relationship with the environment is changed. Feeding can artificially change the carrying capacity of the habitat and affect plant communities and other wildlife species both positively and negatively. Other people feel very strongly about "helping" deer. Feeding has occurred in Ontario for many years. During the 1970s when deer numbers were low and winter habitat was severely degraded, feeding with the support of the government, became commonplace. During the 1980s and 1990s, government attention shifted to habitat retention, but interest in directly feeding deer continued, especially by private citizens.

The carrying capacity of individual yards is the number of deer the yard can support on a sustained basis without destroying the supply of food. The kilograms per hectare of browse that are accessible to deer is measured by sampling the current annual growth on twigs.

Three major factors affect the amount of food available to deer. Firstly, growing conditions in the forest such as soil, light, moisture, forest type and age and secondly, the amount of browsing by deer are important. Although deer only eat the current annual growth of plants, they can easily consume more than the plants can replace. A general guideline is that deer shouldn't consume more than 50% of the growth each year or a decline in food supplies can be expected. Thirdly, winter conditions affect carrying capacity by burying food under snow or limiting access to browse. Severe winters can greatly reduce access to food. This has the same effect as reducing the carrying capacity of a winter yard, in some cases by two- to three- fold. Mild winters allow deer to remain mobile and obtain sufficient forage to enjoy high productivity and survival. Such winters also allow the habitat to recover.

Winter feeding as a management tool has the potential to modify winter effects by artificially manipulating carrying capacity. This allows deer to survive during severe winters but it may also increase the number of deer above the natural capacity of the habitat. Winter feeding can involve cutting browse or felling tree tops to provide food or it can involve the provision of artificial food such as corn, oats, hay or a specially formulated deer pellet ration. The issue of winter feeding is not only a question of whether to feed deer or not, but also includes questions on when to feed, how to feed, what to feed, what are the long versus short term effects and what are the benefits versus costs? There are both advantages and disadvantages to winter feeding.

Winter Feeding Terms

Variation in the use of terms has caused much confusion between the Ministry and the public. The use of the following terms can be extremely helpful in communicating management priorities.

***Emergency Feeding* is providing artificial feed to deer during severe winter conditions because natural food is not available (i.e. not present or inaccessible). Emergencies generally occur only at the end of an exceptionally long, severe winter.**

***Supplementary Feeding* is providing artificial food to deer during the winter to supplement natural foods during normal winters outside of winter emergencies. For example, this could occur where a large herd is yarded in an area where there is little natural food available (e.g. a pine plantation). Supplementary feeding is applied to specific problem areas such as extremely poor winter range.**

Advantages of Winter feeding

A major reason for winter feeding is the prevention of large losses of wintering deer due to starvation. Fawns are still growing during their first year and their energy demands are hard to meet in a tough winter. Their smaller size makes wading through deep snow extra hazardous. Surprisingly, even the large bucks can be at risk. That is because they often exhaust their fat reserves during the annual rut in November. When winter comes early they are unable to replenish the very important fat levels. Published studies from parts of North America show that many winter feeding operations have met with limited success. The failures that have been documented were due to feeding deer the wrong type of food or a failure to get food to most of the deer.

The winter stress on adult does often results in the death of fawns at birth. This is one of the most important hidden effects of Ontario's winter. Even in a normal winter about 20% of fawns die at birth. Studies have shown that captive does fed on a nutritious diet had better reproduction. Thus, winter feeding could help survival of fawns at birth.

Disadvantages of Winter Feeding

The summer ranges of deer in Ontario foster high reproduction. This means that herds can grow to levels higher than the winter range carrying capacity. Supplementary feeding can make this situation even more of a problem. Locally, deer will concentrate around feeders and thus put an extra strain on the core of yards. Even though fed, they continue to browse on natural food eventually eliminating it almost entirely. In the long term, winter range quality declines from overuse. Similarly, deer concentrating around feeders may increase property damage by their grazing on shrubs and trees.

The effect of winter feeding on deer density is a primary concern. Deer numbers that are too high for food supplies during normal winters will eventually result in herds that deplete forage supplies, have lowered survival and productivity and smaller body size. All of these factors can lead to future herds that are smaller where range conditions are poor and deer that are more susceptible to large winter losses. A situation may be created where deer become dependant on human provided food. This situation then requires a long-term commitment to winter food purchase and delivery costs.

Despite recommendations to the contrary, improper diets are often fed. These lead to digestive upset and potentially death. A variety of feeding diseases have been documented for deer that are fed inadequate diets. Interference with normal declines in activity and food intake occurs if supplementary food is supplied. This could result in increased energy demands that offset the advantages of supplying artificial food.

Studies have shown high levels of aggression and fighting occurring at feeders during long-term operations. Dominant animals often prevent others from feeding and the crowded environment leads to additional stress. During MNR research we noticed an increase in fighting as evidenced by tufts of hair whenever bags of feed became about 90% empty.

Normal movement patterns of deer in response to food supply and snow conditions may be affected by artificial feeding stations. This has been used to an advantage to intercept deer from feeding on agricultural crops and to delay entry to winter concentration areas. However, delaying movements may be a disadvantage if it disrupts traditional patterns of behaviour that affect deer survival. Feed stations which increase movements near roads and railroads can increase the number of deer-vehicle accidents.

When To Feed Deer

There is no magic number or formula which will easily and accurately determine whether or when deer in a particular yard should be given emergency feed. There are however some guidelines which can be used to help make that decision. A major factor is winter severity which includes two very important components, the length of winter and the depth of snow.

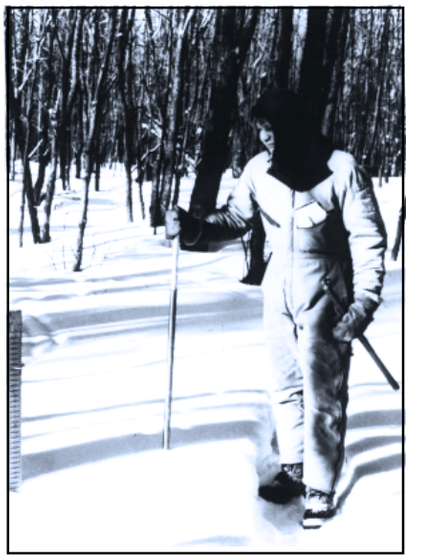
Length of Winter

Deer migrate from their summer home ranges to the winter range in response to increasing snow depth. A snow depth of 20 cm triggers this behaviour. On average, this occurs in mid- to late December across the deer range in central Ontario. Deer may remain on their winter range from 14 to 19 weeks, but usually they are on the winter range for about 16 weeks (110 days), leaving in April, once most of the snow has melted. By this time deer have exhausted their fat reserves even with good food and cover. Thus duration in the yard is critical. If deer come into the yards because of early winter snow in November, or remain in yards because spring is delayed, the consequences can be great. For example deer that enter yards in mid-November would have to leave by mid-March just to enjoy normal survival. The extra four weeks could result in large scale starvation. It is critical to consider duration of winter. . .when deer enter yards and when deer will leave yards. We can estimate onset of migration from the time when snow first reaches 20 cm, but predicting the severity of the winter and the end of the winter is more difficult.

The time spent on the winter range also plays an important role in determining how many deer can be supported in that yard. If, in response to snow, deer are forced to spend an additional 30 days in the yard (arriving early, leaving late or both) the carrying capacity of the yard could be reduced by as much as 20 percent. An additional 50 days in the yard could reduce the carrying capacity of the winter range by 35 percent. This means the yard can support far fewer deer than usual for such prolonged winter periods. This reduction in carrying capacity, combined with less than optimal condition if the deer entered the yard early, can have a severe impact on deer survival and can increase post-natal fawn mortality. The time that deer spend in the yard is therefore an important consideration in determining the impact of winter conditions on deer.

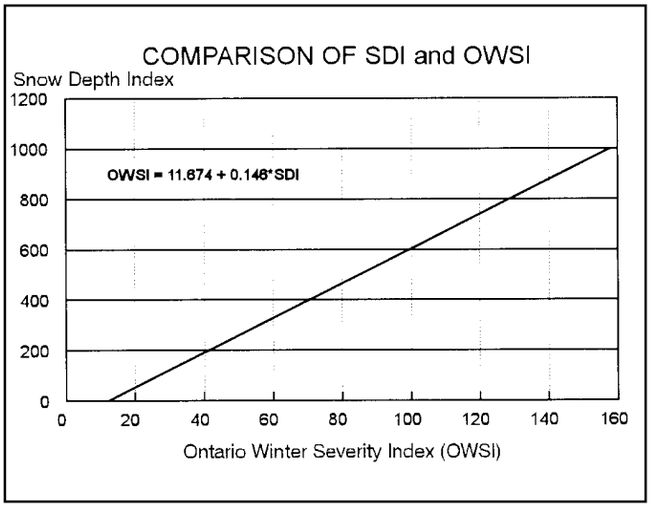
Snow Depth and Winter Severity

Ontario has a network of snow courses throughout the province which aid in assessing winter conditions. A number of indices have been developed for determining the impact of winter conditions on deer. These indices involve various combinations of measurements of snow depth, deer sinking depth, chill and crust development. These are all cumulative indices, meaning simply that weekly measurements are summed to yield an index of winter severity over the course of the winter. The Ontario Winter Severity Index (OWSI) combines snow depth, deer sinking depth (influenced by crusts) and chill, and has been recorded at special courses in the deer range. The Snow Depth Index (SDI), is a much simpler measure involving only the cumulative weekly snow depth readings. All measurements start on November 1st each year.



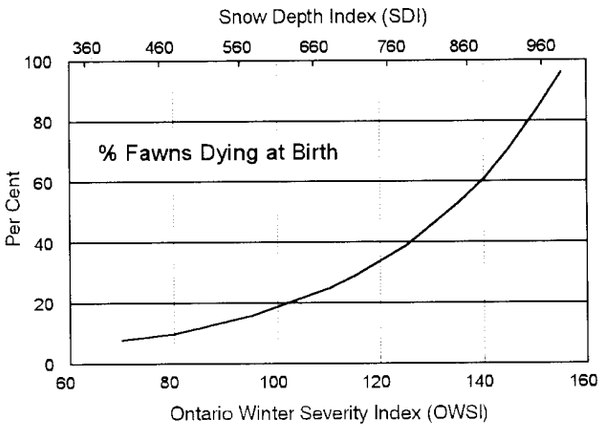
MNR staff monitor winter conditions in deer habitat across the province.

There is a strong correlation between OWSI and SDI even though SDI does not measure chill and they can be used interchangeably for many predictions. This is because snow and cold temperatures are often correlated. Managers have to be aware that other factors like snow crust and extreme cold may need to be considered. For example a very strong crust will allow deer to move about freely and suddenly access natural food. Strong crusts can develop after mid-winter thaws or rain. In contrast some crusts allow predators and dogs to move freely but deer continue to struggle and flounder in the deep snow. Abnormal cold and wind can have an additional drain on energy reserves especially if cover and food supplies are poor.



Making Predictions

Both Snow Depth and Winter Severity Indices can be used to predict potential winter severity impacts on fawn losses at birth. The graph and table provide estimates.



The graph above shows that with an OWSI of 140 or a SDI of 900, there could be a 60% loss of fawns at birth next spring. The table that follows shows the effect of mild to severe winters on fawn loss. The SDI and OWSI can be used to predict late winter conditions based on conditions earlier in the same winter (late January to early February).

How do we use this information to decide if feeding is warranted? From the Table following, if the SDI in early winter (Time 1) is lower than 300 then there is less than a 30 percent chance of severe winter conditions in late March. However, if the early winter SDI value is close to 350 by the last week of January and the winter began earlier than usual, then managers will need to keep a close watch on conditions in the yard and may want to consider other factors in making their decision to conduct emergency feeding (e.g. supply of browse, herd size, etc.). Under the most severe early winter conditions (SDI >401) there is a 75 percent chance of severe conditions developing in late March. Managers will also want to consider other factors before deciding to feed. If deer entered the yard at the usual time and yard quality is high (i.e. lots of accessible browse), then deer may not require emergency feeding.

Prediction of Fawn Loss at Birth

Winter	Winter Severity SDI	Winter Severity OWSI	Fawn Loss at birth
Mild	< 590	< 100	0 - 20%
Moderate	591-760	101-125	20 - 40%
Severe	> 760	> 125	> 40%

Predicting Severe End to Winter

Early Winter Condition SDI	OWSI	Percent chance of severe conditions by late March Period Time 1	Time 2	Time 3
< 300	< 56	< 30	< 25	< 10
301-350	57-64	< 60	< 50	< 25
351-400	65-71	65	60	50
401-450	72-79	75	75	70
> 450	> 79	> 80	> 80	> 80

Time 1 - last week of January
Time 2 - first week of February
Time 3 - second week of February

How to Feed Deer

An emergency feeding program requires efficient delivery of the right type of artificial food. This includes: the ability to get food to deer on a trail network, a method to deliver food to the deer until the end of winter, and a supply of the right type of artificial food.

Before Feeding Begins

A successful emergency feeding program requires a well planned and maintained trail system to get food to as many deer as possible. Trails are efficiently established using snowmobiles but bulldozers or other heavy equipment are very good in brushy areas with deep snow. They create good trails

and provide tops of saplings at the same time. Before any new trails are established a map of the proposed trail network needs to be developed. The largest groups of deer are determined through consultation with local people or by flying over the yard. Trails should link as many large concentrations of deer as possible and areas of food and cover should be connected so that deer can get to natural browse. The creation of dead end trails should be avoided. Also to be avoided, are areas near roads and railroads where roadkills could result. Since feeding must continue until deer leave the yards in the spring it is important to locate trails away from wetlands and lakes since travel on these water courses is treacherous and difficult during late winter.

Developing A Plan

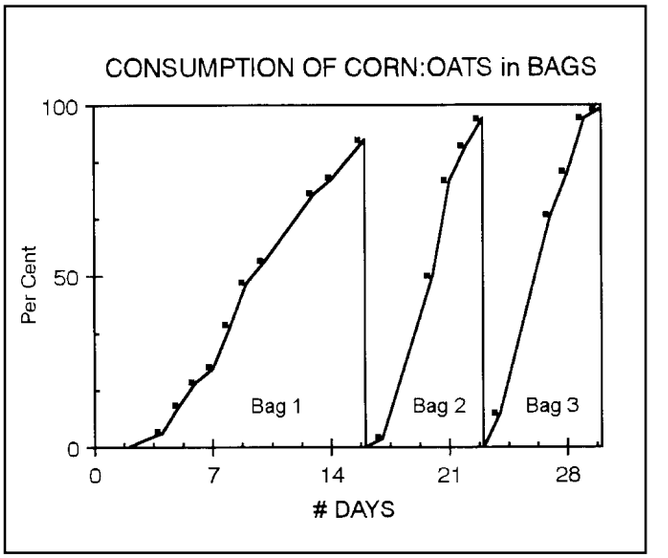
It is very important to develop a plan to address the following:
- Will there be enough money to continue feeding until the end of winter?
- Is there a supplier who can guarantee delivery of specified feed in the amounts required when needed?
- Can you provide up to 1kg of food per deer per day?
- Are there feed storage facilities and vehicles to distribute feed to volunteers?
- Do volunteers have dependable snow machines and sturdy sleighs capable of pulling 250 kg or more of feed?
- Are there backup snow machines and sleighs available in the event of equipment breakdowns?

Feeding Methods: Bags or Piles?

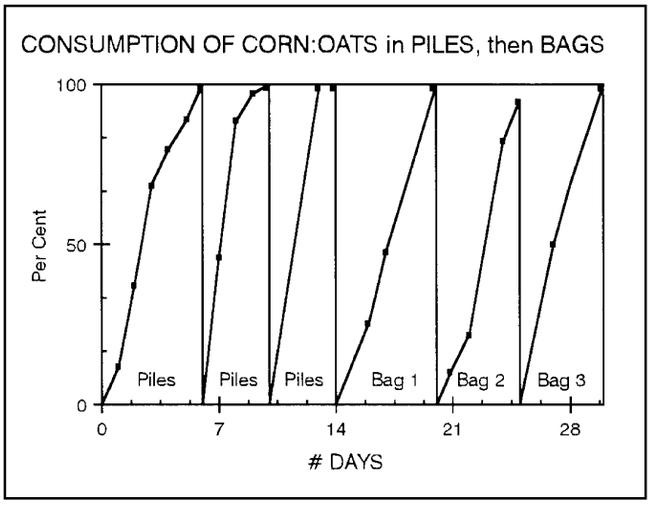
Emergency feed can be delivered by two methods. The pile method uses single pail fulls of feed spaced every 10 meters along snowmobile trails. The bag method uses 25 kilogram plastic woven grain bags spaced every 100 meters along trails. Bags are laid flat and cut open. The edges are folded back to expose the feed as in the picture.

The bag method has several advantages over the pile method. Feed bags are easy to handle and keep the feed from getting wet or sinking into the snow on warm sunny days. After snowfall, they are easier for deer to find and less deeply buried than piles. Less feed is wasted using the bag method. Deer show a more gradual acceptance of feed put out in bags as opposed to piles. This “slow turn on” is an advantage in emergency feeding operations since it results in a more gradual change in diet. This reduces the risk of causing the over-feeding diseases discussed earlier.

A bag of grain cut open and edges folded back



Acceptance of bags of grain by deer. Notice that it takes awhile for consumption to increase, but after the first replacement, acceptance is quicker. Restocking should occur whenever greater than 90% of the feed is depleted.



Initial acceptance of piles of grain by deer is quicker than bags

In some areas, deer may be reluctant to eat from bags. In these situations feed piles may be used for the first two weeks to get the deer eating the feed after which, bags can be used.

Studies have shown that consumption remains high when piles are converted to bags. Switching to the bag method after deer are used to eating the feed allows volunteers to take advantage of the relative ease of the bag method.

Piles or bags should only be placed along sections of trails that are within easy access by the group of deer being fed. You don't want to have deer travelling far from the habitat they have selected to feed in. Feed should be placed under conifer cover to reduce the amount of snow built up on the feed during snowfalls. If there is a very large concentration in a small area, place clusters of 3-4 bags, about 20 meters apart in areas with conifer cover. Feed should not be placed along heavily used snowmobile trails. In these areas a side trail should be developed exclusively for the emergency feeding operation. Remember to avoid feeding deer near roads where roadkills might be a threat to deer.

In some yards there may be established feeding sites with large hoppers, barrels or other types of deer feeders. These can be used in emergency feeding operations. If there is more than one feeder at a site, volunteers should make sure that the feeders are spaced well apart. If they aren't, deer will fight excessively to get at the feed wasting valuable energy in the process.

What to Feed Deer

Recommended Diets

The best diets are either a specially formulated ration of deer pellets, oats, or a mixture of whole corn and oats. Experiments show similar acceptance of corn:oats (1:1) and pellets. Pure oats is also a good ration with a low starch level and good fiber level. Both rolled oats and coarsely milled oats provide easier digestion and less chance of bad effects from a sudden change in diet. Mixtures of whole corn and whole oats are often readily available and easy to handle without waste.

Recipe for Deer Pellets

lbs/tonne	Ingredients
110	soya meal
730	ground shelled corn
200	ground oats
330	red wheat or wheat shorts
300	alfalfa meal
100	molasses
300	ground oat screenings

Analysis:
Crude Protein (min. 12%), Crude Fat (min. 3.5%), Crude Fibre max. 8.0%), Crude Sodium (active 0.2%), Calcium (active 1.0%), Phosphorus (active 0.6%), Vitamin A (min. 10,000 IU/KC), and Vitamin D (min. 2400 IU/KG)

IMPORTANT NOTE:
DO NOT ADD UREA WHICH MAY KILL OTHER SPECIES WHICH MIGHT FEED ON PELLETS

Ratios from 1:1 to 1:4 corn:oats can be used. When given no other choices, the consumption rate for these rations is the same. Deer readily accept these rations. Pellets provide a more complete and balanced ration but corn-oats are generally more available and may be more economical. Both provide an adequate protein and energy level and both have an adequate fiber type and percentage.

Consumption of a pellet and a corn:oat mixture is similar when fed to deer exclusively in bags. Food is consumed in about 2 weeks. When restocked, the consumption rate is higher and depletion occurs in about 1 week. Consumption of pellets and the corn:oat mixture is also similar when fed to deer in piles. However, the consumption rate in piles is considerably faster than for bags with greater than 90% consumed in under 1 week. The consumption rate is similarly high when restocked. When piles are replaced with bags the rate will remain high.

Comparison of corn:oats, pellets and natural food

	Corn/ Oats	Pellets	Hardwood Browse
Moisture %	**14.6**	**13.0**	**26.2**
Dry Matter %	**85.4**	**87.0**	**73.7**
Crude Protein %	**10.3**	**13.1**	**4.7**
Crude Fibre %	**10.4**	**8.2**	**31.8**

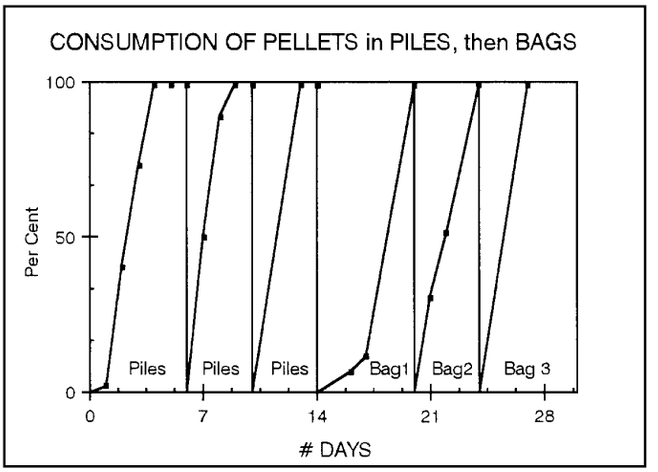
Restocking should occur whenever greater than 90% of the feed is depleted. Please pick up old bags when replacing with new bags. Avoid littering.

Problem Diets

Deer have problems with many diets that livestock consume easily. Deer depend on a variety of bacteria and microorganisms in their rumen (stomach) to break down their food. A change in diet requires a change in the population of these microorganisms to process the new food properly.

Some kinds of food are not be easily adapted by deer. Protein, energy, fiber type and digestibility are all important. When deer have had reduced intake because of low food supplies (a starving condition lasting greater than 7 days) rumen activity declines and fermentation of fiber decreases.

The fiber type in alfalfa cannot be readily broken down and it impacts in the reticulorumen of starving deer, dooming them to continued starvation. Although deer regularly fed alfalfa show fewer problems, the possibility of deer in a "starving



Consumption of pellets is similar to corn:oats when fed exclusively. Note the similarity to the figure showing the consumption of corn:oats.

condition" moving in to the feeding area and consuming the alfalfa is a definite risk. Thus, we should be extremely cautious about some feed types such as alfalfa or hay since it can be very dangerous in certain circumstances. The low fiber levels in pellets and grain avoid this problem.

Pure corn can also cause problems since it is very high in starch (likewise for pure barley and wheat). The sudden intake of corn causes a starch overload. This creates ideal conditions for the growth of bacteria (e.g., clostridium). Associated with this are over-feeding diseases. Deer suddenly presented with an abundant food supply such as cereal grains can develop acidosis (excess acid buildup) which can lead to rumenitis (bacterial infections in lesions developed from acidosis). The development of scours (diarrhea) is another serious problem. Loss of microfauna in the rumen during low intake periods means that deer are quite sensitive to digestive upset. The scours can be the last blow to an already compromised deer whose natural food intake has been reduced with a decline in rumen activity. The problem of scours is likely with a sudden change of diet, especially from a high fiber to low fiber or vice versa.. Thus, a change from twigs, to grain to alfalfa can cause a variety of digestive problems.

One precaution that can be followed is to gradually introduce new food (just as farmers do for livestock) over a 7 to 14 day period, especially when using concentrated cereal diets. Bags have a natural delay in acceptance because of their appearance to deer. This is an advantage in minimizing overeating in emergency situations.

A Note on Supplementary Feeding

Supplementary feeding may assist individual deer during the winter but benefits to populations of deer as a whole may not occur over the long-term. The disadvantages of feeding, presented earlier, listed negative biological consequences that can occur. One published report clearly showed that supplementary feeding was not justified on a cost-benefit basis. Occasionally, situations arise where supplementary (as opposed to emergency) feeding might be considered. One of these situations is when a large herd of deer is in a yard with little or no natural food because of continued over-use of several years or a tradition has developed in an area such as a pine plantation. If the herd is to be sustained, artificial supplementing of the yard food may be helpful. This should be a stop-gap measure as efforts are made to improve the natural habitat and encourage a more natural ecosystem.

When supplementary feeding, it is recommended that deer be gradually introduced to any new food.A method for supplementary feeding developed by the Wildlife Winter Feeding Program Inc. uses a handful of mixed corn and oats set on a handful of alfalfa. The quantity is gradually increased over time to three or four handfuls. They place separate piles at the rate of one pile per deer per day.

Feeding Devices

A network of feeding devices can be established. These may be used profitably in an emergency situation, although most yards will not have sufficient feeders to reach a large proportion of the herd. Methods used to deliver supplementary food include hoppers holding 600 kg of food, smaller wooden hoppers holding 300 kg, barrel feeders constructed of 50 gal drums with 3 feeding spaces (75 kg of food) and pail feeders holding 12 kg.

Observations clearly show that the more feeding spaces, the more deer that can feed at a site at the same time. Depletion/day is similar for 2 small hoppers (55 kg) at one site and 4 barrels (47 kg) at one site as opposed to 1 large hopper (25 kg). Consumption by deer per hour of effort to keep feeders filled shows the same ranking. Construction costs are lower for barrels ($55) compared to small hoppers ($290) and large hoppers ($525). Based on MNR research, maintenance and replacement costs for a five year period ranks these devices:

Peter Smith, shown above, and Gary Zacher did many of the MNR feeding experiments.

1. 4 barrels ($530); 2. 1 large hopper ($725), and 3. 2 small hoppers ($780). A cost-benefit analysis using these data ranks 4 barrels first, followed by 2 small hoppers and 1 large hopper. Four barrels at 1 site is recommended since barrels provide an efficient and effective way to supplementary feed deer.

Supplementary Food Diets

The best supplementary food to feed deer follow the recommendations in the Emergency Feeding section. Managers should be cautious about alfalfa since there is no control over whether deer in a "starving" condition might move into the feeder site. Handling of large round bales of alfalfa also requires special equipment. It has been observed when these large round bales are encountered by deer early in the year, they selectively pick the leafy portions of alfalfa leaving the more fibrous stems. Later in winter, when the deer's requirements for supplementary food are highest, they are confronted with the high fiber stems that remain. These high fiber stems can cause digestive problems for deer if they are in a starving condition.

Modified barrels in clusters of three make very good supplementary feeding devices

Winter Feeding Research - A Team Effort

The field studies and experiments behind this bulletin were truly the result of a team effort. The senior author, Dennis Voigt, a Research Scientist with MNR, was assisted by three Biologists who played a key role not only in preparing this material but also in conducting research during the Cooperative Deer Study. Tim Bellhouse did extensive work on supplementary feeding in the Loring area in addition to deer ecology studies and the winter severity analysis presented here. Jim Broadfoot led field work in Huronia on deer behaviour and he has played a major role in the analysis and reports of the Cooperative Deer Study. Fiona McKay coordinated logistics and acted as a liaison biologist throughout the Study as well as helping produce this bulletin. Two Resource Technicians, Peter Smith and Gary Zacher played a key role in conducting the field experiments on emergency feeding which provide the basis for these guidelines. Peter has also assisted in much deer research for many years throughout the province.

The Research Team included many other biologists and technicians as well as many MNR District and Regional staff throughout many parts of the province. We wish to thank all those people who helped with field work and data collection and specifically J. Abbott, S. Emmes, D. Gilmore, P. Gormley, J. van Geene and B. Kraft for capturing and radio-tagging deer, V. Ewing, K. Maronets, M. Malhiot, and S. Nevard for both capturing and radio-tracking migrating deer, and J. Almond, M. Neitfeld, M. Reed, and P. Smith for radio-tracking. Special thanks are extended to J. Hamr, W. Lintack, and B. Thomas for their outstanding contributions to trapping, radio-tagging, and logistics. District staff, Roger Wolfe, Merilyn Twiss, Ernie Bain, and Paddy Stillar helped tremendously with Loring work. Howard Smith, Ray Stefanski, Al Stewart, Harry Orr, Mike Buss, Midge Strickland, Ron Black, Ken Morrison and Mark Stabb cooperated as they directed related deer and other wildlife management programs.

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All photos were taken by Peter Smith and Dennis Voigt.

EMERGENCY FEEDING RECOMMENDATIONS

Management actions to provide for the emergency winter feeding of deer should be based on decisions that consider the winter biology of deer, the severity of winter conditions, the proper selection of feed and delivery methods and the role of deer in natural ecosystems. The decisions involve assessment, predictions about winter weather, good judgement and careful monitoring of the situation as the winter develops.

Management Decisions and Actions

Late December-Early January

Determine start of deer yarding using snow depth

Criteria	*Rating*	***Action***
> 20 cm snow depth before December	Red	Discuss development of plans among partners
> 20 cm early December	Yellow	Discuss development of plans among partners
> 20 cm after mid-December	Green	Monitor

Early January

Assess mobility of deer

Criteria	*Rating*	***Action***
> 60cm snow depth	Red if Red or Yellow above, else Yellow	Make plans, arrange trailwork
40-60 cm snow	Red if Red above, else Yellow	Make plans, consider trailwork
< 40 cm snow	Green	Monitor

Plans include development of partnerships, decisions on where and how trail-breaking to occur, arrangement for provision of suitable feed type and quantity, plans for maintenance of trails during Jan-April, and communications. The trails should provide for access of deer to food, both natural and artificial and a trail network to allow delivery of food.

Recommended diets are specially formulated deer pellets or 1:1 to 1:4 mixtures of whole corn and oats. Rolled oats or coarsely milled oats are easier on the deer but more difficult to provide. Other feed types should be avoided if uncertain of their effect.

Late January-Early February

Predict end of winter, assess current snow depth and winter severity, evaluate herd status

Criteria	*Rating*	***Action***
SDI = 401, OWSI = > 72, Red or Yellow above	Red	Emergency Feed-start early February
SDI = 350-400, OWSI = 65 -71, no deer access to natural food or supplies very low, Red above	Red	Emergency Feed planned for late Feb
SDI 300-350, OWSI= < 64, deer mobile	Green, or Yellow if Red above	Monitor

Note: SDI is Snow Depth Index OWSI is Ontario Winter Severity Index

If emergency feeding is started, plan for the provision of feed on a sustained basis until the deer leave the yard in the spring. The only exception is that if conditions moderate so much that deer have complete access to natural food and they voluntarily do so.

If conditions suddenly become extreme, an ad-hoc feeding operation may be initiated on a yard-specific basis by considering the local herd and habitat.

What You Can Do

The Ministry of Natural resources has adopted an ecosystem approach to the conservation of wildlife and habitat. This means that our interactions with natural systems are managed to benefit a wide diversity of species and their habitats. Deer are an integral part of many of these systems and are managed at levels that the habitat can support in normal conditions. In approximately 1 in 10 winters severe conditions may jeopardize the sustainability of our deer herds. These emergency situations are determined by considering many factors as outlined in this bulletin.

The following organizations have assisted the ministry in a major way with the trail breaking, browse cutting, winter feeding or fund raising for these activities: Loring-Restoule Vacationland Association, Ontario Federation of Anglers and Hunters, Ontario Federation of Snowmobile Clubs and the Wildlife Winter Feeding Program Inc. The Ministry of Natural Resources would also like to thank the many individuals and local groups throughout Ontario who have played an important role in winter deer management over the years.

The Ministry of Natural Resources welcomes the assistance of landowners and conservation groups during emergency situations. Volunteers have devoted many hours to emergency feeding, cutting browse and breaking trails. During severe winters, the sustainability of our deer herd may depend upon the cooperation of partners which may involve local clubs, provincial associations or special interest groups. At other times, efforts can be profitably directed at improving natural habitat.

For further information on deer habitat and deer ecology, and how you can help in emergency feeding,contact the Ministry of Natural Resources Office nearest you. You may also contact The Ontario Federation of Anglers and Hunters at P.O. Box 2800, Peterborough, Ontario, K9J 8L5, about the Deer Save Fund and program at 1-705-748-6324 (e-mail ofah@oncomdis.on.ca) or The Wildlife Winter Feeding Program Inc. at P.O. Box 5332, Huntsville, Ontario, P1H 2K7 about its activities at (705) 789-5456.

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