# Management of Eastern Hemlock for Deer Wintering Areas

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## Abstract

Hemlock stands provide superior winter cover for white-tailed deer. When a site is suitable for the support of a hemlock community, a decision to undertake active management is appropriate, however the difficulty of securing adequate hemlock regeneration must guide and govern the timber management plan. The need to maintain deer wintering areas creates some limitations to the optimum application of silvicultural guides. Stand diversity caused by site quality variation, management history, or species composition can be exploited to improve quality of cover or to expand a wintering area. Up to 30 % of the main canopy can be non-hemlock, high value timber. A wintering area should be managed by area regulation to assure that at least 50 % of the area is in functional cover at all times. Uneven-age management using small group selection techniques maintains tree vigor and stocking levels for periodic timber yield, while also maintaining adequate winter cover for deer. Single tree selection is not recommended, because it does not adequately stimulate regeneration. Even-age regeneration practices are appropriate only when the stand is large enough to retain the required area of functional cover . Where the wintering area is comprised of large sawtimber with few stems available to replace a harvested component, or where the stand acreage is too small to afford winter cover following a partial harvest, a no-cut prescription is appropriate.

## Introduction

Of all the softwood species which provide winter shelter for whitetail deer (*Odocoileus virginianus*), hemlock stands afford the best.

For many years the designation of deer wintering area as a forest management objective has been made because the stand is currently a deer wintering area, and because wintering area management practices take priority over timber management practices. For some landowners with very strong wildlife interests, current use by deer is not a prerequisite. They will manage their hemlock as a deer yard secure in the knowledge that good winter shelter is available when the deer find it. The priority issue has been, and continues to be, determined by personal desires, institutional objectives, or political expedience.

We must now recognize the need to make a third, and more fundamental determination of whether the subject stand is growing on a hemlock site. Natural communities research which has been lead by Bill Leak for several years portrays a favorable future for hemlock stands. His studies show that many hardwood stands with an agricultural or active timber harvesting history will, in fact, yield to hemlock dominance in time (Leak, 1998,Thompson, 1999).

An active wintering area which is a product of a successional stand can be sustained only as long as human perseverance can hold back the inevitable. In some circumstances that decision can be justified, but the challenge must be acknowledged. A stand which is determined to be a hemlock community is worth the investment in time and effort to assess stand condition, and prescribe and implement management practices. The prospects for wintering area expansion will be good, and the liklihood of regeneration success will be strong.

## Deer Wintering Area Requirements

Deer wintering areas have only two significant components- dense softwood stands for shelter, and a supply of browse close by. Published literature and recommendations of wildlife biologists identify the following general guidelines for wintering area management:

1) within every wintering area there is a nucleus of high canopy, dense softwood which affords the best shelter during stressful periods. This is often referred to as 'functional cover'. In Vermont functional cover is defined as softwood greater than 35 feet in height, and greater than 70 % crown closure.

2) travel lanes consisting of undisturbed bands of softwood cover at least one chain wide should be preserved in every stand treatment. The travel lanes connect numerous small pockets of cover in large wintering areas, and provide routes to facilitate deer movement out of the nucleus for feeding during good weather.

3) no more than 50 % of the area of winter shelter should be disturbed in each entry

4) some diversity of age classes is necessary if a landowner plans to undertake active management, or if sudden loss of the shelter is to be avoided.

5) adequate supplies of nutritious browse close to the preferred cover must be assured.

## Hemlock Management

The initial choice between even-age and uneven-age management should be quickly resolved in favor of an uneven-age regime. The only exception is in the case of a large wintering area, say 50 acres or more, which is not currently used to its capacity. Some publications, notably Lancaster's 'Managing Eastern Hemlock, A Preliminary Guide'(Lancaster, 1985), and others written in the 1980s, recommend even-age management, not uneven-age. A careful reading reveals that the distinction between even-

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and uneven-age management is often based on scale, with clearcut and shelterwood regeneration practices defining even-age, and single tree selection defining uneven-age management. I favor group selection managment, and feel that it is legimately an uneven-age practice at the stand level, and even-age at the group level. There is broad agreement that single tree selection cutting is not an appropriate management regime, because it will not secure enough regeneration.

A managed deer yard should feature three types of softwood stand stucture-functional cover, thinned areas and regenerating areas. The functional cover is the area which must be capable of providing the necessary winter shelter, and this should be at least 50% of the wintering area. The 50% standard is based on the recognition that the short-term loss of half of the best winter shelter is tolerable, because active management will maintain or enhance stand health and vigor, prolong the useful life of the entire wintering area, and that the thinned areas have some shelter value, though diminished. The distribution of the functional cover throughout the wintering area can vary with stand size and terrain. A large stand could be divided in half , and treatments scheduled half a cutting cycle apart. In such a case the need to identify travel lanes would be minimized. Frequently, steep terrain or the presence of watercourses limit operating options, and subdivision of stands must depart from theoretical ideals. If travel lanes are evident, and there are no opportunities to replace or move them, there may be no choices of which areas to treat. In small stands the ability to undertake reasonable management practices often rests with the ability to enlarge the area of softwood cover.

The area to be regenerated requires the most careful planning and execution. If the area regenerated exceeds the ideal, the next entry may need to be delayed, or the area of functional cover may be reduced too much. If regeneration patches are too small or too few, successful regeneration may not become established, or the age and size of the main canopy may grow beyond the point of good merchantability. Regeneration needs can be calculated using the formula

**Cutting interval / rotation age = area to be regenerated**.

Regeneration patch size has been recommended to be no larger than one-half the height of the dominant trees (Reay, 1990), however a little larger patch size is probably acceptable. Due to the uncertainty of regeneration success, and the need to limit the reduction in shelter value of the adjacent stand, error on the side of caution is preferred. A very significant component of site preparation for hemlock regeneration is soil scarification to mix organic matter with mineral soil (Burns, 1990, Lancaster, 1985). This mixture is necessary for moisture retention to allow seedling survival after germination. If seedlings regeneration is successful, they are considered fully established at 3 to 5 feet in height, and can be released. In a wintering area, the real challenge is for seedlings to escape destructive browsing, and reach 5 feet in height.

## Thinning

Thinning should be undertaken in the treated area not identified for regeneration. This is expressed in the formula

**50% of wintering area - area to be regenerated = area to be thinned**

The purpose of thinning is primarily for timber objectives, and the long term vitality of the wintering area. In the short term thinning reduces the shelter value of the canopy, and the forest manager must recognize the trade-offs. Thinning should be to the B line on the hemlock stocking chart (Lancaster, 1985). Note that the hemlock stocking chart has a B line and a B' line. The B' line applies to stands with less than 30% hemlock, and such stands are not suitable wintering areas. It is worth noting, however, that a comparison of Bill Leak's (1983) percent crown cover tables and this stocking chart, shows that thinning a pure hemlock stand to the B' level will still maintain more than 70% crown cover.

## Cutting Cycle

The first cut in a previously unmanaged wintering area is fairly straightforward to prescribe as previously outlined. Subsequent entries must be scheduled based on regeneration success, and recovery of crown closure in thinned areas. It is imperative that 50% of the total wintering area be retained in functional cover at all times. A cutting cycle of twenty years is recommended as a starting point for site-specific determinations. A vigorous stand on a good site will recover faster than a less vigorous stand or one on a poorer site. Also the irregular composition and structure of many hemlock stands may allow for shorter cutting cycles if the hemlock shelter is not reduced.

## Discussion

The ideal conditions described above are rarely encountered, making the treatments difficult to apply if the forest manager tries to use the recommendations like a cookbook. In reality, most hemlock stands are irregular in stocking, structure and species composition. This irregularity is a distinct advantage for the forest manager, because the silvicultural demands and opportunities of the stand are readily apparent. In his study of Canadian deer yards, Telfer (1973) found that a high degree of crown closure in a dense stand was not as valuable as a more irregular stand with a substantial volume of softwood crown between ten and twenty feet above ground (Fig. 1). The high dense cover is effective at retarding snow depths, but the lower softwood crown component is valuable for moderating wind velocity. Although Telfer's work was done in spruce and fir deer yards, this diagram is typical of a patchy hemlock stand.

Unlike northern hardwoods or spruce and fir which respond relatively predictably to carefully prescribed treatments, hemlock stand dynamics include certain features which must be taken into account on a case by case basis. The first challenge is to obtain adequate regeneration, and culture it to a height and stem density where it can be factored into a schedule of stand treatments. In forest conditions hemlock seedlings grow very slowly. The three to

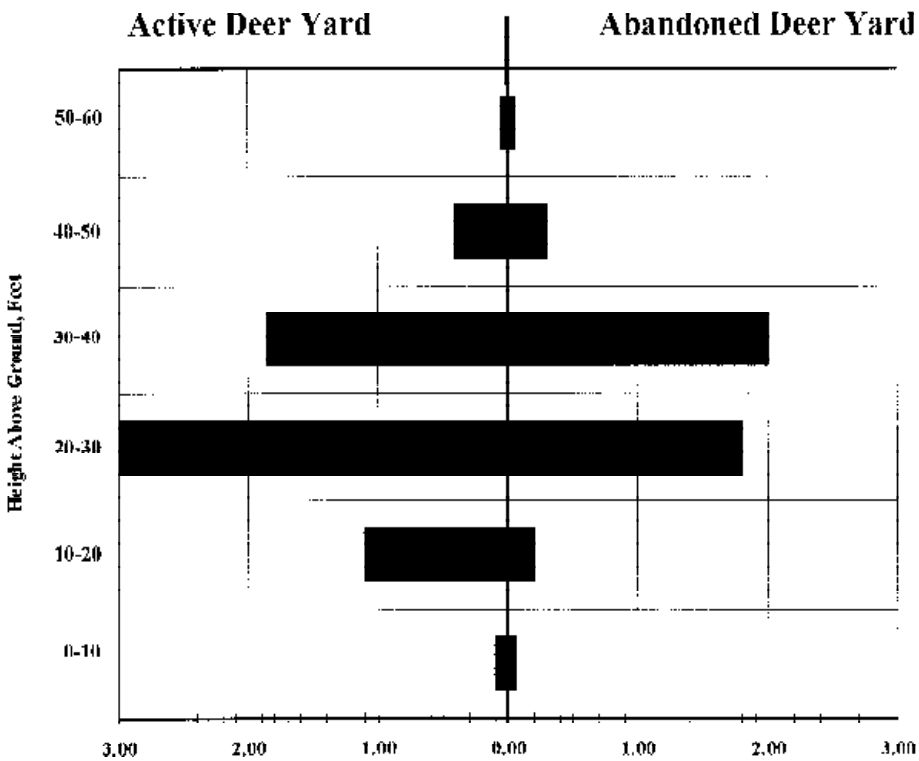


Figure 1.—Volume of space occupied by tree crowns in various height strata. Telfer's figure 1 (1978) converted to English units.

five foot height needed for full establishment may take several decades, especially if destructive browsing occurs. When thinned area recovery proceeds faster than regeneration can be established and brought into the management schedule, the schedule no longer can be applied. This usually means delaying treatments.

One characteristic of hemlock on hemlock sites ( a hemlock community), is its tendency to regenerate slowly, one stem at a time, around the perimeter of a predominantly hemlock stand. These stems grow in a supressed condition for many years, and usually do not afford winter shelter. However, if the stems occur in small groups or at a spacing of less than 20 feet they can be released, and the area they occupy can be added to the wintering area. Matt Kelty (1984) found that understory hemlock which appears to be stagnant is frequently vigorous enough to respond to partial release. For management purposes, this understory hemlock can be considered regeneration for purposes of calculating areas of allowable treatment.

Another characteristic of irregular hemlock stands is its tendency to grow as a dominant or lesser component of mixed stands. Common associates are white pine, oaks, beech, maples, and birches, and their incidence is strongly influenced by site quality and land use history. This mixed stand condition is often the deciding factor in implementing wintering area management practices on lands where the owner has a strong timber management objective. Because of its strong shade tolerance, up to 30% of the main canopy of a hemlock wintering area can be in high-value timber species to offset the low value of hemlock (Reay, 1990). In mixed hardwood and hemlock stands, some regeneration attempts may secure hardwood instead of hemlock, and the forest manager should not feel compelled to take extreme measures to eliminate the hardwood. In mixed pine and hemlock stands, the structure can often be described as a hemlock canopy under a white pine superstory. If care is taken to minimize logging damage, the pine stand can be managed indepently of the hemlock. In this instance, stand entries can be made on a pine management schedule, with less attention to the hemlock regeneration imperative.

Two final stand conditions to be considered are those in which there is not enough structural diversity or vigor to allow for recovery of crown closure following a thinning, or stands which are so small that any reduction of winter shelter is unacceptable. The condition of too little structural diversity is usually found in a mature stand with an inactive land use history, or a stagnant stand on poorly drained or extremely shallow soil. These stands will not respond to treatment within a reasonable time frame, and to continue their function as wintering areas, should not be cut. Small stands of hemlock which provide shelter for a few deer during extreme conditions are unlikely to support a commercial entry in only half the area, and there is the significant risk that any cutting will compromise the shelter value of the whole stand. A no-cut prescription is also appropriate in this instance. The longevity of hemlock, up to 900 years, minimizes the risk of such decisions.

## Conclusions

Hemlock stands provide excellent winter shelter to whitetail deer in the northern portions of their range. These wintering areas are recognized as valuable resources by natural resource professionals, public agencies, land use regulations, many landowners, and the public at large. Research and experience has shown that wintering areas can be actively managed for wood product yield without unacceptable impacts on the shelter value. Hemlock presents formidable challenges in its difficulty to regenerate, slow juvenile growth rate, and low market value. These difficulties are somewhat offset by the species' ability to regenerate slowly and in low numbers on the periphery of a large stand, its ability to respond to release after long periods of suppression, and its great shade tolerance which allows forest managers to retain a component of higher value species without undue impact on winter shelter.

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