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Guidelines for Integrating Deer and Timber Management in northern New York

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Project Title: Wildlife Ecology, Behavior and Habitat Improvement in New York.

Study No. and Title: XIII - Deer Management Research in Northern New York Ecosystems.

Study Objective: To research selected aspects of deer resource dynamics that have been identified as key components in the re-definition and/or implementation of deer management strategic plans and programs in northern New York.

Job No. and Title: XIII-11 - Guidelines for Integrating Deer and Timber Management in northern New York.

Job Objective: To prepare the text and figures for an extension bulletin providing guidelines for integrating deer management with timber management in northern deciduous-coniferous forests of the Northeast.

Period Covered: April 1, 1983 - March 31, 1984.

Abstract: A 20 page manuscript was prepared describing a forest management program designed to integrate deer and timber management in forested regions of the Northeast. This text will be used to develop a bulletin for distribution to private forest landowners and forest managers. The basic requirements of white-tailed deer in northern forests and the components of a successful timber management program are emphasized. The interaction between deer and forests, the assessment of the impacts of deer on forests and techniques to reduce or counteract these impacts are discussed. This integrated forest management program incorporates the management of both summer and winter deer range with a timber production program. Alternative management systems are presented including a discussion of the advantages and disadvantages of each system.

Background: This job was developed in order to present, in a concise manner for public distribution, concerns, concepts and practices related to deer and timber management described in detail in a previous job (XIII-6 - Development of a forest land management plan for a parcel of private land in the central Adirondacks).

Procedures: Project personnel developed a proposed outline for this bulletin which was reviewed by D.E.C. staff. As each section of the manuscript was completed, it was sent to D.E.C. personnel for review and comments. These comments were then incorporated into the revised manuscript. The completed manuscript attached to this report, represents the result of these cooperative efforts.

Findings: See attached manuscript.

Analysis: Not applicable - see attached manuscript.

Recommendations: Following review of this final manuscript, an informational bulletin using the text material included under this job should be developed and distributed to interested private landowners and forest managers in northern New York.

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INTEGRATING DEER AND TIMBER MANAGEMENT IN NORTHERN FORESTS

INTRODUCTION

This bulletin is intended for forest landowners and managers located in the extensively forested northern regions of New York, New Hampshire, Vermont and much of the state of Maine. Within this general area, the information presented is most applicable to forested areas dominated by mixtures of three common forest types:

1) Northern hardwood type - primarily composed of sugar maple, American beech and yellow birch. Associated species include red maple, white ash, black cherry, paper birch, white pine, red spruce and hemlock.
2) Hardwood-conifer type - typically includes varying combinations of yellow birch, red maple, beech, red spruce and hemlock. Other species commonly associated with this type include balsam fir, white spruce, white pine, white birch and sugar maple.
3) Spruce-fir softwood type - represented by varying mixtures of red spruce and balsam fir. Associated species include white spruce, white pine, white cedar, red maple and paper and yellow birch.

Much of this information may be of interest to landowners of small parcels of land; however the implementation of the concepts and management techniques presented is most applicable to continuous tracts of forest land of at least 1,000 acres.

This bulletin provides forest land managers with a practical approach for integrating white-tailed deer and forest management objectives. The

primary goal of this approach is to manage forests to grow, harvest, and reproduce commercially desirable tree species while maintaining or increasing the usefulness of the area for deer.

A key component of integrating deer and timber management is enhancing tree species diversity. Enhancing diversity increases flexibility in future forest management options. First, foresters can adjust to changing wood product markets. Secondly, diversity has the potential to reduce the economic impact of disease and pest infestations in forest stands. Finally, tree species diversity is generally beneficial to deer and other forest wildlife.

Integration of deer and forest management is a challenge that can only be accomplished by having a firm understanding of the concepts involved and the flexibility to apply these concepts. This conceptual framework is essential because of the dynamic nature of deer and forest interactions. For example, one cannot make the generalization that cutting forest stands is beneficial to deer. The forest type involved and the timber harvesting scheme largely determine the value of the subsequent stand to deer. Evaluating the potential value of deer habitat requires an understanding of the food and cover requirements of deer in a forested environment.

WHITE-TAILED DEER ECOLOGY

Food Requirements

White-tailed deer are very adaptable in their food habits and are known to feed on over 600 different species of plants. Although deer are classically termed browsers, they may eat primarily herbaceous plants, aquatic vegetation, and fruits when available. However, in completely

forested areas, deer are dependent on woody plants to survive through the late fall and winter. Providing an adequate food supply for deer requires attention both to quality and quantity of forage available to the animals as well as an understanding of seasonal changes in energy requirements of deer.

In terms of quantity of forage, the most important factor is the amount of vegetation within the reach of deer. Deer can use vegetation up to approximately 6 feet in the non-snow months and can reach higher, depending on depth and texture of snow, in the winter. Generally, recently cut stands (up to 15 years after cutting) have the highest food value for deer. Pole timber stands have the lowest food value to deer because little vegetation is within reach. As a stand matures and openings in the canopy occur, some ground vegetation will develop and the value of the stand to deer increases. However, at no point in stand development is more food available to deer than in the regeneration phase.

The plant species composition of the regenerating stand is also an important consideration. Different species of woody vegetation vary in their nutritional value to deer. A good example of low quality forage is beech. On hardwood and hardwood-conifer sites, areas that are cut and regenerate primarily to beech will be of low food value to deer even though there may be a dense layer of vegetation within reach. Regenerating the stand to higher quality forages such as white ash, sugar maple, yellow birch and hemlock will supply better forage for deer.

Requirements for high quality forage change depending on the seasonal energy demands of deer. For example, gestation and lactation are energy demanding processes and therefore female deer must increase consumption and seek high quality forage during pregnancy and especially at the peak

of lactation. However, the most critical period for deer in terms of meeting energy requirements in areas such as northern New York, Vermont, New Hampshire and Maine, generally occurs during winter months. Deer in these areas are typically subjected to prolonged severe winters and mortality from malnutrition may occur. During severe winters, survival rates for fawns may be especially low because of their small size and limited fat reserves. A good summer and fall food source will enable deer to enter winter in the best condition possible and will increase chances for winter survival.

The importance of woody browse in the winter diet increases in areas where deep snow restricts deer movement and reduces availability of ground cover vegetation. In such areas, tree saplings and woody shrubs are important winter food. From the standpoint of availability and distribution, witchhobble is one of the most important winter browse species.

Winter Shelter Requirements

During spring, summer and fall, cover is not generally a limiting factor for white-tailed deer in heavily forested areas. However, suitable winter range is a critical component of white-tailed deer habitat in areas with severe winter weather. In areas of deep snow, winter home range size of deer is often 10-20% of the summer home range size. This winter home range is selected for its ability to modify severe weather conditions and may be widely separated from a deer's summer home range. These areas are commonly referred to as deeryards, but are more accurately termed winter concentration areas. Deer densities in these areas may exceed 100 deer/ square mile.

Winter concentration areas are typically characterized by dense

mature softwood stands. Frequently, these areas are pure or mixed stands of red or white spruce, balsam fir, white pine, eastern hemlock or northern white cedar. Softwood cover appears to be the most important element of this type of winter concentration area as it provides shallower snow depths because snow is retained in the crowns of mature softwoods. Softwood cover may also provide reduced wind speed, higher temperatures, narrower daily temperature fluctuations and higher relative humidity than areas lacking this shelter. Selection of these areas is an unKnown process, however once an area is selected, deer will continue to use the same area until it no longer has the proper habitat components. Therefore, if these winter concentration areas exist on your ownership, they should be managed with extreme care. It must be emphasized that even though other areas of seemingly suitable habitat may exist, deer may not use them. Destruction or unwise management of the traditional area may result in a drastic reduction in local deer densities.

WHITE-TAILED DEER AND FOREST REGENERATION

Effects of Deer on Forest Regeneration

Browsing of seedlings by white-tailed deer can be the most important factor determining the development of regeneration in a forest stand. Tolerance of the impacts of deer browsing will vary among landowners depending on forest management objectives. The level at which deer need to be maintained to avoid negatively impacting vegetation is variable and depends on many factors that will be discussed later. Because the intent of this bulletin is to provide guidelines for managing deer in a manner which is compatible with timber production, we will discuss the impacts of deer on regeneration from a commercial forestry perspective.

The most severe and easily recognized effect of too many deer is a complete prevention of regeneration of commercially valuable tree species. If regeneration is prevented, a stand may be inundated with ferns, grasses, or non-commercial woody plants. Reclaiming such areas for forestry can be a very expensive process.

A more common impact of deer is in changing the species composition or causing inadequate stocking of desirable or commercial species in a regenerating stand. Deer preferentially feed on some species of woody plants and can cause reduced numbers of those species in the regeneration. For example, in northern hardwood stands that support high deer populations, resource managers commonly see a decrease in sugar maple and yellow birch regeneration relative to the amount of beech in the stands. The increase in the beech component of these stands often results from preferential feeding of deer on maple and birch seedlings. In spruce-fir stands, there may be a decrease in balsam fir and an increase in red spruce because fir is a preferred deer food compared to spruce. Preferential feeding habits of deer are not necessarily detrimental. Deer also feed heavily on some non-commercial species such as pin cherry, striped maple, and witchhobble.

Another common impact of deer is to retard height growth of regeneration, thus delaying its development. Regenerating stems may be heavily browsed year after year. Some species, such as yellow birch, are intolerant to this repeated browsing and will begin dying off after several years. Other species, such as sugar maple, can withstand many years of browsing. Sugar maple stems may persist for 10 or more years without growing out of a deer's reach. Even if these stems eventually grow out of a deer's reach, there is a financial loss associated with this

delay. For example, if a commercial timber grower experiences a 10-year delay in what should have been an 80 year rotation, this represents a 12.5% increase in rotation length.

When trying to evaluate the effects of deer on forest regeneration, it is critical to note that these effects cannot be attributed solely to differences in deer density. The same number of deer per square mile may in one instance cause undesirable changes in forest stand composition, whereas in another area, it may have no adverse effect or even a desirable effect.

In addition to deer density, many interrelated factors affect the response of woody vegetation to browsing by deer. These factors include species composition of a forest stand, age and rate of growth of vegetation, tolerance of vegetation to browsing, site quality, intensity of browsing, and the time of year at which browsing occurs. Clearly, it is impractical to suggest that a private landowner try to evaluate all these factors. However, if the habitat available on your land is supporting too many deer, you can indirectly evaluate the extent of over-population by assessing the quality of your forest stands or the quality of the deer herd your land supports.

Recognizing Effects of Deer on Forest Stands

Often landowners may recognize that deer are impacting their forest lands but find it difficult to evaluate the magnitude of such impacts. Species composition shifts and delays in establishment of regeneration may be subtle and difficult to detect merely by observing the stand. Exclosures, areas that are fenced to keep out deer, are a relatively easy method for detecting these changes.

Exclosures may be almost any shape or size but the area inside the

exclosure should be at least 200 square ft. Many types of fencing can be used, but the major requirement is that the fence be at least 6 feet high and last at least 5 years.

Because the greatest impacts of deer are on regenerating stands, you should concentrate exclosures in cut stands. Following the harvesting of a stand, erect several exclosures (3-6 should provide an adequate sample) distributed throughout the cut. Try to erect the exclosures as soon as possible after cutting, at most one year. If you want to evaluate the impact of deer on advanced regeneration, you may want to erect exclosures in an uncut stand that has regenerating stems in the understory.

One visit a year to the exclosures should be sufficient to see if changes are developing due to the elimination of deer. If time allows, you should tally the woody vegetation inside the exclosures by species and height class. Conduct a second tally in a control area of equal size outside each exclosure. Comparing the tallies inside versus outside the exclosures, you can determine if species composition or height growth of regeneration are being affected. These effects may not show up immediately, but if differences exist, you will probably see them within 2-5 years after erecting exclosures.

In addition to evaluating the impact of deer on the quality of your forest land, you may also want to directly consider the quality of your deer herd. Excessive deer densities not only impact forest regeneration adversely, but result in poorer quality deer. Body weight and antler beam diameter are two of the most common indices used to evaluate the physical condition of deer.

The easiest way to collect information on the physical condition of deer is by checking animals harvested during the hunting season. Little

training is required to collect weight and antler beam diameters. However, to evaluate weight and antler beam measurements, you also need to know the age of animals harvested. Age can be determined by examining tooth wear and replacement. If a trained individual is not available to age the deer at the time of harvest, one side of the lower jaw can be removed and saved. Jaws from animals that are being mounted can be obtained from a taxidermist. Arrangements to have deer aged can often be made with state game agencies or other trained individuals.

As you would expect, deer from an overpopulated range tend to be smaller than deer from a herd that is in balance with the available habitat. The antlers are also a good reflection of the condition of the deer herd. Because antler growth is an extremely energy demanding process, a buck with a high quality diet generally has the potential to grow bigger antlers than a poorly nourished buck. Age is also an important factor in antler development. A trained individual can combine information on the age of the deer harvested on your property with the antler beam measurements from the bucks and evaluate the condition of your deer herd. Most state game agencies conduct deer checking programs and are skilled in evaluating condition indices.

The results of the evaluation of the physical condition of your deer herd and the results of exclosure regeneration tallies should allow you to determine whether or not deer densities need to be reduced on your forest land. The most effective method of reducing deer density is through a hunting program. If you already allow hunting on your property, you may want to expand your current program. There are several alternatives available to allow you to develop a hunting program that suits your forest management objectives.

Controlling Deer Density

Control of deer densities should not be looked upon as a cost by the forest land manager. The deer resource is a valuable product of managed forest land and should be viewed as an additional source of revenue available to the forest landowner. Although the actual ownership of game lies in the hands of the people of each state, the private forest landowner controls access to the game on his land and is, therefore, in a position to capitalize on this situation.

Currently, the pursuit of deer for hunting purposes represents the only real demonstrated demand of the deer resource upon which the landowner can capitalize. Two basic approaches towards capitalizing on the value of the deer resource are available to the forest manager, leasing land for hunting and fee hunting.

Land lease arrangements are the most common technique used in northeastern forests in which large parcels of land are privately owned. Under this system, the landowner leases a parcel of land to a group of people who then pay a prescribed sum to the landowner on an annual basis. Generally, there is a written agreement between the two parties that describes the details of the arrangement. The advantages to the landowner of this system include: minimal administrative costs, some degree of control over the use of the land, an organizational structure with which to work (i.e. hunting club), and a guaranteed annual income.

Fee hunting represents an alternative approach to capitalizing on the value of the white-tailed deer resource. This system is not widely practiced in the Northeast, but has been used extensively in parts of the South, Southwest, and western United States.

The primary advantages of fee hunting (which involves a direct charge

assessed each individual hunter on a daily, weekly, or seasonal basis) are related to the landowner having maximum control and flexibility over the hunting that occurs on his ownership each season. Fee hunting may represent a more appropriate approach where forest management is practiced under an even-aged management system. For instance, hunting activities and hunter densities could be focused on areas where deer density control is necessary to assure development of new regeneration. The location of this intensive hunting could be changed every few years as new areas are regenerated and deer density control becomes necessary.

In general, land lease arrangements involve year round accessibility to the land by leasees. Fee hunting, on the other hand, could restrict use of the land to the hunting season, or portions thereof, as determined by the landowner. Restricted use of this kind may permit other activities to occur on the ownership during the remainder of the year.

Another important question remains to be addressed in regard to deer density control. Researchers have shown that when deer density control is necessary, female deer must be removed from the population to achieve the desired population reduction or to maintain population levels. In many regions of the Northeast, the ability to harvest antlerless deer is provided for by means of a special permit or special season. Other areas operate under a "bucks only" restriction and alternative methods are needed to achieve the desired population control. In many parts of the Northeast, archery and muzzleloader seasons have been established. During these seasons, each licensed hunter can harvest one deer of either sex. These seasons provide the only means of harvesting female deer in some areas. You should note that archery hunting alone will probably not provide adequate hunting pressure to control deer densities.

In summary, given adequate access, hunting pressure, and a system for harvesting female deer, public hunting during the regular fall season can:

1) effectively control deer density,

2) generate significant additional revenue for a private landowner, and

3) increase the chances for successfully regenerating a forest stand.

A deer density control program is not a cure-all for problems involved in regenerating forest stands. A reduction in deer density will not alleviate species composition changes that occurred prior to herd reduction. Counteracting these changes may require site preparation in combination with reduced deer density. Furthermore, undesirable species composition can result from factors other than deer.

Counteracting Changes in Species Composition

In addition to controlling deer densities, forest managers must often practice site preparation to successfully regenerate forest stands. Site preparation, in the general sense, can be thought of as modifying a site to render it more suitable for natural regeneration. Due to species composition and site characteristics present in the Northeast, site preparation frequently involves chemically treating undesirable understory vegetation with herbicides. Two basic techniques have been employed successfully to chemically control undesirable understory vegetation: broadcast treatments and individual stem treatments.

When stem densities of undesirable species are high (400-1000 stems/acre) and a large majority of these stems are in the 1/2 to 3 in. DBH (diameter at breast height) class, broadcast applications of herbicides are most effective and most economical. If stem densities are less than 300-400 stems/acre and trees are generally larger than 3 in.

DBH individual stem treatments are generally best. Other situations that require use of the individual stem treatment technique include stands where slopes, topography, and wet or rocky ground would prevent uniform coverage of broadcast application equipment, and stands in which adequate numbers (greater than 1000 stems/acre at least 6 ft. in height) of sapling sized stems of desirable species would be killed if broadcast treatments were employed. Use of individual stem treatments near sensitive areas such as property boundaries, buildings, lakes or streams, public roads, or anywhere drift might cause a problem, would also be appropriate.

TIMBER/DEER MANAGEMENT STRATEGIES

A properly planned forest management program must have a well defined set of objectives which will establish the direction of the program and permit periodic evaluation of attainment of landowner goals. These goals and objectives should be clearly stated in a comprehensive management plan developed for each ownership. You must recognize the importance of both summer and winter range to the welfare of white-tailed deer when defining timber management strategies.

A primary decision directly related to landowner objectives, site and forest stand characteristics will be the selection of a management system. Both even-aged and uneven-aged management systems are useful in managing the forest types addressed in this bulletin.

Even-aged management is the management of a forest stand composed of trees having relatively small differences in age (generally less than 20 years). This form of management is most appropriately used where:

1) site conditions and access are restrictive (i.e. topography, drainage, road systems),

2) shade intolerant or mid-tolerant species (i.e. aspen, black cherry) are desired,

3) trees left following cutting are subject to windthrow (i.e. lowland spruce-fir stands),

4) intensive forest management practices such as planting, fertilization, site conversion, or site preparation are required,

5) deer densities must be controlled during the regeneration period, and

6) resource managers desire to enhance tree and other plant diversity.

Uneven-aged management is the management of a forest or stand composed of trees that differ markedly in age (generally greater than 20 years). This form of management is most useful where:

1) establishment of desirable regeneration is not a problem (i.e. site preparation not required),

2) shade tolerant species are desired (i.e. sugar maple, beech),

3) land use regulations, policies, or other concerns discriminate against even-aged management,

4) site conditions and access are favorable, and

5) deer densities are not adversely impacting the development and species composition of forest regeneration.

A landowner may choose to use both forms of management within his ownership depending upon stand characteristics, forest types, and management objectives.

Two widely used silvicultural systems used to regenerate stands under an even-aged management system are:

1) clearcutting - the forest crop is cleared over a considerable area at one time; regeneration of a new forest can be either by artificial means (planting) or natural seeding.

2) shelterwood cutting - the forest crop is removed in two or three successive stages with the residual trees providing seed and protection for the establishment and early development of the new regeneration. The first cutting is referred to as the seed cutting. Subsequent cuts which eventually remove the entire original forest crop are known as removal cuts or the final cut.

Clearcutting may be used in conjunction with the management of tree species whose seeds can be widely dispersed by wind (aspen, birches, and most conifers) or seed-eating animals. Adequate regeneration following clearcutting can also result from seed stored in the ground for species such as black cherry, or from advanced regeneration that is present prior to cutting. Site preparation, if required, is generally done immediately following cutting.

Under the shelterwood system, site preparation, if required, is frequently done prior to seed cutting. Seed cast by the residual trees, stored in the soil, or from off-site provides the seedlings to stock the new stand, Trees of the relatively heavy-seeded species such as sugar and red maple, white ash, and black cherry should be left well distributed over the site as part of the shelterwood stand.

Both of these regeneration systems lead to the establishment of an even-aged stand composed of a variety of species. Under the shelterwood system, the residual trees are removed when the regeneration is well established (usually within 10 years) to enhance the develoment of the new

forest crop.

The silvicultural system used in conjunction with uneven-aged management is the selection system. Selection cutting is the periodic removal of trees individually or in small groups (group selection) from an uneven-aged forest to realize yield, encourage growth on residual trees and establish a new crop of irregular constitution. Natural seeding is relied upon to provide new seedlings to stock the stand.

The selection system requires cutting trees across the entire range of diameter classes present in the stand to maintain the appropriate distribution of size and age classes. Thus, small unmerchantable trees may have to be cut along with larger trees at each cutting interval. Failure to follow this prescription will result in an inbalance in size classes which eventually will limit harvesting opportunities (yield) in the future. Unfortunately, many forest stands managed under the guise of the selection system have actually been selectively cut removing only the larger, higher quality trees without regard for maintaining the required distribution of size classes. These stands frequently are dominated by an overabundance of sapling and pole-sized stems.

Timber Management on Summer Deer Range

Cutting units set up for regeneration cuts in hardwood or hardwood-conifer stands managed under an even-aged system should generally not be less than 50 acres, with 100 acres being a more preferred size. Units such as these should be practical to operate using conventional harvesting equipment, large enough to facilitate other management activities (i.e. site preparation, road construction), and less likely to be adversely impacted by white-tailed deer.

The regeneration stage in the development of these even-aged hardwood

and hardwood-conifer stands (up to 15 years of age) provide ideal spring-summer-fall range for white-tailed deer. These areas provide a wide variety of both herbaceous and woody browse material well within the reach of deer. Under a shelterwood management system, this stage will be extended an additional 5-10 years because harvesting the residual shelterwood trees will set back development on a portion of the area. However, development of the new even-aged stand will eventually result in complete canopy closure at a height not accessible to deer. The dense shade of this tree canopy will discourage the development of ground cover vegetation, resulting in a relatively poor habitat for deer. This situation will continue for many years unless periodic thinning, designed to encourage growth of residual trees, provides openings in the stand.

Even-aged stands on hardwood and hardwood-conifer sites managed for sawtimber production should be thinned at least twice (at approximately ages 50 and 80 years) before reaching rotation age (100-120 years). An earlier thinning around age 30 may also be required in some stands to maintain stand development. This thinning at age 30 would not result in a commercial product, as the trees removed would be too small to be merchantable. The objectives of each thinning should be to provide adequate growing space for residual trees, maintain species diversity, and retain the highest quality stems. Thinnings would enhance stand development and promote browse production for deer. Heavier thinning would be preferred to light thinnings throughout the rotation to increase browse production.

Uneven-aged management under the selection system has the potential to prevent prolonged periods of low browse production due to the relatively short cutting cycles (10-15 years) that open up the stand at

regular intervals. However, establishment of regeneration resulting from each cut is never as extensive as that associated with even-aged management. As a result, browsing by white-tailed deer can have severe impacts on the development of the limited amount of regeneration established. Other factors may also limit the establishment of regeneration.

Selection cutting favors the development of shade tolerant species (generally reducing species diversity) because the small "holes" created by the removal of individual trees restrict light penetration to ground level. Shade tolerant species are generally slower growing than shade intolerant or mid-tolerant species. Group selection, where trees are harvested in small patches throughout the stand, encourages establishment of a greater proportion of intolerant and mid-tolerant species and can enhance browse production.

Repeated cutting, at regular intervals, is basic to an uneven-aged management system. Damage to some residual trees is likely to occur as a result of each harvesting operation. Following several cuttings, it is possible that many of the stems in the stand could be damaged. This would have an adverse effect on future stand quality and development, particularly in stands managed for sawtimber production.

Recognition of these limitations of uneven-aged management may assist the forest land manager in avoiding these problems. Selection system management has been used successfully to establish regeneration of desirable species and encourage stand development. In these instances, this system can be beneficial to local deer populations and provide valuable timber products for the future.

Timber Management on Winter Deer Range

Winter concentration areas are vital to white-tailed deer survival in northern regions and require consideration in forest management programs. Both hardwood-conifer and spruce-fir stands are used by wintering deer. Presence of deer in winter during periods of restrictive snow conditions (snow depths exceeding 10-15 inches) is the primary consideration in identifying deer wintering areas. Once identified, the objectives of the forest land manager should be protection, maintenance or development of the stand characteristics associated with these critical areas.

In contrast with summer deer range, where food production within reach of deer is a primary deer management concern, winter range must provide appropriate overhead shelter in addition to a food supply within 2-8 ft. of the ground. Shelter requirements are related to stand density and softwood crown closure. Areas comprised of greater than 50% conifers, with softwood crown closures of 50-75% are most frequently used by wintering deer. However, heavy overhead cover generally inhibits development of a diverse ground cover which could supply the food resource needed by wintering deer and eventually provide a new forest crop. A well planned even-aged management program developed for each deer wintering area within the ownership can resolve this apparent conflict.

The basic strategy for management of softwood stands serving as deeryards is to maintain at all times at least 50% of the area in the 40+ year age class and to promote regeneration of softwood species. This objective can usually be met under either a pulpwood or sawtimber rotation, depending upon landowner goals.

In addition to the factors associated with even-aged management mentioned earlier, this system is especially appropriate to the management

of softwood stands because it:

1) minimizes the losses due to windthrow,

2) favors the use of whole tree harvesting equipment,

3) is compatible with the silvicultural requirements of most of the tree spepcies involved, and

4) can provide both the shelter and feeding areas required by wintering deer.

Both clearcutting and shelterwood cutting systems can be used in deeryard management. Clearcutting should be used in spruce-fir types primarily managed for pulpwood production, while hardwood-conifer stands are frequently managed under a shelterwood system and a sawtimber rotation.

The shelter requirements for deer are maintained by only cutting a portion of the deeryard at any one time. Cutting units should be relatively small, generally 5 to 10 acres in size. These units should be distributed throughout the wintering area, with particular attention given to maintaining continuity within the uncut or mature (greater than 40 years old) residual shelter areas. The newly cut areas will serve to provide browse for wintering deer as regeneration develops. Small, well distributed areas are favored over large areas as deep snow will prevent deer from moving into larger openings except when favorable snow conditions (crusts) occur.

The interval between cuts and the total area cut during each interval should be proportional to the size of the stand and the rotation age. Some compromises will be necessary to accommodate varying stand characteristics as the stand is incorporated under such a management scheme.

Hardwood-conifer and spruce-fir stands that are not used as winter deer concentration areas can be managed in the same manner, however larger cutting units may be more appropriate in these situations.

The high concentrations of deer typical of wintering areas are likely to impact the establishment and development of the regenerating units. Species composition may be affected, with deer browsing severely restricting the development of preferred browse species such as hemlock and white cedar, and to a lesser degree, balsam fir and certain hardwoods. These effects will be most severe along the edges of the regeneration areas and within the uncut shelter areas. The inability of deer to forage throughout the regeneration units due to restrictive snow conditions should encourage adequate establishment and development of desired tree species.

Successful management of deer wintering areas under an uneven-aged management system may also enhance deer use of the area as spring-summer-fall range. Summer use, without restrictive snow depths, may result in severe impacts on developing vegetation in regenerated units. This impact could be reduced with an effective fall hunting program.

SUMMARY

To develop a successful forest management program, which integrates both the timber and white-tailed deer resources, you must understand the basic requirements of these two components of the forest ecosystem and consider the interaction of these components.

The information and methodology presented in this bulletin should be considered as a guide which can be used to aid you in constructing a biologically and economically sound management plan for the lands under your jurisdiction.