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A REVIEW OF TECHNIQUES FOR MINIMIZING BEAVER AND WHITE-TAILED DEER DAMAGE IN SOUTHERN HARDWOODS[1]

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Abstract: Methods of reducing beaver and deer damage to hardwood forest resources are reviewed. Beaver controls considered were poisons, chemosterilants, predators, and trapping. Population reduction through trapping with 330 conibear traps for two weeks during two successive years effectively eliminates beaver from small watersheds and shows greater promise for control than other techniques considered.

Control measures for minimizing damage by deer include trapping, fences, chemicals, protective coverings, scare devices, repellents, and herd reduction. Deer damage has been reduced in certain instances by fences and physical barriers, but economic impracticalities limit them for widespread use. Herd reduction is the most practical control method for deer damage and is believed to be the best solution. Hunter harvest is the best method to accomplish herd reduction.

Additional keywords: white-tailed deer, damage control, hardwood, *Castor canadensis*, *Odocoileus virginianus*.

INTRODUCTION

Of the 215 million acres of commercial forests in the South, nearly 143 million (66 percent) are hardwood (Sternitzke 1975). In the past, high-grade cutting practices were followed by natural regeneration that proceeded at its own pace. These are being replaced in the hardwood forest products industry by more intensive management practices. Among these are improved planting stock and improved growth rates through intensive site preparation, cultivation, and plantation-style stand management. The high cost of hardwood regeneration today necessitates minimizing mortality and eliminating factors or defects that delay growth or downgrade the final product.

Two animal species considered as significant threats to hardwood timber production in the southeastern United States are the beaver (*Castor canadensis*) and the white-tailed deer (*Odocoileus viginianus*). Damage caused by the two species differs. That attributable to beaver usually occurs adjacent to streams and is dramatically obvious, whereas that attributable to deer is generally less restricted and may pass unnoticed by the untrained observer.

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The intent of the following discussion is to relate, through description of the damage, the nature of the conflict between timber producers and the two animals, and to review the results of efforts to correct or minimize the areas of conflict.

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BEAVER

Following a period of population decrease in the late 1800's there was generally an era of beaver restoration that extended into the mid 1950's. Restoration efforts were generally limited to relocating live-trapped beaver. Beaver moved up and down major rivers and tributaries without regard for state boundaries; with few natural enemies and reduced interest in trapping, their populations expanded and increased rapidly.

Hill (1976) summarized the current range and distribution of the beaver within the region including some dollar estimates of damage or acre estimates of damage or both where they were available from individual states. Woodward et al. (1977) and Godbee and Price (1975) subsequently published damage estimates for South Carolina and Georgia respectively.

Variation in the woody and succulent food-plant species and the relatively milder climate of the Southeast appears to be less limiting to beaver than the colder latitudes of the North or higher altitudes of the West where major winter foods may be limited to two or three woody species stored in a cache near the lodge or den. The vast majority of hardwood lands in the Southeast where beaver damage has been reported are situated below 450 m elevation. Stream bottom conditions, stream turbulence, and the steep topography at higher altitudes in the Southeast are generally less favorable for the establishment and maintenance of beaver ponds and populations.

Nature of Damage:

The most serious beaver damage reported by forest landowners of the Southeast is the loss of timber stands in bottomlands as a result of inundation behind beaver dams. The initial loss occurs as the existing stand dies, and there is the loss of the annual growth increment that occurs as long as the land remains flooded. Generally the economic loss incurred from inundation is greater in the relatively flat terrain of the Gulf Coastal Plain than in the steeper topography of upland situations such as exists in the Alabama and Georgia Piedmont or similar hilly regions with relatively narrow valleys.

A second type of damage by beaver is caused by feeding activity. Beaver may fell commercial and noncommercial trees up to 6 inches d.b.h. In addition, larger trees may be partially or completely girdled from ground level up to 0.7 m. If this activity does not kill the tree, it may retard growth or increase disease susceptability resulting in reduced market value, particularly for veneer purposes. The cambium of yellowpoplar (*Liriodendron*

tulipifera), sweetgum (Liquidambar styraciflua), bay (Persea spp. and Magnolia spp.), cottonwood (Populus spp.), pine (Pinus spp.), and willow (Salix spp.) is frequently utilized as food by beaver in the Southeast. Hackberry (Celtis occidentalis), black gum (Nyssa sylvatica), speckled alder (Alnus serrulata), water oak (Quercus nigra), and maple (Acer spp.) are lower in preference, but may appear along with peeled branches of various species in dam and lodge structures.

Damage to young trees in plantations may be severe adjacent to small feeder streams where large areas have been intensively site prepared. Soil disturbance and canopy removal during site preparation stimulate growth of new vegetation containing an abundance of woody and succulent foods that are highly favorable to beaver. Beaver may move into these areas, utilize the preferred foods, and then the planted trees.

Control Measures:

In response to landowner expressions of concern over damage, a beaver symposium was held in Montgomery, Alabama, in 1967 where various state representatives discussed the problem and potential control measures (Anonymous 1967).

Poisons-- A series of studies with penned beaver (Williams 1971, Cooper et al. 1973, and Hill 1976) were conducted to determine acceptability of several baits, effectiveness of certain poisons, and methods and effective times for presentation. These studies revealed that two stomach poisons in sweetgum balsam (storax) painted on sweetgum limbs are readily taken and will effectively kill beaver. However, neither of the compounds is registered for use as a beaver control agent and their use for this purpose is illegal.

There are hazards to nontarget species in most poisoning programs. In addition, the cost of distributing poison baits to feeding sites approaches that of payments for bounty trapping. Finally, the use of poisons in beaver control is wasteful, as it precludes, in most cases, recovery and utilization of the resources.

Chemosterilants-- Chemosterilants have been shown to reduce spermatogenesis, ovulation and pregnancy in beaver, (Gordon and Arner 1977). Effective methods of treating beaver in the wild must be developed for this approach to have practical application.

Predators-- Studies to evaluate the alligator (Alligator mississippiensis) as a potential beaver predator were initiated in Alabama (Hill 1976), Mississippi (Arner 1975), and Arkansas. The studies were discontinued in Alabama following newspaper reports of several alligator attacks on humans in Florida and preliminary results indicated alligators did not reduce beaver populations in farm ponds. The studies in Mississippi and Arkansas are continuing.

Trapping-- Recorded population reductions in beaver have historically been the result of unrestricted hunting and trapping. In the southeastern region, and to some extent nationally, beaver populations reached a low point between the late 1800's and 1930 (Yeager and Hill 1954, Bradt 1935, and Howell 1921). Its vulnerability is related to the beaver's dependency on an aquatic habitat.

A series of beaver populations on four experimental watersheds were systematically trapped using 330 conibear traps in sets described by Hill (1974). These evaluations were undertaken to determine the amount of effort required to control beaver and to obtain an indication of the costs and profits. These studies revealed that trapping to control beaver is effective and profitable if scheduled for approximately two weeks during each of two successive winters (Hill 1976). During the first year the adults and the larger subadults are usually taken. The second year, maturing juveniles can be caught with considerably less effort than if one attempts to catch them in a sustained trapping effort during one year. Normally, no reproduction will have occurred between trapping periods due to removal of gravid females the first year. This scheme of trapping was effective on small watersheds and required surprisingly little effort compared to day-to-day dynamiting of dams, bulldozing, sustained trapping, and various other unsuccessful approaches attempted by landowners.

Those engaged in intensive site preparation will probably benefit during a stand rotation by leaving buffer zones near small streams and branch heads to be managed under selection cutting systems. Debris and tops left near and in the streams render them impassable to a trapper on foot. Beaver can cause severe loss in young plantations in these situations and funds spent on site preparation and planting adjacent to small streams might have been better utilized. Maintenance of a partial canopy will limit development of an extensive understory food supply, and unobstructed streams will aid trappers in controlling beaver that may cause serious damage.

State conservation agencies that are charged with setting regulations for harvest of beaver should continuously monitor the status of beaver populations to guard against overharvest.

DEER

With the recent emphasis given hardwood utilization, more attention has been focused on the state of the art of hardwood regeneration. There has been a dramatic and concurrent increase in white-tailed deer populations of the southeastern region as a result of deer management programs in various states. As one might expect, browsing damage by white-tailed deer in the Southeast has been reported with greater frequency in recent years (Maisenhelder 1957, Carpenter 1967, Beckwith and Stith 1967, Denton et al. 1969, Harlow and Downing 1970, and Robinette 1973).

The lack of reports of damage to various hardwood species in the Southeast probably relates more to the newness of intensive hardwood regeneration rather than to the lack of damage that they receive. The potential for damage exists for all species of trees grown in association with high populations of deer, particularly in recently planted stands under intensive management. This has been demonstrated frequently in various forest types throughout the world.

Nature of Damage:

Although deer graze extensively during some seasons, they are primarily browsers, foliage and twigs constituting the major portion of their diet.

Removal of leaves and twigs from seedlings can be detrimental to tree growth and therefore timber production. The extent of utilization of browse appears to be dependent upon the density of the deer, palatability of the tree species, and condition and availability of alternate foods within their seasonal range. In many areas of the South where hardwood regeneration is being attempted, deer herds have reached or exceeded the carrying capacity of the existing vegetation type. When young palatable browse species are released by cutting or planting in these areas, they are prime targets for deer depredation.

Kverno (1964) placed mammal damage to forests into three categories: (1) seed destruction, (2) foliage clipping and browsing, and (3) root and bark injuries. Since seed destruction that affects forest regeneration is primarily by small rodents only the last two will be considered here.

While little work has been done specifically on deer browsing damage associated with hardwood regeneration in the Southeast, many authors have alluded to it in their works on hardwood silviculture and deer damage in general. Maisenhelder (1957) stated that livestock and deer in excessive concentrations can cause complete failure of hardwood plantations. Stoeckeler et al. (1957), in their work on the effects of deer browse on regeneration in northern hardwood-hemlock forests, concluded that a prolonged period of 6-8 years of rather low deer population was needed to insure good regeneration. Carpenter (1967) reported that deer damage on pine and poplar stand conversion plots in Virginia was so heavy that they were considering not reseeding them. Marquis (1974) noted that deer browsing on hardwood regeneration on the Allegheny Plateau in Pennsylvania and New York resulted in unsatisfactory stocking of commercial species on 25 percent of the areas, and unsatisfactory stocking of preferred species on 42 percent of the areas studied. He also noted a significant reduction in height growth as a result of deer browsing. Marquis et al. (1976) noted severe damage on planted oak seedlings in Pennsylvania as a result of deer browsing.

In the Southeast, Krinard (1973) described a cottonwood plantation in which mortality was high and surviving seedlings failed to grow. Protection of cottonwood for the first year was considered absolutely necessary on most sites to give trees a chance to grow beyond the reach of deer (Denton et al. 1969, and McKnight 1970). Ongoing projects by the junior authors revealed over 50 percent annual browsing on apical branches in a two-year-old oak plantation and over 90 percent browsing on a four-month-old sweetgum stand.

The effect that browsing has on an individual plant is dependent upon the ability of the species to withstand the removal of foliage and twigs. Some species are able to recover from repeated heavy utilization, while others can tolerate very little. Its effects are: (1) death of the seedlings; (2) retardation of vertical growth; and/or (3) reduction in quality of the final product. Of the various types of damage, seedling mortality has the most devastating effect upon a stand.

Retardation of growth is the most frequently encountered effect of deer browsing. Switzenberg et al. (1955) reported as much as a 10-year standstill in tree growth from browsing in Michigan, but said that usually it is only a 3 to 5 year retardation. In Wisconsin, Stoeckeler et al. (1957) found that sugar maple (Acer saccharinum) seedlings that were repeatedly browsed became stunted and malformed and recovered very slowly even with complete protection.

McNeil (1964) described semi-permanent growth retardation in 20-30 year old oak trees that were only 0.6 m tall and 30 year old white pines that were 0.3 m tall. In portions of Clarke County, Alabama where overpopulation has existed 10 years, oaks and sweetgum 7 to 10 years old frequently have a rounded-bushy form and are less than a meter tall.

Kverno's (1964) third category, root and bark injury, deals with deer-inflicted injury by means other than feeding. Injury inflicted on trees by deer rubbing their antlers has been reported by several authors. Hosely et al. (1931) said that rubbing more often deforms than kills the trees. Lutz and Chapman (1944) found this type damage on 14 percent of their plots, and noted that some trees die within a very few years, while disease enters the wound on others and eliminates them as potential crop trees. Death of the trees is almost certain if they are rubbed severely during two successive years. McDowell and Benson (1960) and McNeil (1964) mention trampling and laying on seedlings, but do not quantify the extent of its occurrence. It is doubtful that it would be significant.

The 26 percent crook reported by Switzenberg et al. (1955) is a very important consideration when looking at the effect of deer browse damage to trees. While they felt that in may instances crook is outgrown, they refer to the occurrence of bark injuries among the trees that may develop fungal diseases which could then represent a considerable loss.

Shortly following planting and prior to the development of a good root system, seedlings are susceptible to inadvertent pull-up by animals attempting to browse them. Hines (1971) reported 15-20 percent of a conifer plantation was lost to pull-up. Hardwoods that are root-pruned to facilitate hand planting are more prone to pull-up during animal browsing. This practice may save on planting costs but its growth retardant effects over the length of the rotation should be taken into consideration for each species to be planted.

Clipping studies which test species tolerance to browsing are generally lacking for southern hardwood species. Research is needed to provide this information on trees of the region.

The long-term effect of deer on the forest community is rarely known. Graham (1954) found that heavy deer browsing converted a stand of highly palatable, and very desirable timber species, to one of low palatability and lower quality timber.

Control Measures:

Many methods have been proposed for alleviating deer damage to forest regeneration. These methods fall into two categories: methods of removing deer and methods of repelling deer. Trapping and herd reduction are the two major methods of removal, whereas any of the following may be employed as repellents: fences, chemical repellents, protective coverings, scare devices, and "natural" repellents.

Trapping-- Trapping to control damage in an area consists of live capturing deer in large traps with sliding doors and transporting them to a

location where the potential for damage is less. This method is expensive particularly if there are many animals to move. Suitable areas for releasing deer may also be difficult to find. Therefore, trapping in most instances is impractical (Shick 1955).

Fences-- Fencing is a very common means of repelling deer and several fence designs have been proposed and tested for this purpose. These designs vary widely in their effectiveness and cost, with cost usually increasing with increased effectiveness. Examples of fences tested are: electric, outrigger, common wire (wire mesh, barbed wire, single strand barbless wire), nylon net and debris.

Many electric fence designs have been tested and most have proven ineffective at stopping deer. Some promising results were reported by Patric (1963) with a 2 meter eight-strand fence using four charged wires and four ground wires. Tierson (1969) noted criteria which should make an electric fence more effective in repelling deer. He indicated that the fence should: be tall enough to discourage jumping, have several strands spaced at the bottom to prevent deer from crawling under the fence, contain wire of sufficient strength to prevent breakage when deer come in contact with the fence, and have a charger with a short impulse rate and a high voltage (unlike most commercially available equipment). Using this sort of fence Tierson (1969) was able to partially control deer, but he stated that other fence designs which would give complete protection for about the same cost could be constructed, and therefore, he would not recommend the electric fence as a management tool. Huminski (1968) reported that electrical fences in Poland were impractical due to maintenance problems.

The outrigger fence was designed on the theory that deer must be rather close to the base of a fence in order to jump over it (Blaisdell and Hubbard 1957). This type fence is constructed of a sloping section of woven wire or strands of barbless wire with the high side attached to vertical posts and the low side attached to a vertical section of fence or staked to the ground. The high side of the fence is pointed away from the area to be protected. Outrigger fences tested by Blaisedell and Hubbard (1957) and Jones and Longhurst (1958) proved completely effective in preventing deer from entering protected areas.

Several designs of fences have been tested using common wire fencing materials. Fences constructed of barbed wire were ineffective in preventing deer movement in and out of an area, whereas some of those constructed of woven wire mesh were effective (Longhurst et al. 1962). Fences that were effective were at least 2.4 m in height.

Mealey (1968) tested a fencing technique using nylon netting to protect forest plantations in the Pacific Northwest from deer and elk. The net was fastened at top and bottom to nylon rope and hung from posts around the area to be protected. The fence did not prove effective due to the constant need for maintenance.

McKnight (1970) described a debris fence that effectively excluded deer from plantations for one or two years. It was made from site preparation-debris pushed to the edge of the plantation and piled in a continuous row

approximately 3 m high and 6 m wide. Fences of this type, in addition to providing a deer barrier, provide an alternative to the expense of windrowing and repeatedly burning debris.

Chemicals-- Chemical repellents impart a disagreeable odor, taste, or both to treated species which theoretically discourages browsing. The repellents are applied in one of two ways: by dipping seedlings into a repellent solution before they are planted or by spraying seedlings and trees with a repellent after they have been planted.

There is a wide variation in the degree of success obtained with chemical repellents. Besser and Welch (1959) especially noted this point in a paper summarizing articles on the use of ZAC and TMTD in reducing deer damage. They listed a number of variables that may influence the success of any given repellent: (1) the length of test period, (2) species of trees treated, (3) thoroughness of treatment, (4) herd density, and (5) reaction of subspecies or even individual deer to the repellents. A review of other literature on chemical repellents with the above variables in mind leads to the conclusion that it is difficult to predict whether a particular repellent will be effective under a particular set of circumstances.

In addition to the unpredictable nature of chemical repellents, one must consider the need for repeated applications of the repellent to protect new growth after the initial treatment.

Protective Coverings-- Many types of protective coverings have been tested for preventing deer browse damage on newly planted seedlings. Campbell (1969) evaluated two types of plastic tubes for preventing deer damage to Douglas fir (*Tseudotsuga menziesii*) in Washington. One was made of paper-plastic netting formed into tubes and soaked in TMTD or putrified fish and the other was constructed of black polypropylene net formed into tubes. Good results were obtained but the total expense of treatments was not established.

Hines (1971) evaluated three types of terminal bud protectors as deer browsing preventatives on Douglas fir seedlings in Oregon. These protectors were made from Saran plastic, fiberglass screen, and translucent polyethylene. They proved effective in reducing damage by deer, but some protectors were shed from the plants and the expense did not encourage widespread use. Robinette and Causey (1977) tested plastic bags as a means of preventing deer browse damage on loblolly pine (*Pinus taeda*) seedlings in Sumter County, Alabama. They found them to noticeably reduce deer damage, but the bags caused some seedling mortality and the labor involved in their use was prohibitive.

In general, protective coverings have proven effective in preventing deer damage, but may restrict growth of seedlings, and often are too expensive to be practical.

Research is currently underway by one of the junior authors on various designs of polypropylene mesh tubes to protect southern hardwood seedlings such as oak and sweetgum from deer browsing damage.

Scare devices--A few scare devices have been tested for repelling deer. Mills (1936) reported that white or colored rags hung in trees at the edges of planted fields were ineffective in repelling deer, but that partial success in repelling deer in fruit orchards was achieved using carbide type gas exploders. Klein (1955) evaluated an electronic device called "deerfly" which was supposed to repell deer by means of a buzzing noise, but concluded that this device was ineffective. The use of firecrackers set off by means of trip cords or timed fuses appears to be partially effective, but is dangerous and impractical on a long term basis (Carpenter 1967). Research by one of the junior authors is currently underway to evaluate an AV-ALARM, an electronic scare device for possible use in repelling deer from hardwood plantations and agricultural crop lands.

Generally, scare devices work for only a short period because deer tend to become habituated to them within one or two weeks.

Natural Repellents-- In some cases "natural" repellents such as animal feces, hair from predatory animals, and animal tissue have been used to repell deer. These repellents are usually placed in small bags and hung at intervals along edges of fields, orchards, etc. Carpenter (1967) reported partial effectiveness in repelling deer from orchards in Virginia using an animal tissue or tankage repellent.

Herd reduction--Deer densities that will insure that herds will remain in healthy condition and that will minimize damage to hardwoods are difficult to assign due to variables in habitat conditions. Lack of precise census methods further complicates decision making relative to herd densities. Behrend et al. (1970) noted that a density of one deer per 9.3 ha (23 acres) prohibited growth of hardwoods above 0.9 m whereas a reduction to one deer per 15.4 ha (38 acres) allowed previously browsed hardwoods to recover. Bramble and English (1949) reported that jack pine (*Pinus banksiana*) plantations were successful in areas of moderate populations, about one deer per 16.2 ha (40 acres), but were browsed out of existence when planted intermittently in a scrub oak barren with dense deer populations. Hunt et al. (1976) reported adequate hardwood regeneration in large blocks of clearcut bottomland in Alabama where deer densities were estimated at one per 8.1 ha (20 acres). Bennett (1962) reported that light populations of deer, one per 30 ha (75 acres) caused $0.87 damage per 0.4 ha (acre) between harvest cuttings, whereas heavy populations, one deer per 14.2 ha (35 acres) caused from $4.23 to $23.19 damage. Robinette (1973) reported damage on newly planted loblolly pine at an estimated density of one deer per 9.3 ha (23 acres). Gibson and MacArthur (1965) reported extensive browsing and fraying damage by roe deer (*Capreolus capreolus*) in Scotland at densities of one deer per 19 ha (47 acres) and a ratio of three males per female. Damage and fraying ceased when the sex ratio was evened and the herd reduced to one deer per 39.6 ha (98 acres). Ueckermann and Goepel (1973) indicated that one red deer (*Cervus elaphus*) per 50 ha (123.6 acres) seemed the proper density for 14 management units in Germany to avoid damage to the forest. Ortwein (1972) reported established densities for wild animals for woodlands of Poland as 5-15 red deer, 25-75 roe deer, and 10-30 fallow deer (*Dama dama*) per 1000 ha. It is unknown whether these limits were imposed, but damage problems continued to occur.

It should be mentioned that deer carrying capacities vary among loca-

tions and among vegetation types of a given site. There are many variables that determine if a given herd density will cause damage to forest regeneration. Perhaps a deer per 22 ha (50 acres) is an average density goal that should be sought prior to planting on areas scheduled for hardwood regeneration. This density objective could then be modified as desired once the stand is established.

The most practical and effective means of herd reduction is shooting. It can be applied two different ways: adequate harvest of deer during legal hunting seasons or removal of deer under special shooting permits as directed by state agencies. Wildlife biologists share the opinion that most damages incurred in the Southeast are a result of over-populated deer herds and that this problem can be controlled by adequate hunter harvest. In most cases, this would involve liberalizing hunting laws in problem areas and promoting either-sex hunting. Shooting deer of both sexes under special permit could be employed along with legal fall hunting, but it is usually applied during spring and summer months as a means of alleviating active crop damage. As it is typically used, permit shooting is only partially effective and generally the effectiveness is short-lived.

In planning for hardwood regeneration, one should consider opportunities and arrangements for adequate hunter harvest before planting to decrease browse damage potential, particularly on overpopulated areas.

DISCUSSION

In alleviating serious depredation problems associated with beaver and deer, biological control through population reduction is considered the best and most prudent of currently available corrective measures.

Trapper harvest of beaver using 330 conibear traps for two weeks under favorable water conditions during two successive years effectively controlled beaver damage problems on small watersheds.

Those who may have need to control beaver through trapping should remain alert to possible legislation that may preclude the use of this management tool.

Forest landowners with beaver problems may wish to give consideration to options for income from waterfowl hunting leases on areas created by beaver. With a minimum of management, income from leased beaver ponds will frequently pay taxes on the remaining property.

Research is needed to evaluate compatibility of managing certain wetland sites for production of baldcypress (*Taxodium* spp.) and other water tolerant species in areas where beaver are difficult to control or where multiple land use dictates that beaver populations be partially or completely protected.

Frequently hunters and occasionally landowners limit population reduction measures needed to reduce deer damage. Deer hunters are slow to change from traditional hunting ethics that dictate taking buck deer only. Most of

them, however, were too young to remember that herds were extirpated from most of the region by unrestricted hunting. Hunting traditions may become political pressures that impede needed changes in harvest regulations such as either sex hunting.

Some of the best hardwood sites in the southeast are the bottomlands of the major river systems. The flood plain of these river bottoms is subject to flooding and for the most part is limited to a few temporary residences or hunting camps. With the sparce human population and productive soils, these areas also are considered among the best deer habitat in the region. Where buck-only hunting is allowed or where herds are under-harvested, population growth, after initial stocking usually exceeds the food supply resulting in an overpopulated condition.

In addition to the undesirable effects overpopulation has on hardwood regeneration and the surrounding ranges, there are obvious deleterious effects on the deer herd. Live weights of deer in all age classes decrease, reproductively active females produce fewer fawns per year, and antler development in adult bucks of the various age classes diminishes until range conditions improve or stabilize. To permit such conditions to develop is bad enough, but to allow it to continue is to mismanage the resource.

Improved hardwood regeneration and herd quality can be attained only by reducing the herd to fit the food supply or, through various means, balancing the food supply to fit the herd needs. A wildlife biologist with expertise in deer-forestry relationships should be sought for assistance in handling such problems. It is of greater importance that his recommendations be followed.