LEGAL HUNTING OF WHITE-TAILED DEER WITH DOGS: BIOLOGY, SOCIOLOGY AND MANAGEMENT

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ABSTRACT

In recent years hunting white-tailed deer with dogs, a tradition in many parts of the South, has been the subject of much controversy, but this type of hunting has received little scientific research and there is little data upon which decisions can be based.

The effects of dogs on behavior, movements and welfare of 57 different radio-equipped deer in Alabama, Florida, Georgia, and South Carolina were studied. Six of these animals were experimentally chased with hunting dogs in a way designed to simulate very intensive dog hunting. Information from telemetric and pen studies, field observations, kill data and other sources was analyzed to evaluate the effects of hunting with dogs on reproduction, mortality and harvest efficiency.

Our data do not support the contention that dogs are in any way a limiting factor on deer populations in the areas we have studied. None of the experimentally chased deer were caught by dogs, and there was no evidence of detrimental changes in behavior or other ill effects. Low population densities in some dog-hunted areas are attributed to illegal hunting and low carrying capacity.

Conventional management attitudes derived from experience in areas where dog-hunting is illegal may not be applicable to situations in which deer are traditionally hunted with dogs. Conditions vary from area to area, and management decisions should be based on local situations. Some areas are biologically and sociologically suitable for legal hunting with dogs, others are not. In general, dog-hunting should not be encouraged in areas where legal dog-hunting is not traditional.

INTRODUCTION

Using dogs to find white-tailed deer *(Odocoileus virginianus)* and drive them past the hunter ("dog-hunting") is a traditional means of hunting in the southeastern United States, especially in the Coastal Plain. Dog-hunting of deer is legal in all or parts of 10 southeastern states (Fig. 1), the entire state of California, throughout much of Central America, and in Ontario, Canada. Yet, surprisingly little has been written about this method of hunting and its biological and socio-economic significance or about the unique problems of administering it.

In recent years this type of deer hunting has become an increasingly controversial topic of discussion among game managers and administrators as well as among hunters. Critics of dog-hunting base their views on one or more of several beliefs: (1) The use of dogs gives hunters an advantage that results in an excessively large portion of the population being killed. (2) Dogs catch and kill many deer during the hunting season and indirectly cause the deaths of many others. (3) Hunters allow their dogs to run free out of season, directly or indirectly causing mortality of pregnant does and fawns. (4) Dogs running deer in or out of season may affect reproduction by inhibiting ovulation, inducing fetal mortality or by other means. (5) Constant harassment by hunting dogs may prevent the spread and establishment of deer populations in some areas.

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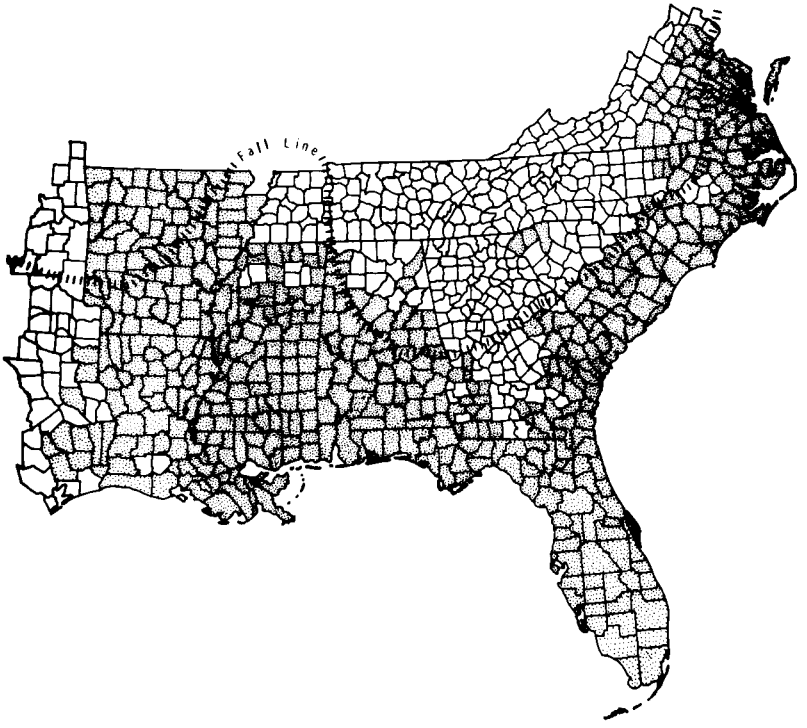

Fig. 1.--Legal dog-hunting in the southeastern United States. Counties including areas permitting the use of dogs for hunting deer are shaded. The Fall Line (hachured line) separates the Piedmont and Coastal Plain Provinces.

The evaluation of these points is complicated in many areas by the presence of free-ranging, feral and other non-hunting dogs, habitat factors, and most significantly, by illegal hunting.

This paper essentially consists of two parts. The first part presents data on the biological effects of chasing deer with hunting hounds. The second part which is necessarily more subjective, deals with the sociological and psychological aspects of dog-hunting and delineates some of the problems of administering legal dog-hunting.

This study was a part of a broader investigation of deer movement-ecology made possible by the cooperation of a number of organizations including the Georgia Forest Research Council; the following units of the University of Georgia: School of Forest Resources, Institute of Natural Resources, Institute of Ecology, and Savannah River Ecology Laboratory; the University of Florida, School of Forestry; the Florida Game and Fresh Water Fish Commission; the Alabama Cooperative Wildlife Research Unit at Auburn University; the Alabama Department of Conservation, Division of Game and Fish; the South Carolina Wildlife Resources Commission; Gulf States Paper Company; U. S. Air Force; U. S. Atomic Energy Commission; U. S. Fish and Wildlife Service; and U. S. Forest Service. Although many individuals contributed to the study, we feel particularly indebted to Mr. Robert J. Bridges, Mr. Lewis K. Jeter, and Mr. Frank H. Smith for their work in gathering much of the data. We also extend our appreciation to all of those who reviewed the manuscript.

METHODS

Data relating to the effects of dogs on deer were obtained primarily from radio telemetry studies. Radio-tracking has been in progress since 1963 and 64 transmitters have been placed on 57 different deer (five of these were pen-reared and released into the wild). Transmitter life ranged from a few days to over 7 months. The cumulative total for all periods of radio-transmission was over 2,000 days. Most individual animals tracked since 1967 were monitored 3-7 months each. Periodic observations and location records of some animals were made for several years after radio transmission ceased. The study animals were located on 8 different areas (Fig. 2) in 4 states, including 35 in Florida, 12 in Alabama, 5 in Georgia, and 5 in South Carolina. The effects of dog-hunting and free-ranging dogs and the causes of mortality of instrumented deer were recorded.

Because of the low level of dog harassment and lack of evidence of dog-caused mortality, we decided to use intensive experimental harasssment to determine the effects of dog pressure on individual deer. Six deer on three study areas — Auburn, Alabama; Eglin Air Force Base, Florida; and Savannah River Plant (SRP), South Carolina — were selected for chasing. These deer had been studied telemetrically until normal behavior, movement patterns and ranges were delineated; this usually required about 2 months of radio-tracking. The animals were then periodically radio-located and chased with packs of hunting dogs.

A wide variety of hunting hounds were used including running walkers, julys, treeing walkers, black and tans, blueticks, and hound-cur crosses. Forty-one different dogs were used; the majority were walker hounds. The dogs included a pack obtained especially for the project supplemented by hounds owned by local deer hunters. Hunters who claimed to have especially fast or long-running dogs were encouraged to participate in the experiment. Pack size ranged from 1 to 9 dogs with an average of 4. We followed the chases by the sound of the hounds "opening" and by radio contact with the deer.

In addition to conducting radio telemetry studies of wild animals we chased tame deer in a 2-acre enclosure under controlled conditions in order to observe

at close range their behavioral responses. We also attempted to gain insight into the effects of dogging at the population level by comparing kill data, populations, and habitat on areas having dog-hunting and on those areas which permit hunting only without dogs ("still-hunting" or "stalk-hunting"). Our experiences in deer hunting, administering deer hunts, discussions with other biologists and hunters, and general observations on deer herd dynamics provided substantiating information.

Our comments on dog-hunting methods, hunter sociology and administrative problems are based on our experiences and observations and those of our associates primarily in Alabama, Florida, Georgia, and South Carolina. Recommendations for management of dog-hunting represent our opinions and certainly will not be applicable to all areas where dog-hunting is legal.

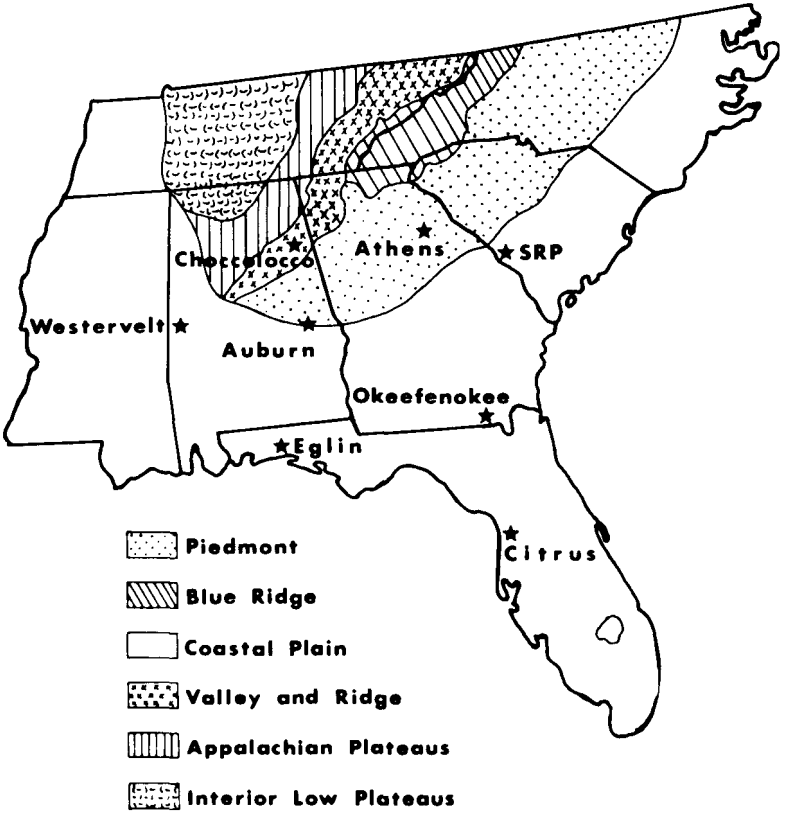

Fig. 2.--Locations of study areas. Physical divisions from A Forest Atlas of the South. U. S. Forest Serv., South and Southeast Forest Expt. Sta., New Orleans, La., and Asheville, N. C.

Effects of Dogs Chasing Deer

Few scientific papers have been written on dog-deer relationships. With the exception of studies made in situations involving deep snow (e.g. Hosley 1956), or possibly mountainous terrain (Barick 1969), those published have not demonstrated convincing evidence of significant detrimental effects to healthy deer populations. Progulske and Baskett (1958) reported that, although hounds were able to make deer leave their home ranges for a time, they were apparently the direct cause of few deaths. Segelquist, et al. (1969) noted several cases in which deer became extremely exhausted when run by dogs. Subsequent necropsies revealed high parasite loads, particularly in the lungs. Many popular articles have been written concerning the subject of dog predation. For the most part, they have expressed the opinion that dogs are very detrimental to deer populations, but these conclusions have generally not been based on scientifically obtained data.

To date, our studies have dealt primarily with hunting hounds in the Coastal Plain. There is reason to believe that dogs (hunting and free-ranging) may be more detrimental and that dog-hunting can be too efficient in mountainous terrain (Jenkins 1952). We hope to obtain some results on a study in mountainous terrain within the next year. Also the domestic dog is a variable species and, unquestionably, there are dogs that can and do catch deer. The type of dog most capable of catching and killing deer remains to be determined. The 41 dogs used in this study did not cover the full range of physical and behavioral attributes present in all dogs.

Harrassment of instrumented deer by free-ranging dogs

Free-ranging dogs were observed on all study areas but seemed to be most common on those which were not in the Coastal Plain: Auburn, Choccolocco and Athens. Dog-deer hunting was legal at Westervelt, Auburn and the Savannah River Plant. It was also legal on land immediately surrounding the study area on Eglin. With the exception of chases initiated by the investigators and five chases occurring during the legal hunting season 1 to 3 years after radio contact was lost, dog harrassment of a radio-instrumented deer was observed only on the Athens study area. The dogs that chased deer on the Athens area were small pets of various breeds although there was also a pack of feral dogs in the area. Only one deer was chased, and this buck was pen-reared and tame enough to allow close observation after being located with the receiver. He was radio-equipped and released into an area with a dense human population. During an 11-month period, 250 hours were spent recording in detail direct observations of his daily activities. Dogs were observed trailing or chasing the deer on several occasions, but he easily eluded the dogs and quickly resumed normal activities (e.g. feeding, bedding). He did not seem to suffer deleterious effects from his close association with the dogs but was noticeably more alert when harassment occurred regularly.

Experimental chases of instrumented deer

Six different deer (two large fawns, two yearlings bucks, one adult doe, and one adult buck) were experimentally chased 65 times. The most intensively harassed deer, a doe fawn, was chased 30 times over a 4-month period. On one occasion chases were intitiated on this individual four times in one day. The maximum distance covered in a single chase was 13.4 miles; the average was 2.4 miles. Chases averaged 33 minutes in duration, with a maximum of 155 minutes. None of the experimental animals died while being studied, and all appeared to remain healthy throughout. Four of them later were harvested and were in good condition at the time of death. The two immature deer grew normally during the experiment.

Deer could be chased out of their home ranges but usually returned within one day or less. The deer in dense populations were very difficult to chase for more than a few minutes because abundant scent trails caused the dogs to switch to other deer. The changes from one deer to another generally would not have been detected without radio equipment.

The deer were able to elude dogs most easily where they had access to swamps with plenty of water. However, even in areas with little water, deer were able to escape with relative ease. Although several escape patterns were defined, certain ones seemed to be used more often by bucks, and others were more prevalent in the doe and fawn chases. Escape patterns also varied with the individual, habitat and population density. A detailed analysis of escape behavior and effects of the dogs on diel activity patterns is presented in a separate paper (Sweeney et al. 1970).

Mortality

Barick (1969) sent questionnaires to personnel on 79 wildlife management areas in 11 southeastern states in an effort to determine the relative importance of deer mortality factors. Dog-caused mortality was estimated to account for 6% of the average annual drain on the deer population (i.e. 1.5% of the annual population) whereas legal hunting accounted for 65%, illegal kill 20%, automobiles 5%, and bobcats 2%. His data indicated that most dog-caused mortality was in mountainous areas and not in the Coastal Plain where deer are legally hunted with dogs.

Of the 57 radio-instrumented deer in the present study 23 instances of mortality were recorded; nine occurred while the transmitters on the deer were still functioning. Five cases of mortality in three other telemetry studies (Byford 1969, Marshall and Whittington 1968, and D. L. Robinette personal communication 1970) involving 14 deer in Alabama and 5 in Georgia are included in Table 1. Causes of mortality are ranked by level of occurrence. Although there was no evidence that dogs were involved in any mortality, they could not be eliminated as a possible cause in four instances because the carcasses were deteriorated when examined.

During the past 13 years, the Southeastern Cooperative Wildlife Disease Study at the University of Georgia College of Veterinary Medicine has investigated over 300 individual cases of deer mortality (not including animals shot for study) from throughout the Southeast. Necropsy records of the Disease Study were examined for mortality attributed to dogs. Although dogs were involved in the death of a few deer, they were not considered to be the "primary" cause of death in any case. A possible explanation is that obvious dog kills are not submitted. However, a number of deer that were obviously killed by automobiles have been submitted.

Biologists and conservation officers should submit deer to the Disease Study or to a state diagnostic laboratory, even if dogs were seen killing the deer. This should be done (1) so that the kill can be placed on record, (2) to determine if there were other contributing factors in the death of the animal, and (3) because collectively these data may be used to determine the circumstances in which dog problems exist.

It is probably significant that areas reported to have heavy dog predation are often also reported to have overpopulations of deer. Dogs may become predator-scavengers where there is an abundance of malnourished and parasitized deer, wounded deer, or other "easy pickings."

Combined data from the telemetric studies, pen studies, field observations and other sources do not indicate that hunting dogs are significant mortality factors for healthy deer within most Coastal Plain habitats.

TABLE 1. KNOWN MORTALITIES OF RADIO-INSTRUMENTED DEER

Causes of Mortality	Number of Animals[1]
Legal hunters	11
Injury during capture	4
Undetermined	4
Malnutrition, senility, parasites	2
Automobile	2
Collected	2
Parturition complications	1
Illegal hunters	1
Tangled in radio	1
	28

[1]Twenty-eight cases of mortality were recorded out of a total of 76 instrumented deer. This total includes 19 animals from studies by Byford (1969), Marshall and Whittington (1968), and Robinette (personal communication 1970).

Influence on reproduction

A concept which has had broad coverage in regional and national magazines recently is illustrated by the following quote:

> It has been scientifically determined that even if does dogged by a pack escape, their rate of reproduction is affected. Dick Payne, a game biologist with the Georgia Game and Fish Commission, and Dave Urbston, a game biologist with the U. S. Forest Service, working jointly on a research project on deer reproduction, found that in areas in which deer had not been hunted in recent years 54.5 percent of the first-year does had been successfully bred. But on areas that had been subject to heavy dogging during the hunts, the rate was cut to 28.1 percent (*Outdoor Life,* February 1969).

There is at present no scientific support for this concept. The investigators in this widely cited study point out that the conclusion of *Outdoor Life* was premature and was printed without the investigators' knowledge or consent (Payne and Urbston personal communication 1970). Urbston continued the study for a 5-year period, and subjected the data to a chi-square analysis. The results revealed no significant effects on reproduction of either first-year (bred as fawns) or adult does related to running with dogs. Urbston stated that there were also no apparent shifts in breeding periods as a result of dogging.

In the above study the deer were run by dogs primarily during the breeding season and the early stage of pregnancy. There have been no studies yet conducted specifically designed to determine effects of dog harassment on does in the latter stages of pregnancy. In most areas, however, this should not be a problem during hunting season.

Harvest Efficiency and Herd Productivity

Comparison of areas

A potent argument commonly made against dog-hunting is that many dog-hunted deer populations remain at low levels and do not produce high annual kills. A critical analysis indicates that the problem is not the result of a simple cause-and-effect relationship and that a number of variables besides harvest methods are involved. Probably the most important of these are habitat, season length and illegal kill.

We obtained information concerning hunting on state game management areas from all southeastern states. Most states that permit dog-hunting on management areas do so for only a few days each year and in many cases hunts

are intensively administered. Florida, however, permits dog-hunting on most management areas for about two months each year without restrictions on numbers of hunters.

The Florida Game and Fresh Water Fish Commission provided us with kill data from all game management areas in northern and central Florida. Although we recognize that conditions in Florida may not be typical, we could not find kill data from any other state that would permit comparison of harvest on intensively dogged areas with harvest on stalk-hunted areas in similar habitats with similar hunting pressure. The Florida data are summarized in Table 2 and are presented by area in Table 3.

It is obvious from these data that populations have generally increased and that they vary greatly from area to area. There is no apparent relationship between population levels or trends and the use of dogs for harvest. Similar habitats yield similar harvests regardless of harvest method (Table 2). Although there is much variation in populations within habitats, this is apparently a result of other variables unaccounted for, such as illegal kill.

Differences in inherent productivity of habitat types must be taken into consideration in making comparisons of populations. Many Coastal Plain areas in the Southeast are hunted with dogs, and many of these same areas have low deer populations, but it does not necessarily follow that dogs cause low deer populations. It seems more reasonable to assume that the Coastal Plain herds have inherently low reproductive rates. Flatwoods habitats, for example, are traditionally dog-hunted, and it is unusual to find high deer population densities in them. Lower Coastal Plain flatwoods habitats, according to data presented by Harlow and Jones (1965:59), have comparatively low carrying capacities. Reproductive rates are low in such habitats; herd increases will occur at a much slower rate than on good range, and "even light illegal hunting can be very effective in preventing expected herd increases" (ibid:116-117). A comparison of areas (Table 2) reveals that this applies to areas where only stalk-hunting is allowed as well as those that are dog-hunted. Areas in the pine-oak upland type yielded nearly three times the harvest of areas in the pine-flatwoods habitat type. Some Coastal Plain habitats that are hunted with dogs (e.g. river swamps) support even more dense deer populations.

Although it is difficult to quantify or eliminate variables, a situation was found in which comparisons could be made between different portions of the same area with most variables accounted for. Biologists Frank Smith and Gordon Spratt of the Florida Game and Fresh Water Fish Commission (personal communication 1970) supplied kill data from the Camp Blanding Wildlife Management Area in northeastern Florida. The management area is part of a military reservation with a high level of protection from illegal hunting and a closely monitored legal harvest. Part of the area (about 32,000 acres) is intensively dog-hunted, the remainder (about 20,000 acres) is still-hunted only. Hunting pressure on the dogged area averaged 2.4 acres per man-day of hunting compared to 1.8 acres per man-day on the still-hunted area. The harvest per unit of area averaged somewhat higher on the dog-hunted portion: 1 deer per 227 acres as compared with 1 per 323 acres on the stalk-hunted area. The deer population has increased rapidly in recent years and is presently one of the most dense management area deer herds in Florida (Table 3). The population density as indicated by track counts and general observation is about the same on the two portions of the area.

In the first quarter of this century, when deer were at their lowest ebb in the Southeast, with few exceptions the only deer surviving were in areas traditionally dog-hunted (see map in Barick 1951). Although this was primarily because of habitat characteristics and a sparse human population, it demonstrates that, even when deer were being killed out with little regard for conservation, they were able to withstand dog-hunting in these areas. Furthermore, in some of these areas, human populations, especially rural populations, have declined significantly in recent years. In recent years some areas (notably parts of South

TABLE 2. BUCK HARVEST BY HABITAT TYPE AND HARVEST METHOD FOR LANDS IN STATE WILDLIFE MANAGEMENT AREAS IN NORTHERN AND CENTRAL FLORIDA[1]

Habitat and harvest method	No. of mgmt. areas	Total acreage	Av. Harvest[2] (deer/ sq. mi.) 1960-65	1965-70
Pine flatwoods				
entire area dogged	7	655,500	0.8	1.0
part of area (90%) dogged	1	89,000	0.9	1.4
stalk-hunted only	2	102,000	0.8	0.9
Pine-oak uplands				
entire area dogged	2	475,000	2.2	2.4
part of area (60%) dogged	1	56,000	1.0	2.1
stalk-hunted only	3	70,500	1.3	2.2
Sand pine scrub				
entire area dogged	1	262,000	1.4	2.1

[1]Data provided by the Florida Game and Fresh Water Fish Commission. Four new areas for which no data were available in 1960-65 are not included: Robert Brent, Lochloosa, Nassau, and Point Washington.

[2]Legal buck: one antler at least 5 inches long.

TABLE 3. DEER POPULATION ESTIMATES ON DOGGED AND STILL HUNTED ONLY WILDLIFE MANAGEMENT AREAS IN NORTHERN AND CENTRAL FLORIDA

Area, Habitat, and harvest method	size of area (acres)	Estimated population (deer/sq.mi.) track count[1]	1960-65[2] av. kill x 10	1965-70[2] av. kill x 10
Pine flatwoods				
Entire area dogged:				
Aucilla	110,000	-	9.7	11.2
Farmton	55,000	11.0	11.4	24.6
Leon-Wakulla	67,000	2.7	4.5	5.8
Liberty	133,000	-	3.7	4.7
Lochloosa	44,000	-	-	6.1
Richloam	63,000	-	3.5	4.8
Robert Brent	95,000	-	-	3.2
Steinhatchee	206,500	3.3	5.9	6.7
Tomoka	110,000	11.0	10.5	11.4
Part of area dogged:				
Lake Butler	89,000	20.0	8.5	13.9
Nassau	90,000	-	-	7.4
Area not dogged:				
Guano R.	10,000	-	0.6	2.6
Osceola	92,000	8.3	8.0	9.1
Pine-oak uplands				
Entire area dogged:				
Blackwater	85,000	2.5	4.1	4.3
Eglin	390,000	22.0	26.4	27.8
Part of area dogged:				
Camp Blanding	56,000	18.5	10.0	20.6
Area not dogged:				
Apalachee	6,000	2.8	6.4	6.4
Citrus	43,000	16.4	18.3	24.6
Croom	21,500	-	5.1	17.8
Sand pine scrub				
Entire area dogged:				
Ocala	262,000	21.3	13.6	14.2
Point Washington	180,000	-	-	4.2

[1]From Harlow and Jones, 1965 (Population estimates converted to deer per square mile.)
[2]Kill data provided by Florida Game and Fresh Water Fish Commission.

Carolina) have allowed dog-hunting for up to 5 months of the year, and deer populations have increased in these areas. This is sufficient evidence that regulated dog-hunting is not overly efficient in those areas.

There are many areas with serious overpopulation problems where dog-hunting is the primary harvest method as well as where only stalk-hunting is allowed.

In general, the evidence indicates that, in many Coastal Plain habitats with similar carrying capacities and regulation of legal and illegal harvest, populations that are dog-hunted will have sustained yields as high as or higher than those which are stalk-hunted only.

The "diminishing returns" principle

It is evident, however, that unregulated dog-hunting with indiscriminant killing of does and fawns can be extremely efficient and can decimate a herd. This has previously occurred in many areas (e.g. Jenkins 1952). The principle of diminishing returns as a self-regulatory harvest control (Leopold 1931:211) seems to operate less efficiently in the case of dog-hunting because many dog-hunters obtain a large share of their recreational experience from the nonconsumptive aspects of the sport (i.e. breeding and training dogs and the excitement of hearing the chase). Consequently, they obtain satisfaction from the hunt even when the actual rewards of seeing and killing deer are small. Furthermore, dog-hunters feel that they at least have a chance to kill a deer as long as they can find a track to put a dog on. Under these conditions they continue to hunt after the deer herd has been reduced to the point that most stalk-hunters would consider hunting unrewarding.

However, under effective buck-only regulation, a variation of the principle of diminishing returns functions to help prevent overharvest of bucks. As the sex ratio shifts in favor of females, the dogs will trail and run does increasingly more often than bucks. This results in a decreasing efficiency in the harvest of bucks which is proportional to the change in sex ratio. Unfortunately, some hunters can not resist temptation and illegal doe kill is often high.

If we assume, as evidence indicates, that hunting dogs are not killing significant numbers of deer and reproduction is not adversely affected, then it follows that over-harvest of a deer herd requires the shooting of both sexes. Dog-hunting, if it does not result in the harvest (legally or illegally) of female deer, cannot result in overharvest of the herd.

ADMINISTRATION AND REGULATION OF DOG-HUNTING

The discussion of management of dog-deer hunting that comprises the remainder of this paper is based on the preceding data and observations. As new evidence is acquired, our comments and recommendations will probably have to be reevaluated, especially in their application to specific localities.

History and Sociology of Dog-hunting

The use of dogs in deer hunting is practiced in various forms throughout the world. No one knows where or when the practice originated. The English stag hunt dates back at least to the time of the Norman conquest and probably much earlier. The stag hunt, in which red deer *(Cervus elaphus)* are flushed by hounds and pursued on horseback, was a favorite sport in the highlands of Scotland.

Early Scottish and English settlers brought this form of hunting to Virginia and the Carolinas where it became established. Dogging was the accepted method of hunting deer among the leisure class of the Old South, regarded by most authorities as the pre-eminent sportsmen of their day (Elliott 1859 and Gohdes 1967). Dog-hunting has persisted with little change in some areas (e.g. parts of Florida and Louisiana). In other areas it has been modified by

increasing the emphasis on standers and eliminating the use of horses.

In some habitat types and especially in areas where it was used primarily as a means of obtaining venison for the pot (subsistence hunting) the method proved too efficient and was declared illegal in many states.

Conflicting viewpoints on dog-hunting often result from different concepts of what dog-hunting is, derived from personal experiences in different areas with different kinds of dog-hunters (and, in too many cases, from no experience at all). The variation in dog-hunting practices and in the hunters themselves must be strongly emphasized and clearly understood. Although no clear-cut classification of hunting methods can be made, some generalizations may be stated.

A common form of dog-hunting is the drive, characteristically practiced by the larger hunting clubs such as those in southwestern Alabama and the South Carolina Low Country. Members of these clubs are often relatively affluent, "gentlemen" hunters. The hunt is typically a "drive" in which fairly large numbers of hunters are involved. Hunters are placed on stands from which they are not allowed to move, and the deer are chased past the standers. The hunts are often as much social events as serious hunting efforts. The individual hunters often do not own dogs, these being maintained by the club or by a local driver who is invited to participate. This type of hunting is described in some detail by Milling (1966).

Another type of hunting is one in which small groups of hunters release dogs in an area, or often on the trail of a particular deer located by its track, and several hunters accompany the dogs. The standers are not confined to specific stands but are permitted to follow the chase and head off the deer being pursued. As previously indicated, horses are still used in some areas (e.g. parts of Florida and Louisiana). In this type of hunting the participants are more likely to be dog owners and to take more interest in the dogs and the chase. Often rural residents, these are among the most enthusiastic and persistent hunters.

Four counties in Florida permit only "slow-trail" hunting in which the hunter stays with his dog and deer are shot as they are jumped.

Some groups hunt in ways that many find extremely objectionable — taking stands along heavily traveled public roads and highways, blocking traffic, and using vehicles equipped with 2-way radios to head off deer pursued by dogs. As with other types of hunters, some dog-deer hunters adhere to very high standards of sporting conduct; others violate every code conceived.

Problems of Administration

Property lines

One of the most difficult problems presented by the dogging of deer is that of confining the chase within the bounds of property lines as hunters cannot completely control the movements of their dogs. Also, in some areas property rights do not extend to hunting rights in the minds of the people, and the problem may be aggravated by inconsiderate hunters who release dogs (sometimes without identification marks) on lands where they do not have hunting rights and take their stands along public roads and highways to head off the chase. Where large blocks of land occur under one ownership or where there is unanimity of consent among landowners, the problem is not too great, but where numerous small ownerships are involved, it can be quite serious.

Accommodating heavy hunting pressures

Dog-hunting is demanding of space, and where there is heavy hunting pressure on lands open to the public, very large numbers of hunters can be accommodated satisfactorily only by well-organized drives that are costly to administer. More hunters can usually be accommodated by stalk-hunting. The problem of heavy hunting pressure is complicated by pressures from dog-

hunters for long seasons. Hunters that own their own dogs often have a considerable monetary investment in dogs, pens, trailers, etc. that is difficult to justify if seasons are only a few weeks long.

Uncontrolled hunting dogs

Another problem associated with dog-hunting results from hunting dogs being allowed to run uncontrolled. Most hound owners regard their dogs as prized possessions and keep them penned or otherwise under control when not in use. However, it is well known that some deer hunters use almost any kind of dog to run deer, and a few even pick up dogs and abandon them after the hunt.

Should Dog-hunting Be Prohibited?

In view of the problems associated with dog-deer hunting, why permit this type of hunting? Dog-hunting has some definite advantages as a harvest method. (1) It is the only acceptable means of harvesting deer in some habitat types. Thick, swampy areas of the Coastal Plain are considered by most hunters to be unhuntable without dogs. (2) Some Coastal Plain habitat types do not support enough deer to provide enjoyable stalk-hunting. Many dog-hunters seem quite satisfied with a low harvest because they derive enjoyment from the chase even when no kill is made. Such nonconsumptive enjoyment is also derived when the animals being chased are not legally harvestable. (3) The use of dogs may help to locate wounded deer and thereby reduce crippling loss. According to Ruhl (1956), the state of Nevada allows hunters to use dogs specifically for the purpose of trailing wounded deer. Florida allows the use of leashed dogs for this purpose on archery hunts.

The attitude of hunters is also an important factor in any decision concerning the use of dogs to hunt deer (e.g. Clark 1950). We think that game managers should not just pursue a narrow goal of maximum harvest for an increasing number of hunters but should also strive to provide opportunities for a variety of quality hunting experiences. Although many hunters and game managers are philosophically opposed to the use of dogs to chase deer and consider it unsporting (e.g. Murphy 1969), many dog-hunters likewise regard "hiding in the bushes and taking pot-shots" at deer without first having a chase as unsporting. The object of the sport is not to "just kill a deer"; the chase is an important part of the hunt to most. Although many of us would disagree with this viewpoint, dogging has been traditionally regarded in many parts of the South and of Europe as the "sporting" way to hunt deer (Gohdes 1967:xii, 148; Milling 1967). Leopold (1949) has pointed out that wildlife managers should nurture tradition as one of the cultural values of hunting. We should also encourage diversity of hunting opportunities unless there are sound biological or administrative objections, or unless a sport is sufficiently offensive (i.e. cruel or unfair) as to produce outcry from a broad spectrum of the public and attacks on hunting in general. The allowance of dog-hunting does not necessarily preclude hunting without dogs. Although there are some conflicts, the two types of hunting are often compatible.

Considerations Relating to Circumstances under which Dog-hunting Should be Allowed

Use of dogs in hunting deer is clearly undesirable in some areas. Factors that should be considered in determining where dog-hunting should be allowed include tradition, characteristics of human population, habitat, and land ownership. The most favorable combinations of these factors are usually found in the Coastal Plain.

Tradition

Generally, the use of dogs in hunting deer should not be encouraged in areas where there is no tradition of legal dog-hunting. Local custom should be a major determinant of when and where dogging should be allowed. In areas where this type of hunting is customary, it is very difficult to convert hunters to stalk-hunting. The significance of dog-hunting to the people in some locales can hardly be overestimated, and in many areas the sport cannot be stopped by any reasonable means. It can be made illegal, but this will not stop it. Prohibiting dog-hunting in these areas can be expected to create a new class of outlaws whose resentment may cause them to lose respect for other game laws that they had previously abided by.

Habitat type

Present knowledge indicates that dog-hunting should probably be excluded from certain habitat types, such as intensively farmed areas, and rugged, mountainous areas. Although it has not been proven, many biologists agree that deer are less able to elude dogs and hunters in mountainous terrain. But, many Coastal Plain habitat types are better suited for dog-hunting than for stalk-hunting. Pine flatwoods may not support a sufficient number of deer to make hunting without dogs attractive, and it may be nearly impossible to obtain adequate harvest in dense Coastal Plain swamps without the use of dogs. Even under intensive dog-hunting these swamps serve as refuges and many such areas are underharvested.

Characteristics of hunting population

Dog-hunting is best suited to areas with relatively low hunting pressure and largely rural populations. Urban hunters are less likely to keep packs of hounds, and large numbers of urban hunters are more easily accommodated by stalk-hunting or still-hunting.

Land ownership pattern

Dog-hunting is best adapted to areas where land ownership is in relatively large holdings and areas on which hunting pressure is maintained at manageable levels. Private and club-leased land is especially well suited for quality dog-hunting. On these lands deer herds are usually well protected, hunting pressure is controlled and hunting companions selected. However, many tracts of industrial and publicly owned lands accommodate dog-hunting very successfully.

Regulation of the Harvest

Conventional approaches to rectifying overharvest of deer herds include reduction of bag limits and season length, and restriction of hunting methods. In our opinion, the reduction of bag limits is likely to have little result. Shortening the season may be helpful, but extreme curtailment usually is strongly opposed by hunters. The hunters, who have large investments of time and money in packs of dogs, feel that they cannot justify keeping the dogs unless a reasonable portion of the year can be used to run them. Some hunters use deer-dogs to chase fox, coyote, bobcat, or raccoon during the off-season, and special deer hound training seasons are allowed in a few states. Although this helps to alleviate the problem and provides added recreation for the hunters' investments, long legal seasons are generally desirable wherever possible.

It should be emphasized that problems of underharvest and difficulty in convincing the public of the need to shoot does are common under both dog-hunt and stalk-hunt regulations. But, where a problem of overharvest resulting from illegal kill is critical, as we believe it to be in some dog-hunting areas, it becomes important to sell the public on the value of protecting does. Poaching is undoubtedly greater than is commonly recognized. The results of a recent

survey of wildlife law enforcement (Morse 1968) reflect something of the attitudes of southerners toward game laws as compared to other regions of the country. The total number of wildlife law enforcement agents in the Southeast was reported to be almost twice the number in any other region of the country. The agents reportedly spend more of their time on enforcement and have smaller districts to patrol than those in any other region except the Northeast. In the Southeast there are more enforcement agents relative to the number of hunters than in any other region, and the number of arrests per 1000 hunters and fishermen is highest by far. Percent convictions and average fines are much lower than in other regions. High illegal harvest is one of the most common objections to dogging deer, but this is an enforcement and education problem rather than a legitimate objection to hunting deer with dogs.

We are of the opinion that, for reasons previously stated (see discussion of "diminishing returns"), the harvest of does should generally not be permitted during the regular dog-hunting season. Then — if restriction on killing of antlerless deer is respected and enforced — it is hardly possible to overharvest bucks as previously pointed out. We think that where reduction of the doe population is desired, this may, in most cases, best be accomplished by special antlerless hunts before or after the regular season. These may be dog-hunts or still-hunts depending upon the circumstances. We recognize that dog-hunters may resent special seasons for stalk-hunting, and this approach is dependent upon the cooperation of sportsmen.

Restriction of hunting methods is also a means of harvest regulation. There are a number of ways to restrict hunting methods while still maintaining the practice of dog-deer hunting. Some of these include the regulation of when and where a hunter can have a loaded weapon, how motor vehicles can be used, and the use of radio equipment. It is possible under certain circumstances to set limitations as to breed, size and number of dogs which can be used. Examples which have been used in some states include restricting hunters to the use of one dog (California), beagles (Arkansas) and slow trail hounds (Florida). Care must be taken in the establishment of criteria concerning the kind of dogs to be used because of the difficulty of classifying dogs and personal preferences by local hunters for particular breeds.

In the past and even today in some areas landowners and dog-hunters commonly set aside refuges or "pastures" closed to hunting. It is questionable whether such areas serve to restock surrounding habitat to any significant extent, but they may have some value as escape areas where natural refuges such as large swamps are not available and intensive road systems allow a high degree of accessibility to hunters.

More aggressive information and education programs and more rigorous law enforcement are needed in some problem areas. We believe this is best accomplished by gaining the confidence and respect of hunters and "working from the inside." We know of groups of dog-owning sportsmen (including fox and raccoon hunters) that have organized *against* game departments because they are convinced that the game departments would like to abolish their sport. Efforts should be made to regain the confidence of these groups, to understand their attitudes, and to convince them that the game departments are interested in the welfare of their sport. Their aid could then be enlisted in promoting sportsmanship and respect for game laws and the rights of other hunters and landowners.

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