

# DEER RESTORATION IN THE SOUTHEASTERN UNITED STATES

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Deer restoration work has been in progress for many years in some southeastern states, and in others it is a relatively recent undertaking. In either case it is wise to occasionally review our progress, check our failures and successes, and confer with our neighbors, so that we may be able to re-orient our efforts with renewed vigor along more efficient lines. It is hoped that this condensation of reports on deer restoration from the eleven southeastern states will be of value in guiding newly established programs, and serve as a spur toward even greater progress on the part of veteran agencies. This manuscript was compiled from reports by C. L. Traywick of Alabama, Carl G. Hunter of Arkansas, Fred W. Stanberry of Florida, Jack A. Crockford of Georgia, Don H. Strode of Kentucky, Lyle S. St. Amant and C. J. Perkins of Louisiana, William H. Turcotte of Mississippi, Frank B. Barick of North Carolina, Frank P. Nelson of South Carolina, Albert E. Hyder of Tennessee, and Richard H. Cross of Virginia.

## POPULATION

There is apparently a wide gap between present and potential deer populations in all of the southeast. At one time deer were common to the entire region, but advancing human population and land clearing for agriculture have severely cut into the stock. In most states the point of lowest population was reached about 1915 to 1925 (Fig. 1), and since then there has been a steady, if slow, increase. Estimated present populations range from a low of 2,500 and 8,700 in Kentucky and Tennessee to about 65,000 in Virginia and Louisiana (Table 1).

Various methods have been used to estimate potential future populations, most of them based on some multiple of forest acreage. In some states the total forest acreage was considered as the basis for computations, in others only a certain proportion of the forest land was considered as potential deer range. Using what appears to be a conservative estimate of about 50 acres per deer, potential populations range from 155,000 and 165,000 deer in North Carolina and Louisiana to 400,000 and 450,000 deer in Florida and Alabama.

Thus, even those states which are producing nearest to the theoretical maximum are still producing at only about one-third of capacity, and the other states are reportedly producing at only one to twenty percent of capacity. If we assume an annual kill of ten percent and a hunter success ratio of ten percent, the number of deer hunters would equal the deer population, so that on a region-wide basis we should be able to provide deer hunting for an army of about 3,000,000 as opposed to the present estimate of less than half a million. We might well take this as a production goal for the next ten years.

## HISTORY OF RESTORATION EFFORTS

The present state restoration programs were in most cases preceded by restocking on private estates and/or by the U. S. Forest Service, except that in

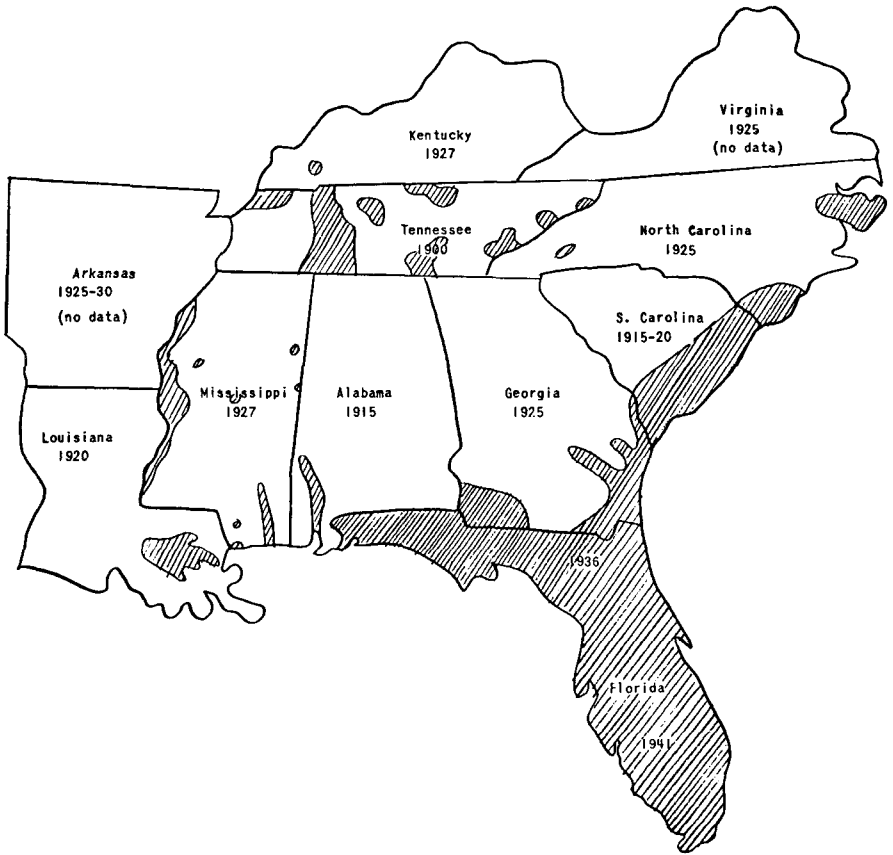


Fig. 1. Southeastern deer distribution at lowest point in population.

Florida much of the early deer restoration work was done by the Livestock Sanitation Board. Although state programs were started in 1915 and the 1920s in Arkansas and Louisiana, most states did not undertake deer restoration work until the 1930s or later (Fig. 2). Although some work was done prior to PR, it appears that the great bulk of deer restoration has been done with Federal Aid.

Some of the earlier government restocking was on private land or on a closed county basis. The current trend, however, appears to be in the direction of restocking completely protected wildlife management areas located on public land. Probably as this public land is restocked, there will be a reversion toward work on private land leased for this purpose. None of the states reported restocking as completed; on the contrary, several felt that it will take another five to ten years to restock all of the remaining habitable range.

The number of areas already restocked varies considerably from state to state (Table 2), from none in some to some restocking in nearly every county in one. The number of deer reported to have been stocked varies from 467 in Kentucky to 2,000 in Virginia and 2,400 in Arkansas. Even with the completion of restoration

Table 1. Estimated Southeastern deer populations.

State	Original Distribution	Point of Lowest Population		Population		Basic Range Computation
		Date	Numbers	Present	Potential	
Alabama	Statewide	1915	1,000	32,000	450,000	1 deer per 40 A. forest on 18,000,000 A. forests
Arkansas	Statewide	1925 1930		55,000	500,000	1 deer per 25 A. forest on 75% of forest area
Florida	Statewide	N-1936 S-1941		40,000	400,000	1 deer per 50 to 80 A. on 23,700,000 A. deer range
Georgia	Statewide	1925				
Kentucky	Statewide	1927		2,500	230,000	1 deer per 50 A. forest on 11,500,000 A. forests
Louisiana	Statewide	1920	15,000 to 20,000	67,000	165,000	1 deer per 50 A. of 8,400,000 A. deer range
Mississippi	Statewide	1927		45,000	240,000	1 deer per 50 A. on 12,000,000 A. com. forest
N. Carolina	Statewide	1925		55,000	155,000	1 deer per 50 A. on 7,785,000 A. deer range
S. Carolina	Statewide	1915 1920		35,000		
Tennessee	Statewide	1900		8,700	250,000	1 deer per 54 A. on 13,500,000 A. deer range
Virginia	Statewide	1925		64,000	190,000	3 × allowable deer kill increase
Totals				404,200	2,580,000	



Fig. 2. Southeastern deer restoration areas.

work in the next few years, several states reported that it would probably require at least 25 years of intensive educational and law enforcement work to bring the deer populations up to the biological capacity (Fig. 3, 4).

#### DEER TRAPPING METHODS

Due to the general similarity of trapping methods throughout the region we will not discuss each state separately but rather list the basic techniques, and variations therefrom.

Trapping areas throughout the region are generally located on state or federally operated wildlife management areas, with some deer being secured from private estates and damage complaint areas. Other government areas such as Eglin Air Base in Florida also supply some deer. The number of deer secured per year has varied from none, to a few dozen, to over 600 one year in Arkansas. It appears that trapping continues for the duration of the cold season in most states with no limitation on numbers but in other states maximum quotas are set up per refuge.

Table 2. History of Southeastern deer restoration.

State	Work Done Prior to State	State Program Started	Number of Deer Stocked	Source of Stock	Release Areas
Alabama	Private Club Restocked one area	1938		Pisgah, Texas, State Refuge	PR 13-D restocks PR areas, State restocks other public areas.
Arkansas	U. S. Forest Service	1915	2,400	Private areas, U. S. Forest Service	Deer restocked in most counties, refuges located over entire state.
Florida	Livestock Sanitation Board started 1936	1949	1,303	Wisconsin, Texas, Eglin Field	Restoration statewide, L.S.B. replaced deer lost in tick control program
Georgia	U. S. Forest Service started in 1925	1947		State and Federal refuges	Hope to stock about 200 deer per year till better areas are restocked
Kentucky	Hillman Land Co. in 1920s	1945	467	Three counties	
Louisiana	Private Refuges stocked in 1920s	1920s 1948-PR		Texas, Wisconsin State refuge, Private area	11 refuges set up, 2 more proposed entirely under PR
Mississippi	1 private stocking	1932 1944-PR	862	Mexico, Pisgah, other U.S.F.S. areas, private areas	23 refuges stocked, by PR since 1944
N. Carolina	Private estates U. S. Forest Service	1937 1944-PR	1,390	Pisgah, other U.S.F.S. areas, Private, Wisconsin	U. S. Forest Service started stocking on 6 areas, State finished these and stocked 7 more refuges, mostly in West
S. Carolina		1951		U. S. Forest Service	Present coastal herds expanding westward, trapping started to stock Sumter National Forest Restocking on State-controlled areas
Tennessee		1938 1938-PR	2,000	State refuges, Private areas, Wisconsin Pisgah, State refuges, Private areas.	Major restocking completed by 1944, mostly on National Forest land in West.

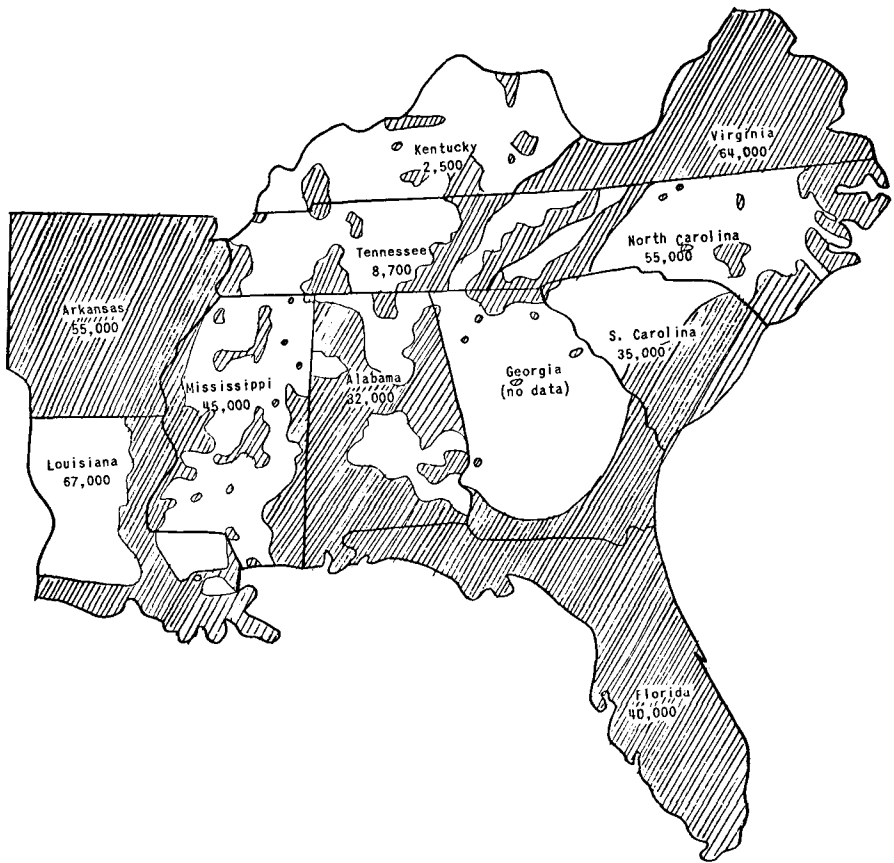


Fig. 3. Present southeastern deer distribution.

An example of the latter is North Carolina where not more than 50 deer are allowed to be taken from one area and of these not more than 20 to 25 percent may be bucks.

The box trap is the most commonly used, with up to 150 being used in any one state. Box traps made of poles have been used but found to be undesirable because of damage to the deer. Traps made out of oak lumber are very durable but also very heavy. Dressed lumber appears to be the best suited. Traps made of lighter wood such as pine or chestnut dressed down to  $\frac{3}{4}$  inch are sufficiently substantial but great care must be taken that the doors slide freely and that the wire or rope that holds them up is not too stiff so as to hold the doors up after the trigger has been tripped. In Mississippi the lumber is treated with Penta solution to make it rot resistant and lengthen its life span.

The wire antechamber used on the old Pisgah deer traps were of some value in getting the deer into the traps but too often the deer cut themselves badly on the wire. In Louisiana a heavy wire screen over one end of the trap has been found to be quite successful. One state reported that light could come into the trap from

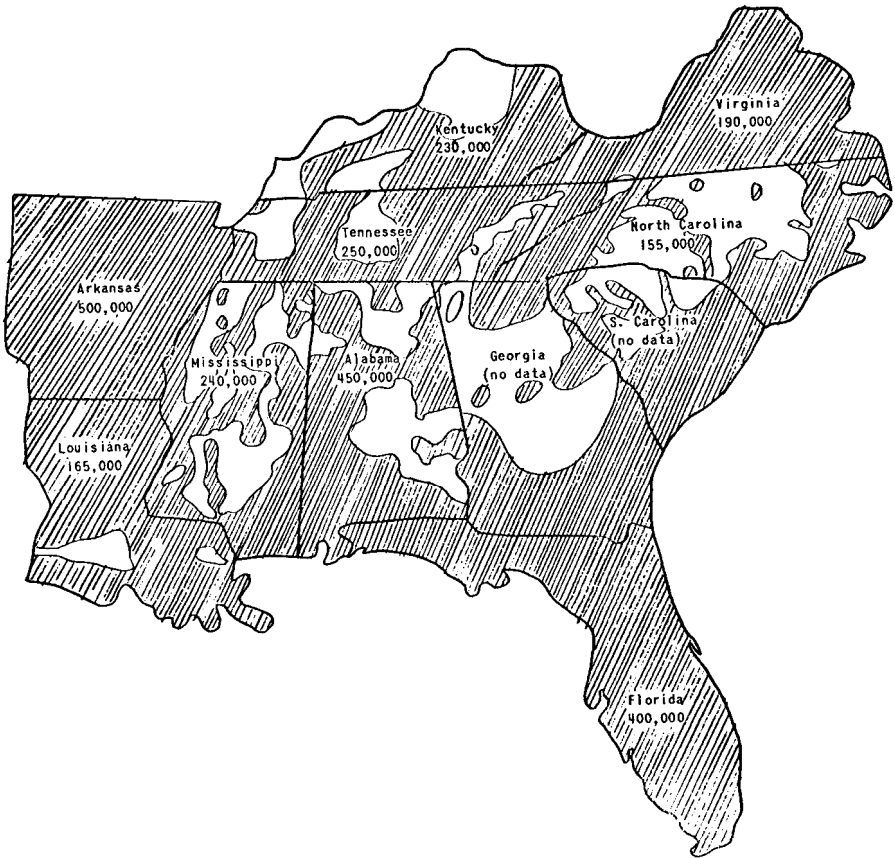


Fig. 4. Southeastern potential deer range and population.

near the bottom but if there were light holes near the top, especially at the ends, the deer would jump up at them and cut themselves.

Very little work has been done with corral trapping. Large corrals made of mesh fencing have proven successful in catching deer on the Pisgah and the Biltmore Estates in North Carolina but they killed up to 50 percent of the deer. A corral trap made of wooden panels was tried last year in North Carolina and showed some sign of effectiveness without hurting the deer.

However, it needs more testing before it can be fully endorsed. South Carolina is also experimenting with fences and corrals.

Trigger devices have generally been of the hinge type with a notched bar to hold the hinge down. The mouse trap booster has been used with much success in North Carolina — this has the effect of making the trigger much more sensitive. A great variety of bait or trigger wires has been reported: hay baling wire, stove pipe wire, piano wire, copper wire — some 30 gauge enameled, some blackened by burning off the insulation. Button hole thread has been used but it expands and contracts too much with changes in humidity. Nylon thread has been used, reportedly free of these defects. Fishing leader has been suggested.

Apparently deer react differently to wire thickness. One state reported several cases where the deer have gone into the trap as far as the trigger wire then backed out without tripping the trap, and for this reason their trappers have been trying to find a very light and inconspicuous material.

The leading bait in the entire region appears to be corn. Apples have been used with success, as have acorns, salt, chops, cottonseed cake, sweet potatoes, and mistletoe. Baits used in some areas are not effective in others. Although not stated in any of the reports from the contributing states, some hints were made that trapping was most effective at the start of the trapping season and least effective at the end. It was found in North Carolina that about 75 percent or more of the deer caught in any one season were caught during the first two months of trapping. Consequently, trapping activities have been curtailed to a two-month period with a considerable saving in cost over the former six month trapping period. The first day of trapping on any area appears to be the most important, especially if the animals have been conditioned to go into the traps over a pre-baiting period of a few weeks. If this first day is carefully selected so that it is a day when deer are especially active, it has been found that 40 percent or more of the traps will make catches. These periods of intensive activity and feeding appear to be immediately before storms, on a falling barometer.

The amount of marking and amount of data recorded in regard to deer handled varied considerably. Most states ear-tag deer with numbered tags. One state applies colored dyes to the tail and rump patches so that deer observed near the release area can be identified as stocked animals. This also gives data on rate and distance of spread from release point.

Data recorded for each deer has included: tag number, sex, age, weight (scaled in some cases, guessed in others), condition, number of points, trapping area, trap number, release area, names of trappers, releasers, witnesses, and color of dyes applied. Apparently all weighing is done in the handling crate, some with a platform scale, others with a simple beam scale. Large bucks can be weighed in the banding crate if they are de-horned, but special weighing crates must be made if the antlers are not removed.

It appears that in most cases the tagging is done through a hole in the crate, but in other cases the deer is taken out of the transfer crate and stretched out on the ground to facilitate marking. This has the advantage of holding the deer still and not allowing it to hurt itself by jumping about in the crate.

Apparently all states use the transfer or banding crate to move larger deer from the trap to the truck. Small deer can of course be carried by hand. In Louisiana one end of the banding crate is made of plexiglass, which probably facilitates getting the deer out of the trap. In Alabama deer are removed from the traps at night and they are attracted into the banding crate with a flashlight. In other cases reluctant deer are chased into the banding crate by one of the trappers who enters the trap, or if the deer is small it is taken out of the trap without using the banding crate at all.

In Florida antlered bucks are roped in the trap and then de-horned, in North Carolina bucks with antlers too large to enter the banding crate are taken out of the trap by hand — lifting the trap door and catching the deer's leg or antler and throwing it to the ground. This sometimes results in a bruised knuckle.

Most states haul the deer in special darkened crates built on pick-up trucks. Straw or shavings are used for bedding and a grid of slats is nailed to the floor to



keep the deer from slipping. In some cases the walls of the crate are padded as a further precaution against damage, and although this is probably not necessary it makes for good public relations. Some states have found it necessary to ship deer in separate individual crates or compartments; in other states deer of different ages and sexes are placed in the same crate with no apparent injury.

Trapping has resulted in some mortality in all states reporting catches. In some cases death is due to self-inflicted physical injury, in other cases to fright, without any apparent external injury. Bleeding from the nose is common; it is not clear whether this is due to hemorrhaging of the lungs or bruising of the nose. Reported mortality rates range from 0.07 to 10 percent, with an average of about four percent.

Trapping costs are of course inversely related to success. Reported success varies from no catches to 1.8 trap nights per catch, with intermediate reports of 50, 6, and 4 trap nights per catch. The highest number caught in any one year (600) was reported by Arkansas, at a cost of about \$15 per head. Most reported trapping costs ranged about \$40 to \$50 per deer, with some as high as \$70 to \$85 and one up to \$200.

Public reaction to trapping varies from favorable to very much the opposite. Concessions made in the direction of appeasing opposition have included cessation of trapping, setting up quotas as to total numbers and sex ratios, padding transport crates, giving illustrated talks on the program to explain objectives and methods, releasing deer in same region of the state as they are trapped, allowing hunting on the trapping area, and postponing trapping until after the hunting season.

## IMPORTING OUT OF STATE DEER

Most of the deer imported by Southeastern states have come from Texas, Wisconsin, and Mexico with a few from Pennsylvania and the Pisgah Game Preserve. Numbers imported vary from none in Kentucky and South Carolina to about 1300 in Florida and 2000 in Virginia. On a region-wide basis an average of about 30 percent of the restocking has been done with imported deer.

In general deer imported from the northern states cost more than trapped deer — \$70 to \$120 — while those imported from Texas and Mexico cost less than trapped deer — \$35 to \$65.

The northern deer are much larger than native deer and native deer larger than those from Texas and Mexico. There have been very limited observations as to the effect of imported stock on the size of the local deer. In Alabama, areas restocked with Pisgah deer yield specimens about 10 percent heavier than areas stocked entirely with natives. Mississippi reports little difference in size of Mexican deer (as compared to natives) after the first generation cross, with the major factor influencing size being the location within the state. In Florida, successive generations of Wisconsin deer have not maintained their original size but they are still larger than the native deer. In North Carolina, where imported Wisconsin fawns averaged around 65 pounds in December, what appears to have been a native born fawn of either pure or part Wisconsin parentage weighed 65 pounds in early October. This compares to an average of about 35 pounds for Western North Carolina fawns trapped in December.

In general, it would appear safe to say that there is some carry-over in size of imported deer in succeeding generations, but the degree to which this characteristic is carried is strongly influenced by local food conditions.

## RESTORATION AREAS

Although 10,000 acres was reported as the minimum acceptable size for a deer restoration area in several states, some have apparently succeeded with areas as small as 2,500 and 5,000 acres. Most states have also stocked areas considerably in excess of 10,000 acres. Except where stocking is in counties closed to deer hunting, release area boundaries are generally posted and/or painted.

It appears that the bulk of the restocking has been done on publically owned land, and in some states restocking is confined to such land. In both states leases have been for ten years. Stocking rate has apparently varied widely, in one state 20 deer per 10,000 acres are considered adequate, in others 50 or more are stocked for this size area. In most cases, and certainly in most of the successful cases, habitat development and protection have been provided by full time refuge managers. In this regard, one state found that on several release areas where full time refuge managers were not stationed, the herd was soon dissipated.

The consensus of opinion is that the majority of the deer remain on the release area provided food conditions and protection are adequate. Of those which wander from the area, reports of 5 to 15 miles are not uncommon, and some have been seen as far as 25 miles from the point of release. Unless there is some unusually strong attraction, it would appear safe to assume that about 60 to 75 percent of the deer released on a 10,000-acre protected and developed area remain on the area and that a peripheral three-mile zone would contain the bulk of the remainder.

Some very interesting observations over a five-year period in Mississippi indicate a 35 to 40 percent proportion of fawns each year on a fully protected refuge on which intensive habitat development was done. This would be a relatively high rate of increase, for even a 25 percent annual increment (and no drain) would double the population in three years.

Virginia data in Table 3 indicate that in a group of twelve counties the total stocking of 729 was more than recouped with a harvest of 944 in the first three years of hunting. In the first six years of hunting nearly four times as many deer were harvested as had been stocked. Of particular interest, too, is the fact that the kill made substantial gain each year, indicating that the population was increasing in spite of the hunting.

Conditions associated with successful restockings are of course the direct opposite of those associated with failures. The three major factors may be listed as: protection from poaching and dogs, vegetation in regard to food and cover, and the presence or absence of disease and parasites.

It appears that throughout most of the southeast, deer restoration has of necessity been confined to extensive forested areas. This has been necessary principally because of the need for protection. The presence or absence of protection has probably had a greater influence on deer restoration than any other factor. The greater part of the region appears to be plagued with an overabundance of stray and free running dogs, and these alone have in many cases held back an otherwise promising deer herd.

Table 3. Deer stocking and harvest in twelve Virginia counties.

County <sup>a</sup>	Deer Released	Deer Kill					
		1945 2 Days	1946 2 Days	1947 2 Days	1948 2 Days	1949 2 Days	1950 3 Days
Bland-Tazewell	59	No seas.	36	53	37	19	48
Botetourt	42	No seas.	17	9	17	26	38
Craig	76	No seas.	24	20	30	37	71
Giles	49	No seas.	19	15	36	38	66
Grayson-Wythe	177	45	69	51	90	94	123
Roanoke	21	No seas.	15	7	3	4	6
Scott-Wise	158	75	83	140	136	152	147
Smyth	119	23	61	73	112	95	154
Washington	28	27	31	51	61	64	90
Totals	729	170	355	419	522	529	748
729:2738 = 1:4 = ratio of stocking to kills							

<sup>a</sup> Botetourt, Craig, Grayson-Wythe, Smyth, and Washington Counties contained closed restocking areas averaging 5,000 acres which were not opened to hunting until 1950. The Scott-Wise closed area was first opened to hunting in 1949. The Roanoke area remains closed.

Settlement back into the farthest hills by strongly independent folk has also been a limiting influence. The spread of industry in search of clear water has further concentrated illegal hunting in certain areas. In addition, the lack of cooperation on the part of local justices of the peace in setting maximum penalties has tended to encourage illegal take. For these reasons, the major hurdle in much of the southeast is not the restocking of deer, but the enactment and enforcement of more stringent laws protecting the stock.

The attitude of the people living near restoration areas is most important. Hunting regulations which favor these people are reported as a valuable means of gaining their cooperation. Another effective method is to gain the support of the local wildlife clubs. Also, the wise selection of local men to act as unpaid deputy protectors, and hiring these men to help the refuge manager with the installation of habitat improvements appears to be working out very well on some refuges.

Vegetation may be considered the second most important factor in deer restoration. In view of the fact that there is so much unoccupied range, vegetation has seldom been a limiting factor. Tennessee, however, reports an interesting case where deer moved out of a restoration area onto the surrounding farms, apparently in search of better food. North Carolina has had a similar experience where some deer were stocked on a small mountain refuge in a predominantly flat land farming county.

Since most of the restoration has been confined to forested areas, the type of forestry practiced has a very strong influence on the amount and quality of food. Short rotation forestry such as is practiced for paper pulp and mine props is especially well suited to maintaining high quality deer range. Since highly selective logging seldom produces much deer browse, an attempt should be made to have some heavy cutting on each unit of deer range every few years.

The establishment of food patches is a practice being widely used on refuge areas. Although earlier plantings were largely confined to annuals, a trend has set

in toward the establishment of permanent pastures. Where there is a large deer herd already on the area it is necessary to plant in units of two acres or more in order to keep the deer from eating it out before it gets established. On new refuges where the deer population is low, plantings of permanent pasture as small as 0.2 acres have proven effective.

The value of these plantings is not so much in the quantity of food that they supply but rather in the quality, since these pastures are highly fertilized. Furthermore, the food is provided at a time of the year when other natural foods are at a minimum. Preliminary findings in some states indicate that it may be possible to exert some control over deer distribution by means of such plantings, and to keep the deer from wandering off the refuge areas. The distribution of salt blocks, especially trace element salt, appears to have the same influence but to a lesser degree.

Disease and parasites apparently have little effect on the preliminary stages of deer restoration. Kentucky reports one case where disease appeared to play havoc with a restoration effort, and Mississippi reported some trouble with an importation of deer that were in poor physical condition. Generally speaking, however, the deer population is so low on newly established restoration areas as to rule out the expectation of difficulty from this source.

#### CARRYING CAPACITY AND CROP DAMAGE

The only reported completed study of deer carrying capacity is that done by the U. S. Forest Service on the Pisgah Game Preserve. The figure arrived at in this work was an average of one deer per fifty acres of mountain range. Estimates in Louisiana indicate that cut-over bottomland will support one deer on 20 acres and that long leaf pine areas with scattered spring fed streams would support about one deer per 60 acres. Mississippi reports an estimate of 30 to 50 acres per deer, depending on location within the state. In Florida a carrying capacity of one deer per 50 to 80 acres is assumed. The carrying capacity question is being investigated at the present time by PR 26-R in Alabama, and it is scheduled to be studied in the near future in Arkansas.

Six of the eleven states have what appear to be localized over-populations. In each case, however, the reports indicated only one or two overstocked areas. In Mississippi a 1,300-acre fenced area with a stocking of one deer per 13 acres showed a browse line on preferred food species. A fenced area in Louisiana with one deer per 15 acres was considered to be overbrowsed. In eastern Virginia overpopulated areas were brought under control with doe hunts. In a western North Carolina refuge, what was considered to be a heavy overpopulation of deer was not able to hold back the development of a dense stand of seedling yellow poplar following a heavy cutting of timber.

Tennessee reports an area with one deer per 20 acres while Arkansas has a 4,000 to 5,000 head herd with only 10 to 15 acres per deer on a year-round basis, and with winter concentrations of one deer per three to five acres. Florida reports a 420,000 acre range with 4,200 deer as a heavily populated area. In Louisiana a 200,000 acre area supports a population of about one deer per 35 acres and has provided a kill of 500 to 600 deer each year for the past 75 years. Virginia reports a three day hunt on which 36 bucks were taken off a 3,300 acre area.

In spite of generally low deer populations, each of the eleven southeastern states has at least a few complaints about deer damage to agricultural crops. Only one state, however, reports paying any damage claims. In most cases the only compensation has been moral support or an offer to kill or trap the deer. Some states have laws allowing the killing of animals in the act of depredation. Florida has used Z.I.P. deer repellent with considerable success but most of the other states have either not used it or have not yet tested it sufficiently to arrive at any conclusion as to its effectiveness. Z.I.P. is available from the B. F. Goodrich Chemical Company of Cleveland, Ohio. Last quotations known were at \$23.50 per 5 gallon drum, which came to about \$4.00 per acre in Florida.

The list of crops damaged by deer with the ones mentioned most frequently at the head of the list are: corn, peas, green beans, soy beans, sweet potatoes, apple trees, small grains, bicolor lespedeza, clover, strawberries, and watermelons.

## ADMINISTRATION OF RESTORATION

Deer restoration is administered by the state game and fish department in each state, except that in Florida the State Sanitation Board was responsible for the removal of many tick infested deer and therefore took the responsibility of providing much of the out of state stock for restoration. In Tennessee the U. S. Forest Service assists with management plans and in Virginia the Forest Service is in charge of executing management plans on cooperative National Forest lands.

Individual restoration projects have been carried out entirely at state expense in a few instances but the bulk of the restoration has been done through Pittman-Robertson projects. At the present time each state has one or more PR projects assigned to deer trapping and transplanting or restoration area establishment, management and investigation. In many cases the trapping programs include not only deer but also turkey and beaver.

Among the cooperating agencies, the U. S. Forest Service has probably been the most important. This agency has provided a large scale share of the land used for restoration and management areas, and the land under their supervision has provided many of the deer used for restocking. Other agencies providing land have been state Forest and Park services, the U. S. Soil Conservation Service, the Fish and Wildlife Service, the U. S. Corps of Engineers, and the U. S. Air Force. In one case the State Park Service provided not only land but also money for restoration work. In at least two cases the U. S. Park Service has provided land for permanent sanctuary purposes.

Local wildlife clubs have functioned principally as a means of focusing local interest on restoration projects. In some cases they have assisted with the posting of boundary lines and protecting the stock by reporting violators, posting a reward for the reporting of violators and assisting with dog control. Such intensive participation, however, has usually been on private lands stocked at government expense.

## LEGISLATION AND LAW ENFORCEMENT

All of the southeastern states are plagued by the same types of illegal kill: stray dogs, out of season hunting, night hunting, and killing of doe deer. Aside from the fact that all of the states (except Virginia and Georgia) allow buck only as

legal game there is a general lack of effective protective legislation. Three bright spots, which it is hoped other states can copy, are:

1. In Virginia it is unlawful to carry fire arms in the closed season on the National Forests, and kill in violation of this law invokes the confiscation of the fire arms, other sporting equipment, and automobile.
2. In Tennessee a recently passed law prohibits firearms on refuges; violation of the law calls for confiscation of hunting equipment (for sale at public auction), \$50 fine and 6 months in prison. In the event of a second offense, the same penalty is increased by a fine of \$250. Perhaps the most compelling part of the law is the provision that the prison sentence is mandatory and cannot be suspended.
3. In Alabama a recently passed law calls for a \$500 fine and six months imprisonment for night hunting. It is reported that this has had a salutary effect on the night hunting situation.

Several of the states have provisions to control stray dogs in refuges, such as allowing the wardens to shoot dogs running deer, fines, and payment of costs for apprehended dogs. A few states have law prohibiting dogs from running during part of the year. Apparently none of these states has a satisfactory dog control law, and this appears to be the number one problem. North Carolina estimates over 1,000 deer killed by dogs each year.

## DEER KILL

The deer kill is summarized in Table 4. Of course, these are largely estimates, but even at that it is significant to note that they generally run less than ten percent of the total population. Since annual increment should average around 25 percent, legal kill ought to be somewhere around 20 percent of the total population. This ten percent gap may be taken as further indication of the great amount of illegal kill and gives further emphasis to the need for better laws and law enforcement.

Another significant need is for methods of securing more accurate kill data. Virginia has a state-wide system of checking stations placed at locations convenient to hunters all through the areas open to hunting. This system requires all kills to be tagged, with pertinent data being recorded relative to each deer. It is estimated that the system is 90 percent accurate. Arkansas law requires all kills to be checked by the wardens but it is reported to be hard to enforce. Florida and North Carolina report new kill check systems scheduled to be tried. Other systems are largely confined to refuge hunting records and county game protector estimates.

More accurate kill data should be helpful in more effectively pointing out the discrepancy between expected and actual legal kill, and thereby serve not only as a means for more efficient management, but also as a means to convince legislatures of the need for more stringent protective legislation.

## EDUCATION

Reported educational activities ranged from no education division and very little effort to very active education work. The most frequently used media appear to be talks to groups, and personal contacts by wardens. Written articles are probably the next most important. Radio talks, moving pictures and youth group

Table 4. Deer kill summary.

State	Sex <sup>a</sup>	Bag Limit	Estimate of Kill	Estimate of Population	Method of Kill Estimation
Alabama	Antlers required	3	2,500	32,000	Combination of estimation and sampling
Arkansas	6" antlers	2	3,000 to 4,000	55,000	Kill check system in which deer are tagged by wardens
Florida	5" antlers	2	8,000	40,000	Hunter kill records & questionnaire, new inventory method scheduled
Georgia	Visible antlers	1 - mountains 2 - coast			
Kentucky	no open season			2,500	
Louisiana	bucks	2	5,000	67,000	Careful study of hunting club records on 200,000 acre area
Mississippi	4" antlers	1	1,400 to 2,400	45,000	Warden bag checks, deer camp permits, estimates
N. Carolina	Visible antlers	1 - mountains 2 - coast	7,500	55,000	Game protector estimates, mgmt. area records; post-season check scheduled
S. Carolina	bucks	1 - mountains 5 - coast		35,000	
Tennessee	bucks	1	(1950) 274	8,700	Hunting on mgmt. area only, all hunters checked
	2" antlers in East 2 prongs 1 side in West	1 - mountains 2 - coast	4,000 to 7,000	64,000	Checking stations in all hunting sections, all deer must be tagged

<sup>a</sup>Bucks only allowed in all states, with limited exceptions as follows:

Georgia — doe deer may be taken on two management areas;

— one doe may be taken in some eastern countries where bag limit is two deer.

contacts are used to a lesser extent. One relatively inexpensive yet highly effective method consists of talks illustrated by color slides showing restoration activities.

## RESEARCH

A total of 21 research projects were reported as having been completed, in progress, or definitely scheduled. Since information derived in some states will be of value in others, each of these is listed below. Twelve PR research projects were listed:

Alabama — 26-R — Study of population densities, browse utilization, sex ratios, kill records, and management techniques — in progress.

Arkansas — A study of browse conditions on National Forest Land has been completed. A new, more comprehensive study is being scheduled.

Florida — Parallel studies are in progress on four different areas in regard to food habits, carrying capacity, reproduction, life history, disease, screw worm, influence on major land use practices, and management techniques.

Kentucky — 18-6 — Study of population increase and movement on and around restoration areas and in regard to different cover types and habitat improvement — in progress.

Louisiana — 24-R — Study of the effectiveness of restocking, annual increment, browse conditions and carrying capacity — in progress.

North Carolina — 20-R — State-wide survey of game, including deer, completed. Another project, about to be completed, analyzed the trace mineral content of important browse species from different sections of the state.

Virginia — State-wide game survey, including deer, completed.

Six research projects in cooperation with educational institutions were reported:

Alabama — The Wildlife Research Unit in Alabama Polytechnic University is studying the effect of hardwood ammate poisoning on deer.

Georgia — A graduate study problem is scheduled at the University of Georgia to determine the physical condition, reproduction, mortality, and disease of deer in relation to browse on a management area.

North Carolina — State College is assisting with analysis of mineral content of deer browse and is also working on the isolation of the pathogen causing deer die-offs attributed to "black tongue." A cooperative wildlife research unit has been recently established to further this type of work.

Virginia — The Virginia Cooperative Wildlife Research Unit at Virginia Polytechnic Institute has completed an evaluation of habitat improvement work on National Forest land. In progress is an evaluation of deer browse reconnaissance methods and their usefulness as an index of deer abundance. Also in progress is a study of the effect on game of ecological succession on abandoned areas.

Three studies were reported as having been made by or with the cooperation of other organizations:

Arkansas — The U. S. Forest Service and the University of Arkansas cooperated with the State Game and Fish Commission in a study of browse conditions which has been completed but not published.



Mississippi — Browse studies have been made by U. S. Fish and Wildlife Service representatives on the Leaf River Refuge.

North Carolina — The U. S. Forest Service completed a comparatively comprehensive study of life history and management of the Pisgah deer herd. This was bound in 1938 but never officially published for wide distribution and now is out of print.

The total of only 21 studies in eleven states and a large number of educational institutions over a period of several years can certainly not be considered a very good record. Even though several studies have probably not been reported, the best that can be said is that we may be on the threshold of systematic analysis of restoration and management problems. This presents a particularly challenging picture to educational institutions throughout the entire region. With the added emphasis on graduate study as prerequisite to employment in the wildlife field, we should look forward to a great increase in basic wildlife research. There is particular need for partition of problems into work units adaptable to the graduate level and organization which will allow study of different individuals over an extended period of time. The PR program also offers opportunities for more basic research. Of particular value would be long term projects cooperatively sponsored by the state game and fish commissions and educational institutions in which graduate students could participate. Some problems in particular need of study are:

Nutritional requirements of deer, especially in regard to natural foods.

Nutritional value of natural and planted foods, and how their abundance or depletion affects deer populations.

Effect of logging intensity, distribution, and scheduling, on deer condition and population.

Analysis of kill records in regard to total populations and as an index of herd and range condition.

The determination of "normal" and "most productive" herd composition, i.e. age and sex ratios.

Life history studies, particularly as regards herd productivity.

Disease and parasite identification and control.

## SUMMARY OF PROGRAM NEEDS

Nine of the eleven states reported more efficient protective legislation and law enforcement as an important requisite to restoration, and several rated this item as the most pressing need. Specifically, there is need for stiffer penalties and for greater cooperation on the part of local justices in meting out penalties. There is also much room for legislation controlling stray dogs.

More efficient public education was listed by nine states as an important part of the restoration work. Some suggested education on wildlife club level in the direction of encouraging local justices to give heavier penalties. More restoration work was cited by seven states as an important program need. Other items listed were: more intensive club participation in restoration work, additional sources of deer for restocking, increased trapping efficiency, education of commissioners in regard to biological factors, more money, and improved landowner-sportsmen relations.