

AN INVESTIGATION OF CONDITIONS INFLUENCING
THE PATTERN, OF OVERPOPULATED DEER AREAS IN
VIRGINIA DURING 1949

by

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INTRODUCTION

Certain states have suffered, and at present are suffering, the penalties of having a deer population in excess of the carrying capacity of the deer range. Notable among these are Pennsylvania, Michigan, and Wisconsin. The annual deer kill in Virginia does not begin to reach the numbers reported from the above named states, but reports of damage to agricultural crops, and browse lines on native vegetation have begun to appear in local areas. Leopold (1942) states, "Game management is the art of making land produce sustained annual crops of wild game for recreational use." To this definition it might be well to add: "insofar as the wild game does not interfere with man's pursuits of maintaining himself." For example, we need not sorrow over the passing of the buffalo, because our Middle West could not have become the great bread basket of the world if huge herds of buffalo migrated through it every year. The key phrase of Leopold's definition is: "for recreational use." We strive, therefore to produce yearly crops of game for recreation, but must limit game populations to less than that which would interfere with the welfare of either man or the game itself.

Purpose of This Investigation

The purpose of this investigation was to develop a means of determining the status of a deer population in a given area with particular regard to the effect of this deer population on the general environment, including both vegetation and animal populations.

Reasons for the Study

Reports of damage to agricultural crops in Virginia by deer have become more and more numerous during the past eight to ten years. Also, within the past three years reports of deer browse lines have been received. If we in Virginia are to profit by the mistakes of others, we should note these danger indicators, and avoid the damage that comes when a deer herd gets out of balance with its environment. It is only by heeding these warnings, and taking proper management steps that serious problems resulting from overpopulated deer conditions can be avoided.

County big game stamp sales and payments

In 1942, two counties in Virginia started requiring county damage stamps to pay damages caused in the county by bear and deer. Since that time other counties have joined in selling county damage stamps. This undesirable situation is spreading, and still other counties propose damage stamp sales at this time (1950). All big game hunters must buy a damage stamp before they are legally permitted to hunt in six western Virginia counties. These stamps are on sale only at the respective court

Table 1. County bear-deer damage stamp sales and payments handled by the Virginia Commission of Game and Inland Fisheries - 1942-49.

Fiscal Year	Receipts	Claims
	Bath County	
1942-43	\$2783.00	\$1000.00
1943-44	2871.00	1588.00
1944-45	2971.00	1492.00
1945-46	3793.00	1387.00
1946-47	5021.00	2267.93
1947-48	5180.00	2863.00
1948-49	5267.00	1910.94 (Bear \$292.00)
	<u>\$27836.00</u>	<u>\$12509.87</u>
	Botetourt County	
1942-43	\$ 33.00	-- --
1943-44	41.50	\$ 15.20
1944-45	50.00	-- --
1945-46	87.50	20.90
1946-47	439.50	-- --
1947-48	563.00	-- --
1948-49	568.50	-- --
	<u>\$ 1783.00</u>	<u>\$ 36.10</u>
	Buchanan County	
1947-48	\$ 10.00	\$ -- --
	<u>\$ 10.00</u>	<u>\$ -- --</u>
	Highland County	
1946-47	\$ 1050.00	\$ 410.00
1947-48	1234.00	894.00
1948-49	1181.00	813.00 (all bear)
	<u>\$ 3465.00</u>	<u>\$ 2117.00</u>
	Rockbridge County	
1946-47	\$ 351.00	\$ 296.40
1947-48	447.00	367.00
1948-49	545.00	486.92 (Bear \$264.92)
	<u>\$ 1343.00</u>	<u>\$ 1150.43</u>
	Wise County	
1945-46	\$ 644.00	\$ 385.00
1946-47	1497.00	-- --
1947-48	1869.00	317.00
	<u>\$ 4010.00</u>	<u>\$ 702.00</u>
Grand Total	\$38487.00	\$16515.29

houses of the counties which require these stamps. The amount of money involved is presented in Table 1 and it will be noted that bear damage payments also are included in those data.

Deer harvest records 1923-1949

Deer hunting in Virginia is becoming more and more important as time goes by. At the same time the deer herd is increasing, providing more and more recreation for more and more sportsmen. This information is presented in Table 2.

Table 2. Annual deer kill, number of counties in which the kill was made, and big game license sales.

Year	Number Deer Killed	Number Counties	Big Game License Sales
1923	793	34	
1924	267	30	
1925	No data available		
1926	No data available		
1927	687	38	
1928	561	32	
1929	790	32	
1930	1299	39	
1931	1399	34	
1932	1151	36	
1933	1040	31	
1934	1184	36	
1935	1158	35	
1936	1475	34	
1937	1526	37	4,938
1938	1391	39	5,540
1939	1365	43	5,870
1940	1691	40	6,093
1941	1901	45	6,484
1942	1448	41	8,434
1943	2282	44	8,081
1944	3433	48	9,615
1945	4545	55	13,225
1946	6543	64	20,374
1947	3987	71	34,421
1948	5220	69	41,926
1949	7021	71	43,081

Prior to 1947 the kill figures are Game Warden estimates; starting in 1947 all legal deer had to be tagged at official check stations and reported to the Richmond office.

As is indicated in Table 2, the deer harvest has increased greatly in the past 25 years. In 1924, 267 deer were killed in thirty counties; in 1949, the season just passed, 7,021 deer were killed in seventy-one counties. The fact that deer were killed in 71 out of the 100 counties in Virginia indicates that deer hunting provides an extensive and important form of recreation in this state.

State big game license sales

It can be seen in Table 2 that the number of big game hunters in Virginia has grown from 4,938 in 1937, when big game licenses were first sold, to 43,081 in 1949. Trippensee (1948), in discussing forest game management, states, "Of all the game species in the United States, the white-tailed deer ranks first." It can be readily seen that in Virginia big game hunting is rapidly increasing in popularity; ultimately Trippensee's statement may apply specifically to Virginia, as well as to the nation at large.

A recreation of great importance as deer hunting is rapidly becoming in Virginia deserves intelligent management in order that it may not be handicapped by the unfortunate results of overpopulations. By anticipating such conditions and taking heed of such warnings as present themselves, we can avoid overpopulations of deer by wise management practices.

Definition of Overpopulation In This Study

For the purposes of this study an overpopulated area is defined not only as an area in which the deer are inflicting damage to the forest vegetation, but also as an area in which agricultural crops are being damaged to such a point that the deer are interfering with a farmer's method of obtaining a livelihood, even though the deer in the locality may not be exerting any appreciable pressure on the native vegetation.

DEER DISTRIBUTION AND DENSITY IN VIRGINIA

During the Colonial period deer were abundant throughout the entire state of Virginia, even though Virginia is one of the earliest settled sections of the United States. Around 1915 to 1920 the deer population in Virginia apparently reached its lowest ebb (Handley, 1932). Since that time the deer population has been slowly but steadily increasing.

History of Deer Populations in Virginia

Deer were unquestionably abundant in Virginia when the colony was first settled. Seton (1929) in speaking of the history of the white-tail quotes Thomas Hariot, an Englishman in the service of Sir Walter Raleigh, who visited the Virginia Colony in 1584; "Of Beastes. Deare, in some places there are great store: neere unto the sea coast, they are of the ordinarie bignes as ours in England, and some lesse: but further up into the countrys there is better feed they are greater: they differ from ours onely in this, their tails are longer, and the snags of their hornes looke backward."

Despite heavy hunting, deer have persisted in the eastern portion of the state. This has been due to the nature of the terrain of the tidewater section of Virginia. In this area are found many creeks, rivers, and bays with the accompanying marshes and swamps that offer safety to the deer from dogs and poachers.

Deer at one time were plentiful in the mountainous section of the state. Due to the topography and methods of hunting, the deer population declined to a much lower point than in eastern Virginia. In the

mountain sections the deer cannot escape from its pursuer and find refuge in swamps, marshes, and rivers as can the eastern deer. By 1900, principally because of hunting with dogs, deer were practically exterminated in the mountain areas, except in the counties of Bath, Alleghany, Craig, Highland, and Shenandoah.

Figure 2 shows the deer distribution in Virginia in 1938 as stated by Patton (1938).

Restocking records and herd control methods

In 1938, according to Clarke and Karger (1942), the Virginia Commission of Game and Inland Fisheries, through use of Pittman-Robertson funds, began a five-year program of restocking deer in the depleted deer ranges of the mountains. The plans for this period called for a release of 1305 deer in the George Washington and Jefferson National Forests. Since that time additional deer have been released and at the present time (1950) additional deer are being secured for release in certain areas of the Jefferson National Forest. A recorded total of 1813 deer have been released in the mountainous section of Virginia by the state up to 1950. In addition, an undetermined number of deer have been released by interested sportsmens groups in such localities as Harrisonburg and Norton. These deer were purchased with private funds, sometimes matched by the state game department.

The success of these releases has largely depended upon the amount of protection that the small herds have been given from free-running dogs and illegal hunting. Public opinion has played an important role in the success of these herds. In those areas where the public has been interested and cooperative, the deer herd has increased rapidly.

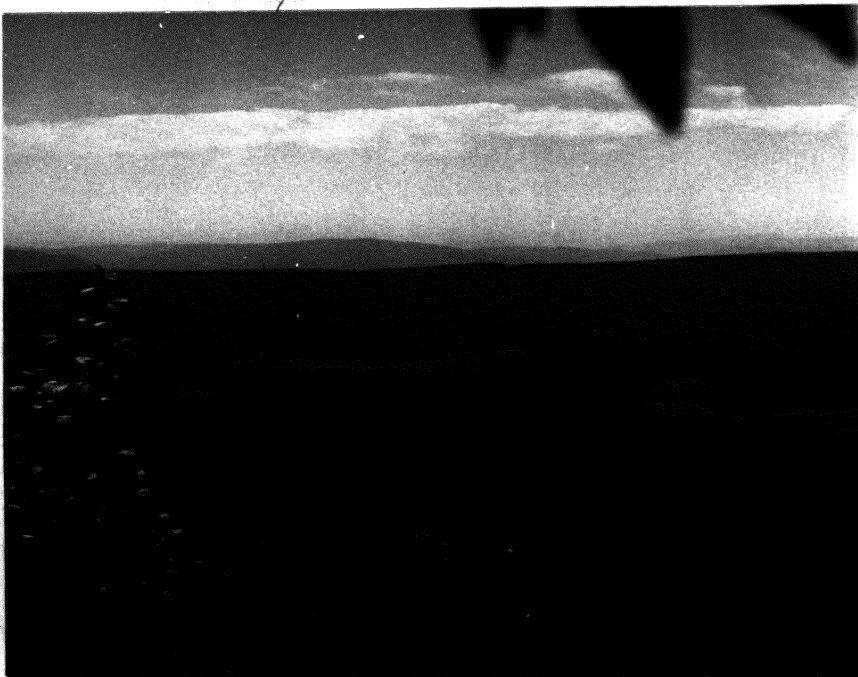


Figure 1. A total of 1813 deer have been released in the mountains of Virginia. A majority of the releases have been made in heavily wooded areas, with scattered farms, such as shown above.

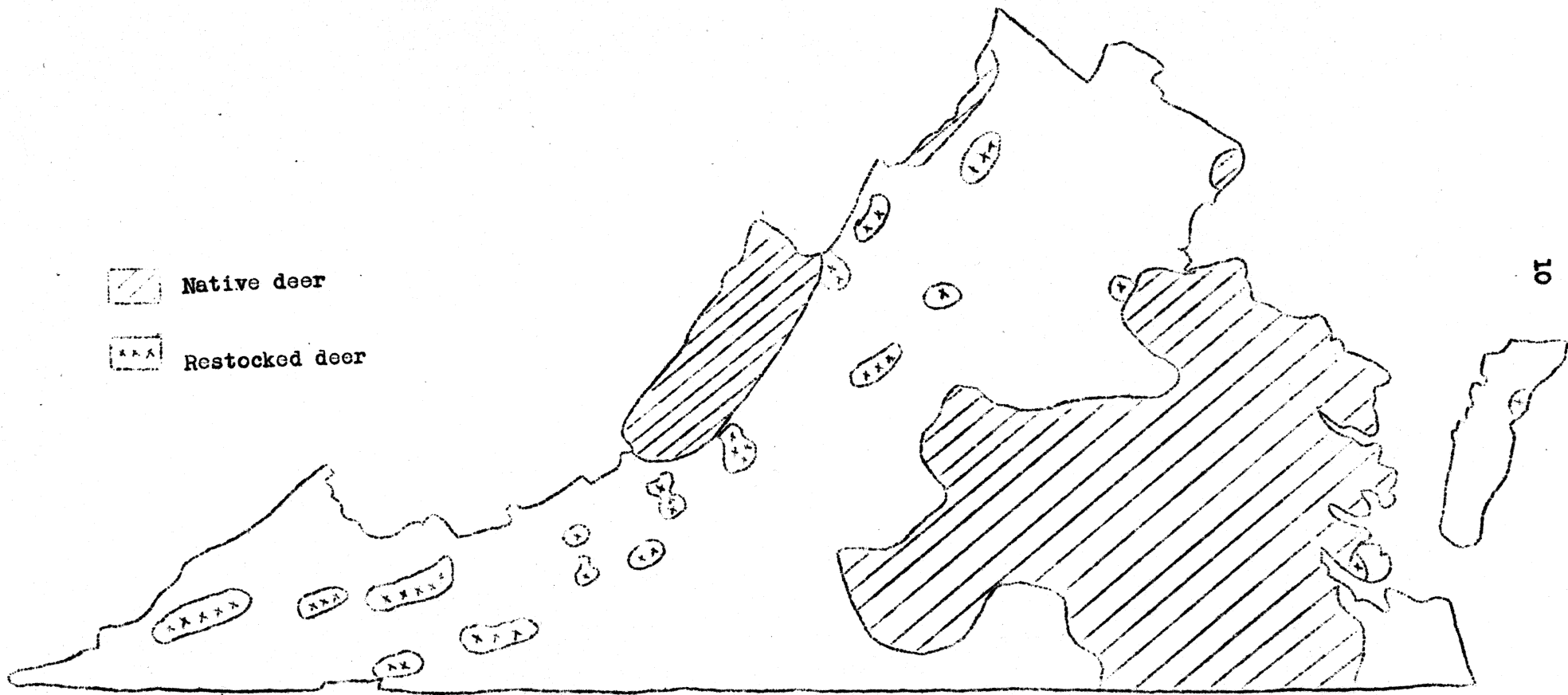


Figure 2. DISTRIBUTION OF NATIVE AND RESTOCKED DEER (Patton, 1938)

Prior to and including the 1923-24 hunting season it was legal to kill bucks, does and fawns in Virginia. Following this season the "buck law" came into being. At first this law was very unpopular and attempts were made to have it changed. But the law weathered the storm of opposition that was built up against it. Now, some local exceptions to the buck law have been made, and doe seasons have been declared when conditions warrant them. The buck law, plus adequate protection, gave the deer in the tidewater and piedmont sections of Virginia the chance to increase and spread throughout these regions.

Areas selected for further investigation

Overpopulation deer areas in Virginia were located in the following manner: A questionnaire was sent to all of the district wildlife technicians requesting the following information: location of areas in each district where deer damage is reported to either agricultural or forest land, type of crop that is damaged, and the location of any electric fences that have been established for the purpose of keeping deer out of crops. This information was quickly returned and plans were made to visit the reported areas. Locations of these areas is shown in Figure 3.

These overpopulation areas are listed in Table 3, together with the season deer damage is inflicted and the crop damaged.

1. BRANDON
2. HOMEVILLE
3. WEST POINT
4. TAPPAHANNOCK
5. NAVAL MINE DEPOT
6. GLADES WILDLIFE AREA
7. WINCHESTER
8. DEERFIELD
9. BACK CREEK MOUNTAIN
10. FAUKLAND ESTATE
11. BUCKINGHAM FOREST
12. PARAMCRE ISLAND

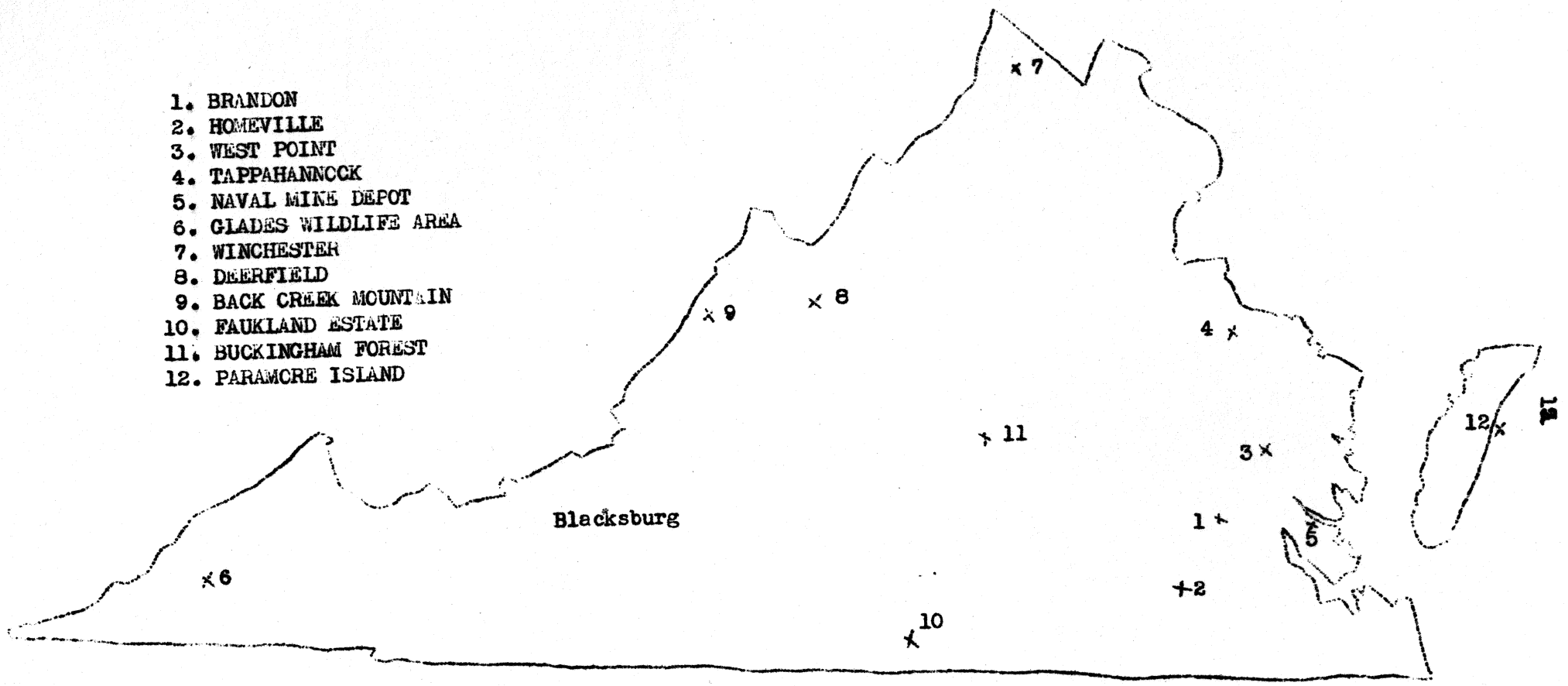


FIGURE 3. LOCATION OF OVERPOPULATED DEER AREAS IN VIRGINIA DURING 1949

Table 3. Location, season and vegetation damaged by deer in Virginia

	<u>Location</u>	<u>Type of Vegetation</u>	<u>Season</u>
1.	Brandon Pr. George County	Corn Soy Beans	Aug.-Nov. July
2.	Homeville Sussex County	Soy Beans	July
3.	West Point King Wm. County	Soy Beans Alfalfa	July-Aug.
4.	Tappahannock Essex County	Apple Orchard	May-June
5.	Naval Mine Depot York County	Forest Land	Late winter
6.	Glades Wildlife Area Wise and Scott Counties	Forest Land	Late winter
7.	Winchester Frederick County	Apple Orchard	April and Oct.
8.	Deerfield Augusta County	Corn	Sept.-Nov.
9.	Back Creek Mountain Bath County	Forest Land	Late winter
10.	Faukland Estate Halifax County	All Crops Including Tobacco	May to April
11.	Buckingham State For. Buckingham County	Wildlife Food Plantings	Sept.-Nov.
12.	Paramore Island Accomac County	Forest Land	Year around

All areas were visited and case histories of each area tabulated. These case histories appear in the appendix of this report. Certain characteristics on each area were investigated to determine if similar characteristics exist in the other areas reporting damage to vegetation by deer.

Location and Density of Deer for 1949

While the annual Game Warden School was held at Virginia Polytechnic Institute in the summer of 1949 each warden from every county was interviewed and information concerning the distribution and density of the deer in their counties was plotted on county highway maps.

Three classifications of density were used: (1) absent; (2) few, meaning not in sufficient numbers to justify good deer hunting; and (3) good, meaning abundant enough to furnish good deer hunting. This information is presented in Figure 4.



Figure 4. Deer distribution and relative abundance in Virginia, 1949, as reported by county game wardens.

THE CHARACTERISTIC PATTERN OF OVERPOPULATION

This project was undertaken with the basic assumption that if an overpopulation of deer is about to develop, there will be certain characteristics, or a characteristic pattern of the area, which will indicate its stage of development. The major work of the study was concerned with determining such characteristics, and defining them in order that they might be recognized and utilized in deer management.

After investigations were made of the twelve areas reporting damage to vegetation it was decided to concentrate upon six of them. These areas are: Brandon in Prince George County; Faulkland in Halifax County; Naval Mine Depot in York County; Glades Closed Wildlife Area in Scott and Wise Counties; and the Back Creek-Hidden Valley Farm area in Bath County. In addition, six other areas were considered, but not studied intensively in this investigation because it was felt that the crop damage in these areas was a result of having a highly desirable food in or near ideal deer habitat that contained only a normal deer herd. It is true that such a condition presents a problem of deer management as a result of the landowner resentment and public illwill. One deer browsing in an apple orchard is one deer too many; damage is going to result, even though that deer might be the only one in the vicinity.

History of Population Increase on Study Areas

With one exception, deer hunting has been either restricted or prohibited on all areas considered in this study.

Controlled hunting by club members is becoming particularly prevalent in the tidewater section of Virginia. It is becoming more and more difficult for a person who is not a club member to find a place to hunt deer. This condition was found to be true in Brandon, Faulkland, Homeville, West Point, Tappahannock, and Paramore Island.

Similar conditions are to be found in the mountains of Virginia, where the large landowners post their lands in order that they and their friends may have private hunting areas. There are, however, the two national forests which offer a large area of public hunting grounds of some 1,500,000 acres.

The deer herd in the Glades Wildlife Area started with 133 restocked deer. These deer were restocked between 1931-41. The area has served as a refuge for the deer, being closed to all hunting, and having a full-time deputy wildlife manager. During the past season (1949) the area was opened to public deer hunting for the first time. During the two-day legal season in this area 20 bucks and 3 illegal does were killed. It is estimated that this area reached a saturation point in regards to number of deer and the carrying capacity of the range in 1947-48. The removal of 23 deer from this area has not noticeably reduced the present deer herd.

The deer herd in the Naval Mine Depot is reported to have started with two does and a buck released in 1922. There has been no hunting on this area since that time. During the past hunting season (1949)

24 deer were killed in a controlled hunt. Deer became common in this area around 1939, a period of 17 years from the time of the first release. At the present the deer in this area are overabundant.

There has been no hunting in Brandon for thirty years. During the past season the area was opened to hunting for the first time and a kill of approximately 200 deer is reported. It appears that this may have reduced the deer population to some extent.

The area in Faukland is hunted by members only. In the past two years they have had quite a number of guests on each hunt, and the hunts are held more and more frequently. The number of people hunting on any one day seldom exceeds ten. The number of deer taken in a season has increased from a kill of 5 bucks in 1939 to a kill of approximately 125 in 1949.

The yearly deer kill in Back Creek Wildlife Area and Hidden Valley Farm has remained fairly constant over the past ten years. The annual kill on these two areas, approximately four miles apart, totals 20 to 25 deer. There has been nothing done in these areas to maintain or increase the deer browse that was present in the area 25 years ago. At the present time (late 1949) some logging operations are being started on the Hidden Valley Farm area which may help overcome the present browse deficiency.

In other areas reporting damage by deer, such as Homeville, West Point, Tappahannock, Deerfield, Buckingham State Forest, and Paramore Island, similar conditions are found. In a period of from 10 to 15 years a small scattered herd has increased to the point where the deer are now causing damage to agricultural crops.

Relationship of Game Populations to Deer on Study Areas

Of all the game species of wildlife that occur in the state the deer appears to offer the most serious competition with the wild turkey, quail, and grouse.

Whether or not the decrease in game bird populations is due to the increase in the deer population, changes in agriculture, or ecological succession were not investigated. Only the changes in relative population numbers were recorded.

Of the twelve areas reporting deer damage, turkeys have decreased in four, remained constant in three, and are absent from five areas.

Quail are reported to be decreasing in two areas, constant in four, and to be absent in three areas. No information was obtained from the remaining three areas.

Grouse occur in the mountains and are therefore considered in four areas. Of these four, grouse have decreased in one area, namely the Glades Wildlife Area. Here the deer have so severely browsed an important grouse food, greenbrier, that its density has been reduced an estimated 85 to 90 per cent.

It apparently is a characteristic of over populated areas that the game bird population decreases as the number of deer increase. Game bird population have decreased in eight instances and remained constant in ten, but some of the reports of constant game bird population has been due to such circumstances as bear oak thickets where the deer cannot reach all of the mast crop.

Damage to Vegetation

Location of areas with overpopulations were made by finding those areas that were reported to have damage to vegetation, whether it was forest or agricultural. All too often damage to vegetation is not recognized until the deer population has already reached too great a density. In addition, people familiar with one area are seldom familiar with other areas. Some system of measuring the deer density - carrying capacity relationships is urgently needed.

Forest vegetation

An important objective of this project was to determine the relationship of the deer population of an area to its native vegetation. This phase of the investigation was planned for the critical winter months when wildlife foods in general are at their lowest point. This past winter (1949-50) was very mild, with little or no snow. The browse survey was conducted during the month of February, and weather conditions were practically the same throughout the month. The presence or lack of snow, therefore, has not caused any undue pressure on any particular plant species. Browse surveys on all areas were carried out as quickly as possible in order that the areas might be surveyed under similar conditions.

The method used in conducting this browse survey is a modification of that described by Aldous (1944), which was developed for use in the deer yards of the northern states. Modifications of this method also have been used by Goodrum (1948) in Alabama, and Georgia.

Aldous' method is briefly this: Using a tally sheet the occurrence and utilization of browse in a given area is recorded on a sample

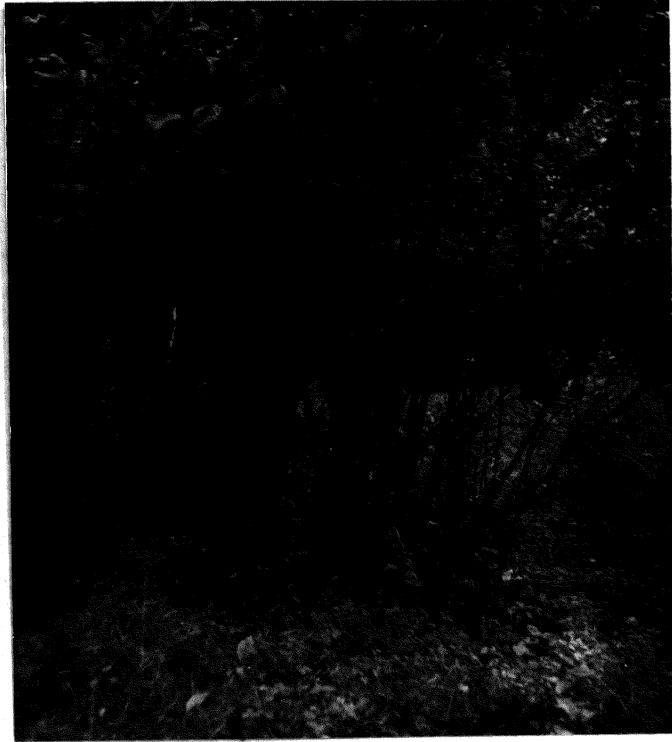


Figure 5. Heavily browsed witchhazel (Hamamelis virginiana).



Figure 6. Unbrowsed witchhazel (Hamamelis virginiana) adjacent to the above bush.

quadrat basis. Aldous used 1/100 acre plots laid out at predetermined intervals. The method used in this study employed the same techniques and tally sheet as described by Aldous, but the size of the plots was increased from 1/100 acre to 1/4 acre.

In this investigation, the number of plots to be used on a given area was controlled by the maximum and minimum acreage of the largest and smallest areas to be surveyed, and by the time allotted to conduct the survey in the six areas scattered throughout the state. Twenty-eight days were to be spent in covering the six areas. Transportation required approximately one day to reach each area and one day to return. The largest area, 9,000 acres, was in Halifax County. One day could be spent on the area and 30 plots measured in a day. The Back Creek area in Bath County contained 600 acres and is 1/15 the size of the area in Halifax County. Therefore, 2 plots were measured at Back Creek, or 1/15 the number in Halifax. The number of plots surveyed in each area was divided equally between the major vegetation types present on the area, regardless of the per cent of the total area covered by the vegetation types. A summary of the acreage, number of plots and major vegetation types is shown in Table 4. The location of the plots was selected at random in the major vegetation types. A radius of 58.9 feet was used to lay out the 1/4 acre circular plots.

A summary of the information collected by this system of browse measurement is presented in Tables 5 through 10. According to Aldous (1944) deer in a good healthy condition should not depend on any one plant species alone for food, but should utilize several species.

Table 4. Acreage, number of plots, and vegetation types in areas on which the deer browse survey was conducted - 1950.

Location	Acreage	No. of Plots	Vegetation Types
Back Creek	600	2	1
Bath County			
Glades Wildlife Area	1200	4	2
Scott County			
Hidden Valley Farm	1600	5	2
Bath County			
Brandon	6000	20	2
Pr. George County			
Naval Mine Depot	8400	28	2
York County			
Faukland Estate	9000	30	4
Halifax County			

Table 5. Winter utilization of browse by deer, Back Creek Wildlife Area, Bath County, Virginia: Two 1/4 acre plots; February, 1950.

Browse Species	No. of Plots (1)	Average Density (2)	Average Degree Browsing (3)	Utilization Factor (4)	Per Cent of Food Eaten (5)	Per Cent of Browse Available (6)
Dogwood (<u>Cornus florida</u>)	2	17.5	37.5	655.25	59.9	26.9
Greenbrier (<u>Smilax</u> spp.)	2	5.0	50.0	250.00	22.8	7.6
White Oak group (<u>Quercus</u> spp.)	2	5.0	17.5	87.50	8.0	7.6
Red Maple (<u>Acer rubra</u>)	1	2.5	15.0	37.50	3.4	3.8
Vaccinium (<u>Vaccinium</u> spp.)	1	15.0	2.5	37.50	3.4	23.0
Multiflora rose (<u>Rosa multiflora</u>)	1	2.5	2.5	6.25	.5	3.8
Mt. laurel (<u>Kalmia latifolia</u>)	1	2.5	2.5	6.25	.5	3.8
White pine (<u>Pinus strobus</u>)	1	2.5	2.5	6.25	.5	3.8
Hemlock (<u>Tsuga canadensis</u>)	1	2.5	2.5	6.25	.5	3.8
Birch (<u>Betula lenta</u>)	1	2.5	0.0	0.00	0.0	3.8
Red Oak group (<u>Quercus</u> spp.)	1	2.5	0.0	0.00	0.0	3.8
Red Spruce (<u>Picea rubra</u>)	1	2.5	0.0	0.00	0.0	3.8
Witch hazel (<u>Hamamelis virginiana</u>)	1	2.5	0.0	0.00	0.0	3.8
Totals		65.0%		1092.75	99.5%	99.3

- (1) The number of plots in which the plant species occurred.
- (2) The average per cent of the plot covered by the plant species indicated.
- (3) The per cent of the plant species browsed by deer.
- (4) This column is a product of columns 2 and 3.
- (5) Determined by dividing the total of column 4 into the utilization factor for the individual plant species: i.e., for dogwood, 655.25 divided by 1092.75 equals 59.9 per cent.
- (6) Determined by dividing the total of column 2 into the average density for individual plant; i.e., for dogwood, 65.0 divided into 17.5 equals 26.9 per cent.

Table 6. Winter utilization of browse by deer, Glades Wildlife Area, Scott County, Virginia:
Four 1/4 acre plots, February 1950.

Browse Species	No. of Plots	Average Density	Average Degree of Browsing	Utilization Factor	Per Cent of Food Eaten	Per Cent of Browse Available
Greenbrier (<u>Smilax</u> spp.)	3	10.0	36.3	362.50	63.4	12.5
Azalea (<u>Rhododendron</u> spp.)	1	7.5	7.5	55.25	9.6	9.3
Rhododendron (<u>Rhododendron maxima</u>)	1	7.5	7.5	55.25	9.6	9.3
Laurel (<u>Kalmia latifolia</u>)	2	25.0	1.3	31.25	5.4	31.2
Vaccinium (<u>Vaccinium</u> spp.)	4	11.3	2.5	28.13	4.9	14.0
Sassafras (<u>Sassafras variifolium</u>)	1	1.3	17.5	21.87	3.8	1.5
Red Maple (<u>Acer rubra</u>)	3	10.0	1.3	12.50	2.2	12.5
Shawnee haw (<u>Viburnum cassinoides</u>)	1	1.3	1.3	1.51	trace	1.5
Sourwood (<u>Oxydendrum arboreum</u>)	1	1.3	1.3	1.51	trace	1.5
Dogwood (<u>Cornus</u> spp.)	1	1.3	1.3	1.51	trace	1.5
Totals		76.5			98.9	99.4

Table 7. Winter utilization of browse by deer, Hidden Valley Farm, Bath County, Virginia:
Five 1/4 acre plots, February 1950.

Browse Species	No. of Plots	Average Density	Average Degree of Browsing	Utilization Factor	Per Cent of Food Eaten	Per Cent of Browse Available
Dogwood (<u>Cornus florida</u>)	4	5	35	175	47.1	6.0
Vaccinium (<u>Vaccinium</u> spp.)	4	48	3	144	38.8	57.8
Beech (<u>Fagus grandifolia</u>)	3	3	6	18	4.8	3.6
Witch hazel (<u>Hamamelis virginiana</u>)	1	1	14	14	3.7	1.2
Laurel (<u>Kalmia latifolia</u>)	2	7	2	14	3.7	8.4
Sassafras (<u>Sassafras variifolium</u>)	1	1	6	6	1.6	1.2
Cataegus spp.	2	3	--	--	--	3.6
Hickory (<u>Hicoria</u> spp.)	3	3	--	--	--	3.6
Red oak group (<u>Quercus</u> spp.)	4	5	--	--	--	6.0
Red maple (<u>Acer rubra</u>)	4	4	--	--	--	4.8
White oak group (<u>Quercus</u> spp.)	3	3	--	--	--	3.6
Totals		83			99.7	99.8

Table 8. Winter utilization of browse by deer, Brandon, Prince George County, Virginia: Twenty 1/4 acre plots, February 1950.

Browse Species	No. of Plots	Average Density	Average Degree of Browsing	Utilization Factor	Per Cent of Food Eaten	Per Cent of Browse Available
Honeysuckle (<u>Lonicera japonica</u>)	12	21.8	32.3	704.14	75.1	39.2
Greenbrier (<u>Smilax</u> spp.)	11	3.0	29.5	88.50	9.4	5.3
Bay myrtle (<u>Myrica carolinensis</u>)	13	4.5	14.8	66.60	7.1	8.0
Holly (<u>Ilex opaca</u>)	10	2.5	9.5	23.75	2.5	4.4
Red maple (<u>Acer rubra</u>)	6	1.5	5.5	8.25	.8	2.6
Pine (<u>Pinus taeda</u>)	5	1.3	5.0	6.50	.6	2.3
Sweetgum (<u>Liquidambar styraciflua</u>)	10	3.8	.5	1.90	.2	6.8
White oak group (<u>Quercus</u> spp.)	4	1.0	1.8	1.80	.2	1.7
Cedar (<u>Juniperus virginiana</u>)	2	.5	5.0	2.50	.2	.8
Blackberry (<u>Rubus</u> spp.)	1	.3	--	--	--	.5
Ironwood (<u>Ostrya virginiana</u>)	1	.3	.3	.09	--	.5
Red oak group (<u>Quercus</u> spp.)	6	2.8	--	--	--	5.0
Totals		43.3			99.6	99.1

Table 9. Winter utilization of browse by deer, Naval Mine Depot, York County, Virginia: twenty-eight 1/4 acre plots, February 1950.

	No. of Plots	Average Density	Average Degree of Browsing	Utiliza- tion Factor	Per Cent of Food Eaten	Per Cent of Browse Available
Greenbrier (<u>Smilax</u> spp.)	12	8.9	27.1	241.19	52.1	17.7
Honeysuckle (<u>Lonicera japonica</u>)	6	8.4	17.5	146.00	31.5	16.7
Bay myrtle (<u>Myrica caolinensis</u>)	17	10.7	2.8	29.96	6.4	21.3
Dogwood (<u>Cornus</u> spp.)	12	4.9	5.5	26.95	4.8	9.7
Sweetgum (<u>Liquidambar styraciflua</u>)	13	3.2	2.1	6.72	1.4	6.3
Cedar (<u>Juniperus virginiana</u>)	6	1.0	5.7	5.70	1.2	1.9
Vaccinium (<u>Vaccinium</u> spp.)	6	2.0	1.0	2.00	.6	3.9
Beech (<u>Fagus grandifolia</u>)	9	3.4	---	---	---	6.7
Blackberry (<u>Rubus</u> spp.)	2	.3	.3	.90	---	.5
Beauty berry (<u>Callicarpa americana</u>)	1	.1	---	---	---	.1
Hickory (<u>Hickoria</u> spp.)	2	.3	---	---	---	.5
Holly (<u>Ilex opaca</u>)	12	2.1	.3	.63	---	4.1
Pine (<u>Pinus taeda</u>)	8	1.4	---	---	---	2.7
Red oak group (<u>Quercus</u> spp.)	6	1.0	.1	.11	---	1.9
Red maple (<u>Acer rubra</u>)	3	.5	2.5	1.25	---	.9
Sassafras (<u>Sassafras variifolium</u>)	1	.1	2.5	.25	---	.1
Tulip popular (<u>Liriodendron tulipifera</u>)	5	.8	.3	.24	---	1.5
White oak group (<u>Quercus</u> spp.)	6	1.0	.1	.11	---	.1
Totals		51.1			99	98.4

Table 10. Winter utilization of browse by deer, Faukland Estate, Halifax County, Virginia:
Thirty 1/4 acre plots, February 1950.

Browse Species	No. of Plots	Average Density	Average Degree of Browsing	Utilization Factor	Per Cent of Food Eaten	Per Cent of Browse Available
Dogwood (<u>Cornus</u> spp.)	14	8.2	10.8	88.56	28.1	17.2
Ladino clover (<u>Trifolium repens</u> var <u>latum</u>)	4	9.3	9.3	86.49	27.5	19.6
Greenbrier (<u>Smilax</u> spp.)	8	6.0	112.5	75.00	23.8	12.6
Milo maize (<u>Sorghum</u> spp.)	3	3.0	7.0	21.00	6.6	6.3
Wheat (<u>Triticum sativum</u>)	3	3.0	7.0	21.00	6.6	6.3
Red maple (<u>Acer rubra</u>)	13	2.2	5.5	12.10	3.8	4.6
Honeysuckle (<u>Lenicera japonica</u>)	2	1.2	4.7	5.64	1.7	2.5
Vaccinium (<u>Vaccinium</u> spp.)	9	1.5	.7	1.05	.3	3.1
Pine (<u>Pinus taeda</u>)	2	.3	2.3	.69	.2	.6
Birch (<u>Betula nigra</u>)	4	2.8	.3	.84	.2	5.9
Blackberry (<u>Rubus</u> spp.)	3	1.3	.5	.65	.2	2.7
Coral berry (<u>Symphoricarpos orbiculatus</u>)	2	.3	.2	.06	--	.6
Cedar (<u>Juniperus virginiana</u>)	3	.5	2.7	1.35	.4	1.0
Hickory (<u>Hickoria</u> spp.)	3	.5	--	--	--	1.0
Holly (<u>Ilex opaca</u>)	1	.2	--	--	--	.4
Ironwood (<u>Ostrya virginiana</u>)	1	.2	--	--	--	.4
Red oak group (<u>Quercus</u> spp.)	8	1.7	--	--	--	3.5
St. John's Wort (<u>Hypericum</u> spp.)	1	.2	.2	.04	--	.4
Sweetgum (<u>Liquidambar styraciflua</u>)	12	2.8	--	--	--	17.2
White oak group (<u>Quercus</u> spp.)	6	1.0	--	--	--	2.1
Beech (<u>Fagus grandifolia</u>)	2	1.2	--	--	--	2.5
Totals		47.4			99.1	99.2

The purpose of the browse study was to find the relationship between the deer and the existing range conditions. Unfavorable range conditions might be due to fire, overbrowsing, or ecological succession; the result would be the same, a shortage of suitable browse for the number of deer present on the range. In this manner range conditions in eastern Virginia can be compared to range conditions in western Virginia, even though the carrying capacity of deer range in eastern Virginia may be greater than that in the mountainous section.

It would appear logical to compare various deer ranges by measuring the proportion of low value foods in the total diet of the deer on one area, and compare it with the proportion of low value foods utilized on another area. A difficulty, however, which is immediately encountered in attempting to rate deer ranges by this method is that of determining what deer foods may be classified as low value, or "stuffing foods." Leopold (1942) classified laurel and rhododendron as stuffing foods. Trippensee (1948) lists pines and hemlocks as being foods that do not provide a sustaining ration, and classifies the oaks as being poor food. Goodrum (1948) calls sweetgum, blueberries, and winter huckleberry fourth-rate deer foods. Petrides (1941) lists hemlock, white pine, beech, and blackberry as emergency foods; blueberry, bush honeysuckle, sweetfern and meadow sweet are termed stuffing foods. This writer has not yet found a way to determine definitely which foods should be rated as non-sustaining. For that reason all of these plants are termed secondary foods in this study. Some of them occur abundantly in some areas but are seldom browsed; they do not appear to be as palatable as other foods. A rating of the six areas according to the quantity of secondary deer foods taken is given in Table 11.

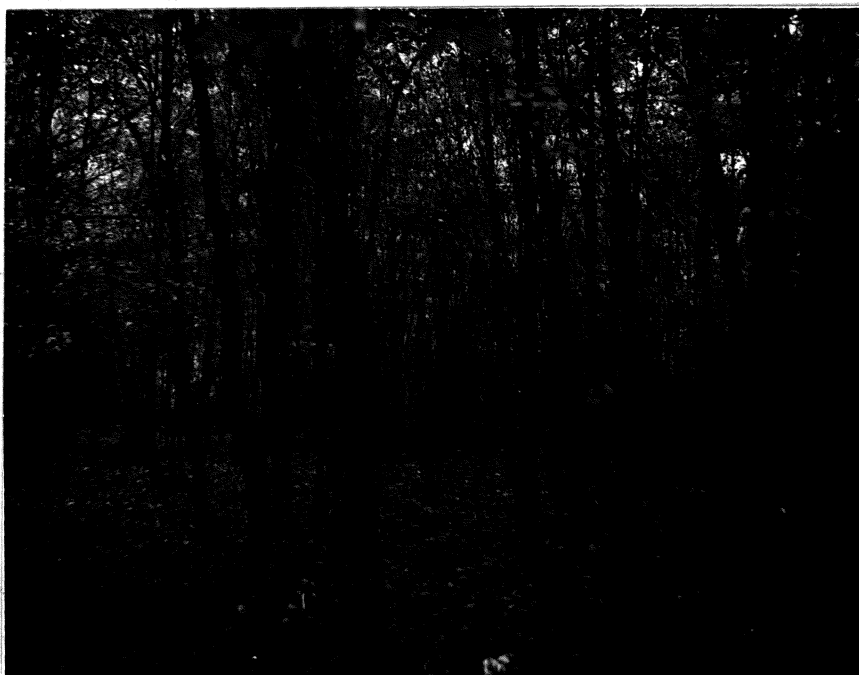


Figure 7. Poor deer range conditions may be caused by a closed forest canopy which shades out most, if not all of the shrubby vegetation normally used for food by the deer.

Table 11. A rating of the severity of high populated deer ranges in Virginia according to the amount of secondary foods eaten by deer.

Location	Secondary Foods		Total %	Rating
Hidden Valley Bath County	<u>Vaccinium</u> spp.	38.8%	47.3	1
	Beech (<u>Fagus grandifolia</u>)	4.8%		
	Mt. laurel (<u>Kalmia latifolia</u>)	3.7%		
Glades Scott County	<u>Rhododendron maxima</u>	9.6%	19.9	2
	Mt. laurel (<u>Kalmia latifolia</u>)	5.4%		
	<u>Vaccinium</u> spp.			
Back Creek Bath County	W. Oak group (<u>Quercus</u> spp.)	8.0%	12.9	3
	<u>Vaccinium</u> spp.	3.4%		
	Mt. laurel (<u>Kalmia latifolia</u>)	.5%		
	W. Pine (<u>Pinus strobus</u>)	.5%		
	Hemlock (<u>Tsuga canadensis</u>)	.5%		
Brandon Prince George Co.	Bay myrtle (<u>Myrica carolinensis</u>)	7.1%	10.8	4
	Holly (<u>Ilex opaca</u>)	2.5%		
	Pine (<u>Pinus taeda</u>)	.6%		
	Sweetgum (<u>Liquidambar styraciflua</u>)	.2%		
	W. oak group (<u>Quercus</u> spp.)	.2%		
	Red cedar (<u>Juniperus virginiana</u>)	.2%		
Mine Depot York County	Bay myrtle (<u>Myrica carolinensis</u>)	6.4%	9.6	5
	Sweetgum (<u>Liquidambar styraciflua</u>)	1.4%		
	Red cedar (<u>Juniperus virginiana</u>)	1.2%		
	<u>Vaccinium</u> spp.	.6%		
Faukland Halifax County	<u>Vaccinium</u> spp.	.3%	.9	6
	Pine (<u>Pinus taeda</u>)	.2%		
	Red cedar (<u>Juniperus virginiana</u>)	.4%		

An attempt was made to determine the nutritional value of certain foods in order that a more scientific measurement of the evaluation of deer ranges could be made. A collection of twigs similar to that of deer browse were collected from fifteen plants, and the nutritional value analyzed by the Agricultural Chemistry Department at the Virginia Polytechnic Institute. The results of these analyses were surprising, as the protein content, especially of the various plants analyzed do not coincide with the browse values generally attributed to these plants.

The mineral and protein analysis of these plants is presented in Table 12.

Table 12. Mineral constituents and protein content of fifteen deer browse plants, collected April 13, 1950 at Blacksburg, Virginia

Plant Species	Protein	Phosphorus	Calcium
Bay myrtle (<u>Myrica carolinensis</u>)	12.38	.124	1.05
Honeysuckle (<u>Lonicera japonica</u>)	10.19	.190	2.36
Red cedar (<u>Juniperus virginiana</u>)	9.88	.200	1.32
Dogwood (<u>Cornus florida</u>)	9.06	.224	3.18
Loblolly pine (<u>Pinus taeda</u>)	8.63	.152	.66
White pine (<u>Pinus strobus</u>)	8.56	.167	.70
Mt. laurel (<u>Kalmia latifolia</u>)	8.25	.152	1.36
Azalea (<u>Rhododendron nudiflora</u>)	7.06	.167	1.71
Beech (<u>Fagus grandiflora</u>)	7.00	.133	.93
Hemlock (<u>Tsuga canadensis</u>)	6.88	.152	.70
Sweetgum (<u>Liquidambar styraciflua</u>)	6.75	.148	3.49
Rhododendron (<u>Rhododendron maxima</u>)	6.56	.100	1.05
Greenbrier (<u>Smilax</u> spp.)	5.88	.090	.27
White oak (<u>Quercus alba</u>)	5.50	.119	1.24
Vaccinium (<u>Vaccinium</u> spp.)	5.31	.110	1.26

Agricultural vegetation

Damage to agricultural crops is reported more often than damage to forest land as a result of closer observation of an investment that

is expected to yield a return every year. Damage to agricultural crops is varied, and the season during which it occurs varies throughout the state.

Growing crops in the vicinity of good deer range, particularly in fields surrounded by woodland, is inviting deer to feed on vegetation more nutritious and desirable than the deer can find in the woods. The solution to the problem this condition presents is not clear at the present time. Deer have a low radius of mobility; perhaps the answer is to remove all deer in close proximity to agricultural lands.

Deer in an apple orchard are certainly pests to the orchardist. One deer in an orchard is one too many. Deer damage to orchards close to the mountains is to be expected and is occurring, especially in those bordering on the Shenandoah Valley.

A summary of the location, time of year and type of crop damage in the eight agricultural areas examined is given in Table 13.



Figure 8. Damage to corn from August to October is a common complaint in overpopulated deer areas

Table 13. Location, time, and crop damaged in Virginia during 1949 as reported by District Wildlife Technicians.

Location	Time	Agricultural Crop
Brandon Pr. George County	August - November July	Corn Soy Beans
Homeville Sussex County	July	Soy Beans
West Point King Wm. County	July - August July - August	Soy Beans Alfalfa
Tappahannock Essex County	May	Apple Orchard
Winchester Frederick County	Spring and Fall	Apple and Cherry Orchards
Deerfield Augusta County	October	Corn
Faukland Estate Halifax County	Growing Season	Soy Beans, Corn Wheat, Tobacco

Effects of Man and Predation

Leopold (1947) reports that only one region in the United States; namely, the Southeast, is without deer overpopulation troubles. He attributes this to the "screw worm and hound dog." The only alleged wild predator of deer that we have in Virginia is the bobcat, and his toll on deer is undoubtedly small. The total absence of predators on deer is an undesirable condition as is pointed out by Trippensee (1948) in his discussion of deer range conditions on the Kaibab National Forest of Arizona.

Dogs

Free-running dogs have no doubt kept the deer population down in certain areas in Virginia. However, in practically all areas investigated in the study, there were relatively few dogs running free in the deer range. In the areas of Faukland, Glades Wildlife Area, Back Creek Wildlife Area, and Hidden Valley Farm, active measures have been taken to keep the free-running dog off of the range. In such areas as those at Tappahannock, Brandon, and Paramore Island, houses are so far apart that very few dogs, if any, are kept on the areas. Areas such as the Naval Mine Depot, Homeville, West Point, and Buckingham State Forest do little to keep free-running dogs off of the deer range. These areas would undoubtedly have reached higher population numbers before now but for the dog problem.

Illegal kill

Illegal killing of deer has been kept to a very minimum in all areas studied. Due to the location, ownership, or land use the areas are under such close supervision that illegal killing is practically non-existent.

Twelve deer were found wounded in the Naval Mine Depot during 1948. It is believed that this area suffers more illegal killing of deer than any of the other areas studied.

Plant Indicators As Demonstrated By Range Studies

It would be useful to the wildlife manager if he could state that deer browse on certain plants was an indicator of approaching poor range

conditions. These plants undoubtedly would be plants of low browse preference which the deer were forced to feed upon out of necessity and not by choice.

The difficulty most often encountered is the fact that by the time an area is recognized as an overpopulated areas, the reduction in the deer herd should have taken place three to four years previously.

As a result of the deer browse survey conducted during this project a list of plants indicating poor range conditions has been developed. These are: Vaccinium spp., the Rhododendron maxima, the white oak group, the red oak group, bay myrtle, mountain laurel, beech, sweetgum, red cedar, the pines, and hemlock.

COMPLEMENTARY STUDIES

In addition to the previously mentioned characteristics of over-populated deer areas some other possible factors were investigated. Work on this phase was not extensive enough to be used in comparing areas throughout Virginia; however, the information collected may be of some future use and is therefore listed here.

Statistical Analysis of Weights and Measurements of Deer

At the beginning of this project plans were made to collect as much data as possible regarding the weights and measurements of deer from areas of high and average populations. It was thought that a comparison of such information might reveal significant differences in size, between high and average deer population areas. Deer weights and measurements were taken whenever possible, but such data could not be collected in the quantity desired. Information collected has been discussed with members of the Statistics Department at Virginia Polytechnic Institute who are of the opinion that the weights and measurements obtained are insufficient for statistical analysis.

Information collected from 27 specimens is presented in Table 14. Some weights, collected at Brandon with the assistance of G. A. Gehrken and Harry King, were hog-dressed weights. These weights have been changed to live weights by use of Dr. W. T. Hornaday's formula: "The dressed weight being given in pounds, add to it five ciphers, divide by 78612, and the result will be the live weight in pounds."

Woolley (1941) gave the following information concerning the average eastern Virginia legal buck for 1940: weight 140.4 pounds, total length 65.2 inches, and average number of antler points 6.3. An examination of Table 14 will show that legal bucks collected in 1949 at Buckingham, Faukland, and Brandon are very similar in this small sample. Bucks at Buckingham range from 105 to 180 pounds, at Faukland from 106 to 168 pounds, and at Brandon from 95 to 160 pounds.

Table 14. Weights and measurements of 27 deer obtained in Virginia during the 1949 hunting season.

Location	Sex	Total Length Inches	Hind Foot Inches	Tail Inches	Points on Antlers	Weight in Pounds
Cumberland County	M	61-1/2	18	11-1/2	4	110
Essex County	M	61-1/2	15	6	Imat.	52
Buckingham County	M	64	16-1/4	10-1/2	5	105
	M	61-1/2	16-1/4	11	6	123
	M	62-1/2	18-1/2	9-1/2	8	141
	M	68-1/2	18	10	8	180
Faukland, Halifax County	M	63-1/2	17-1/2	11	4	106
	M	59	15-1/2	9	6	108
	M	62	17-1/2	9	7	131
	M	62-1/2	17-1/2	8-3/4	8	134
	M	68-1/4	10-1/4	10-1/2	8	168
	F	56-1/2	13-1/2	7-1/2		52
	F	56-1/2	14-3/4	7-3/4		60
	F	56-1/2	15-1/2	10-1/2		95
Brandon, Pr. George County	M	51	14	8-1/4	Imat.	53
	M	49-1/2	14-3/4	8	Imat.	64
	M	61-1/2	16-1/2	9	7	95
	M	60-1/2	17	10	3	98
	M	66	18-1/2	9	18	160
	F	46	14-1/2	7		51
	F	50-1/2	14-1/2	8		57
	F	49	15-3/4	7-1/2		79
	F	60-1/2	16-1/2	8-1/2		92
	F	59-1/2	16-1/2	8		102
	F	58	17	7-3/4		106
	F	60-1/2	17	9		110
	F	60-1/2	16	8		126

A comparison of the 1949 average weights and measurements of legal bucks obtained by this writer from specimens taken on overpopulated deer areas in eastern Virginia with the average weights and measurements of legal bucks from eastern Virginia in 1940 is presented in Table 15.

Table 15. Comparison of average deer weights and measurements of legal bucks obtained in 1949 from highly populated deer areas in eastern Virginia with average measurements of eastern Virginia deer obtained in 1940. (The 1949 sample is not large enough to be statistically important)

	Number of Deer	Average Weight Pounds	Total Length Inches	Average Number Antler Points
Buckingham	4	137.25	64.1	6.75
Faukland	5	129.4	63.15	6.6
Brandon	3	117.66	62.66	9.3
Eastern Va. Average 1940	63	140.4	65.2	6.3

Pathological Studies of Deer

It appears logical that in an area which contains a high deer population disease and parasitism should be more prevalent than in an area of low deer population. Caton (1877) found that of all the members of the family Cervidae the genus Odocoileus was the most susceptible to disease.

Parasites

Two deer were collected from the Faukland area for examination for parasites. The first of these animals was a male fawn collected under a special permit on August 6, 1949. This animal weighed 29 pounds. It was planned to pick the ticks off of the deer and preserve them in alcohol; however, the ticks were so numerous that it was simpler to trim off the edges of the ears and eyelids and put them in alcohol.

The second deer collected was an adult doe with a fawn by her side. This animal had three legs, 10.3 cm. of the right hind foot had been lost in a previous accident. The leg had apparently healed satisfactorily. Ticks from this deer were collected in a fashion similar to the fawn. The alimentary tracts of both animals were preserved in formaldehyde for later examination.

All ticks collected were identified as the Lone Star tick, Amblyomma americanum, by Dr. F. C. Bishopp of the Bureau of Entomology and Plant Quarantine. These ticks are very abundant in this area and two cases of Rocky Mountain Spotted fever occurred in immediate vicinity during the past summer (1949).

Hermes (1939) lists the Lone Star tick as a vector for the eastern type of Rocky Mountain spotted fever. According to Dr. J. M. Grayson of Virginia Polytechnic Institute, it is probably also a vector of tularemia, and perhaps other unknown diseases.

Alimentary tracts of the two deer were examined for internal parasites under the supervision of Dr. W. L. Threlkeld. The method used was to wash the contents of the alimentary tract through a series of sieves and recover the parasites. All parasites were counted and then identified.

Only one genus of parasite was recovered from the two animals examined. This was the medium stomach worm of cattle, a nematode known as Ostertagi sp. This identification was made by Dr. Threlkeld. There were 330 worms in the adult animal and 12 in the fawn. Parasites present in these numbers are not considered to be debilitating to the animals according to Threlkeld and Johnson (1948 and 1942) who state that animals



Figure 9. Contents of the alimentary tract are extracted in preparation for extracting parasites. (Photo by Mosby)



Figure 10. Contents of the alimentary tract are washed through a series of sieves of decreasing size. (Photo by Mosby)



Figure 11. Contents of sieves are washed with a stream of water to remove foreign matter. (Photo by Mosby)



Figure 12. Contents of sieves are washed back to recover the parasites. (Photo by Mosby)



Figure 13. Material is examined for the presence and identification of parasites under binoculars. (Photo by Mosby)

would have to have several thousand Ostertagi present before the parasites would have a harmful effect. The exception to this, of course, would be with very young animals, in which case their rates of growth would be greatly reduced. The harmful effects of these parasites are caused by their sucking blood, plus the production of ulcerlike pustules in the wall of the abomasum as a result of their activities.

During the process of this investigation the writer brought material into the laboratory where Dr. W. B. Bell, college veterinarian, found parasites in the esophagi of several deer specimens. Dr. W. L. Threlkeld identified these parasites as gullet worms, Gongylonema pulchrum, and this identification was confirmed by Dr. John C. Lucker of Beltsville, Maryland. Further collection of gullets from deer during the hunting season disclosed these parasites in 17 out of 22 deer examined from widely separated counties in Virginia. Laboratory examination of the esophagi of the individuals showed the worms free in the lumen or imbedded in the membranous lining and connective tissues. Some mild hemorrhaging was found in these esophagi.

The importance and significance of this organism in deer in Virginia is not clear. Morgan and Hawkins (1949) do not consider it a harmful parasite to domestic livestock. However, it would seem that the presence of a free worm that can rapidly bore from one end of the gullet of a deer to the other must have some effect on the deer. Such parasites should make the deer nervous and irritable even though it does not otherwise interfere with the normal functions of the animal.



Figure 14. Esophagus of deer containing gullet worms, Gongylonema pulchrum. Note the esophagus is somewhat edematous and presents small hemorrhages in the region of certain worms. (Photo by Mosby)

Briefly the life cycle of the Gongylonema pulchrum according to Morgan and Hawkins (1949) is as follows: "The embryonated eggs are passed out in the feces and are ingested by various dung beetles (Aphodius spp.) or cockroaches (Onthophagus spp.). The liberated larvae, about 250 microns long, penetrate the intestinal wall into the body cavity where they encyst and become infective in about 4 weeks. Cattle acquire the infection by swallowing the infected insects. How the worm reaches the esophagus is not known. Treatment is considered unnecessary (unknown)."

Why the worm was so common in the deer examined is somewhat of a mystery, since the deer is by nature a browsing animal rather than a grazing animal.

Location of the counties from which specimens of deer esophagi were collected and examined for the gullet worm, Gongylonema pulchrum, is shown in Figure 15.

Pathology

Five deer found dead in the field were brought into the laboratory and autopsied by Dr. Bell. Examination of all five deer failed to show any symptoms of disease. All the deer examined had died as a result of mechanical injuries caused by accidents.

During the past fall (September, 1949) a number of deer were found dead in the northern part of Virginia. As reported by Thornton (1949) the majority of these deer were found in the vicinity of Hayfield, Mountain Falls, and Mount Williams in Frederick County. Approximately 50 dead deer were reported to the county game warden, does outnumbering bucks by a ratio of 8 to 1.

Counties	Sex	Number Deer Examined	Gongylonema	
			Present	Absent
A Halifax	3M 4F	7	7	0
B Smyth	1M	1	1	0
C Giles	2M	1	1	0
D Bath	3M	3	3	0
E Buckingham	3M	3	2	1
F Essex	1M	1	0	1
G Carroll	1F	1	0	1
H Alleghany	1M	1	0	1
I Pr. George	3M 1F	4	3	1
TOTAL	16M 6F	22	17	5

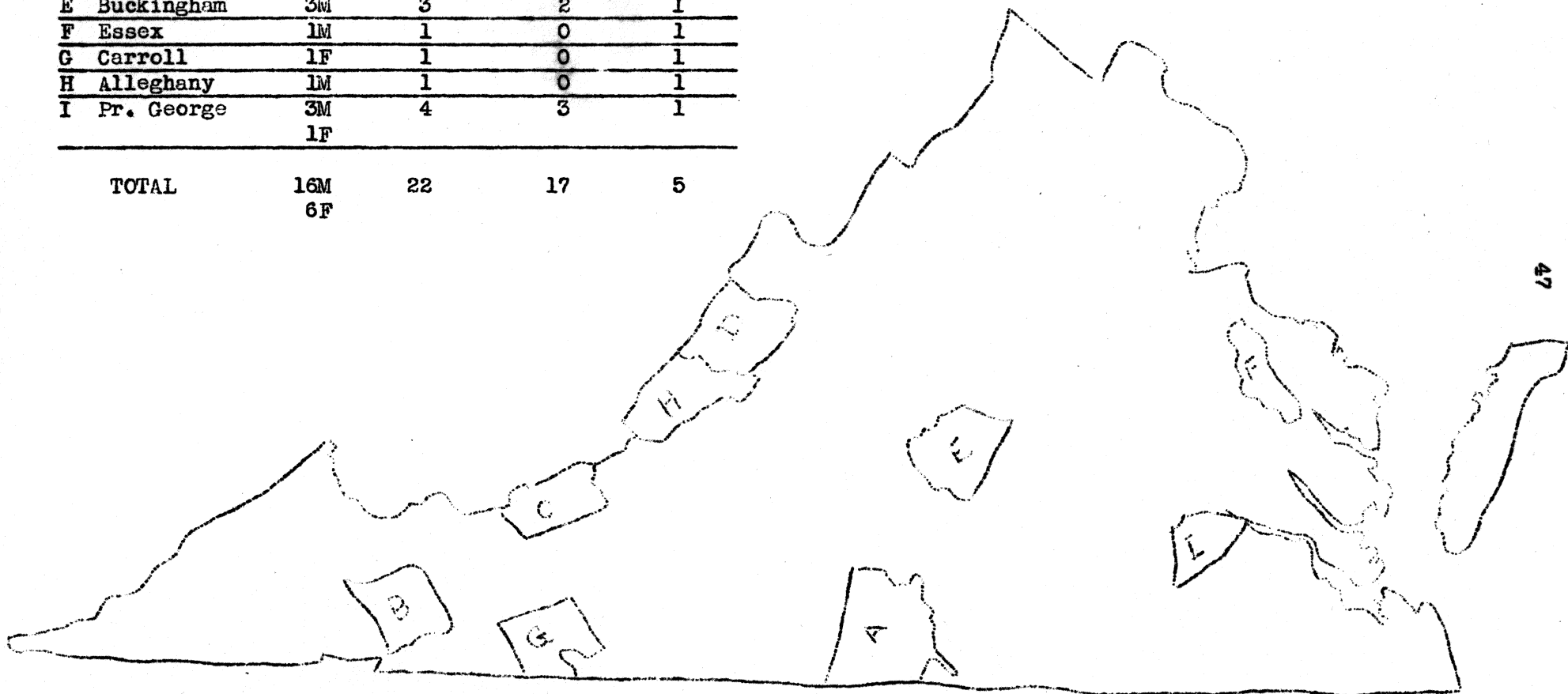


Figure 15. Distribution and location of deer examined for gullet worms, Gongylonema pulchrum, in Virginia during 1949



Figure 16. Dr. J. B. Bell, college veterinarian, examining dead deer for evidence of disease. (Photo by Mosby)

Disease has not shown itself to be a characteristic of high populated deer areas. The one report of disease came from an area of normal deer population. Brandon and West Point are reported to have had a high concentration of deer reduced by disease approximately 30 years ago.

MEASURES USED TO CONTROL POPULATIONS

Various methods have been tried in other states to control deer populations. These have included repellents, noise, special permits to kill deer, trapping, and antlerless deer seasons, in New York and Pennsylvania. Bump (1949) is of the opinion that herd control measures in New York, through antlerless deer seasons, have proven satisfactory in reducing the damage to agriculture by deer. The biggest difficulty in controlling the deer herd has been in the opposition of sportsmen long accustomed to the 'buck law'.

'The first state to directly attack the problem through special seasons aimed at reducing the herd, was Pennsylvania. In the face of terrific opposition an antlerless deer season was declared in two townships in 1923.' 'Since then, in 15 open seasons the reported legal kill of antlerless deer has reached the amazing total of 566,093 individuals. Nor did the Pennsylvania herd seem to be unduly depleted thereby if one may judge by a kill during the fifteenth season of 63,568 antlerless deer.' (Bump 1949)

The need for a control method should be evident when it is realized that under southern New York conditions a pair of deer would produce 22 individuals in five years, and 194 in ten years if all survived following birth (Bump 1949).

Shooting

Legal season

Antlerless seasons are not new in eastern Virginia. Open seasons on does have been declared in various eastern counties, or parts of

counties, in response to complaints of deer damage to crops. An example of this during the past season (1949-50) is in Sussex county, where 702 deer of both sexes were killed as compared to 197 bucks the season before (1948-49).

The area at Brandon has had antlerless seasons during 1948-49, and 1949-50. In 1948-49, does were legal game during the first two weeks of the hunting season. The kill for the entire county during this season was 298 deer. Only a few of these were does. During the 1949-50 season there was an open season on does the entire hunting season and 621 deer were killed. The opinion of the local hunters in the Brandon area was that the doe season at the first of the season was ineffective in reducing the deer population because of the reluctance of the hunters to shoot does when they would have a later chance to shoot a buck. In the case of the 1949-50 season, the majority of the does were killed during the latter part of the season, and thus a greater deer kill was made. The reason for this is that hunters in the latter part of the season realize that their chances of getting a buck are not so good, due to less time, and will shoot does. Thus it would appear that a doe season at the close of the regular hunting season would be more effective in reducing the population than one at the beginning of the season.

No antlerless seasons in the western part of the state have been declared as yet. The buck season is fairly short and will probably be lengthened before any doe season is declared. In the Jefferson National Forest the season is but two days; in the George Washington National Forest the season is three days, with the exception of Bath and Highland Counties where a six-day season is held.

Game warden permit

The Virginia Game, Inland and Fish and Dog Laws contains the following law relative to deer damage. "Whenever it is found that deer are damaging fruit trees or crops in the state, the owner or lessee of the lands on which such damage is done shall immediately report such fact to the local game warden for investigation. If after investigation the game warden finds that deer have so injured the fruit trees or crops of such owner or lessee as to cause substantial damage, he shall authorize the owner or lessee to kill such deer when they are found upon the premises and in the act of further injuring such trees or crops.

"The carcass of every deer so killed shall be delivered by the owner or lessee to the game warden of the county, who shall deliver it to such charitable institution or hospital as designated by the Commission of Game and Inland Fisheries. (Chap. 149, Acts 1948)." (Virginia Commission of Game and Inland Fisheries 1948)

It has been found in the course of this investigation that very few people have applied for a permit to kill deer under the above-quoted provision. Also it has been found that very few people are aware of the fact that they can apply for a permit to kill deer that are damaging their crops. Most of the game wardens do not release this information voluntarily, and very few deer are killed under this provision.

Some farmers interviewed in this study wanted the Game Commission to pay them damages for the crops eaten by the deer. This has been partially brought about by the fact that six western Virginia counties have been paying damages. Efforts have been made to point out that deer damaging crops have the same status as any other pest, animal or plant,

that attacks crops and should be dealt with accordingly. Because of the long period of protection that has been afforded deer in this state it is difficult for many people to view this problem objectively.

Repellents

Repellents have been tried in several states on different occasions in the past and for the most part have proven unsuccessful. A new deer repellent in the form of Goodrite z.i.p. was tested in Maine by Powell (1949) and given a very favorable report. Even effective repellents, however, are in no way a solution to overpopulation, but merely a means of protecting high value agricultural crops.

Effect on deer

The compound Goodrite z.i.p. was tested in three different counties on six areas during the summer of 1949. This repellent was tested on soybeans, combined milo-maize, and a Wood's Mixture wildlife food planting.

Two of the six areas sprayed were on the Faulkland Estate in Halifax County. One area was a plot of soybeans in a four-acre field of soybeans. This area was sprayed with a mixture prepared in accordance with the manufacturer's instructions. The soybeans were sprayed on July 4, August 7, and on August 24, 1949. No appreciable difference in the production of soybeans on the sprayed and unsprayed areas was observed. The entire area of sprayed and unsprayed soybeans was a loss due to the heavy deer browsing. The second area sprayed on the Faulkland Estate was a Wood's Mixture planting. This area was sprayed on July 4, and August 7, 1949. Upon returning to the area on August 24th it was found

that the deer had browsed all of the milo-maize on the sprayed area. It was reported that this was, however, the last planting which the deer had browsed. In other words, they browsed all other plantings at Faulkland before browsing the area that had been sprayed.

On September 13, 1949 two different areas of milo-maize were sprayed on the Cumberland State Forest. These areas were sprayed in an attempt to determine if the milo-maize could be made unpalatable to deer but still furnish a desirable food for turkeys. The Good-rite z.i.p. apparently had no effect on the deer since W. C. Newman, game manager, reported no difference in the browsing activities of the deer. Deer browsed the milo-maize as readily in the sprayed area as in the unsprayed area.

On September 14, 1949 two different areas of milo-maize were sprayed on the Buckingham State Forest. This area is similar to Cumberland, except the deer population is much higher. Reports from this area were the same as those at Cumberland. Apparently the Good-rite z.i.p. had no effect on stopping deer from browsing milo-maize.

A quantity of Good-rite z.i.p. was tried by other workers on apple orchards in the vicinity of Winchester. A young orchard of approximately 35 acres had been damaged by deer several years ago. It was given a dormant spray of Good-rite z.i.p. of a concentration unknown to this writer, but assumed to be in accordance with the manufacturer's instructions. Results were reported to be excellent. A second spraying was applied in the fall of 1949 and the results were unsatisfactory. This second spraying was reported to be at a rate of two pounds of Good-rite z.i.p. to fifty gallons of water, a concentration 1/10 the strength recommended by the manufacture.



Figure 17. Good-rite z.i.p. applied with a garden sprayer. In these tests, the deer repellent was not entirely satisfactory. (Photo by Mosby)



Figure 18. Milo-maize, left to right, normal head, deer browsed, and turkey browsed. (Photo by Mosby)

The Virginia Agricultural Experiment Station in Winchester has tried the use of Good-rite z.i.p. as a fungicide. It was effective in controlling the pests of the apple orchard, but the zinc in the compound causes a rough skin so that its use as a fungicide appears impractical. However, since deer damage to apple orchards occurs in the fall and early spring, the spray could be used at those times without affecting the quality of the fruit.

Effect on other wildlife

The wildlife food planting experiments with Good-rite z.i.p. were made with the assumption that it would keep deer from eating the materials sprayed, but that the treated food still might be acceptable to wild turkeys and quail. No information was available concerning the palatability to birds of foods so treated. Therefore, it was decided to test the acceptability of repellent treated food on pen-raised quail and turkey at the State Game Farm.

As a result of these experiments it would appear that quail distinguish between treated and untreated foods, while turkeys apparently do not. A summary of these findings is given in Table 16.

Table 16. Acceptability of Good-rite z.i.p. treated food for pen-raised quail and wild turkey poults. (1)

		Amount of Food Left			% of Food Taken
		2nd Day		3rd Day	
		A.M.	P.M.	A.M.	
(a) Two pens of approximately 40 quail each. One lb. treated and one lb. untreated Purina-checkers					
Pen 1.	Treated	14 oz.	5 oz.	4 oz.	37.5%
	Untreated	5.5 oz.+	0 oz.	0 oz.	100%
Pen 2.	Treated	16 oz.	10 oz.	8 oz.	25%
	Untreated	6 oz.+	0 oz.	0 oz.	100%

		Amount of Food Left		% of Food Taken	
		5th Day	8th Day		
		(b) Two pens of approximately 100 wild turkey poults (12 wks.), 12.5 pounds of treated and 12.5 pounds of untreated scratch feed.			
Pen 9.	Treated	2 lb. 8 oz.	2 lb. 3 oz.	82.4%	
	Untreated	1 lb. 6 oz.	1 lb. 5 oz.	89.5%	
Pen 10.	Treated	3 lb. 1 oz.	12 oz.	94%	
	Untreated	1 lb. 12 oz.	9 oz.	95.4%	

(1) Feed was offered the quail for two days, turkeys one week.
+ Added 16 ounces of fresh food.

Electric Fence

The electric fence has been tried in practically every place in the nation where deer damage occurs. McAtee (1939) gives a fairly exhaustive list of places where the electric fence has been tried. The conclusion reached is that it is possibly 80 to 90 per cent effective, but the electric fence is not a cure for an overpopulated deer area. Use of an electric fence simply defers the day of reckoning when the population will have to be reduced.

The electric fence has been tried for protection against deer damage in at least two different areas in Virginia. One of these was at the Faulkland Estate in Halifax County. The fence there was three-strands

of barbed wire, with all three strands charged. It worked satisfactorily for one year and then was demolished by deer one night. It was not replaced and has not been tried since.

Another area where an electric fence was tried was on the farm of Lee D. Butler at Tappahannock in Essex County. The main fence (Virginia Wildlife, 1948) consists of five strands of barbed wire, the topmost strand being five feet high. At two feet above the ground the fence has a wire set off from the main fence by two feet. Wires number 2,4, and the off-set are charged on a current of 110-120 volt, 60 cycle A.C., using a one-ampere fuse. This fence surrounds a thirty-acre apple orchard and has proven satisfactory over a three year period.

Trapping

Leopold et al. (1947) found that 47 states have deer and that 30 of these report trouble with overpopulated deer areas. These states report a total of 100 different localities with overpopulation conditions. Of these 100 areas, only 8 have been reduced by trapping.

Plans had been made by the Virginia Commission of Game and Inland Fisheries to conduct trapping operations on three areas in Virginia during 1949-50. The purpose of this trapping was not primarily to reduce deer populations, but rather to obtain deer for restocking certain areas in the Jefferson National Forest.

It had been planned to conduct trapping operations on the Naval Mine Depot, and six traps were constructed on the area in the winter of 1948. However, these traps were never used.

At Comers Rock Wildlife Area, near Wytheville, Virginia, three deer traps were set up. These three traps were operated during January, 1950. Two deer were caught at the beginning of the trapping operations, but none thereafter. These two deer were released in Bland County.

At the Glades Wildlife Area nine traps were operated for the first two weeks in January. Three deer were caught and released in Dickenson County. The traps were operated again for two weeks during the first week of February, but no deer were caught.

It is evident that no attempt was made to reduce the deer populations by trapping on any area in Virginia, even though some deer trapping was carried on in the Jefferson National Forest.



Figure 19. Joe Rose, deputy wildlife manager, baiting deer trap with apples in the Glades Wildlife Area during 1950. Such trapping has been of little value in reducing an excessive deer population under Virginia conditions.

RECOMMENDATIONS AND CONCLUSIONS

Recommendations

Certain phases of this study could well be investigated further.

These phases are enumerated below.

1. Further collection of weights and measurements of deer from high-population deer areas in Virginia for a comparison with deer from normal areas.
2. Correlation of the weights and measurements with the age of the deer examined, in order that a statistical analysis can be performed.
3. A thorough investigation of the parasitological condition of deer in Virginia.
4. Further evaluation and classification of deer range conditions in areas of high and normal deer population.
5. Trapping of deer from high-population deer areas in Virginia for releasing in areas where no deer are present.
6. An intensive program of shooting to reduce the deer herd on an overpopulated area as an example of the work, results, time, and money involved to reduce a herd to the carrying capacity of the land.

Conclusion

1. For the purpose of this study an overpopulation area is defined as an area in which the deer are inflicting damage on the forest vegetation, or an area in which agricultural crops are being damaged to such a point that the deer are interfering with a farmer's method of obtaining a livelihood, even though the deer in the locality may not be exerting any appreciable pressure on the native vegetation.

2. Twelve areas in the State of Virginia were reported to have an overpopulation of deer.

3. One of these overpopulation areas, the Glades Wildlife Area, is a result of the restocking program in the western portion of Virginia.

4. Three overpopulated areas in eastern Virginia resulted from restocking of deer; these are the Naval Mine Depot, Ollesen Farm at West Point, and Paramore Island.

5. The remaining eight overpopulated areas developed from native deer already present on the area.

6. Yearly deer kills in Virginia have increased from 267 individuals in 1924 to 7,021 in 1949.

7. The extent of deer hunting has increased from 30 counties in 1924 to 71 counties in 1949.

8. Big Game license sales have increased from 4,938 when they were first sold in 1937, to 43,081 in 1949.

9. Six western counties have charged the big game hunters a total of \$38,487.00 for big game damage licenses during the period of 1942 to 1949. Some \$16,515.29 has been paid in claims for damage caused to agriculture by deer and bear during the same period of time.

10. Experiments with the deer repellent Good-rite z.i.p. to protect wildlife food plantings from deer damage did not indicate any appreciable protection as a result of the application of this chemical.

11. In experiments with pen-raised birds, quail avoided food treated with Good-rite z.i.p., while turkeys did not distinguish between treated and untreated food.

12. A five foot electric fence of five strands of wire, and a two foot off-set, with wires 2,4, and the off-set charged, has proven satisfactory in protecting an apple orchard in eastern Virginia.

13. Trapping of deer in Virginia during 1949-50 was not used as a tool in reducing overpopulated deer areas.

14. Game warden permits to shoot deer which are damaging crops have not been used to any great extent in Virginia.

15. Antlerless deer seasons have been declared in some counties in eastern Virginia, with 621 deer being killed in Prince George County, 702 in Sussex County, and 409 in Halifax County, during the 1949-50 season.

16. Gullet worms, Gongylonema pulchrum, were found in 17 out of 22 deer examined from 9 widely separated counties in Virginia and were not a characteristic of overpopulated areas.

17. Medium stomach worms, Ostertagia spp., were found in two deer examined from Halifax County.

18. Overpopulated areas do not appear to be characterized by disease among the deer. However, Brandon is reported to have had the deer numbers decreased by disease thirty years ago. The one case of disease reported in Virginia during 1949 did not occur in an area of high deer populations.

19. Areas with overpopulations of deer have had a decrease in the number of free-running dogs on the area.

20. Deer populations are capable of increasing to a point beyond good land management practices in 8 years as demonstrated by conditions in the Glades Wildlife Area, Faukland Estate, Buckingham State Forest, Homeville in Sussex County, and Dcerfield in Augusta County.

21. In some instances 25 to 30 years were required for a deer herd to develop beyond the carrying capacity of the range as demonstrated by the Naval Mine Depot, West Point, and Brandon.

22. Areas with overpopulations of deer have a restricted form of hunting on them with the exception of the Back Creek Wildlife Area in the George Washington National Forest which is open to public hunting.

23. Plant indicators of overpopulated deer areas possibly are red oak, white oak, white pine, rhododendron, mountain laurel, vaccinium, red cedar, sweet gum, loblolly pine, bay myrtle, American holly, and hickory.

24. A rating of the relative severeness of deer range conditions according to the amount of secondary foods taken by the deer are:

(1) Hidden Valley Farm, (2) Glades Wildlife Area, (3) Back Creek Wildlife Area, (4) Brandon, (5) Naval Mine Depot, and (6) Faukland Estate.

APPENDIX

Deer Harvest Records

The yearly deer harvest records were obtained from the files of the Law Enforcement and Game Divisions in the Richmond offices of the Virginia Commission of Game and Inland Fisheries.

Prior to the 1944 hunting season all figures are game warden estimates. During the season 1944 to 1946 the data are for tagged deer west of the Blue Ridge. Since 1947 all deer killed statewide must be tagged at Big Game Checking Stations.

Estimated state kill of deer in 1921-22 was 691 deer, and in 1922-23 was 630.

Deer Harvest Records

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	23-24	24-25	25-26	County	23-24	24-25	25-26
Accomac				King William	25	15	
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany				Lousia			
Appomattox				Lunenburg	25	1	
Arlington				Madison			
Augusta				Mathews		1	
Bath				Mecklenberg	10		
Bedford				Middlesex			
Bland				Montgomery			
Botetourt	10	7		Nansemond	53		
Brunswick	40	3		Nelson		3	
Buchanan				New Kent			
Buckingham	30	8		Norfolk	23	13	
Campbell				Northampton			
Caroline	2			Northumberland			
Carroll				Nottoway	5	3	
Charles City	29	13		Orange			
Charlotte	27	8		Page			
Chesterfield	69	16		Patrick			
Clarke				Pittsylvania			
Craig	9	5		Powhatan	50	6	
Culpeper				Prince Edward	15		
Cumberland	29	4		Prince George	10	2	
Dickenson				Prince William			
Dinwiddie	15	8		Princess Anne			
Eliz. City				Pulaski			
Essex		4		Rappahannock			
Fairfax				Richmond			
Fauquier				Roanoke			
Floyd				Rockbridge		1	
Fluvanna				Rockingham			
Franklin	1			Russell			
Frederick	1			Scott			
Giles				Shenandoah			
Glouster				Smyth			
Goochland	16	16		Southampton	45	11	
Grayson				Spottsylvania	1		
Greene				Stafford			
Greensville	30	8		Surry	100	14	
Halifax	11			Sussex	5	4	
Hanover	32	20		Tazewell			
Henrico	30	21		Warren			
Henry				Warwick			
Highland				Washington			
Isle of Wt.	2	5		Westmoreland			
James City				Wise			
King and Queen				Wythe		1	
King George				York			
(1922-23 - 630)							
(1921-22 - 691)				State Total	793	267	

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	26-27	27-28	28-29	County	26-27	27-28	28-29
Accomac				King William		8	5
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany				Lousia		10	
Appomattox		3		Lunenburg		11	
Arlington				Madison			
Augusta				Mathews			
Bath				Mecklenberg		15	
Bedford				Middlesex			
Bland				Montgomery			
Botetourt		7		Nansemond		42	5
Brunswick		6	6	Nelson		5	8
Buchanan		34		New Kent		53	6
Buckingham			16	Norfolk		10	4
Campbell		10	2	Northampton			
Caroline		10	1	Northumberland			
Carroll				Nottoway		8	
Charles City		21	32	Orange			
Charlotte		27	20	Page			
Chesterfield		53	105	Patrick			
Clarke				Pittsylvania		3	
Craig		4	4	Powhatan		10	8
Culpeper				Prince Edward		11	3
Cumberland		10	50	Prince George		10	30
Dickenson				Prince William			
Dinwiddie		40	6	Princess Anne			
Eliz. City				Pulaski			
Essex			1	Rappahannock			
Fairfax				Richmond			
Fauquier				Roanoke			
Floyd				Rockbridge			
Fluvanna				Rockingham			
Franklin				Russell			
Frederick		2		Scott			
Giles		2		Shenandoah			3
Glouster		9		Smyth			
Goochland		35	5	Southampton		20	18
Grayson				Spottsylvania			
Greene				Stafford			
Greensville		25	18	Surry		75	40
Halifax		1		Sussex		28	61
Hanover		15	13	Tazewell			
Henrico		15	40	Warren			
Henry				Warwick			
Highland			5	Washington			
Isle of Wt.		5	2	Westmoreland			
James City		2	1	Wise			
King and Queen			3	Wythe			
King George				York			
				State Total		687	561

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	29-30	30-31	31-32	County	29-30	30-31	31-32
Accomac				King William	7	12	28
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany	25	5	15	Lousia			
Appomattox				Lunenburg		2	
Arlington				Madison			
Augusta				Mathews			
Bath	80	150	110	Mecklenberg		18	2
Bedford				Middlesex		7	5
Bland				Montgomery			
Botetourt		1		Nansemond	5	25	30
Brunswick	7	3		Nelson	4	22	
Buchanan				New Kent	18	42	63
Buckingham	20	25	20	Norfolk	33	49	50
Campbell			1	Northampton			
Caroline	7	5	35	Northumberland			
Carroll			1	Nottoway	2	1	
Charles City	42	47	70	Orange			
Charlotte	15	11	13	Page			
Chesterfield	100	115	250	Patrick			
Clarke				Pittsylvania			
Craig	6	3	5	Powhatan	14	20	20
Culpeper				Prince Edward		13	35
Cumberland		18	10	Prince George	45	69	105
Dickenson				Prince William			
Dinwiddie	14	27	50	Princess Anne			
Eliz. City				Pulaski			
Essex	1	1		Rappahannock			
Fairfax				Richmond			1
Fauquier				Roanoke			
Floyd				Rockbridge			
Fluvanna				Rockingham			
Franklin		1		Russell			
Frederick				Scott			
Giles				Shenandoah			
Glouster	2			Smyth			
Goochland	2	9	77	Southampton	27	65	75
Grayson				Spottsylvania			
Greene				Stafford			
Greensville	25	90	50	Surry	60	125	80
Halifax	8	17	16	Sussex	97	173	88
Hanover	42	23	15	Tazewell			
Henrico	38	31	35	Warren			
Henry				Warwick			
Highland		2	2	Washington			
Isle of Wt.	2	20		Westmoreland		2	
James City	2		4	Wise			
King and Queen	5	4	7	Wythe			
King George				York			
				State Total	790	1299	1399

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	32-33	33-34	34-35	County	32-33	33-34	34-35
Accomac				King Williams	14	11	12
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany	8	25	15	Lousia	1		
Appomattox			2	Lunenburg			
Arlington				Madison			
Augusta				Mathews			
Bath	150	140	202	Mecklenberg	20	3	6
Bedford				Middlesex	1	3	5
Bland				Montgomery			
Botetourt				Nansemond	45	30	20
Brunswick	2	1	2	Nelson			
Buchanan				New Kent	63	78	68
Buckingham	25	22	4	Norfolk	50	47	19
Campbell				Northampton			
Caroline	25	23	25	Northumberland			
Carroll				Nottoway			
Charles City	78	92	80	Orange			
Charlotte	9	3	1	Page			
Chesterfield	150	145	210	Patrick			
Clarke				Pittsylvania			
Craig	4	5	8	Powhatan	31	27	20
Culpeper				Prince Edward	8	10	25
Cumberland	7	5	7	Prince George	56	27	63
Dickenson				Prince William			
Dinwiddie	35	17	18	Princess Anne			
Eliz. City				Pulaski			
Essex			5	Rappahannock			
Fairfax				Richmond			
Fauquier				Roanoke			
Floyd				Rockbridge			
Fluvanna				Rockingham			
Franklin				Russell	1		
Frederick			2	Scott			
Giles				Shenandoah	1		2
Glouster			6	Smyth			
Goochland		10	40	Southampton	40	50	60
Grayson				Spottsylvania			
Greene				Stafford	3		
Greensville	54	28	12	Surry	85	48	60
Halifax	19	15	13	Sussex	58	61	61
Hanover	15	9	33	Tazewell	1		
Henrico	35	25	25	Warren			
Henry				Warwick			
Highland				Washington			
Isle of Wt.	6		6	Westmoreland			
James City	15	28	22	Wise			
King and Queen	5	7	8	Wythe			
King George				York			
				State Total	1120	1041	1184

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	35-36	36-37	37-38	County	35-36	36-37	37-38
Accomac				King William	12	8	11
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany	7	15	10	Lousia			
Appomattox				Lunenburg			
Arlington				Madison			
Augusta	3	3	6	Mathews	3		
Bath	200	218	226	Mecklenberg		10	7
Bedford				Middlesex	3	5	1
Bland				Montgomery			
Botetourt				Nansemond	30	20	20
Brunswick	2	2	6	Nelson			
Buchanan				New Kent	50	82	80
Buckingham	12	8	12	Norfolk	14	37	45
Campbell				Northampton			
Caroline	18	22	17	Northumberland			
Carroll				Nottoway			38
Charles City	50	85	100	Orange			
Charlotte	2	3	1	Page			
Chesterfield	314	400(?)	300	Patrick			
Clarke				Pittsylvania			
Craig	2	5	3	Powhatan	8	25	15
Culpeper				Prince Edward	25	15	25
Cumberland	5		10	Prince George	50	62	87
Dickenson				Prince William			
Dinwiddie	30	45	25	Princess Anne			
Eliz. City				Pulaski			
Essex	1	2	14	Rappahannock			
Fairfax				Richmond			
Fauquier				Roanoke			
Floyd				Rockbridge			
Fluvanna				Rockingham			
Franklin				Russell			
Frederick				Scott			
Giles				Shenandoah	3		
Glouster	3	13	22	Smyth			
Goochland	12	50	40	Southampton	50	50	50
Grayson				Spottsylvania			
Greene				Stafford			
Greensville	24	18	22	Surry	52	38	75
Halifax	15		45	Sussex	34	87	92
Hanover	6	12	3	Tazewell			
Henrico	25	25	20	Warren			
Henry				Warwick			
Highland	1			Washington			
Isle of Wt.	10	5	1	Westmoreland		1	
James City	26	40	39	Wise			
King and Queen	6	9	15	Wythe			
King George				York		5	15
				State Total	1158	1475	1526

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	38-39	39-40	40-41	County	38-39	39-40	40-41
Accomac				King William	11	4	
Albermarle				Lancaster			
Amelia			75	Lee			
Amherst			1	Loudoun			
Alleghany	25	30	35	Lousia			
Appomattox		2		Lunenburg			
Arlington				Madison			
Augusta		10	19	Mathews			
Bath	200	200	190	Mecklenberg	13	9	21
Bedford				Middlesex	3	2	5
Bland				Montgomery			
Botetourt				Nansemond	25	32	49
Brunswick	3	6	8	Nelson	1	15	19
Buchanan				New Kent	78	69	62
Buckingham	11	8	18	Norfolk	45	40	75
Campbell		12	10	Northampton			
Caroline	18	26	17	Northumberland			
Carroll				Nottoway	2	3	
Charles City	83	95	82	Orange			
Charlotte	3	3	2	Page			
Chesterfield	60	125	175	Patrick			
Clarke				Pittsylvania			
Craig				Powhatan	6	18	28
Culpeper		1		Prince Edward	15	20	10
Cumberland	2		1	Prince George	90	93	87
Dickenson				Prince William			
Dinwiddie	35	30	60	Princess Anne			
Eliz. City				Pulaski			
Essex	9	11	13	Rappahannock			
Fairfax				Richmond			
Fauquier				Roanoke			
Floyd				Rockbridge			
Fluvanna	1			Rockingham			
Franklin				Russell			
Frederick	2		15	Scott			
Giles				Shenandoah	5	16	8
Glouster	2	7	12	Smyth			
Goochland	150(?)	40	3	Southampton	50	60	60
Grayson				Spottsylvania			
Greene				Stafford			
Greensville	25	22	29	Surry	65	39	75
Halifax	125	80	100	Sussex	84	77	129
Hanover	5	3		Tazewell			
Henrico	10	10	20	Warren			
Henry				Warwick			
Highland	6	20	19	Washington			
Isle of Wt.		6	5	Westmoreland		3	
James City	39	49	48	Wise			
King and Queen	15	11	21	Wythe			
King George			2	York	22	10	11
				State Total	1391	1365	1690

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	41-42	42-43	43-44	County	41-42	42-43	43-44
Accomac				King William	26	18	25
Albermarle				Lancaster			
Amelia				Lee			
Amherst				Loudoun			
Alleghany	25	50	35	Lousia			
Appomattox				Lunenburg			
Arlington				Madison			1
Augusta	23	23	36	Mathews			
Bath	240	193	224	Mecklenberg	9	22	1
Bedford				Middlesex	3	4	
Bland			2	Montgomery			
Botetourt				Nansemond	85	65	45
Brunswick	18	12	11	Nelson	30	4	15
Buchanan				New Kent	90	108	95
Buckingham	38	8	33	Norfolk	120	77	65
Campbell	6	6	4	Northampton..			
Caroline	21	23	38	Northumberland			1
Carroll				Nottoway		5	7
Charles City	85	88	100	Orange			1
Charlotte	8	4	5	Page			
Chesterfield	190		215	Patrick			
Clarke				Pittsylvania			
Craig				Powhatan	25	20	19
Culpeper	1			Prince Edward	18	1	5
Cumberland	1	1		Prince George	94	92	93
Dickenson				Prince William			
Dinwiddie	50	40	42	Princess Anne			
Eliz. City				Pulaski			
Essex	11	7	7	Rappahannock	1	1	
Fairfax				Richmond	6	2	7
Fauquier	1			Roanoke			
Floyd				Rockbridge			
Fluvanna				Rockingham			
Franklin		25		Russell			
Frederick	18	14		Scott			
Giles				Shenandoah	13	38	58
Glouster	15		4	Smyth			
Goochland	5			Southampton	75	(?)	150
Grayson				Spottsylvania			
Greene				Stafford			
Greensville	32	37	48	Surry	80	72	163
Halifax	98	50	200	Sussex	135	120	186
Hanover	25		15	Tazewell			
Henrico	15	20	15	Warren			
Henry				Warwick			
Highland	24	32	24	Washington			
Isle of Wt.	3		4	Westmoreland		1	
James City	37	55	62	Wise			
King and Queen	31	15	25	Wythe			
King George	1	1	1	York	13	13	13
				State Total	1901	1448	2282

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	44-45*	45-46	46-47	County	44-45	45-46	46-47
Accomac				King William	40	75	75
Albermarle				Lancaster	2	1	6
Amelia				Lee			
Amherst				Loudoun			
Alleghany	100	125	22	Lousia			
Appomattox		12	8	Lunenburg			
Arlington				Madison			
Augusta	165	230	279	Mathews	4	9	34
Bath	182	281	391	Mecklenberg	6	33	30
Bedford				Middlesex	9	13	17
Bland	1		15	Montgomery			
Botetourt			17	Nansemond	65	60	100
Brunswick	40	51	46	Nelson	9	18	14
Buchanan				New Kent	155	225	310
Buckingham	32	46	120	Norfolk	85	115	125
Campbell	3	2	9	Northampton			
Caroline	83	93	293	Northumberland		1	
Carroll				Nottoway	8		
Charles City	200	250	300	Orange			
Charlotte	11	18	31	Page		12	27
Chesterfield		280	350	Patrick			
Clarke				Pittsylvania			
Craig			27	Powhatan	20	27	39
Culpeper				Prince Edward	4	6	10
Cumberland	1	10	700(?)	Prince George	120	149	143
Dickenson				Prince William			
Dinwiddie	45	125	150	Princess Anne			
Eliz. City				Pulaski			
Essex	7	13	17	Rappahannock			
Fairfax				Richmond	15	9	22
Fauquier				Roanoke			15
Floyd				Rockbridge			1
Fluvanna	2	1	15	Rockingham		50	84
Franklin				Russell			
Frederick		65	102	Scott		27	32
Giles			19	Shenandoah	60	102	137
Glouster	35	56	78	Smyth	8	23	74
Goochland	2	10	10	Southampton	90	300	300
Grayson		33	65	Spottsylvania			8
Greene				Stafford			
Greensville	60	65	80	Surry	145	155	178
Halifax	150	200	150	Sussex	268	615	715
Hanover	31	23	29	Tazewell			28
Henrico	15	16	15	Warren			
Henry				Warwick			
Highland	29	46	56	Washington			31
Isle of Wt.	5	36	30	Westmoreland	6	6	17
James City	72	110	110	Wise		56	60
King and Queen	28	35	125	Wythe		11	18
King George	2	1	10	York	20	20	25

* Tagged data for West of the Blue Ridge

State Total 3433 4545 6543

Deer Harvest Records (Cont.)

Appendix Table 1. Yearly deer kill in the counties of Virginia

County	47-48	48-49	49-50	County	47-48	48-49	49-50
Accomac			2	King William	99	338	375
Albermarle	30	23	36	Lancaster	11	8	10
Amelia	58	56	54	Lee			9
Amherst	1	1	4	Loudoun			
Alleghany	40	41	46	Lousia	5	3	5
Appomattox	15	6	31	Lunenburg	1		
Arlington				Madison			
Augusta	183	240	274	Mathews	16	14	15
Bath	357	444	460	Mecklenberg	17	11	19
Bedford				Middlesex	11	73	9
Bland	28	18	11	Montgomery			
Botetourt	9	17	26	Nansemond	43	72	70
Brunswick	24	19	19	Nelson	9	5	12
Buchanan				New Kent	123	161	220
Buckingham	77	87	113	Norfolk	115	212	218
Campbell	6	9	4	Northampton			
Caroline	243	266	348	Northumberland	3	5	5
Carroll				Nottoway	5	4	
Charles City	131	155	200	Orange			
Charlotte	26	28	21	Page	14	20	22
Chesterfield	125	99	91	Patrick			
Clarke				Pittsylvania		2	
Craig	20	30	37	Powhatan	17	20	38
Culpeper				Prince Edward	12	12	21
Cumberland	11	58	88	Prince George	140	298	621
Dickenson				Prince William			
Dinwiddie	65	68	77	Princess Anne	1		
Eliz. City				Pulaski			
Essex	17	59	39	Rappahannock			
Fairfax				Richmond	13	18	28
Fauquier				Roanoke	7	3	4
Floyd				Rockbridge			37
Fluvanna	10	6	14	Rockingham	52	75	101
Franklin				Russell			
Frederick	93	122	130	Scott	58	61	67
Giles	15	36	38	Shenandoah	104	171	221
Glouster	24	19	35	Smyth	73	104	96
Goochland	10	11	11	Southampton	196	200	370
Grayson	32	80	60	Spottsylvania	16	12	18
Greene				Stafford			
Greensville	30	39	32	Surry	80	103	119
Halifax	95	276	409	Sussex	327	197	702
Hanover	34	46	40	Tazewell	25	19	8
Henrico	18	26	19	Warren	12	13	17
Henry				Warwick	1	3	16
Highland	57	75	106	Washington	51	61	64
Isle of Wt.	16	20	31	Westmoreland	9	9	13
James City	111	134	164	Wise	82	75	85
King and Queen	191	148	186	Wythe	19	18	34
King George	3	12	24	York	15	39	72
+ - Tagged Data Statewide				State Total	3987	5220	7021

Resident State Big Game
License Sales

Appendix Table 2. Record of annual sales of big game stamp sales in Virginia, 1937 to 1949.

Fiscal Year Ending	Number of License Sales
1937	4,938
1938	5,540
1939	5,870
1940	6,093
1941	6,484
1942	8,434
1943	8,081
1944	9,615
1945	13,225
1946	20,374
1947	34,421
1948	41,926
1949	43,081

(Information obtained from the annual reports of the Virginia Commission of Game and Inland Fisheries)

Location of Overpopulated Deer Areas

Appendix Table 3. Questionnaire used to locate overpopulated Deer areas in Virginia.

Location of Deer Overpopulated Areas in Va.

Please answer these questions on this sheet, and return to the Virginia Co-op. Wildlife Unit, Biology Dept., VPI, Blacksburg, Va. If more room is needed, use the back of this sheet of paper.

As a result of this questionnaire, it is planned to visit the areas mentioned by you in order that a comparison of the various overpopulated deer areas can be made. From this comparison several areas will be selected for further investigation.

1. Are there any areas in your district that report severe damage to agricultural crops from overpopulated deer herds? YES NO
2. Are there any other areas in your district, not in the near proximity to agricultural areas, such as Nat. Forest, that you believe to have an overpopulation of deer? YES NO
3. Do you think these reports of damage to be real or imaginary? YES NO
4. Please give the following information concerning these areas:

Landowner's name -

Post office address -

County -

5. What type of crop is reported to be damaged?

Corn

Peanuts

Others

Soybeans

Orchard

6. Approximately what month does the damage to crops occur?
List crop and month

7. Are there any electric fences established in your district that were built to keep deer out of crops? YES NO What type crop?

8. If the answer to #7 is yes, please furnish the following:

Landowner's name

Post office address

Type crop to be protected

Case Histories of Areas Reporting Deer Damage

Brandon, Prince George County

Brandon is located in the eastern portion of Prince George County, a county in the tidewater section of Virginia. The area studied is a point of land that is formed by a bend in the James River. The point is divided by a county road into two parts, known as Upper and Lower Brandon. Both areas are treated as one in this study.

Brandon is primarily an agricultural area, being level river bottom-land. The combined area of Upper and Lower Brandon is approximately 7,000 acres. The fields in the area are very large. The agricultural land may be thought of as a belt running across the point, with a marsh on the river side, and a pine-oak woodland on the upland side. The area is not what would be commonly thought of as forest game habitat because of the large fields, a scarcity of woodland, and few hedgerows between the fields.

Deer in this area are in all probability native deer, since there have been no records or reports of restocking deer in this vicinity. The deer herd has built up from the residual herd left along the river and marshes in this vicinity.

Five years ago there was a fair turkey population in the pine-oak woodland adjacent to the agricultural land and running back toward the higher land. At the present time the turkey population in this area is very low, the remnants of one gang of turkeys being left. This may be illustrated by the kill figures of the Burrowsville Hunt Club which has hunted the pine-oak uplands for several years.

Appendix Table 4. Kill figures for the Burrowsville Hunt Club on opening day of the hunting seasons 1947-1949. Total membership of 14 members, plus a possible one guest for each member

Year	Deer Killed	Turkeys Killed
1947	5 Bucks	3
1948	9 Bucks	0
1949	20 Bucks; 3 Does	0

Deer in this area are apparently in excellent health. No deer have been found by the local game warden that were dead from any unknown causes. Deer examined by the writer during the hunting season were heavily covered with fat. This condition is not hard to understand in view of the excellent agricultural crops that are raised in the Brandon area. Weights of three bucks taken in this area during the hunting season had an average weight slightly less than that of the average eastern Virginia deer weighed in 1940. It was reported by an old farm hand that prior to World War I the deer were as plentiful in this section as they are now. About 1920 they are reported to have diminished greatly in numbers, as a result of disease.

Damage to agricultural crops in this area has been rather severe in 1948 and 1949. Damage is possibly not as noticeable at Brandon because the fields are very large. It was estimated by the farm manager on Upper Brandon that 1/2 to 2/3 of a crop of soybeans in a 58-acre field had been damaged. The farm manager at Willow Hill, adjacent to Upper Brandon, estimated that 1/4 his corn crop was damaged in 1949. Damage to crops



Appendix Figure 1. The area at Brandon has large well kept fields, with few hedgerows. These fields are bordered by woodland and marshland. The deer feed out into the fields from the cover, and it is along the edges of the fields that the greatest amount of damage is found.

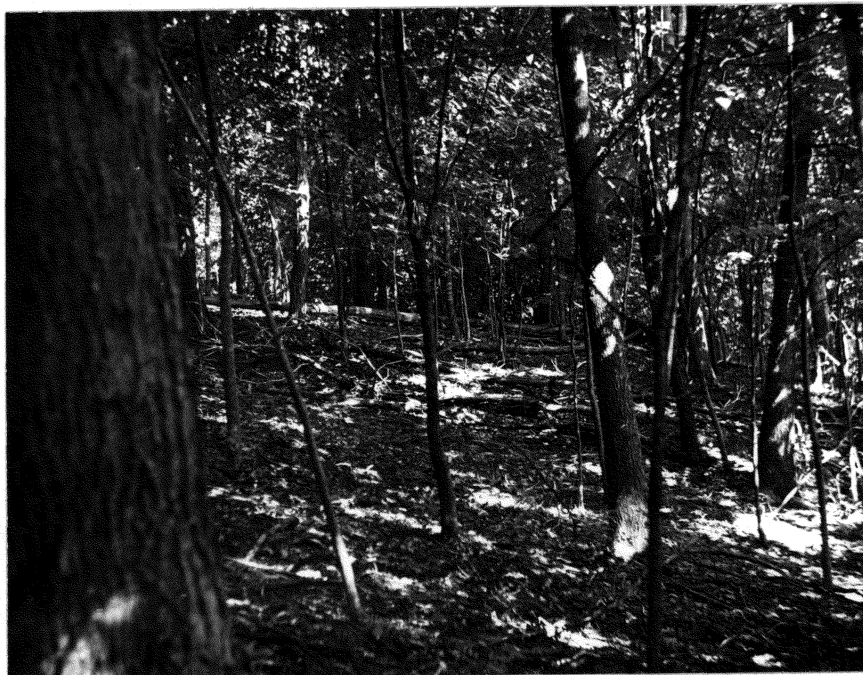
such as soybeans occurs in July, when the plants first come up. Damage to crops such as corn takes place when the corn reaches maturity. Farm workers and land owners in this area are beginning to complain about the damage. Prior to this time the people have enjoyed the sight of a few deer. Before 1949, there had been no deer hunting at Brandon for thirty years. This year the hunting rights to Lower Brandon were leased to the Burrowsville Hunt Club for \$1,500.00. The owner of Lower Brandon does not plan to allow hunting on her property during the 1950 season. Approximately six hunts were staged on Upper Brandon under the supervision of the game wardens. The hunts on Upper Brandon grossed \$2,100.00. These payments in some measure repaid the landowners for the damage to their agricultural crops.

Back Creek, and Hidden Valley Farm, Bath County

Back Creek and Hidden Valley Farm are two different areas in the western portion of Bath County, located on the same mountain but about four miles apart. Back Creek Wildlife Area is on the west slope of Back Creek Mountain, while Hidden Valley Farm is on the east slope of Back Creek Mountain.

Both areas are wooded and on slopes of oak-hickory type forest vegetation, with pine patches on some of the more exposed and poorer soil types. The Back Creek Wildlife Area studied contains approximately 600 acres and the Hidden Valley Farm approximately 1400 acres.

Deer in this area probably originated mainly from native stock that was left in the county when the season was closed in Bath County from 1922 to 1927. It is reported, however, that some deer from other states were placed in the area during the nineteen twenties.



Appendix Figure 2. The forest vegetation at Hidden Valley Farm has a thick canopy that shades the ground to the extent that the area has become park like in appearance. Under such conditions, a minimum of deer browse is available to deer.

Turkey and grouse populations in this area have remained fairly constant over the past ten years. No decrease in these game bird populations has been noted as the deer populations have been increasing.

The deer in this section appear to be in good condition in view of the fact that no deer have been found that were dead from any unknown causes. Killing of deer by dogs is unusual, since public opinion is against dogs running deer. Deer-running dogs are quietly liquidated; they are viewed with the same disfavor as are sheep-killing dogs. Illegal hunting of deer in this county has been a serious problem in the past, but is gradually being brought to a minimum.

In the Back Creek Wildlife Area a browse line was noted in 1947 on maple, dogwood, and the oaks. This browse line was first noted during a period of heavy snowfall; the results are still evident in certain local areas as was pointed out by the Deputy Wildlife Manager, Gwynn Lightner. The State Forest Service reported in 1949 that a browse line was also evident in the Hidden Valley Farm Area. An investigation disclosed, however, that this condition was due to the normal ecological succession. A heavy second-growth of white oak has developed to a height of approximately 20 feet following logging operations 13 years ago. The thick growth of white oak, combined with natural pruning, has developed such a thick canopy that browse food material below this canopy is very scarce.

Buckingham State Forest, Buckingham County

The Buckingham State Forest is located on Highway 24 between Appomattox and Sprouses Corners, in the piedmont section of Virginia.

Ownership of the forest is not solid, but in portions of varying size. The total area is approximately 18,000 acres. The hardwoods are

oak-hickory type, with stands of shortleaf pine scattered throughout the area. This forest is now under the control of the Virginia Forest Service with the Virginia Commission of Game and Inland Fisheries managing the wildlife. The deer herd in this area has developed from the original seed stock that was left in the area.

From 1947 to 1948 the turkey population in the Buckingham Forest decreased from 17 gangs of turkeys to two. Meanwhile the deer population has continued to increase steadily. As a result of the state game commission action there was no hunting of any kind on this area during 1948. During the 1949 season a controlled hunt of one-week duration was allowed on the area for all types of game with the exception of turkeys. During this time 7 deer were killed on the area. This number of deer is in no way an indication of the deer population, but is rather an indication of the hunter activities.

No deer have been found dead in this area from unknown causes by state employees working on the area. Deer examined during the hunting season in the course of this study were in excellent condition.

The condition of food plantings intended for wild turkeys in the area seems to indicate an overpopulation of deer, considering the definition of overpopulation used in this study. During the 1948 season records were kept on the utilization of the food plantings by wildlife. This information demonstrated that deer are using the food plantings to such an extent that all of the preferred turkey foods are gone before the critical winter months arrive. The primary aim of the wildlife management on this area has been to increase the number of wild turkeys. The deer are nullifying all of the efforts being made in this direction.

Deerfield, Augusta County

Deerfield is located on Route 272, thirty miles west of Staunton, Virginia.

The area surrounding Deerfield is a valley, approximately 1/2 by 18 miles, used principally for livestock farming. The valley is surrounded by mountains which support an abundant supply of wildlife in the forms of deer, bear, turkey and grouse.

Deer in this area were restocked by the Virginia Commission of Game and Inland Fisheries as part of their restocking program to re-establish deer in the mountainous section of Virginia. The annual deer kill has been steadily increasing since the opening of the season in 1936. The largest portion of the annual kill in this county is made in the western portion.

The deer population is apparently in a health condition since no deer have been found dead in this county from unknown causes.

Reports from this area indicate that the deer cause some damage to corn crops after the corn is cut and shocked in the fall. This is to be expected because of the surrounding mountainous woodland. This crop damage is generally accepted without rancor by the valley residents, who seem to feel that the possible late damage to corn causes even the lazy farmer to get his corn shucked early, and thus avoid any serious losses. The concensus of opinion seems to be that shucking corn early is not too great a price to pay for the privilege of having good deer hunting.

Faukland Estate, Halifax County

The Faukland Estate is in the eastern portion of the piedmont section of Virginia, located approximately four miles east of Scottsburg, adjacent to the Staunton River State Park,

This area of approximately 9000 acres at one time was made up of a number of small farms. It is managed primarily as a hunting estate, and game is the major crop. The forest vegetation is loblolly pine in spotted stands, and oak-hickory in older woodland. Scattered fields of submarginal farm land intersperse the area. One side of the estate is bounded by a river, and what were at one time fields along the river are now growing into a thick brush of birch, maple and gum.

The deer herd in the Faukland area developed from native stock. The deer population after 1900 was evidently very low. No records exist of deer being taken on the area before 1920, when one doe was killed by the tenant; a Mr. Clay.

As the deer population has been increasing, the turkey and quail population has been seriously declining. No attempt has been made to determine if this has been due to the deer competition, or as a result of a change in the agricultural practices and natural succession. Kill figures compiled by the family that has habitually hunted at Faukland for the first several weeks of the hunting season since 1923 are given in Appendix Table 6.

Appendix Table 5. Kill figures for the Faukland Estate, by members during the first several weeks of the hunting season, 1923 to 1949.

Year	Deer	Turkey	Year	Deer	Turkey	Year	Deer	Turkey
1923	1	22	1935	3	35	1941	5	27
1924	2	18	1936	3	41	1945	50	8
1925	1	18	1937	3	52	1946	43	7
1932	1	14	1938	7	56	1947	14	27
1933	4	43	1939	5	62	1948	46	7
1934	2	36	1940	17	52	1949+	60	14

* Season kill exceeded 110



Appendix Figure 3. Deer in the Falkland area have caused extensive damage to all agricultural crops, especially the corn crop. Typical deer damage to corn is shown in the above picture.

Populations of quail have decreased from a point when 30 coveys could be found in a half-day hunt until now when only 3 coveys can be found in an all-day hunt.

Deer on the area appear to be in good physical condition in view of the fact that all deer examined during the hunting season and mid-summer were covered with fat. The tick problem is steadily increasing on the area. Some ticks were collected from deer on the area and identified by Dr. F. C. Bishopp as the lone star tick, Amblyomma americanum. No deer have been found dead on the area that have died from unknown causes.

Deer in this area damage all types of agriculture, including tobacco growing in the fields. An example of the damage that is being caused in the corn is given in Appendix Table 7.

Appendix Table 6. Deer damage to corn, Faukland Estate, Halifax, Virginia

	Stalks Examined	Ears Destroyed	Ears Injured	Untouched
Row # 1	50	27	30	16
Row # 2	50	55	16	16

These data were taken stalk for stalk, the first fifty stalks in rows picked at random. (Destroyed - 1/2 or all of ear taken; injured - less than 1/2 ear taken)

The manager of this area is greatly concerned over the fact that he cannot raise agricultural crops. The concern is not that a financial return from agricultural crops is expected, but that it is desired to raise enough food to feed the quail and turkeys during the winter months. In other words, they would like very much to have fewer deer and more quail and turkeys.

Glades Closed Wildlife Area, Scott County

The Glades Wildlife Area is approximately ten miles from Norton, Virginia, and seven miles from the nearest county road. The area lies on the county line of Scott and Wise Counties. Both of these counties are in the mountainous coal mining region of the state.

The Glades is in the midst of a large expanse of wooded mountain country. Clearings have been established throughout the area as part of the wildlife management plan. All slopes and ridges are in oak-hickory forest type, while in the creek bottom are patches of rhododendron and hemlock. Here and there are found coal outcroppings. Originally the area was 4,500 acres in size; it has since been reduced to 1,200 acres.

The state game department, through use of its P-R funds, stocked 133 deer in this area from 1931 to 1945. These deer came from a wide assortment of places, from as far south as Alabama and as far north as Wisconsin. Private sources in Norton released an undetermined number of deer in this vicinity over the same period.

Turkeys have been absent from this area for at least 15 years. The grouse population has decreased considerably in the past seven to eight years, to a point where one is seldom seen. Outside the area the grouse are more plentiful. There are no quail present at this time.



Appendix Figure 5. Deer browse line on rhododendron, (Rhododendron maximum), in the Glades Wildlife Area. Browsing on this plant is believed to be an indication of overpopulation conditions.

No deer have been found in the area by the Deputy Wildlife Manager, Joe Rose, that have died from unknown causes. A few deer are preyed upon by dogs, but a very few. Practically no illegal killing of deer occurs within the area.

Deer overpopulation of this area was first noticed when a browse line appeared on rhododendron and on white pine plantings. Subsequently, some crop damage was noted on a few small farms on a nearby mountain. These farms produce poor crops at best and the deer do these small sub-marginal farmers a greater proportion of damage than they would a large farmer. In 1948, the largest amount of damage was done to a bean field, for which the owner was paid \$130.00. There was little damage in this field in 1949. Public interest in the deer herd is high and the majority of people concerned are interested in getting a good strong deer herd re-established in this vicinity. Most people concerned are interested in getting the deer damage under control, but at the same time they want to keep their good deer hunting.

Homeville, Sussex County

This area is located two miles southeast of Homeville, in Sussex County, a county in the tidewater section of Virginia.

The crop damage at Homeville was to soybeans and peanuts in a small remote field some three miles from the nearest dwelling. Loblolly pine woods surrounded the field on all sides. The tenant farmer rents the field from a member of the Waverly Hunt Club, who does not want to reduce the number of deer present. This land and adjacent land is controlled by the Waverly and Wakefield Hunt Clubs, and deer hunting is limited to club members and their guests.



Appendix Figure 5. Deer damage to soy beans at Homeville, Virginia. Such damage results in a stunted and branched plant, and may cause death to the plant.

The deer herd in this region has developed from the original native stock.

No comparison of the increase in the deer population to quail and turkey populations was made on this area. Grouse are absent from the tidewater region of Virginia.

Some illegal hunting of deer is done in this vicinity, and because of the remote location of the field it is the most logical choice of poachers. Three poachers were apprehended during the past year.

The apparent health of the deer in this vicinity is good, as is indicated by the fact that no deer have been found dead from unknown causes. Deer taken during the hunting season are reported to be in fine condition.

With the assistance of the county game warden and the district wildlife technician, an estimate was made that 40 per cent of the soybean crop in a 35-acre field had been damaged to the extent of \$300.00. The farmer is very bitter about the damage and wanted the game department to reimburse him, but refused a permit that would allow him to kill the deer.

Naval Mine Depot, York County

The Naval Mine Depot is an area of 12,000 acres, including marshland, located just north of Yorktown along the York River, in the tidewater section of Virginia.

This area was purchased from several farmers in 1918 to form a munitions storage area. What was woodland then is now in hardwoods, and what was open fields then is now in pine. Some logging operations have been going on in this area since 1944. These are for the most part

thinning and release cuttings. The roads also serve as firebreaks, having grass strips on either side of the road as wide as the road itself. Other than this the area is mostly wooded.

In 1922, two does and one buck were released on the area. It is believed that some deer must have been present in the marshes along the river and contributed to the development of the present herd. Dr. N. W. Hosley and Phil Goodrum estimated the present deer herd to be 1200 to 1500 animals. They also estimated that 300 to 400 deer should be removed to avert mortality in the deer herd as a result of starvation.

Deer became "common" in this area in 1939, and at that time there were 15 gangs of turkeys present. Grouse are absent from the tidewater region and the quail population is reported to be about the same now as it was ten years ago. At the present time there are three gangs of turkeys present on the area.

The deer are apparently healthy in this area since the guards report that they have not found any deer dead from unknown causes. Twelve deer were found injured with gunshot wounds during the past year.

The presence of the deer was vividly brought to the attention of the Navy personnel stationed on the base when they found it was impossible to raise gardens at the Mine Depot. A browse line is present on honeysuckle in the area. Dr. Hosley is of the opinion that if it were not for the honeysuckle the deer would have suffered starvation mortality before now.

Paramore Island, Accomac County

Paramore Island is an island in the Atlantic Ocean located 2 miles off of the coast of the eastern shore of Virginia.

This island is approximately seven miles long and 3/4 of a mile wide. It is covered with sand dunes on which grow loblolly pine and bay myrtle. The owners use the island as a duck hunting preserve since there are several small seepage ponds just inland from the ocean. Because of their interest in duck hunting, little time is spent in deer hunting, one or two deer being taken in a season.

In 1937, two does and one buck were released on this island. The buck was later found dead and was replaced. It is not impossible for the deer to leave the island since it is approximately two miles to the mainland through marshes and small channels. At some undetermined date prior to the stocking of the deer, the island was stocked with goats in an attempt to thin out the underbrush to enable the club members to get to the duck shooting ponds. In the fall of 1949 the goat population was high, since goats apparently increase faster than do deer.

There are no populations of turkeys or quail on the island.

Paramore Island was reported as a possible spot of overpopulation because four deer were found dead on the island in the early spring of 1949. It was thought that possibly the deer had died as a result of starvations, however, no thorough examination was made at the time of the discovery. No dead deer were reported during the spring of 1950.

A very definite browse line can be seen on vegetation, but to differentiate between deer browse line and the goat browse line is impossible. From casual observation on one visit to the island in September, 1949, it appeared that there would be a shortage of deer food the following winter or early spring. The goats can evidently utilize food of a lower nutritive value than the deer. During the past winter of 1949-50 attempts

have been made to get the goats off of the island. The results of these efforts has not been reported to the writer.

Tappahannock, Essex County

Deer damage in Essex County is reported on the property of Lee D. Butler, a farm of over a thousand acres located seven miles north of Tappahannock.

This area is located at the junction of the piedmont and tidewater sections of Virginia. Part of the land is rolling and part is flat. The majority of the woodland is in oak-hickory hardwoods with some scattered islands of pine; the remainder of the land is farm land. Several new fields have been created on the area by clear cutting, followed by bulldozing the stumps and heavy fertilization in preparation for planting green cover crops. Deer in this area have originated from native parent stock.

Other game populations in this area have apparently held their own. The best turkey populations in the county are found on this farm and according to the county game warden, William Edward Ware, turkeys have possibly increased in the past five years.

No deer have been found in this part of the state that have died from unknown causes.

The Butler farm was reported as being overpopulated because of the damage that the deer had caused to a young apple orchard on the area. When Mr. Butler bought the land he planned to grow fruit orchards and purebred cattle. He has been forced to abandon the idea of the fruit orchards due to the high deer populations. The presence of very expensive beef-cattle on the area has caused him to close the area to deer hunting

because of the fear that some one will injure the cattle. Since this general section is heavily wooded, the agricultural activities directed toward cattle raising have greatly benefited the deer. Lush pastures of heavily fertilized legumes are supplying rich grazing in abundance. The apple orchards have provided preferred browse; damage to the 30-acre orchard was so great that it was necessary to erect an electric fence around it. The fence is five strands high with a two-foot offset. Over a two year period this has proven very satisfactory, having been passed only once, when the fence was broken by the deer. This electric fence has enabled Mr. Butler to raise apples where it was impossible to do so before. The cost of such a fence, however, is practically prohibitive.

West Point, King William County

This area is about five miles north of West Point, a farm known as the Ollesen Farm, owned by the family that owns the paper pulp mill at West Point. King William County is in the tidewater section of Virginia.

The area includes approximately 800 acres, 200 of which are under cultivation. Land not under cultivation is growing loblolly pine. Land adjacent to the Ollesen property is hunted by hunt clubs; the Ollesen's have just one hunt a year with an average kill of six to eight deer.

Two deer were released on the farm in 1921, and at that time they were thought to be the only deer in the immediate vicinity. It is likely, however, that some native deer were still present in swamps and marshes of adjacent rivers, and that the deer herd built up from a combination of the two sources.

Turkeys are absent from this vicinity, and grouse do not occur. The quail population is reported to be lower than it was ten years ago,

but this is a common complaint. The deer population has definitely increased.

The deer are apparently in good health now in view of the fact that no deer have been found dead from unknown causes. The farm manager reports that the deer were thought exterminated in this region between 1910 and 1918.

H. J. Tuttle of the state game department has reported that this farm suffered severe damage to its corn crop in 1948. Also a 35-acre field of alfalfa was so severely browsed by deer that it was turned under rather than cut for hay. In 1949 the deer did noticeable damage to soybean fields along the edges of the woodlands. The landowners do not seem to be too greatly alarmed about the damage; possibly because they do not farm for a living but derive their income from the pulp mill.

Winchester, Frederick County

Several local areas around Winchester have been reporting damage to orchards. The one main investigation in this area was at the apple orchard of Phil Glaze. The orchard belongs to the Glaze Brothers in Winchester and the orchard is located approximately seven miles west of Winchester.

This orchard is approximately 120 acres in size and split into several sections of different age groups. The sections are bounded on two sides and sometimes on three sides by woodland. The orchard is near the mountains, in the western part of the Shenandoah Valley.

Deer in this section have been restocked as part of the efforts of the Virginia Commission of Game and Inland Fisheries to reintroduce the deer to the western portion of Virginia.

While some deer were reported to have been found dead in the adjacent county of unknown causes in the fall of 1949, no deer in the immediate vicinity were found dead.

This orchard was reported to be damaged by deer, with the owner using Good-rite z.i.p. as a deer repellent. He has tried two applications, the first of which apparently worked satisfactorily. The second application seemed to have no effect on the deer. It was made at the rate of two pounds of Good-rite z.i.p. to fifty gallons of water, which is 1/10 the strength recommended by the manufacturer. The strength of the first application is unknown. The Virginia Agricultural Experiment Station in Winchester has tried the use of Good-rite z.i.p. as a fungicide. It controls the pests of the apple orchards but the zinc in the compound causes such a rough skin to develop on the apple that its use is impractical.

A cherry orchard in the vicinity of Winchester, belonging to Bob Rea at Mt. Jackson, was also inspected and found to be having considerable deer damage. Mr. Rea has erected an eight-foot fence around the orchard in an attempt to keep the deer out, but he is still getting deer damage. This orchard is on the eastern side of the Shenandoah Valley close to the mountain.

It should be remembered that even one deer in an orchard is going to do enough damage to be objectionable; in a young orchard a single deer could damage the trees irreparably.

Form Used In Making Range Utilization Study

Appendix Figure 6. Front of tally sheet used in making range utilization study

Winter Deer Range Browse Analysis

Name of Area: *Glades Wildlife Area*

Forest: *Jefferson Nat. For.*

Date: *2/3/50*

County: *Scott & Wise*

Approx. Acreage: *1200*

Miles to Road: *7*

Type: *(1) Rhododendron*
(2) Oak-hickory Slopes

Surveyors: *Engle*

Species	Plot Numbers (Density over Browsing)												Totals	
	1	2	3	4	5	6	7	8	9	10	11	12		
<i>Rhododendron</i>	M													$\frac{30}{30}$
<i>Smilax</i>	L	H	H											$\frac{40}{145}$
<i>Shawnee Haw</i>	L													$\frac{5}{5}$
<i>Vaccinium</i>	M	O	L	S										$\frac{45}{10}$
<i>Mt. Laurel</i>	O			L										$\frac{100}{5}$
<i>Red Maple</i>	O	S	L											$\frac{40}{5}$
<i>Dogwood</i>		S												$\frac{5}{5}$
<i>Azalia</i>		L	O											$\frac{10}{10}$
<i>Sassafras</i>		H												$\frac{40}{10}$
<i>Sourwood</i>			S											$\frac{5}{5}$
<i>Deer Seat Groups</i>	21	0	3	9										33

Density: D-dominant (50% or more) Browsing; H-heavy (more than 50%)
M-moderate (10 - 50%) M-moderate (10 + 50%)
S-sparse (trace to 10%) L-light (trace to 10%)
O-no browsing

Form Used In Making Range Utilization Study (Cont.)

Appendix Figure 7. Back of tally sheet used in making range utilization study.

Deer Range Utilization Survey

Type of winter - Severe: _____ Mild: Yes Average: _____
Maximum snow depth: 2 in. Heavy crusts: No
Number of deer present: Numerous Scarce: _____ Optimum _____
Estimated number if possible: _____
Browse line present? Yes How high: 4.5 Ft. On which species Rhododendron
Food conditions - Good: _____ Fair: _____ Poor: _____ Explain: _____

Type description: (1) Rhododendron Bottom along Creek
(2) Oak-hickory slopes - 20-40%

Plant reproduction:

Improvement possibilities and management suggestions:

Mortality: Causes, number of carcasses seen, ages, sex, breeding data and physical condition:

Some bucks have not yet shed their antlers (Feb. 3-'50)

Remarks - Recent fires, logging, topography, etc.:

Deer trails cross through out the bottom land

Kill figures for past season: does, bucks, fawns? 20 ♂ + 3 ♀

Predators during the past year, any, few, many? 16 in Jan.

Illegal kill? 3 ♀ as above

(Aldous, Shaler E. 1944. A deer browse survey method. Jour of Mammalogy 25(2) 130-136, 3 tables)

Deer Esophagi Examined For Gongylonema pulchrum

- November 6, 1949: Female deer obtained in Halifax County. Entire esophagus examined and the gullet worm Gongylonema pulchrum discovered. Most of these parasitic worms were found embedded under the muscosa; others were partly embedded. The tracts of the embedded worms were tartantus, some red in color, some white. The esophagus was somewhat edematous and presented small hemorrhages in the region of certain worms.
- November 14, 1949: Male deer obtained from Smyth County. Entire esophagus examined and gullet worms found in the distal portion, all embedded between muscosa and submuscosa. None were free or partially free in the lumen. No evidence of hemorrhage or edema.
- November 24, 1949: Male deer obtained from Giles County. Entire esophagus examined and one specimen of gullet worm found.
- December 2, 1949: Six deer were collected from Halifax County. (1) Male: Eight inches of gullet examined, 8 - 10 worms with one end free in lumen, many embedded, with the gallery red in color, muscosa appears rough and thickened.
- (2) Male: Fourteen inches of gullet examined, many worms embedded, none free, and muscosa appears rough.
- (3) Female: Thirteen inches of gullet examined, 3 or 4 worms with one end free in the lumen, and several

embedded. (4) Unknown sex: Twelve inches of gullet examined, many embedded, and muscosa appears rough. (5) Male: Twenty inches of gullet examined, many worms with one end free in the lumen, many worms embedded, and surface of muscosa appears rough with the galleries red in color. (6) Female: Fifteen inches of gullet examined, 24 - 36 worms with one end free in lumen, many worms embedded, and muscosa rough and thickened.

December 2, 1949: All of the following were collected from deer in Bath County. (1) Male: Fifteen inches of gullet examined, 12 - 15 worms with one end free from 1 to 2 inches in the lumen, many worms embedded and the muscosa appears rough and thickened. (2) Male: Fifteen inches of gullet examined, several worms embedded but major portion of the esophagus appears clean and smooth. (3) Male: Fifteen inches of gullet examined, several worms embedded, and muscosa appears roughened and thickened.

December 13, 1949: All of the following were collected from the Buckingham State Forest. (1) Male: Eighteen inches of gullet, no gross evidence of parasites. (2) Male: Eight inches of gullet examined, a few worms present but none with a free end protruding. (3) Male:

Twenty-one inches of gullet examined, many parasites embedded in end of esophagus toward rumen, none with a free end protruding into the lumen.

November 29, 1949: Female deer obtained from Carroll County. Entire esophagus examined and no gullet worms found.

January 6, 1950: Male, immature, weight 52 pounds; 12 inches esophagus examined, no worms present.

January 6, 1950: All of the following were collected in the Brandon area of Prince George county. (1) Female: Eighteen inches of gullet examined, few worms embedded. (2) Male: seven point, weight 95 pounds, ten inches of gullet examined, no worms present. (3) Male: three point, weight 98 pounds, fourteen inches of gullet examined, few worms embedded. (4) Male: eighteen point, weight 160 pounds, nine inches of gullet examined, one worm embedded.

Deer Restocking Records For Western Virginia, 1927-44

County	Area	Years	Total B/D	Total No. Deer
Augusta				
	Big Levels	1932-38	uk.+	60
	Little River	1933-36	uk.	38
	Dry Branch	1940-41	6/10	16
	Holloway Draft	1940-41	6/20	26
	Hodges Draft	1939-41	5/3	8
	Ramsey Road	1940-43	4/23	27
	Corbetts Branch	1939-41	15/19	34
	Tizzle Flat	1940-41	6/14	20
	Wallace Draft	1940-43	1/17	18
	Great North Mt.	1940-41	3/6	9
	Little River	1938-40	20/22	43
	Hite Hollow	1939-43	22/31	53
	Dry Branch Gap	1939-43	14/27	41
	Fridley Cove	1938-39	7/14	21
	Kellison Flat	1938-39	10/14	24
Amherst				
	Brown Mountain	1942-43	7/11	18
	Pedlar Dam	1942-43	18/33	51
	Rock Row Run	1942-43	4/16	20
Bland				
	Round Mountain	1930-32	uk.	22
Botetourt				
	Pen Branch	1936-39	uk.	17
	Little Patterson Ck.	1938-39	uk.	7
	North Creek	1938-40	9/9	18
Buchanan				
	Dismal River	1941-42	4/8	12
	Looney Creek	1938-39	5/5	10
Carroll				
	Iron Mountain	1937-38	4/13	17
Craig				
	Barbours Creek	1938-43	28/48	76

+ uk. - unknown

Deer Restocking Records For Western Virginia (Cont.)

County	Area	Years	Total B/D	Total No. Deer
Dickenson				
	Twin Branch	1941-42	4/9	13
	Cone Creek	1940-41	1/5	6
Giles				
	Mountain Lake	1936-42	13/11	24
	Big Stoney	1940-44	uk.	17
	Eggleston	1938-39	uk.	8
Grayson				
	Spring Valley	1937-39	uk.	16
Montgomery				
	Poor Mountain	1936-38	uk.	10
Page				
	Pitt Springs	1938-39	4/6	10
	Cub Run	1939-40	8/18	26
	N. Runkles Gap	1940-41	1/0	1
	Fridley Gap	1938-39	5/5	10
Pulaski				
	Max Creek	1934-35	uk.	8
	Tract Fork	1942-43	14/27	41
Roanoke				
	Havens Refuge	1927-37	uk.	21
Rockingham				
	Beaver Creek	1942-43	6/12	18
	Cow Know - W.Va. Line	19 ?	uk.	13
	Dry Run Union Spr.	1940-41	3/11	14
	Blacks Run	1940-41	0/1	1
	Kepharts Hollow	1941-42	5/6	11
	Dry River	1939-43	20/38	58
	Rocky Run	1941-42	0/2	2
	Dry Run	1940-43	12/51	63
	Union Spr. Hollow	1940-41	7/25	32
	Mud Hole Gap	1938-39	5/13	18
	Skimone Branch	1939-40	8/23	31
	Port Repub.-Big Run	1933-34	uk.	17
	Rawley Sp.-Slate Lick	1936-38	uk.	12

Deer Restocking Records For Western Virginia (Cont.)

County	Area	Years	Total B/D U/D	Total No. Deer
Russell	Harry Stuart's Farm	1932-33	uk.	2
	Clinch Mt.-Hayger's Gap	1937-38	uk.	12
Scott	Powell Mt.-Stock Creek	1931-32	uk.	25
Shenandoah	Massanutten Mt.-Buck Run	1934-35	uk.	9
	Mas. Mt.-Edinburg Gap	1932-36	uk.	25
	Mas. Mt.-Mid Hole Gap	1939-41	6/26	32
Smyth	Hurricane Closed Area	1938-42	35/68	103
	Hungry Mother Park	1939-40	2/8	10
	Skull Gap	1942-43	4/2	6
Tazewell	Poor Valley	1930-31	uk.	21
	Fast River-Mt. Cove	1942-43	2/14	16
Washington	Alum Wells-12 mi. N. Bristol	1937-38	uk.	6
	Straight Branch Creek	1930-40	uk.	16
	Holston-1 mi. north	1937-38	uk.	6
Wise	Glades Closed Area	1931-41	uk.	133
Wythe	Comers Rock	1939-42	36/73	109
	Gullion Fork	1942-43	23/29	<u>52</u>
Total Number Deer				1790

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