

ANALYSIS OF THE SPATIAL AND TEMPORAL OCCURRENCE OF
DEER SPOTLIGHTING VIOLATIONS IN VIRGINIA

by

Michael Arthur Kaminsky

Thesis submitted to the Graduate faculty of the
Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Wildlife Management

APPROVED:

Robert H. Giles, Jr., Chairman

Burd S. McGinnes

George R. Gross

July, 1974
Blacksburg, Virginia 24061

ACKNOWLEDGEMENTS

This project was made possible through a grant from the National Rifle Association. Special thanks are expressed to their Grant-In-Aid Committee for providing funds for a pioneer research effort in the field of wildlife law enforcement.

The cooperation of the Virginia Commission of Game and Inland Fisheries, especially _____, Chief of Enforcement, was necessary for the success of this project. I would also like to thank all of the agents whose perseverance with the necessary forms provided the data for this project.

I would like to thank _____ and _____ for assistance in collecting the spotlighting arrest records and for development of a computer program to analyze the data; and _____ for consultation and advice; and _____ for clerical and secretarial assistance.

I am deeply grateful to my major professor, Dr. Robert H. Giles, Jr., Professor of Wildlife Management, for his advice, criticism, diligence, and patience throughout this study; to Dr. Burd S. McGinnes, Leader of the Virginia Wildlife Cooperative Research Unit, and Dr. George R. Gross, Assistant Professor of Sociology, for serving as members of my graduate committee.

I would like to especially thank my wife, _____, for her comments, proofreading and typing of endless rough drafts and the final thesis.

A study of this nature involved the contributions of many people, and the list would be too numerous to thank individually. I am indebted to them all.

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	viii
LIST OF FIGURES	x
INTRODUCTION	1
LITERATURE REVIEW	7
METHODS AND PROCEDURES	15
Assumptions	15
Preliminary Arrest Report Survey	17
Agent Selection	18
N. R. A. Spotlighting Violation Questionnaire	21
Spotlighting Arrest Report Form	25
Correspondence with Other States	27
Survey of Virginia's Agents	28
RESULTS AND DISCUSSIONS	30
Preliminary Arrest Report Survey	30
Time of Arrests	30
Day of the Week for Each Violation	33
Violations by Non-Virginia Residents in 1969	36
1970 Spotlighting Data	38
Violations on Holidays in 1970	38
Day of the Week for Each Violation in 1970	42
Non-Resident Violations in 1970	43
Cummulative Totals-Preliminary Arrest Report Survey ...	46
Time of Arrest	46
Number of Spotlighting Arrests by Month	46
Age of Spotlighting Violators	49

Fines Paid by Convicted Spotlighters	49
Summary of Preliminary Arrest Report Survey	49
The Extent of Spotlighting in Virginia	50
Number of Spotlighting Violations Based on Complaints	
Received by Agents	51
Tests of Various Factors that May Influence the Extent	
of Spotlighting	53
N.R.A. Spotlighting Violation Questionnaire Analysis ..	56
Spotlighting Violation Statistics-June and September ..	57
Time and Date of Arrests	58
Type of Weapon	58
Type of Vehicle	58
Type of Spotlight	58
The Weather at the Time of Arrest	58
The Violator	59
The Violation Site	60
The Apprehension Site	62
Spotlighting Violation Statistics-October	62
Time of Arrest	66
Type of Weapon	69
Type of Vehicle	70
Type of Spotlight	70
The Weather at the Time of Arrest	70
The Violator	71
The Violation Site	72

The Apprehension Site	75
Spotlighting Violation Statistics-November	76
Time of Arrest	80
Type of Weapon	83
Type of Vehicle	84
Type of Spotlight	84
The Weather at the Time of Arrest	85
The Violator	85
The Violation Site	87
The Apprehension Site	89
Summary of November Spotlighting Violations	89
Spotlighting Violation Statistics-December	90
Time of Arrest	91
Type of Weapon	92
Type of Vehicle	92
Type of Spotlight	92
The Weather at the Time of Arrest	93
The Violator	93
The Violation Site	94
The Apprehension Site	95
Summary of December Spotlighting Violations	96
Spotlighting Violations Statistics-Cummulative Totals .	96
Time of Arrest	97
Type of Weapon	101
Type of Vehicle	101
Type of Spotlight	104

Weather at the Time of Arrest	104
The Violator	105
The Violation Site	106
The Apprehension Site	110
Summary of Spotlighting Violation Report	112
Spotlighting Arrest Report Form	112
September and October Spotlighting Arrest Reports	113
November Spotlighting Arrest Reports	116
December and January Spotlighting Arrest Reports	119
Cumulative totals	120
A Comparison of the Spotlighting Arrest Report Form with the N. R. A. Spotlighting Survey	127
Spotlighting Data Obtained from Correspondence with Other States	129
Spotlighting Survey of the Virginia Commission of Game and Inland Fisheries	130
A Sociological Theory of Criminal Behavior	133
The Decision to Spotlight	138
SUMMARY AND CONCLUSIONS	142
LITERATURE CITED	145
APPENDIX I: N. R. A. SPOTLIGHTING QUESTIONNAIRES	147
APPENDIX II: SPOTLIGHTING ARREST REPORT FORM	159
APPENDIX III: INTRODUCTORY LETTER FOR THE SPOTLIGHTING ARREST REPORT FORM	162
APPENDIX IV: SPOTLIGHTING SURVEY OF VIRGINIA AGENTS BY THE VIRGINIA COMMISSION OF GAME AND INLAND FISHERIES .	165

APPENDIX V:	SUGGESTED FORM FOR THE CONTINUATION OF SPOTLIGHT-	
	ING DATA COLLECTION	167
VITA		170
ABSTRACT		

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Rank of spotlighting arrests in 1969 and 1970 by county and agent	20
2	Time and number of spotlighting arrests by month in 1968 ..	31
3	Time and number of spotlighting arrests by month in 1969 ..	32
4	Number of spotlighting violations for a week preceeding and following a holiday	34
5	Number of spotlighting arrests by the day of the week for each month	35
6	Test of the expected number of 27.4 spotlighting violations for each day of the week in 1969	37
7	Time and number of spotlighting arrests by month in 1970 ...	39
8	Number of spotlighting arrests by the day of the week for each month in 1970	44
9	Spotlighting arrests by months-1967, 1968, 1969, 1970, and 1971	47
10	Correlation of several factors that may influence the number of spotlighting arrests	54
11	Time spent on patrol prior to a spotlighting arrest-October	63
12	Age of deer killed by violators	65
13	Time of arrest-October spotlighting cases	67
14	Number of cases made on each day of the week in October ...	68
15	Time spent on patrol prior to an arrest-November	78
16	Ages of deer killed by violators in November	79
17	Time of arrest-November spotlighting cases	81
18	Number of cases made on each day of the week in November	82
19	Time spent on patrol prior to a spotlighting arrest-all cases	98
20	Ages of deer killed by spotlighters	99

21	Number of spotlighting cases by month	100
22	Number of cases made on each day of the week	102
23	Time of arrest-all spotlighting cases received	103
24	Direction of travel while spotlighting	108
25	Type of field in which spotlighting violations occurred ...	109
26	Direction from the apprehension site to the spotlighting violation site	111
27	Day of the week for September and October spotlighting violations	114
28	Day of the week for November spotlighting violations	117
29	Time of the spotlighting violation all cases from S. A. R...	122
30	Spotlighting violations by the day of the week all cases from S. A. R.	123
31	Spotlighting violations classed according to field type ...	124

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Number of spotlighting arrests by month	40
2	Mean monthly time of spotlighting arrests	41
3	Number of spotlighting arrests by the day of the week	45

INTRODUCTION

The enforcement of game laws and regulations is integral to the total practice of wildlife management. In the ideal situation, the interactions of habitats, wild animal populations and man should be the major considerations for management. The wildlife biologist is responsible for analyzing population data and for determining the condition and trends of range. In addition he proposed hunting regulations to adjust populations to be within an estimated carrying capacity, and to achieve other management goals. The biologist makes his proposals after careful study utilizing techniques developed through research. The literature abounds with methods of censusing populations, aging animals, and evaluating habitats. Using these techniques, the wildlife biologist can estimate the exact number of animals to be harvested.

After these detailed calculations have been made, the wildlife biologist may submit his report containing the desired kill and estimates of the number of hunting days and the conditions for hunting required to achieve such an objective. State fish and game departments may hold public hearings on proposed regulations, and eventually a hunting season will be approved. Once the regulations are established, the enforcement of these regulations becomes the responsibility of the game wardens, officers, etc. (hereinafter called "the agent"). Although biologists have taken all possible cautions to avoid bias, error, or faulty conclusions about a desired harvest, the role of the agent is highly variable and can be a major factor in achieving the desired harvest. The law enforcement system is currently operating at an unknown level of accuracy

or, if known, at a level that is not comparable to that attained by the biologist. The concept of significant numbers states that the number of useful decimal points in the final analysis is the number in the least accurate observation. Thus, in wildlife management this concept suggests a current imbalance. Some data are very precise and abundant; others sparse and vague. Perhaps when hunting regulations are approximately observed, only approximate habitat and population data are needed for the wildlife management program. The converse is probably true; more accurate enforcement data are needed.

There exists a great need for research into wildlife law enforcement. Several authors, among them Giles (1970), Giles (1971), McCormick (1968) and Morse (1969) have called attention to various aspects of wildlife law enforcement that need to be studied and evaluated.

Of the many problems of enforcement, those involving big game appear to be the most conspicuous to the public. Illegal killing of big game may connote a lack of effectiveness and thus encourage other violations. It can also have an adverse effect on wildlife populations, and may prevent many management efforts from being successful. The loss of big game animals by illegal hunting also constitutes an important economic drain on a valuable natural resource.

The spotlighting regulation is one of many game regulations that are violated each year. Spotlighting, described in detail later, is generally the act of night hunting deer from roadsides. Spotlighting is somewhat unique among game violations in that the violators usually plan on committing the violation. It is a premeditated act rather than

accidental or circumstantial as are many other game violations. A typology of the different types of spotlighters that were observed will be presented in a later chapter.

Although spotlighting is the most common term, it is also known as headlighting, firelighting, jacklighting, or nightlighting. This particular regulation was chosen as the subject of study for several reasons. It is one of the most difficult violations to apprehend and many factors enter into the problem of controlling it. Among them are the skill of the warden, the size of the area he has to patrol, the land use patterns throughout his area, his relationship with the community in which he works, the type of communities present in the area he patrols, the economic base of the area, and the secrecy and cunning of the violators. It is hoped that the results of this study can show the relationships of these variables and provide guidance for more effective planning and use of enforcement personnel.

Reliable information is currently lacking concerning the spatial and temporal occurrence of deer spotlighting. Perhaps with information about the operations of spotlighters, enforcement of the regulation may be made more efficient. This study attempted to provide such information on the theory that understanding the violator and how he operates may later provide the information necessary to improve the strategies for successful agent patrols. It is hypothesized that the information to be collected will be processed similarly to the search methods used in military land patrol and anti-submarine warfare, in which case the exact position of the enemy may not be known, but there exists information

about his operating characteristics, strategic objectives, and strike range.

The spotlighting violation is described in Section 29.144 of the Virginia Game Law. Two categories of spotlighting are defined. According to Section 29.144.2, "Any person who kills or attempts to kill any deer or elk between a half hour after sunset on any day and a half hour before sunrise the following day by use of a light attached to any vehicle or a spotlight or flashlight shall be guilty of a misdemeanor and shall be punished by a fine of not less than fifty dollars nor more than two hundred and fifty dollars or by confinement in jail for not less than thirty days nor more than sixty days, either or both. The flashing of a light attached to any vehicle between a half hour after sunset on any day and a half hour before sunrise the following day by any person or persons, then in possession of a rifle, shotgun, crossbow, or bow and arrow, or speargun, with good cause, shall raise a presumption of an attempt to kill deer or elk in violation of this section. Every person in or on such vehicle shall be deemed a principal in the second degree and subject to the same punishment as a principal in the first degree."

(1962,c.520)

Section 29.144.4, the lesser of the spotlighting violations in terms of penalties, differs from Section 29.144.2 in that "any person in any vehicle and then in possession of any weapon between a half hour after sunset on any day and a half hour before sunrise the following day, employs a light attached to such vehicle or a spotlight or flashlight to cast a light beyond the water or surface of the roadway upon any place

used by deer or elk shall be guilty of a misdemeanor. Every person in or on any such vehicle shall be deemed prima facie a principal in the second degree and subject to the same punishment as a principal in the first degree. Any person who violates this section shall be punished by a fine of not less than fifty dollars and not more than one hundred fifty dollars or by confinement in jail for not more than thirty days or by both such fine and imprisonment." (1962,c.520) For conviction under Section 29.144.2 the individual must have killed a deer or be apprehended while in the act of attempting to kill a deer, whereas Section 29.144.4 makes it illegal to merely shine a light upon places used by deer while in possession of a weapon. Under Section 29.144.4 it is not necessary to be apprehended while attempting to kill a deer. For example, an individual that shines a light in a field used by deer, and has a weapon in his car is in violation of Section 29.144.4. If this individual happened to locate a deer with the light and raised his weapon to shoot, this would be considered attempting to kill and a violation of Section 29.144.2.

Management, to be successful, must begin to measure and quantify the entire network of game law violations, and incorporate these findings into meaningful and workable programs. It is no longer satisfactory for those involved in wildlife management research continually to strive to improve census techniques and habitat evaluation procedures while the enforcement program operates at an unknown or highly variable level of accuracy. The extent of illegal kills, the extent of violations without kills, the spatial and temporal characteristics of violators, the effectiveness and efficiency of enforcement are just a few of the many

areas of wildlife law enforcement where research is currently needed (Giles 1971). The detailed calculations of the biologist must be matched by an equivalent detail and accuracy within the enforcement program. Less knowledge is an inadequate basis for operating a sophisticated natural resource management system, and will likely result in mis-management. This study therefore has the objectives of:

1. To describe when and where reported spotlighting violations occurred in selected areas of Virginia throughout a year.
2. To provide data for the development of optimal search strategies to increase the efficiency and effectiveness of enforcement directed against spotlighting.
3. To develop a method for estimating the extent and probability of spotlighting occurrences based on several factors, including time, habitat, weather and human population in the area.

LITERATURE REVIEW

Laws and regulations governing the taking of game, and their enforcement, have been a traditional method within wildlife management. Originally, protection was provided to insure the maintenance of an adequate breeding stock of a population. Today, laws are also designed to provide an orderly and fairly distributed harvest of the wildlife crop among sportsmen. Regulated seasons and bag limits provide an equal opportunity for the majority of hunters to be in the field at the same time in competition for the harvestable game (Dambach 1948). The sale of hunting licenses and enforcement of the law requiring the purchasing of a license to hunt, provides the state wildlife agency with the necessary funds to carry out other programs of management, such as habitat improvement (Patton 1964).

While laws and enforcement are useful, they are limited in achieving the objectives of wildlife management. Dambach (1948) stated that the enforcement of hunting restrictions, even to the extent of closing seasons, has not effectively halted the decline of wildlife suffering from habitat depletion. He also stated (1948) that under the terms of the universal law of wildlife ownership

the manufacturer who profits from the sale of hunting equipment may exploit this resource through encouraging hunting with his equipment to harvest game he likewise did nothing to produce. The right of the individual to use wildlife is thus guaranteed but with this right there is no legal responsibility, except obeying game laws, and little moral recognition of responsibility for its welfare. The state, on the other hand, is charged with responsibility for the welfare of wildlife but has little opportunity to exercise it because wildlife is produced primarily on lands managed for agricultural purposes. It is the land owner or farmer who has the opportunity to provide for the welfare of wildlife through his management of the land. Unfortunately there is little incentive for him to do so. Under these

circumstances it is but natural that the states have resorted to managing their wildlife largely by dividing the crop as equitable as possible through enforcement of game laws. Although these efforts appear to have been fairly effective in dividing the crop, it is clear that they have little to do with producing it.

Patton (1964) asserted that volumes of laws and regulations are useless if unobserved. All of the persuasion of education at its best cannot obtain sufficient voluntary compliance from the public. Since voluntary compliance with laws is not fully obtained, enforcement programs are necessary. Chabreck (1967) stated in an article about the American alligator that

enforcement will be as important in the future as it has been in the past. Without adequate enforcement, laws and regulations are useless. Whenever the welfare of a resource is in jeopardy, most people are honest enough to abide by laws set up to protect the resource. However a few people are not, and without adequate enforcement by the courts as well as game agents, this small segment of violators will continue to operate. Then in reality all you will have is a private hunting club for the lawless element.

The successful management effort must represent a balance between laws and enforcement, education, habitat improvement, and wildlife population manipulation.

The illegal taking of game can have significant effects on the population, and the extent of these losses should be considered. According to Morse (1969) who agreed with Patton (1964), "the illegal kill would reduce most of our wildlife if enforcement were not adequate, and the United States limited wildlife population at the turn of the century shows this." While illegal hunting can quickly reduce a wildlife population, it is important to recognize that other factors such as habitat destruction, can also quickly reduce a wildlife population.

Since the turn of the century, the wildlife enforcement field has made some progress. The conservation officer is better trained and educated now, and has acquired the use of modern equipment. Most state agencies now provide two-way radios for their officers, and automobiles capable of high speeds. Several states utilize airplanes and helicopters to assist the officers in their patrols (Milstead 1964). In many states there is a cooperative agreement between the wildlife agency and the state police for assistance in performing laboratory analysis of fingerprints, blood, hair, or game meat samples suspected of being evidence in a violation.

On the national level, Morse (1972) stated that there are over 150 federal agents and over 5,800 wardens, rangers, conservation agents and their supervisors. These men represent 32.3% of the state wildlife agencies personnel, and account for an average annual outlay of 27.4% of the state's operating budgets. The state enforcement agencies spend over \$72 million annually, a significant sum in natural resource management. Among the many diverse tasks assigned to the agents are law enforcement, public relations, information and education, game and fish stocking, and courtroom appearances. Knowledge of wildlife biology, first aid, sociology, journalism, education, legal and investigational procedures, along with some mechanical ability is required. Nationwide, 60% of the agent's time is devoted to enforcement, with a major portion of the rest being spent on education and public relations work. This is a substantial investment of time and money for controlling the harvesting of wildlife, and the benefits received need to be carefully analyzed and

evaluated to assure efficiency.

In a publication of the Canadian Wildlife Service (1971) the statement was made that "little attention has been paid to losses caused by illegal hunting, probably because accurate statistics are not easily obtained." Several investigators have attempted to quantify the extent of illegal kills. Barick (1969) in North Carolina reported that the legal harvest of deer on some management areas accounts for only a little over half the annual drain. In areas of inadequate protection and less stringent laws, legal kills may constitute less than 10% of the annual drain, with much of the rest lost to illegal hunting. Vilkitis' work in Idaho (1968) and Maine (1971) is unique in that it attempted to quantify the extent of the illegal kill. He simulated deer poaching under the general concept that the proportion of times the researcher is caught to the number of simulated poaching acts is an approximation of the relationship between poachers arrested and the unknown total number of violators. Utilizing the technique in Maine he estimated that there were 20,199 spotlighting violations in 1970. His study in Idaho revealed that 3.1% of the estimated number of out-of-season big game violators were arrested in 1968.

A method of estimating the bias in reported deer kills to known deer kills has been developed by Hesselton and Maguire (1965). It compared reports of agent-checked hunters with actual data on the same hunters. McCormick (1968) has also developed a series of statistical techniques to evaluate the effectiveness of enforcement, and to estimate the number of violators for an area. Using these methods, he found that during the

1967 deer season in California, 72,000 violations of the game laws occurred, or 16.5 violations per 100 deer hunters.

In terms of its magnitude of effect and the difficulty of apprehending violators, spotlighting is a major big game violation. It is of relatively recent origin according to Eye (1968) and had its beginning in Europe. Prior to World War II, West Virginia had no reported spotlighting problem, however as veterans returned home, spotlighting increased and black market sales of deer became common. A survey by Gillam (1969) in Virginia showed that a majority of wardens felt that most spotlighting is done for "kicks" and to obtain meat for home consumption. Market hunting was not thought to be a significant factor in the increasing number of violations. However, some wardens, especially in the area near Washington, D.C., stated that a black market does exist, for which one can receive 25 to 50 dollars per deer.

Brown (1962) described several spotlighting incidents in Tennessee and pointed out that drinking is involved in many of these cases and often the violator is apprehended only after a high speed chase. The procedures for employing aircraft in patrolling for this violation were outlined by Milstead (1964) and he stated that close co-ordination between the plane and the patrol cars is essential. Undercover work also has its merits in apprehending market violators, according to Kirpatrick (1968). He stated,

"undercover work deals with the extreme individual who most often is cunning, fearless, brazen and very knowledgeable in his activities; and knows that the chances of apprehension are one in a hundred through routine law enforcement practices, and then it is more often by luck than design."

Spotlighting is not confined to public areas but occurs on military bases as well. At Quantico Marine Base in Virginia, ten agents staked out an area and with the use of a helicopter, made 27 arrests in one night (Windsor and Flory 1967).

The occurrence and distribution of deer at night has also been investigated by several researchers. Progulske and Duerre (1964) worked on a study involving the factors influencing the spotlighting counts of deer. They stated that deer did not appear frightened when spotted, and that 79% of the deer observations were made within four hours after sunset. Cloud cover, temperature, precipitation, dew and relative humidity were recorded for each observation over a three month period, and these five factors gave a R^2 value of 0.8528, indicating that 85.28% of the variation in deer counts could be accounted for through five weather factors and their interaction. Dealy (1966) also evaluated the factors involved in the number of deer observed by spotlighting and obtained results similar to Progulske and Duerre. He stated that the number of animals observed increased gradually to mid-summer and then dropped sharply through late August and September. Montgomery (1963), in a study in Pennsylvania, reported that deer spent the days in wooded parts of the area, then began to move into open fields one or more hours before sunset in winter and during the hour of sunset in summer. Deer apparently entered the fields later in summer and earlier in winter than in spring or fall. These movements on the area were believed to be in response to a lack of browse in the wooded sections. Nearly all deer on the area were active during all seasons for a period lasting from 1 to 2

hours before sunset until at least 1 hour after sunset. Deer grazed in the open fields for about 4 hours after sunset in winter and for 7 to 8 hours after sunset in summer. Dasmann and Taber (1956), Cronemiller and Bartholomew (1950) Harper (1962) and others have reported that the activity of various cervids is greater on cool, cloudy days than on sunny, clear days. In summer, the peak of bedding occurred 7 to 8 hours after sunset (just before dawn) and nearly all deer were active at dawn. Bedding usually lasted for about $1\frac{1}{2}$ hours. In the fall, the first peak of bedding occurred about 5 hours after sunset, and in winter about 4 hours after sunset. The deer usually moved into the woods just before dawn. Anderson (1959) stated that deer were influenced significantly in their standing and bedding habits at night by moonlight, temperature, and humidity. These studies provide useful information on the various weather factors associated with spotlighting deer and will aid in the development of patrol strategies designed to offer the most effective and efficient protection to deer at night.

Some speculation has been offered as to the nature of the big game violator and measures that could be undertaken to control him. Vilkitis (1968) has characterized the big game violator as a male, in the 20-29 year age group, that has an elementary school education. He is likely to be married with three dependents under 18 years of age, is an industrial worker, and holds more than one job. He owns an automobile, earns more than \$2000 a year, spends more time on public land than a legitimate hunter, prefers to just hunt, and does little fishing. Violators were more likely than hunters to turn in a violation by a

stranger. Also, the violator, contrary to the hunter, believed that hunter crippling losses were higher, and that the game laws were well enforced.

Moser (1962), commenting on bighorn sheep in Colorado, suggested that the local inhabitants are probably the greatest deterrent to illegal hunting. They realize and appreciate the aesthetic values of the bighorn, and keep close watch on the factors affecting them. He called for revoking the privilege of hunting for convicted violators and publicizing the names of those convicted. What effect such action might have is directly related to the psychology of the violator. The interpretation and control of undesirable behavior requires knowledge of the genesis of criminal behavior based on sociological and criminological theory.

According to Sutherland and Cressey (1970) a fundamental step in the development of crime prevention programs is the formulation of a theory which explains how individuals choose to commit unlawful acts. Most current policies for the prevention of crime are based, implicitly or explicitly, on theories of crime causation. "The greatest need in crime prevention is, and has always been, irrefutable facts about the causes of crime, and sound means for transforming that knowledge into a program of action" (Sutherland and Cressey 1970). Several theories on criminal behavior will be discussed in a later chapter along with a possible application of these theories to game violations.

METHODS AND PROCEDURES

Data about violators and violation characteristics were collected using a questionnaire designed to record the arresting agent's observations for each violation. Terms commonly used in the questionnaire are defined here. A game violation is an act by an individual or group of individuals that is contrary to the wording of a state or federal game law. An individual in violation of a law is a violator. An arrest or citation is a violation in which the violators are apprehended and prosecuted. A case is a violation that results in the arrest of one or more persons. For example, three people in a car may be arrested for a spotlighting violation, and this is considered as one case. It is possible to have several arrests as the result to one violation and one case. A conviction is obtained when the violator is found to be in violation of a law by the courts. An incident is a violation where there is definite evidence of illegal activity, but documentation of the facts were not sufficient for arrest and prosecution.

Illegal kills are the killing of game animals in violation of the law. Poaching generally refers to the illegal killing of big game, and in this study it is used to refer to the illegal killing of deer. Spotlighting, as defined earlier, is a form of poaching.

The law enforcement representative of the state wildlife department is the agent. Other terms commonly used to designate the agent are game wardens, conservation officers, and rangers.

Assumptions

Since it was virtually impossible to gather sufficient information on spotlighting via eyewitness accounts, it was determined that a

questionnaire directed towards the agents involved in the cases would be the most feasible alternative. A personal interview has the advantage of an increased response. In addition, the interviewer can note specific reactions and eliminate misunderstandings about the questions being asked. Several assumptions were necessary to insure the reliability of this investigational technique. They are:

1. The number of spotlighting arrests made by the agent is directly proportional to the total extent of illegal spotlighting activity occurring.
2. The spotlighting arrests that are made are a random sample of the total number of spotlighting violators.
3. The agents are able accurately to recall the various facts concerning each spotlighting case.

The first assumption implies that more arrests should occur when the illegal activity is frequent than when it is infrequent. This assumption was supported by all agents interviewed. They based their support on past experience and observation, but the exact relationship between arrests and total illegal activity was not quantified.

The second assumption is that the characteristics of the violators arrested by the agents are representative of all others engaged in the illegal activity. Although it may be argued that those arrested are the least cautious, and therefore not representative of the group, this does not seem to be correct. The agents work at times and locations that are not accurately known by the violators. The violator may know the agent is on patrol, but he rarely knows where. The agent may suspect a violation to occur but he usually does not know the time or location. Those who take precautions to determine the agent's locations may succeed in avoiding apprehension on several outings, but with each

trip there is still a probability of their being caught.

The third assumption was necessary due to the period covered by the interviews. Cases from January 1969 to December 1971 were covered by the questionnaire. The interviews were conducted from September 1971 to April 1972. Although the exact details surrounding many of the agents' arrests might be easily and understandably forgotten, this did not seem to be true. In several of the cases, a few questions remained unanswered, but the agents appeared to have excellent recall of important details when prompted by their field notes and violation records. Another aid in providing answers to many of the questions was the visitation of the violation site, and this also gave the investigator an eyewitness view of the areas where spotlighting occurred.

Preliminary Arrest Report Survey

The literature review of wildlife law enforcement did not reveal the type of information concerning the characteristics of spotlighting that was desired. For this reason, and also to gain some insight into the problem prior to the development of a questionnaire, it was decided to conduct a preliminary compilation of the arrest report forms for all 1968, 1969, and 1970 spotlighting arrests and convictions filed with the Virginia Commission of Game and Inland Fisheries in Richmond, Virginia.

Permission was secured from Mr. John H. McLaughlin, Chief of Enforcement. This investigator along with Mr. William Conlin and Mr. A. Blair Jones, III proceeded to record the information contained on the arrest citations. The month, day and year of the violation along with the time of arrest were recorded on standard IBM data sheets. The

county of the violation, the sex of the violator, the violator's age, and place of residence were all entered onto the data sheets. The arresting agent for each case was also coded and recorded along with the specific spotlighting violation charge. The final entry was the amount of fine paid by the violator. The total time required for recording these data, excluding keypunching, was 4.5 man days. After this procedure the three years of spotlighting violations were instantly available for comparison and analysis. A computer program developed by Mr. A. Blair Jones, III, written in Fortran IV, produced a printout summarizing the data by year, county, month, day of the week, and agent.

The above data were utilized as the major basis for selecting the agents to be interviewed. Other factors were also considered in choosing a sample of agents from the 126 full-and part-time wardens employed by the state of Virginia. In addition to the agents' familiarity with spotlighting based on arrests for this violation, the legal season deer kill of the agents' patrol areas was examined. It was hypothesized that counties having a high legal kill would have a high deer population, and the chance of spotlighting violations would be greater in these areas. Tests for correlations between the number of known violations with such factors as the legal deer kill, estimated deer population, human city population, human rural population, and the mileage of light surface roads were conducted to determine if the relationships, if any, were significant.

Agent Selection

The final selection of the agents was based on their 1969 and 1970

arrest records. The selection was intentionally planned not to be a random sample of all agents, in order to utilize efficiently the limited time and funds available. A decision was reached to concentrate only on those agents familiar with the violation.

Two lists were established in which the counties and agents were placed in decreasing order of the number of arrests. See Table 1. Many agents work outside of their assigned counties in assisting other agents with stakeouts and patrols, and for this reason the two lists were not identical.

The twenty agents listed represent 21.6% of all Virginia agents making a spotlighting arrest in 1969 and 1970. These twenty agents accounted for 52.5% of all the spotlighting arrests made during the two year study period.

Each agent was expected to provide information on at least three cases that he made during the study period, thus data on at least 60 cases would be collected. This would provide information on more than 60 violators, since many cases involved several arrests. The 60 arrests represent 12.2% of the total number of arrests made for the study period. The cases each agent reported to the investigator were randomly selected by the agent. In an effort to introduce as little bias into the sample as possible, the agent was asked to pick out one case from his violation records of the 1969 and 1970 season. He was then asked to recall the various aspects, such as time of arrest, weather and violator characteristics concerning the case. The agent was given several minutes to organize his thoughts and the interview then proceeded.

Table 1. Rank of spotlighting arrests in 1969 and 1970 by Virginia county and agent

County	Number of arrests	Agent	Number of arrests	Assigned county
Bath	30	F.C. Boggs	39	Spotsylvania
Alexandria	30	D.P. Wirt	22	Rockbridge
Rockingham	28	D.R. Miller	18	Bath
Augusta	27	W.W. Nance	15	Montgomery
Spotsylvania	26	J.K. Updike	14	Rockingham
Rockbridge	21	C.D. Torrence	13	Appomattox
Botetourt	16	R.E. Wilfong	12	Rockingham
Buchingham	16	J.D. Dedrick	12	Fredricksburg
Stafford	14	G.P. Carson	12	Millboro
Southampton	13	J.W. Dove	11	Augusta
Bland	12	D.W. Gentry	10	Southampton
Gloucester	12	C.R. Walker	9	Albemarle
Fluvanna	11	W.T. Jamison	9	Giles
Albemarle	11	L.R. Buchanan	8	Louisa
Caroline	11	J.T. Newman	8	Cumberland
Craig	11	J.K. Cooke	8	Nelson
Montgomery	10	S.P. Doggett	8	Stafford
Alleghany	9	J.R. Bellamy	8	Chesterfield
Appomattox	9	H.H. Pittman	8	Lancaster
Chesterfield	8	E.R. Arrington	7	Highland

N.R.A. Spotlighting Violation Questionnaire

The questionnaire was designed in several sections to cover each aspect of the violation. (See N.R.A. Spotlighting Questionnaire, Appendix I). The first section covered the general facts surrounding the case. Several questions attempted to establish if a deer was killed, the number of deer killed, and the age and sex of each deer killed. If a deer was killed, a question was asked to determine if the carcass of the animal was left to decompose. This would also provide an indirect estimate of the motivation for spotlighting. When a deer was left in the field to decompose, this was thought to support the premise that spotlighting was done for "kicks".

Since it is quite dangerous for an agent to work a spotlighting stakeout by himself, the number of agents involved in each case was required so that the average number of agents per case could be established. The method used by the agent to apprehend the violator was by means of a tip, stakeout, or routine patrol. In several instances a tip alerted the agent to a violation, and the arrest was made as a result of a subsequent stakeout. Under these circumstances, the arrest was recorded as being made as a direct result of a tip. A stakeout was defined as the act of concealing a vehicle used by the agents and waiting in an area for spotlighters to appear. A routine patrol was defined as the patrol of areas at night by agents riding in their vehicles. In a routine patrol no attempt was made by the agents to conceal the vehicle. The agents in routine patrol were simply cruising an area for the chance of observing a violation.

It was necessary to determine the amount of time spent on the various patrols prior to an arrest for comparison of the different tactics. Time spent prior to an arrest made as a result of a tip was counted from the time the agents staked out an area or from the reception of the tip, until the violators were apprehended. For example, if a tip was received on a Thursday night at 8:00 P.M. stating that a violation was going to occur at 10:00 P.M. on the following night, the agent would stake out the area on Friday night. The time from the start of this stakeout until the arrest would be recorded.

A question was asked to determine the percentage of stakeouts that result in an arrest. This question required the agent to estimate the average number of stakeouts he usually worked before he made an arrest.

Frequently, after an agent is sighted by a violator, the violator will attempt to elude the agent, and a chase usually results. Questions were asked to determine the frequency of chases and the speeds reached.

Although the agent may have made an arrest, the courts may fail to give a conviction in a case. Thus, there is usually a percentage of arrests that do not carry convictions, so the question was asked to determine how many convictions were obtained. Also, if a conviction was obtained, it was necessary to know if any fines were suspended.

The next section of questions covered the temporal aspects of the violation. The date of the violation, the day of the week of the violation, and the time the violator was arrested were recorded. Also, the type of hunting season open at the time of the violation and if the violation occurred on a holiday were factors used to describe exactly when

the spotlighters were operating.

The weather conditions at the time of the violation were among the most important to consider when describing the violation. Rainfall, snow cover, if any, and temperature were recorded for each violation. The sky conditions, such as moonlight, clear, fog or clouds, were believed to affect the sightings of deer at night.

The violator was characterized along with his operating characteristics in the following section. In view of the possibility that a work layoff from a factory may produce an economic hardship on some persons, the question was asked to determine if any violations involved a violator on strike or work layoff. Data from the preliminary survey of arrest reports showed that a large number of arrests occurred on military bases. A question was formulated to determine if military personnel were involved in spotlighting cases.

Women and children (under 12 years old) may also participate in spotlighting, and a question attempted to establish the extent to which they were involved in cases. The presence of children was thought to relate to the premise developed in the literature review that criminal behavior is learned.

Since a violator may also be guilty of another offense, the agents were asked to specify the number of cases involving multiple charges and the nature of those charges. The dress of the violator was also characterized as street clothes, camouflaged, work clothes or hunting clothes.

The nature of the weapon, shotgun, rifle, pistol or bow, along with gauge and caliber, and the make and model, were listed. The vehicle type

and year, and the type of spotlight used was recorded to determine if any particular piece of equipment is preferred by violators. If this was so, perhaps these characteristics could be identified by agents and used as an aid in locating spotlighters.

The final question of this section concerned the incidence of violators under the influence of alcohol. This includes those consuming alcoholic beverages prior to or during the spotlighting trip.

The site of the violation was identified by the county in which it occurred, and whether the land was public or private. The agent was asked if making an arrest at the particular site changed his rate of patrol of that site. Violations may occur on restricted areas of several types, such as a state game area, private posted area, or state refuge, and it was desired to know if any of these sites were preferred by violators. The site of the apprehension, if different from the site of the violation, was also described by the above questions.

The type of vegetative cover at the violation site provided information on deer usage, as well as the cover preferred by spotlighters. If the violation occurred in a field, the size of the field, and the type and size of trees surrounding the field were listed. The agent was also asked if the violation would have been visible from the air. If this question was answered affirmatively in a majority of cases, it would lend support to aerial reconnaissance as a method of patrol. The apprehension site was also similarly described.

The data from this questionnaire were transferred to computer cards. A computer program designed by Mr. A. Blair Jones compiled and analyzed

the data. The data were summarized monthly, as well as yearly, and statistical treatments included calculation of means, standard deviation, variance, analysis of variance, and multiple regression equations.

Spotlighting Arrest Report Form

The data obtained from the N.R.A. spotlighting violation questionnaire were dependent upon the agents' recall of 1969 and 1970 cases. The spotlighting arrest report form was designed to be filled out by the agent immediately after an arrest and was to provide 1971 data for comparison with the N.R.A. questionnaire. (See Appendix II for the complete form) The spotlighting arrest report form was similar to the N.R.A. questionnaire but condensed into one page to facilitate carrying and answering by the agents. The questions established the agent making the arrest and the number of agents assisting in the case. The date, day of the week and the time of violation were asked. Since some cases require an investigational period before an arrest is made, the time from the commitment of the violation until the arrest was established. If any deer were killed, they were recorded by sex and age.

The location of the violation was described by county, road number, the name of the nearest town, and the distance and direction from the violation site to that town. The vegetation at the violation site was described by field or forest type, or in some cases as "other" (e.g. golf courses). The probable visibility of the violation from the air was also established.

Weather conditions were described by precipitation type, if any, temperature, moonlight, or fog or clouds.

Violator characteristics included number, age and sex of those arrested. Also, a question was asked to determine if any of the violators were on strike or a work layoff. The number of violators drinking prior to, or during the violation was also established. The type of weapons and vehicles used were described.

The agents selected to receive this questionnaire were those interviewed using the N.R.A. survey. In addition to these 20 agents, 5 additional agents were selected at random from all agents that made at least one spotlighting arrest in 1970. This was done to increase the response, since a mail questionnaire characteristically yields a lower rate of reply than a personal interview.

To further insure a high response rate, the questionnaires were mailed from the office of Mr. John H. McLaughlin, Chief of Enforcement, Virginia Commission of Game and Inland Fisheries. A cover letter explained that the questionnaire was part of a deer spotlighting study being conducted by the Virginia Tech Wildlife Research group under a grant from the N.R.A.. Instructions were provided, and the forms were to be mailed to Mr. McLaughlin's office along with the agents' monthly reports. The agents were further assured that the study was not directed at measuring their personal effectiveness and that all statements would be held in strict confidence. (See Appendix III for the letter.)

It was hoped that each agent could be personally interviewed before receiving this form, but this was not accomplished. For these agents, a letter was sent outlining the objectives of the study and why they were chosen. Also, they were assured that only general overall findings

would be reported.

Each agent selected received an ample supply of questionnaires based on his 1970 arrests. For most agents, the number of forms he received was his 1970 number of arrests plus five additional forms. If more forms were desired or if any questions arose concerning the form, the agent was instructed to contact the investigator.

A total of 225 questionnaires were mailed in late September, 1971, just prior to the "spotlighting season". The forms were to be used through January, 1972.

The data from this questionnaire was summarized for each month, and also for the total study period. Statistical treatments included means, averages, standard deviations and variances. Calculations were done on a Monroe Epic desk calculator, although with several program changes, these could be carried out using the program developed for the N.R.A. questionnaire. Comparisons with the N.R.A. form were also made using analysis of variance.

Correspondence With Other States

Since spotlighting violations are not unique to Virginia, it was decided to correspond with several states to determine their knowledge of spotlighting characteristics and to make comparisons with data obtained for Virginia. The states of Pennsylvania, West Virginia, New Jersey, North Carolina, and Florida were selected. This was to be a general comparison, no formal criteria were used for selection of these states. Most of the states chosen were mentioned in articles cited in the literature review and contained reports of spotlighting.

A letter was mailed in early January 1972 to the chief of the enforcement section of each state wildlife agency. The purpose of the study was outlined and it was explained that only general observations would be reported. It was requested that the states supply any information they had concerning the characteristics of the spotlighting violations. Specifically, they were asked to estimate the number of deer killed illegally by spotlighting each year and the procedure used to obtain this estimate. The number of arrests made per year and an opinion as to the most efficient and effective method of patrol were requested. The vegetative type of the areas spotlighted, the time of arrests, and weather conditions at the time of the violation were also asked. The states were also asked if they used an undercover detective corps or aerial surveillance to enforce the spotlighting law.

Responses were received from West Virginia, North Carolina, New Jersey and Pennsylvania. The data supplied by these states are presented without any statistical analysis because of the method of collection and the subjective nature of the questions.

Survey of Virginia's Agents

A spotlighting survey was conducted in early 1970 by Harry L. Gillam of the Education Division of the Virginia Commission of Game and Inland Fisheries. The one page questionnaire was designed to provide background for a magazine article that would attempt to point out to the legitimate hunter what spotlighters were doing to the deer herd, and what the hunter could do to help stop spotlighting.

The survey was distributed to all of Virginia's agents and was to be

completed by February 1, 1970. The completed forms were obtained from the Commission for possible use in this study by Dr. Robert H. Giles. Statistical treatments were limited to calculations of means, averages, and percentages.

The survey attempted to establish if spotlighting was increasing or decreasing in 1969 as compared to 1968. The agents were asked whether most incidents occur pre-season, in season, or constantly. The number of actual complaints and the number of casual reports of spotlighting received per week was established. Although terms such as "most incidents" and "actual complaints" and "casual reports" were vaguely defined, they were used to establish general trends and as supplemental information.

The agents were asked to rate a list of suspected motivations for spotlighting based on their arrests and investigations. In conclusion, the agents were asked to state how the land owner and sportsman could help curb spotlighting. The complete survey is given in Appendix IV.

RESULTS AND DISCUSSION

Preliminary Arrest Report Survey

The data obtained from the spotlighting arrest records on file at the Virginia Commission of Game and Inland Fisheries are presented here. The records for 1968 were found to be incomplete as only 43 arrest tickets were located in the files, as compared to 165 arrests reported in the Virginia State Game Warden Activities publication. In 1969, 192 arrests were recorded and in 1970, 284 arrests for spotlighting were made. Based on these data the rate of increase from 1968 to 1969 was approximately 25%, and doubled to approximately 50% in 1970.

Time of Arrests

In 1968, the mean time of arrest for spotlighting was 10:35 p.m. with a standard deviation of 2.38 hours, and a variance of 5.66. Thus, 67% (1 s.d.) of all cases occurred between 7:57 p.m. and 1:13 a.m. and 98% (2 s.d.) of all cases occurred between 5:19 p.m. and 3:51 a.m.. Table 2 lists the number of arrests made for each month. Of the 43 arrests, 40, or 93%, occurred during the months of October, November and December.

The mean time of arrest for the 192 spotlighting violations in 1969 was 11:54 p.m. with a standard deviation of 3.14 hours. Thus, 67% (1 s.d.) of all 1969 cases occurred between 8:40 p.m. and 3:08 a.m., and 98% (2 s.d.) of all cases occurred between 5.26 p.m. and 6.12 a.m.. Of the 192 violators, 174 were residents of Virginia, while 18, or 9.3% were nonresidents. Table 3 lists the violations by time and number for each month of 1969.

Of the 192 arrests, 159 were made in the months of October, November, and December for a total of 82.8%. A total of nine arrests

Table 2. Time and number of spotlighting arrests by month in 1968

Month	Number of Arrests	Mean time of Arrest	Standard Deviation (HR)
January	1	9:30 P.M.	---
February	0	--	---
March	0	--	---
April	0	--	---
May	1	12:00 A.M.	---
June	0	--	---
July	0	--	---
August	0	--	---
September	1	7:45 P.M.	---
October	9	12:13 A.M.	2.6651
November	18	10:07 P.M.	1.6586
December	13	10:24 P.M.	2.7474
Totals	43	10:35 P.M.	2.3769

Table 3. Time and number of spotlighting arrests by month in 1969

Month	Number of Arrests	Mean Time of Arrest	Standard Deviation (HR)
January	18	9:01 P.M.	2.1249
February	1	12:00 A.M.	—
March	0	—	—
April	0	—	—
May	0	—	—
June	6	2:15 A.M.	0.0000
July	3	2:30 A.M.	0.0000
August	2	9:35 P.M.	0.0256
September	3	9:10 P.M.	0.2887
October	28	11:05 P.M.	2.2094
November	104	12:42 A.M.	3.0830
December	27	10:58 P.M.	3.7563
Totals	192	11:54 P.M.	3.1346

were made on holidays. Two violations were recorded for January 1, four violations for November 11, Veterans Day, and three violations for November 27, Thanksgiving Day. Although no arrests were made on Columbus Day, October 12, four arrests were made on October 11. It was theorized that since most people do not work on holidays, an increase in violations would occur. The prospective violator might assume that the agent would not be working on a holiday, and with the evening or early morning hours available without having to awake for work the following day, the possibility of a violation may increase. The data failed to support this theory, and no significant increase in the number of violations on a holiday occurred. (See Table 4)

Day of the Week for Each Violation

The day of the week for each arrest was recorded and totaled for the 1969 data (Table 5).

Sixty arrests were made on Saturdays representing 31.2% of the total violations, while 84 arrests, or 43.7% of the total, were made on Saturdays and Sundays.

Assuming that spotlighting violations, on a yearly basis, are as likely to occur on any day of the week, the expected number of violations for any day of the week in 27.4

$$\left(\frac{192 \text{ violations per year}}{7 \text{ days of the week}} \right)$$

The expected number of violations for any day of the year is 0.075 or

$$\left(\frac{27.4}{365} \right) = 0.075$$

This assumption was tested using the t distribution with a 0.05 level of

Table 4. Number of spotlighting violations for a week preceeding and following a holiday, the date underlined is a holiday

Date	Number of Violations	Date	Number of Violations	Date	Number of Violations
<u>12/25/68</u>	0	11/ 4/69	2	11/20/69	6
12/26/68	0	11/ 5/69	4	11/21/69	1
12/27/68	0	11/ 6/69	0	11/22/69	12
12/28/68	3	11/ 7/69	0	11/23/69	2
12/29/68	0	11/ 8/69	2	11/24/69	0
12/30/68	0	11/ 9/69	1	11/25/69	1
12/31/68	3	11/10/69	3	11/26/69	1
<u>1/ 1/69</u>	<u>2</u>	<u>11/11/69</u>	<u>4</u>	<u>11/27/69</u>	<u>2</u>
1/ 2/69	0	11/12/69	2	11/28/69	0
1/ 3/69	0	11/13/69	0	11/29/69	5
1/ 4/69	2	11/14/69	0	11/30/69	0
1/ 5/69	3	11/15/69	8	12/ 1/69	0
1/ 6/69	3	11/16/69	4	12/ 2/69	0
1/ 7/69	0	11/17/69	19	12/ 3/69	2
1/ 8/69	0	11/18/69	10	12/ 4/69	1

Table 5. Number of spotlighting arrests by the day of the week for each month

Month	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total by Month
1	4	3	1	4	2	0	4	18
2	0	0	0	0	0	0	1	1
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	6	0	0	0	0	0	0	6
7	0	0	0	0	0	0	3	3
8	0	0	0	0	0	0	2	2
9	1	0	0	0	2	0	0	3
10	3	0	6	2	0	10	7	28
11	10	22	17	9	0	1	36	104
12	0	0	3	6	5	6	7	27
Total by day	24	25	27	21	18	17	60	192
Percent by day	12.5	13.0	14.1	10.9	9.4	8.9	31.2	--

significance. The values of the t statistics are presented in Table 6.

The number of spotlighting violations occurring on Thursday, Fridays, and Saturdays is significantly different from the assumed expected value of 27.4.

On Thursdays and Fridays, fewer violations were recorded than were expected, while a significantly greater number of violations occurred on Saturdays. According to these data, spotlighting violations are not distributed evenly throughout the week. The number of arrests on Saturdays was significantly greater than those of the other days of the week.

Violations by Non-Virginia Residents in 1969

Residents of Virginia in 1969 were arrested in 174 spotlighting violations or 90.63% of the total. Non-residents arrested in 18 violations or 9.37% of the total arrests. Most of the non-resident violators were from the nearby states of Pennsylvania and Maryland, and also Washington, D.C.. Of the 18 non-resident violators, 17 were arrested in the month of November, while one was arrested in October. During the month of November, most hunting seasons are open, including deer, and the number of non-residents hunting in Virginia probably peaks at this time. A total of 104 spotlighters were arrested in November, and of this 17, or 16.3% were non-Virginia residents. It was not possible to determine if any of these non-resident violators were charged with other offenses, such as hunting without a license. The greatest amount of spotlighting appears to be done by residents of Virginia, and the month of November is the peak for non-resident violations.

Table 6. Test of the expected number of 27.4 spotlighting violations for each day of the week for 1969

Day of the Week	Number of Violations	t Statistic
Sunday	24	0.60
Monday	25	0.43
Tuesday	27	0.07
Wednesday	21	1.10
Thursday	18	1.60*
Friday	17	1.80*
Saturday	60	5.80*

$t_{.05(6)} = 1.44$ * Significant Difference

1970 Spotlighting Data

Virginia agents arrested 284 spotlighting violators in 1970. The mean time of arrest was 11:34 p.m. with a standard deviation of 2.44 hours. Table 7 shows the number of and time of the violations by month. Comparison of the 1969 and 1970 mean time of arrest show that the difference is 20 minutes (11:54 p.m. in 1969, and 11:34 p.m. in 1970). The standard deviations vary by approximately 42 minutes. The means were tested to see if the observed difference was significant. Using the formula:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} \right)^{\frac{1}{2}}}$$

$$\text{yielded } z = \frac{11.90 - 11.57}{\left(\frac{9.8257}{192} + \frac{5.9536}{284} \right)^{\frac{1}{2}}} = 1.22$$

Since this value is less than $z_{.05} = 1.96$, no significant difference exists between the mean time of arrest in 1969 and 1970.

Of the 284 arrests, 236 or 83.1% of all 1970 spotlighting arrests were made in the months of October, November, and December. A comparison of the number and time of arrests by month for both years is illustrated in Figs. 1 and 2. The number of spotlighting arrests increased during the fall of each year and reached a maximum in November. During the spring and summer months, the number of arrests was minimum.

Violations on Holidays in 1970

Of the 11 holidays in 1970, arrests were made only on Memorial Day, and Thanksgiving Day. Seven arrests were recorded on Memorial Day, and

Table 7. Time and number of spotlighting arrests by month in 1970

Month	Number of Arrests	Mean Time of Arrests	Standard Deviation (HR)
January	9	9:08 P.M.	1.1563
February	1	Not Known	--
March	3	10:30 P.M.	0.0000
April	2	3:00 A.M.	0.0000
May	7	12:35 A.M.	0.0068
June	1	12:00 A.M.	0.0000
July	7	11:41 P.M.	0.9759
August	4	11:30 P.M.	0.0000
September	15	12:47 A.M.	1.2535
October	78	11:42 P.M.	2.0146
November	118	11:12 P.M.	2.8864
December	40	12:12 A.M.	2.3952
Totals	284	11:34 P.M.	2.4393

Fig. 1. Number of spotlighting arrests by month

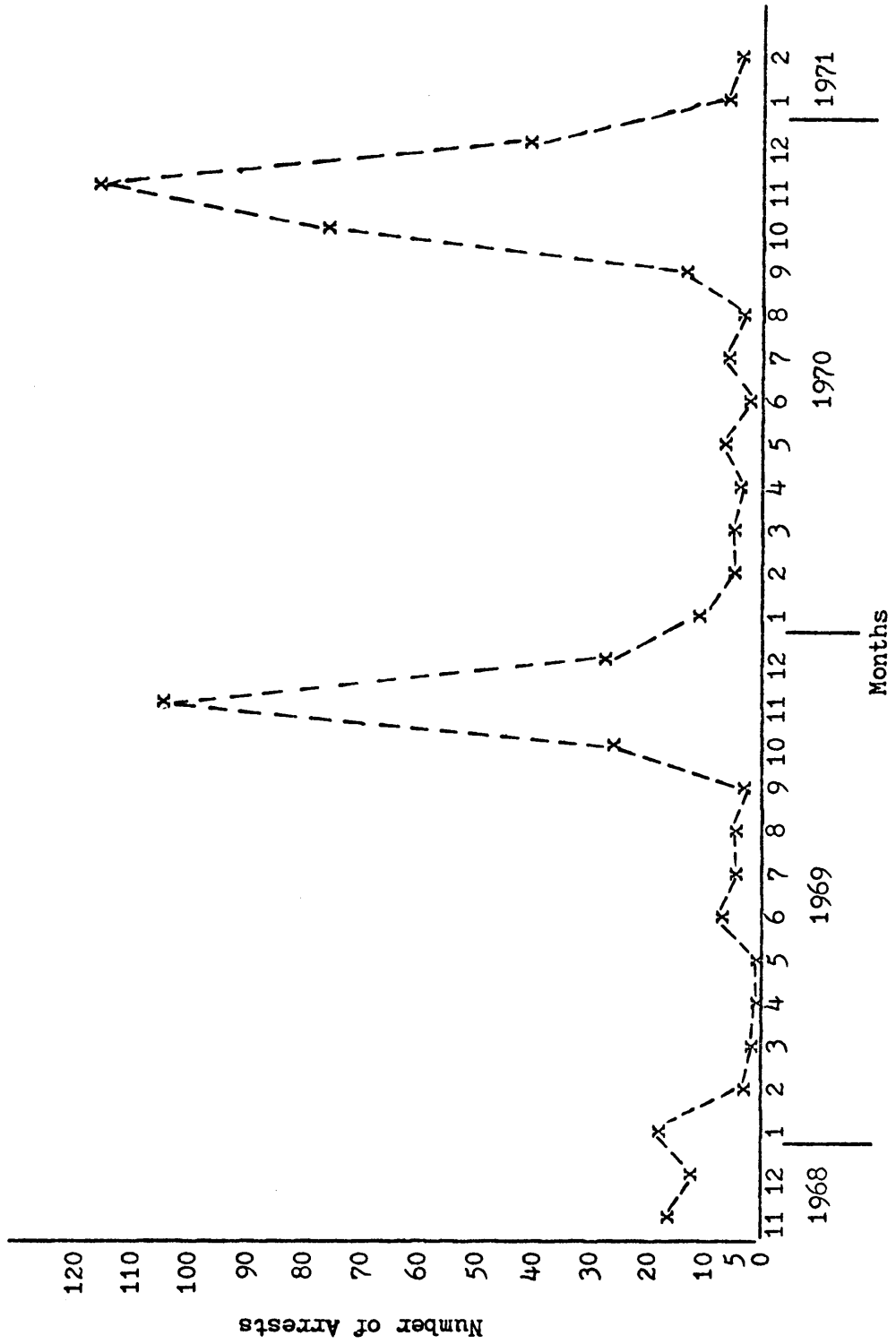
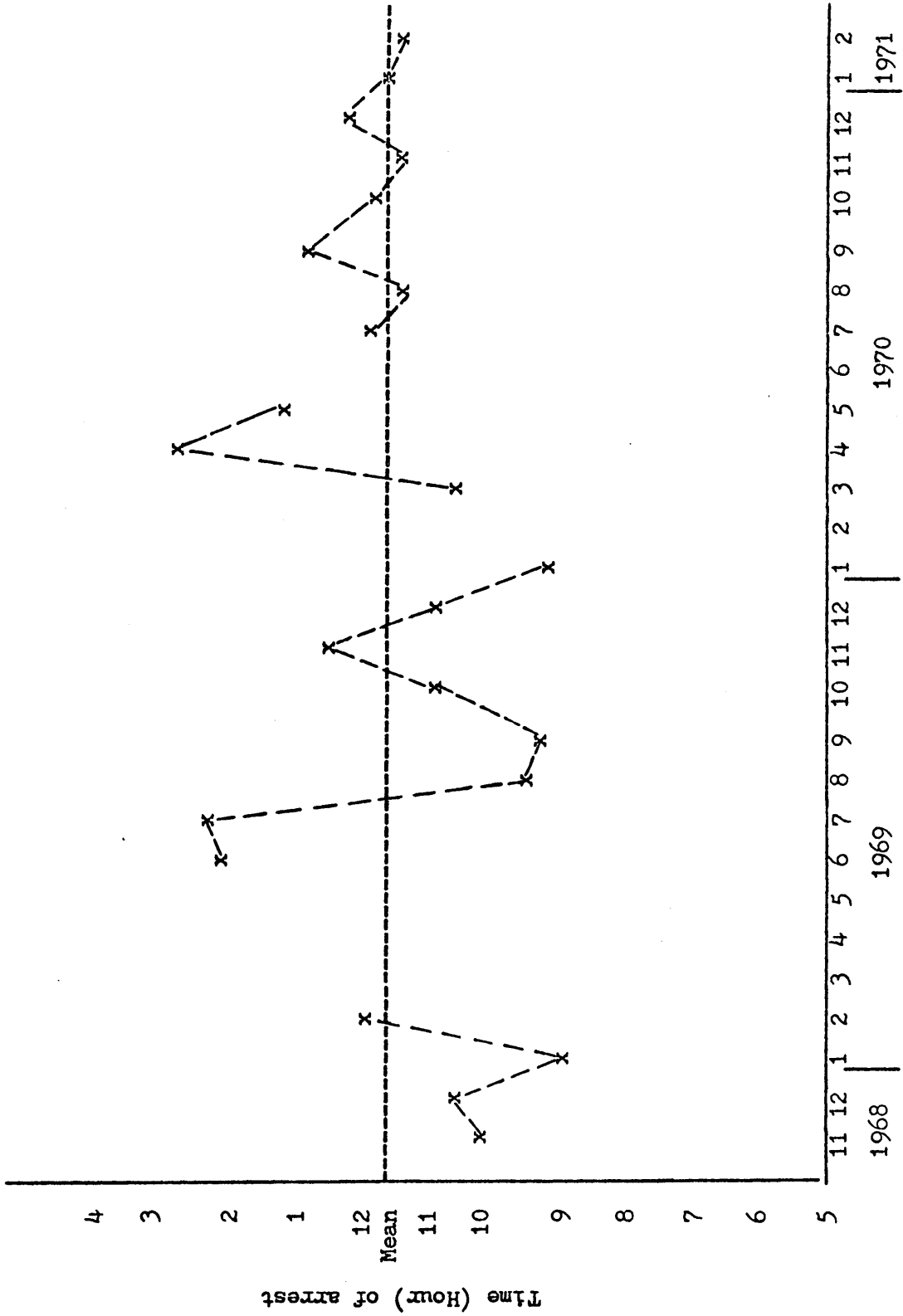


Fig. 2. Mean monthly time of spotlighting arrests



since no arrests were made for a month prior to and a month after this date, this increase in violations can be attributed to the holiday. Although no arrests were made on Columbus Day, October 12, 1970, nine arrests were made on the eve of October 11. This also occurred in 1969 when four arrests were made on the eve of the holiday. On Thanksgiving Day, four arrests were made on the holiday, and ten arrests were made on the following Friday. Since November has a large number of violations, the arrests on Thanksgiving do not appear to be different from what would usually be expected during this time of the year. This holiday did not appear to result in any extraordinary number of arrests, while on Memorial Day and the eve of Columbus Day the number of arrests made were greater than expected. This could possibly be attributed to the dates being holidays, and the increase in arrests could be related to the majority of people being off from work and able to sleep the following day. They may assume that since it is a holiday the agent is also off from work and the chances of being apprehended are small. Overall, holidays did not result in an increase in violations, with the exceptions of Columbus Day and Memorial Day.

Day of the Week for Each Violation in 1970

It is important to describe when spotlighting violations occur. If violations are more frequent on Saturdays than on Wednesdays, the agent's chance of making an arrest should be higher when more violations occur. Patrols on Saturdays are likely to be more effective, but this does not mean weekday patrols are ineffective. The maximum efficiency and effectiveness of agents can be obtained when patrols are conducted at times

when violations are most likely to occur. Table 8 shows the number of arrests made on each day of the week by month for 1970.

Violations of Saturday account for 40.15% of the total number of arrests while violations of Saturdays and Sundays represent 63.00% of all arrests for 1970.

If the spotlighting violations were distributed evenly throughout a week, the percent for any day would be 14.28. It is apparent from Table 8 that the violations are not evenly distributed, and that the majority of the violations occur on weekends. Most arrests for spotlighting in 1970 were made on Saturdays.

A comparison of the number of spotlighting violations by day of the week for 1969 and 1970 is given in Fig. 3. Both years show a peak in the number of arrests on Saturdays and the data tend to approximate a normal distribution.

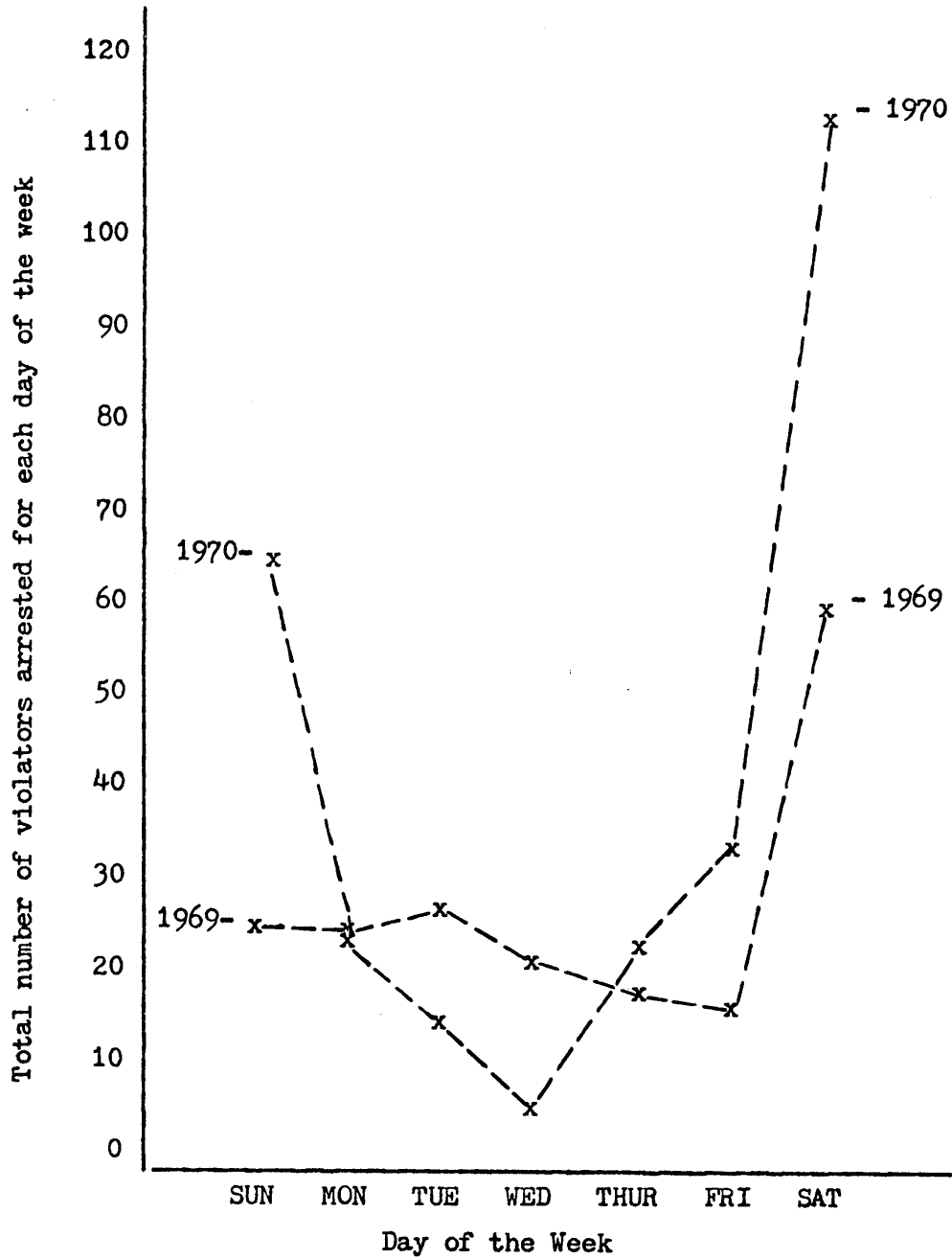
Non-Resident Violations in 1970

Of the 284 spotlighting arrests, 256 were Virginia residents while 28, or 9.86% were non-residents. In 1969 non-residents accounted for 9.37% of the total arrests. The arrest of non-resident spotlighting violators was greatest in November of 1970, when 16 were apprehended. In October, six arrests were made, while in December and March three arrests were recorded in each month. The data for 1969 and 1970 non-resident arrests closely correspond and suggest that approximately 10% of the spotlighters arrested are non-residents and that the majority of these are apprehended in the month of November.

Table 8. Number of spotlighting arrests by the day of the week for each month in 1970

Month	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total by Month
1	0	4	1	0	0	0	4	9
2	0	0	0	0	0	0	0	0
3	0	0	0	0	3	0	0	3
4	0	0	0	0	0	2	0	2
5	0	0	0	0	0	0	7	7
6	0	0	0	1	0	0	0	1
7	5	0	0	0	0	0	2	7
8	0	0	0	0	0	0	4	4
9	4	4	0	0	2	0	5	15
10	19	1	0	1	7	14	36	78
11	31	12	14	5	9	13	34	118
12	6	3	1	0	3	5	22	40
Total by day	65	24	16	7	24	34	114	284
Percent by day	22.85	8.47	5.65	2.46	8.47	11.95	40.15	--

Fig. 3. Number of spotlighting arrests by day of the week



Cumulative Totals-Preliminary Arrest Report Survey

The data collected from the spotlighting arrest tickets were processed separately for the years 1969 and 1970, in addition to a cumulative total of all years. This includes limited data from 1967, and 1968, and also 1969, 1970 and 1971 violations. A total of 549 arrests were recorded.

Time of Arrest

Based on 549 violations, the mean time of arrest was 11:37 p.m. with a standard deviation of 2.71 hours. According to the Empirical Rule of statistics, 68% of the sample data are contained in the interval of the mean plus and minus one standard deviation. The period from 8:55 p.m. to 2:19 a.m. contains 68% of all spotlighting arrests. As was stated in the methods and procedures section, it was assumed that the number of arrests is an indication of the number of violations actually occurring from the above sample data, and on the validity of this assumption, it appears that during the $5\frac{1}{2}$ hour period from 8:55 p.m. to 2:19 a.m., 68% of all spotlighting violations occur.

Number of Spotlighting Arrests by Month

The cumulative total indicates that spotlighting is principally a fall activity. The months of September, October, November and December contain 85.24% of all spotlighting arrests. See Table 9. A possible explanation of this seasonal tendency is that hunting is primarily a fall sport and the shooting interest is more prevalent at this time of year. Although, frustration of not being able to obtain game legally may be a factor influencing spotlighters, many others may pursue this

Table 9. Spotlighting arrests by months-1967,1968,1969,1970 and 1971

Month	Number of Violations	Percent of Total
January	36	6.55
February	4	.72
March	8	1.45
April	2	.31
May	8	1.45
June	7	1.27
July	10	1.82
August	6	1.09
September	9	3.46
October	117	21.31
November	250	45.53
December	82	14.94
Totals	549	--

just for some excitement or a chance to do some shooting. It is notable that April contains the fewest number of violations. Traditionally, this is the month in which the fishing season usually begins, and it is quite possible that the interest in shooting has been overshadowed temporarily.

The possibility exists that the data collected from the interviews might be subject to a systematic bias on the part of the agent. This might occur if the agent only patrolled from September to December for spotlighting violations or if he only conducted these patrols on weekends. However, the seasonal occurrence of spotlighting was supported by several factors, and suggest that the possibilities of bias were minimal. The agent stated that spotlighting was a fall activity although violations do occur all year. Their patrols were conducted intensively during the fall because they believed that this is when most of the illegal activity occurred. It was also stated that violations were more common on weekends due to those hunting for "kicks", however, those hunting for home consumption were likely to do so any time or day.

It was believed that the agents would adjust their patrols according to the number and time of spotlighting in their area based on observations, complaints, reports and experience. That spotlighting arrests are made in other than fall months tends to indicate that violations occur year round, but in the opinion of most agents, such incidents are few.

November is the month in which most spotlighting arrests are made. The week prior to the opening of deer season, along with the week of the deer season, have a large number of arrests. The total for all years shows 169 arrests, 30.8% being made from November 14th to November 28th.

Another factor to consider is that many hunters spend their deer season in hunting camps, and spotlighting may be done as an evening past time or as a means of "scouting" for the next day's hunt. If this scouting results in the sighting of a deer, the temptation may be great enough that the hunter decides not to wait until morning.

Age of Spotlighting Violators

The age of the arrested violator was recorded on 505 of the 549 arrest tickets. The average age was 27.00 with a standard deviation of 9.54. Based on the Empirical Rule, 68% of spotlighting violators are between the ages of 18 and 37.

Fines Paid by Convicted Spotlighters

The amount of fines paid by 409 arrested violators averaged \$99.79. The standard deviation of \$60.84 suggests a large variation in the amount of fines levied by judges. The range of fines was from \$31.75 to \$200.00 for a single violation. Only 409 arrest tickets had the fines recorded on them, and this does not imply the 140 violators did not receive fines. These may have been omitted from the arrest cards by an oversight or the cases may not have been settled in court. Several violators received jail sentences, but in all cases, these were suspended.

Summary of Preliminary Arrest Report Survey

A total of 549 arrests was recorded and processed in this survey. The mean time of arrest was 11:37 p.m.. The majority of arrests were made on a Saturday evening. Most holidays did not appear to result in an increase in arrests. Spotlighting is primarily a fall activity with the peak in the number of arrests occurring in November, particularly

around the time of the legal deer season. Approximately 10% of arrested spotlighters were non-residents of Virginia, and the majority of these were arrested in the month of November. The average age of those arrested was 27, and the average fine paid upon conviction was nearly \$100.00.

The Extent of Spotlighting in Virginia

Vilkitis presented in his Idaho study (1968) a formula to estimate the illegal kill of big game animals. The application of this formula to estimate Virginia's spotlighting violations is made here. Vilkitis stated that in 25 spotlighting ventures, an average of 1.4 animals was seen per trip. Animals were seen in 66.7% of the spotlighting incidents. He also reported that it required an average of 108 hours and three minutes of spotlighting to kill one animal.

The illegal kill formula presented by Vilkitis based on arrest reports is:

$$I = \frac{m_1 c_1}{r_1}$$

Illegal kill, I, was related to the total arrests for big game violations for the field study period, m_1 , in the same way as the total number of illegal kills created by the investigator, c_1 , was related to the number of times the investigator was stopped by enforcement personnel, r_1 . According to his estimate, enforcement agents wrote one citation for every 32 big game animals taken illegally or cited 3.1% of the violators.

Using data from Virginia, 284 spotlighters were arrested in 1970. If this represents 3.1% of the actual violations then 9,088 spotlighting

incidents actually occurred.

Number of Spotlighting Violations Based
on Complaints Received by Agents

Another approach to estimating the extent of spotlighting in Virginia was based on data supplied by Mr. Gillam of the Education Division of the Virginia Commission of Game and Inland Fisheries. In a survey conducted of all Virginia agents in the fall of 1969, the number of actual and casual complaints of spotlighting received by each agent was recorded. Of the 109 full time agents, 80 responded to this questionnaire which is illustrated in Appendix IV.

As was stated in the methods and procedures section, the data obtained from this survey were of questionable statistical significance, since terms such as "actual complaints and casual reports" were vaguely defined. However, the large sample size and unique nature of the data prompted their use as an estimator of the extent of spotlighting. It must be made clear that these estimates are useful as "ballpark" figures. They provide a basis for indications of the number of spotlighting violations, and are more likely to be of greater reliability than mere guesswork.

An average of 3.94 actual complaints were received per week by Virginia's agents during a 12 week period from October 1st to December 31st. The range was from 0 to 40 complaints per week. During the same period the number of casual complaints was 3.55 per week with a range of 0 to 25. The 12 week period contained 93.0% of all spotlighting arrests in 1968, 82.8% in 1969 and 83.1% in 1970 for a three year average of 86.3%. During this 12 week period there were 109 full time agents

working in Virginia. Based on the agents' report of an average of 3.94 complaints per week during the 12 week period an estimated 5,153 spotlighting complaints would occur (i.e. 109 agents x 12 weeks x 3.94 complaints/week = 5,153).

Since an average of 86.3% of all spotlighting arrests occurred during the 12 week period, it was assumed that this is proportional to the total amount of illegal activity occurring. That is, during the remaining 40 weeks of the year 13.7% of the total spotlighting arrests were made. If an assumption is made indicating that the complaints received are representative of violations occurring, then the 5,153 violations occurred during the 12 week period. The number of complaints was utilized to provide an estimate of actual illegal activity. The actual number may be higher than the complaints received since all violations are not reported. Duplications in reporting, or reports of legitimate hunting as spotlighting would tend to lower the estimate. Applying these two assumptions, the estimated number of spotlighting violations for the average of the three years would be 5,971. An average of 173 arrests were made during 1968, 1969, and 1970. Based on this average, and the above estimate of 5,971, the agents succeeded in arresting 2.89% of the violations.

This method provides a useful estimate of the number of spotlighting violations and it compares favorably with the estimates obtained by Vilkitis who found that approximately 3.1% of all big game violators were arrested.

Tests of Various Factors That May
Influence the Extent of Spotlighting

An attempt was made to isolate several factors that may have influenced the extent of spotlighting in different localities. Nine counties were selected from the original list of 25 having the most numerous spotlighting arrests. The data to be correlated was not available for all 25 counties, and only those counties reporting the required data were used. The counties and the respective data are given in Table 10. It was theorized that the mileage of light surface roads might be related to the number of spotlighting arrests. The correlation (r) was .092. These roads are usually found in areas that are not well traveled. The number of access roads available to the spotlihter might be related to the number of violations and arrests. However, the correlation coefficient indicates that there is almost no correlation between the number of spotlighting arrests and the miles of light surface roads.

A correlation test was conducted using the miles of all weather roads and the number of spotlighting arrests. The r value was 0.1680. This also was not a significant factor in explaining the extent of spotlighting violations and arrests.

The relationship was tested between the number of spotlighting arrests and the ratio of the square miles of rural area in a county to the total square miles. The theory was that the greater the percentage of rural area in a county, the greater would be the number of spotlighting arrests. The calculated r value was 0.4001, and this was not significant.

Another correlation was conducted using the number of spotlighting

Table 10. Correlation of several factors that may influence the number of spotlighting arrests

County	Number of Spotlighting Arrests	Miles of Light Surface Roads	Known Illegal Deer Kills	Sq. Miles Rural Area Total Square Miles	Miles of All Weather Surface Roads
Augusta	27	26	19	985 1000	280
Bath	30	20	34	540 540	64
Bland	12	22	28	362 369	129
Botetourt	16	24	12	547 549	261
Giles	8	27	36	358 363	145
Montgomery	10	54	0	386 400	121
Rockbridge	21	94	12	600 602	195
Rockingham	28	41	38	860 865	280
Spotsylvania	26	68	22	411 417	38

arrests and the legal deer kill. Data for this test were obtained from 48 counties and the value of r was 0,2558. This indicates that there is no significant correlation between these two factors. It seemed natural to assume that the higher the legal deer kill, the higher the deer population, and the higher the number of spotlighting arrests. The calculations failed to support this theory and suggest that the number of spotlighting arrests is not related to the legal deer kill. Further investigations should be conducted in this area, as it is possible that a large spotlighting kill could reduce the population and thus lessen the legal kill. However, this effort, if profound, should result in a negative value of r .

The known illegal deer kill for each of the above counties and the miles of light surface roads were tested, and a r value of 0,33 was obtained. The known illegal kill includes all types of violations, not just spotlighting. Light surface access roads are also important to out-of-season violators, and the idea tested was that the greater the access, the higher the illegal kill in the county. This was not supported by the data, as no significant correlation was determined.

Another assumption tested was that the higher the preseason deer population, the higher would be the known illegal kill. The value of r obtained was 0,0618 indicating almost no correlation. The preseason deer population was based on estimates for 1969 provided by wildlife biologists, and the known illegal deer kills represent those from all types of violations.

The purchase of damage stamps prior to hunting for deer was

required in eight of the nine counties listed in Table 10. The sales of these stamps indicate the number of persons legally hunting for deer in each county. It was hypothesized that the higher the number of deer hunters, the higher would be the known illegal deer kill. The r value for this correlation was 0.1245 and was not significant, perhaps due to the spotlighters failure to purchase a damage stamp as required.

Before any definite conclusions can be drawn from this correlation test, several points must be established. The relationship of the known illegal deer kill is assumed to be reflective of the total illegal kill, but the exact ratio can only be estimated. Vilkitis stated that only 6.2% of illegal kill incidents were discovered in Idaho. This small percentage is likely to fluctuate greatly with the skill of the agent, weather, time of year, and can cause a large variability in the estimate. Damage stamp sales indicate only legally licensed hunters, and those that hunt without proper licenses are probably more likely to commit an out of season or other type of illegal kill.

These correlation tests failed to reveal significant relationships in describing the extent and locations of spotlighting. Since limited data were available for approximately 8% of Virginia's counties, further testing should be conducted as more data are collected before specific conclusions can be made on a statewide basis.

N.R.A. Spotlighting Violation Questionnaire Analysis

The responses obtained from this agent survey were tabulated by month. Cases were received for the months of January, June, September, October, November and December. A total of 70 cases were recorded, al-

though the agents were unable to recall the dates for eight cases. The survey covered 197 arrests from 1969 and 1970, or approximately 40% of the total arrests made by all Virginia agents.

Spotlighting Violation Statistics-June and September

A total of three cases were recorded in these months which resulted in 11 arrests. The agents arrested all of those present during the violation. Convictions were obtained in all cases, although in one case the fines were suspended. Stakeouts were the method used to make two of the cases, while the other was made during a routine patrol. The stakeouts were set up as the result of a tip, and in one case the agents spent one to two hours before an arrest, while in the other two to three hours on stakeout were required before an arrest. The arrests made by means of a routine patrol required an investigation time of over 12 hours before an arrest was made. A mean time of 1.5 hours of patrol by the agents was spent prior to making the arrests. In one case, or 33.3%, a violator was arrested while in the act of shooting at a deer, but a deer was not killed. In the remaining two cases, the violators were still in the process of searching for deer.

An attempt by the violators was made to elude the agents in two cases, and this resulted in a chase to make the apprehension and arrest. In one case the maximum speed obtained was 60 m.p.h., while in the other, the speed was 80 m.p.h., with a mean of 70 m.p.h.. The violators succeeded in eluding the agents in one case, but were later apprehended after an investigation.

Time and Date of Arrests

In September, two cases were made between the hours of 8:00 p.m. and 10:00 p.m.. The arrests made in June were between 4:00 p.m. and 5:00 p.m.. The data were recorded in hour categories and the per cent of arrests made in each hour is given in the discussion of the remaining months that had more violations. Two cases were made on Saturday evening and one was made on Friday.

Type of Weapon

Rifles were used in two cases, and a shotgun was present in the other. The rifles used in both cases were .22 caliber and in one case a scope was mounted on the gun. The shotgun was a 12 gauge pump model.

Type of Vehicle

Vehicles were present in all cases. The vehicle was catergorized as being "old" if it was made prior to and including 1965. "New" vehicles were those models built during and after 1966. In the three cases for both months the vehicles were sedans built prior to 1965.

Type of Spotlight

The various types of spotlights commonly used by violators include those fixed to the vehicle, such as are found on many police cars. Others used were hand-held flashlights, sealed-beam battery packs, the vehicles headlights, and those that plug into a vehicle cigarette lighter. The type used by the violators for all three cases made in June and September were hand-held flashlights.

The Weather at the Time of Arrest

The mean temperature at the time of arrest for all three cases was

50 degrees F with a minimum of 40 and a maximum of 60. One case was made when it was raining, one when it was cloudy, and one when the evening was clear. Precipitation had been predicted prior to the case made when it was raining.

The Violator

For the three cases, a mean of 3.67 persons were arrested. The maximum number of arrests from one case was six persons, while the minimum was two. All of the violators were male, and no children were present in any of the cases. The average age of those arrested was 28.33 years, with the oldest being 45, and the youngest 15.

In one case, the violator was on strike at the time of the violation. None of the violators were in military service. All of the violators were residents of Virginia.

The dress of the violator was described as normal street clothes, camouflaged, hunting clothes or other. The violators in two cases wore hunting clothes, and in one case they wore street clothes. Since hunting clothes were worn in the two cases, and no hunting season was legally open at the time, it appears the violators dressed especially for the spotlighting venture. This indicates that there was some time prior to the actual violation in which the violators prepared and perhaps, planned, the spotlighting trip.

In one case, the violators were also charged with violating other game laws. The most common additional charges were violations of trespass laws, hunting without a license, and hunting with illegal weapons.

The violators were not known by the agents prior to the arrest in

two cases, but in one case the violators were personally known by the agent. Drinking of alcoholic beverages was evident in two cases, but no charges were pressed for being intoxicated.

The Violation Site

The violations occurred on private land in two cases, and on public land in one case. In all cases the spotlighting was done from a public road. Even though public roads were used, it was possible for the violation to occur on private land if the spotlight was aimed onto the private land. The private lands in both cases were restricted as they were posted against trespassing. The public land was not a restricted area such as a posted refuge, institutional area, state game area, or a military base.

The estimated distance from the violation site to the agent's house averaged 26.67 miles. The minimum distance from the agent's house to the violation site was 17 miles and the maximum was 35 miles. All of the agents interviewed used their home as an office. The mean distance from the violation site to the nearest occupied house was 2.5 miles. The closest the violators came to an occupied house was 0.2 mile while the maximum distance was seven miles. The relatively short distance of 0.2 of a mile indicates danger exists to the occupants of the house as many rifle caliber's are effective for ranges of up to 500 yards. A careless shot could easily pierce a window and seriously injure anyone struck by the bullet if they happened to be in the line of fire.

The nearest town was an average of 10.33 miles from the violation site. The closest was seven miles while the farthest was 14 miles. The

violators home was an average of five miles from the violation site. The maximum distance was seven miles and the minimum was three miles, indicating that these violators were fairly close to their homes and probably in areas which were familiar to them.

The violators in one case were on a heavy duty paved road, while in another a medium duty road was used. A heavy duty road includes two and four lane highways, whereas a medium duty road would be a paved surface, although all are two lanes, and are not as heavily used as a highway. The distinction is rather difficult to make, but these categories were chosen as these of the Virginia Department of Transportation. These classifications were given for each Virginia county, and each road type's mileage for the county was provided on their published maps. The remaining case was spotlighting from a dirt road. The slope of the roads in all cases was described as slight, (0 to 5% slope).

In two cases the spotlighting was done on harvested corn fields, while one occurred in a yellow pine forest. Of the two cases that occurred in a field, one was surrounded by an oak-pine forest with trees having a dbh of approximately ten inches. The distance from the road, across the field, to the woodlot was an average of 250 yards for the two cases made. This distance was estimated along a line drawn perpendicular to the road to the woodlot and gives an indication as the depth of the field. The case made in the forest of yellow pines had trees of an average dbh of 20 inches.

All three cases were visible from the air. This tends to support the belief that airplanes or helicopters could be an aid in patrols for spotlighters.

The Apprehension Site

In two of the cases the violators were apprehended and arrested at a site other than where the violation occurred. In one case the violator was arrested at his home, while in the other, the arrest was made at a site 100 miles from the scene of the violation. In both of these cases an attempt was made to elude the agents, and resulted in a chase. Although both did manage to escape temporarily, the vehicles license plates were identified and the agents were successful in locating and arresting all of those involved.

Spotlighting Violation Statistics-October

Agent interviews obtained information on 14 cases made in October. A total of 37 arrests were made, or an average of 2.64 arrests per case. The agents arrested 78.72% of all those present at the time of the violation. The majority of those not arrested were women and children. An average of 1.82 agents were involved in each case, with a maximum of six agents assisting, and a minimum of one agent working by himself. Convictions were obtained in 13 cases or 92.86%. One case was dismissed, and another received a conviction but the fine was suspended.

The methods of patrol used by the agents in these cases were stakeouts based on a tip. Stakeouts, without a tip, were the means used to make seven cases or 50%. Based on a tip, the agents set up a stakeout to make four cases or 28.57%. Routine patrols were responsible for three cases or 21.43%.

The time spent prior to an arrest for each type of patrol is presented in Table 11. All cases required at least one hour of patrol before any violators were arrested. Even in those cases in which

Table 11. Time spent on patrol prior to a spotlighting arrest

Time Spent (Hrs)	Stakeout and Tip	Stakeout (No. of Cases)	Routine Patrol
0 - 1	0	0	0
1 - 2	0	1	1
2 - 3	1	1	0
3 - 4	0	3	0
4 - 5	0	0	0
5 - 6	0	1	0
6 - 7	0	0	1
7 - 8	1	0	0
8 - 9	1	0	0
9 - 10	0	0	0
10 - 11	0	0	0
11 - 12	0	0	0
12 +	1	1	1

information relating to a violation was supplied by a tip, it was necessary to remain on stakeout for seven to nine hours. A mean of 11.36 hours was spent prior to an arrest on stakeout, patrol or investigation. The maximum time spent was 80 hours, and the minimum was one hour, with a standard deviation of 20.62 hours. Three cases required investigations of more than 12 hours before an arrest was made, and this was responsible for the high mean number of hours spent prior to an arrest and the large standard deviation.

Determination of the most effective method of patrol will be made in a later section and based on the total of all cases obtained by agent interviews. The agents were also asked to estimate the per cent of stakeouts that were successful and the mean was 9.2%. A maximum of 10% and a minimum of 5% were recorded with a standard deviation of 2.04%. Thus 98% of the estimates are between 5% and 13%. In the agents' opinion, based on their experience, it required approximately ten stakeouts before an arrest was made.

In three cases, 21.43% of the violators were arrested while in the act of shooting at a deer. The violators in two cases, 14.29% were arrested while in the act of retrieving a dead deer. Deer were killed in eight cases, or 57.14% of all October cases. Thus, approximately six cases out of ten involve a deer kill. A total of 13 deer were killed in the 14 cases, for an average of 0.93 deer killed per case. Table 12 lists the estimated ages of those deer killed by violators and recovered by agents.

The sex ratio of the deer killed was 75 males to 100 females based

Table 12. Age of deer killed by violators

Age	:	Number Killed
6 Months	:	1
1 Year	:	1
1.5 Years	:	3
2.5 Years	:	2
3.5 Years	:	0
4.5 Years	:	0
5+ Years	:	0

on the seven deer examined by the agents.

Of the eight cases that involved a deer kill, an attempt was made in seven cases to elude the agent. A chase was necessary to apprehend the violators. The speed of the chase could not be recalled by the agents during the interview, and no responses to this question were obtained. No chases were recorded for cases that did not involve a deer kill. Deer were found in the violators possession in four cases, or 28.57%, while deer were found decomposing at the violation site in three cases or 21.43%. In one case, a blood trail was found, but no carcass was recovered. This case was also counted as a kill, as the chances for survival of a wounded deer are not high.

Time of Arrest

The time of arrest by hour for October cases is presented in Table 13.

Between the hours of 8:00 p.m. and 3:00 a.m., 71.42% of all arrests were made. The cases arrested between 1:00 p.m. and 3:00 p.m. were made as a result of an investigation. The greatest number of arrests were made during the period of 11:00 p.m. and 12:00 a.m.. In the cumulative data from 1969 and 1970 reported earlier, the mean time of arrest was 11:37 p.m. and 68% of all arrests were made between 8:55 p.m. and 2:19 a.m.. October violations were not significantly different from the cumulative data, and suggest that the sample obtained for this month was representative of the total number of cases actually made by agents.

The number of cases made on each day of the week is given in Table 14. On Saturdays 42.86% of the cases were made, while the total for

Table 13. Time of arrest-October spotlighting cases

Time	Number of Cases	Percent of Total
12 P.M. - 1 P.M.	0	0.00
1 P.M. - 2 P.M.	1	7.14
2 P.M. - 3 P.M.	1	7.14
3 P.M. - 4 P.M.	0	0.00
4 P.M. - 5 P.M.	0	0.00
5 P.M. - 6 P.M.	0	0.00
6 P.M. - 7 P.M.	0	0.00
7 P.M. - 8 P.M.	0	0.00
8 P.M. - 9 P.M.	1	7.14
9 P.M. - 10 P.M.	1	7.14
10 P.M. - 11 P.M.	2	14.29
11 P.M. - 12 P.M.	3	21.43
12 P.M. - 1 A.M.	1	7.14
1 A.M. - 2 A.M.	1	7.14
2 A.M. - 3 A.M.	1	7.14
3 A.M. - 4 A.M.	0	0.00
4 A.M. - 5 A.M.	1	7.14
5 A.M. - 6 A.M.	0	0.00
6 A.M. - 7 A.M.	1	7.14

Table 14. Number of cases made on each day of the week in October

Day	Number of Cases	Percent of Total
Sunday	2	14.29
Monday	1	7.14
Tuesday	0	0.00
Wednesday	2	14.29
Thursday	1	7.14
Friday	1	7.14
Saturday	6	42.86

Saturdays and Sundays was 57.15%. The total for all 1970 arrests show 40.15% of all arrests were on Saturday's, and on Saturdays and Sundays, 63.0% of all arrests were made. These figures are approximately the same and also add support to the validity of the sample.

One case was made on the eve of a holiday, Columbus Day. As was discussed in an earlier section, no increase in the number of violations was observed on holidays in October.

Type of Weapon

A special preference by the violators for a particular type of weapon was not observed. Rifles were used in seven cases, 50.00%, while shotguns were used in five cases or 35.71%. Pistols were not found in any cases, but violators in two cases, 14.29% used bow and arrows. The use of a bow and arrow to commit a violation is the quietest weapon available to violators, and can be very effective. However, a greater degree of skill is required to use it effectively when spotlighting deer, as compared to using firearms.

When rifles were used, .30 caliber weapons were the most popular. Violators in five cases, 71.43%, used these caliber weapons. This indicates that the spotlighters probably were using a regular season deer rifle, as the .30 caliber cartridges are among the most popular with hunters. In two cases, 28.57%, the violators used .22 caliber rifles. It was the opinion of several agents that .22 caliber weapons were preferred by experienced spotlighters. None of the rifles involved in the violations were scoped.

Shotguns of 12 gauge were used in two cases, while a 20 gauge was

in one case and a .410 caliber was used in one case. Two of the shotguns were single barrel varieties, while one was an automatic and the other was a pump action. None of the shotguns were sawed off.

Type of Vehicle

Vehicles were used by the violators in all cases. In seven cases, the vehicles were made prior to and including 1965, while in the other seven cases the vehicles were 1966 or later models. Sedans were used in 57.14% of the cases, pick-up trucks in 21.43%, and station wagons in 14.29%. In one case, 7.14%, a jeep was used.

Type of Spotlight

The portable spotlight that plugs in the vehicles cigarette lighter was used by violators in five cases or 35.71%. The vehicles headlights were used in three cases or 21.43%. Hand-held flashlights were used in two cases and sealed-beam battery packs were also used in two cases. In one case the spotlight was fixed to the vehicle. The spotlights that plug into the cigarette lighter appeared to be favored by the violators. These spotlights can be purchased in most department stores or automotive supply centers for approximately \$3.00. Thus, they are a cheap, effective and maneuverable piece of equipment easily available to the violator.

The Weather at the Time of Arrest

The average temperature at the time of arrest for all cases was 42°F with a standard deviation of nine degrees. No cases were made when it was raining and none were made when snow was on the ground. In five cases, 35.71%, the sky was clear at the time of arrest, and in four,

28.57% there was at least a half moon. There were fog clouds present at the time of arrest in four cases. From these data there does not appear to be a particular type of evening sky condition preferred by violators. Although no cases were made when it was raining, precipitation had been predicted for the evenings of three cases. Apparently the chance of precipitation did not deter the violators from spotlighting.

The Violator

The average age of the violators arrested in October was 29 years, with a maximum of 37 years and a minimum of 22 years. An average of 2.64 persons were arrested from a group of 3.36 persons in each case. The average age of those not arrested was 30 years, with a maximum of 45 and a minimum of 2. A standard deviation of 4.98 years was determined for the age of those arrested, while the standard deviation of those not arrested was 12.27 years. Thus, 98% of the violators arrested in October were between the ages of 19 and 39 years, while 98% of those not arrested were between the ages of 5 and 54. A child of two was present in one case, and women were present in three cases, but arrested in only two cases.

The arrested violators were on strike or a work layoff in two cases, or 14.3% of the total cases for October. None were in military service, and 85.7% of the cases involved Virginia residents. In seven cases additional charges were made against the spotlighting violators. These included hunting without a license, trespass and hunting too close to an occupied dwelling.

The violators were dressed in street clothes in 64.3% of the cases,

in camouflage clothes in 7.1% of the cases, and in hunting clothes in 21.4% of the cases. For one case, the agent could not recall the dress of the violator. In four cases, 28.6%, the agent knew the violators personally, that is, by name, and in two cases, 14.3%, the agent had made a prior arrest of the spotlighters, although not necessarily for spotlighting. The agent did not previously know the spotlighting violators in 57.1% of the cases. Thus, nearly 43% of the violators were known to the agents either personally or through a previous arrest. This would indicate that the agents could gain insight as to possible violators in a large percentage of spotlighting cases through a careful review of their personal acquaintances and previous arrests. This also points out the need for keeping the time and location of patrols secret. Also the possibility exists for reaching prospective violators if the agent were to conduct some public relations work among his acquaintances centering on the effects that out-of-season hunting can have on game populations.

Violators were drinking or under the influence of alcohol in 42.9% of the cases. The possibility of personal harm to an agent working alone under circumstances involving alcohol, firearms, and the threat of heavy fines should not be underestimated, and for this reason, patrols should be made by two agents if possible.

The Violation Site

The spotlighting was done on public land in four cases, 28.6% and on private land in ten cases, or 71.4%. In ten cases, the violations were conducted from a public road, while in three cases, 21.4% the violations

were on private roads. In one case, 7.2% of the violators were on a military road.

Violations occurred on a restricted area in eight cases, 57.1%. Of these, five cases, 35.7% were on private-posted property, and two cases 14.3%, were on a posted military area. In one case, the violators were on a state game area.

The average distance from the violation site to the agents house was 23.8 miles. The maximum distance from an agent's home to a violation site was 50 miles, while the minimum distance was three miles. The average distance from the violation site to the nearest occupied house was 2.4 miles, and the closest a violation occurred to an occupied house was 0.1 mile. The maximum distance from the violation site to an occupied house was nine miles. The nearest town was an average of 10.5 miles from the violation site.

The average distance from the violator's house to the violation site was 41 miles. The maximum distance was 250 miles, while the minimum was three miles. A standard deviation of 70 miles indicates a large variation in the miles traveled to the violation site. Non-residents of Virginia were believed to be responsible for this variation, as the miles traveled in the months of June and September when no non-resident arrests were made averaged five miles.

The violator were on heavy duty roads in eight cases, on medium duty roads in five cases, and on light duty roads in one case. These road types were described in the section on the violation site for the months of June and September. The average distance from the violation

site to the nearest stream, river or lake was 1.42 miles, with a minimum distance of 0.1 mile and a maximum distance of four miles. A standard deviation of 1.5 miles indicates that 98% of all violation sites are approximately within 3.5 miles of a stream, river or lake.

The violators were traveling in an easterly direction in 38.5% of the cases, and west in 30.8% of the cases. In two cases 15.4%, the violators were traveling north, and in one case the violators were traveling south, and southwest in one case while spotlighting. Thus, a total of 69.3% of the cases were traveling either east or west, as compared to 31.7% traveling north or south.

The slope of the road at the violation site was level (0-5%) in 12 cases, and moderate (6-14%) in two cases. Most of the violations appear to be committed from fairly level roads, and this is probably related to the presence of fields usually on level to moderate sloped land.

The violation occurred in a field in 12 cases, 85.7%, and in a forest in two cases, 14.3%. Of those violations occurring in a field, two cases were in corn fields, two cases were in abandoned fields with mostly cedars and weeds, three cases were in blue-grass and clover fields, and five cases were in orchard grass fields. The two corn fields and one orchard grass field were harvested at the time of the violation. The average distance from the road, across the field, to the woodlot surrounding the field was 129 yards. The maximum depth of a field was 500 yards, and the minimum was one yard. The minimum distance of one yard occurred along a roadside planted in blue-grass and clover. The average dbh of the trees surrounding the field was 8.67 inches with a

maximum of 15 inches, and a minimum of three inches. An oak-pine mixture was the type of woodlot next to the field in eight cases, while an oak-hickory woodlot was present in two cases. In one case, the woodlot was yellow pines. The oak pine mixture is the most common type found bordering fields where spotlighting occurred, and is also one of the most common types of forest found in Virginia.

Of the two cases of spotlighting made in forests, one case was in an oak-pine forest, and one case was in a predominantly oak forest. The average dbh was ten inches and a minimum of seven inches.

The violations would have been visible from the air in 13 cases, or 92.9%. The agents stated for all 14 cases that having made the spotlighting arrest would not affect their frequency of patrols of the violation site. That is, the agents believed that making an arrest at a particular site did not lead them to change the time spent on following patrols at the site.

The Apprehension Site

In eight of the cases the violators were apprehended and arrested at a site other than where the violation occurred. In seven cases an attempt was made to elude the agents, and in three of these cases the violators were temporarily successful. An investigation was necessary to identify, locate, and arrest the violators in these three cases, and the arrests were made at the violators home. In one case the agents made an arrest after receiving the license number of the vehicle involved in the spotlighting from a landowner who witnessed the violation. The vehicle was then apprehended further down the road and was still spotlighting.

The average distance from the violation site to the apprehension site was 44 miles, with a maximum of 140 miles and a minimum of five miles. The average chase was approximately ten miles.

The average time of arrest for spotlighting in October was 11:37 p.m.. Over 40% of the arrests were made on Saturday evening. An average of 1.82 agents arrested 2.64 violators in each case. Stakeouts were the method of patrol used to make 50% of the cases. An average of 0.93 deer were killed per case by the violators. No special preference was observed in the choice of weapons used by the violators. Old vehicles were used as often as new vehicles, and 57% of the vehicles were sedans. The spotlight used in most cases were the type that plugs into the vehicle's cigarette lighter.

The violator was a male in 94% of the arrests, and averaged 29 years of age. Street clothes were worn in 64.3% of the cases, and the violators were drinking or under the influence of alcohol in 43% of the cases.

Spotlighting violations occurred on private lands in 71% of the cases. The violation occurred in a field in 85.7% of the cases, and orchard grass was the predominant species in 41.7% of the fields. The average depth of the field at the violation site was 129 yards. Approximately 93% of the violations would have been visible from the air.

Spotlighting Violation Statistics-November

Virginia agents provided information on 27 spotlighting cases made in November. A total of 89 arrests were made for an average of 3.3 arrests per case. Convictions were obtained in all cases, although in

11.1% of the convictions the fines were suspended. An average of 1.33 agents were involved in each case, while the maximum number of agents participating in a single case was three. The agents arrested 95.7% of those present at the spotlighting violation site.

Stakeouts were the most successful means of patrol. Agents made 13 cases or 48.1% of the total for November by setting up a stakeout. Table 15 shows the time spent on each different method of patrol prior to the arrest.

The agents received a tip that a violation was going to occur, or had already occurred, in eight cases. During routine patrols six spotlighting cases were made. For all methods of patrol, an average of 3.66 hours were spent by the agents on patrol prior to an arrest. In one case, 20 hours were spent on an investigation to locate and apprehend the spotlighters. The shortest length of time spent on patrol prior to an arrest was approximately 15 minutes. That is, 15 minutes after the agent arrived at the stakeout location, a violation was observed, and violators were arrested.

In three cases, 11.1% of November's total, the violators were arrested while in the act of shooting at a deer while spotlighting, while in tow cases, 7.4%, the violators were arrested while in the act of retrieving a deer. A total of seven cases, or 25.9% involved a deer kill. A total of seven deer were killed these cases, for an average of 0.26 deer killed per case in November. The sex ratio of the deer killed was 400 males to 100 females. Table 16 lists the estimated ages of those deer killed by violators.

Table 15. Time spent on patrol prior to an arrest-November

Time Spent (Hours)	Tip	Stakeout	Routine Patrol
0 - 1	2	0	0
1 - 2	1	5	0
2 - 3	1	3	3
3 - 4	1	4	1
4 - 5	1	0	0
5 - 6	0	1	1
6 - 7	0	0	0
7 - 8	0	0	0
8 - 9	0	0	0
9 - 10	0	0	0
10 - 11	0	0	1
11 - 12	0	0	0
12 +	2	0	0

Table 16. Ages of deer killed by violators in November

Age	Number of Deer	Percent of Total
6 Months	0	0.00
1 Year	0	0.00
1.5 Years	3	42.86
2.5 Years	1	14.29
3.5 Years	1	14.29
4.5 Years	0	0.00
5+ Years	0	0.00

Bucks were heavily favored in the illegal kills, and deer in the 1.5 year age class were taken in nearly 43% of kills.

When a deer was killed in a spotlighting case, and the violators faced apprehension by the agent, an attempt was made in four cases to elude the agent. The violators in three cases with a deer kill did not attempt to elude the agent. Thus, no definite pattern was observed as to whether the violator would be more likely to attempt an escape when a deer was killed. Violators attempted to elude the agents in three cases that did not involve a deer kill, and in 17 cases without a deer kill, no chase was necessary to arrest the violators. The average speed of chases was 68 MPH, with a minimum of 50 MPH and a maximum of 90 MPH.

Time of Arrest

Between the hours of 8 P.M. and 3 A.M., 55.5% of the November cases were made. In October 71.4% of the cases were made during this period. However in November, 25.9% of the cases were made between the hours of 3 A.M. and 6 A.M.. See Table 17.

The period from 10 P.M. to 11 P.M. contained six cases, or 22.22% of the November total. This represents the largest number of arrests for any time period. The six cases made between 3 A.M. and 5 A.M. differ significantly from October, when only one case, or 7.14% of October's total, was recorded during this time. During deer season in November many hunters travel to hunting areas at this time, and spotlighting is probably done along the way.

The day of the week for each case is presented in Table 18. The cases recorded in November from agent interviews did not follow the

Table 17. Time of arrest-November spotlighting cases

Time	Number of Cases	Percent of Total
12 P.M. - 1 P.M.	1	3.70
1 P.M. - 2 P.M.	0	0.00
2 P.M. - 3 P.M.	0	0.00
3 P.M. - 4 P.M.	0	0.00
4 P.M. - 5 P.M.	0	0.00
5 P.M. - 6 P.M.	1	3.70
6 P.M. - 7 P.M.	1	3.70
7 P.M. - 8 P.M.	1	3.70
8 P.M. - 9 P.M.	2	7.41
9 P.M. - 10 P.M.	3	11.11
10 P.M. - 11 P.M.	6	22.22
11 P.M. - 12 A.M.	2	7.41
12 A.M. - 1 A.M.	0	0.00
1 A.M. - 2 A.M.	1	3.70
2 A.M. - 3 A.M.	1	3.70
3 A.M. - 4 A.M.	3	11.11
4 A.M. - 5 A.M.	3	11.11
5 A.M. - 6 A.M.	1	3.70
6 A.M. - 7 A.M.	0	0.00
7 A.M. - 8 A.M.	0	0.00
8 A.M. - 9 A.M.	0	0.00
9 A.M. - 10 A.M.	0	0.00
10 A.M. - 11 A.M.	0	0.00
11 A.M. - 12 P.M.	1	3.70

Table 18. Number of cases made on each day of the week in November

Day	Number of Cases	Percent of Total
Sunday	3	11.11%
Monday	4	14.81%
Tuesday	1	3.70%
Wednesday	4	14.81%
Thursday	6	22.22%
Friday	2	7.41%
Saturday	3	11.11%

pattern of October cases. On Saturdays, agents made 11.1% of November cases, while in October, 42.8% of the cases were on Saturdays. The per cent for any day of the week would be 14.28 if the violations were evenly distributed throughout a week. The cases recorded in November roughly approximate a uniform distribution. However, data compiled during the preliminary arrest report survey indicate that the cases made in November tend to approximate a normal distribution (Table 7). The peak occurs on Saturday, when most cases were made. There is evidence of a discrepancy between the preliminary arrest report survey and the sample collected by agent interviews, and this can be attributed to sampling error. The data pertaining to the location of the violation, the violator and weather are presented and discussed. These results, although subject to sampling error, were believed not to be affected to the same extent as the time of arrest and the day of the week. The spatial distribution of the violation would also be subject to sampling error and the results are discussed with this in consideration. Most arrests for spotlighting were made on Thursday in November. There were two holidays in November, Veteran's Day and Thanksgiving, and a single case was made on each of these dates. This observation is consistent with an earlier section establishing that holidays do not result in a significant increase in the number of spotlighting violations.

Type of Weapon

The weapon used by spotlighters in November were pistols, rifles and shotguns. In 40.74% of the cases a rifle was present or used, and 81.8% of these were .30 caliber. There were two cases, 18.2% in which

.22 caliber rifles were used, A scope was present on the rifles in three cases, 27.3%. Shotguns were used in 14 cases, 51.85%, and 71.4% of these were 12 gauge varieties. In one case, a 20 gauge shotgun was used, while in another, a 410 caliber shotgun was present. Of the shotguns 57.1% were single barrel weapons, 21.4% were semi-automatics, 14.3% were double barrels, and in one case the agent could not recall the type. None of the shotguns had sawed off barrels. Pistols were used in 7.41% of the cases, and 50% of these were .22 caliber varieties. In the remaining cases the agent could not recall the caliber. Thus, the violator showed a slight preference for a shotgun of the 12 gauge, single barrel type, although rifles of .30 caliber were nearly equally preferred.

Type of Vehicle

Vehicles were used in all cases, that is, no violators were spotlighting on foot. New vehicles, those built during and after 1966, were used in 55.6% of the cases. Old vehicles, those built before 1965, were used in 44.4% of the cases. Sedans were used in 63% of the cases, pickup trucks in 25.9%, and station wagons in 11.1%. Thus, slightly more violators used new model vehicles than old models, and most were sedans. Comparison with October violations show that violators also used sedans in most cases.

Type of Spotlight

Spotlights that plug into the vehicles cigarette lighter were used in 51.9% of November cases. The vehicles headlights were the type of spotlight used in 29.6% of the cases. Sealed-beam battery packs were used in 11.1% of the cases, and hand-held battery flashlights were used

in 7.4% of the violations. In October, the violators' choice of spotlights was very similar to those used in November with the cigarette lighter plug-in type being the most popular, followed by vehicle headlights.

The Weather at the Time of Arrest

The average temperature at the time of arrest for November cases was 37 degrees. The maximum temperature was 50 degrees and the minimum was 20 degrees for a spotlighting case. Two violations were found when it was raining, and one case was made when snow was on the ground. The sky was clear at the time of the violation in 59.3% of the cases, and moonlight was present in an additional 11.1% of the cases. Fog or clouds were present during 25.9% of the cases. The sky conditions for one case, 3.7% of the total, could not be recalled by the agent. Precipitation had been predicted for the evening of three cases, 11.1%. The weather conditions during most of November's violations could be summarized as clear sky, with moderate temperatures. Prediction of rain fall did not appear to deter the violators from going spotlighting.

The Violator

An average of 3.30 violators were arrested from a group of 3.44 persons in November spotlighting cases. The average age of those arrested was 28 years, with the oldest person being 60 years and the youngest 16 years. The average age of those not arrested but present at the time of the violation was 26 years, with the oldest being 50 years and the youngest 12 years. The variance of the ages of those arrested was 100.21, and the variance of the ages of those not arrested was 84.45. An F test

indicates that there is no significant difference between the ages of those arrested and those not arrested at a 0.05 level of significance.

In one case, 3.7%, the violator was on strike or a work layoff, and in another case, 3.7%, the violators were in military service. The violators were residents of Virginia in 92.6% of the cases. The theory stated earlier that a strike or work layoff might contribute to an increase in spotlighting does not appear to be supported.

The violators were dressed in street clothes in 48.15% of the spotlighting cases and wore hunting clothes in 51.85% of the cases. No violators were dressed in camouflaged outfits. Those dressed in hunting clothes may have been legally hunting during the day and on their way home when they conducted spotlighting, or they may have been traveling to a hunting site in early morning and decided to spotlight.

Women were present in six cases, 22.2%, and were arrested in four cases, 14.8%. No children were present in any of the cases. The violators were not known previously by the agents in 70.4% of the cases, while 29.6% of the violators were personal acquaintances of the agent. None of the violators were arrested by the agent prior to the spotlighting case, although these violators may have been arrested by other agents for other game violations. Additional charges were levied in 29.6% of the spotlighting cases, and these ranged from trespassing, hunting without a license and illegal possession of a game animals. The violators were drinking or under the influence of alcohol in 22.2% of the cases. Thus, the percentage of violators drinking in November was one-half that of October, when 42.9% of the violators were found to be drinking.

A suitable explanation of this difference could not be made.

The Violation Site

Agents recorded 23 spotlighting cases, 85.2% of November's total that occurred on private land. Violations occurred on public land in 14.8% of November's cases. Although most of the violators were spotlighting on private land, 88.9% were traveling on public roads. In two cases, 7.4%, the violators were traveling on military roads, and one case, 3.7%, the violators were on a private road.

In 11 cases, 40.7%, the violations occurred on nonrestricted areas, while in 40.7%, the violations were on areas that were privately posted. The violators were spotlighting within 200 yards of a private home in 7.4% of the cases, and were on a state game area in one case, 3.7%. In two cases the violators were on a military area.

The average distance from the agent's house to the violation site was 20 miles, while the maximum distance was 60 miles, and the minimum distance was two miles. The average distance from the violation site to the nearest occupied house was 1.1 miles, and the closest a violation came to an occupied house was 0.1 mile. The nearest town was an average of ten miles from the violation site, although the minimum distance was 0.1 mile. The maximum distance from the violation site to the nearest town was 37 miles. An average distance of 32 miles from the violators home to the violation site was traveled in November's cases. The minimum distance traveled was 0.2 mile and the maximum distance traveled was 150 miles.

In 14 cases, 51.8%, the violators were traveling on heavy duty roads.

The various road classifications were described in an earlier section. Violations occurred from medium duty roads in 40.7% of the cases. Unimproved dirt roads were used in 7.4% of the cases. The violators were traveling north in 25.93% of the cases, east in 18.52%, south in 25.93%, west in 25.93%, and northwest in 3.7%. Thus, no patterns were observed in the direction of travel of the violators during November's cases. The slope of the road at the violation site was between 0 and 5% in 96.3% of the cases, and between 6 and 14% in 3.7% of the cases.

The violation occurred in a field in 96.3% of November's cases, and a forest in 3.7% of the November's cases. Of those cases occurring in a field, 38.5% were corn fields, 7.7% were wheat, 3.8% were soybeans, 26.9% were orchard grass, 7.7% were apples, and 11.5% were bluegrass and clover. The crops had been harvested in 57.7% of the fields.

The average depth of the field at the violation site was 168 yards. The maximum depth was 600 yards and the minimum depth was four yards. The woodlot surrounding the field was an oak-pine mixture in 66.7% of the cases, and yellow pines in 25% of the cases. In 8.3% of the cases the woodlot was an oak-hickory mixture. The average dbh of the trees surrounding the field was eight inches, with a minimum of three inches and a maximum of 16 inches.

The one case that occurred in a forest was in an oak-pine mixture. The dbh of the trees was ten inches, and the violation would not have been visible from the air. All the violations that occurred in fields would have been visible from the air. In 66.7% of the cases the agents stated that having made a case at a particular site would have no effect on

their frequency of patrols at that site. In 25.9% of the cases the agents stated that they would increase the frequency of patrols, while in 7.4% of the cases the agents would decrease their frequency of patrols.

The Apprehension Site

The violation site was not the same as the apprehension site in 33.3% of the cases. The average distance from the violation site to the apprehension site was 40 miles, and a maximum of 150 miles and a minimum of three miles was recorded. The direction from the apprehension site to the violation site was north in 12.5% of the cases, east in 37.5%, south in 37.5%, and west in 12.5%. It appears that the violators were more likely to head north or west when leaving a violation site. Apprehensions were made in a forest in one case, while two apprehensions were made in fields, and four were made at the violators homes. Usually the apprehension site was different from the violation site if the violators attempted to elude the agent, or if an investigation was required to identify and locate the violators.

Summary of November Spotlighting Violations

The average time of arrest for spotlighting in November was 11:12P.M.. An average of 1.33 agents made 3.3 arrests in each case. Stakeouts were the method of patrol used to make 48% of the cases. An average of 0.26 deer were killed per case by the violators. A slight preference for a 12 gauge, single barrel shotgun was observed as the violators weapon choice. New vehicles were used slightly more often than old vehicles and 63% of the vehicles were sedans. The spotlight used in most cases was the type that plugs into the vehicles cigarette lighter.

The violator was a male in 92.1% of the arrests, and averaged 28 years of age. Street clothes were worn in 48% of the cases, and the violators were drinking or under the influence of alcohol in 22.2% of the cases.

Spotlighting violations occurred on private lands in 85.2% of the cases. The violation occurred in a field in 96.3% of the cases, and corn was the predominant plant found in 38.5% of the fields. The average depth of the field at the violation site was 168 yards. The violation would have been visible from the air in 96.3% of the cases.

Spotlighting Violation Statistics-December

Interviews of Virginia agents resulted in 12 spotlighting cases being recorded. A total of 32 arrests were made in these cases for an average of 2.66 arrests per case. An average of 1.8 agents were involved in each case, with a maximum of four and a minimum of one agent participating. The agents arrested all persons present at the time of the violation in each case. Convictions were obtained in 11 cases 91.7%, and fines were suspended in two of these cases.

Stakeouts were the method of patrol used to make 50.0% of the cases. In five cases, 41.7%, the agents received a tip that a violation was to occur and stakeouts were set up. In one case, the agents received a tip that a violation had already occurred and an investigation was required to identify and locate the violators.

The agents spent from zero to one hour on stakeout before an arrest was made in two cases. In two cases, the agents were on stakeout from one to two hours before an arrest, and in another two cases, the agents

spent two to three hours on stakeout before an arrest. For two cases in which tips were received, the agents spent from one to two hours on stakeout, while in another two cases the agents spent two to three hours on stakeout. In one case the agents received a tip that a spotlighting violation had occurred, and an investigation of over 12 hours was necessary before an arrest was made.

The violators in two cases, 16.6%, were arrested while in the act of shooting at a deer. No violators were arrested with a deer in their possession. Deer were killed in two cases, 16.6% of the total cases in December, and a total of three deer were killed. An average of 0.25 deer were killed per case in spotlighting incidents in December. The ages and sex of the deer killed in these cases could not be recalled by the agents.

A chase was necessary to apprehend the violators in one case, and a deer kill was also involved. In the other cases with a deer kill, and in the ten cases without a deer kill, no attempt was made to elude the agents. The maximum speed obtained in the chase was 65 MPH. The agents estimated that approximately 10% of the stakeouts were successful in making a spotlighting case.

Time of Arrest

During the month of December 50.0% of all cases were made between the hours of 7 p.m. and 10 p.m.. Between the hours of 6 p.m. and 11 p.m. agents made eight cases, or 75% of the December total. The remaining cases were all made during the early morning hours. One case was made between the hours of 2 a.m. and 3 a.m., one between 4 a.m. and 5 a.m.,

one between 6 a.m. and 7 a.m., and another between 7 a.m. and 8 a.m..

The agents could recall the day of the week for six of the December cases. Three cases, 25%, were made on Friday evening, and three cases were made on Saturday evenings.

Type of Weapon

Violators used rifles in 33.3% of the December cases. All of the rifles were .30 caliber weapons, and in two cases, 50% of the rifles, a scope was used. Shotguns were used in 66.7% of the December cases, and all were 12 gauge. Double barrel shotguns were used four cases, and semiautomatic shotguns were used in two cases. A single barrel shotgun was used in one case, and pump action was used in one case.

Type of Vehicle

Vehicles were used in all cases. New vehicles were used in seven cases, 58.3% of the December cases, while old vehicles were used in 41.7% of the cases. Sedans were the type of vehicle used in 66.7% of the cases, and pick-up trucks were used in 33.3% of the cases. The vehicle types used in December were very similar to those used in previous months.

Type of Spotlight

The vehicle headlights were used in 41.7% of the cases as a spotlight. The cigarette lighter plug in type was used in 25.0% of the cases, and the spotlight was fixed to the car in 16.7% of the cases. Hand-held flashlights were used in 8.3% of the cases, and sealed beam battery packs were used in 8.3% of the cases. A slight difference was observed from previous months where the cigarette lighter plug-in type

was used most frequently.

The Weather at the Time of Arrest

The average temperature at the time of arrest was 36 degrees. It was raining at the time of arrest in 8.3% of the cases, and snow was on the ground in 8.3% of the cases. The sky conditions were clear in 58.3% of the cases, and moonlight was present in an additional 16.7% of the December cases. Fog or clouds were present in 25.0% of the cases. Precipitation had been predicted for the evening of 16.7% of the cases.

The Violator

An average of 2.67 arrests were made per case. All persons present at the time of the violation were arrested. The minimum number of persons arrested per case was two, while the maximum was five. The average age of those arrested was 30 years, while the oldest was 55 years, and the youngest was 17 years. The violators were on strike or a work layoff in 8.3% of the cases. In one case, 8.3%, the violators were in military service. All of the violators were residents of Virginia.

The violators were dressed in normal street clothes in 66.7% of the cases, and wore hunting clothes in 33.3% of the cases.

Children were present in 8.3% of the cases, although the exact age could not be recalled. The child was not arrested. Women were not present in any of the cases.

The violator was not previously known by the agent in 50.0% of the cases. In 41.7% of the cases, the violator was known personally by the agent, and in 8.3% of the cases the violator was arrested previously by the agent. The violators were charged with additional offenses in 58.3%

of the cases. The violators were drinking or under the influence of alcohol in 58.3% of the cases.

The Violation Site

Violations reported by the agents were on private land in 91.7% of the cases, and on public land in 8.3% of the cases. All of the violations occurred from a public road. In 33.3% of the cases the violation occurred on an unrestricted area, while in 58.3% of the cases, the violation occurred on private-posted property. The violators in one case were spotlighting within 200 yards of an occupied home.

The average distance from the violation site to the agent's home was 12.4 miles. The average distance from the violation site to an occupied house was 0.37 miles, with a maximum of one mile and a minimum of 0.1 mile. The nearest town was an average of five miles from the violation site, with a maximum of ten miles and a minimum of 0.5 miles. The average distance from the violator's home to the violation site was 52 miles, with a maximum of 450 miles and a minimum of one mile. The violators were on heavy duty roads in 8.3% of the cases, on medium duty roads in 58.3% of the cases and on unimproved dirt roads in 33.3% of the cases. The average distance from the nearest waterway was 0.55 mile, with a maximum of one mile and a minimum of 0.1 mile.

The violators were traveling in a westerly direction in 45.5% of the cases with spotlighting, and northwest in 9.1% of the cases. In 9.1% of the cases the violators were traveling east, and 18.15% they were traveling north, and in 18.15% they were traveling south. All of the violations were from roads of 0 to 5% slope.

The violations occurred in fields in all 12 cases. In 75.0% of the cases, the violation was in a corn field, in 8.3% in an orchard-grass field, and in 8.3% in a permanent pasture. The agent could not recall the field type in one case. The crops in the field had been harvested in 83.3% of the cases at the time of the violation.

The average distance from the road to the trees around the field was 167 yards, with a maximum of 400 yards and a minimum of 50 yards. The average dbh of these trees was 7.3 inches. The trees around the field were an oak-pine mixture in 75% of the cases, and oak-hickory in 16.7% of the cases. Yellow pines were the predominant species in 8.3% of the cases.

The agents stated that they would continue to patrol 83.3% of the violation sites with the same frequency as before the cases were made. In 16.7% of the cases, the agents stated that they would increase the frequency of patrols of the violation site. The violation would have been visible from the air in 91.7% of the cases.

The Apprehension Site

The apprehension site was different from the violation site in 25% of the cases. The direction from the violation site to the apprehension site was east in 33.3% of the cases, west in 33.3% of the cases, and north in 33.3% of the cases. The average distance from the violation site to the apprehension site was 207 miles, with a maximum of 600 miles and a minimum of 0.8 miles. The average distance from the apprehension site to the violator's house was 4.0 miles, with a maximum of eight miles and a minimum of zero miles.

Summary of December Spotlighting Violations

The average time of arrest for spotlighting in December was 12:12 a.m.. An average of 1.8 agents made 2.66 arrests in each case. Stake-outs were used to make 50.0% of the cases. An average of 0.25 deer were killed per case. Shotguns of 12 gauge were used in 66.7% of the cases. The vehicles headlights were used as spotlights in 41.7% of the cases.

An average age of the violator was 30 years. Street clothes were worn in 66.7% of the cases. The violators were drinking or under the influence of alcohol in 58.3% of the cases.

Spotlighting violations occurred on private lands in 91.7% of the cases. All of the violations were in fields, and 75% of these were corn fields. The violation would have been visible from the air in 91.7% of the cases.

Spotlighting Violation Statistics-Cummulative Totals

The interviews of Virginia agents provided information of 70 spotlighting cases made during 1969 and 1970. Convictions were obtained in 64 cases or 91.43%, and seven cases, or 10.0% had suspended fines. A total of 197 persons were arrested or an average of 2.81 arrests per case. Of those present at the time of the violation 92.43% were arrested. An average of 1.44 agents were involved in each case and a standard deviation of 1.02 was determined. The maximum number of agents involved in any case was six, one agent was minimum.

Stakeouts were used to make 52.86% of the spotlighting cases. Routine patrols resulted in 15.71% of the cases, and a tip was received in 28.57% of the cases. For those cases in which a tip was received, a

stakeout was usually set up to apprehend the violators. The agents described the method of patrol as "other" in 2.86% of the cases, and no clarification of this procedure was obtained. The time spent on each method of patrol prior to an arrest is presented in Table 19.

An average of five hours was spent prior to an arrest for all methods of patrol. The maximum time spent on an investigation before an arrest was 80 hours, and the minimum was 1 minute. The agents estimated that 10.2% of all stakeouts resulted in a case and a maximum of 25% and a minimum of 3% were reported.

The violators were arrested while in the act of shooting at a deer in 17.14% of the cases, and the violators were retrieving a deer in 7.14% when they were arrested. Deer were killed in 22 cases, or 31.43% of the total. A total of 31 deer were killed for an average of 0.44 deer killed per case. The ages of the deer killed are presented in Table 20. The sex ratio of 100 males to 100 females was observed among the deer killed by violators.

A chase was necessary to apprehend the violator in 22 cases. Of the 22 cases in which deer were killed, 17 of these cases involved a chase. For those cases in which deer were not killed, five cases involved a chase, while in 43 cases a chase did not occur. The average speed of the chase was 68 MPH, and the maximum speed was 90 MPH, while the minimum speed was 50 MPH. A standard deviation of 12.5 MPH was determined.

Time of Arrest

The number of cases received from agent interviews for each month is presented in Table 21.

Table 19. Time spent on patrol for all cases prior to a spotlighting arrest

Time Spent (Hours)	Tip	Stakeout	Routine Patrol
0 - 1	2	2	0
1 - 2	4	11	1
2 - 3	5	9	3
3 - 4	1	11	1
4 - 5	1	0	2
5 - 6	1	4	1
6 - 7	0	0	1
7 - 8	2	0	0
8 - 9	1	0	0
9 - 10	0	0	0
10 - 11	0	0	1
11 - 12	0	0	0
12 +	4	1	1

Table 20. Ages of deer killed by spotlighters

Age	Number of Deer	Percent of Total
6 Months	1	3.23
1 Year	6	19.35
1.5 Years	6	19.35
2.5 Years	3	9.68
3.5 Years	2	6.45
4.5 Years	0	0.00
No Response	13	41.93

Table 21. Number of spotlighting cases by month

Month	Number of Cases	Percent of Total
January	6	8.57
February	0	0.00
March	0	0.00
April	0	0.00
May	0	0.00
June	1	1.43
July	0	0.00
August	0	0.00
September	2	2.86
October	14	20.00
November	27	38.57
December	12	17.14
No Response	8	11.43

In eight of the cases received the agents could not recall the exact month of the violation. The day of the week on which each case was made is presented in Table 22.

The time of the arrest for all cases is presented in Table 23.

The largest percentage of arrests were made on Saturdays between the hours of 10 P.M. and 11 P.M.. Nearly 56% of all cases were made between the hours of 8 P.M. and midnight.

Type of Weapon

The violators were using rifles in 47.14% of the cases, shotguns in 47.14%, pistols in 2.86%, and bow and arrow in 2.86% of the cases. Of the rifles used, 72.73% were .30 caliber, 21.21% were .22 caliber, and 3.03% were .270 caliber. No response was obtained describing the caliber in 1.43% of the cases involving rifles. Scopes were present on 21.21% of the rifles.

Of the shotguns used, 78.79% were 12 gauge, 6.06% were 20 gauge, and 6.06% were .410 caliber. No response was obtained describing the gauge in 9.09% of the cases involving shotguns. Of the cases involving shotguns, 17.14% were single barrel models, 11.43% were double barrels, 2.86% were pumps, and 12.86% were semi-automatics. The models were not described in 2.86% of the cases involving shotguns. None of the shotguns used had sawed off barrels.

Of the pistols used, 50% were .22 caliber models, while the other 50% was not described.

Type of Vehicle

Vehicles were used by the violators in all of the spotlighting cases

Table 22. Number of cases made on each day of the week

Day of the Week	Number of Cases	Percent of Total
Sunday	5	7.14
Monday	6	8.57
Tuesday	1	1.43
Wednesday	6	8.57
Thursday	8	11.43
Friday	12	17.14
Saturday	16	22.86
No Response	16	22.86

Table 23. Time of arrest—all spotlighting cases received

Time	Number of Cases	Percent of Total
12 A.M. - 1 P.M.	2	2.86
1 P.M. - 2 P.M.	1	1.43
2 P.M. - 3 P.M.	1	1.43
3 P.M. - 4 P.M.	0	0.00
4 P.M. - 5 P.M.	1	1.43
5 P.M. - 6 P.M.	1	1.43
6 P.M. - 7 P.M.	2	2.86
7 P.M. - 8 P.M.	3	4.29
8 P.M. - 9 P.M.	9	12.87
9 P.M. - 10 P.M.	9	12.87
10 P.M. - 11 P.M.	14	20.02
11 P.M. - 12 A.M.	7	10.01
12 A.M. - 1 A.M.	1	1.43
1 A.M. - 2 A.M.	2	2.86
2 A.M. - 3 A.M.	3	4.29
3 A.M. - 4 A.M.	3	4.29
4 A.M. - 5 A.M.	5	7.15
5 A.M. - 6 A.M.	1	1.43
6 A.M. - 7 A.M.	3	4.29
7 A.M. - 8 A.M.	1	1.43
8 A.M. - 9 A.M.	0	0.00
9 A.M. - 10 A.M.	0	0.00
10 A.M. - 11 A.M.	0	0.00
11 A.M. - 12 P.M.	1	1.43
Total	70	100.00

reported in this survey. Sedans were used in 67.1% of the cases and pick-up trucks were used in 22.86% of the cases. Station wagons were used in 7.14%, and in 2.86% of the cases, jeeps were used. The vehicles were described as new, those made after and including 1966, in 52.86% of the cases, and as old in 47.14% of the cases. Thus, the most commonly used vehicles for spotlighting appeared to be a new sedan.

Type of Spotlight

The type of spotlight used by the violators in 37.14% of the cases was the model that plugs into the vehicles cigarette lighter. The vehicle headlights were used in 24.29% of the cases as spotlights. Seal-beam battery packs were used in 17.14% of the cases, and hand-held flashlights in 12.86% of the cases. The spotlight was fixed to the vehicle in 7.14% of the cases. The agent could not recall the type of spotlight used in 1.43% of the cases. The most commonly used spotlight was the type that plugs into the vehicle's cigarette lighter. This type of spotlight provided a portable, low-cost, and one of the most powerful means of illumination to the violators.

The Weather at the Time of Arrest

The estimated average temperature at the time of the arrest was 37 degrees, and a maximum of 60 degrees and a minimum of 20 degrees was reported. A standard deviation of 8.87 degrees was determined. It was raining at the time of the arrest in 7.14% of the cases, and snow was present in 2.86%. Precipitation had been predicted for the evenings in 17.14% of the cases. The sky conditions were described as clear in 47.14% of the cases, clear with moonlight in 20.0%, and fog or clouds in

27.14% of the cases.

The Violator

An average of 2.81 persons were arrested from a group of 3.09 persons. The maximum number reported arrested for any case was eight and the minimum was one. A standard deviation of 1.57 was determined for the average number of persons arrested, and a standard deviation of 1.56 was found for the average group size. The average age of those arrested was 28.76 years, while the average age of those present but not arrested was 28.30 years. The oldest person arrested in any case was 60 years, and the youngest person arrested was 15 years. A standard deviation of 9.18 was determined for the average age of those arrested and 95% of the persons arrested would be included in the interval from ten years to 47 years. The average age of arrested spotlighters was considerably older than the average criminal. The largest arrest rates for criminal offenses were between the ages of 18 and 20 years (Sutherland, 1970: 123)

The violators were on strike or a work layoff in 7.14% of the cases, and 2.86% of the violators were in military service. The violators were residents of Virginia in 94.29% of the cases.

The violators were dressed in street clothes in 61.43% of the cases, in hunting clothes in 35.71%, and in camouflaged outfits in 1.43% of the cases. The agent could not recall the dress of the violator in 1.43% of the cases.

Women were present in 14.29% of the cases and arrested in 8.57%. Children were present in 2.86% of the cases, but were not arrested.

The spotlighting violators were personally known by the agents in 31.42% of the cases, and were not previously known in 64.29% of the cases. The violator had previously been arrested by the agent in 4.29% of the cases. Although the agent knew these violators through a previous arrest, the arrest was not necessarily for a spotlighting violation.

The spotlighting violators were charged with additional violations of game laws in 40% of the cases. The violators were drinking or under the influence of alcohol in 32.86% of the cases.

The Violation Site

The spotlighting violations occurred on public land in 14.29% of the cases, and on private lands in 85.71% of the cases. The spotlighting was done from public roads in 90.0% of the cases, from private roads in 5.71%, and from military roads in 4.29%. Violations occurred in non-restricted areas in 47.14% of the cases, and in restricted areas in 52.86% of the cases. Of the cases on restricted areas, 35.72% were in private posted areas, 8.57% were too close to private homes, 5.71% were in military areas, and 2.86% were in state game areas. Since the majority of spotlighting was done from public roads, it appears that the violators probably were not hunting on their own lands as a farmer taking deer for his own use would not have to use a public road.

The average distance from the violation site to the agent's home was 18.7 miles, and a standard deviation of 13.51 miles was determined. A maximum of 60 miles and a minimum of 0.1 mile was observed for the distance between the violation site and the agent's home. The nearest occupied house was an average of 1.29 miles from the violation site,

and a maximum of nine miles and a minimum of 100 yards was observed. A standard deviation of 1.71 miles was determined for the distance from the violation site to the nearest occupied house. The nearest town was an average of 8.7 miles from the violation site, and the maximum distance observed was 37 miles while the minimum observed was 0.1 mile. The average distance from the violator's home to the violation site was 34.3 miles, with a maximum of 450 miles and a minimum of 0.1 mile reported. A standard deviation of 66.7 miles was determined.

The violators were traveling on heavy duty roads in 41.4% of the cases, on medium duty roads in 25.74% of the cases, on light duty roads in 5.72% of the cases, and on unimproved dirt roads in 27.17% of the cases. The direction of travel is presented in Table 24.

The violators were observed traveling in an easterly direction in 32.35% of the cases. Thus, slightly more violators were traveling east than in any other direction. The slope of the road at the violation site was described as 0 to 5% for 94.2% of the cases, and 6 to 14% in 5.8% of the cases.

The spotlighting violation occurred in a field in 94.2% of the cases, and in a forest in 5.8% of the cases. The types of field in which spotlighting violations occurred is presented in Table 25.

The crops in the fields had been harvested in 56.0% of the cases. Thus, the largest portion of spotlighting violations appear to occur in harvested corn fields.

The average depth of the field, that is, the distance from the road at the violation site across the field to the woodlot, was 171 yards,

Table 24. Direction of travel while spotlighting

Direction	Number of Cases	Percent of Total
North	11	16.18
Northeast	0	0.00
East	22	32.35
Southeast	1	1.47
South	14	20.59
Southwest	1	1.47
West	17	25.00
Northwest	2	2.94

Table 25. Type of field in which spotlighting violations occurred

Field Type	Number of Cases	Percent of Total	Cumulative Percentage
Corn	23	35.90	35.90
Orchard grass	15	23.42	69.32
Bluegrass-clover	10	15.62	74.94
Abandoned	5	7.82	82.76
Wheat	4	6.26	89.02
Soybean	3	4.70	93.72
Apples	3	4.70	98.42
Pastures	1	1.58	100.00

The maximum field depth recorded was 800 yards and the minimum was 1 yard. A standard deviation of 148.15 yards was determined. The average dbh of the trees surrounding the field was 7.92 inches, with standard deviation of 3.35 inches. The trees surrounding the field were yellow pines in 21.31% of the cases. A mixture of oak-pine was present in 60.66% of the cases, oak-hickory in 14.75%, and red oak-basswood-ash in 3.28%.

A total of four cases were made in forests. The average dbh of the trees at the violation site was 11.75 inches with a standard deviation of 5.68 inches. The forest was described as an oak-pine mixture in 50.0% of the cases, yellow pines in 25.0%, and red oak-basswood-ash in 25.0%.

The violations would have been visible from the air in 67 cases, or 95.71% of the total. The agents stated that in 75.72% of the cases, they would continue to patrol the violation site with equal frequency, and they would patrol 17.14% of the sites with greater frequency, and 7.14% of the sites with less frequency.

The Apprehension Site

The apprehension site was different from the violation site in 21 cases, or 30.0% of the total. The direction from the apprehension site to the violation site is presented in Table 26.

The direction from the apprehension site to the violation site was east in nearly 43% of the cases. Data presented earlier showed that the direction of travel while spotlighting was also east in nearly 33% of the cases. Thus, east represents the largest percentage for both directional factors. For those violators that were not apprehended at the violation site, it appears that they traveled east while spotlighting

Table 26. Direction from the apprehension site to the spotlighting violation site

Direction	Number of Cases	Percent of Total
North	2	9.52
Northeast	1	4.76
East	9	42.86
Southeast	0	0.00
South	6	28.57
Southwest	0	0.00
West	3	14.29
Northwest	0	0.00

and west while returning from the violation.

The average distance from the apprehension site to the violation site was 65.6 miles, and a maximum of 600 miles and a minimum of 0.8 mile was reported. A standard deviation of 129.72 was determined.

Summary of Spotlighting Violation Report-
Cumulative Totals

The average time of arrest for spotlighting for all cases reported was 11:30 p.m.. An average of 1.44 agents made 2.81 arrests per case. Stakeouts were used to make 52.86% of the cases. An average of 0.44 deer were killed per case. Rifles and shotguns were each used in 47.14% of the cases, and .30 caliber and 12 gauge were the most popular sizes. The most commonly used spotlight was the type that plugs into the vehicle's cigarette lighter.

The average age of the violator was nearly 29 years. Street clothes were worn by the violators in 61.43% of the cases. The violators were drinking or under the influence of alcohol in 32.86% of the cases.

The spotlighting occurred on private land in 85.71% of the cases. The violations occurred in a field in 94.2% of the cases, and 35.9% of these were corn fields. The violations would have been visible from the air in 95.71% of the cases.

Spotlighting Arrest Report Form

This form was distributed to 25 Virginia agents to obtain information of 1971 spotlighting cases. A total of 225 forms were sent to agents, and 41 were completed and returned for a response rate of 19%. Of the 25 agents surveyed, 64% completed and returned at least one report. The arrest reports were analyzed for the months of September and October,

November, December and January and cumulatively for all cases.

September and October Spotlighting Arrest Reports

A total of 11 cases were received from agents for September and October. A total of 29 persons were arrested for an average of 2.64 arrests per case. In eight cases, 72.7% of the total, more than one agent was involved, and the average number of agents participating per case was 1.90. The spotlighting violators were charged with violating Section 29,144.4 of Virginia's Game Laws in four cases, and Section 29,144.4 in four cases.

The average time of the violation was 11:05 p.m., with a standard deviation of 1.19 hours. An average of 2 hours 38 minutes elapsed from the time of the violation until the time of arrest. A large standard deviation of over six hours indicated that several cases required investigations to locate and apprehend the violators. The day of the week of the violation is presented in Table 27.

A comparison with the data obtained from the N.R.A. spotlighting survey shows that 42.86% of the cases were made on Saturdays.

Deer were killed in three cases, 27.3% of the total, for an average of one kill per 3.66 cases. A total of three deer were killed and all of these were does.

The violation occurred in a field in 90.9% of the cases and in a forest in 9.1% of the cases. Clover fields and corn fields were each the scene of the violation in 22.25% of the cases. In the remaining cases, one case, 11.1% was made in each of the following field types: orchard grass, pasture, hay, corn and peanut, and abandoned. The a-

Table 27. Day of the week for September and October spotlighting violations

Day	:	Number of Cases	:	Percent of Total
Monday	:	1	:	9.09
Tuesday	:	2	:	18.18
Wednesday	:	2	:	18.18
Thursday	:	0	:	0.00
Friday	:	1	:	9.09
Saturday	:	5	:	45.46
Sunday	:	0	:	0.00

verage distance from the violation site to the nearest town was nearly seven miles. All of the violations would have been visible from the air.

It was raining at the time of the violation in two cases, 18.2%, and the average temperature was 52 degrees. In 18.2% of the cases, there was moonlight present, while in 45.5% of the cases it was clear, and in 36.3% fog or clouds were present.

The average age of those arrested was 27 years and a standard deviation of 11.9 years was observed. Women were present in four cases, 36.4%, and totaled 13.8% of all arrested violators. None of the violators were on strike or a work layoff. The violators were drinking or under the influence of alcohol in six cases, or nearly 60%.

Rifles were used in 45.45% of the cases, shotguns in 45.45%, and pistols in 9.1%. Of the shotguns, 40% were 12 gauge, 40% were 20 gauge and 20% were .410 caliber. Of the rifles used, 25% were .243 caliber, 25% were .30-.30, 25% were .30-06, and 25% were .264. No response was obtained on the pistol caliber. New sedans were used in 54.5% of the cases, old sedans in 27.3%, old station wagons in 9.1%, and new trucks in 9.1% of the cases.

Comparison with data obtained from the N.R.A. Spotlighting Violation Survey for October indicated that most of the statistics concerning the violation do not differ significantly. However, the number of deer killed per case was observed to differ considerably as a ratio to 0.93 was reported in the N.R.A. October survey, and 0.27 reported in the arrest report forms. A possible explanation for this is presented in the discussion of the November data.

November Spotlighting Arrest Reports

A total of 26 cases were received from Virginia agents for the month of November. In 16 cases, 61.5% of the total, more than one agent participated, while an average of 1.62 agents per case was observed. A total of 59 persons were arrested, for an average of 2.3 arrests per case. The violators were charged under Section 29.144.2 in 63.3% of the cases, and under Section 29.144.4 in 36.7% of the cases.

The average time of the violation in November was 11:05 P.M. with a standard deviation of 2.85 hours. The average time from the commitment of the violation until the arrest was one hour and 42 minutes, and a standard deviation of 7 hours and 49 minutes was determined. The large standard deviation indicates that in several cases an investigational period was necessary to locate and apprehend the violators. The day of the week of the violations is given in Table 28.

Deer were killed in 11.5% of the cases or one deer per 8.66 cases. Three deer were killed, and two deer were bucks and one was a doe.

The spotlighting was done in fields in 80.0% of the cases, and in forests in 12.0%. In addition, one case was reported in a golf course and another in an orchard. Of those that were in fields, 18.75% were planted in peanuts, and 18.75% were pastures. In the following fields, 12.5% of the cases were reported in each: orchard grass, corn, corn and peanuts, and soybean. One case, 6.25%, was made in a clover field and another was made in an abandoned field. The average distance from the violation site to the nearest town was 6.7 miles and a standard deviation of 4.2 miles was determined. The violations would have been

Table 28. Day of the week for November spotlighting violations

Day	Number of Cases	Percent of Total
Monday	4	15.38
Tuesday	1	3.84
Wednesday	2	7.70
Thursday	6	23.08
Friday	6	23.08
Saturday	6	23.08
Sunday	1	3.84

visible from the air in 88.5% of the cases.

The average temperature at the time of the violation was 39 degrees. It was raining at the time of the violation in 3.8% of the cases, and no cases were made when it was snowing. It was clear at the time of the violation in 42.3% of the cases and in an additional 34.6%, moonlight was present. Fog or clouds were present in 23.1% of the November cases reported.

The average age of those arrested was 28 years and a standard deviation of 12.0 years was determined. Women were present in 23.1% of the cases. In 3.8% of the cases the violators were on strike or a work layoff. The violators were drinking or under the influence of alcohol in 36.0% of the cases.

Rifles were used by the violators in 44% of the cases, and shotguns in 28%. Rifles and shotguns were present in 16% of the cases, and pistols, shotguns and pistols, and rifles, pistols and shotguns were each present in 4%. Of the shotguns used, 78.6% were 12 gauge, 14.3% were 20 gauge, and 7.1% were 16 gauge. Of the rifles used 20.0% were .22 caliber, 20.0% were .243, 26.7% were .30-30, 6.7% were .303, 6.7% were .264, 6.7% were 7.5 mm, and .308 were 13.2%. The pistols were .22, .38, and .45 calibers.

Old sedans were driven in 23.1% of the cases, new sedans in 34.6%, and new trucks in 26.9%. Old trucks were used in 11.6% of the cases and old station wagons in 3.8%.

A comparison with data obtained from the N.R.A. Spotlighting Violation Survey for November indicated several differences. In the N.R.A.

Survey, one deer was killed per four cases, while in the arrest report one deer was killed in every eight cases. The average number of violators per case also differed as the N.R.A. Survey determined 3.30 persons compared to the 2.3 from the arrest reports. A possible explanation for the discrepancies could have been a tendency for the agent to report more cases in which deer were killed and a large number of persons arrested during the personal interviews for the N.R.A. Survey. The arrest reports filled out after each case may have reduced the chances of this type of bias from entering into the sampling.

December and January Spotlighting Arrest Reports

Four cases were received from agents for the months of December and January. In view of the small number of reports received, the data were not subject to statistical analysis or comparisons with the N.R.A. survey. A total of nine persons was arrested for an average of 2.25 arrests per case. In 75% of the cases, more than one agent was involved, and an average of 1.75 agents per case was observed. The violators were charged with violation of Section 29.144.2 in 50% of the cases and Section 20.144.4 in 50% of the cases.

The average time of the violation was 12:10 a.m. with a standard deviation of 3.43 hours. An average of 34 minutes elapsed from the time of the violation until the arrest. One case was made on each of the following days: Monday, Tuesday, Friday and Saturday.

A deer was killed in 25% of the cases, or one deer kill per four cases. The sex of the single deer killed was a doe.

The violation occurred in a field in all four cases. In one case,

25%, the field was planted in corn and peanuts, and in another, small grains were present. In two cases the fields were not described by the agents. The average distance from the violation site to the nearest town was 7.8 miles. All of the violations would have been visible from the air.

In one case it was raining at the time of the violation. No cases were reported when it was snowing. The average temperature was 34 F° at the time of the violation. It was clear on the evenings of 75% of the cases, and in 50% of the cases moonlight was present. Fog or clouds were present in 25% of the cases.

The average age of those arrested was 35 years and a standard deviation of 13.2 years was observed. All of those arrested were males. No cases were reported in which the violators were on strike or a work layoff. The violators were drinking or under the influence of alcohol in all four cases.

Shotguns were used in 75% of the cases, and in 25% a shotgun and a rifle were present. All the shotguns were 12 gauge, and the rifles were .30-06 caliber. New sedans were used by the violators in 75% of the cases, and old sedans were used in 25% of the cases.

A comparison with the N.R.A. survey indicate only slight differences in the time of arrest, the deer killed per case, the age of the violators, and the weapon used.

Cumulative Totals-Spotlighting Arrest Report

A total of 41 cases were received from agents covering spotlighting cases made from September 1971 to January 1972. In 26 cases, 63.4% of

the total, more than one agent was involved in the case, and an average of 1.68 agents participated.

The average time of the violation for all of the months covered was 11:10 p.m. and a standard deviation of 2.52 hours was determined. See Table 29. Thus at least 95% of the spotlighting violations occurred between the hours of 6:00 p.m. and 4:00 a.m..

The day of the week of the violations is presented in Table 30.

The average time from the commitment of the violation until the arrest was 11.2 minutes in those cases in which an investigation was not required. A standard deviation of 19.64 minutes was determined. The average time from the commitment of the violation until the arrest for all cases, including those requiring an investigation was 1 hour 53 minutes, with a standard deviation of 420 minutes.

The violators were charged under Section 29.144.2 of Virginia's Game Laws in 53.8% of the cases, and under Section 29.144.4 in 46.2% of the cases. Thus, more violators were charged under the statute for which the most severe penalties could be levied.

Deer were killed in 17.1% of the total cases. A total of seven deer was killed, or one kill for every 5.8 cases. Bucks accounted for 28.6% of the kill, while does numbered 71.4% of the deer kill.

The violation occurred in a field in 85% of the cases, in a forest in 10% of the cases, and 5% were described as other. The type of field in which the violation occurred is presented in Table 31.

From these data, the violators apparently did not have a special preference for any particular field type. No response was obtained from

Table 29. Time of the spotlighting violation-all cases from S. A. R.

Month	Number of Cases	Average Time of Violation	Variance	Standard Deviation
Sept.	2	12:15 A.M.	0.56	0.75
Oct.	9	10:45 P.M.	1.24	1.11
Nov.	26	11:05 P.M.	8.12	2.85
Dec.	1	4:45 A.M.	----	----
Jan.	3	10:30 P.M.	3.13	1.77
Total	41	11:10 P.M.	6.37	2.52

Table 30. Spotlighting violations by the day of the week

Day	Number of Cases	Percent of Total
Monday	6	14.64
Tuesday	4	9.75
Wednesday	4	9.75
Thursday	6	14.64
Friday	8	19.52
Saturday	12	29.26
Sunday	1	2.44

Table 31. Spotlighting violations classed according to field type

Field Type	Number of Cases	Percent of Total	Cummulative Percentage
Corn and Peanut	4	14.8	14.8
Pasture	4	14.8	29.6
Corn	4	14.8	44.4
Clover	3	11.1	55.5
Orchard Grass	3	11.1	66.6
Peanut	3	11.1	77.7
Hay	3	11.1	88.8
Soybean	1	3.7	92.5
Abandoned	1	3.7	96.2
Small Grain	1	3.7	99.9

the agents on the question describing the type of forest in which the spotlighting violation occurred. The average distance from the violation site to the nearest town was 6.8 miles with a standard deviation of 4.1 miles. The direction to the nearest town was north in 27.5% of the cases, northeast in 25%, east in 10%, southeast in 12.5%, south in 17.5%, southwest in 12.5%, west in 10%, and northwest in 7.5%. The violations would have been visible from the air in 92.5% of the cases.

The average temperature at the time of the violation was 42 °F with a standard deviation of 10.8 degrees. It was raining at the time of the violation in 9.75% of the cases. No cases were made when it was snowing. The sky was clear at the time of the violation in 41.5% of the cases. Moonlight was present in 31.7% of the cases, and fog or clouds in 26.8% of the cases.

A total of 97 persons were arrested for an average of 2.37 arrests per case. Of those arrested, 87.6% were males, and 12.4% were females. Females were present in 24.39% of the cases and all were accompanied by males. The average age of those arrested was 28 years with a standard deviation of 12.11 years. Thus, at least 95% of the violators were between the ages of four and 52. The minimum age would appear to be at least 16 years since no persons were arrested that were any younger. The violators were on strike or a work layoff in 2.44% of the cases. The violators were drinking or under the influence of alcohol in 48.7% of the cases.

The spotlighting violation appears to be a group activity in many cases, and the consumption of alcohol may be a part of the complex

group behavior. The group may be spontaneously formed or it may be planned. The relationship between the consumption of alcohol, the reason for spotlighting and whether it was an individual or group activity could not be determined from the existing data. It was speculated however, that those hunting for "kicks" would be more likely to be in a group, and part of the group activity would involve drinking alcoholic beverages. The market hunter, or one hunting for home consumption, would be less likely to consume alcoholic beverages, but group participation in these cases would be variable. The market hunter would want few persons to know of his activities, whereas the spotlihter seeking excitement would probably brag of his adventure, and another person participating and witnessing the act would make his "bragging" more credible.

Rifles were used by the violators in 41.47% of the cases. Shotguns were used in 36.58% of the cases, and pistols in 4.88%. A rifle and shotgun were present in 12.19% of the cases, and a shotgun and pistol were present in 2.44%. A rifle, pistol and shotgun were present in one case or 2.44%. Bows were not used by any of the violators arrested during this survey. Of the rifles used, 25% were .30-30, 20% were 243, 15% were .22, 10% were .30-06, 10% were .264, and 10% were .308 caliber. A 7.5 mm rifle was present in one case, 5% of the total rifles used, and a .303 caliber rifle was also present in one case.

Of the shotguns used in the spotlighting violations 73.91% were 12 gauge, 4.34% were 16 gauge, 17.41% were 20 gauge, and 4.34% were .410 caliber. Of the pistols used by the violators, 50% were .22 caliber, 25% were .38 caliber and 25% were .45 caliber.

The violators were driving new sedans in 43.90% of the cases, and old sedans in 24.39% of the cases. New trucks were used in 19.52% of the cases while old trucks were used in 7.32% of the cases. Old station wagons were driven in 4.87% of the cases, and no cases involved a new station wagon.

In summary the 41 cases from the Spotlighting Arrest Report show that in an average case 1.68 agents arrested 2.37 persons. The average time of the violation was 11:10 p.m.. Deer were killed in 17.1% of the cases, and 71.4% of the deer killed were does. It was raining at the time of the violation in 9.75% of the cases, and fog or clouds were present in 26.8% of the cases.

The average age of those arrested was 28 years, and 12.4% of those arrested were females. The violators were drinking or under the influence of alcohol in 48.7% of the cases. Rifles were used in 41.5% of the cases, while shotguns were used in 36.6% of the cases. Of the rifles, the .30-30 caliber was the most popular, and the 12 gauge shotgun was preferred by those using shotguns. The violators were driving new sedans in 43.9% of the cases and old sedans in 24.4% of the cases. The violation would have been visible from the air in 92.5% of the cases.

A Comparison of the Spotlighting Arrest Report
Form with the N.R.A. Spotlighting Survey

The various aspects of the spotlighting violation obtained from both surveys are compared here. In the N.R.A. Survey, an average of 1.44 agents participated in each case, while in the Spotlighting Arrest report (S.A.R.) an average of 1.68 agents was involved. An average of 2.81 arrests per case were made in the N.R.A. survey, while 2.37 was

made in the S.A.R..

Deer were killed in 31.4% of the cases reported in the N.R.A. survey, as compared to 17.1% in the S.A.R.. This difference could be attributed to the agents remembering those cases with a deer kill more vividly, and thus, a higher percentage of these cases would be reported to the investigator when conducting the interview.

Of the total cases in the N.R.A. survey, 22.86% were made on Saturday evenings, while 29.26% were made on Saturdays in the S.A.R.. In the S.A.R., 19.52% of the cases were on Fridays, compared to 17.14% in the N.R.A. survey.

The average age of the violators arrested in the S.A.R. was 28 years, while in the N.R.A. survey the average age was 29 years. Females were present in 24.4% of the S.A.R. cases, and in 14.3% of the N.R.A. survey cases. The violators were drinking in 48.7% of the S.A.R. cases, and in 32.9% of the N.R.A. survey cases.

The violators used rifles in 41.5% of the S.A.R. cases, and 47.1% of the N.R.A. survey cases. Shotguns were used in 36.6% of the S.A.R. cases, and 47.1% of the N.R.A. survey cases. The vehicle used in 68.3% of the S.A.R. cases was a sedan, compared to 67.1% sedans in the N.R.A. survey.

The violation occurred in a field in 85.0% of the S.A.R. cases, and in 94.3% of the N.R.A. survey cases. Corn fields were the site of the violation in 14.8% of the S.A.R. cases, and in 34.9% of the N.R.A. survey cases. The violations would have been visible from the air in 92.5% of the S.A.R. cases compared to 95.7% of the N.R.A. survey cases.

The data obtained from these surveys appear to have consistent results in describing the spotlighting violation. The figures are most useful when viewed as providing general characteristics and patterns of the violators, and as guides to when and where the violations are most likely to occur.

Spotlighting Data Obtained from
Correspondence with Other States

Inquires to the states of Florida, New Jersey, North Carolina, West Virginia and Pennsylvania, concerning the characteristics of spotlighting violations produced replies from all states except Florida.

West Virginia stated that an average of 225 arrests are made each year for spotlighting. An estimated loss of 7500 to 8000 deer per year from illegal kills was reported. The adaptability of the airplane as a spotlighting enforcement tool was being investigated, and initial reports indicated that it would be an effective deterrent and means of locating and apprehending the spotlihter.

The reply received from North Carolina stated that "most of the night deer hunting is done from 1 September to 1 January, probably heavier in November and December. Approximately 75% of the spotlighting arrests made were in harvested soybean, cornfields and pastures, 25% were in wooded and fallen fields. Clear and cold nights seemed to be the type of weather desired in 75% of the arrests, compared to 25% cloudy and falling weather."

North Carolina has been using aircraft to assist in spotlighting patrols for 16 years, and with well planned ground crews, excellent results were obtained. The airplanes assisted in approximately 40%

of all spotlighting arrests made over the past eight years. Currently, four planes are in use: three Super Cubs and one Aero Commander.

In 1971, 175 spotlighting arrests were made. Of these, 132 were found guilty, 32 were not guilty, and 11 were still pending trial. No procedure was in use for estimating the extent of spotlighting, however it was felt that the violations were decreasing due to efficient patrols. Arrests for spotlighting were 15% less in 1971 compared to 1970. The agents have found that more arrests were made between 7:00 p.m. and 10:00 p.m., and between 12:30 a.m. and 2:30 a.m.. Also, a slight increase in arrests had occurred in the hour just before daylight over the last few years.

The reply from Pennsylvania acknowledged that spotlighting was a problem, and that available characteristics of the violation indicated that airplane patrols would be suitable for enforcement use. The reply from New Jersey stated that a total of 220 violations involving deer occurred in 1971 however the details requested concerning the spotlighting cases were not known.

The data received from North Carolina and West Virginia correspond with those from Virginia, and suggest that the results of this study might be applicable to other states in the southeast region. Since little information was provided from the states in the northeast region, no comparisons could be made.

Spotlighting Survey of the
Virginia Commission of Game and Inland Fisheries

This survey was distributed to all of Virginia's agents in 1970, and replies were received from 80 agents. Of the agents replying, 62.4%

stated that spotlighting violations in their county has increased when compared to 1968. The number of spotlighting violations was decreasing according to 18.8% of the agents, while 18.8% stated that the number of violations had remained constant in their county.

The majority of the agents, 62.4%, felt that most spotlighting violations occurred prior to the legal deer season, while 25.9% stated that most violations occurred during the legal deer season. The violations were believed to occur constantly according to 11.7% of the agents.

The agents stated that an average of 3.94 actual complaints of spotlighting were received per week from October 1st to December 31st. A range of 0 to 40 complaints was observed. An average of 3.55 casual complaints per week per agent was reported during the same period, with a range of 0 to 25 complaints observed.

Based on arrests and investigations for spotlighting, 39.9% of the agents stated that the reason for spotlighting was "hunting for kicks". According to 25.2% of the agents replying, the spotlighting was to obtain deer for home consumption, while 16.2% of the agents felt that the violators "couldn't resist spotlighting when the opportunity presented itself". Market hunting was believed to be the reason for spotlighting according to 8.9% of the agents, while 8.8% of the agents felt the "frustration in not obtaining a deer legally" was the basis for spotlighting.

The reasons given for spotlighting could be used as a basis for classifying spotlighters. The characteristics of the violation are

likely to vary depending upon the reason the particular violator has for spotlighting. Those spotlighters "hunting for kicks" are not as likely to take the same precautions to avoid arrest as market hunters. The characteristics of those violators spotlighting for home consumption are likely to be different from those that spotlight when the opportunity presents itself. In addition to these types, another reason for spotlighting was observed. Certain persons may have a grudge against the agent and participate in a spotlighting violation as a means of "getting back" at the agent. The continued collection of data from spotlighting cases could include several questions to test this hypothesis concerning the operational characteristics of spotlighters based on their reasons for spotlighting and their probability of being apprehended.

The agents were of the opinion that the land owner could best help to curb spotlighting by reporting immediately all shots, slow moving or suspicious cars, or lights on a field to the agent. If possible, the make, year, license and color of suspected vehicles should be observed. Also, information including the number of persons involved, and the number of shots heard would be most helpful. The landowner should be willing to testify in court if he has witnessed a violation, and allow the agents to set up stakeouts on his land.

The agents felt that legitimate sportsmen could help to curb spotlighting by warning fellow hunters that any violations would be reported to the agent. Also, it was suggested that spotlighting without guns be curtailed, as this often produces complaints which must be investigated and consume much of the agents' time. Spotlighting without guns also

result in the disclosure of stakeout positions and may alert the real violators as to the agents' location.

A Sociological Theory of Criminal Behavior

An adequate theory of crime causation must explain the distribution of criminal behavior in time and space and provide the basis for deriving predictive statements. Also, as part of that theory there must be a statement that identifies, at least by implication, the process by which persons come to exhibit criminal behavior. Such a statement, to be judged satisfactory, must enable predictions to be made about the behavior of individuals and their probability of committing a criminal act.

Several theories have been advanced to explain crime causation. The classical theory states that crime results when an individual calculates that the pleasures obtained from committing a crime exceed the pain of being apprehended and punished. This hedonistic casual philosophy is currently reflected in many present day reactions to crime. Punishment, in the form of fines or imprisonment, is the most frequently used response, and is based on the belief that the consequences of apprehension and punishment should exceed the benefits that an individual can derive from commitment of the crime. Also, inherent in this reaction is the belief that if the penalty is severe enough, the criminal will not want to suffer the pains of a second penalty, and this serves to prevent the individual from committing the crime again.

One theory currently held to be among the most widely acceptable is Sutherland's theory of "differential association" (1924). The following nine points form the framework for this explanation of crime causation:

1. Criminal behavior is learned.
2. Criminal behavior is learned in interaction with other persons in a process of communication.
3. The principal part of the learning of criminal behavior occurs within intimate personal groups.
4. When criminal behavior is learned, the learning includes:
 - A. techniques of committing the crime
 - B. the specific direction of motives, drives, rationalizations and attitudes
5. The specific direction of motives and drives are learned from definitions of the legal code as favorable or unfavorable.
6. A person becomes delinquent because of an excess of definitions favorable to violation of law over definitions unfavorable to violation of law.
7. These differential associations may vary in frequency, duration, intensity and priority.
8. The process of learning criminal behavior by association with criminal and anticriminal patterns involves all of the mechanisms that are involved in any other learning.
9. While criminal behavior is an expression of general needs and values, it is not explained by those general needs and the values, since noncriminal behavior is an expression of the same needs and values

This theory can be useful in explaining how individuals come to commit game violations, even though the original theory was formulated to include only civil and criminal law violations. Game violations, although part of civil law, have not been explained using this criminological theory. In this study the theory is applied in an attempt to describe the processes involved in the violation of this particular game law. The first premise is that the spotlighting behavior is learned in interaction with intimate personal groups through a process of communication. Those who have not been exposed to spotlighting through contacts with close personal friends are not likely to engage in this violation. Impersonal means of communication, such as newspapers, play a relatively unimportant part in the genesis of criminal behavior (Sutherland 1924).

The learning of the behavior defined as criminal will include the techniques of committing the crime and redefinitions of the legal codes as unfavorable. These redefinitions provide direction to the learner's motives, drives, rationalizations, and attitudes. In many groups in society individuals are surrounded by people who define the legal codes as rules to be observed, while in others they are surrounded by those whose views are favorable to the violation of the legal codes. In American society, in general, these definitions are almost always mixed. The consequence of this normative pluralism is cultural conflict in relation to the legal codes. When a citizen is caught produces conflict. When he sees around him more attitudes supporting spotlighting than rejection, he may violate the law.

The small chance of being apprehended, the low to non-existent cultural reaction to violation of game laws, and the opportunity for excitement and profit, are factors conducive to violations. Also, inadequate public education concerning wildlife management and a lack of public understanding about the need for wildlife protection requirements, contribute to the apathy displayed by many people towards game violations. In some rural areas where wildlife damages crops, hostility towards wildlife may be evident, and may serve as justification for violating the law.

Some people have respect for all laws, believing that thereby they contribute to the net social welfare, and will usually abide by these laws. The social stigma that may be attached to an individual if he is caught violating a law and the threat of punishment work against those

factors favorable to violating the law. The principle of differential association stated that a person becomes delinquent because of an excess of definitions favorable to violation of the law over definitions unfavorable to violation of the law. When a person violates the law, he does so because of associations with criminal patterns and isolation from anticriminal patterns.

Although the technique of spotlighting deer is probably known by most hunters, not all choose to violate this law. Sutherland attempted to explain why certain individuals will violate the law by stating that an individual's differential associations with criminal behavior and also associations with anticriminal behavior may vary in frequency, duration, priority, and intensity. "Frequency" and "duration" as modalities are easily apparent and need no explanation. "Priority" is assumed to be important in the sense that lawful behavior developed in early childhood may persist throughout life, and also that delinquent behavior developed in early childhood may persist throughout life. Sutherland further stated that "this tendency, however, has not been adequately demonstrated and priority seems to be important principally throughout its selective influence". "Intensity" has to do with such things as the prestige of the source of a criminal or anticriminal pattern and with emotional reactions related to the associations.

A person learns criminal behavior by association with criminal and anticriminal patterns, and this learning involves all of the mechanisms that are involved in any other learning. Negatively, this would mean that the learning of criminal behavior is not restricted to the process

of imitation. In other words, when individual A observes B committing a criminal act, A may also commit a crime and imitate B's technique, but the explanation of A's behavior is not simply based on imitation. The association that A experiences with criminal and anticriminal behavior patterns and his definition of the legal codes as favorable or unfavorable are among the factors Sutherland listed that will influence the decision to violate the law.

Although criminal behavior is an expression of general needs and values, it is not explained by those general needs and values, since non-criminal behavior is an expression of the same needs and values. For example, thieves generally steal in order to secure money, but likewise honest laborers work to secure money. The attempts by many scholars to explain criminal behavior by general drives and values, such as the happiness principle, the struggle for social status the money motive, or frustration, have been futile, since they explain lawful behavior as completely as they explain criminal behavior (Sutherland 1970 : 77).

The act of spotlighting deer, culminating in the violation itself, is a complex sociological phenomenon. The theory of differential association offers an attempt at understanding the nature of the causes of criminal behavior, and suggests methods that can be used for preventive strategies.

In summary, we assume that the act of spotlighting deer by an individual in violation of state law 29,144 is a behavior pattern that is learned by association with others that have participated in this

activity. Specifically, we assume that those who do not commit violations after being exposed to associations favorable to spotlighting receive an excess of associations favorable to abiding by the law. Conversely, those that do break the law are exposed to an excess of associations favorable to breaking the law. These associations vary in frequency, duration, priority, and intensity, depending upon the individual and the societal structure to which he is exposed, and the definition by that structure of a behavior pattern as desirable or undesirable.

An area for possible research would be the collection of suitable data to conduct a test of Sutherland's theory as it applies to the spotlighting violation in particular, and to game violations in general. It must be pointed out that tests of a theory of this nature are likely to involve empirical measurements and that conclusive proof or disproof possibly cannot be obtained. However, through careful study and analysis, the investigator may be able to determine whether adequate support is rendered for the use of the theory of Differential Association in explaining how individuals choose to commit violations of the game laws.

The Decision to Spotlight

The violation of the spotlighting law appears to be a decision made by an individual after a deliberation of possible outcomes and alternatives. The act of spotlighting is, in most cases, planned by the violator prior to the violation itself. Included in this planning would be various inputs and desired outputs which would be processed by the individual prior

to the violation.

In the field of decision theory there are three types of decision problems generally recognized and are designated:

1. decision making under certainty
2. decision making under risk
3. decision making under uncertainty

Decisions made under certainty are those for which the decision maker has complete information about the state of nature and therefore knows which state of nature is true. Decisions made under uncertainty are those for which the decision maker does not know the likelihood of occurrence of the various possible states of nature. Decisions made under risk are those for which the probability of each can be calculated or assigned (Buffington 1972).

In decisions made under risk, the decision maker does not know the true state of nature, but rather has partial information which can be expressed in terms of probabilities applicable to all of the possible states of nature. The probability associated with each possible state of nature may be derived either objectively or subjectively (Morris 1964). The violation of the spotlighting law appears to be a decision made under risk.

An analysis of this decision must include the inputs, processes, outputs and feedback characteristic of a system approach.

Numerous inputs enter into the decision to spotlight, and these would include the desired benefits such as a deer kill, food for a family, money from the sale of a deer, chance for excitement, or a chance to beat the agents. The chance of being apprehended, the fines

and penalties if convicted, along with the social stigma that may be attached to the violator would be thought of as risks. Other inputs might include the abundance of deer in the area, a knowledge of the agents patrols activities, the techniques of spotlighting, and an association with other individuals involved in spotlighting. The individual's cultural, educational and economic status would probably have an influence on the weight assigned or risks associated with those inputs that are considered prior to the violation.

The individual's decision would be based on a processing of these inputs comparing the benefits of spotlighting and the risks of apprehension. In several cases the spotlighting occurs when a deer runs in front of a vehicle and the individual sees the chance for an easy kill. Under these circumstances the decision must still be made to fire the weapon at the deer. In this type of case, the individual's decision is often rapidly determined and a limited number of inputs are likely to be considered. In other types of spotlighting cases, the decision must also be made as to when and where to spotlight. The choice of where to spotlight would probably be based on the individual's knowledge of an area, the abundance of deer, and any knowledge of the agents' patrol tactics in the area. The time of the violation, is likely to be based on arrangements made with other individuals, the desired benefits from spotlighting, and knowledge of the agents' activities.

The outputs of the decision to spotlight would be the individual's success in obtaining his desired benefits.

The feedback present in a systems analysis would be positive,

negative or possibly neutral. Positive feedback would occur if the violator was apprehended and the value assigned to the risk of spotlighting increased. Negative feedback would occur if the violator was not apprehended and the value assigned to the risk of spotlighting decreased. A neutral feedback would occur when no change in the inputs or processes was observed due to the apprehension or lack of it. Investigation of this area of wildlife law enforcement has been lacking and it is recommended that further research be conducted to determine the probabilities and relationships of the inputs, processes, outputs and feedbacks, as they apply to the decision to violate the law. It seems likely that Sutherland's (1924) concept of criminal behavior can be accommodated within the above analysis and the techniques and concepts of the systems approach found useful in extending his perception and developing solutions.

SUMMARY AND CONCLUSIONS

The largest percentage of arrests were made on Saturdays between the hours of 10:00 p.m. and 11:00 p.m.. Nearly 56% of all cases were made between the hours of 8:00 p.m. and midnight. A study by Progulske and Duerre (1964) stated that 79% of the deer observations were made within four hours after sunset. Therefore, patrols by the agents would appear to be most productive, in terms of apprehending violators and protecting deer, if conducted between the hours of 8:00 p.m. and midnight. The month of November contains the most arrests for spotlighting, with a peak around the legal deer season. Spotlighting violations appear to increase in frequency starting in October, and decrease in frequency after January. Spotlighting patrols should be conducted accordingly at these times.

Most of the violators appeared to spotlight during clear weather conditions, however several cases were made when it was raining.

Nearly all spotlighting occurred in private fields and from public roads. Corn fields surrounded by a mixture of oaks, and pines were the most common type of field. This description could apply to numerous areas within an agent's territory, but it was also observed that many violators traveled on heavy duty roads in an easterly direction. The violation occurred an average of approximately one mile from an occupied house, and 19 miles from the agent's home.

The agents should be especially alert for late model sedans carrying three males in their late twenties. Spotlights that plug into the vehicles cigarette lighter were commonly used.

Patrols using airplanes in conjunction with supporting ground crews

would appear to be successful in locating spotlighting violators. This method of patrol is currently in use in several states, and the possibilities for application in Virginia should be considered. Currently, stakeouts result in the most arrests for spotlighting. The data presented on the characteristics of the spotlighting violation should serve as guidelines for the location and time of spotlighting patrols and is discussed in detail in the text.

Using Vilkitis' formula, it was estimated that approximately 9000 spotlighting violations occurred in Virginia per year. Another estimate, based on the complaints of spotlighting received by agents, was approximately 6000 violations per year. Correlation tests utilizing the number of spotlighting arrests and several factors such as the legal deer kill, miles of road, etc., failed to establish any significant relationships.

Spotlighting data obtained from other states indicated that the characteristics of the spotlighting violation were similar to the characteristics observed in Virginia. It was reported that the most common reason given for spotlighting included hunting for excitement, to obtain meat for home consumption and market hunting.

This study attempted to describe a particular game law violation with the intent of providing information that would be useful in its control. From this study, it was evident that further research in the field of wildlife law enforcement is necessary. The following topics are recommended as areas of future investigation.

1. Continuation of spotlighting data collection by means of the form presented in Appendix V to indicate trends in violator and violation characteristics.

2. Determination of the relationship between the motivation for spotlighting and the characteristics of the violator.
3. A critical discussion of the sociological and criminological aspects of game law violations.
4. Development of computer simulations of big game violations as an aid for enforcement training.
5. Development of airplane patrols for big game enforcement work.
6. Determination of the relationship between game violation complaints received by agents with the number of arrests made for the violation.
7. Determination of the relationship between the number of arrests for a particular game violation and the actual number of violations occurring.
8. Development of a computer program that classifies, stores and provides immediate retrieval of all fish and game arrest records.
9. Conservation education of hunters and its effectiveness in curbing violations.
10. Development of a methodology for assigning agents to areas based on previous arrests, miles of roads, human population, game population, square miles of rural area, topographic characteristics, etc., as opposed to the current one agent per county.

It was concluded from this study that spotlighting violations are seasonal in frequency; that clear weather was favored for violations; that airplane patrols would be beneficial; that spotlighting occurs after a decision by the violator; that 6 to 9 thousand such violations occur each year in Virginia; and that spotlighting is wide and a serious enforcement problem in many other states.

LITERATURE CITED

- Anderson, C.F. 1959. Nocturnal activities of the Columbian black-tailed deer, Odocoileus hemionus columbianus Richardson, affecting spotlight census results in the Oregon coast range. M.S. Thesis, Oregon State University, Corwallis, Oregon.
- Barick, F.B. 1969. Deer predation in North Carolina and other South-eastern States. Southeastern Deer Symposium, Nacogdoches, Texas 24 p.
- Brown, G.T. 1962. The use of radio in law enforcement. Proc. of the Annual Conf. Southeastern Assoc. Game and Fish Commission 16:475-477.
- Buffington, C.D. 1972. An analysis of the desicion making systems within the National Wildlife Refuge System. Unpub. PhD. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 165 p.
- Canadian Wildlife Service, 1971. Law Enforcement. 15-16.
- Chabrack, R.H. 1967. The American Alligator-past, present, and future. Proc. of the Annual Conf. Southeastern Assoc. Game and Fish Commission 21:554-555.
- Cronemiller, F.P. and P.S. Bartholomew. 1950. The California mule deer in chaparral forests. California Fish and Game 36 (4):343-365.
- Dambach, C.A. 1948. Ohio State University Press. Columbus 222-229.
- Dasmann, R.F. and R.D. Taber 1956. Behavior of Columbian black-tailed deer with reference to population ecology. J. Mammal 37 (2):143-164.
- Dealy, J.E. 1966. Spotlighting deer:Potentials for management in western Oregon. Pacific North West Forest and Range Exp. Station 8 p.
- Eye, R.J. 1968. Spotlighting in West Virginia. Proc. Annual Conf. Southeastern Assoc. Game and Fish Commission 22:570-572.
- Giles, R.H., Jr., 1970. Wildlife law enforcement and research needs Manual of Wildlife Conservation R.D. Teague (ed) p. 131-133. The Wildlife Society, Washington, D.C.
- Giles, R.H., Jr., M. Kaminsky, and J. McLaughlin. 1971. Wildlife law enforcement research-The context and the needs. Proc. Annual Conf. Southeastern Assoc. Game and Fish Commission 25:677-687.
- Gillam, H.S. 1969. Spotlighting survey of Virginia wardens (unpub. data)
- Harper, J.A. 1962. Daytime feeding habits of Roosevelt elk on Boyes Prairie, California. J. Wildlife Management 26 (1):97-100.

- Hesselton, W.T. and H.F. Maguire. 1965. Report on percentage of hunters reporting the deer they take-1964. A separate report. PR Project W-89-R-9, Job VII-C, Albany, New York 4 p.
- Kirpatrick, G.D. 1968. The role of undercover investigations in conservation law enforcement, past, present and future. Proc. Annual Conf. Southeastern Assoc. Game and Fish Commission, 22:528-535.
- McCormick, J.B. 1968. A procedure for evaluating the effectiveness of wildlife law enforcement. Proc. Western Assoc. of State Game and Fish Commission, 12 p.
- Milstead, R.E. 1964. Aircraft employment in wildlife law enforcement. Proc. Annual Conf. Southeastern Assoc. Game and Fish Commission 18:562-564.
- Montgomery, G.G. 1963. Nocturnal movements and activity rhythms of white-tailed deer. J. Wildlife Management. 27 (3):423-427.
- Morris, W.T. 1964. The analysis of management decision, R.D. Irwin, Inc. Homewood, Ill. 551 p.
- Morse, W.B. 1969. Law enforcement. The Wildlife Soc. News. No. 119 51 p.
- Morse, W.B. 1972. Wildlife Law Enforcement. Presented at the West Assoc. of State Fish and Game Commission. Portland, Oregon 20 pp. (mimeo)
- Moser, C.A. 1962. The bighorn sheep of Colorado. Bulletin 10 Colorado Game and Fish Department. 49 p.
- Patton, C.P. 1964. The role of law enforcement in wildlife management Virginia Wildlife 25 (2):6.
- Progulske, D.R. and D.C. Duerre. 1964. Factors influencing spotlight counts of deer. J. Wildlife Management 28 (1):27-34.
- Sutherland, E. H. and D.R. Cressey. 1970. Criminology (8th ed.) Lippincott Co. 659 p.
- Vilkitis, J.R. 1968. Characteristics of big game violators and extent of their activity in Idaho. Unpub. M.S. Thesis, University of Idaho, Moscow, Idaho, 202 p.
- Vilkitis, J.R. 1971. The violation simulation formula proves as reliable as field research in estimating closed-season illegal big game kill in Maine. (Unpub. manuscript)
- Windsor, B.W. and W.L. Flory 1967. Cooperation between civilian and military game law enforcement. Proc. Annual Conf. Southeastern Assoc. Game and Fish Commission 21:558-559.

APPENDIX I

N.R.A. SPOTLIGHTING QUESTIONNAIRES

N.R.A. SPOTLIGHTING VIOLATION SURVEY

Agent _____

Observer Reporting the Violation _____

VIOLATION

1. Code _____
2. Was a deer actually killed? _____
3. Number of deer killed? _____
4. Approximate age of deer killed? _____
5. Sex of the deer killed? _____
6. Was the violation indicated by a carcass left to decompose? _____
7. If above is yes, what is the longest time the violation would be detectable? _____
8. Was the violator arrested or summonsed? _____
9. Number of wardens assisting in the case? _____
10. If the violator was arrested or summonsed, was this made as a result of a: 1. Tip? _____ 2. Stakeout? _____ 3. Routine Patrol? _____
4. Other? (Describe) _____
11. If an arrest was made, how much time was spent from the start of the patrol to the arrest of the violator? _____
12. What approximate percentage of stake outs result in an arrest? _____
13. Was there a chase to apprehend the violator? _____
14. If yes, estimate the maximum speed? (MPH) _____
15. Was the violator arrested with a deer or parts of a deer in possession? _____
16. Was the violator arrested while in the act of shooting a deer? _____
17. Was the violator arrested while in the act of retrieving a deer? _____
18. Was there a conviction obtained? _____
19. Were there any fines suspended? _____
20. Type of hunting season that was open at the time of the violation?

DATE

1. Date of the violation? _____
2. Day of the week of the violation? _____
3. Was it a holiday? _____
4. Time the violator was arrested? _____
5. Was it AM? _____

WEATHER

1. Was it raining at the time of the violation? _____
2. Was there snow on the ground at the time of the violation? _____
3. Was precipitation predicted for the time of the violation? _____
4. What was the approximate temperature at the time of the violation?
_____ (of)
5. At the time of the violation, how many days were there since the last precipitation? _____
6. During the evening of the violation, was there: 1. moonlight? _____
2. starlight? _____ 3. fog or clouds? _____

VIOLATOR

1. There were _____ persons arrested from a group of _____ persons, with an average age of _____ for those arrested, and an average age of _____ for the rest of the group.
2. Was the violator on strike or a work layoff from his job? _____
3. Residence of the violator? _____
4. Was the violator in military service? _____
5. Was the violator apprehended at: 1. the site of the violation? _____
2. his home? _____ 3. other? _____
6. Were there women present at the time of the violation? _____
7. Were any women arrested? _____
8. Were there any children (under 12) present? _____
9. Was the violator guilty of any other offense? _____

10. Violator was dressed: 1, normally _____
 2. camouflaged _____ 3. other (describe) _____
11. Did you know the violator: 1, personally? _____
 2. thru a previous arrest? _____ 3. previously not known? _____
12. The weapon used was a ; 1. rifle? _____ 2. pistol? _____
 3. shotgun? _____ 4. bow? _____
13. If a shotgun was used, was it a: 1, single barrel? _____
 2. double barrel? _____ 3. pump? _____ 4. automatic? _____
14. Was it sawed off? _____
15. What was the gauge and shot size? Gauge _____ Shot _____
16. If a rifle or pistol was used, what was the caliber? _____
17. Was a scope used? _____
18. Was a vehicle used? _____ If so, answer 19 and 20; if not, go to 21.
19. Vehicle used was: old(1965-) _____ new (1966+) _____
20. Vehicle used was a: 1, sedan _____ 2. truck _____
 3. station wagon _____ 4. other _____
21. The type of spotlight used was: 1, fixed to car _____
 2. hand flashlight _____ 3. headlights _____
 4. lighter plug in rig _____ 5. sealed beam battery pack _____
22. Was the violator under the influence of alcohol? _____

LOCATION OF THE VIOLATION

1. Topographic map ID code _____ Section _____
2. County code _____ Watershed code _____
 Planning region _____
3. The area is now patrolled with _____ frequency
 since the violation (1=greater, 2=equal, 3=less)
4. Was the spotlighting done on 1, public land? _____
 2, private land? _____
5. Was the spotlighting done on a: 1, military road _____
 2, public road _____ 3, private road _____
6. Was the violation on a restricted area? _____

7. If answer to above is yes, was it a: 1. military area _____
 2. state game area _____ 3. state institutional area _____
 4. private home _____ 5. private posted refuge _____
 6. public posted refuge _____ 7. guest hunting area only _____
8. Estimate the road distance in miles from the violation site to:
 1. agents house _____ 2. agents office _____
 3. nearest occupied house _____ 4. nearest town _____
 5. violators house _____ 6. heavy duty road _____
 7. light duty road _____ 8. waterway _____
9. In what direction was the violator moving? _____
10. Name of nearest stream, river or lake? _____
11. What is the direction to the nearest stream, river or lake? _____
12. Estimate the slope of the road at the violation site? _____

LOCATION OF APPREHENSION

1. Was the site of apprehension the same as the site of the violation? _____
2. If answer is no, what is the topographic map ID code? _____
 Section _____
3. County code? _____ Watershed code? _____
 Planning region? _____
4. This area is now patrolled with _____ frequency
 since the violation (1=greater, 2=equal, 3=less)
5. What is the direction from the violation site to the apprehension
 site? _____
6. What is the distance in miles between the violation site and the
 apprehension site? _____
7. Estimate the road distance in miles from the site of apprehension to:
 1. agents house _____ 2. agents office _____
 3. nearest occupied house _____ 4. nearest town _____
 5. violators house _____ 6. heavy duty road _____
 7. light duty road _____ 8. waterway _____
8. What is the name of the stream, river or lake closest to this
 site? _____
9. What is the direction from the site to the nearest stream, river or
 lake? _____

COVER DENSITY AT VIOLATION SITE

1. Did the violation occur in a: 1. forest? _____ 2. field? _____
3. other? _____ If answer is #1, answer questions 8 to 11. If answer is #2, answer questions 2 through 7, and #11.
2. If the violation occurred in a field, what type of crop or pasture was the field planted in? _____
3. Was the crop harvested before the time of the violation? _____
4. How far from the field was the nearest woodlot? _____
5. What is the average diameter at breast height (dbh) of the trees? _____
6. What type of forest is around the field? _____
7. What is the understory density code? _____
8. If the violation occurred in a forest, what type was it? _____
9. What is the average diameter at breast height (dbh) of the trees? _____
10. What is the understory density code? _____
11. Would the violation have been visible from the air? _____

AT THE APPREHENSION SITE (if different from above)

1. Did the apprehension occur in a: 1. field? _____
2. forest? _____ 3. other? _____
If answer is #1, answer questions 2 through 5, and #9. If answer is #2, answer questions 6 to 9.
2. If it occurred in a field, what type was it? _____
3. What is the average diameter at breast height of the trees surrounding the field (dbh)? _____
4. What is the understory density code of the above trees? _____
5. What is the forest type around the field? _____
6. If the apprehension occurred in a forest, what type was it? _____
7. What is the average diameter at breast height (dbh) of the trees? _____
8. What is the understory density code? _____
9. Would the apprehension have been visible from the air? _____

N.R.A. SPOTLIGHTING SURVEY CODE SHEET

RESPONSE

0=No response; 1=Yes; 2=No

VIOLATION

1=29.144.1; 2=29.144.2; 3=29.144.3;
4=29.144.4

DEER AGE

1=6 Months; 2=1 Year; 3=1½ Years;
4=2½ Years; 5=3½ Years; 6=4½ Years

DEER SEX

3=Male; 4=Female

HUNTING SEASON

1=Deer; 2=Small Game; 3=Furbearers;
4=Turkey; 5=Migratory; 6=None;
7=Bow; 8=Everything; 9=Bear

DATE

1=Sunday; 2=Monday; 3=Tuesday;
4=Wednesday; 5=Thursday; 6=Friday;
7=Saturday

WEATHER

2=Below 0°F; 0=Above 0°F

COMPASS CODE

1=North; 2=Northeast; 3=East;
4=Southeast; 5=South; 6=Southwest;
7=West; 8=Northwest

SLOPE

1=0-5% (Slight); 2=6-14% (Moderate); 3=15% +

TYPES OF FOREST-Coniferous

113=Pines; 122=Hemlock-White Pine;
123=Spruce-Fur; 131=Cedar-Pine; 144=Hedge

HARDWOODS

200=Oak-Pine- mostly oak; 240=Oak-gum-cypress;
262=Red Oak-Basswood - Ash; 250=Oak-Hickory;
252=Black locust; 261=Yellow poplar

COVER DENSITY-Types of Fields

01=Corn;	02=Alfalfa;	03=Oats;
04=Wheat;	05=Barley;	06=Rye;
07=Sorghum;	08=Soybeans;	09=Abandoned-Cedar and Weeds;
10=Tobacco;	11=Lespedeza;	12=Grass;
13=Apples;	14=Peaches;	15=Pears;
16=Permanent Pasture;	17=Bluegrass-Clover;	
18=Truck Crops;	19=Peanuts	

CITY/COUNTY CODE

<u>CODE</u>	<u>COUNTY</u>	<u>CODE</u>	<u>COUNTY</u>
100	Accomack	149	King and Queen
101	Albemarle	150	King William
102	Alleghany	151	Lancaster
103	Amelia	152	Lee
104	Amherst	153	Loudoun
105	Appomattox	154	Louisa
106	Arlington	155	Lunenburg
107	Augusta	156	Madison
108	Bath	157	Mathews
109	Bedford	158	Mecklenburg
110	Bland	159	Middlesex
111	Botetourt	160	Montgomery
112	Brunswick	161	Nansemond
113	Buchanan	162	Nelson
114	Buckingham	163	New Kent
115	Campbell	165	Northampton
116	Caroline	166	Northumberland
117	Carroll	167	Nottoway
118	Charles City	168	Orange
119	Charlotte	169	Page
120	Chesterfield	170	Patrick
121	Clarke	171	Pittsylvania
122	Craig	172	Powhatan
123	Culpeper	173	Prince Edward
124	Cumberland	174	Prince George
125	Dickenson	175	Prince William
126	Dinwiddle	177	Pulaski
128	Essex	178	Rappahannock
129	Fairfax	179	Richmond
130	Fauquier	180	Roanoke
131	Floyd	181	Rockbridge
132	Fluvanna	182	Rockingham
133	Franklin	183	Russell
134	Frederick	184	Scott
135	Giles	185	Shenandoah
136	Gloucester	186	Smyth
137	Goochland	187	Southampton
138	Grayson	188	Spotsylvania
139	Greene	189	Stafford
140	Greensville	190	Surry
141	Halifax	191	Sussex
142	Hanover	192	Tazewell
143	Henrico	193	Warren
144	Henry	195	Washington
145	Highland	196	Westmoreland
146	Isle of Wright	197	Wise
147	James City	198	Wythe
148	King George	199	York

<u>CODE</u>	<u>CITY</u>
200	Alexandria
238	Bedford (1-1-69)
201	Bristol
202	Buena Vista
203	Charlottesville
234	Chesapeake
204	Clifton Forge
205	Colonial Heights
206	Covington
207	Danville
236	Emporia (1-1-68)
232	Fairfax
208	Falls Church
233	Franklin
209	Fredericksburg
210	Galax
211	Hampton
212	Harrisonburg
213	Hopewell
235	Lexington
214	Lynchburg
215	Martinsville
216	Newport News
217	Norfolk
218	Norton
219	Petersburg
220	Portsmouth
221	Radford
222	Richmond
223	Roanoke
237	Salem (1-1-68)
224	South Boston
226	Staunton
227	Suffolk
228	Virginia Beach
229	Waynesboro
230	Williamsburg
231	Winchester

AGENT CODE

<u>CODE</u>	<u>NAME</u>	<u>CODE</u>	<u>NAME</u>
1	Lewis Brandt	48	E. R. Arrington
2	C. R. Walker	49	J. A. McClenny
3	F. W. Hanks	50	W. E. Eggleston
4	J. E. Allen	51	Donald Zepp
5	R. B. Chenault	52	C. T. Bland
6	C. D. Torrence	53	G. H. Meredith
7	N. O. Cole	54	H. H. Pittman, Jr.
8	Jerry W. Dove	55	E. T. Rasnic
9	Donald R. Miller	56	T. A. Daniel, Jr.
10	W. W. Shields	57	L. R. Buchanan
11	W. E. Wilmoth	58	Melvin R. Johnson
12	W. W. Richardson	59	R. S. Crigler
13	P. P. Monaghan, Jr.	60	G. P. Simmons
14	J. W. Heslep	61	B. U. Miller
15	Ted Ward	62	W. W. Nance
16	D. E. Blosser	63	Norman B. Myers
17	J. P. Monaghan	64	Joseph K. Cooke
18	Roland Eagar	65	R. L. Griffith
19	C. R. Chappelt	66	J. W. Crumb
20	D. L. Montgomery	67	O. C. Crowther
21	J. L. Elgin	68	Nelson Phelps
22	J. R. Bellamy	69	J. W. Crickenberger
23	B. S. Denney	70	Robert W. Inskeep
24	J. H. Eakin	71	T. J. Clement
25	R. O. Young	72	S. V. Pickrel
26	Jacob T. Newman	73	J. A. Tramel
27	Otto Kendrick	74	James C. Holt
28	F. M. Fenderson, Sr.	75	Kenneth W. Dudley
29	R. C. Hutchinson, Jr.	76	Garland Foster
30	R. G. Holdaway	77	W. L. Flory
31	G. A. Wilkes	78	Donald A. McLeod
32	J. W. West	79	Irvin L. Kenyon, Jr.
33	W. M. Haden	80	J. Leonard Ross
34	D. H. Thompson	81	D. P. Wirt
35	G. T. Preston	82	Jesse K. Updike
36	Jerry D. Whittaker	83	R. E. Wilfong
37	David R. Ramsey	84	J. H. Perry
38	William T. Jamison	85	Joseph J. Gillespie
39	S. R. Stanford	86	Fred W. Hottle
40	J. S. Winn	87	W. B. Tuttle
41	Page Clark	88	W. W. Newman
42	C. L. Collins	89	B. H. Perry
43	R. E. Austin	90	J. B. Nicholson, Jr.
44	A. E. Cole	91	D. W. Gentry
45	W. R. Redrods, Jr.	92	F. C. Boggs
46	J. J. Westbrook	93	Stuart P. Doggett
47	R. W. Crawford	94	C. N. Hunter

<u>CODE</u>	<u>NAME</u>
95	G. A. Hawks
96	J. C. Wilson
97	J. W. Simpson
98	Roy A. Smith
99	F. E. Settle
100	R. W. Marshall
101	R. G. Mithcell
102	E. G. Mitchell, Jr.
103	J. D. Dedrick
104	S. B. Snead
105	D. W. Hinchey
106	G. C. Fentress
107	James L. Ogden
108	E. E. Walters
109	H. E. Kingery
110	B. L. Ambler
111	V. W. Edwards
112	G. J. Otey
113	G. P. Carson
114	C. C. Spensor
115	F. Strickler
116	A. Dippre
117	T. Sandy
118	E. R. White
119	R. N. Wolfeuden
120	P. Davenport
121	G. Chesser
122	L. S. Huffner
123	J. W. Raybourne
124	C. H. Wells
125	Swain
126	K. L. Bowyer

APPENDIX II
SPOTLIGHTING ARREST REPORT FORM

SPOTLIGHTING ARREST REPORT

Agent Making the arrest _____

Number of other agents assisting in the case _____

Date of the violation _____

Time of the violation _____

Day of the week of the violation _____

Time from the commitment of the violation until arrest _____

Violation code 29.144, _____

Number and sex of deer killed: Bucks _____ Does _____

LOCATION OF THE VIOLATION

1. County _____ Road Number _____

2. Name of the nearest town _____

3. Distance in miles to the nearest town _____

4. Direction to the nearest town _____

5. Did the violation occur in a: Field (Type) _____
Forest (Type) _____ Other (Describe) _____

6. Would the violation have been visible from the air? _____

WEATHER

1. Was it raining at the time of the violation? Yes _____ No _____

2. Was it snowing at the time of the violation? Yes _____ No _____

3. What was the approximate temperature at the time of the violation?
_____ °F

4. At the time of the violation was there: Moonlight _____
Clear _____ Fog or clouds _____

THE VIOLATOR

1. Number of persons arrested? Males _____ Females _____

2. Age of those arrested _____

3. Were any of the violators on strike or work layoff? _____

4. Were any of the violators drinking? _____

5. The weapon(s) used was a: Rifle (caliber) _____
Pistol (Caliber) _____ Shotgun (Gauge) _____
Bow _____
6. The vehicle used was: old(1965-) _____
new (1966+) _____ sedan _____
truck _____ station wagon _____
jeep _____

APPENDIX III
INTRODUCTORY LETTER FOR THE
SPOTLIGHTING ARREST REPORT FORM

TO: Select Wardens

FROM: John H. McLaughlin

The questionnaires enclosed are a part of the deer spotlighting study being conducted by the Virginia Tech Wildlife Research group under a grant from the National Rifle Association. You have been previously notified of this study and its objectives, and if you have not yet been contacted by the graduate student conducting the research, you will be interviewed sometime within the next two months.

The enclosed forms are for the purpose of gaining accurate information regarding some of the characteristics of spotlighting violations and violators. For each spotlighting arrest that you make this year, your cooperation is requested in filling out one of these forms. The few minutes required to do this will be greatly appreciated by all those involved in this study. The completed forms should be mailed to this office with monthly reports, etc.. We'll send them to Virginia Tech. If any questions arise concerning the form, or if more forms are desired, please feel free to contact Michael Kaminsky at the Division of Forestry and Wildlife Science, Cheatum Hall, VPI and SU, Blacksburg, Virginia 24061, or phone 951-2865.

Again please be assured that this study is not directed at measuring your personal effectiveness, and all statements will be held in strict confidence. Only the general overall findings from the questionnaires will be reported.

Thanks again for your cooperation.

SELECT WARDENS

1. C. R. Walker, Route 6, Charlettesville 22901
2. F. W. Hanks, R. F. D. #2, Hotsprings 24445
3. C. D. Terrence, R. F. D. #2, Appomattex 24522
4. J. W. Dove, Route 1, Box 57, Churchville 24421
5. D. R. Miller, Box 122, Warm Springs 24484
6. D. E. Blessner, Dillwyn 23936
7. R. Eager, Bowling Green 24427
8. J. R. Bellamy, 3810 Dunraven Road, Richmond 23225
9. J. H. Eakin, Box 235, New Castle 24127
10. J. T. Newman, Cumberland 23040
11. R. G. Holdaway, Apartment 201, 10756 Main Street, Fairfax 22030
12. D. H. Thompson, Palmyra 22963
13. W. T. Jamison, Pembroke 24136
14. E. R. Arrington, P. O. Box 41, Monterey 24465
15. H. H. Pittman, Jr., Regina 22540
16. W. W. Nance, P. O. Box 214, Christiansburg 24073
17. J. K. Cooke, Route 2, Box 232AAA, Aften 22920
18. D. P. Wirt, P. O. Box 1270, Lexington 24450
19. J. K. Updike, Timberville 22853
20. R. E. Wilfong, R. F. D. #5, Harrisonburg 22801
21. D. W. Gentry, Route 1, Box 65, Wakefield 23888
22. F. C. Boggs, Route 3, Box 143, Fredericksburg 22401
23. S. F. Doggett, R. F. D. #3, Box 122E, Stafford 22554
24. J. D. Dedrick, Route 3, Box 2B, Spotsylvania 22553
25. G. Carson, Sr., Route 1 Box 36, Millboro 24460

APPENDIX IV
SPOTLIGHTING SURVEY OF VIRGINIA'S
AGENTS BY THE VIRGINIA COMMISSION
OF GAME AND INLAND FISHERIES

SPOTLIGHTING SURVEY

We are trying to collect information for a magazine article on Spot-
lighting. If you will help us by filling out the form below to the best
ability, we will try to prepare an article telling the legitimate hunter
what these outlaws are doing to his deer herd and what he can do to help
stop it.

I would say spotlighting in my work area is up down
from what it was in 1968.

Most incidents occur pre-season, in season constantly.
I get about actual complaints, plus casual reports of spot-
lighting per week from October to December.

Based on your arrests and investigations, rate the following
motivations for spotlighting in 1, 2, 3 order according to importance.

- Hunting for Market
- Hunting for "Kicks"
- Frustration at not finding deer during legal hours
- Can't resist when opportunity comes
- Hunting for meat for home consumption
- Other

How can the land owner best help you to curb spotlighting?

How can the law abiding sportsman best help you to curb spotlighting?

Please describe your most interesting spotlighting case during the
past couple of years on the reverse side of this form in as much detail
as possible. It is not necessary to use names.

APPENDIX V
SUGGESTED FORM FOR THE CONTINUATION
OF SPOTLIGHTING DATA COLLECTION

SPOTLIGHTING ARREST REPORT

Agent's Name _____

Assigned County _____

Date of the violation _____

Time of the violation _____

Day of the week of the violation _____

Violation code 29.144. _____

Number and sex of deer killed: Bucks _____ Does _____

What was your total time spent on spotlighting patrols from your last spotlighting arrest until this one? (Include time spent on unsuccessful spotlighting patrols) _____ hours.

LOCATION OF THE VIOLATION

1. County _____

2. Distance to the nearest occupied house _____

3. Type of roads the violators were traveling on: highway _____
secondary paved _____ stone _____ dirt _____

4. Did the violation occur in a: field(type) _____
Approximate acreage _____ forest(type) _____
other (describe) _____

WEATHER

1. Was it raining at the time of the violation? Yes _____ No _____

2. Was it snowing at the time of the violation? Yes _____ No _____

3. What was the approximate temperature? _____ OF

4. At the time of the violation was there: moonlight _____
clear _____ Fog _____ Clouds _____

THE VIOLATOR

1. Number of persons arrested? _____ Males _____ Females _____

2. Age of those arrested _____

3. Were youth (Less than 16) present? Yes _____ No _____

4. Were any of the violators drinking? Yes _____ No _____
5. Were any of the spotlighters charges with other violations? If so, please describe. _____
6. Were any of the violators know to the agent? Yes _____ No _____
If so, was this through a previous arrest or a personal acquaintance?

7. What was the violators reason for spotlighting?
 a. hunting for kicks or excitement _____
 b. obtain deer for home consumption _____
 c. couldn't resist when the opportunity presented itself _____
 d. market hunting _____
 e. frustration in not obtaining a deer legally _____
 f. other _____
8. The weapon used was a: rifle(caliber) _____ bow _____
 pistol (caliber) _____ shotgun (gauge) _____
9. The vehicle used was: old(1967-) _____ truck _____
 new (1968+) _____ sedan _____
 station wagon _____ jeep _____
10. Was the arrest made as the result of a: tip and investigation _____
 tip and stakeout _____ stakeout _____
 routine patrol _____ other (Describe) _____

**The vita has been removed from
the scanned document**

ABSTRACT

Interviews with 20 conservation agents of the Virginia Commission of Game and Inland Fisheries provided information on 70 cases of deer spotlighting violations in 1969 and 1970. An additional survey produced information on 41 deer spotlighting cases in 1971. The number of spotlighting violations was observed to increase during the month of October, peak in November, and decrease in January. The average time of arrest for spotlighting was 11:37 p.m., and the largest percentage of arrests were made on Saturday evenings.

The various aspects of the violation were described including such factors as the weather; characteristics of the violator; weapon, spotlight and vehicle used; violation site; and apprehension site.

Estimation of the extent of spotlighting in Virginia was made. Using two methods 6000 and 9000 violations per year were obtained. There were no significant correlations between legal deer kill or miles of road with the number of spotlighting arrests. Correspondence with several other states indicated violator and violation characteristics were similar to those found in Virginia.

The sociological and criminological aspects of the violation were discussed, and a typology of the spotlighting violator was developed based on the assumption that the spotlighting violation occurred as the result of a decision made by the violator.