A GEOGRAPHY OF DEER HUNTING IN THE UNITED STATES

By

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UNITED STATES

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PREFACE

This study dealt with the patterns of deer hunting in the United States. Selected deer hunting variables were analyzed to determine the degree of spatial variation while factor analysis and clustering were utilized to produce deer hunting regions.

I want to thank my advisor, Dr. Gordon E. Matzke, for his advice and encouragement throughout the preparation of this thesis, although there were times when both of us had our doubts about many things. Dr. Robert E. Norris, another committee member, is due appreciation for his help on the methodological problems that I experienced. The guidance of committee member Dr. Jim Shaw is also appreciated.

The help that Dr. Steve Tweedie and Dr. Keith Harries provided me while working with the computer programs used in this thesis was invaluable. Completing this thesis would have been a much more difficult task without their assistance. Thanks also goes to Mrs. Marilyn Wheeler, who typed this thesis, and to Rod Lindner and Don Wade for their cartographic advice.

I would also like to thank my parents, Roy and Adeline Springer, for without their support I could not have completed my work at Oklahoma State. Finally, I want to thank Lisa Lorenzen for all of her help and encouragement. Even though I may have been a "dud" while I was working on this project, she stood by me all the way. Thank you Lisa.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Background

Hunting in the United States is an old, well established tradition, although over the years the reasons for hunting have changed. At one point in American history, hunting was largely a means of livelihood. It now has evolved into primarily a sporting activity. The numbers and species of animals hunted have also changed over time, and although hunting regulations have been in effect in some states for centuries, only recently have comprehensive regulations been adopted by states in an attempt to manage game as a resource.

Due to expanded research efforts, much is known about wildlife conservation. The U.S. Fish and Wildlife Service and other Federal agencies continue to conduct research in game management. Each state's fish and game department works on a local level to improve wildlife conservation. State colleges and universities undertake game research through wildlife extension programs. Much of the money needed to continue this research comes from the hunters themselves, generated through a tax on the sale of firearms and ammunition. These combined efforts provide conservationists and environmentalists with an increasing amount of knowledge.

Today's wildlife experts are skilled in utilizing methods of resource management and conservation. These specialists cannot

make law; it is their responsibility to recommend to State conservation commissions and Federal agencies hunting regulations that both protect game populations and allow hunters to harvest surplus game. The differences in hunting regulations that result from decisions made by game commissioners provide interesting geographic questions.

Purpose of the Study

The purpose of this thesis is to determine the geographical patterns of deer hunting regulations and provide possible reasons why these patterns occur. It is through the geographic method that deer hunting regulations can be examined to show that distinct deer hunting regions have developed, based on patterns of hunting practices and resource availability.

The deer, chosen to be the focus of this thesis, is the most frequently hunted big game animal in the United States and is the only big game animal hunted in all 50 states. They are subject to constant management attempts to maximize herd size for the available habitat and to provide a maximum Fall harvest.

The opportunity to hunt deer is controlled by the individual states. Most state legislatures have established game commissions with the authority to set rules governing the hunting of all non-Federally regulated wildlife. It is important, therefore, to understand the workings of the game commission and the pressures on the commissioners in the performance of their duties.

The individual state deer hunting regulations will be examined and discussed. In addition, a series of maps will be presented to emphasize the deviations found in the regulations. It is possible to

separate the regulations into basic catagories; therefore they will be divided into sections concerning:

a. licensing requirements
b. hunters
c. season length
d. bag limits
e. methods of taking
f. harvest

These sections will include data from both firearm and archery deer hunting. In addition, factor analysis and clustering will be utilized to group states with similar deer hunting characteristics based on specific criteria.

Data used in the research were derieved from an examination of each state's hunting regulations, the National Rifle Association's Hunting Annual , as well as published literature on deer habitat, population, and harvest. The study area will be limited to the contiguous United States.

This examination of deer hunting regulations will address the following questions:

1. How do:
   a. season lengths
   b. bag limits
   c. legal methods of taking deer
   d. deer hunting license fees
   e. deer licensing requirements

   differ over the United States?

2. What areas of the United States have like deer hunting characteristics and can therefore be regionalized?

A discussion of these questions will show that a large degree of the differences in deer hunting regulations is explained as much by the desire for hunter convenience and tradition as by wildlife management needs. An examination of the regulations will illuminate the "human" side of hunting and the importance of the hunter in the overall wildlife management program.

Literature Review

One of the difficulties encountered in dealing with the subject of deer and deer hunting is the great abundance of available literature. Popular sporting magazines present new techniques of deer hunting and articles on where to hunt deer appear almost monthly. Each state's fish and game department publishes detailed information concerning fees, bag limits, shooting hours and other licensing requirements. A national hunting organization compiles licensing information and data on deer populations, harvest and hunting regulations on a nation-wide basis (National Rifle Association, 1976).

The majority of the published technical literature examines only the biological aspects of deer management, while ignoring the role that people, especially deer hunters, play in overall deer management (Cain, 1960). Cain argued that the answers to many of the management problems could be solved by a more thorough understanding of the behavior of the hunter.

Recognition of the importance of the role of the hunter in wildlife management is relatively recent. Shea (1948) stated that

game management is a profession requiring a knowledge of both wildlife management and human relations, and that an understanding of human nature could lead to better overall game management. Williamson and Teague (1971) believed that man's behavior towards wildlife resulted from several factors, including religion, culture, tradition, politics and economics. Each culture, they argued, established its own values on what types of wildlife are to hunted or protected. These cultural viewpoints may still be strongly felt in some parts of the nation today. One way these differences may be best observed is by examining the hunting regulations currently in effect across the nation.

Some modifications of hunting regulations are in response to factors such as terrain, herd size, climate, vegetation, available food supply and the number of hunters. Other regulations aim to improve hunter success (Richardson and Peterson, 1974). Williamson and Teague, (1971) urged that the social sciences be included in wildlife management research so that fields such as human ecology, anthropology, history and social psychology can be utilized to provide a better overall game management program.

Along with the social sciences mentioned above, it is also possible to perform wildlife research through the use of geographical analysis. Modern geography is based on four main areas or traditions: spatial science, area studies, man-land and earth science (Pattison, 1964). The spatial science tradition, the examination of phenomema over space, primarily involves the use of maps and has been utilized by many geographers. Abler, Adams and Gould (1971), discuss spatial interaction in their book Spatial Organization: The Geographer's View of the World, as does Haggett (1972). Stout's (1972) survey

of the nationwide use of the antlerless deer harvest as a management tool is one of the few papers written by a wildlife expert that describes deer regulations in a geographical viewpoint, following much the same format as Capel's (1970) analysis of wild turkey regulations.

Although hunting has been virtually ignored by geographers, the study of the geography of team sports has been examined. Rooney, in his book From Cabin Creek to Anaheim: A Geography of American Sport (1974), presents many basic geographical concepts applicable to sport, and is the vangard text in this area. Prepared along the same lines is Jenkinson's (1972) study of basketball in Indiana.

Attention should also be given to the concept of the geographical region. As viewed by geographers, regions refer to areas of the earth's surface which have a substantial degree of internal homogenity (Wheeler, Kostbade and Thoman, 1969). Regions can be physical, social, economic, political, or composites of these.

Regions can also be based on cultural phenomenon. According to Zelinsky (1973), five processes have worked singularly and in combination to produce American cultural regions:

1. The importation of selected individuals and, hence, selected cultural traits.
2. Long distance transfer of people and their culture.
3. Cultural borrowing from the aboriginal population.
4. The local evolution of American culture.
5. A continuing interchange with other parts of the world.

(p. 6-9).

Regions are intellectual concepts of the human -- natural landscape where a variety of elements and their mutual interdependence are examined in some segment of earth space (McDonald, 1972). Regions are used in an attempt to show areas of the earth surface having common traits as part of the larger whole. Basic elements of regions include: location, distance, direction, spread and extent (Whittlesey, 1967).

It is important to determine the region, its boundaries, and the amount of variation possible in the region according to an established set of criteria. In this way, only factors relevent to the makeup of the total region will be utilized in the study. There are almost endless criteria on which to base the formulation of a region. Regions identified in this thesis will be formed along state boundaries; climate, terrain or other geographical factors will not be used as regional measures. Formation of regions will be based on similarities in deer hunting regulations, harvests and other stated deer hunting factors.

It can be seen, then, that a great deal of research is needed before the impact of culture and tradition on wildlife management can be fully understood. One method of measuring this impact would be to utilize geographic analysis to identify cultural hunting regions. Through the identification of culture areas and use of other social science tools, game management specialists could become more aware of the role of man's beliefs and behavior on wildlife management.

Objectives and Procedures

Briefly stated, the objectives of this thesis are to (1) determine how deer hunting regulations differ over space (2) suggest reasons for these differences and (3) to produce a national regionalization of areas having similar deer hunting characteristics based on biological and cultural factors. The study is intended to examine deer hunting regulations geographically, not biologically. This is not to assume that some regulations are not promulgated in accordance to biological factors, only that the biological factors will be dealt with geographically.

Chapter II will briefly describe the deer situation in the United States, including the distribution of deer species. Also included is a short history of deer hunting in this country. The powers of the state game commissions and their role in the establishment of deer hunting regulations are discussed.

Chapter III contains an examination of deer hunting regulations for both firearm and archery seasons. While it is possible to visually display the regulations by state and explain some of the differences through non-biological factors, it must be remembered that many states are divided into management units for the purpose of deer hunting, and that intrastate disparity is common. Although the length of a state's firearm deer season will be listed, for example, this does not necessarily mean that the entire state will have exactly the same season length. At all times only those regulations in effect over all or most of a state will be examined.

Chapter IV will deal with the formation of regions of like deer hunting characteristics. In this chapter selected deer hunting traits will be subjected to factor analysis and clustering. It is through these techniques that deer hunting regions can be determined.

Chapter V will summarize the study and provide suggestions for future research.

CHAPTER II

THE DEER AND DEER HUNTING IN THE UNITED STATES

In order to understand the sport of deer hunting, it is important to know the distribution of deer in the United States. In addition, knowledge of the history of deer hunting in this country is vital, for it is out of the past that our present-day deer regulations have evolved. An awareness of the workings of the game commission is also essential, for it is usually the game commission that promulgates the regulations that the deer hunter must follow.

The deer hunted in the United States fall into three main species: white-tailed (Odocoileus virginanus) mule (Odocoileus hemionus) and black-tailed (Odocileus hemonus columbianus). Each species varies according to size, habits and characteristics, and food preference.

The Whitetail Deer

The white-tailed deer is a deer of the timberland. It can be found in forests over most of the United States, in much of the same area it inhabited in primitive times (Laycock, 1971). Generally, the range of the white-tailed deer extends from southern Canada to northern South America (Kellogg, 1956). The number of white-tails in any area depends upon many factors, the most important being man's use of the land. In general, the states with the highest numbers of white-tails are the northern states, such as Minnesota, Wisconsin,

New York and Pennsylvania. Another major area of white-tailed deer population in Texas (Laycock, 1971).

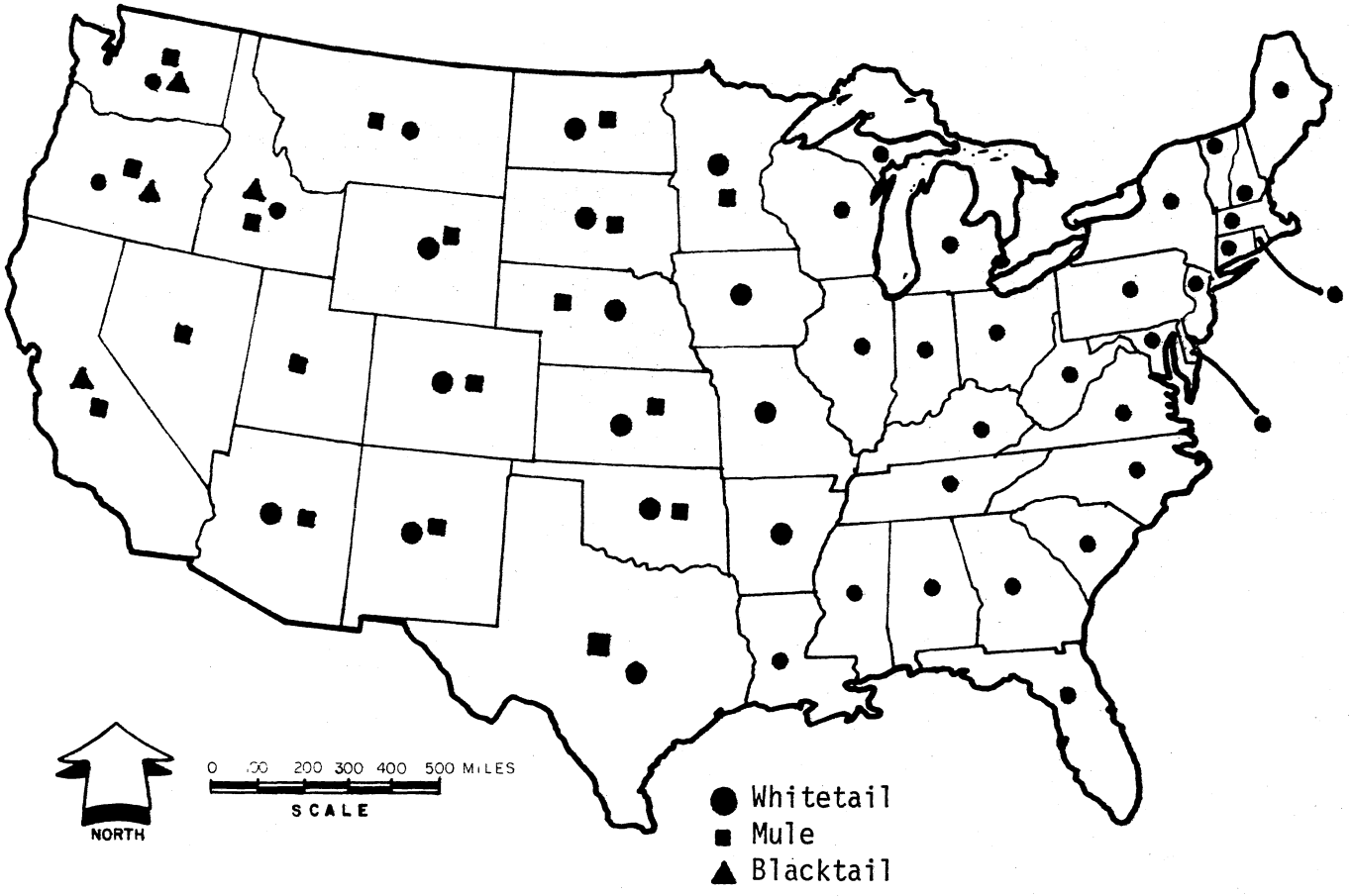
The Mule Deer

The mule deer is a deer of the mountains and open spaces. Its basic range lies in the western United States and Canada, and also portions of western Mexico (ibid). The mule deer can be found from the high mountains to deserts, almost always in the roughest terrain (Cowen, 1956). The population of the mule deer is at about three million, making it about the fifth or sixth most populous big game animal in the world (Brakefield, 1976).

The Blacktail Deer

A small subspecies of the mule deer, the black-tailed deer inhabits the forests and mountains slopes of the Pacific Coast states (Laycock, 1971). Black-tails make up a substantial portion of the harvest in these states, although compared to the whitetail or mule deer, black-tails are quite small, and their antler size insignificant (Cowan, 1956).

The distribution of the three types of American deer is indicated in Figure 1, which depicts the species of deer hunted by state. Note that the entire eastern half of the nation offers only white-tailed deer hunting, and in many Eastern States is the only big game animal legal to hunt. The Western States, however, offer white-tailed deer, and often mule and black-tailed deer hunting.



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 1. Deer Species Found by State

History of Deer Hunting in the United States

Deer hunting is an American tradition born both of necessity and of love of the chase. It is said that deer ranked behind only cattle and sheep in general utility to North American man, because of the food, skins and recreation opportunities they offered (Young, 1956). It was man's reliance on the deer during the frontier years, coupled with a depleted habitat, that caused the decline in deer population throughout the country.

The American Indian hunted deer (Laycock, 1971), but the relatively few Indians, coupled with their inefficient methods of hunting, made no serious inroads into deer populations. When the colonists came from the Old World they found a land abundant with deer and other game (Madson and Kozicky, 1971).

The early settlers harvested game to feed their families, but later as methods of transportation improved and cities grew, wild game became a cash crop for professional hunters. The era of the market hunter began. Big game and small, any animal in demand was fair game and men made fortunes from the slaughter of wildlife.

The best example of big game depletion was the passing of the buffalo; by 1887 they had all but vanished from the plains (ibid). Other animals were also endangered. In 1887 there were no deer left in Pennsylvania, and only 500,000 were left in the United States (Popowski, 1949).

The decline in the number of deer were caused by other factors as well. In fact, habitat destruction, not hunting, was the main reason behind the reduction of most wildlife populations within the last 500 to 100 years (Williamson and Teague, 1971).

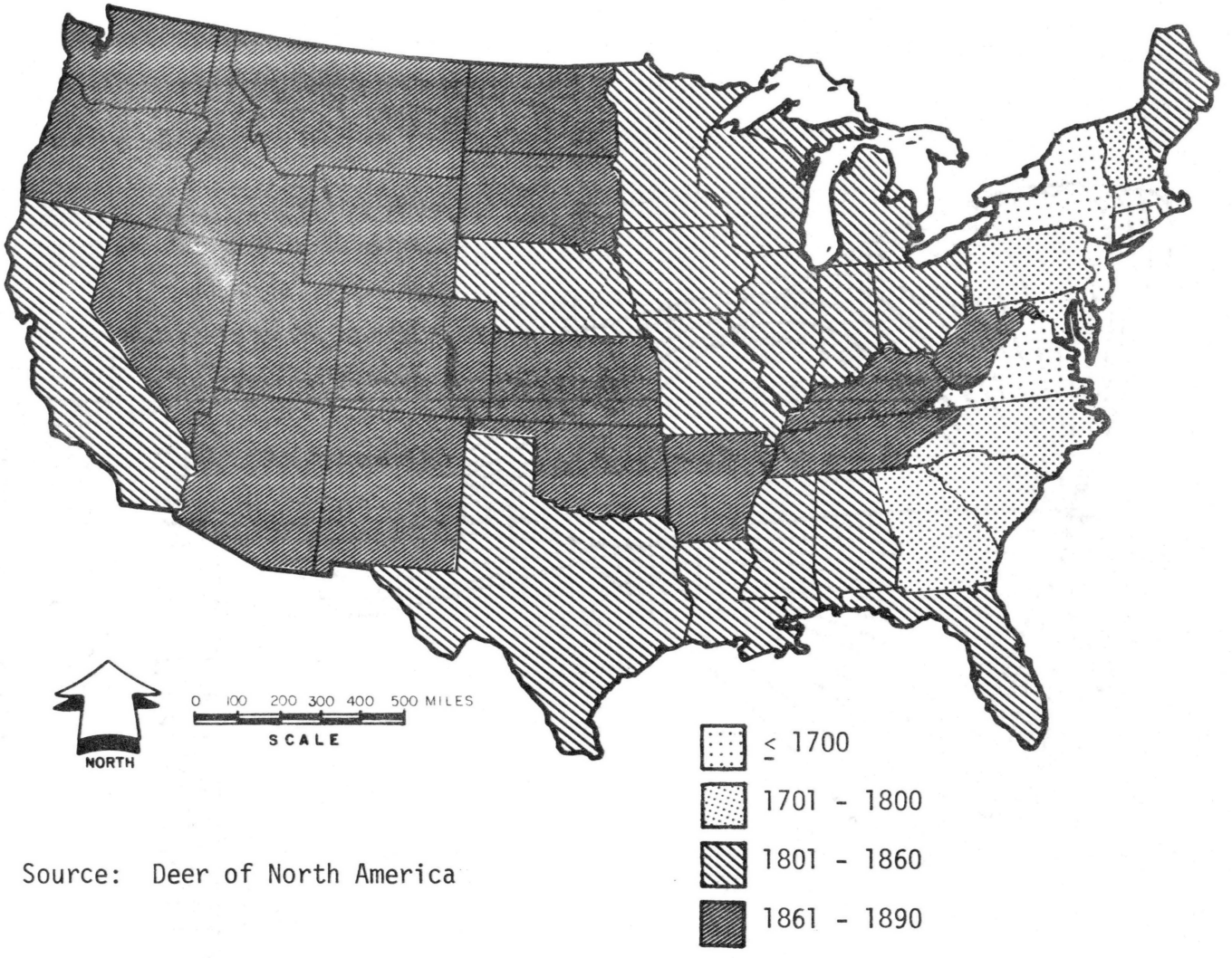
American saw the reductions of deer herds over many years. In 1646, Rhode Island established a closed season on deer, followed later by Connecticut and Massachusetts (Young, 1956). According to Young, "the dates on which the colonies, and states adopted their first game laws are of interest since the deer is usually predominately mentioned." (p. 22).

Figure 2, based on Young's research, shows the dates of establishment of each state's first game laws. Predictably, the states settled earliest were generally the first states to adopt hunting regulations. The diffusion of game laws throughout the nation followed the general pattern of national settlement.

By the end of the 1800's, many states began attempting to stop the hunting of all game with declining populations. Unfortunately, wildlife law enforcement at the state level was not able to stop the market hunter, and there was fear that other animals would follow the path of the buffalo (Madson and Kozicky, 1971).

Between 1900 and the end of World War I, however, several events helped reverse the trend of wildlife waste. President Theodore Roosevelt helped introduce new concepts of wildlife management. Under his administration the U.S. Forest Service was established and the size of the national forest system increased dramatically. Roosevelt also supported the concept of scientific resource use. He believed that if renewable resources such as forests and wildlife were properly managed, they could be harvested indefinitely (Gillham, 1965).

The Federal government, with the Lacey Act of 1900, banned interstate transportation of illegally taken game (Madson and



Source: Deer of North America

Figure 2. Date of Adoption of First Hunting Laws

Kozicky, 1971), while the Migratory Bird Treaty Act of 1916 placed all migratory birds under Federal protection. State game laws were enforced as public opinion against uncontrolled hunting increased.

The United States entered the 1920's with a new concept in wildlife management--protectionism. Deer and other forms of wildlife were being protected from hunting. Game preserves were established, and bounties were declared on predators. Laws such as the "buck law", the harvest of males only to preserve breeding stock, became popular. The buck law was not a new concept, having been introduced in Virginia as early as 1738, and the idea was sound, at least during this time of low deer population (Gabrielson, 1951).

In areas of limited hunting and little predation, deer populations soared. In a classic case, the 3,000 mule deer on the Kaibab Plateau in Arizona in 1906 swelled to 100,000 in 1924. The food supply in this area shrunk rapidly and by the harsh winter of 1924 deer died by the thousands (Madson and Kozicky, 1971). It was a case of deer being guarded to death.

From the disasters in Arizona and elsewhere it became evident that protectionism was not the total answer to wildlife management. A new policy, as proposed by Aldo Leopold at the seventeenth annual American Game Conference in 1930, was that of game management, the scientific approach. Based on the premise that with the proper management wildlife populations could stabilize or increase, Leopold urged that game management become a profession, politics be taken out of game management, and that funds from both the public and private sector be used to carry out education and research (Madson and Kozicky, 1971).

A source of Federal revenue was needed to help finance conservation efforts in the individual states. In 1933 the Federal government placed a ten percent excise tax on the sale of sporting arms and ammunition, the proceeds going to the general Treasury. The U.S. Senate Committee on Conservation of Wildlife Resources began generating support to earmark those funds to go directly to wildlife management programs (Madson and Kozicky, 1971), and in 1937 the Federal Aid in Wildlife Restoration Act (more commonly called the Pittman-Robertson Act) become law.

The Pittman-Robertson Act had a beneficial effect on wildlife conservation programs in the United States; now the purchasers of sporting arms and ammunition directly participated in the wildlife restoration program. To be able to participate in the P-R program,

> each state had to pass a law that assented to the provisions of the Federal P-R law, pass state laws for the conservation of wildlife, and prohibit the diversion of license fees paid by hunters for any purpose other that the administration of the state fish and game department" (Wildlife Management Institute, 1975, p. 3).

It can be seen, then, that the history of hunting in general, and deer hunting in particular has been one of constant change since the arrival of the White man in America. Game management has become a science and all states now have comprehensive game programs and regulations. The game commission usually determines game policy and regulations and bears the responsibility for the implementation of the regulations.

Much of the financial and political support for game management comes from hunters, and state game policy is based largely on satisfying hunter demands. If processes are in existence producing

American cultural regions, it may be assumed that these same processes are working to produce regional patterns of game policies and practices based on cultural traits.

CHAPTER III

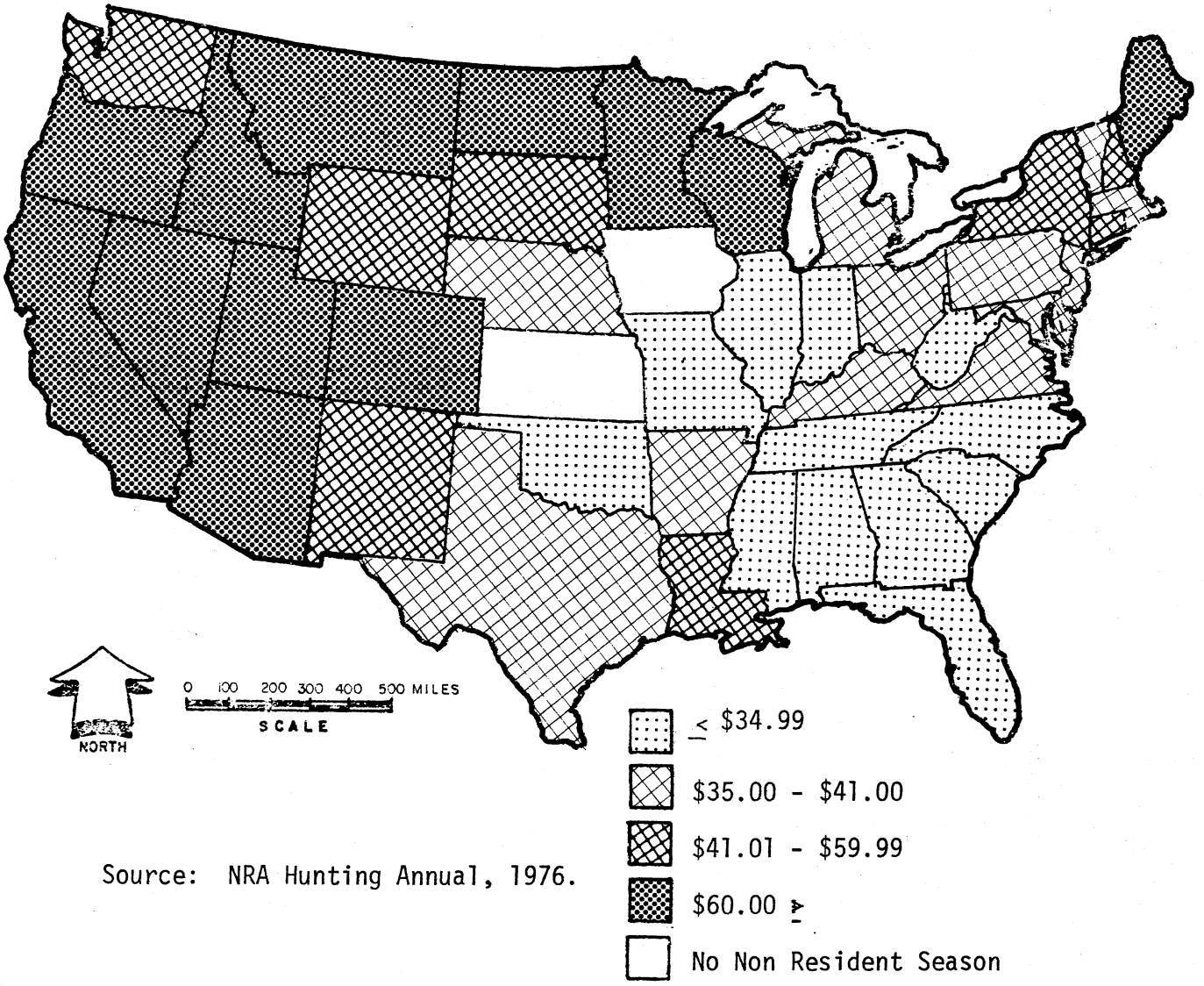
THE SPATIAL VARIATION OF DEER HUNTING REGULATIONS

In this chapter, maps depicting deer hunting regulations will be presented. Basic patterns will be noted and possible reasons for the interstate differences in the regulations will be expressed. The maps will be presented in six catagories, including: licensing requirements, hunters, season length, bag limits, methods of taking, and harvest. Several maps are in themselves descriptive and will need little explanation; other maps will require more extensive narration.

Licensing Requirements

The first category, licensing requirements refers to specific regulations the individual states have adopted concerning the mechanics of deer hunting, such as fees, hunting safety and other reqirements. An analysis of 1976-77 resident firearm deer hunting fees indicated that relatively little variation exists across the nation. Therefore, no map of resident deer hunting fees will be presented.

Non-resident firearm deer hunting fees are shown in Figure 3. A much greater discrepency occurs for non-resident fees than for resident fees. It is much less expensive for non-residents to hunt in the Southwestern states then it is in the New England, Northern, Rocky Mountain and Pacific Coast States.



Source: NRA Hunting Annual, 1976.

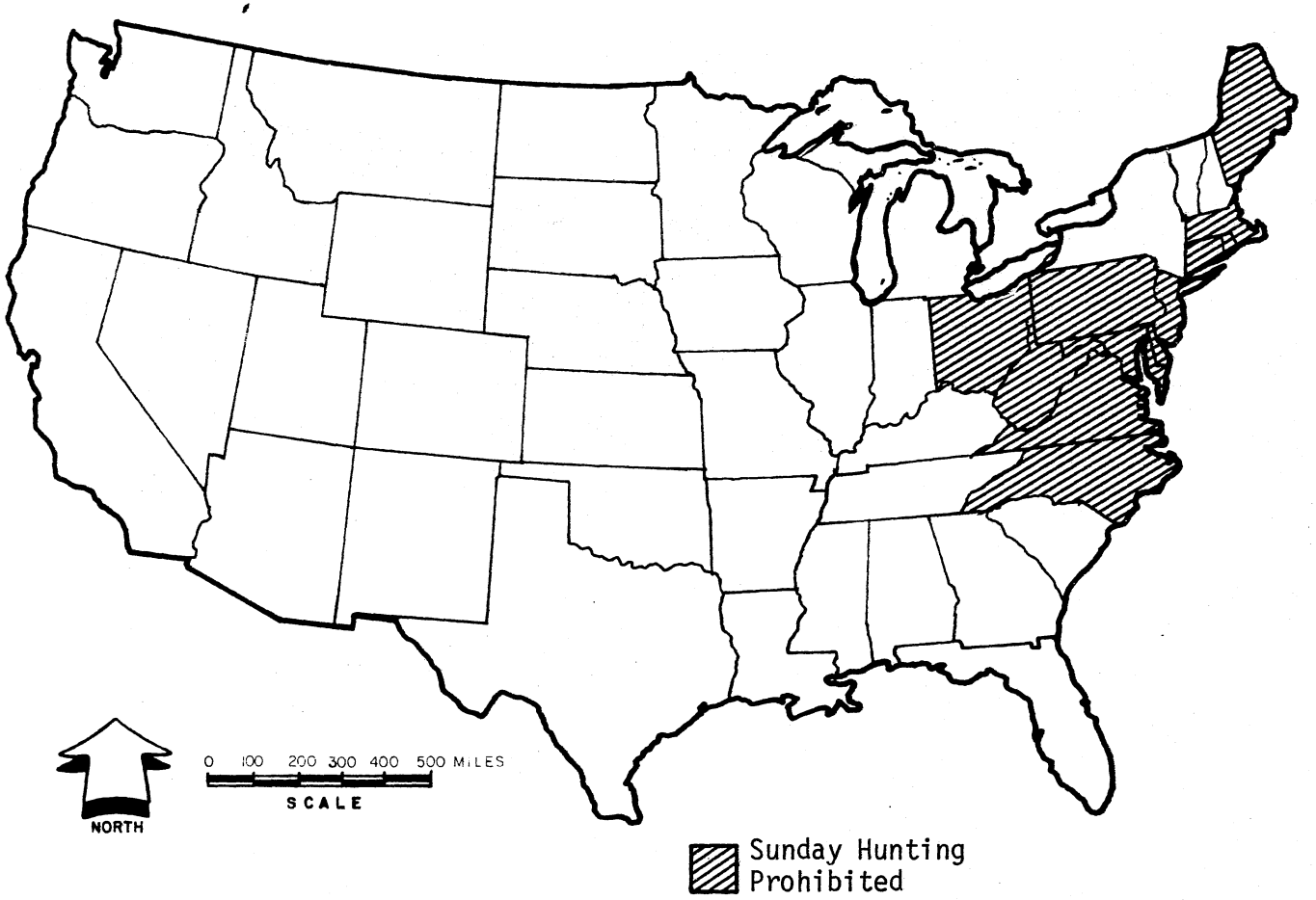
Figure 3. Non-Resident Firearm Deer Hunting Fees

It is evident that the western and northern states have established hunting rates that are generally higher for non-residents than residents. It is possible that the game commissions in these states realize the value of deer as a resource and have set the high non-resident fees as a method of preventing over-harvest of deer (Cartier, 1974). In doing so, the commissioners are in effect attempting to "save" the deer population for the resident hunters, and forcing non-resident hunters to pay a share of the cost of wildlife support that resident hunters pay through in-state taxes.

Two states, Iowa and Kansas, do not offer non-resident deer hunting seasons. The reasons why residents only seasons are held are not known, but relatively low deer populations in these states may be a factor.

Those states banning Sunday hunting state-wide are indicated in Figure 4. This regulation is a holdover from the "blue laws" established during the settlement of the nation. The first compulsory Sunday law in recorded history was written by the Roman Emperor Constantine in 321 A.D., declaring that "all judges and city people and the craftsmen shall rest upon the venerable Day of the Sun" (Cohen, 1962, p. 2). The first Sunday law in the American Colonies was enacted by Virginia in 1610, based on similar regulations previously in existence in England (ibid).

At one time a great majority of states had blue laws, regulating many types of activity from selling liquor to playing baseball. So widespread were the blue laws that in 1890 only Arizona, California and Idaho had not adopted such laws (Blakely, 1890). Today, most states have adopted laws banning Sunday activity of some sort.



SOURCE: NRA HUNTING ANNUAL, 1976.

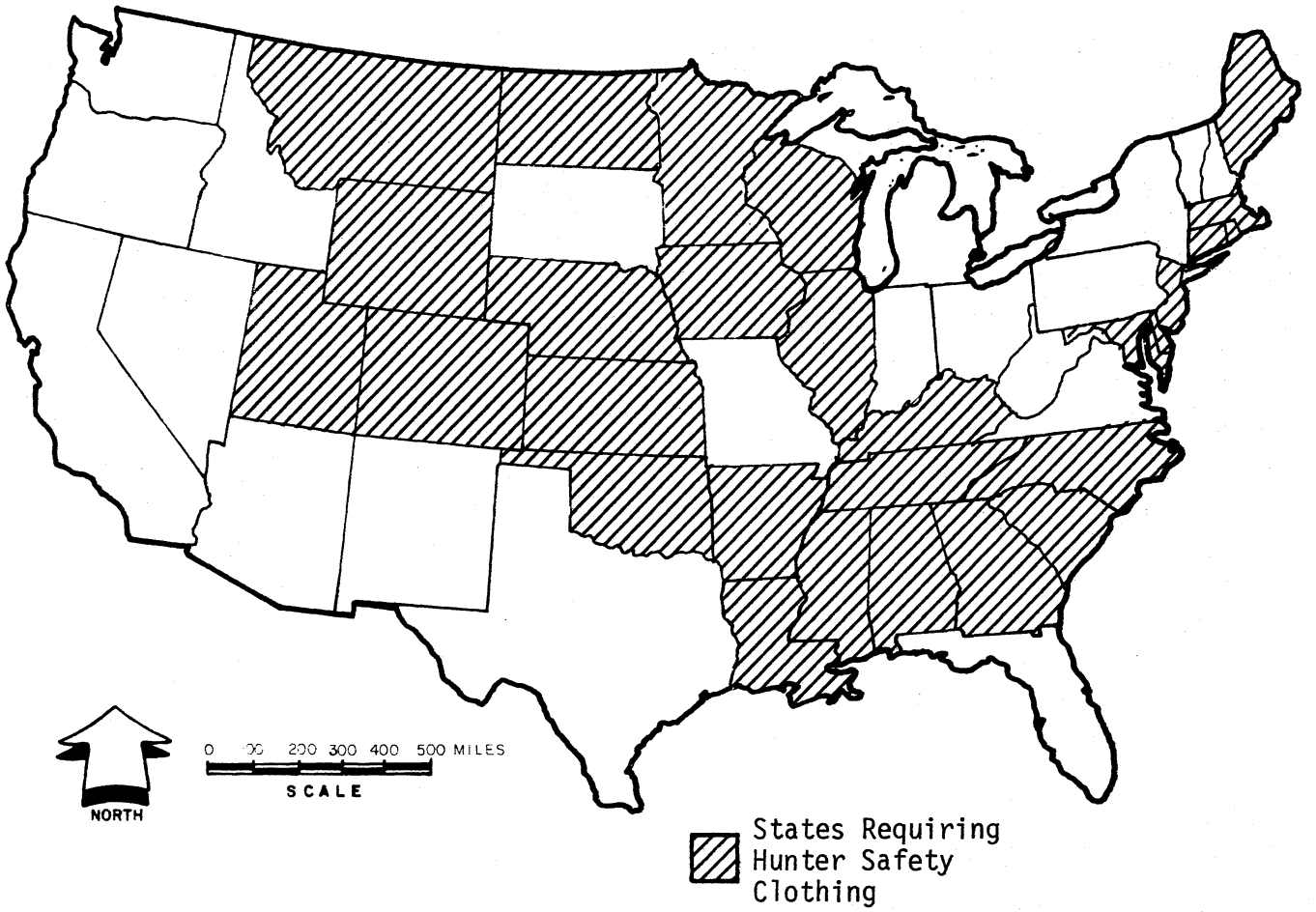
Figure 4. States Banning Sunday Hunting

It is interesting to note that those Colonial states where Sunday legislation first went into effect are the only states to maintain the ban on Sunday hunting at the present time. With the growing amount of leisure time available to Americans today, pressure may be put on game commissioners to discontinue the ban on Sunday hunting. Opposition to lifting the ban could be strong, however, for presently the public can venture into the woods only on Sunday with no danger of being mistaken for an animal by a hunter.

Figure 5 represents those states requiring hunters to wear brightly colored outerwear so they may be readily seen by other hunters. The type, color and amount of color that a hunter must wear varies by state. Several other states recommend but do not require the use of hunter safety colors.

The entire South except for Florida, and most of the Great Plains and some of the Rocky Mountain states require the use of hunter safety colors. The east-central states and a band of western states stretching from Texas to Washington do not require its use. This regulation is purely for the protection of the hunter, for deer are color blind and cannot detect the bright color (Richardson and Peterson, 1974). The number of states requiring the use of safety colors may increase in the future.

William Sinkus, hunting safety director at the Illinois Department of Conservation, states that "I'm convinced that all hunters should wear hunter orange at all times when in the field, whether or not it's required by law." (Cartier, 1976, p. 170). In Massachusetts, firearm accidents have declined 67 percent since the initial passage of that state's hunter orange law (ibid).



SOURCE: USA HUNTING ANNUAL, 1976.

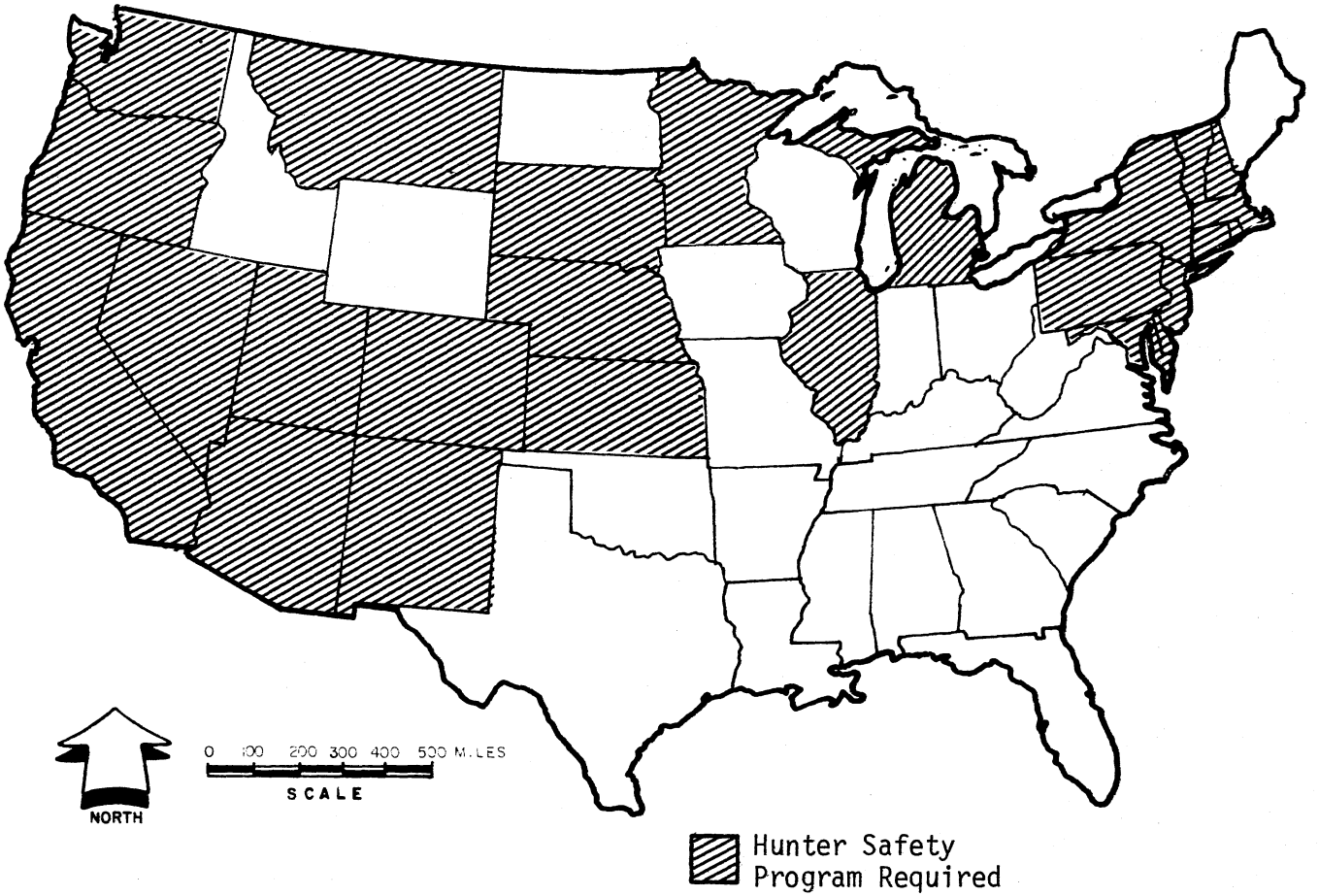
Figure 5. States Requiring the Use of Hunter Safety Clothing

Those states requiring completion of hunter safety courses for all or a portion of the hunting population are shown in Figure 6. The spatial variations produced in this map are intriguing, as Figure 6 is quite dissimilar to Figure 5. While most southern states require the use of hunter safety colors, no southern state requires that any hunter receive firearm safety training. Those Western states that did not require the use of hunter safety colors do require young hunters to complete a basic firearm training course.

Although 49 states offer courses in hunter safety to about one million young people yearly, the programs are mandatory in only 23 states. Of all the shooters or victims in hunting accidents nationwide, about 85 percent of all hunting accidents involved hunters between the ages of 12-29 years. It is the young hunters who would most benefit from hunter safety courses (Cartier, 1976).

Hunters

The three maps presented in this section will show the total number of licenses, tags, permits and stamps issued to resident and non-resident hunters per 1000 population of the state of purchase for the 1974 hunting season. These indicators are used in place of the total number of resident and non-resident deer hunters and include all hunters, regardless of the animal hunted. It is difficult to determine the exact number of deer hunters, for in many states different game species besides deer can be hunted with the purchase of a single license. It would be possible to calculate hunter population from deer population and hunter success figures, but resident-non-resident totals would be impossible to gather using that method.



SOURCE: NRA HUNTING ANNUAL, 1976.

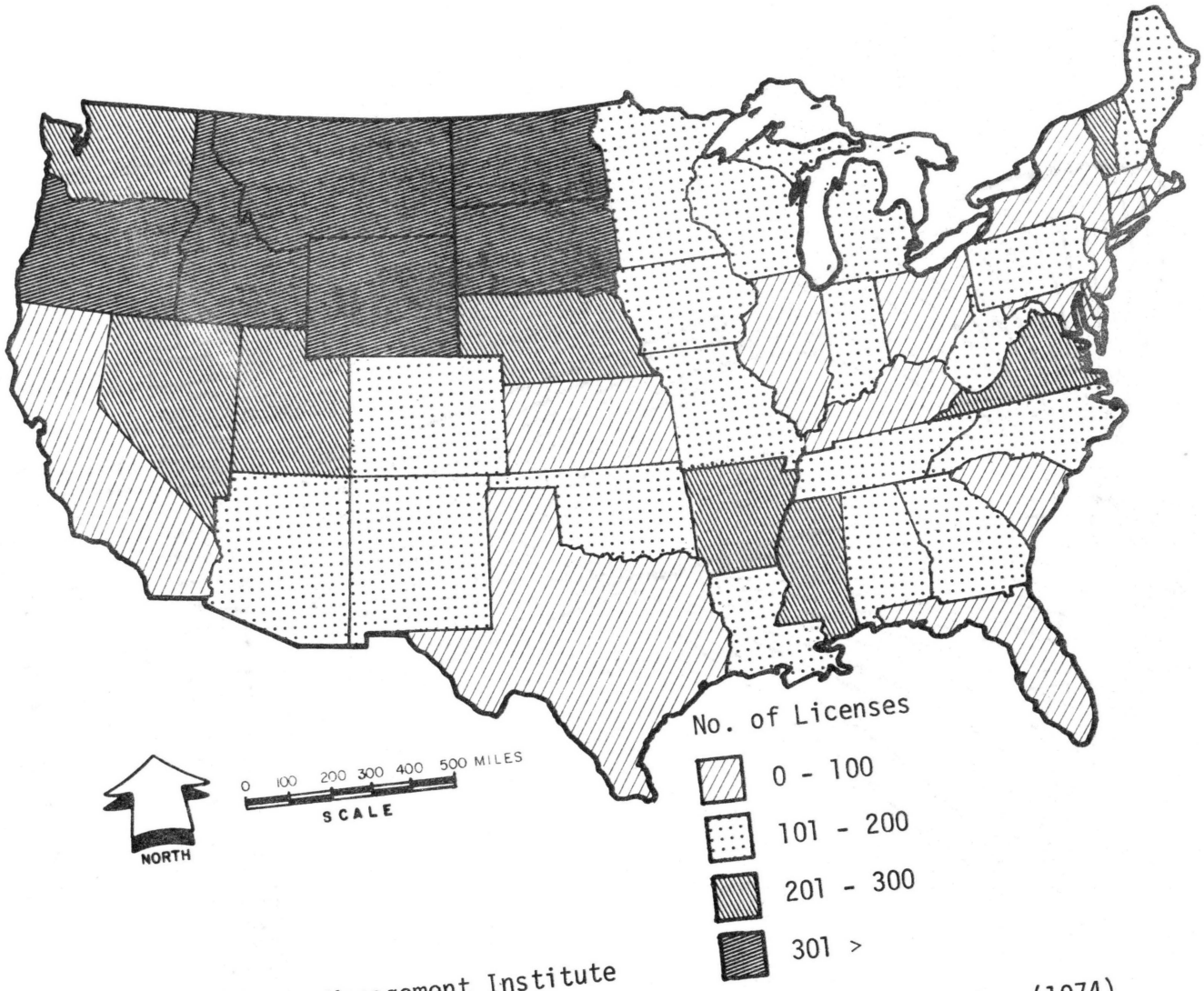
Figure 6. States Requiring Hunter Safety Program Participation for All or a Portion of Hunters

The number of total resident licenses and stamps sold per 1000 population is shown in Figure 7. Those states with the largest number of residents per 1000 purchasing licenses range from North and South Dakota westward to Oregon. The states with the fewest licenses or stamps sold per 1000 population are located generally in New England, and in states with large urban populations such as Ohio, Illinois, Texas and California (see figure 8).

One reason that comparatively few licenses are sold in urbanized areas may be that increasingly larger numbers of young people are being raised in urban areas, where access to open areas is limited, unaware of the potential benefits of hunting as a pastime (Williamson and Teague, 1971). If young people do not continue to hunt in the large numbers they once did, the practice of hunting as a form of wildlife population control could lose its effectiveness.

Figure 9 portrays the number of non-resident purchasers of licenses and stamps per 1000 population of the state in which the licenses were issued. The region of heaviest non-resident hunting is much the same as that of resident hunting, with certain exceptions. Ohio, Vermont and Maine support high numbers of non-resident hunters, while Minnesota supports only about one non-resident purchaser for every 1000 state residents. Reasons for this pattern could be the abundance or lack of wildlife in a state, hunting success rates, efforts of the individual state's fish and game departments to attract non-resident hunters, license cost, or climatic or scenic attractions.

Figure 10 is a combination of Figures 8 and 9, showing the ratio of resident to non-resident license purchasers in 1974. Note that a



Source: Wildlife Management Institute

Figure 7. Resident Hunting Licenses Sold per 1,000 Population (1974)

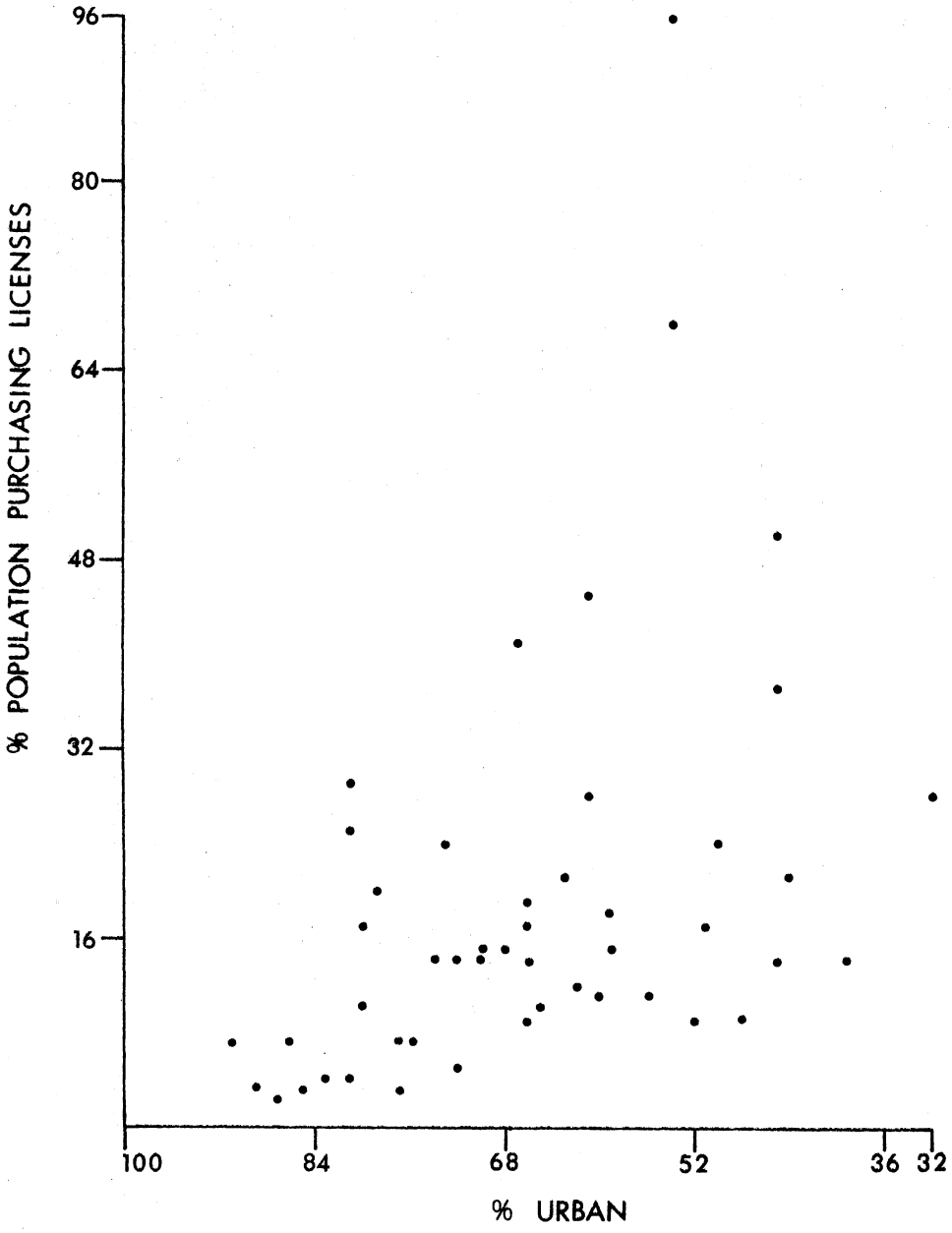
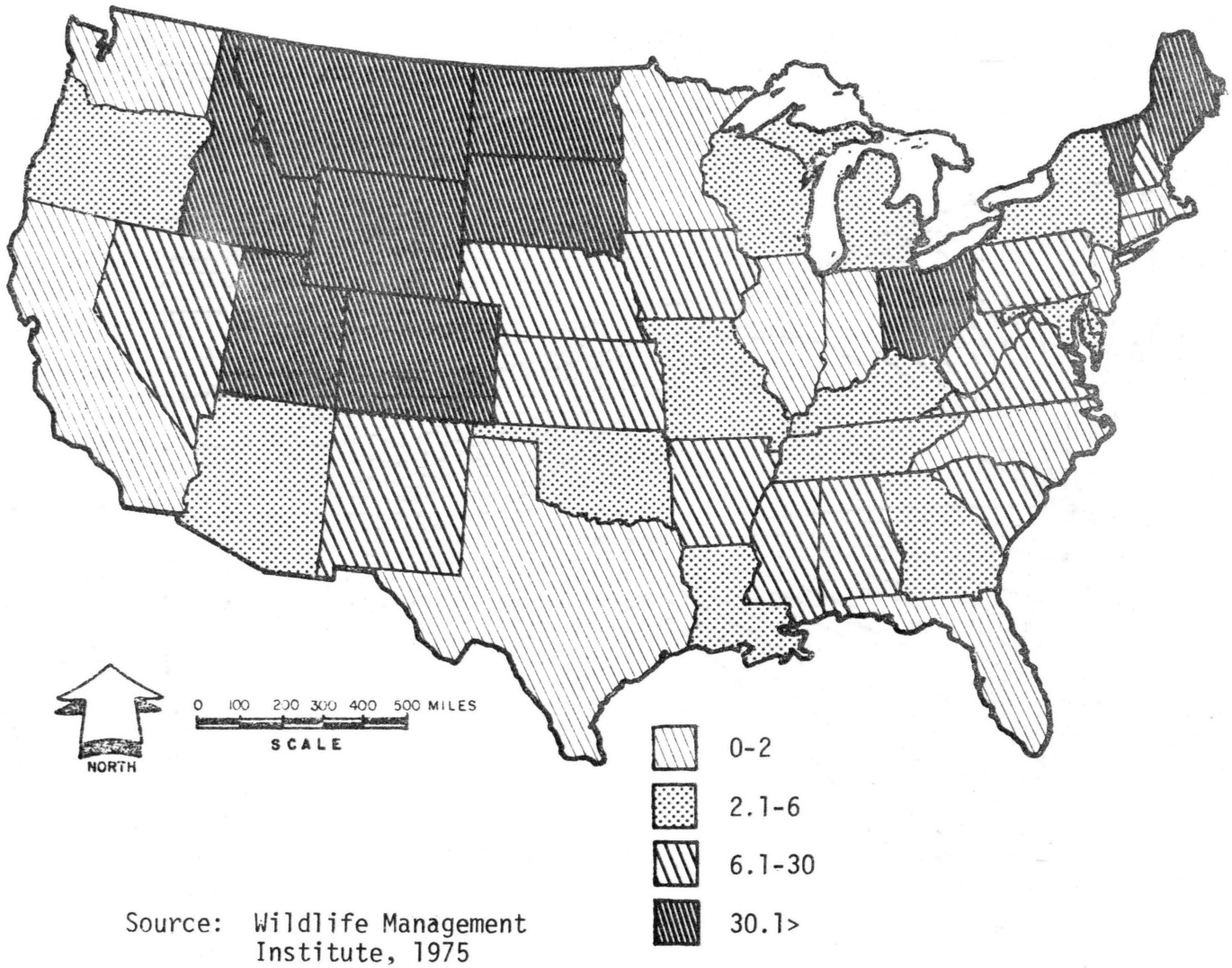
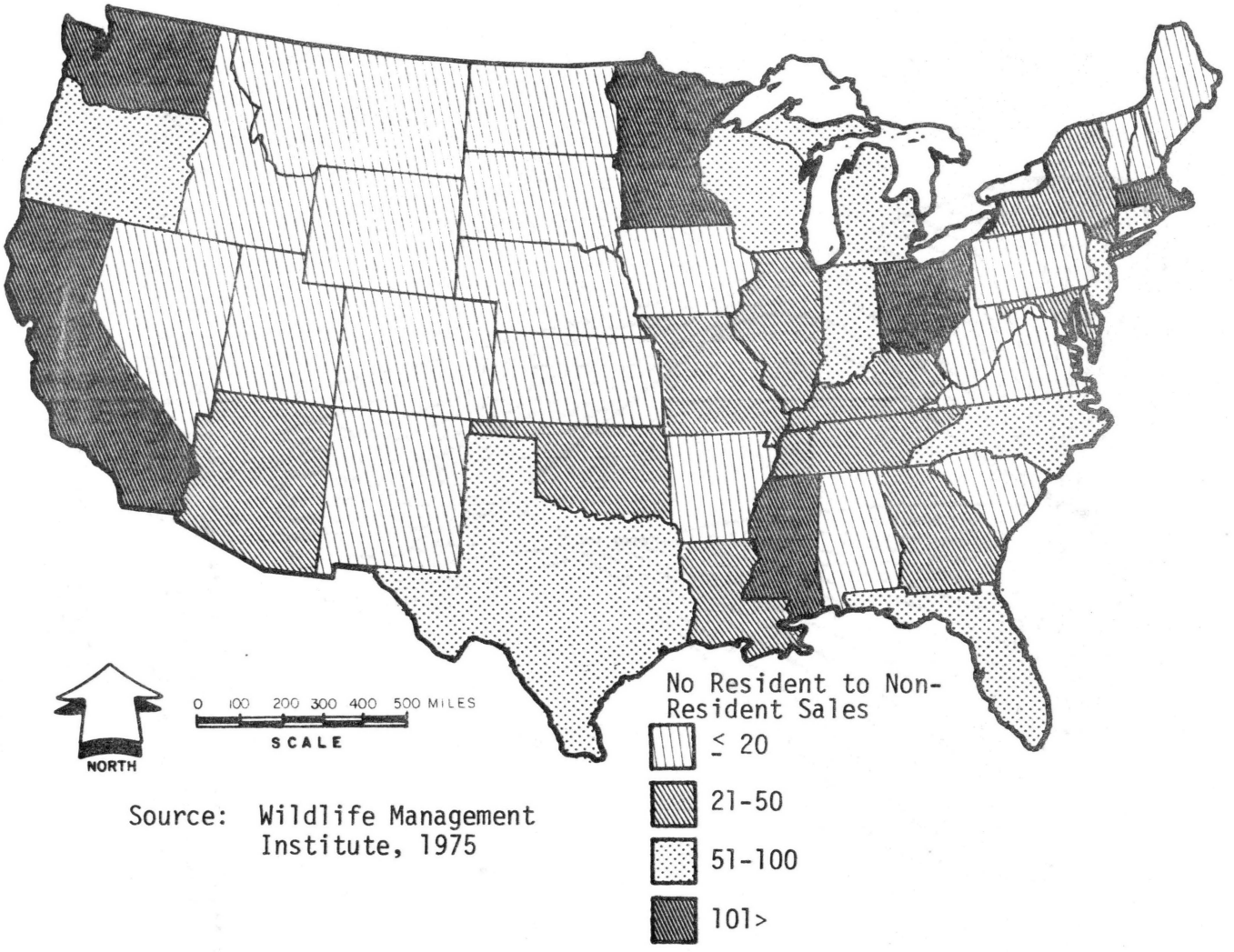


Figure 8. Percentage of State's Urban Population to Percentage of State Population Purchasing Licenses, Fees and Tags.



Source: Wildlife Management Institute, 1975

Figure 9. Number of Non-Resident Hunting Licenses Sold Per 1000 Population



Source: Wildlife Management Institute, 1975

Figure 10. Ratio of Total Resident to Total Non-Resident License Sales, 1974

large block of the western states, northern New England, and several eastern and southern states have the lowest resident to non-resident ratio. States with the highest ratio of residents to non-residents are Wyoming and Vermont, where every third hunter is a non-resident. California, on the other hand, only supports one non-resident for every 514 resident hunters.

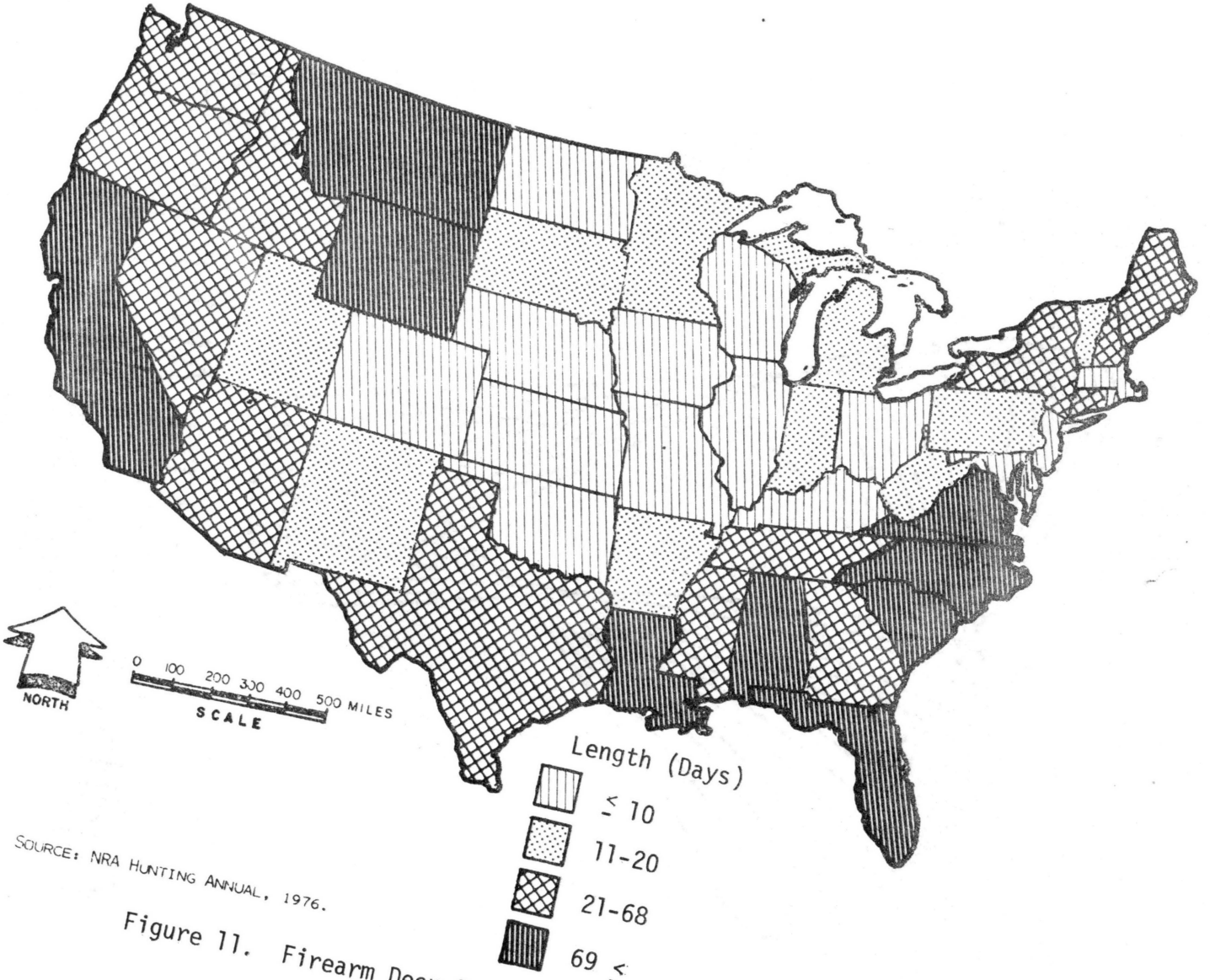
Season Length

The firearm and archery deer season lengths for 1976-1977 are shown in Figures 11 and 12. Only the basic season lengths are indicated; special deer seasons, which may include hunts in wildlife management areas, paraplegic hunts or primitive weapon hunts, are not addressed.

Figure 11 indicates that the longest firearm deer seasons are found in the West and South, the shortest seasons throughout the Northwestern and New England states. Length of the deer season is a factor in the outcome of the total harvest, and normally season length varies little from year to year, the only difference being a few days in opening and closing dates (National Rifle Association, 1976).

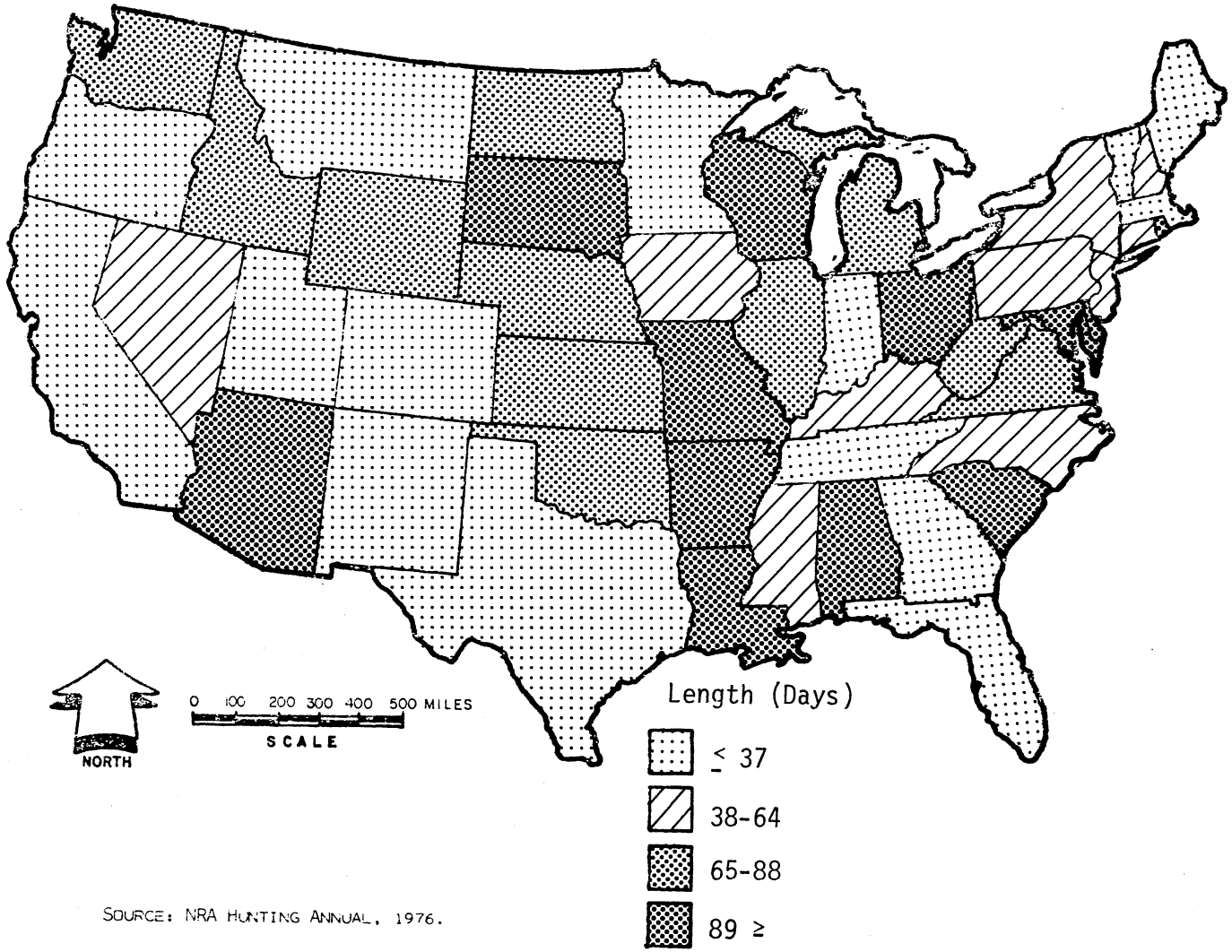
The timing of the deer season is also an important factor in hunter success. For example, late seasons are favored in the North because it is easier to track deer in the snow and hunter success rates improve (Kellogg, 1956). It is also easier for hunters to spot deer after the leaves have fallen.

Archery season lengths are shown in Figure 12. Generally, archery seasons are at least as long as firearm seasons and often much longer. The southeastern states generally offer the longest seasons.



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 11. Firearm Deer Season Length, 1976-77



SOURCE: NRA HUNTING ANNUAL, 1976.

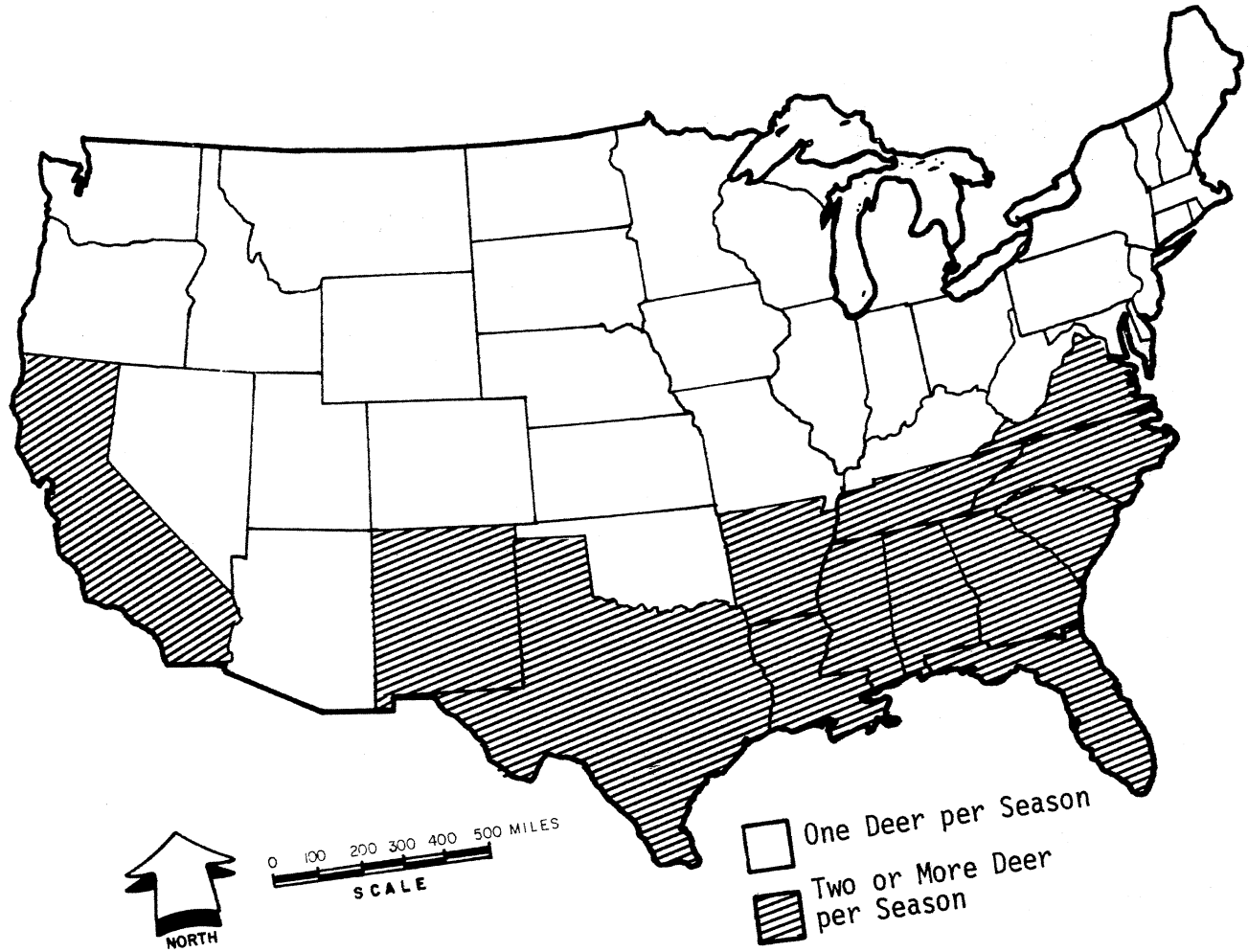
Figure 12: Archery Deer Season Length, 1976-77

The sport of modern-day archery deer hunting is relatively new, the first season offered by Wisconsin in 1934. It is popular because it allows hunting opportunities to last longer. Archery seasons are common now that game commissioners realize that archery hunters cannot appraoch the success rate of firearm hunters (Laycock, 1971). Because it is more difficult to stalk and kill a deer using a longbow, the number of archers will probably increase but not reach the total number of firearm deer hunters. Archery deer hunting offers a state with limited deer resources a chance to provide a greater amount of sport hunting with less damage to deer herd numbers (Ruhl, 1956).

Bag Limits

The two maps presented in this section deal with the number and sex of deer allowable per hunter per season using firearms. Figure 13 represents the basic bag limit for each state. Some states offer limited special multiple deer seasons requiring the hunter to purchase an additional stamp or pay an additional fee. The data in Figure 13 represents the bag limits for firearm hunters paying only the basic firearm hunting fees.

Figure 13 shows a distinct difference between the northern and southern states, the northern states allowing a bag limit of one deer per season. Much greater variation exists in the South, however, where it is possible to harvest two or more deer per season. Some examples of seasonal bag limits in southern states include: Florida, three deer; North Carolina, four deer; and Alabama, one deer per day.



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 13. Deer Season Bag Limits, 1976-77

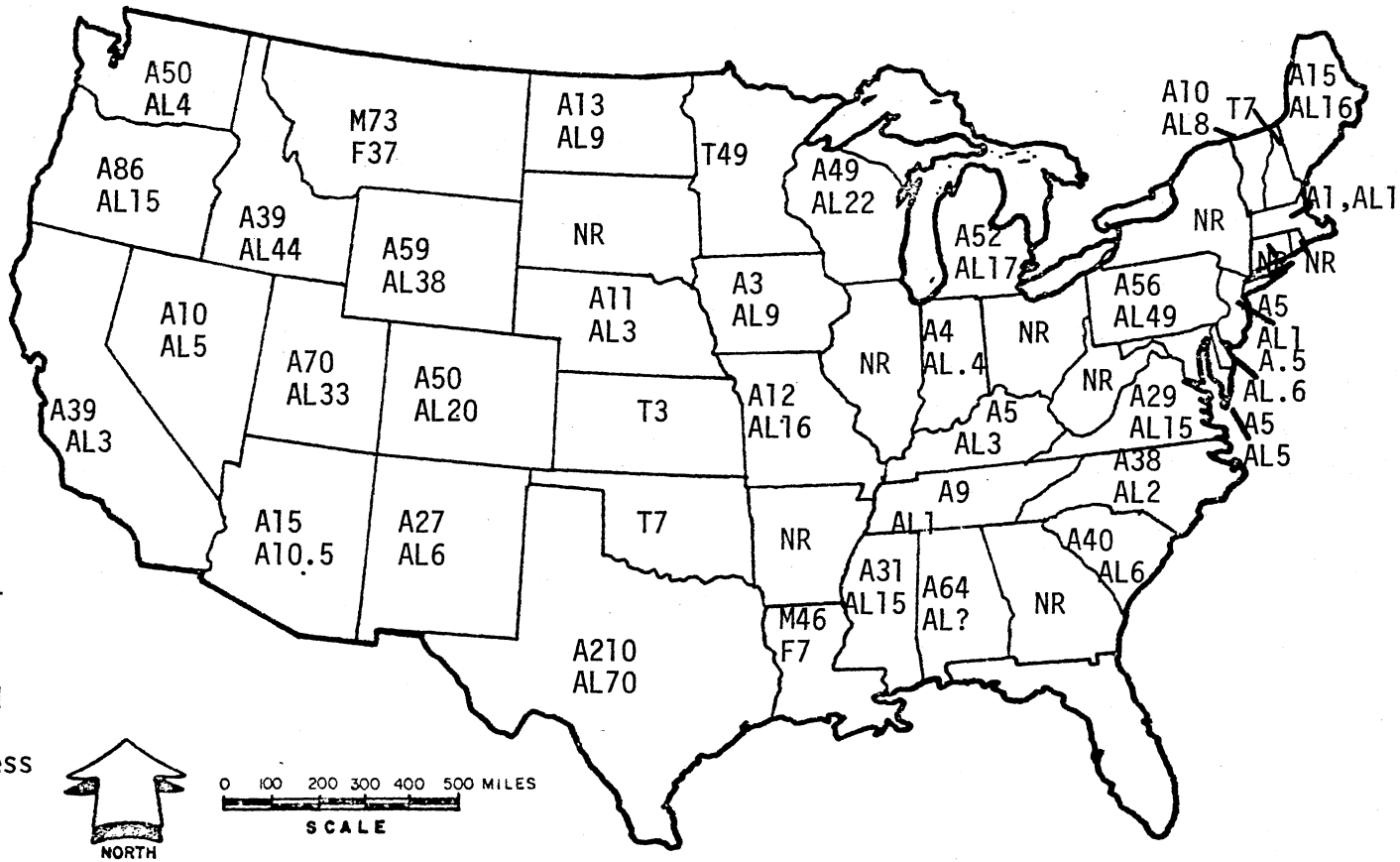
Figure 14, taken from Stout's A Nationwide Survey of Antlerless Harvest as a Deer Managment Tool (1971) shows the magnitude of deer harvested in a recent year, with special emphasis placed on sex of deer harvested. It must be noted that this map represents only one year's deer harvest, and that yearly harvests can vary. The map does show, however, the strong impact of the buck law on game regulations and hunting practices today. Presently, only five states: Connecticut, Delaware, Maine, New Hampshire and Rhode Island allow statewide deer harvest with no regard to the sex of the animal. It is desireable to protect the doe in certain conditions as a method of preserving breeding stock (Gabrielson, 1951), but under normal conditions to prevent overpopulation of deer, both sexes should be harvested (Richardson and Peterson, 1974).

Even in areas where antlerless deer hunting is allowed, public sentiment may vary.

> It appears that Northern states have a greater percentage of anterless deer in the harvest than do Southern states but there are exceptions to this generalization. With such variety one cannot help but get the impression antlerless harvest is not being utilized to its fullest potential in many areas. It has potential for being one of, if not the, most effective deer management tools available (Stout, p.19).

Methods of Taking

The methods used to hunt deer are important to consider when estimating deer harvest and hunter success. The methods of hunting deer that will be discussed are: rifle, shotgun, antique firearm (muzzleloader), handgun, and the use of dogs in running deer.



Deer Harvest
(in 000's)

A - Antlered

AL - Anterless

M - Male

F - Female

T - Total

NR - No Response

Figure 14. Magnitude of Deer Harvest in Relation to Sex

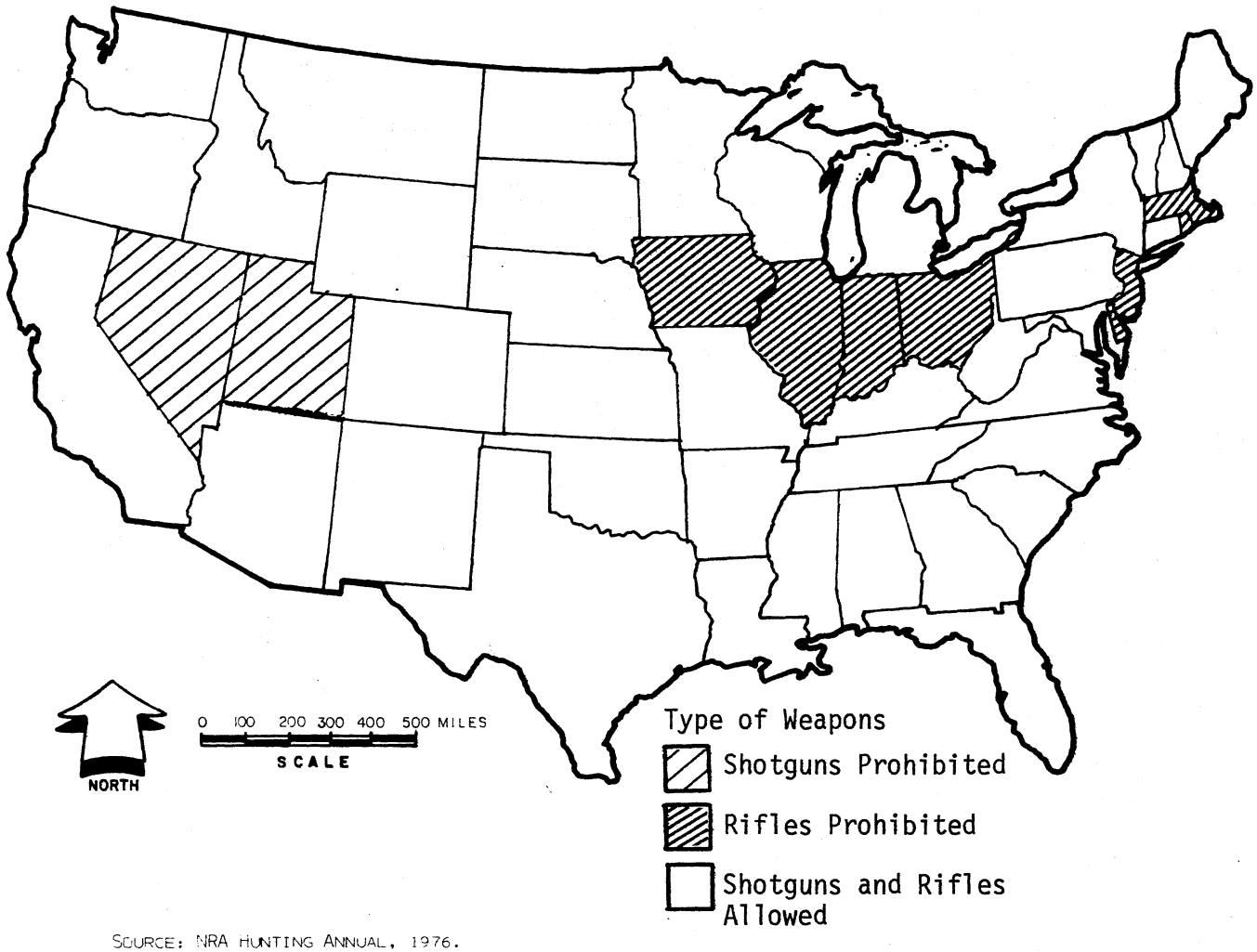
Source: A Nationwide Survey of Anterless Harvest as a Deer Management Tool, 1972

The variations in the type of standard firearms allowed statewide are depicted in Figure 15. Although several states have restricted rifles or shotguns in certain areas (the southern half of the lower peninsula of Michigan, for example), only statewide regulations will be discussed here.

The majority of the states allow deer hunters to hunt with either a rifle or shotgun, although calibers and guages allowed may vary by state. Only two states, Nevada and Utah, prohibit the use of shotguns for deer hunting.

Mule deer are hunted in Nevada and Utah. Generally, mule deer are shot at a greater distance than whitetailed deer. Shooting a white-tailed deer at 100 yards may be a ririty, but hitting a mule deer at 200 yards is an accepted practice (Koller, 1961).

The range of most shotguns is about seventy-five yards or less for deer (Laycock, 1971), but terrain also plays an important factor in the type of weapon allowed. Gene McDowell, of the Nevada Department of Game, Fish and Parks stated that "Nevada's deer country is generally wide open and the very nature of the terrain would make the shotgun impractical" (p. 1). More may be involved in the question of allowing shotguns in these states than terrain, however, for it is legal to hunt deer with bow and arrow in these states. Cultural factors also may have an impact on decision making. According to C. Quinn Harding, Information Specialist for the Utah Division of Wildlife Resources, "Utah has never allowed the use of shotguns in big game hunting, nor has there been a push by sportsmen in the state to allow this weapon's use. It is also our feeling that one rifle bullet is more sporting" (p.1).



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 15. Statewide Firearm Restrictions for Deer Hunting

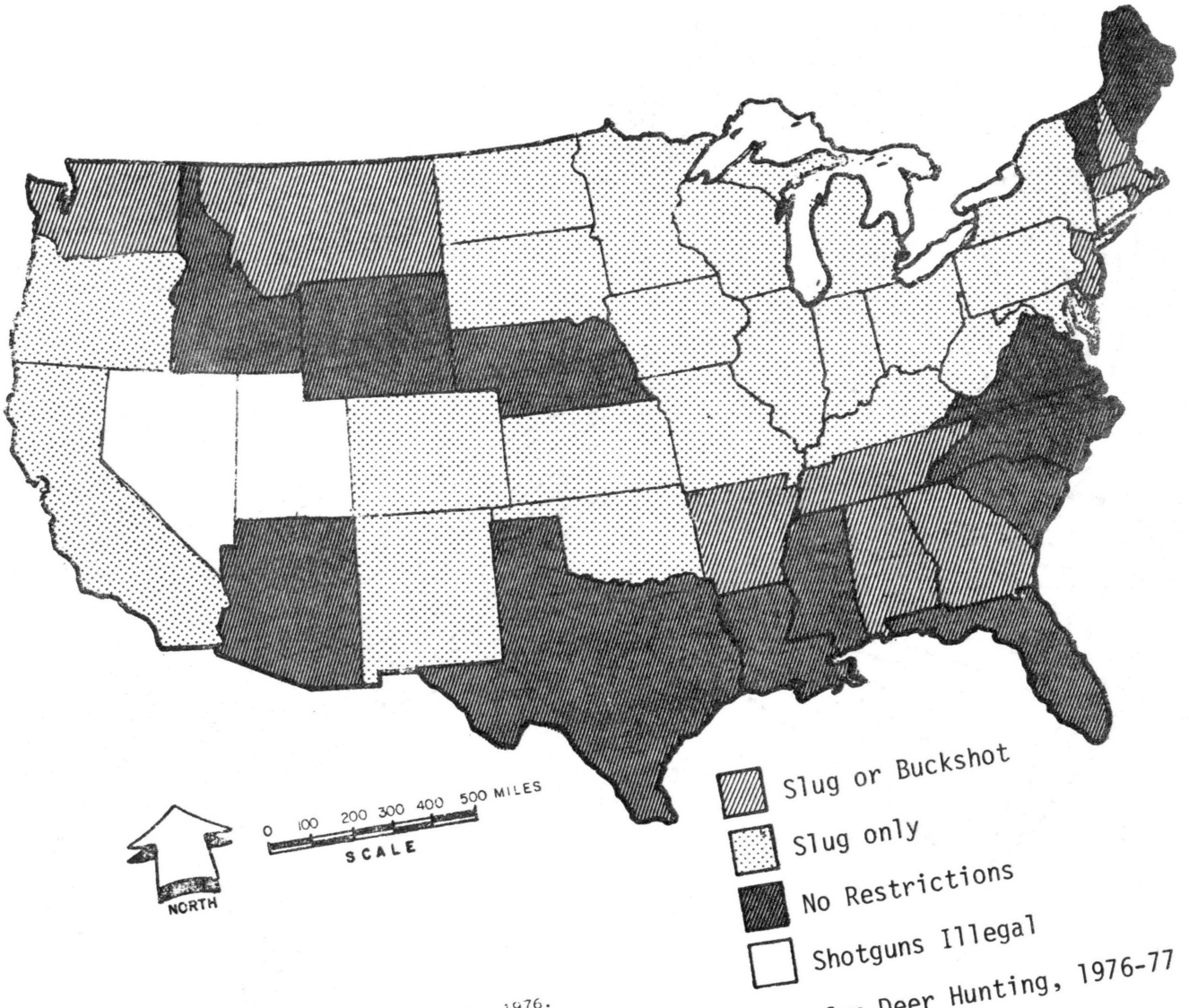
A belt of heavily populated farm states and four Atlantic Coast states have banned the use of rifles for deer hunting in an effort to protect the lives of both hunters and non-hunters. The high-powered deer rifle can kill at long range. With urban sprawl and the movement of people out of the city into the country, prime deer habitat has been divided into small parcels. This means that hunters must hunt closer to residences, where the chance of a stray bullet striking a person increases. When a deer hunter is able to use only a shotgun, the risk of accident at long range (over 200 yards) is nearly eliminated (Cartier, 1976).

According to Cartier, however, about 80 percent of the time the shooter and victim are members of the same hunting party. More importantly, the majority of hunting accident victims are shot within 50 yards of the person firing the gun.

Although the rifle is the traditional weapon of the deer hunter, shotguns are often used in areas of thick underbrush. In the Southeast, the shotgun is used on white-tailed deer and also in the dense underbrush of the West Coast on black-tailed deer (Laycock, 1971).

Two kinds of shotgun ammunition are used for deer hunting. Buckshot is the traditional load in the South, where it is used at close range in thick cover. The rifled slug or ball of soft lead is used for longer range shots and can kill animals larger than deer (ibid).

Figure 16 shows the variation of state regulations concerning shotgun ammunition. No significant spatial patterns are evident, although the majority of the states require the use of a slug. Several states have no restrictions on shotgun ammunition, in which case fine shot, which is not recommended for deer hunting, would be legal for use on deer (Kellogg, 1956).



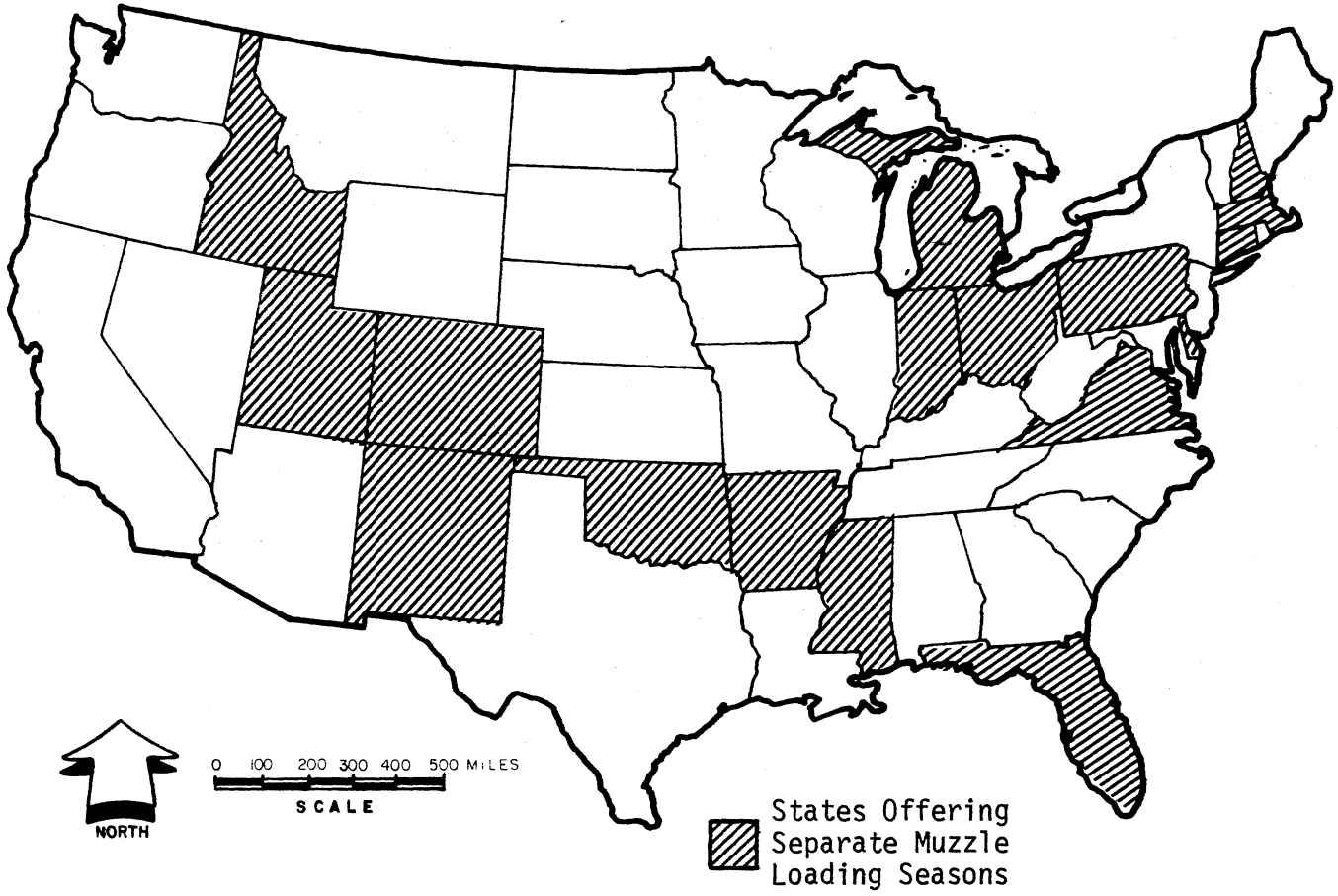
SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 16. Shotgun Ammunition Restrictions for Deer Hunting, 1976-77

Many hunters feel that the use of the repeating rifle or shotgun takes away much of the thrill of the hunt. Some hunters will switch to the bow and arrow to find more of a challenge. Recently the muzzleloader rifle, a single-shot frontier style rifle, has become popular with hunters as a method of handicapping themselves (Wagar, 1971). Some game commissions have provided hunters using muzzleloaders with a separate season, as shown in Figure 17. Again no definite spatial pattern is evident; as muzzleloaders grow in popularity the number of special seasons may also increase.

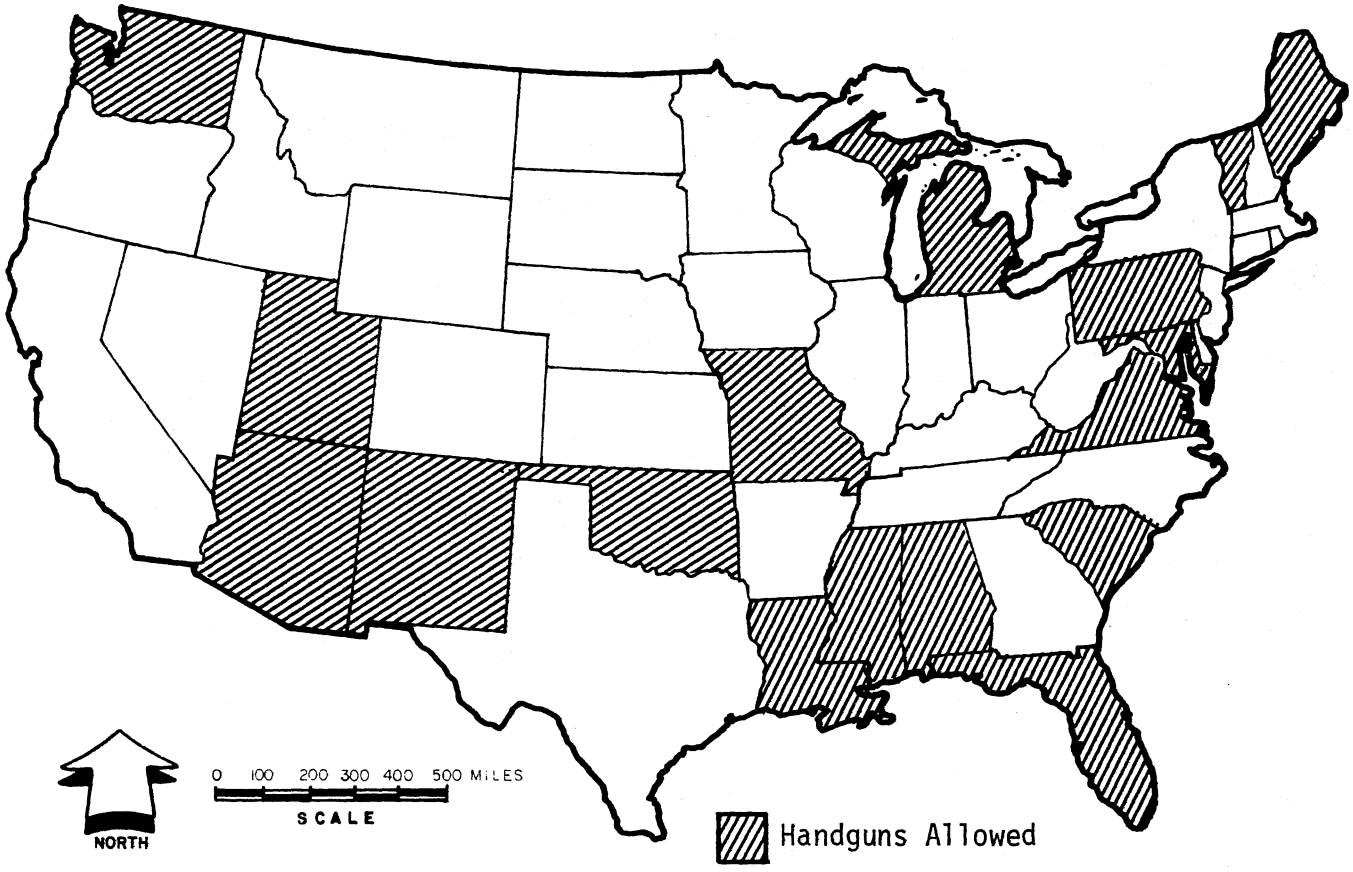
The use of handguns for hunting deer is allowed by eighteen states (Figure 18). No identifiable patterns are evident in this map. The use of handguns in deer hunting is a concept that should be questioned. A handgun is a weapon used at extremely close range and is very difficult to shoot accurately. The modern magnum pistol can wound far beyond its killing range; a hunter using a handgun must be both an excellent judge of distance and a good shot (ibid).

Where vegetation makes it difficult to stalk or drive deer, the use of dogs in hunting deer has become an established custom (Figure 19). Perhaps nowhere else in the United States is deer hunting more difficult than in the Southeast. In this swampy country dogs are a necessity. "'What else could you do', one southern deer hunter asked me once, 'when it's so dark in them swamps the alligators get lost and you wouldn't see a deer till you stepped right on him?'"(Laycock, 1971, p.31). The rough, chapparal-covered hills of California may account for the use of dogs in that state.



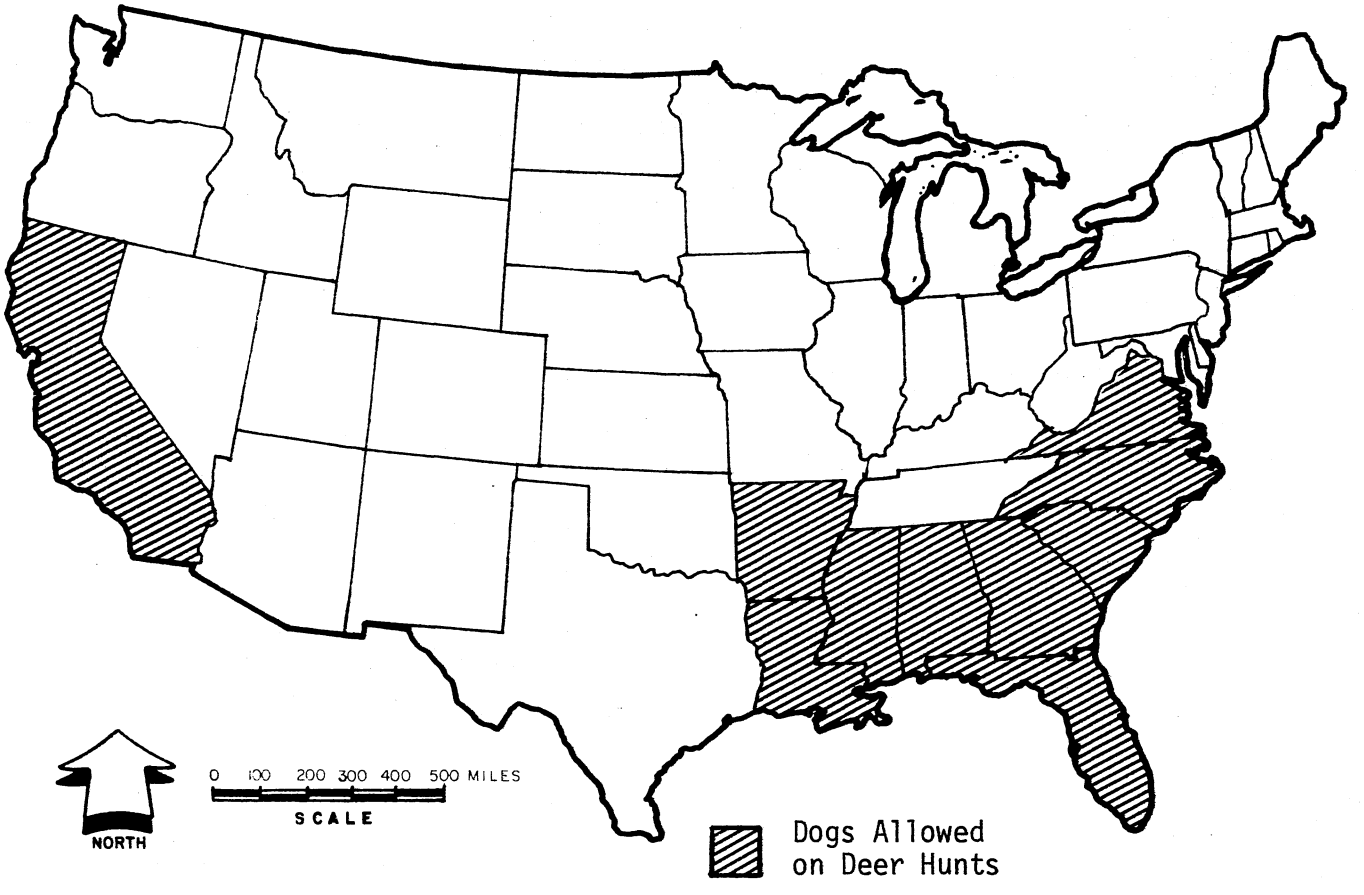
SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 17. States Offering Separate Muzzleloader Deer Seasons, 1976-77



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 18. States Allowing Hunting of Deer with Handguns



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 19. Use of Dogs Allowed for Deer Hunting

Harvest Aspects

The last series of maps will deal with harvest characteristics. Relationships between deer population, harvest and success rates will be discussed.

It is estimated there are twelve million deer in the United States (ibid). It is evident from Figure 20, showing estimated deer population by state, that the distribution of deer is not well defined by geographic regions, but depends instead upon many variables. The state with the largest number of deer is Texas, with an estimated 3,235,000 head. Rhode Island maintains 1500 deer, the smallest number of any of the states (National Rifle Association, 1976). Significant numbers of deer are found in the Southeast, North Central, and Western states, while relatively few deer inhabit Kansas, Iowa, Nebraska, Indiana, Ohio, Kentucky and the small New England states.

Figure 21 shows each state's deer population per square mile. It is evident that on a per square mile basis, the greatest number of deer are found in the South, the East and West Coast. The Central and Rocky Mountain states have low per square mile deer populations.

The estimated deer harvest by all hunting methods is shown in Figure 22. Basically, the states with the largest harvests are the states with the highest deer populations. Texas' harvest in 1975 was 360,000 deer -- the largest harvest of any state. Wisconsin, Michigan, New York, Pennsylvania and Alabama harvested in excess of 100,000 deer. Not surprisingly, Rhode Island harvested a total of only 120 deer during that state's permit-only season (ibid). Figure 23 portrays the relationship between herd size and magnitude of harvest.

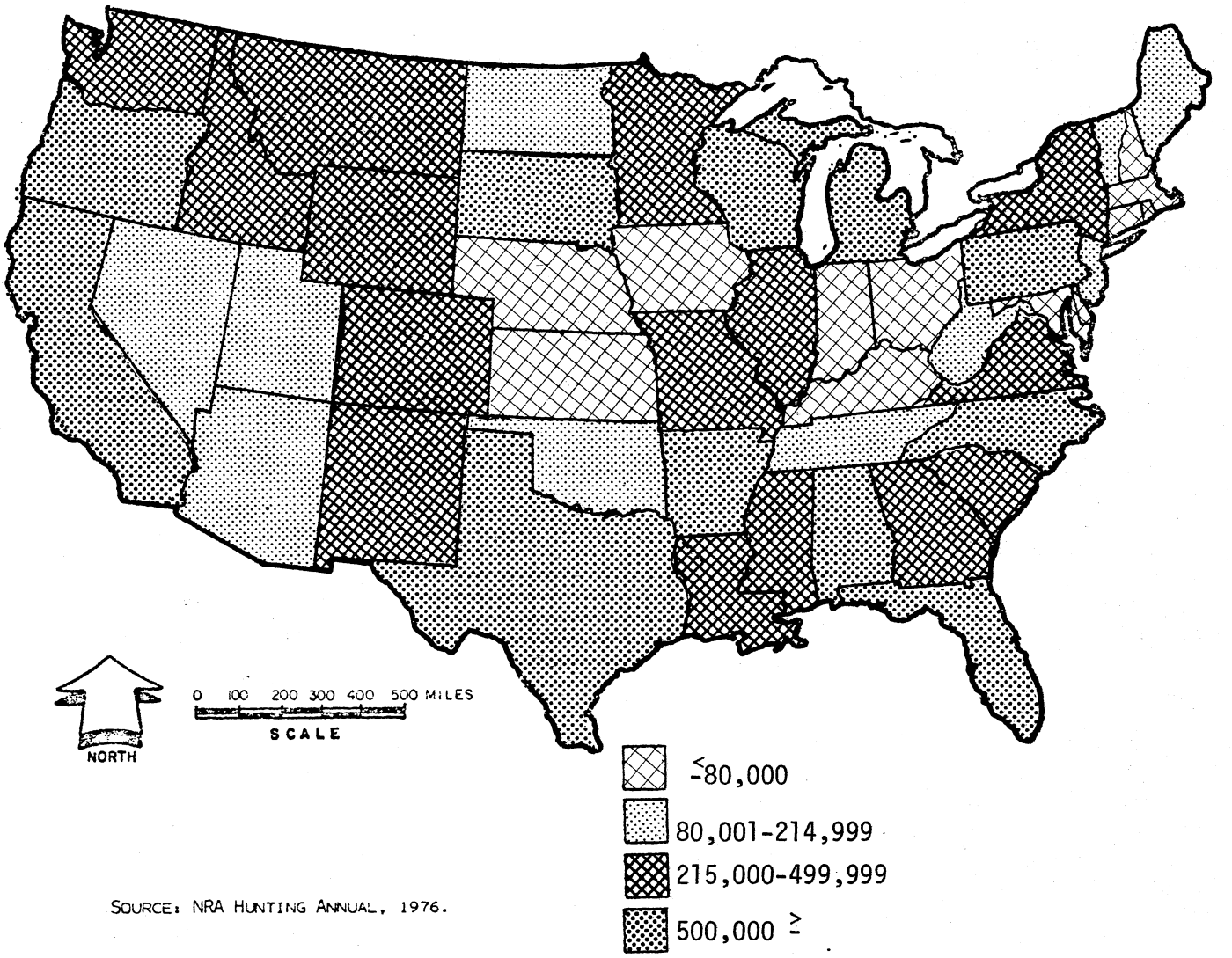


Figure 20. Estimated Deer Population by State, 1976

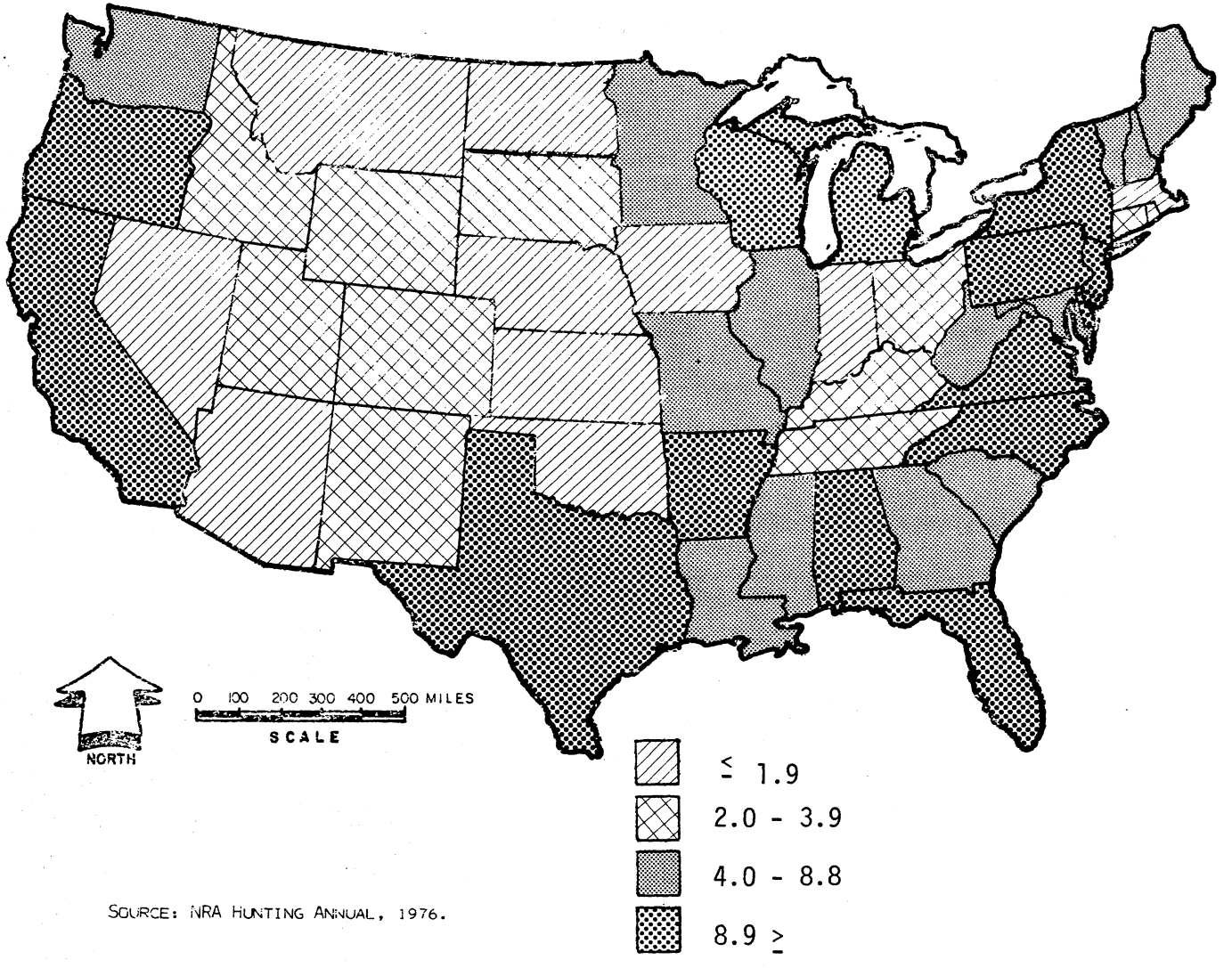
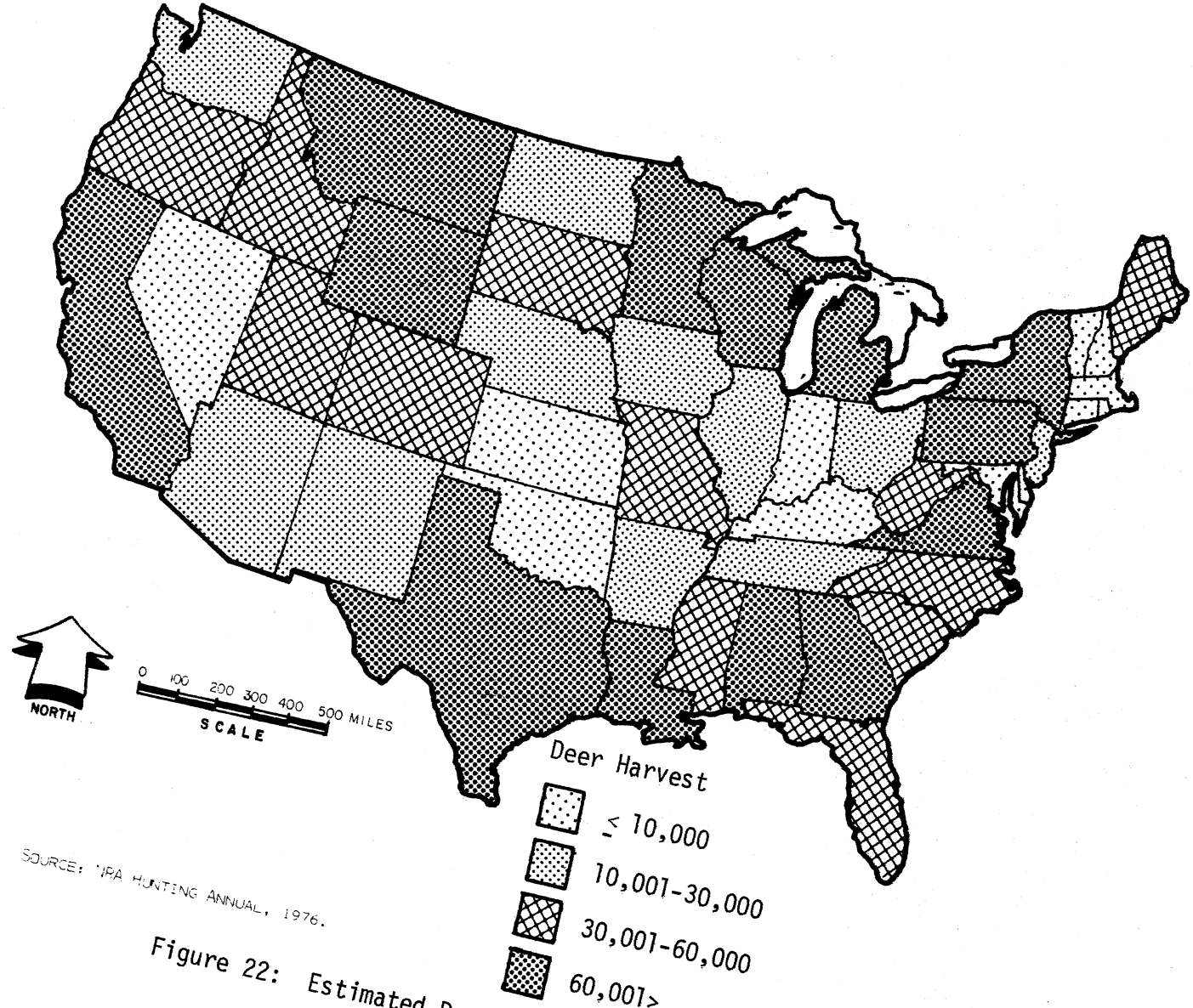


Figure 21. Estimated Deer Population per Square Mile



SOURCE: NRA HUNTING ANNUAL, 1976.

Figure 22: Estimated Deer Harvest, 1975

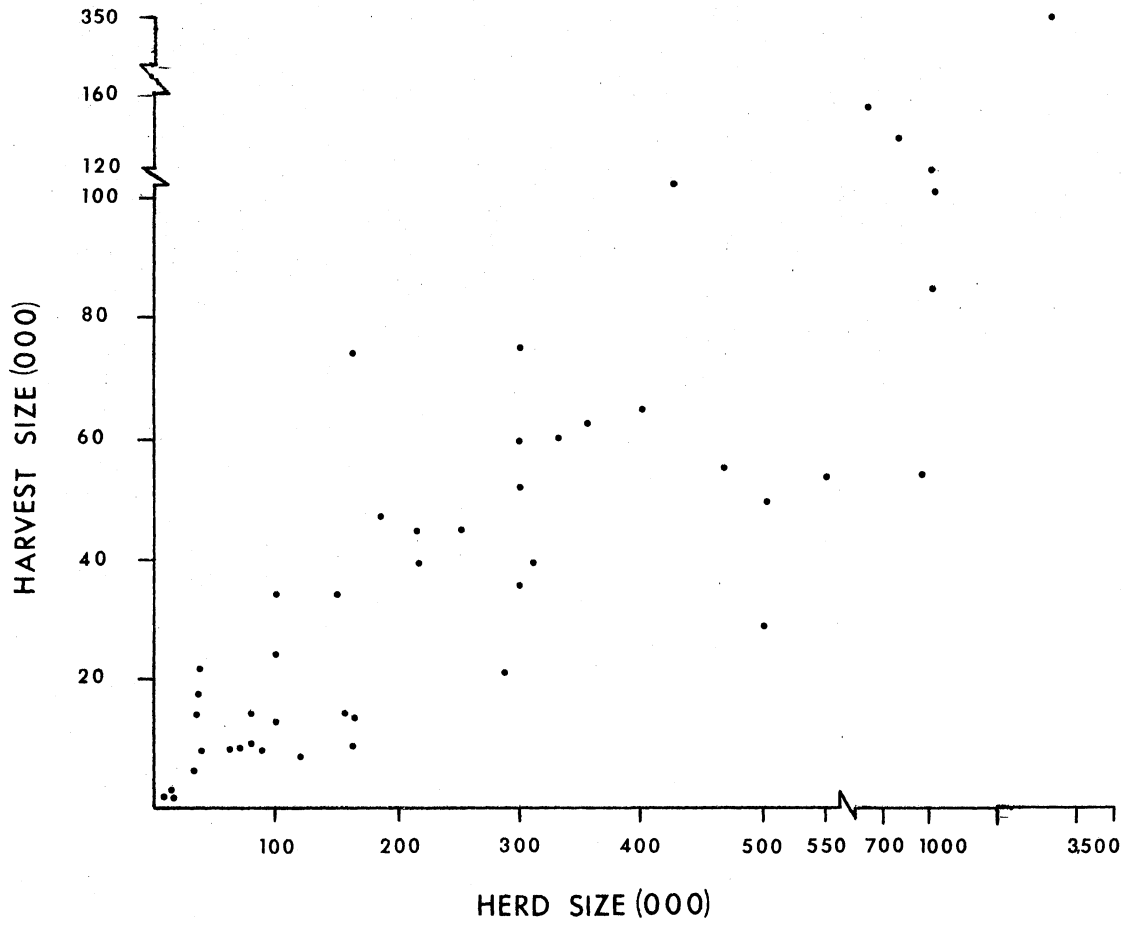


Figure 23. Relationship of State Deer Herd Size to Harvest Size, 1975.

Source: NRA Hunting Annual

Hunter success is shown in Figure 24. Hunter success is defined as the percentage of licensed hunters successful in taking a specimen (Nesbitt, 1977). In other words, hunter success indicates where the most successful overall hunting is in the nation. The states with the highest deer hunter success rates for 1975 were: Wyoming, 73%, South Dakota, 60%; North Dakota and New York, 55%; Nebraska, 53%; Montana, 44%; and Texas, 42% (Cartier, 1976). It must be remembered that these success rates are from only one year, and that success rates can vary greatly from year to year. It is significant to note, however, that although the South and Mid-western states had a high total harvest, the success rates for those states were generally quite low. This indicates that there are many deer hunters in these states that are going home empty-handed, or are not hunting deer even though they were issued licenses.

One reason why success rates are so low in the South may be due not only to the terrain but to the lack of available hunting land. Jack Crawford, of the Georgia Game and Fish Commission, stated, "Many property owners in the South won't allow hunting except by family and friends. That means a lot of good deer country is underhunted" (Cartier, 1974, p. 145).

The success rates in the Mid-west seem to be declining. Several years ago Michigan, Wisconsin and Minnesota offered excellent deer hunting, but as deer populations declined, all three state's success rates fell below 25 percent (ibid).

Proof of the difficulty of harvesting deer with bow and arrow is illustrated in Figure 25, showing those states with bow hunter success of ten percent or greater. North Dakota and the Rocky

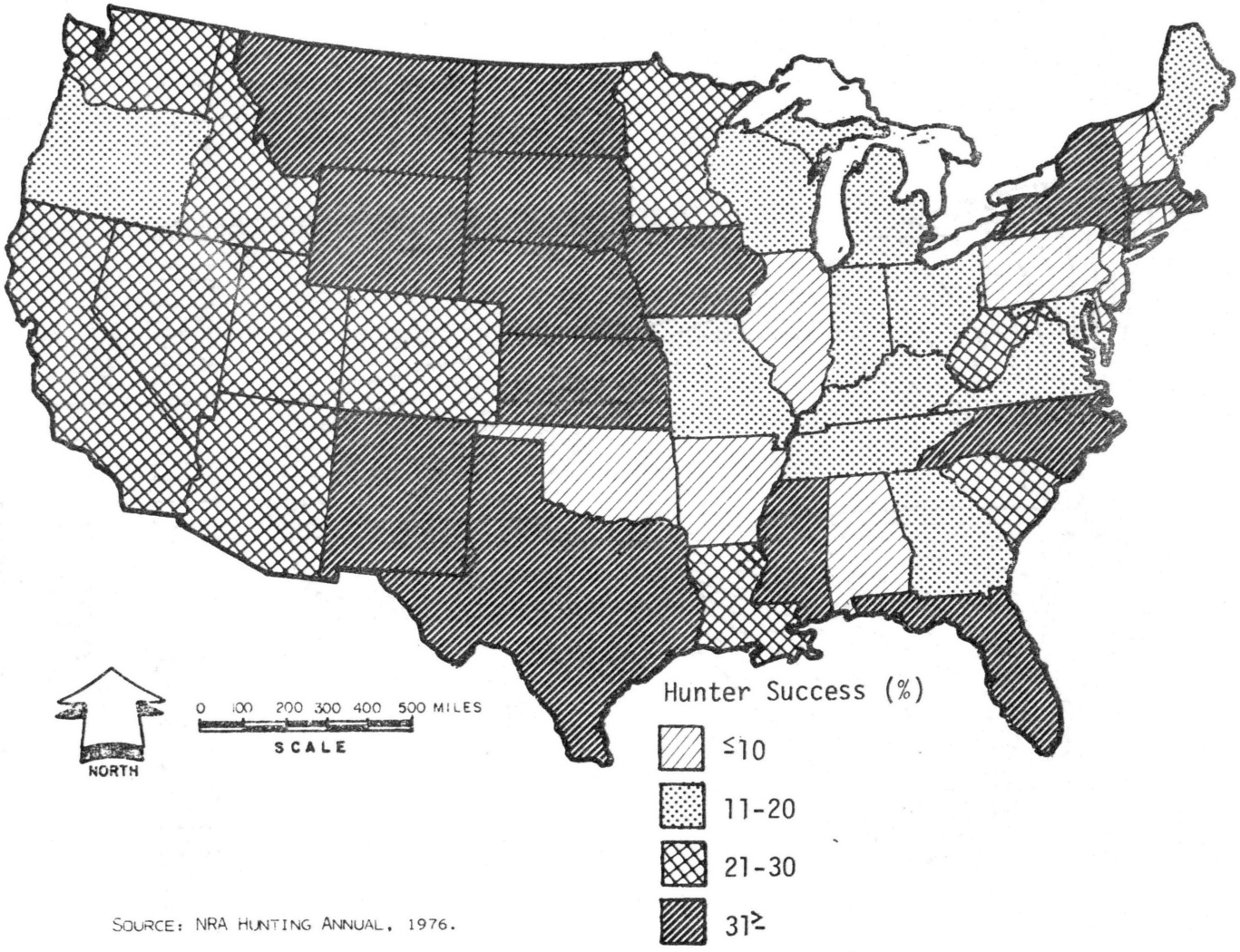
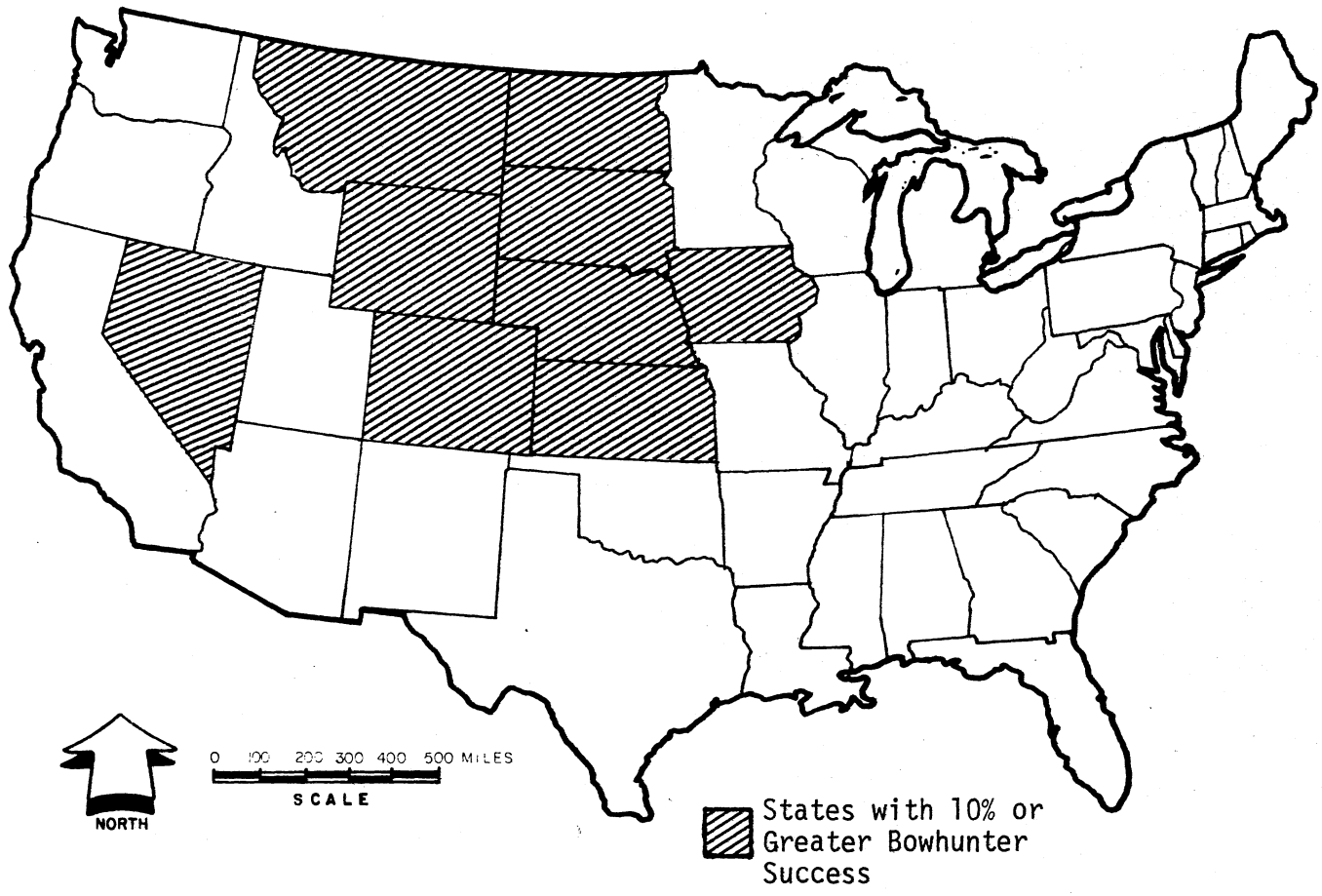


Figure 24. Estimated Firearm Deer Hunting Success, 1975



Source: Outdoor Life, 1974

Figure 25. States with Ten Percent or Greater Archery Deer Hunting Success

Mountain states boast the highest success rates.

> The archery take also rates high in Iowa, South Dakota, Kansas and Nebraska where wooded terrain is often found in small patches. Archer success ratios are low in the heavily forested states east of the Mississippi for the opposite reason. It's just too difficult to pinpoint deer and get close to them (ibid, p. 146).

It is hoped that the maps presented in this chapter clearly display the differences found in deer hunting regulations throughout the United States. Again, it must be emphasized that the regulations depicted in these maps are only the most general statewide regulations, and that a great deal of intrastate fluctuations is possible.

The differences seen in several maps are clearly due to physical or biological factors relating to deer population. But the deviations in other maps are due to other, more cultural and regional factors. It is the human factors that provide the most interesting and most difficult to explain regulations. In the following chapter an attempt will be made to utilize data from several maps as 'indicators' in order to identify regions according to deer hunting characteristics.

CHAPTER IV

IDENTIFICATION OF DEER HUNTING REGIONS

In Chapter III attention was given to various aspects of deer hunting, such as deer and hunter populations, licensing requirements, and harvest estimates. A series of maps was presented, each map describing one deer hunting characteristic. The complexity of these maps, however, makes the comprehensive understanding of deer hunting regulations on the macro-scale difficult.

An effort must be made, then, to reduce the number of variables to a size where they can be more readily observed without "losing" the important information found in the original data. The procedure utilized to accomplish this goal was factor analysis. This technique is applied to many problems in the behavioral sciences and has achieved a large degree of acceptance (Veldman, 1967).

Users of factor analysis have three main objectives; (1) to examine the correlations of many characteristics by clustering them into factors so that the characteristics within each factor are highly correlated; (2) to interpret each factor according to the indicators found within each factor; and (3) to summarize a great amount of information into a few factors (Frone and Hill, 1975). In this way the original components can be replaced by a few factors with little loss of information. The factor scores, which are computed, replace the original regulations and are used to identify spatial patterns.

The BMDP4M factor analysis program was utilized in this study. Five factors were estimated and rotated orthogonally. Factor scores were also calculated. The communality values, or the proportion of the variance that can be explained by the five factors, show that much of the unconformity is explained by factors one and two (see Table I). The total proportion of the divergence accounted for in Table II is .672 or 10.78 divided by 16 indicators.

The factor analysis program results are found in Table I, which indicates the relative strength of each factor as revealed by the eigenvalues and the proportion of deviation explained by each factor. Table III details the structure of each of the five factors as shown by those indicators with the highest loadings. Factor scores for each state were also computed, allowing the geographical patterns to be identified.

The scores are mapped for each factor. Four intervals were arbitrarily determined, two intervals placed below the mean score and two above. Each factor map is in effect a summary of the initial indicators in the factor analysis program and each map will be discussed separately.

Factor 1: Hunters

Factor 1, dealing with hunters, accounts for more variance than any other factor (21.4 percent). The highest loadings are on those indicators showing number of resident and non-resident license purchasers per 1000 population (see Table III). Another indicator showing a high loading on this factor is non-resident firearm fees; a low non-resident fee could possibly increase the number of deer hunters found in a state.

TABLE I

HUNTING FACTORS: EIGENVALUES AND VARIANCE EXPLAINED

Factor Number	Factor Description	Eigenvalues	Explained Variance %	Cumulative Explained Variance %
1	Hunter	3.4	21.4	21.4
2	License Requirement	3.1	19.2	40.6
3	Population/Harvest	1.7	10.9	51.5
4	Success	1.4	8.9	60.4
5	Firearms	1.1	7.0	67.4

TABLE II

COMMUNALITY (h^2) VALUES, ARRANGED ACCORDING TO RANK ORDER

Indicator	h^2
Number of Residents per 1000 Buying Licenses	.87
Estimated Deer Population	.83
Shotgun Ammunition Allowed	.82
Archery Success Rates	.80
Resident Firearm Fees	.79
Number of Non-residents per 1000 Buying Licenses	.78
Estimated Deer Harvest	.77
Estimated Hunter Success	.72
Type of Standard Firearms Allowed	.67
Non-resident Firearm License Fees	.65
States Requiring Safety Courses for Hunters	.65
Season Bag Limit	.63
Firearm Season Length	.62
States Requiring Use of Hunter Safety Colors	.47
Archery Season Length	.37
Sunday Hunting Allowed	.34
	h^2 = 10.78

Total Proportion of Variance Accounted for is .672.

TABLE III

DEER HUNTING FACTOR SCORES, SORTED
ROTATED FACTOR LOADINGS
IN DECREASING ORDER

Factor 1: Hunters	
Indicator	Loading
Resident License Purchasers	.917
Non-resident License Purchasers	.842
Non-resident Firearm Fees	.703
Factor 2: License Requirements	
Indicator	Loading
Safety Courses Required	- .766
Bag Limit	.736
Firearm Season Length	.734
Factor 3: Population/Harvest	
Indicator	Loading
Estimated Deer Population	.808
Estimated Deer Harvest	.766
Hunter Orange Clothing Required	- .655
Factor 4: Success	
Indicator	Loading
Resident Firearm License Fees	.792
Archery Success Rate	.718
Firearm Success Rate	.711
Factor 5: Firearms	
Indicator	Loading
Legal Shotgun Ammunition	.762
Shotgun-Rifle Requirements	.669

The states with the highest factor scores are North and South Dakota, Montana, Wyoming, Idaho, and Vermont (see figure 26). It is in those states that the proportion of resident and non-resident hunters per 1000 population is the greatest. Generally, the Western states tended to score high on this factor while the Eastern states, with the exception of northern New England, scored low. The high percentage of urban population in many of the eastern states may have been a factor in producing these low loadings.

Factor 2: License Requirements

The second factor, license requirements, is an important factor because it explains 10.2 percent of the total variance, almost as much as the first factor. This factor groups those states with similar licensing requirements.

The variables with the highest loadings on this factor are safety courses required (-.766), bag limits (.736), and firearm season length (.734). The states with the highest factor scores on Factor 2 were generally the southeastern states, where the bag limits are the highest, the firearm season length usually longest and where hunter safety courses are generally not required (see figure 27). Lower factor scores were indicative of shorter seasons, lower bag limits, and safety course requirements.

It is interesting to note the emergence of the South as a region on this map. For the three indicators presented, a greater similarity in license regulations is found in the South than on any other portion of the United States.

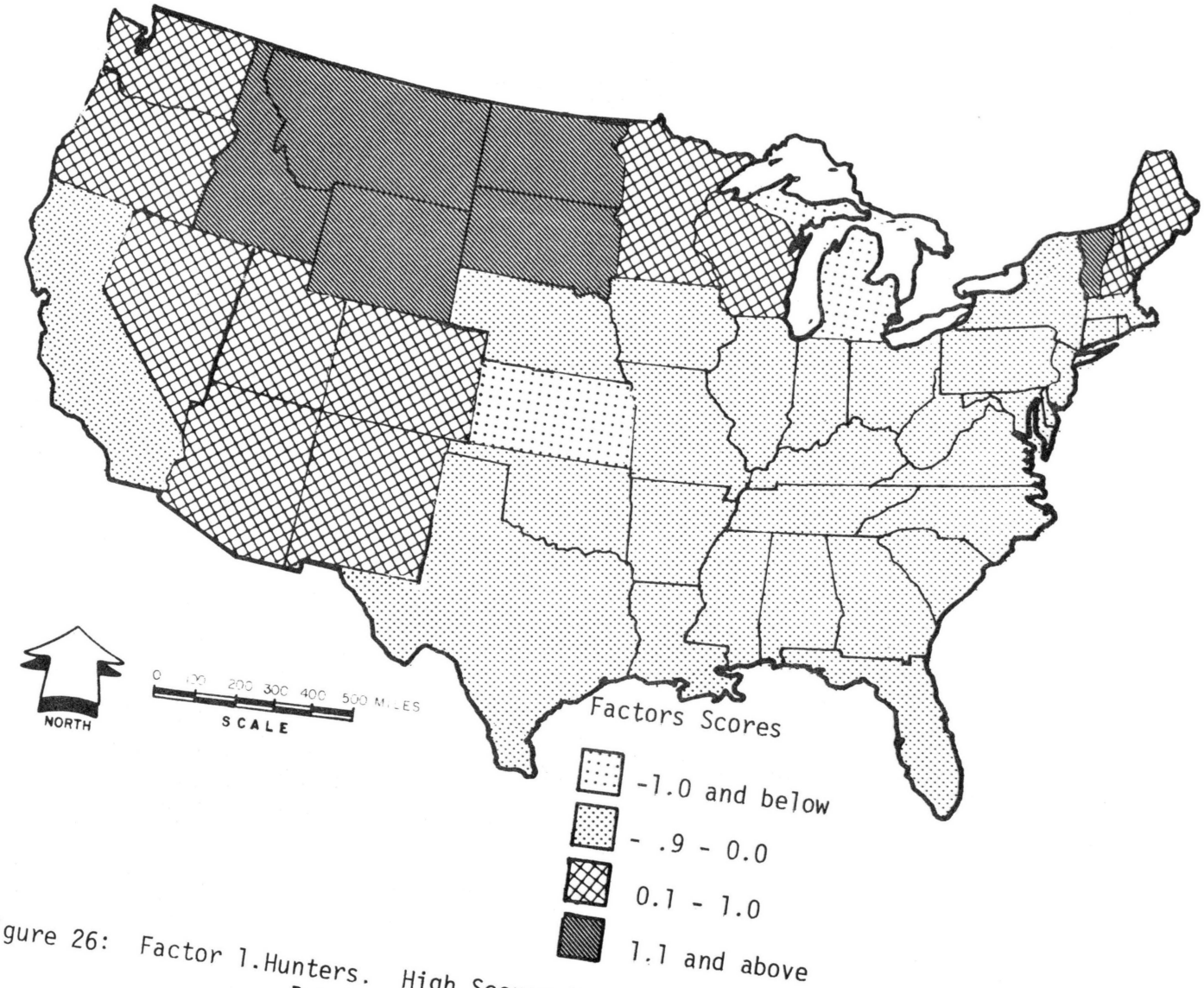


Figure 26: Factor 1.Hunters. High Scores Indicate Large Total Numbers of Hunters Per 1,000 Population and High Non-Resident Deer Hunting Fees

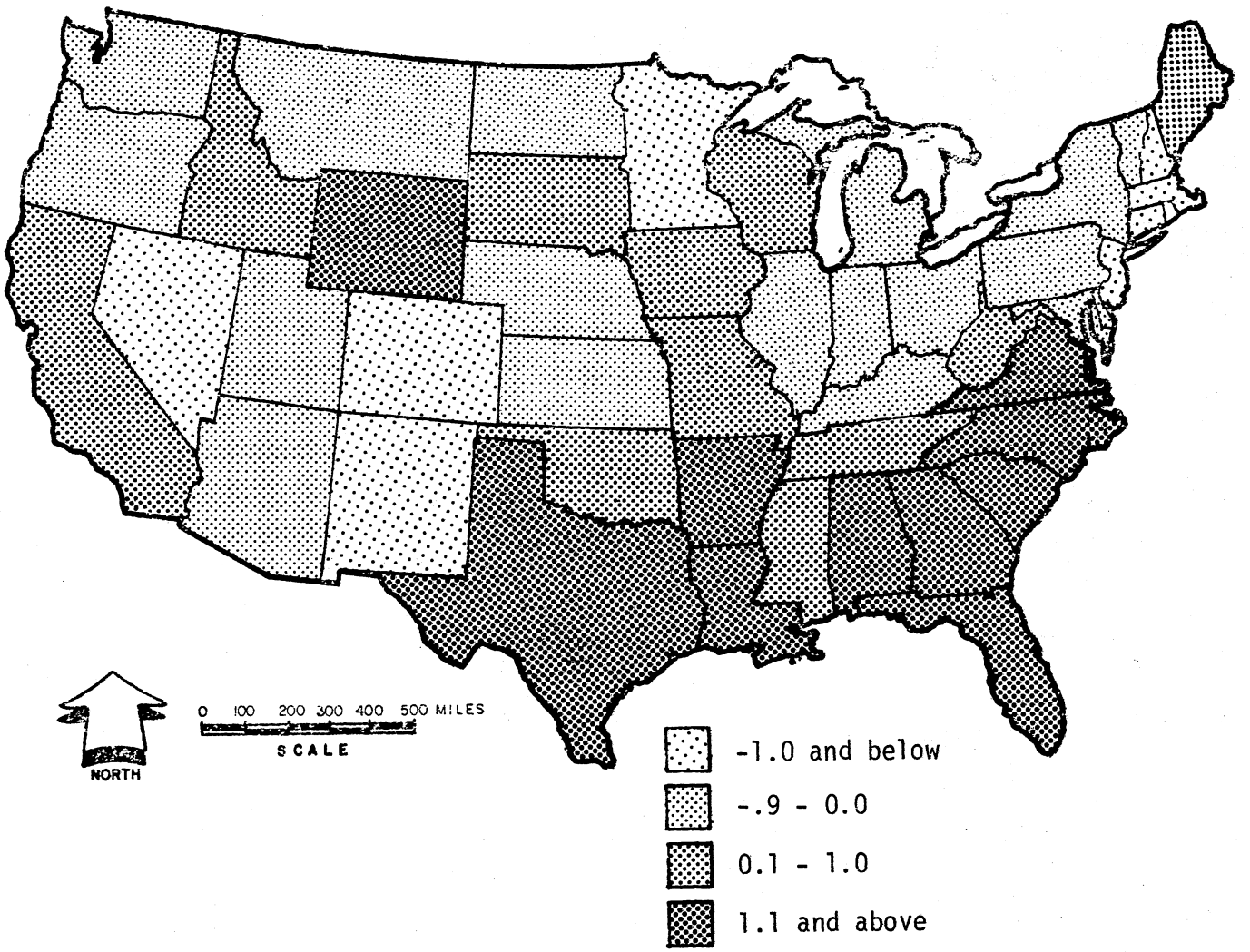


Figure 27. Factor 2: License Requirements. High Scores Indicate States with Similar Licensing Requirements

Factor 3: Population/Harvest

Three indicators concerning deer population and deer harvest load highest on this factor explaining 10.9 percent of the total variance. Estimated deer population and estimated deer harvest both have high positive loadings (.808 and .766 respectively), while hunter safety clothing loads negatively (-.655).

An examination of Figure 28 shows no distinct regional patterns in evidence for Factor 3. It may be assumed, however, that the states with the highest scores have the largest deer populations and the largest deer harvests, as evidenced by the high deer populations and harvests of Texas, Minnesota, California, New York and others. The reason for the appearance of the negative loading on hunter safety clothing in this factor is not known, but it is interesting to realize that in many of the states with the large deer populations and harvests, no hunter safety clothing is required.

Factor 4: Success

Three positive-loading hunting success indicators make up Factor 4, explaining 8.9 percent of the total variance. Resident firearm license fees loads highest (.792), archery success rates has a loading of (.718) and firearm success rate loads at (.711).

Figure 29 describes Factor 4 spatially. The most striking pattern found is of those states with the highest factor scores, i.e., New York, Michigan, and a group of six West Central states. The states with the highest factor scores are those with high resident firearm license fees and high archery and firearm success rates. It is possible that the game commissioners in those states with the highest success rates

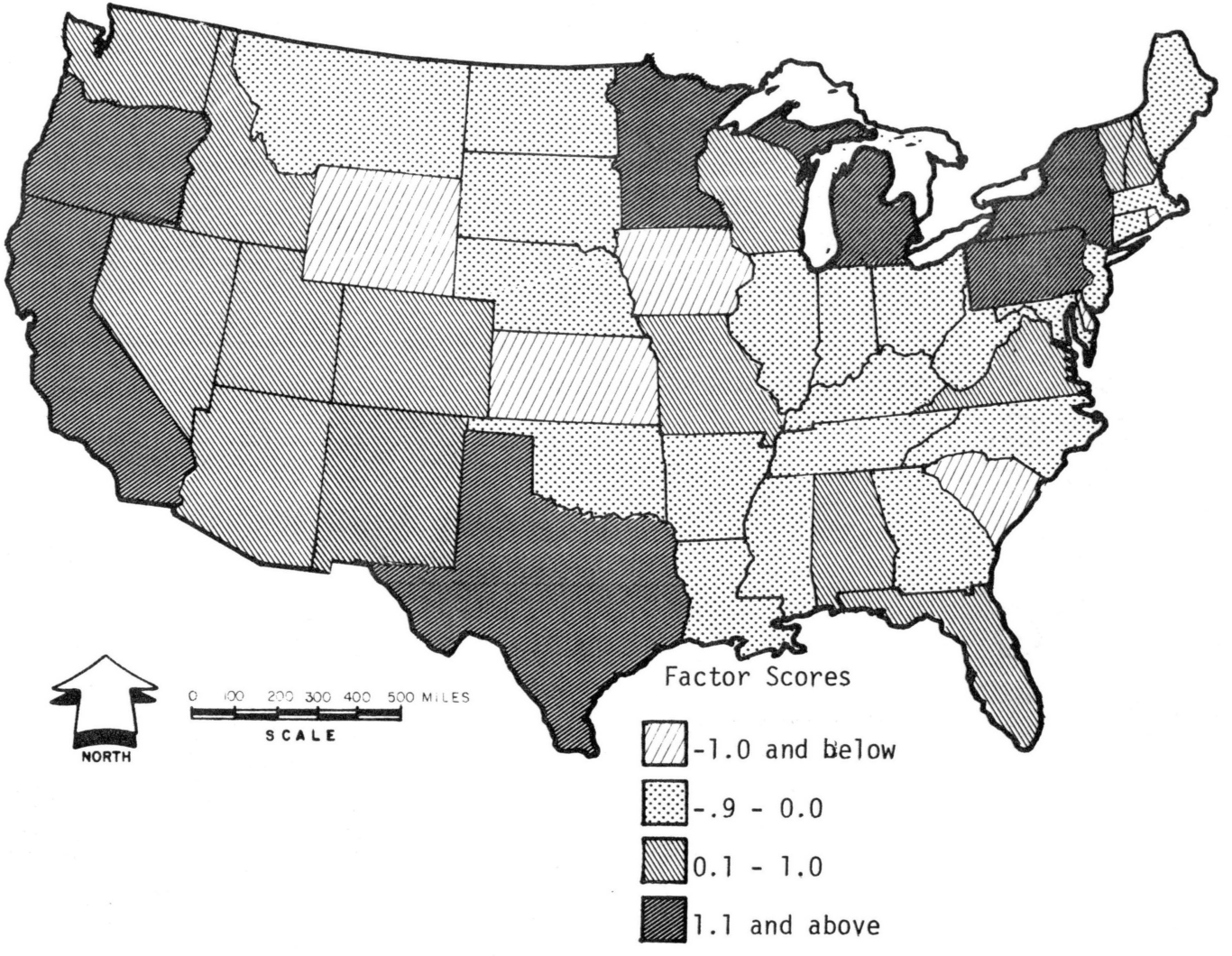


Figure 28: Factor 3: Population/Harvest. High Scores Indicate High Deer Populations and Harvests

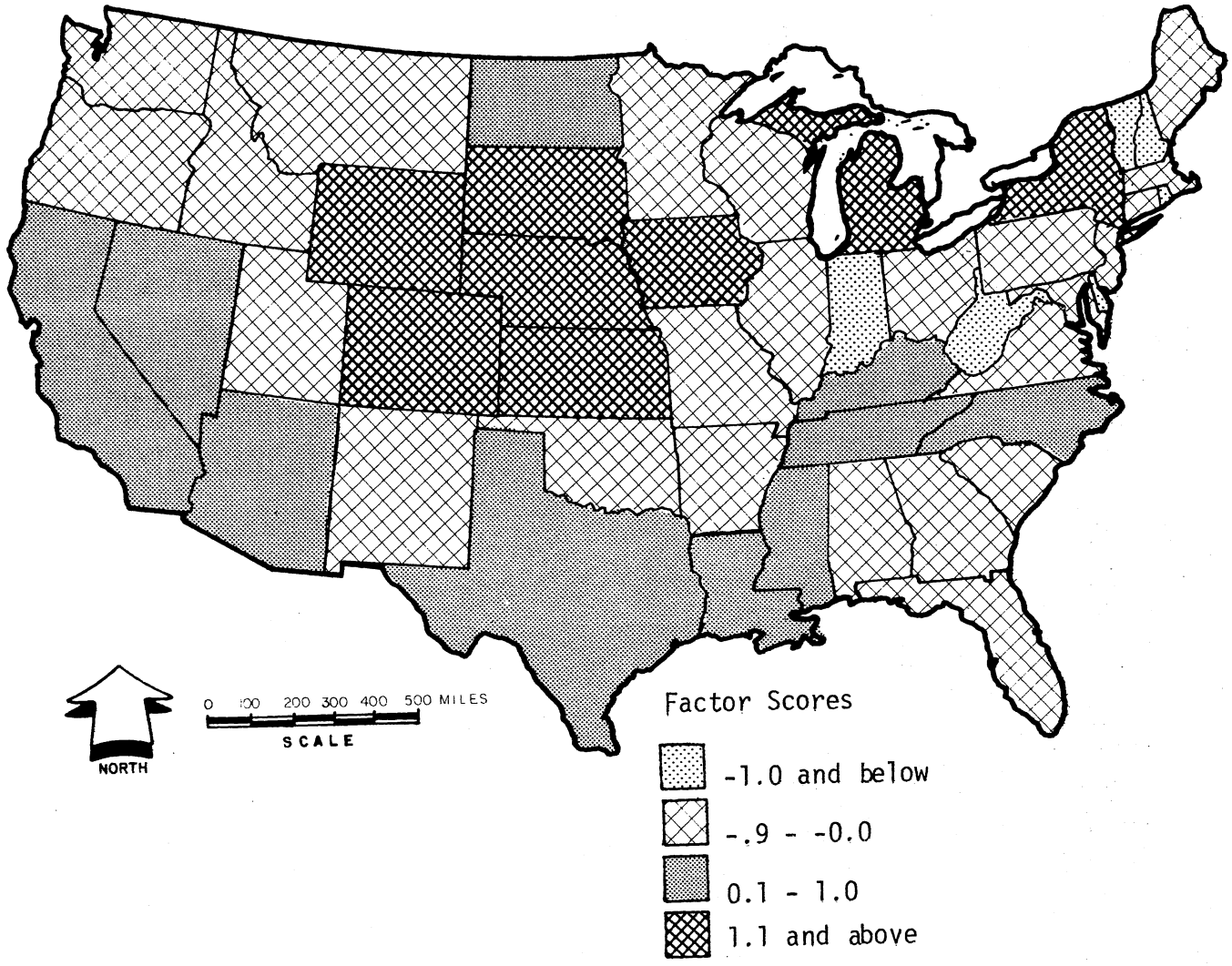


Figure 29: Factor 4. Success. High Scores Indicate High Resident License Fees and High Hunter Success Rates

may have increased the resident firearm fees, realizing that resident hunters will be willing to pay more when the chance of success is high.

Factor 5: Firearms

Only two firearm-related indicators make up factor 5: legal shotgun ammunition (.762) and shotgun-rifle requirements (.669). Factor 5 explains only 7.0 percent of the total variance, less than any other factor. No distinct regional patterns are found in Figure 30, with the possible exception of the three states with the lowest factor scores: Indiana, Nevada, and Utah. Indiana bans the use of rifles in deer hunting, while both Nevada and Utah ban shotguns.

Summary

The effect of factor analysis is, then, to reduce a number of selected deer hunting indicators to a more manageable number of factors. The indicators selected were by no means inclusive; important indicators may have been omitted. Hopefully the use of factor analysis in this research has produced new understanding and insight into the spatial variation of deer hunting in American, and the factors produced suggest possible new indicators to utilize in future research.

Regional Patterns

After the production of a series of five maps through factor analysis, it is logical to consolidate the factor maps to produce a single map of deer hunting regions. A cluster analysis program, HGROUP, was conducted on the five sets of factor scores. HGROUP performs a cluster analysis that groups states so that each new

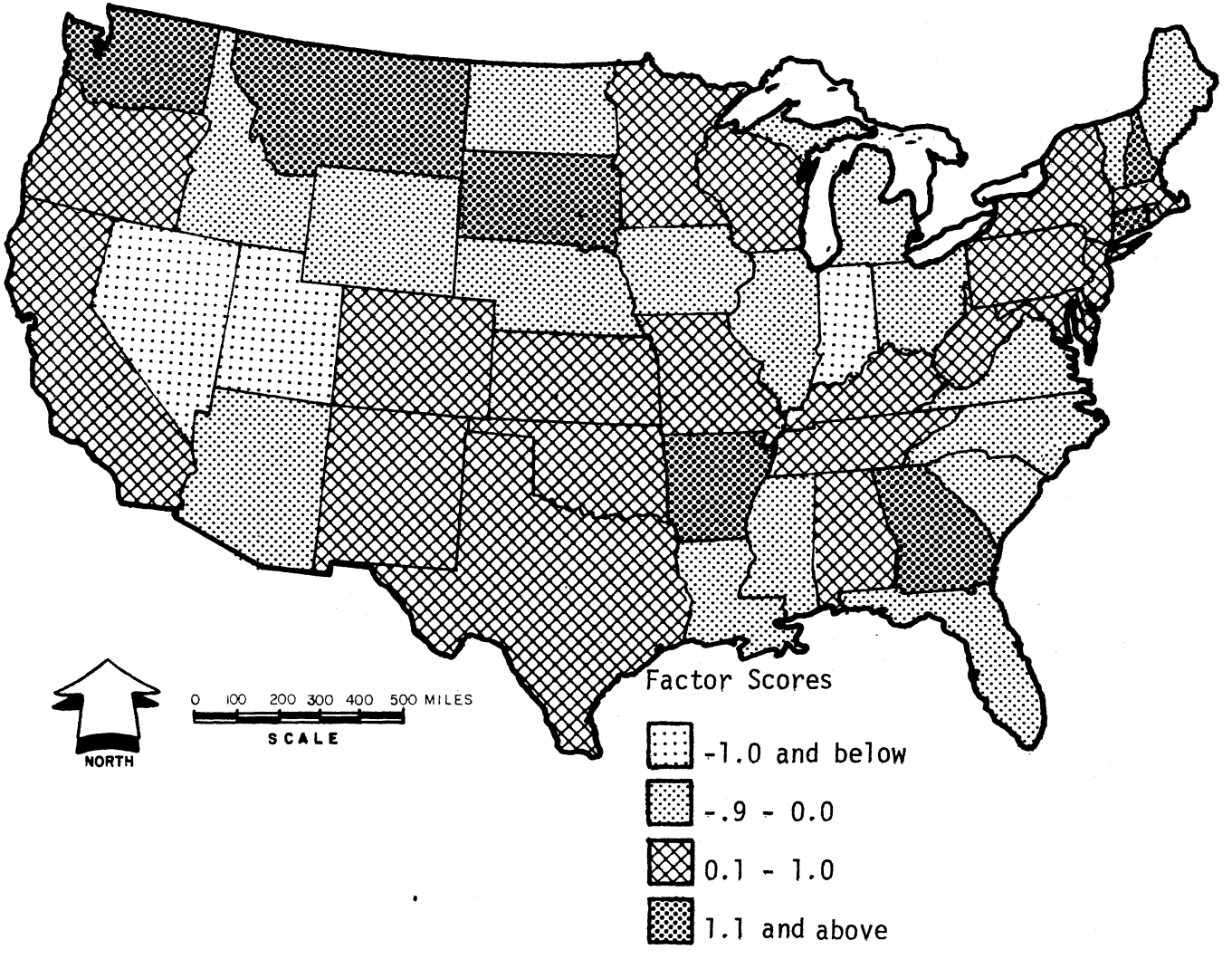


Figure 30. Factor 5: Firearms. High and Low Scores Indicate States With Like Firearm Regulations.

group makes the least possible increment to the within-group sum of the squared distances (Butt, 1975). Figure 31 represents the step in the cluster analysis where five groups remain to be clustered, and where a decision was arbitrarily made to depict five regions.

An examination of Figure 31 shows the formation of three hunting regions. The main focus in this section will be on the three regions and the reasons for their formation.

The ban on shotguns was probably a major factor in the formation of a region composed of Nevada and Utah. This region is alike in many other ways, i.e. deer species, deer habitat, license fees and other licensing requirements. These states can be termed a region, because of the unique regulations regarding the use of shotguns in deer hunting, and the similarities in vegetation and terrain in this area.

As in many of the maps previously presented, the South exists as a distinct region. Just as the South forms regions socially, historically and economically, the grouping of the South as a deer hunting region appears logical. It is in the South perhaps more than in any other region that cultural, biological and geographical similarities can be observed.

The third region is made up of four states: North and South Dakota, Montana and Wyoming. This area is one of the high hunter success, high non-resident license fees and proportionately high total number of hunters. If a hunter wished to find an area where deer hunting is the "best", that area would probably be within the four-state region, even though deer populations are relatively low per unit area, compared to other parts of the nation.

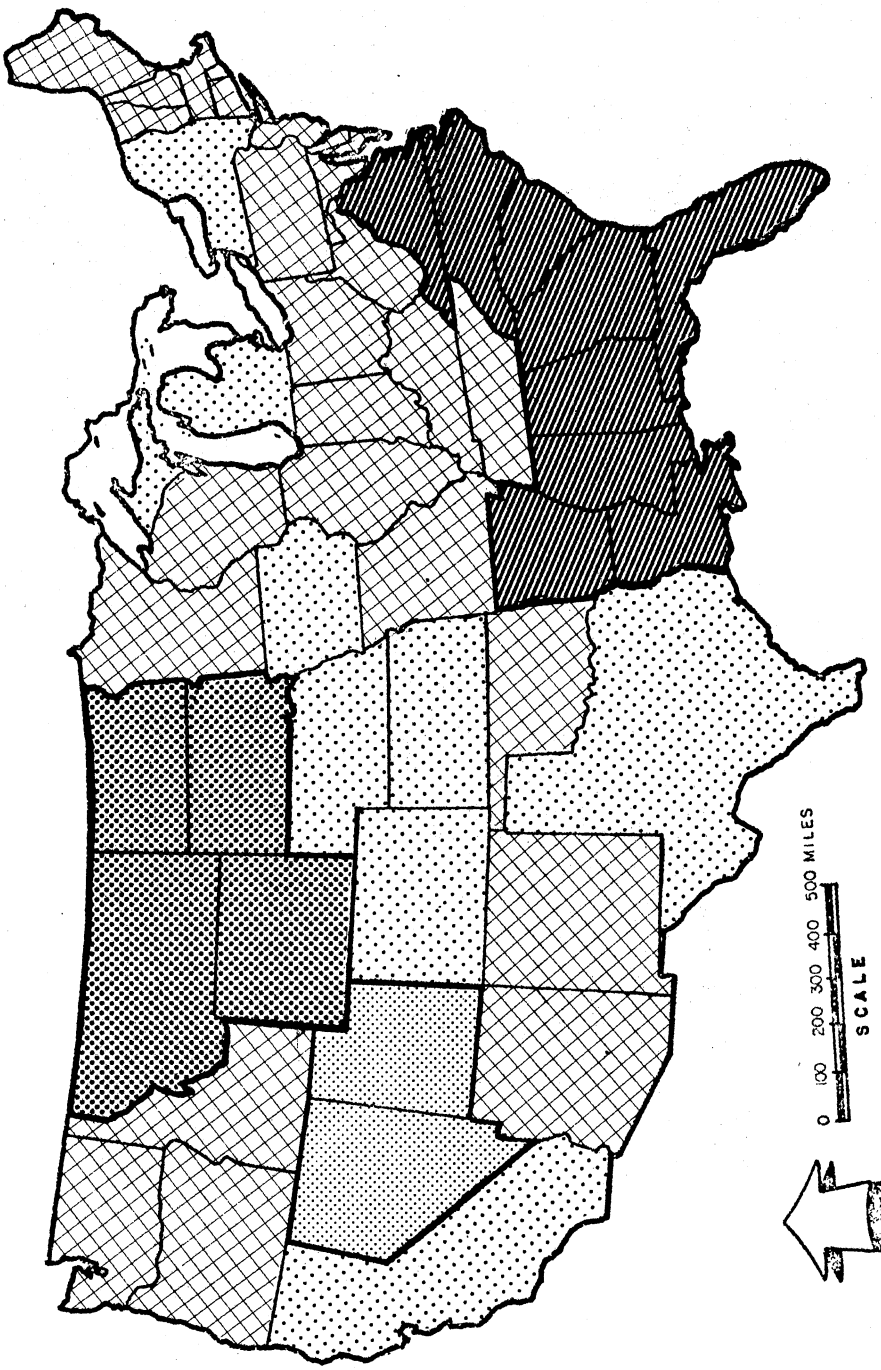


Figure 31: HGROUP Deer Regions

It can be seen, then, that through the technique of clustering it is possible to produce geographical regions from factor scores. The variations in deer hunting regulations as described in Chapter III can be attributed to deer population and habitat, and also to cultural values as evidenced by the appearance of regions in the South, North Central states, and Nevada and Utah. In the final chapter some implications for further research from the findings of this study will be presented.

CHAPTER V

SUMMARY AND IMPLICATIONS

The general purpose of this study was to determine the patterns of deer hunting regulations and to examine their occurance. A series of maps describing various deer hunting regulations, populations and harvest were presented and discussed. Additionally, factor analysis and clustering were utilized to form statistical deer hunting regions, based on selected deer hunting characteristics.

A series of questions were posed in Chapter I concerning deer hunting regulations and regions of like deer hunting characteristics. In this chapter the questions previously stated will be discussed, as will any implications this study may have on future research in this area.

How and Why Do Deer Hunting Regulations Differ?

Chapter III contained a series of maps detailing characteristics of selected deer hunting regulations. Perhaps the most interesting result of this chapter was that deer hunting regulations produce intriguing patterns. The differences presented were usually not random; in many maps a great amount of regionalization was apparent.

One of the more difficult challenges of this thesis was attempting to discover the causes for the regions created by the differences in deer regulations. Surely some of the regionalization was

caused by geographical or bilogical factors; there are more deer in some areas of the nation than in others and there is great difference in deer habitat. Regions appeared, however where physical or biological factors did not fully explain their formation. What can help to explain the formation of many regions is the varied cultural and traditional beliefs of people throughout the nation, as expressed to game commissions and enacted into law.

There are various examples of cultural differences found throughout Chapter III. The cultural diversity evident in the people of this nation is based on variables such as bag limits, use of dogs in hunting deer, the prohibition of Sunday hunting, type of weapons used to hunt deer and other requirements. What areas of the United States have like deer hunting characteristics and can therefore be regionalized?

Based on factor analysis and clustering analysis, detailed in Chapter IV, it is possible to delineate deer hunting regions from selected biological and cultural traits. The existence of three regions is indicated.

The emergence of the South as a deer hunting region is logical, for perhaps nowhere else in the nation are deer hunting practices more similar than in this grouping of states. North Dakota, South Dakota, Montana and Wyoming form a region of moderate deer population and high hunter success. In this region harvesting a deer could be termed the "easiest". Nevada and Utah form the other region based on herd size, terrain and the mutual banning of shotguns for deer hunting. The remaining states are divided into two statistical areas based on biological and cultural similarities.

Implications

The possibilities for further research in the human aspect of wildlife management are many and varied. Although a number of indicators were utilized in this study, others could be evaluated under the same format for deer or any animal with a wide distribution.

A study of the history of game commissions in the United States, with emphasis on the diffusion of various hunting regulations over space and time would have great value. Further work is also needed in the compilation of population, harvest, and hunter success data on both a state and nationwide basis. Hunter success could be broken down by the various types of weapons used, by species, and by the portion of the season where the most kills occur.

Investigation of the migration patterns of non-resident hunters and the economic impact of those hunters could provide important information to states regarding licensing procedures and out-of-state promotion activities. Also needed is further study of hunting pressure and the ratio of public/private hunting land in the United States.

The cultural impact of man on wildlife management is a subject that may never by fully understood. It is through investigation and analysis that a perspective can be found on which to base further study, thus leading to a better understanding of both man and nature.

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