A WHITE-TAILED DEER HARVEST DATA-ANALYSIS AND INFORMATION SYSTEM FOR VIRGINIA

by

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INTRODUCTION

History

The precolonial status of the white-tailed deer (*Odocoileus virginianus*) in Virginia is uncertain. Early Virginia colonists reported abundant deer populations in the early 1600's but these reports may have been exaggerated. There may have been few deer in the supposed climax forests of precolonial Virginia, though they were probably widely disributed and readily taken by expert hunters intent on getting them for food. Whatever the early situation was, by the early 1900's, deer had completely disappeared from all but four mountain counties (Alleghany, Bath, Craig, and Highland) in Virginia, where the best wilderness areas of the state remained (Handley 1947). Over 100 years of unregulated hunting, uncontrolled fire, and habitat alteration were significant factors leading to the complete elimination of the native deer population from the rest of the state.

An extensive restocking program was initiated in the mid-1920's and an effective fire control system was established in the early 1930's. Between 1926 and 1943, 1,285 deer, obtained from Pennsylvania, Wisconsin, North Carolina, and Michigan, were released in the mountain counties of Virginia (Handley 1947). In 1945, after nearly 50 years in which deer could not be legally taken, a deer hunting season was opened in southwestern Virginia.

Known reported Virginia deer harvests have increased from 4,019 deer in 1947 to 63,671 deer in 1976, Fig. 1. This increase of nearly 60,000 deer in 30 years (a compound rate of increase of 9.65 percent) is dramatic and reflects intensified deer management following the restocking program, changing land-use patterns, and increased hunting pressure. There is obviously some limit to the number of deer that can be harvested from Virginia's present and potential deer range. The capability of an uncontrolled deer population (and ungulates in general) to overpopulate its range and destroy its habitat has been well documented. An adequate harvest is required to allow much of the utility of the herd to be experienced in a wide variety of hunt-related activities; to stabilize the herd, providing opportunities for non-hunt related benefits; to crop excessive deer populations, preventing habitat deterioration; and to prevent excessive forest and crop damage.

Virginia Deer Harvest Strategy

The Virginia Commission of Game and Inland Fisheries (hereinafter called the Game Commission) utilizes three basic season types in their deer management program; 1) bucks-only hunting all season, 2) a bucks-only season with either-sex hunting at the beginning or end of the season,

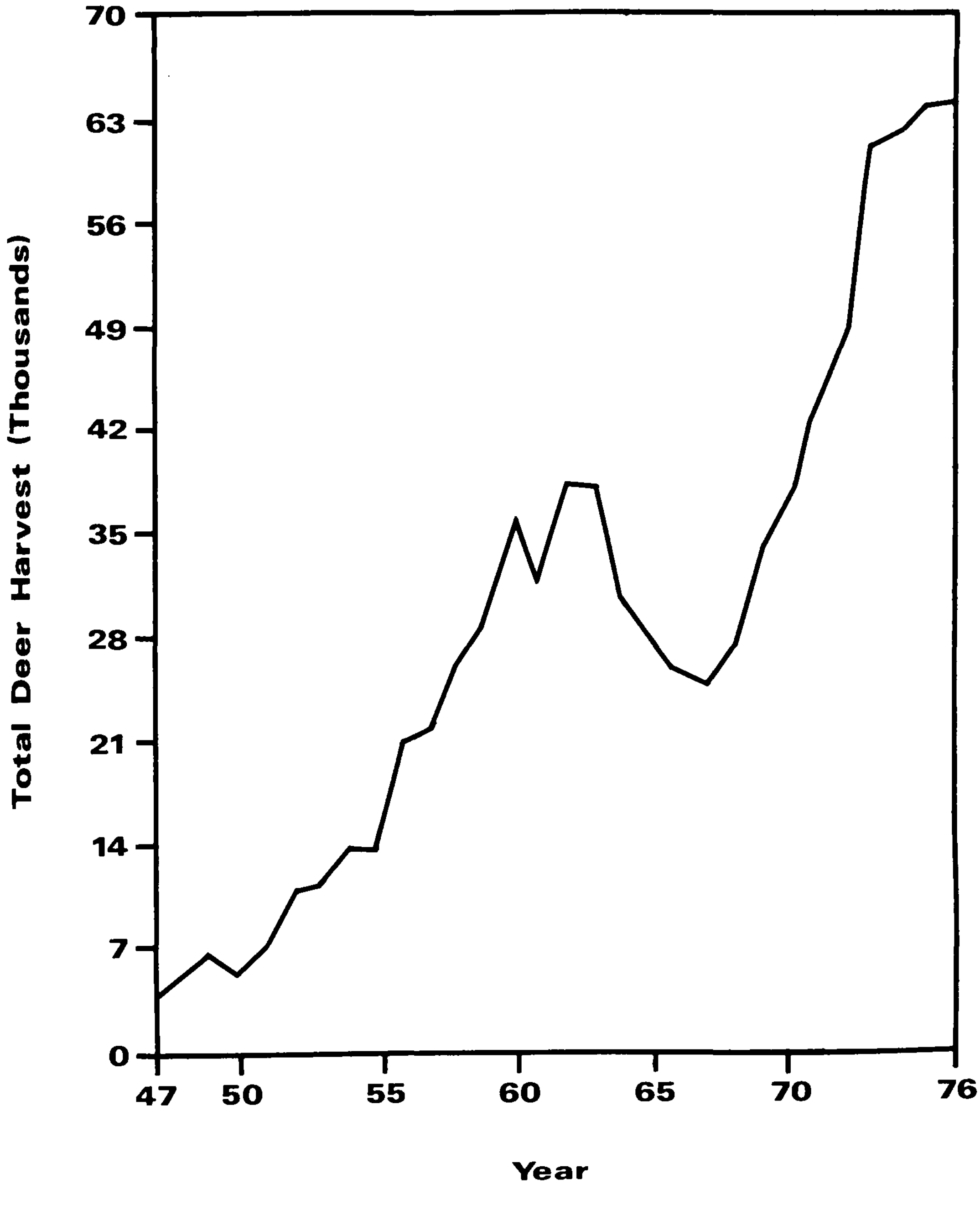


Fig. 1. Reported legal deer harvests in Virginia, 1947-1976.

and 3) either-sex hunting all season. The use of these three basic season types is an integral part of the Virginia deer harvest strategy. The research described in this thesis was conducted to assist the Game Commission in applying the season-setting strategy in their total deer management program.

In 1967, following a 17-year experimental period of liberal doe hunting throughout most of the state, the Game Commission adopted their present philosophy of managing deer herds by manipulating the percentage of does in the total reported harvest (Gwynn 1976A). The desired percentage of does in the harvest is achieved by regulating the number of either-sex hunting days in the season. This concept emerged from observations and experience by Robert G. Martin (Fish Division Chief) in the late 1950's (Gwynn 1976A). The mathematical theory underlying the concept was examined and later described by Dr. Don W. Hayne of the Southeastern Cooperative Fish and Game Statistics Project (Hayne and Gwynn 1977).

The concept of managing deer herds by manipulating the percentage of does in the total harvest is instituted by subjectively classifying each county into one of three deer population categories; 1) below carrying capacity, 2) at carrying capacity, and 3) above carrying capacity (Gwynn 1976A). Management of those counties in the first category is directed toward increasing the population. Bucks-only seasons are predominantly selected for those 'below carrying capacity' counties to allow the population to grow. Occasional either-sex hunting days may be held in particular counties to allow hunters to become accustomed to the doe-hunting philosophy of deer management.

Counties with deer populations at carrying capacity, category two, are managed to stabilize the population. Utilizing information from past harvests, biologists determine the number of either-sex hunting days needed in the season to produce a harvest containing 30 to 40 percent does. Such a harvest normally is believed to stabilize a population.

Counties in the third category are managed to reduce the deer population before extensive damage to the habitat is sustained. A number of either-sex days in a season must be selected to achieve a percentage of does in the harvest near or above 50 percent. Such regulations are likely to achieve herd reduction.

The actual percentages of does required to achieve the objectives of each category are variable since they are dependent upon the productivity of the herd, natural mortality rates, and hunting pressures. The above percentages serve only as general guidelines to be followed.

Virginia Check Station System

Since general guidelines, alone, cannot provide the information needed to reduce adequately the risks of specific management decisions, e.g. prescribing season regulations, a state-wide deer check station system was established in Virginia in 1947. Deer hunters are required by law to report all kills at an official deer check station. Over 1,000 deer check stations across the state have been established and are operated by volunteer local businessmen and women under the supervision of the local game wardens. Data collected at these check stations include total kill (by sex), type of weapon, and class of license holder.

A subset of these check stations is selected from among those west of the Blue Ridge mountains and these are manned by Commission biologists and wildlife management area supervisors on the first and last day of the season. At these check stations deer are sexed and aged, yearling bucks are weighed, and antler points are recorded for all bucks. Longer seasons, fewer public lands, and a lack of available personnel prohibit the collection of these data east of the Blue Ridge mountains except on several military areas.

Optimum Deer Yields

Hunting is normally the only practical means available to the deer manager for controlling and maintaining deer populations to prevent or minimize damage to agricultural crops, commercial forests, and wildlife habitat. Other control measures, such as the reintroduction (or protection) of natural predators, are impractical, rarely (if ever) effective, and usually uncontrollable. Hunters are not only effective but also are subject to control and the majority are willing to cooperate. Prescribing hunting season regulations, e.g. bag limits, season lengths, opening dates, weapon restrictions, etc., allows the deer manager to exercise control over hunting pressure and distribution, thus affecting harvests.

In addition to population control and maintenance, the deer manager has obligations to provide 'quality' recreation opportunities to consumptive and non-consumptive resource users. While the deer hunter serves as a management tool for the deer manager, he is also a beneficiary of deer management programs. To obtain, or maintain, the maximum cooperation and financial support of the hunting and non-hunting public, deer management programs must provide, in return, 'adequate' deer hunting opportunities and benefits.

For many years a primary objective of the deer manager was to maximize deer populations, on the premise that success (killing a deer) was the dominant source of satisfaction for the hunter. Maximizing the number of deer maximized the probability of success, thus maximizing hunter satisfaction. Numerous studies in recent years have disclosed that hunting satisfaction is determined by many factors other than the probability of success. Thus, deer management programs emphasizing quality deer hunting opportunities are gradually replacing programs directed toward maximizing success ratios.

The role of success, or the probability of success, in determining quality hunting has initiated considerable discussion. Potter, Hendee, and Clark (1973) claimed that "The expectation of success is necessary, but by itself, it is insufficient to produce quality hunting experiences". More (1973) described the kill as a goal and achieving this goal defines a problem for the hunter. More concluded, ".....the actual kill is an integral part of hunting because it provides the hunter with information that he has succeeded in solving the problem". In a study by Stankey, Lucas, and Ream (1973), 45 percent of the surveyed unsuccessful hunters who did not intend to hunt on the study area again the next year cited the lack of adequate game numbers and poor hunting as their reasons for not wishing to return. They concluded that ".....management programs that insure some minimum probability of success should have high priority".

Data Analysis--Information

Achieving an optimum deer yield, insuring that the harvest and population are maintained within the desired minimum and maximum, may be difficult without indepth, comprehensive research and management programs, e.g. intensive management. Intensive management of any resource requires an effective plan of action based upon an extensive information base. Gross, Roelle, and Williams (1973) noted that a major difficulty often encountered in intensive management is a lack of sufficient information to provide an adequate degree of credibility in management decisions.

Decisions are based on supportive information. The credibility of a decision is dependent upon the amount and quality of the information upon which it is based. Information, on the other hand, is not necessarily increased by the collection of more data. Data contains information and the amount and quality of information extracted from it often may be increased through more complete and intense analyses. Efficient utilization of available data often may be more valuable than the collection of additional data in terms of information gains per unit cost. Modern data analysis, systems analysis, and simulation techniques may be utilized to make currently available data more useful, generally improving natural resource management decisions. A data anlysis system, such as the one developed in this study, provides valuable feedback and feedforward mechanisms by which data inputs and/or analysis techniques may be modified to increase the amount of, or improve the quality of, the information that is produced. The efficient utilization of available data is thereby enhanced.

The amount of data that is available is often limited. Data collection is usually expensive and time consuming. Economic and time constraints are often the predominant factors prohibiting the collection of all of the data that may be desired. Which data are collected is determined by the information needs of the decision maker. When data collection is restricted, the decision-maker must determine what data is essential, most used, abtained at lowest cost, most long lasting, most readily analyzed, and answers the highest priority questions.

Time and economic constraints may also prohibit the comprehensive data analysis that is desired and often preclude needed research and management programs. The ability of the modern computer to store, sort, and analyze large quantities of data can eliminate many of the constraints imposed on data analysis. Time and money spent on compiling and analyzing data and generating tables and figures for progress reports by hand could often be spent elsewhere more effectively and efficiently.

Objectives

The objective of this study was to design a computerized data analysis and information system that would;

1) provide the deer manager with a flexible data analysis tool which would enable him to maximize information gains from, and effectively and efficiently utilize, available deer harvest and population data,

and 2) fulfill the information requirements of decision makers whose decisions significantly influence the future status of Virginia deer populations.

This thesis describes how that objective has been achieved. The resultant system, while specifically useful in Virginia, is likely to be useful in other states.

LITERATURE REVIEW

Biology

The white-tailed deer has played an important role in American history. It was heavily utilized by early Americans and has long been among the most popular big game animals in North America. Its history and nature as a game animal have led to its becoming one of the most managed of all wildlife species. Much is known about the white-tailed deer and a large amount of literature on its biology and management is available. Prominent references include Taylor (1956) and Siegler (1968) which deal with its life history, habits, and management.

Deer Management Systems

The evolution of the high-speed electronic computer has had a profound impact upon society, infiltrating practically every imaginable field; from the most applied uses to the most esoteric of sciences. The modern computer's ability to manipulate mathematically and logically store and sort large quantities of data has made it a practical instrument for any field requiring rapid, accurate analyses of numerous data. Automated data processing systems have become indispensable assets for many businesses and industries and are rapidly being implemented in many other managerial fields.

Buffington (1967) designed a computerized system of harvest analysis for Idaho big game management in order; 1) to aid efficient data collection, 2) to provide more thorough data analyses, and 3) to assist in rapidly distributing big game harvest and hunter activity information.

Buffington's harvest analysis system was designed, in particular, for states which utilize randomized post-season questionnaires to collect big game harvest data in lieu of a system of mandatory or volunteer game check stations. He included a non-linear approximation method to estimate harvest and hunter statistics, eliminating non-response biases often encountered using linear approximations.

Information provided by the system included: 1) species specific harvest statistics and estimates, 2) hunter activity information, 3) temporal and spatial harvest analysis, 4) hunter success, 5) hunting pressure, 6) incidental kill, 7) trophy value trends, and 8) confidence limits for each statistic.

Buffington's computerized harvest analysis and information system, though never fully implemented, had the potential of providing more accurate harvest estimates than had been possible before. Its capability of providing rapid, thorough data analyses could justify the collection of additional high-quality data. The system enabled the user to extract more information from the same amount of data that was already being collected.

Gross et al. (1973) led a research team at the Colorado Cooperative Wildlife Research Unit in developing an information processor for wildlife agencies. They stated that the objectives of the project were (Gross et al. 1973:3):

> "1. To determine the balance between the kind and amount of data generated by research and management and the kind and amount of information required to more effectively answer management questions and solve management problems.
> 2. To develop an information framework (or management-planning framework) whose mechanism insures the generation of and consideration of alternative solutions and attending consequences of the solutions in the decision-making process.
> 3. To develop a communication system that insures the routing of information to and from each decision maker in kind and amount commensurate with the role he plays in the decision making process."

The information processor employed a complex algorithm that directed information from all parts of the management and research system to the appropriate decision makers. The algorithm was developed by analyzing conceptual and real world management systems to identify and describe the structural and functional features that are essential to efficient management systems.

A population simulation model, PROGRAM ONEPOP, constituted the core of the information processor. The computerized model simulated big game population dynamics and associated forage relationships. A population model was employed on the premise that the most efficient management decisions come from information accurately reflecting the status of the dynamics of the population and forage relationships which interactively determine the condition or status of the population. PROGRAM ONEPOP is currently being utilized by 12 state game agencies (Gross, pers. comm.).

Simulation

Numerous deer population models have been developed as education, research, and/or management aids. Simulation can be an aid to education by allowing students in the wildlife management curricula or other interested person, e.g. hunting clubs, to test management strategies and ask 'what if' type of questions. A simulation thus allows the user to gain familiarity with population responses to management strategies and to increase their understanding of the internal processes of the population.

Hoecker (1976) developed an educational simulation program, NATAL, on white-tailed deer nutrition and reproduction. A student manages an imaginary deer herd attempting to achieve an objective or objectives specified by the instructor. The student must determine what sex ratio, age structure, gross energy, percent crude protein, and the type of hunting season that would be required to meet the specified objectives. A student's performance is based on; 1) the kilograms of deer harvested, 2) the final population size, and 3) the energetic efficiency of the final population, i.e. the ratio of the amount of gross energy input into the system to the kilograms of harvested deer biomass.

The aid provided by simulation to management is similiar to that provided to education, with the exception that the manager has a specific, often long-term, objective(s) which he desires to reach. The manager can utilize a simulation model to evaluate two or more management strategies or actions which are being considered. The simulation model assists the manager in selecting the one strategy or action which best will satisfy his long or short term objective(s).

Walls (1974) developed a dynamic white-tailed deer population simulator called DEER. The computer simulation was designed to serve primarily as a management aid but also as an educational device and a research tool. The simulation is based on a dynamic age and sex specific algorithm incorporating bioenergetic, sociological, hunter, and deer population characteristics. The simulation determines a harvest strategy that will stabilize the deer population at a sex ratio and population size specified by the user or determined from available forage data.

Six different harvest methods may be selected by the user. Three alternatives allow the user to specify a certain proportion of the population to be removed as antlered deer, antlerless deer, or both. The fourth and fifth alternatives allow the simulator to select the harvest proportions required to achieve an optimum sex ratio specified by the user or one calculated by the simulator. The sixth alternative lets the user specify the antlered or antlerless harvest for every year of the simulation.

The simulator also employs a random number generator to facilitate the random determination of population characteristics between lower and upper limits specified by the user for each population parameter. The simulation is thus stochastic, but, by setting the upper and lower limits for each parameter equal, the model can be made discrete.

The major drawback of Walls' simulator is its complexity and specific data requirements (a minimum of 55 data items) which seriously limit the practical implementation of the simulator. The simulator also requires either a deer population estimate or seasonal bioenergetic (forage) data. Bioenergetic data are rarely available in the real world and population estimates, assumed by the model to represent the carrying capacity of the area, are often difficult to obtain.

Rayburn (1972) constructed a model of inter- and intra-seasonal energy flow through deer populations to evaluate the potential biological productivity of a tract of land for deer. The model was designed to be used to compare lands that are being considered for acquisition as deer management areas. Deer productivity and maintenance were measured and described in terms of standard deer units of energy. Rayburn (1972;71) defined one standard deer as being a 50 kg female deer which is maintaining a constant body weight, and is not pregnant or lactating. The standard deer unit is a measure of the energy potentially available for supporting a deer.

A statistical distribution, the Weibul, was used to estimate successional changes in cover and forage requirements over a 50-year planning period. Potential sightable and harvestable deer production indices (standard deer units) were calculated at 5-year intervals during the 50-year cycle.

Simulation may assist the researcher by allowing him to gain further insight into the complexities and processes of the real system being modeled. Simulation may help explain why a realistic event occurred or why it did not occur. Simulation may assist researchers in locating unknown significant factors influencing the system or population, or better defining or delineating the values of system parameters.

Smith (1968) employed simulation to investigate observed population responses. Simulations of Vancouver Island black-tailed deer populations were compared with observed population changes over a 12-year period to determine the effects of succession and hunting on the deer populations. The simulation model was constructed specifically for this research, utilizing the most precise information available and resorting to abstraction only when necessary. Simulated population changes corresponded well with the observed changes.

Davis (1967) constructed a dynamic linear programming (LP) model for deer management planning. Given a specific managerial goal (objective function) the model determined an optimum management strategy for a 20-year planning horizon. The major ecological aspects of deer production and population dynamics were necessarily described as mathematical equations to facilitate the application of the linear programming technique. Factors of fertility, mortality, food requirements, breeding requirements, hunter harvest, browse production, and the amount of money, labor, and land available to the manager were incorporated into the model.

Two different objective functions were utilized in the

LP model. One objective was to maximize the number of deer harvested over the 20-year planning period. The second objective was to maximize the value of the total management program by assigning a higher "value" to a harvested buck than a doe and a higher "value" for a doe than a fawn. The second objective was primarily one of maximizing resource user benefits whereas the first objective did not utilize value weights in the objective function.

An analysis was conducted by varying the parameters of mortality, productivity, and harvested deer value weights to determine the sensitivity of management programs to changes in these factors. The program was also expanded to study multiple-use management problems by introducing timber management as a management alternative.

The practical implementation of the LP model is perhaps greatly restricted by its specific data requirements, its inflexibility, and the need to make assumptions about future climatic events (e.g. extraordinary winters), and land-use and socio-economic trends. The L.P. model may, however, benefit management of small tracts of land where deer population and habitat conditions can be effectively monitored and manipulated.

Deer Harvest Data Analysis

Mechler (1970) used multiple linear regression and correlation analysis to analyze Virginia's deer harvest data, 1947 to 1967. The analysis was conducted to identify significant factors influencing the white-tailed deer harvest in Virginia.

Correlation analysis was used to analyze county data concerning proximity, access , human population, average farm size, farmland uses, and the types and acreages of forest stands in 10 western Virginia counties. Multiple linear regression was used for analyzing independent variables that could be estimated annually; weather, hunting regulations, and deer kill characteristics of previous hunting seasons. Total deer kill and buck kill were used as the dependent variables.

Factors which were significantly (90% confidence) correlated with both total deer kill and buck kill included: 1) miles of road within 40 miles of urban centers (pop. $\geq$ 20, 000), 2) county population (1960), 3) county population, ages 15 to 29, 4) local area people in skilled occupations, 5) non-commercial forest acreage (1957 and 1966), and 6) estimated square miles of deer range (1964).

Multiple linear regression equations predicting the natural log of the total deer harvest were derived for 74 of the then 98 Virginia counties. The independent variables in the regression equations varied between counties but normally included hunting season characteristics and regulations and harvest statistics from the previous hunting season.

Regressions developed by Mechler were subsequently combined and programmed. The computer program predicted county deer harvests that would likely result from the selection of a particular season type; bucks only all season, either-sex all season, or either-sex hunting at the beginning or end of the season.

Graf (1973) developed and programmed a methodology for delineating wildlife and other environmental management regions. Regionalization serves to group similar contiguous counties into management units or regions, enhancing efficient and effective management.

A G-value algorithm (effectiveness rating) was employed to determine the optimum deer management regions by grouping contiguous counties based on their similarity with respect to various criteria. Optimum regionalization is acheived by a fundamental algorithm of cluster analysis, that is, minimizing intraclass (within region) variability and maximizing interclass (between region) variability. A judgement is required to select between few regions (simplicity) and many regions (explanatory ability).

Graf used a computer mapping routine, SYMAP (Dougenik and Sheehan 1975), to display graphically the grouping criteria to aid in selecting which criteria were to be used. Any number of criteria can be used, but explanatory ability is lost as more variables are considered in the grouping process.

Selecting the criteria of the natural log of the buck kill, natural log of the total kill, the number of any-deer days, and the number of hunting days by county, management regions were delineated which closely reflected the deer hunting regulations.

The legal responsibility for deer management in the United States has been delegated to the states. While the basic principles of deer management remain nearly the same between states, the methodologies of administering deer management strategies vary. Methods of regulating deer harvests, collecting deer harvest and population data, and manipulating hunting pressure and distribution differ. Harvest data analysis techniques used by individual states depend largely upon the method of harvest data collection.

Three basic methods of collecting deer harvest data exist; voluntary hunter report cards, hunter mail questionnaires, and voluntary or mandatory check stations. Each method has its advantages and disadvantages and lends itself to particular data analysis techniques. Jack V. Gwynn, game biologist supervisor for the Game Commission, explained that the Game Commission prefers the check station method over the others because it provides a minimum, direct count of the deer harvest rather than an estimate of the harvest obtained from hunter questionnaires or report cards (Gwynn, pers. comm.).

Davey (1957) reviewed deer population and harvest characteristics (indicators) that are utilized by the Game Commission in the analysis and management of Virginia's deer population. Important indicators of population status and dynamics that he determined through harvest analysis included; 1) percent yearling bucks, 2) fawn to adult doe ratio, 3) fawn sex ratio, 4) adult sex ratio, 5) buck and doe age class distribution, and 6) condition (weight, antler development, etc.).

The published scientific literature contains numerous methods of collecting and analyzing deer harvest and population data. State Game Agency reports and publications were reviewed to identify current methods being used to collect, analyze, and present deer harvest and population data. The 'Proceedings of the Southeastern, Northeastern, and Western Association of Game and Fish Commissioners', the 'Transactions of the North American Wildlife and Natural Resource Conference', 'M.S. Thesis Abstracts', and 'Wildlife Abstracts', 1965 to present, were reviewed to locate additional data analysis methodologies which could be useful in Virginia and incorporated into the data analysis system to be developed in the study described in this thesis.

METHODS

User Definition

Prior to designing an automated data processing-information system, the potential and/or planned users of the system and their respective data analysis and information requirements must be accurately defined and delineated. While the primary users of the system likely are known at the outset, it is often possible, and desirable, to subdivide users further into smaller, more discrete entities having discernably different data analysis and information needs. Defining users with discrete information requirements enables more efficient and effective information distribution. An automated data processing-information system then can be designed to provide only necessary information to each user, to avoid the production of unnecessary information, to save time and money, and to prevent possible confusion by, and/or misuse of such information.

Three potential users of a Virginia white-tailed deer harvest data analysis-information system were identified in this study: 1) State game biologists, 2) State game commissioners, and 3) county, region, or state land-use planners. The game biologist requires the most comprehensive deer harvest, population, and habitat information available. The game commissioner is largely reliant upon the game biologist for sound biological advice and does not require explicit deer harvest and population information. The land-use planner has little need for detailed annual deer harvest statistics. Information concerning general deer harvest, population, and habitat trends with an introduction to basic deer management principles would more than likely fulfill the land-use planners' information requirements.

System Design

Meetings and correspondence with Game Commission biologists Jack V. Gwynn and Joe L. Coggin and Game Commissioner Ralph Weaver provided significant information regarding available deer harvest and population data, current data analysis techniques, and perceived current and future information needs of the Game Commission.

After the potential users of the system and their respective information requirements were accurately defined, data analysis methodologies capable of providing the needed information were located, tested, compared, and evaluated. Published wildlife literature and state wildlife agency progress reports were reviewed to identify and evaluate potential methods of analyzing and presenting deer harvest and population data.

Data analysis methodologies and computer programs developed during prior graduate research studies at Virginia

Polytechnic Institute and State University were also reviewed. Those methodologies and computer programs having a potential utility to a deer harvest and population data analysis-information system were evaluated and their data requirements were identified. Several of these were found to be useful following minor modifications and improvements. Methods and programs for which only limited data were currently available were also tested and evaluated to estimate their potential utility to the data analysis system if adequate data should become available.

System Characteristics

As a writer often writes for a specific audience, the computer system designer designs a system to serve the specific needs of a particular user or set of users. Several system characteristics are influential in determining the resultant utility and effectiveness of a data analysis-information system and received special attention throughout the design, development, and programming of the system described in this thesis. These system characteristics include; 1) flexibility, 2) legibility and appearance, 3) operational simplicity, 4) economic feasibility, and 5) documentation.

Flexibility

The flexibility of a data analysis-information system is an important consideration when user demands placed upon the system are subject to frequent change. The system's program logic and design then must enable the system to respond automatically, or easily be modified, to meet the changing information demands. The system's program logic and design should also facilitate the addition or modification of new or existing data analysis methodologies when necessary. System flexibility is equally important if new users are identified which place new data analysis and/or information demands upon the system.

The data analysis-information system developed in this study was designed to provide a moderate degree of flexibility as user demands were not anticipated to change radically in the foreseeable future. The programming logic was designed, however, to facilitate the addition of new components to the system when additional data and/or new data analysis methodologies become available.

Legibility and Appearance

The legibility and appearance of the system's output are important factors influencing the potential effectiveness and utility of the system. The attractiveness, neatness, and organization of the output produced by the system influence the credibility of the system as well as its legibility. System users are likely to be apprehensive toward information presented in a disorganized unprofessional manner.

Proper formatting of the system's output is determined largely by its intended use. A formal format is desirable when the output is to be used extensively, distributed widely, and reproduced for inclusion in formal reports. A less formal format would suffice if the output is to receive only limited use and is soon discarded. Formal or informal; neat, legible output is essential for the full potential of the system to be realized. Simple, straight-forward, and well-organized system output enables the user to locate easily and quickly desired items of information.

Information produced by the deer harvest data analysis-information system developed in this study is presented in a formal manner. Much of the information produced by the system is similar to that which has been incorporated in Game Commission annual progress reports. Considerable time and money is devoted by the Game Commission to compiling harvest statistics, producing tables and figures for inclusion in progress reports, and maintaining permanent data files. The ease and speed with which these same tables and figures can be produced by the computer can save time and money and greatly enhance the utility and attractiveness of the system.

<u>Operational Simplicity</u>

Operational simplicity is of special importance in allowing the user to efficiently and effectively utilize the system. Complex operating procedures lead to a high probability of error and long retrieval times. The acceptable level of complexity is determined largely by the intended use of the system and the computer background of the system users. If users with little or no computer background are given frequent direct access to the system, simple operation procedures are necessary. When information requests are less frequent, or trained personnel operate the system, operational simplicity is less important.

The annual nature of deer harvest data reduces the frequency of information or data analysis demands which are placed on a deer harvest data analysis-information system. Limited use, however, does create a problem of recurring unfamiliarity with the systems operating procedure. The system user is apt to forget how to operate the system from year to year and must relearn the operating procedure annually. Thus, it was considered necessary to design the system in such a way that its operation required minimum effort, time, and computer experience.

Economic Constraints

Economic constraints imposed upon system development and the economic constraints of each user of the system must be considered throughout the system's design and development stages. The cost of developing the system together with the cost of operating and maintaining the system should not exceed the value (benefit) of the information and/or services provided by the system. Systems developers should aim to maximize the benefit-to-cost ratio yielded by the final system. By correctly identifying and delineating users with discrete information needs, only that information which is required is provided by the system, thus saving the cost of providing unnecessary information.

The existence of economic constraints was recognized in this study but such constraints were not anticipated to pose any serious difficulty. A liberal estimate of $100.00 was made for the maximum allowable cost to obtain a complete printout of all of the information the system could provide. Operating costs were closely observed as the system was developed but costs never approached a level which could be considered limiting.

Documentation

Documentation is an important, though often neglected, factor influencing the overall quality of a computer program or automated data processing system. The primary purposes of documentation are to: 1) facilitate later development and modification of the system; 2) provide necessary information regarding system maintenance, data and hardware requirements, testing procedures, and system operation; and 3) inform potential new users of the system's functions and capabilities.

Considerable effort was devoted to documenting all aspects of the system that were developed in this study. Extensive documentation was included within the computer program to facilitate future modifications and improve its readability. A users/operations manual was prepared to provide system users with instructions for operating the system, updating the data base, and interpreting the system output. This thesis provides additional documentation of the system's internal design and logic.

The Computer Program

A computer program (FORTRAN), named VADMIS (Virginia Deer Management Information System), was developed to analyze and summarize Virginia deer harvest data. FORTRAN was selected as the programming language because of its flexibility and its widespread availability and use. The computer program was written and tested on the IBM/370 model 158 computer facilities at Virginia Polytechnic Institute and State University. System utility functions which are unique to the VPI&SU computer facility were avoided to insure that the program would be operational on other computer facilities.

Data Base

Thirty years of county deer harvest and season regulation data, dating back to 1947, were coded and stored, by county, as a direct access file on magnetic disk to serve as the VADMIS data base. The Game Commission reports deer harvest data for 98 'counties' (counties and large independent cities). Deer harvests within the cities of Hampton and Newport News are reported together and the city of Arlington is permanently closed to hunting. County deer harvest data were stored on disk for the counties listed in Table 1 with the appropriate numerical codes used by the VADMIS program. Storage space was allocated to accomodate 40 years of harvest data to facilitate the storage of additional annual deer harvest data. Annual deer harvest and regulation data stored on disk include:

1) Doe kill
2) Total kill
3) Season dates information
    0 - no season
    1 - single season
    2 - two sets of dates
    3 - only part of county open
    4 - split season
4) Total days in season
5) Acres of forested deer range
6) Season type
    0 - closed season
    1 - either-sex all season

Table 1. List of Virginia counties and county codes used by VADMIS.

Code	County	Code	County	Code	County
1.	Accomack	43.	Hanover	83.	Scott
2.	Albemarle	44.	Henrico	84.	Shenandoah
3.	Alleghany	45.	Henry	85.	Smyth
4.	Amelia	46.	Highland	86.	Southampton
5.	Amherst	47.	Isle of Wight	87.	Spotsylvania
6.	Appomattox	48.	James City	88.	Stafford
7.	Augusta	49.	King and Queen	89.	Surry
8.	Bath	50.	King George	90.	Sussex
9.	Bedford	51.	King William	91.	Tazewell
10.	Bland	52.	Lancaster	92.	Virginia Beach
11.	Botetourt	53.	Lee	93.	Warren
12.	Brunswick	54.	Loudoun	94.	Washington
13.	Buchanan	55.	Louisa	95.	Westmoreland
14.	Buckingham	56.	Lunenburg	96.	Wise
15.	Campbell	57.	Madison	97.	Wythe
16.	Caroline	58.	Mathews	98.	York
17.	Carroll	59.	Mecklenburg		
18.	Charles City	60.	Middlesex		
19.	Charlotte	61.	Montgomery		
20.	Chesapeake	62.	Suffolk		
21.	Chesterfield	63.	Nelson		
22.	Clarke	64.	New Kent		
23.	Craig	65.	Northampton		
24.	Culpeper	66.	Northumberland		
25.	Cumberland	67.	Nottoway		
26.	Dickenson	68.	Orange		
27.	Dinwiddie	69.	Page		
28.	Essex	70.	Patrick		
29.	Fairfax	71.	Pittsylvania		
30.	Fauquier	72.	Powhatan		
31.	Floyd	73.	Prince Edward		
32.	Fluvanna	74.	Prince George		
33.	Franklin	75.	Prince William		
34.	Frederick	76.	Pulaski		
35.	Giles	77.	Rappahannock		
36.	Gloucester	78.	Richmond		
37.	Goochland	79.	Roanoke		
38.	Grayson	80.	Rockbridge		
39.	Greene	81.	Rockingham		
40.	Greenesville	82.	Russell		
41.	Halifax				
42.	Hampton & N. News				

2 - bucks-only all season

3 - either-sex at beginning of season

4 - either-sex at end of season

5 - not a uniform season

7) Number of either-sex days in season

8) Number of Sundays in season (during which hunting is not allowed)

Utilizing the annual county total kill and doe kill statistics stored on disk, the program calculates buck kill by simple subtraction and estimates antlered buck kill by the methodology employed by the Game Commission. Antlered buck kill is estimated as being equal to the buck kill minus 30 percent of the doe kill; assuming that 30 percent of the harvested does are fawns and that male and female fawns are harvested in equal proportions. The annual percentage of does in the total kill and harvest densities (kill / square mile forested deer range) for total kill, buck kill, antlered buck kill, and doe kill are also calculated.

Estimates of the square miles of forested deer range in each county for the years 1956 and 1966 were obtained from the Game Commission. A linear regression was performed on the county range estimates to approximate gradual county deer range changes between 1947 and 1986 (40 years). The linear regression was performed on the range estimates to avoid incongruous harvest density figures over time.

Age and sex data collected at 15 check stations west of the Blue Ridge mountains, Table 2, were also stored, as a separate file, on magnetic disk. Several other check stations west of the Blue Ridge collect age and sex data but often collect few data of uncertain reliability and are frequently grouped into various combinations by the game biologist for special analysis. The 15 check stations summarized by the VADMIS program are those for which the greatest amount of reliable data are annually available. Age and sex data items on disk include:

1) 1/2 year old bucks
2) 1 1/2 year old bucks
3) 2 1/2+ year-old bucks
4) 1/2 year-old does
5) 1 1/2 year-old does
6) 2 1/2+ year-old does
7) Percent spikes
8) Average weight of 1 1/2 year-old bucks

McDonald (1977) developed a Virginia County Information System, VACIS, which stores and retrieves county natural resource information and selected county socioeconomic information. The data base for VACIS is accessed by the VADMIS program to acquire county land-use and habitat information. County data items acquired from the VACIS data

Table 2. List of Virginia deer check stations summarized by VADMIS.

Station name	County
Triangle Service Station	Alleghany
Buffalo Gap	Augusta
West Augusta	Augusta
Mount Grove	Bath
Warm Springs	Bath
Maggie	Craig
New Castle	Craig
Dismal	Giles
Stoney Creek	Giles
Headwaters	Highland
West Lexington	Rockbridge
Fulks Run	Rockingham
Mount Jackson	Shenandoah
Sugar Grove	Smyth
Speedwell	Wythe

base include:

1) Total land area
2) Percentage of farmed land
3) Number of farms
4) Average farm size
5) Acres of cropland
6) Acres of pasture
7) Acres of forest
8) Acres of National Forest land

County Harvest Summary and Analysis

When the game biologist is specified as the user, program execution begins by retrieving county harvest data from the data base stored on disk. Data for each county are retrieved, then summarized and analyzed before the data for the next county is read. County harvest statistics are calculated, stored for future use, and printed out in a table summarizing the county deer harvests dating back to 1947. Recent changes in the county harvest statistics, expressed as percentages, are then calculated and summarized to aid in identifying county harvest trends and summarizing the effects of recent season regulation changes.

County deer harvest predictions are then made, utilizing an auto-regression system based upon research conducted by Mechler (1970) at Virginia Tech. The auto-regression system involves the automatic calculation of a multiple regression equation for each county from 15 years of county harvest data. The dependent variable for the regression equation is the natural log of the total kill in a year (year t) and the independent variables are the natural logs of the total kill and buck kill of the previous year (year t-1) and the number of hunting days (year t). Natural logorithms are used to transform the data and were found by Mechler to provide the best predictions. Predictions are made from the calculated regression equation by inserting the natural logs of the total kill, buck kill, and number of hunting days in the most recent season.

The predicted harvest is for a season with the same number of hunting days as there were the previous season. This is necessary because the calculated Beta value corresponding to the number of hunting days is sometimes negative, i.e. increasing the number of hunting days might result in a lower predicted harvest, while decreasing the number of hunting days might result in a higher predicted harvest.

County deer harvest predictions are made for three season types; bucks-only hunting all season, either-sex hunting all season, and either-sex hunting at the beginning or end of a bucks-only season. County harvest predictions are only made for those season types which have been held at least three times within the last 15 years. Only by such limits can an adequate (though minimal) data base be created for the regression.

The form of each county regression equation is dependent upon the number of season types for which predictions are to be made. Dummy variables are utilized when predictions are made for more than one season type. The equation for regressions on a single season type takes the form:

```
TK(t+1) = Intercept + B1*TK(t) + B2*BK(t) + B3*HD(t)
                                           +/- error

     where  TK = log Total kill (years t and t+1)
            BK = log Buck kill
            HD = log Number of hunting days
            B1,B2,B3 = Regression coefficients
                       (Beta values)
```

Utilizing the above notation, the equation for regressions on two season types takes the form:

```
TK(t+1) = Intercept + B1*TK(t) + B2*BK(t) + B3*HD(t)
                                 + B4*Dummy +/- error

     where  Dummy = 1  for first season type
                  = 0  for second season type
```

The equation for regressions on all three season types takes the form:

```
TK(t+1) = Intercept + B1*TK(t) + B2*BK(t) + B3*HD(t)
                 + B4*Dummy1 + B5*Dummy2 +/- error
```

where Dummy1 = 1 if prediction is for a bucks-only season
= 0 if otherwise

Dummy2 = 1 if prediction is for either-sex all season
= 0 if otherwise

In addition to calculating harvest predictions for the next year, the auto-regression system was programmed to summarize county deer harvest predictions for each of the past 5 years. These harvest predictions are presented and compared with the actual reported harvests for those same 5 years whenever a prediction was made for the season type which was actually held. The numerical and percentage differences between the predicted and actual harvests are calculated and averaged, providing a county harvest prediction history, or "index" of predictive reliability for each county. The calculated average numerical and average percentage differences between the predicted harvests and the actual harvests are averages of the actual absolute differences. The absolute difference is used to preclude the erroneous averaging of compromising positive and negative differences. Inspection of past harvest predictions indicated that some counties consistently provided more accurate predictions than other counties. A 5-year harvest prediction summary enables the user to distinguish between counties which consistently produce 'good' predictions and those which have consistently 'poor' predictions.

The auto-regression system was tested to evaluate its performance and the accuracy of the predictions produced. The size of the data base on which the county regression equations was based was altered to determine its influence on the accuracy of the predictions. County predictions were made for the past 15 years utilizing 5-year, 8-year, 10-year, 12-year, and 15-year data bases and then compared.

Five interactive subroutines, GRAPH, TYTEL, XAXIS, HISTO, and COMBN, were written and programmed to produce histogram plots of county deer harvest data and district and state harvest data as well. Subroutine GRAPH, called from the main program, determines which type of histogram is to be produced and sends the appropriate data to the other four subroutines. Subroutine TYTEL prepares the appropriate titles for each histogram based upon information received from the calling subroutine, GRAPH. Subroutine XAXIS labels or numbers the x-axis of each histogram. Subroutine HISTO is responsible for creating the histogram; the x- and y-axes are scaled, the data plotted, titles and x-axis labels are appended, and the completed histogram is stored in a 60 row - 130 column array. Subroutine COMBN controls the printing of the histograms, e.g. adjusting pagination and printing appropriate headings.

Histograms of four harvest statistics (total kill, buck kill, antlered buck kill, and percenage does in the total kill) may be plotted by year for each county. A data input option allows the user to select any combination, or none, of these four variables. If the data input option is not utilized, then the program defaults to plotting total kill and antlered buck kill. Conversations and correspondence with Game Commission biologists Jack V. Gwynn and Joe L. Coggin indicated that these two harvest statistics are of greater interest to Virginia game biologists than are the buck kill and percentage does in the total kill.

<u>District Harvest Summary and Analysis</u>

After the desired histograms for a county have been produced, the data for the next county are read from disk and harvest summaries, predictions, and histograms are again produced. This cycle continues until the summaries and analyses for all 98 counties have been completed. County harvest data are then grouped into districts for analysis and summarization.

A data input option was programmed to enable the user to assign counties to selected districts. A maximum of 10 districts and 20 counties in each district may be defined. If districts are not defined by the user through the data input option, the program assumes default county-district assignments. Default districts correspond to six general physiographic areas of Virginia; north mountain, south mountain, north piedmont, south piedmont, north tidewater, and south tidewater districts. The map in Fig. 2 depicts the six physiographic districts. The default districts and the counties within each district are listed in Table 3.

District harvest data are summarized by year, 1947 to present, and by county for the current year. District harvest changes over the last 5 years are also calculated (as percentages) and presented to identify possible harvest trends. The district harvest data are also averaged to provide mean harvests for the most recent 10-year period and the previous 10-year period, e.g. 1957 to 1966 and 1967 to 1976.

For each district, counties are ranked, in descending order, with respect to any of four harvest variables: total kill per square mile of forested deer range, buck kill per square mile, antlered buck kill per square mile, and/or percentage doe in the total kill. The same data input option that controls the production of county histograms also determines which harvest variables are to be used for county ranking. Defaults are total kill per square mile and antlered buck kill per square mile.

County harvest statistics for the two most recent years are ranked and presented graphically as histograms. County rankings are produced to enable the biologist to determine the relative improvement or decline of each county in the

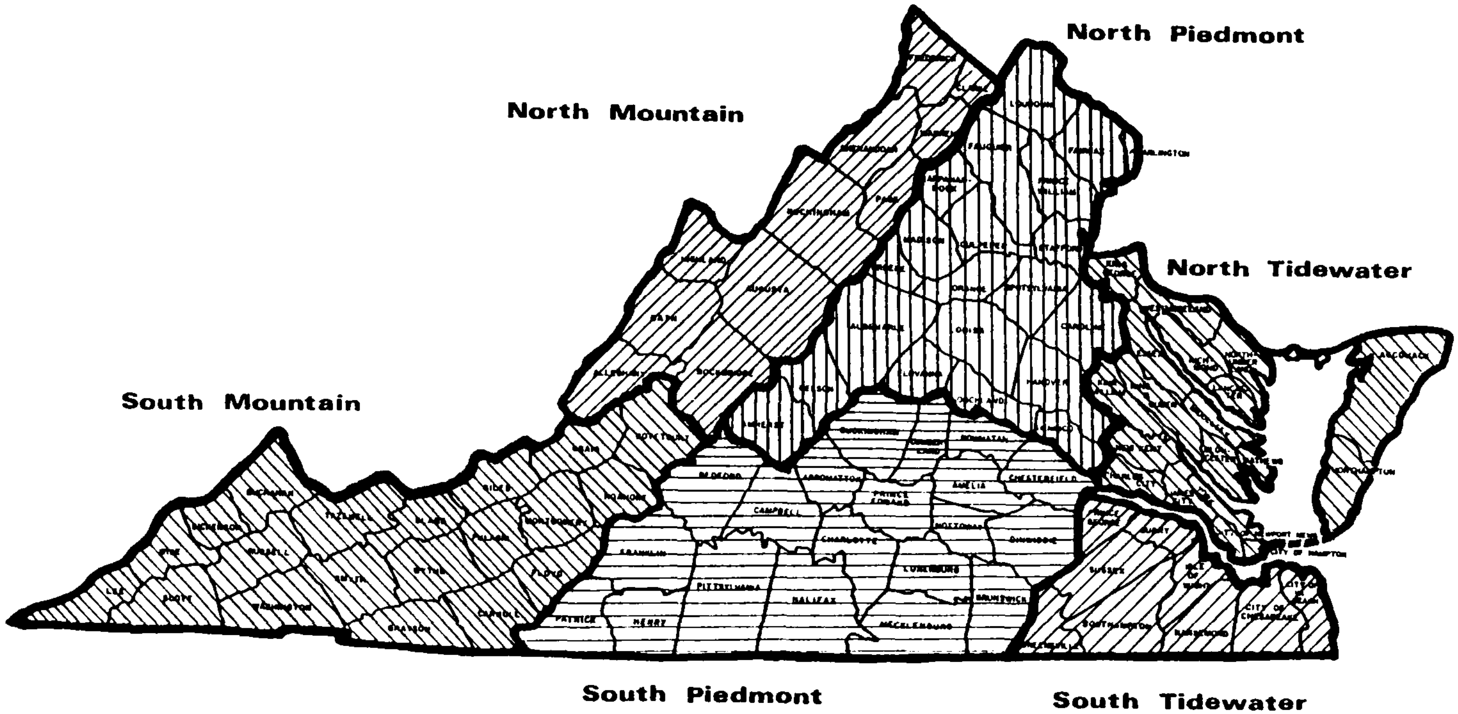


Fig. 2. Six physiographic districts of Virginia used within VADMIS.

Table 3. Counties within the six physiographic districts of Virginia used by VADMIS.

District	Counties	
North Mountain	Alleghany	Page
	Augusta	Rockbridge
	Bath	Rockingham
	Clarke	Shenandoah
	Frederick	Warren
	Highland	
South Mountain	Bland	Montgomery
	Botetourt	Pulaski
	Buchanan	Roanoke
	Carroll	Russell
	Craig	Scott
	Dickenson	Smyth
	Floyd	Tazewell
	Giles	Washington
	Grayson	Wise
	Lee	Wythe
North Piedmont	Albemarle	Henrico
	Amherst	Loudoun
	Caroline	Louisa
	Culpeper	Madison
	Fairfax	Nelson
	Fauquier	Orange
	Fluvanna	Prince William
	Goochland	Rappahannock
	Greene	Spotsylvania
	Hanover	Stafford
South Piedmont	Amelia	Franklin
	Appomattox	Halifax
	Bedford	Henry
	Brunswick	Lunenburg
	Buckingham	Mechlenburg
	Campbell	Nottoway
	Charlotte	Patrick
	Chesterfield	Pittsylvania
	Cumberland	Powhatan
	Dinwiddie	Prince Edward

Table 3. (Continued).

District	Counties	
North Tidewater	Accomack	Lancaster
	Charles City	Mathews
	Essex	Middlesex
	Glouchester	New Kent
	Hampton & N. News	Northampton
	James City	Northumberland
	King and Queen	Richmond
	King George	Westmoreland
	King William	York
South Tidewater	Chesapeake	Suffolk
	Greenesville	Surry
	Isle of Wight	Sussex
	Prince George	Virginia Beach
	Southampton	

district with respect to the other counties in the district.

Region Harvest Summary and Analysis

Following the district harvest summaries, district harvest data are combined into regions. Regions may be defined by the user or by program default. Four physiographic regions are defined by default; 1) mountain-west of the Blue Ridge, 2) piedmont, 3) tidewater, and 4) east of the Blue Ridge. The map in Fig. 3 delineates these four regions. The mountain region is composed of the counties in the two default mountain districts, the piedmont region includes the counties in the two piedmont districts, and the tidewater region includes the counties in the two tidewater districts. The region east of the Blue Ridge is a combination of two other regions, the piedmont and tidewater regions.

Region deer harvest data are summarized by year, beginning with 1947, harvest changes occurring over the last 5 years are calculated, and 10-year means for two 10-year periods are calculated.

State Harvest Summary and Analysis

After the region harvest summaries are completed, regional harvest data are summed to provide state deer harvest statistics. State harvest statistics dating back to 1947 are summarized, harvest changes over the last 5 years are calculated, and 10-year means are calculated. State

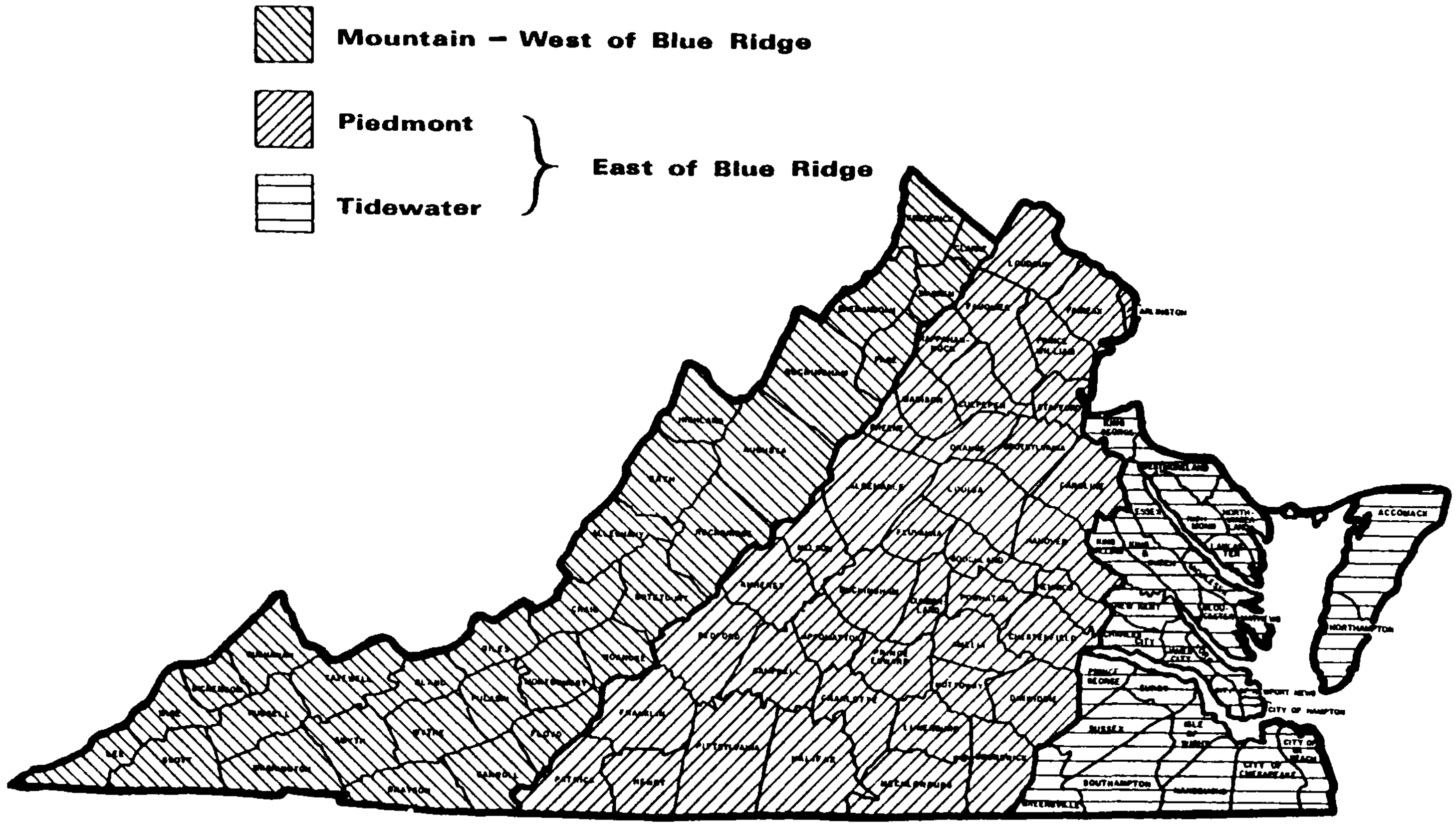


Fig. 3. Four physiographic regions of Virginia used within VADMIS.

deer harvest data are then plotted against time, providing a visualization of state deer harvest trends. The data input option used to control the production of county and district histograms also determines which, of four, state harvest variables are to be plotted; total kill, buck kill, antlered buck kill, and/or percentage doe in the total kill.

A table summarizing county deer harvest statistics and season regulation information for the most recent year with state and region totals is then produced, providing the user with quick, convenient access to all of the county harvest statistics for the latest season.

County harvest density data for the entire state are then ranked, printed and plotted in descending order. Counties are ranked by four variables; total kill per square mile of forested deer range, buck kill per square mile, antlered buck kill per square mile, and doe kill per square mile. Counties are ranked for the two latest years, providing a means by which the user can estimate the relative current status, or change in status, of any county with respect to other counties throughout the state. Averages for east and west of the Blue Ridge and state-wide averages are also calculated for each year.

Game Commission annual progress reports contain 11-year county summaries in which county deer harvest over the last 11 years are summarized. The VADMIS program produces formal tables presenting 11-year county summaries of four harvest statistics; total kill, buck kill, antlered buck kill, and percentage of does in the total kill. These tables also contain 10-year means for the first 10 of the 11 years for each county and 11-year harvest statistics for east and west of the Blue Ridge and the state.

Season Regulation Changes Summary

Game Commission biologists utilize information from past season regulation changes to estimate the effects of future regulation changes on county deer harvests. A subroutine, SEACH, was written and programmed to summarize the effects of recent season regulation changes on county deer harvests. A simple search procedure is utilized to identify counties which experienced similar regulation changes, or counties which had similar regulation, over the past two seasons. Counties which experienced similar regulations, or regulation changes, over the last 2 years are gouped together and the changes in their harvests between years are summarized; by county and group totals. A table summarizing county and group harvest statistics for both years and the observed harvest changes is produced for each group.

Check Station Data Summary

Age and sex data for 15 deer check stations west of the Blue Ridge are then read from disk and summarized in formal tables. The raw data are summed and used to calculate several population indicators. The Game Commission biologists utilize five basic population indicators; 1) the percent fawns in the total antlerless kill (PFTA), 2) the percent fawns in the total buck kill (PFTB), 3) the percent fawns in the total doe kill (PFTD), 4) the percent yearlings (age 1 1/2 years) in the total adult (1 1/2+ years) buck kill (PYAB), and 5) the percent yearlings in the total adult doe kill (PYAD). These five indicators are calculated as follows:

$$PFTA = \frac{\text{fawn bucks + fawn does}}{\text{fawn bucks + total does}}$$

$$PFTB = \frac{\text{fawn bucks}}{\text{total bucks}}$$

$$PFTD = \frac{\text{fawn does}}{\text{total does}}$$

$$PYAB = \frac{\text{yearling bucks}}{\text{total adult bucks}}$$

$$PYAD = \frac{\text{yearling does}}{\text{total adult does}}$$

Optimum Deer Management Regions

Optimum deer management regions are delineated utilizing an algorithm developed by Graf (1973) for delineating wildlife and other environmental management regions. Contiguous counties with similar deer harvest-habitat indices are grouped together into seven deer management regions. County similarities are determined based on a harvest-habitat index, Y, where:

Y = Total kill / square mile / number of hunting days. Indices for 5 years are calculated for each county and used in the grouping process. Utilizing indices for 5 years reduces the natural variation within counties and the resultant groups are better balanced. The methodology for delineating optimum management regions is described in detail by Graf (1973).

Computer Mapping

A computer mapping package, SYMAP (Dougenik and Sheehan 1975), was incorporated into the VADMIS program and is used to map county deer harvest data and display the optimum deer management regions. Data identifying the optimum deer management regions and county deer harvest density data for 3 years are passed to the SYMAP package. Four maps are produced; one map depicting the optimum deer management regions and three contour maps depicting state-wide deer harvest densities for three different years, year t, t-2, and t-6 (e.g. 1976, 1974, and 1970). The contour maps provide a visualization of state-wide harvest trends and patterns.

<u>Game Commissioner</u>

When the Game Commissioner is designated as the user, the VADMIS program summarizes county, district, region, and state deer harvest data; 1947 to present. Subroutines which produce county deer harvest predictions, regulation changes summaries, check station data summaries, and optimum deer management regions are bypassed and this information is not provided. Computer maps are suppressed by preventing the execution of the SYMAP package.

<u>Land-use Planner</u>

When the land-use planner is designated as the user, the VADMIS program requires that the county or counties of interest be identified. Subroutine INTPO first is called to print a three-page introduction to the principles of white-tailed deer management. County deer harvest data are then read from disk and summed by district. Subroutine VACIS is called to produce summaries of county deer harvests and habitat characteristics. Habitat information is retrieved from the data base for the Virginia County Information System developed by McDonald (1977) at VPI&SU.

For each requested county a report is generated which presents county harvest and habitat information and compares county statistics to the average statistics for the district in which the county is located. A table summarizing county deer harvests, 1947 to present, is provided following the one page county report.

RESULTS

Program Characteristics

A computer program, VADMIS (Virginia Deer Management Information System), was designed and programmed (FORTRAN) to analyze and summarize Virginia county, district, region, and state deer harvest data from 1947 to present. The program was designed and programmed for Virginia in particular but may be modified for use in other states.

The program was designed to serve three distinct users; the game biologist, the game commissioner, and the county, region, or state land-use planner. The program provides each user with a distinct set of information. Users may utilize several data input and control options to control program execution and information production.

The VADMIS program (Appendix Table 1) requires 60,976 bytes of computer storage. The execution time and operation cost of the program vary among users and with the selection of data input options. Program execution for the game biologist, utilizing program option default parameters, requires 5 minutes and 38 seconds of execution time and costs (VPI&SU Computer Center charges 1978) $21.80. A run for the game commissioner requires 2 minutes and 14 seconds of execution time and costs $17.68. A run for the land-use planner, in which summaries for all 98 counties are requested, requires 1 minute and 8 seconds of execution time and costs $13.03. For the planner, the first county requested costs approximately $5.28 while each additional county request costs approximately $0.08.

Data Input Options and Requirements

Nine data input options are available to the user. These nine data input options enable the user to:

1) identify the user (biologist, commissioner, or planner)
2) specify the latest year of interest,
3) update annual county deer harvest data,
4) update annual deer check station data,
5) delineate deer management districts and regions,
6) provide district and region names,
7) select which data are to be plotted as histograms,
8) define the number of counties in the state, and
9) define the contiguity of counties.

A data identification or title card preceeding each input option (data set) enables the computer program to identify the option and read the data which follow. Identifying input data options in this manner enables the user to place the data options in variable order for input. Only the first four columns of each title identification card are read by the computer, format A4. Columns 5 through 80 are ignored and may be used to complete an explanatory title or additional comments about the following data. Nine, four-letter abbreviations are recognized by the program and they correspond to the nine option functions listed above; 1) USER, 2) YEAR, 3) UPDA, 4) CHEC, 5) DIST,

6) TITL, 7) HIST, 8) COUN, and 9) CONT.

USER

The first data card following the title card 'USER' identifies which one of three users, biologist (1), commissioner (2), or planner (3), is to be served by the program. The user number, 1, 2, or 3, is punched in column one of the card following the title card. Only this one data card is required unless the planner, (3), is designated. In the case of the planner, the next card specifies the number of counties, N, for which deer harvest and habitat summaries are desired, format I3. N cards must then be provided, each card containing the numerical code, Table 1, of a single county, format I3.

The default value for USER is 1, thus the data input option 'USER' is not required when the game biologist is the user.

YEAR

One data card, format (2X,I2), follows the title card 'YEAR' and identifies the latest year of deer harvest data to be summarized. The full four-digit year may be punched in columns 1 through 4, e.g. 1976, though the format requires only the last two digits in columns 3 and 4, e.g. __76. This data input option has no default value and is required for all three users.

UPDA

The 'UPDA' title card informs the program that the annual county deer harvest data base is to be updated with the data which follows. The card following the title card gives the year of the data being submitted and the number of counties for which data are being provided, format (2x,I2,1x,I3). One data card for each county must follow. Each county data card contains the following information, format (2F7.2,6F9.0):

1. Doe Kill
2. Total Kill
3. Season Dates Information; coded as follows:
   - 0 - no season
   - 1 - one set of dates
   - 2 - two sets of dates
   - 3 - only part of county open
   - 4 - split season
4. Total Days in Season
5. Acres of Deer Range (Not required for Virginia since acres of range have been estimated and stored)
6. Season Type; coded as follows:
   - 1 - Either-sex all season
   - 2 - Bucks-only all season
   - 3 - Either-sex at beginning of season
   - 4 - Either-sex at end of season
   - 5 - Not a uniform season
7. Either-sex Days in Season
8. Number of Sundays

CHEC

The title card, CHEC, indicates that the deer check station data are to be updated. The first card of this data set gives the year of the data being submitted, format (2x,I2). Fifteen data cards must follow; one card for each check station, format (8F10.0), in the order listed in Table 2. Data items required for each check station include, format (8F10.0):

1. 1/2 year old bucks
2. 1 1/2 year old bucks
3. 2 1/2+ year old bucks
4. 1/2 year old does
5. 1 1/2 year old does
6. 2 1/2+ year old does
7. Percent spikes
8. Average weight of 1 1/2 year old bucks

DIST

The data input option introduced by the 'DIST' title card enables the user to delineate deer management districts and regions. A district may consist of 1 to 50 counties and up to 20 different districts may be defined. Regions are defined as groups of whole districts. A maximum of 10 different regions may be defined, with no limit on the number of districts that can be grouped into a single region.

Following the title card is a data card containing 3 items of information, format (3I3): 1) the total number of counties in the state, 2) the number of districts to be defined, and 3) the number of regions to be defined; all right justified. Next, counties are assigned to appropriate districts. Each county is given the number of an appropriate district; 10 counties per card, format (10I5).

Example:

```
  columns  1         2         3         4         5
  12345678901234567890123456789012345678901234567890

card 1    3    4    2    3    5    5    6    2    1    2
card 2    1    4    5    2    6    3    5    2    1    4
 etc.
```

where: County number 1 is assigned to the 3rd district, county number 2 is assigned to the 4th district, county number 3 is assigned to the 2nd district, ...,and county number 11 is assigned to the 1st district.

Districts are assigned to regions in the same manner, and district assignment cards immediately follow the county-to-district assignment cards. Each card contains the region assignments for 10 districts, format (10I5).

If this option is not used, the program utilizes 6 default districts, Fig. 2 and Table 3, (North Mountain, South Mountain, North Piedmont, South Piedmont, North Tidewater, and South Tidewater) and 4 default regions, (Mountain-West of the Blue Ridge, Piedmont, Tidewater, and East of the Blue Ridge), Fig. 3. Under default conditions, the program combines the Piedmont and Tidewater regions into the fourth region called east of the Blue Ridge. This is a special case only obtainable by utilizing the default districts and regions. If new districts are defined, then new regions must be defined.

TITL

The data set following the 'TITL' card contains alphanumeric data specifying the names for districts, regions, and nine harvest variables. Each data card is read with a 24(A1) format to enable the program to manipulate individual characters (letters) as required for the production of labels on histograms. The first data card following the title card specifies if new districts and regions are to be defined using the 'DIST' data input option. If the 'DIST' option is used, then 'YES' is punched in columns 1 through 3. Any character string other than 'YES' punched on this card indicates that the default districts and regions will be used and 6 cards containing the default district names must be provided. If new districts and regions are defined, 'YES', the 'TITL' option must be informed of the number of districts and regions for which data cards (names) must be read and the next card would then contain the number of new districts (columns 1 and 2) and the number of new regions (columns 4 and 5). Both data items are right justified.

Subsequent cards contain the appropriate alphanumeric names for the nine harvest variables and the specified number of districts and regions. Table 4 presents the standard data set for the 'TITL' option that should be used

Table 4. Standard alpha-numeric data set for data input option 'TITL'.

Card Number	Card Columns 1111111111222222222233333333334 1234567890123456789012345678901234567890
1	TITL
2	NO
3	TOTAL KILL
4	BUCK KILL
5	ANTLERED BUCK KILL
6	PERCENT DOE KILL
7	TOTAL KILL/SQ.MILE
8	BUCK KILL/SQ.MILE
9	ANTL. BUCK KILL/SQ.MILE
10	DOE KILL/SQ.MILE
11	DOE KILL
12	STATE SUMMARY
13	NORTH MOUNTAIN DISTRICT
14	SOUTH MOUNTAIN DISTRICT
15	NORTH PIEDMONT DISTRICT
16	SOUTH PIEDMONT DISTRICT
17	NORTH TIDEWATER DISTRICT
18	SOUTH TIDEWATER DISTRICT
19	MOUNTAIN-WEST OF B. R.
20	PIEDMONT
21	TIDEWATER
22	EAST OF THE BLUE RIDGE

when the default districts and regions are employed. Card numbers 3 through 12 in Table 4 are required, in the order shown, for both new and default districts and regions. Names for the appropriate number of districts follow, in the order referred to in the 'DIST' option. Names for the appropriate number of regions follow the district names and complete the data set. A maximum of 24 characters (including blanks) per name is allowed.

HIST

The user may use this option to select among four harvest variables which may be plotted as histograms for county, district, and state deer harvest summaries. The four harvest variables are; 1) total kill, 2) buck kill, 3) antlered buck kill, and 4) doe kill. Any one or any combination of these four variables may be selected. Only one data card is required for this data input option. Four data fields, format (4I2), are read from this card, each field corresponding to one of the four variables. A '1' punched in one of these fields indicates that the corresponding variable is to be plotted;

To Plot	Punch '1' in Column
Total kill	2
Buck kill	4
Antl. Buck kill	6
Doe kill	8

Under default conditions for this option, total kill and antlered buck kill are plotted.

COUN

The data input option headed by the 'COUN' title card is used to define the number of counties in the state. This option need only be used for a state other than Virginia with fewer or more than 98 counties. The default is 98 counties. The number of counties in the state is punched in columns 1 through 3, right justified.

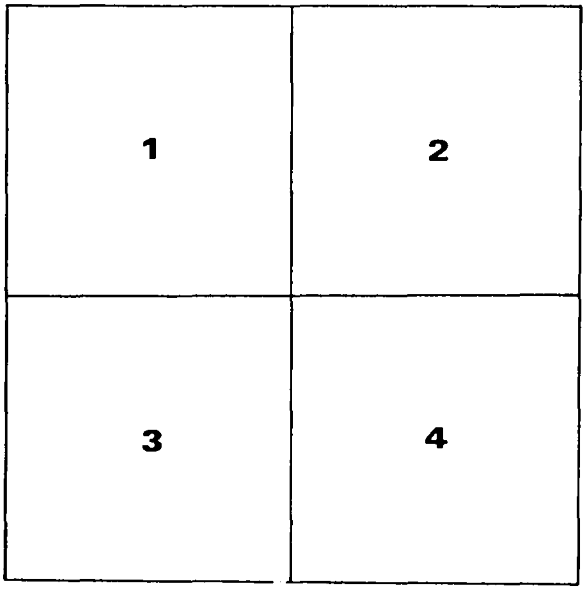
CONT

For the program to delineate optimum deer management regions, a county contiguity matrix defining the proximity of counties to each other must be provided. The first card following the title card, 'CONT', contains the number of counties in the state, punched right justified, in columns 1 to 3. The contiguity matrix follows.

The matrix will always be an N x N matrix, where N is the number of counties in the state; one row and one column for each county. When two counties are contiguous, (i.e. adjacent to each other over some distance, but not just at a point), the number '1' should be entered in the appropriate rows and columns of the matrix. A county is coded as being contiguous to itself. Fig. 4 presents an example of a sample area and its associated contiguity matrix.

Each row of the matrix is entered on a separate card.

Sample Area



Contiguity Matrix

row \ column	1	2	3	4
1	1	1	1	
2	1	1		1
3	1		1	1
4		1	1	1

Fig. 4. A sample study area and its associated contiguity matrix.

Columns of the card correspond to columns in the matrix. For more than 80 counties, the row is continued on a second card, column 1 of the second card being equivalent to column 81 in the matrix. The 98 county matrix for Virginia is read with a format of (80I1/18I1). Appendix Table 2 lists Virginia counties and the counties contiguous to each.

<u>User Requirements</u>

Of the nine options available, each user is required to use only three. The biologist must submit the YEAR, TITL, and CONT options. Runs for either the commissioner or the land-use planner require the USER, YEAR, and TITL options. All options are applicable to the biologist while all but the contiguity matrix (CONT) are applicable to the commissioner, and all but HIST and CONT are applicable to the planner.

Output

<u>County Harvest Summary and Analysis</u>

Tables summarizing annual deer harvest data for four counties, Charles City, Prince Edward, Shenandoah, and Surry, are illustrated in Figs. 5, 6, 7, and 8. Columnar data for each year of county harvest data include:

1) Total kill
2) Antlered buck kill per square mile forested deer range
3) Buck kill
4) Antlered buck kill
5) Doe kill
6) Percent doe in the total kill

VIRGINIA COUNTY DEER HARVEST SUMMARY
1947-1976

COUNTY: CHARLES CITY

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
47	131.	1.0	131.	131.	0.	0.0	40.	0.	2.
48	155.	1.1	155.	155.	0.	0.0	40.	0.	2.
49	200.	1.5	200.	200.	0.	0.0	40.	0.	2.
50	195.	1.4	195.	195.	0.	0.0	41.	0.	2.
51	255.	1.9	255.	255.	0.	0.0	41.	0.	2.
52	327.	2.4	327.	327.	0.	0.0	40.	0.	2.
53	377.	2.8	377.	377.	0.	0.0	40.	2.	4.
54	407.	2.2	327.	303.	80.	19.66	40.	1.	4.
55	491.	2.7	394.	365.	97.	19.76	40.	40.	1.
56	566.	2.2	361.	300.	205.	36.22	42.	2.	4.
57	503.	2.2	345.	298.	158.	31.41	42.	2.	4.
58	449.	1.6	276.	224.	173.	38.53	43.	2.	4.
59	203.	1.5	203.	203.	0.	0.0	44.	0.	2.
60	269.	2.0	267.	266.	2.	0.74	40.	0.	2.
61	325.	2.4	325.	325.	0.	0.0	41.	0.	2.
62	1023.	2.7	521.	370.	502.	49.07	42.	42.	1.
63	1059.	2.9	550.	397.	509.	48.06	42.	42.	1.
64	585.	1.7	316.	235.	269.	45.98	44.	44.	1.
65	157.	1.2	157.	157.	0.	0.0	45.	0.	2.
66	209.	1.5	208.	208.	1.	0.48	40.	0.	2.
67	234.	1.7	234.	234.	0.	0.0	41.	0.	2.
68	281.	2.1	281.	281.	0.	0.0	42.	0.	2.
69	367.	2.7	365.	364.	2.	0.54	42.	0.	2.
70	489.	3.6	488.	488.	1.	0.20	44.	0.	2.
71	708.	3.9	567.	525.	141.	19.92	45.	3.	4.
72	717.	3.9	570.	526.	147.	20.50	41.	3.	4.
73	972.	4.4	686.	600.	286.	29.42	42.	6.	4.
74	1084.	4.8	756.	658.	328.	30.26	42.	6.	4.
75	818.	3.3	538.	454.	280.	34.23	43.	6.	4.
76	699.	3.7	553.	509.	146.	20.89	45.	3.	4.
HARVEST CHANGES									
73-74	11.52%	9.56%	10.20%	9.56%	14.69%	0.83			
74-75	-24.54%	-30.96%	-28.84%	-30.96%	-14.63%	3.97			
75-76	-14.55%	12.16%	2.79%	12.16%	-47.86%	-13.34			

HARVEST PREDICTION HISTORY

YEAR	SEASON TYPE	PREDICTED KILL	ACTUAL KILL	DIFF.	% DIFF.
1972	4.	746.	717.	28.8	4.0
1973	4.	846.	972.	-126.5	-13.0
1974	4.	897.	1084.	-186.8	-17.2
1975	4.	1070.	818.	252.3	30.8
1976	4.	553.	699.	-145.9	-20.9
			AVERAGE-----	148.1	17.2

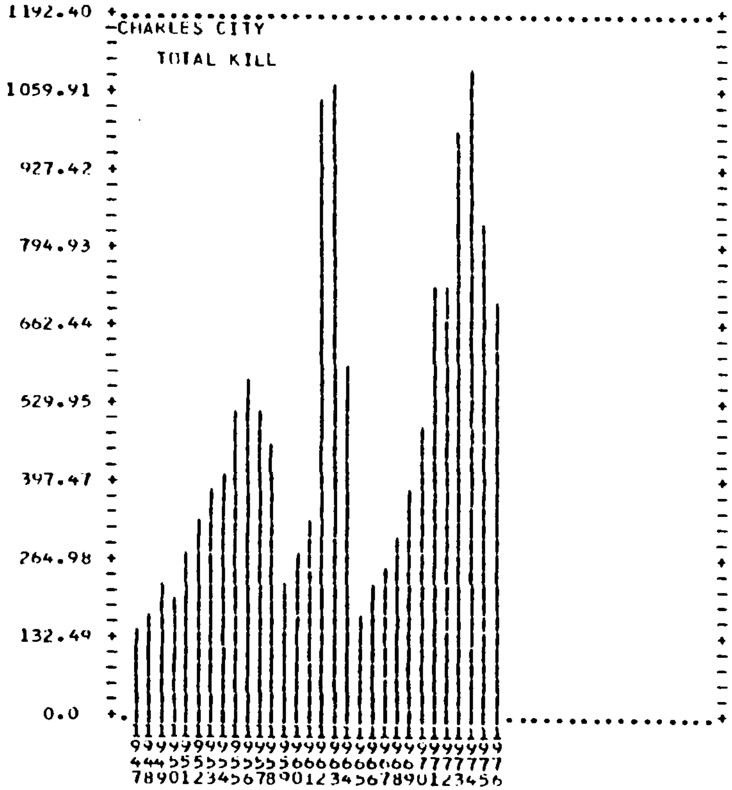
SEASON TYPE CODE
1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. E.S. AT BEGINNING OF SEASON
4. E.S. AT END OF SEASON
5. NOT A UNIFORM SEASON

FOREST RANGE: 136.0 SQ. MILES

Fig. 5. VADMIS county deer harvest summary for Charles City county.

HARVEST PREDICTIONS FOR 1977---CHARLES CITY

SEASON TYPES	1	2	3&4
HUNTING DAYS IN SEASON	45	45	45
LOWER LIMIT	765	315	448
MEAN	1197	493	701
UPPER LIMIT	1872	771	1097



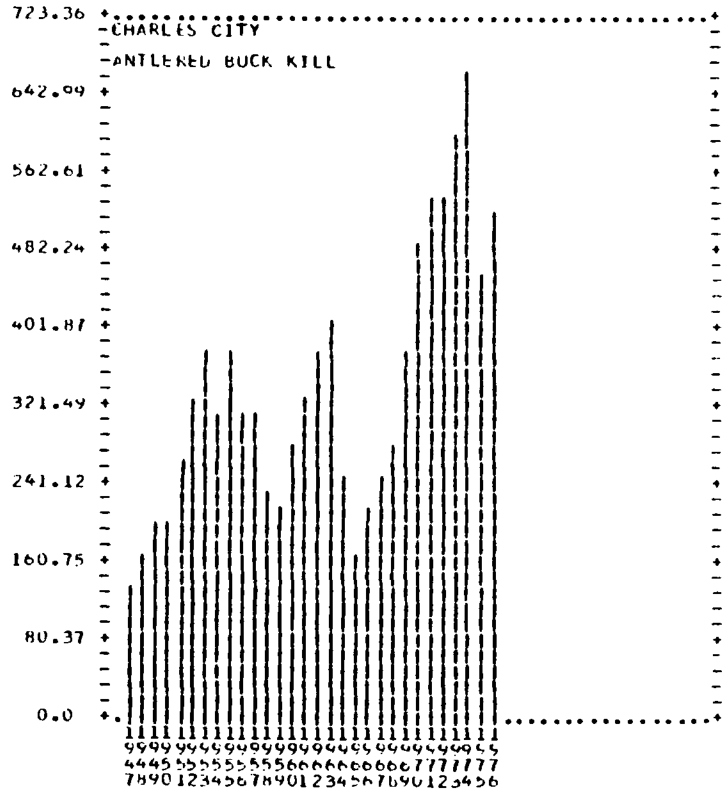


Fig. 5. Continued.

VIRGINIA COUNTY DEER HARVEST SUMMARY
1947-1976

COUNTY: PRINCE EDWARD

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
47	12.	0.0	12.	12.	0.	0.0	40.	0.	2.
48	12.	0.0	12.	12.	0.	0.0	40.	0.	2.
49	21.	0.1	21.	21.	0.	0.0	40.	0.	2.
50	12.	0.0	12.	12.	0.	0.0	41.	0.	2.
51	16.	0.1	16.	16.	0.	0.0	41.	0.	2.
52	13.	0.1	13.	13.	0.	0.0	40.	0.	2.
53	21.	0.1	21.	21.	0.	0.0	40.	0.	2.
54	19.	0.1	19.	19.	0.	0.0	40.	0.	2.
55	26.	0.1	26.	26.	0.	0.0	40.	0.	2.
56	11.	0.0	11.	11.	0.	0.0	42.	0.	2.
57	15.	0.1	14.	14.	1.	6.67	42.	1.	4.
58	9.	0.0	9.	9.	0.	0.0	43.	0.	2.
59	29.	0.1	29.	29.	0.	0.0	44.	0.	2.
60	21.	0.1	21.	21.	0.	0.0	40.	0.	2.
61	26.	0.1	26.	26.	0.	0.0	41.	0.	2.
62	141.	0.2	71.	50.	70.	49.65	42.	42.	1.
63	163.	0.3	93.	72.	70.	42.94	42.	42.	1.
64	61.	0.2	51.	48.	10.	16.39	44.	5.	4.
65	59.	0.2	59.	59.	0.	0.0	45.	0.	2.
66	53.	0.2	53.	53.	0.	0.0	40.	0.	2.
67	79.	0.3	79.	79.	0.	0.0	41.	0.	2.
68	101.	0.4	101.	101.	0.	0.0	42.	0.	2.
69	143.	0.6	143.	143.	0.	0.0	42.	0.	2.
70	188.	0.8	188.	188.	0.	0.0	44.	0.	2.
71	194.	0.8	194.	194.	0.	0.0	45.	0.	2.
72	304.	1.3	304.	304.	0.	0.0	41.	0.	2.
73	364.	1.3	321.	308.	43.	11.81	42.	1.	4.
74	494.	1.7	423.	402.	71.	14.37	42.	1.	4.
75	511.	1.8	450.	432.	61.	11.94	43.	1.	4.
76	606.	2.1	514.	486.	92.	15.18	45.	3.	4.
HARVEST CHANGES									
73-74	35.71%	30.88%	31.78%	30.38%	65.12%	2.56			
74-75	3.44%	7.88%	6.38%	7.47%	-14.08%	-2.44			
75-76	18.59%	15.11%	14.22%	12.67%	50.82%	3.24			

HARVEST PREDICTION HISTORY

YEAR	SEASON TYPE	PREDICTED KILL	ACTUAL KILL	DIFF.	% DIFF.
1972	2.	283.	304.	-21.2	-7.0
1973	---* NO PREDICTION---				
1974	---* NO PREDICTION---				
1975	4.	439.	511.	-72.4	-14.2
1976	4.	576.	606.	-29.7	-4.9
			AVERAGE-----	41.1	8.7

* NO PREDICTION FOR SEASON TYPE HELD

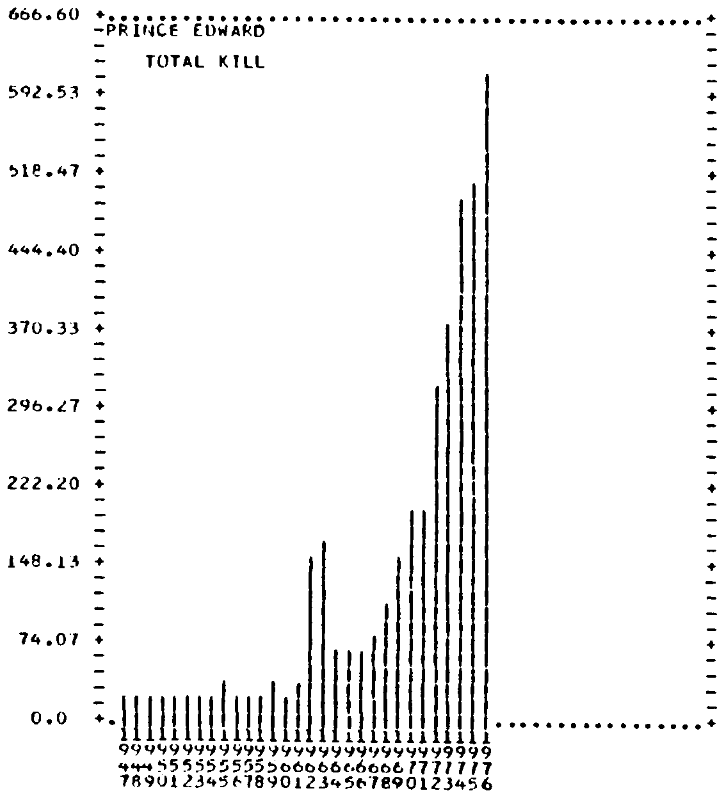
SEASON TYPE CODE
1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. E.S. AT BEGINNING OF SEASON
4. E.S. AT END OF SEASON
5. NOT A UNIFORM SEASON

FOREST RANGE: 233.6 SQ. MILES

Fig. 6. VADMIS county deer harvest summary for Prince Edward county.

HARVEST PREDICTIONS FOR 1977---PRINCE EDWARD

SEASON TYPES	1	2	3&4
HUNTING DAYS IN SEASON	0	45	45
LOWER LIMIT	0	392	399
MEAN	0	612	623
UPPER LIMIT	0	955	973



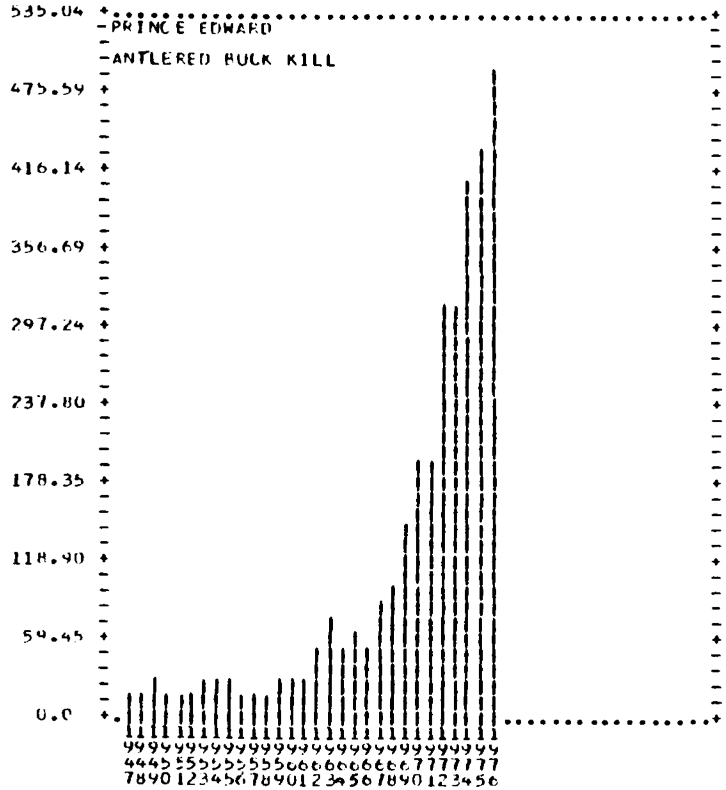


Fig. 6. Continued.

VIRGINIA COUNTY DEER HARVEST SUMMARY
1947-1976

COUNTY: SHENANDOAH

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
47	104.	0.4	104.	104.	0.	0.0	3.	0.	2.
48	171.	0.6	171.	171.	0.	0.0	3.	0.	2.
49	221.	0.8	221.	221.	0.	0.0	3.	0.	2.
50	298.	1.0	298.	298.	0.	0.0	3.	0.	2.
51	512.	1.8	512.	512.	0.	0.0	5.	0.	2.
52	1196.	2.1	741.	605.	455.	38.04	6.	1.	4.
53	743.	2.6	743.	743.	0.	0.0	6.	0.	2.
54	1381.	2.6	897.	752.	484.	35.05	6.	1.	4.
55	1052.	3.6	1044.	1042.	8.	0.76	6.	0.	2.
56	2817.	3.8	1501.	1106.	1316.	46.72	6.	2.	4.
57	2175.	2.9	1161.	857.	1014.	46.62	6.	2.	4.
58	2491.	3.3	1306.	951.	1185.	47.57	6.	2.	4.
59	2065.	2.8	1097.	807.	968.	46.88	6.	3.	4.
60	2536.	2.7	1184.	778.	1352.	53.31	6.	3.	3.
61	1779.	1.9	844.	564.	935.	52.56	6.	3.	3.
62	719.	1.2	426.	338.	293.	40.75	6.	1.	3.
63	763.	1.3	457.	365.	306.	40.10	6.	1.	3.
64	820.	1.3	485.	385.	335.	40.85	12.	1.	3.
65	787.	1.3	479.	387.	308.	39.14	12.	1.	3.
66	875.	1.3	493.	378.	382.	43.66	13.	1.	3.
67	768.	1.3	474.	386.	294.	38.28	13.	1.	3.
68	707.	1.7	537.	486.	170.	24.05	12.	1.	4.
69	877.	1.9	631.	557.	246.	28.05	11.	1.	4.
70	826.	1.8	600.	532.	226.	27.36	12.	1.	4.
71	1048.	2.2	744.	653.	304.	29.01	12.	1.	4.
72	1190.	2.4	808.	693.	382.	32.10	12.	1.	4.
73	1247.	2.5	846.	726.	401.	32.16	12.	1.	4.
74	1276.	2.6	880.	761.	396.	31.03	12.	1.	4.
75	1497.	3.0	1031.	891.	466.	31.13	11.	1.	4.
76	1493.	3.0	1022.	881.	471.	31.55	12.	1.	4.
HARVEST CHANGES									
73-74	2.33%	4.86%	4.02%	4.89%	-1.25%	-1.12			
74-75	17.32%	17.04%	17.16%	17.08%	17.68%	0.09			
75-76	-0.27%	-1.21%	-0.87%	-1.18%	1.07%	0.42			

HARVEST PREDICTION HISTORY

YEAR	SEASON TYPE	PREDICTED KILL	ACTUAL KILL	DIFF.	% DIFF.
1972	4.	1313.	1190.	123.3	10.4
1973	4.	1334.	1247.	87.4	7.0
1974	4.	1398.	1276.	121.8	9.5
1975	4.	1403.	1497.	-93.5	-6.2
1976	4.	1646.	1493.	153.1	10.3
		AVERAGE-----		115.8	8.7

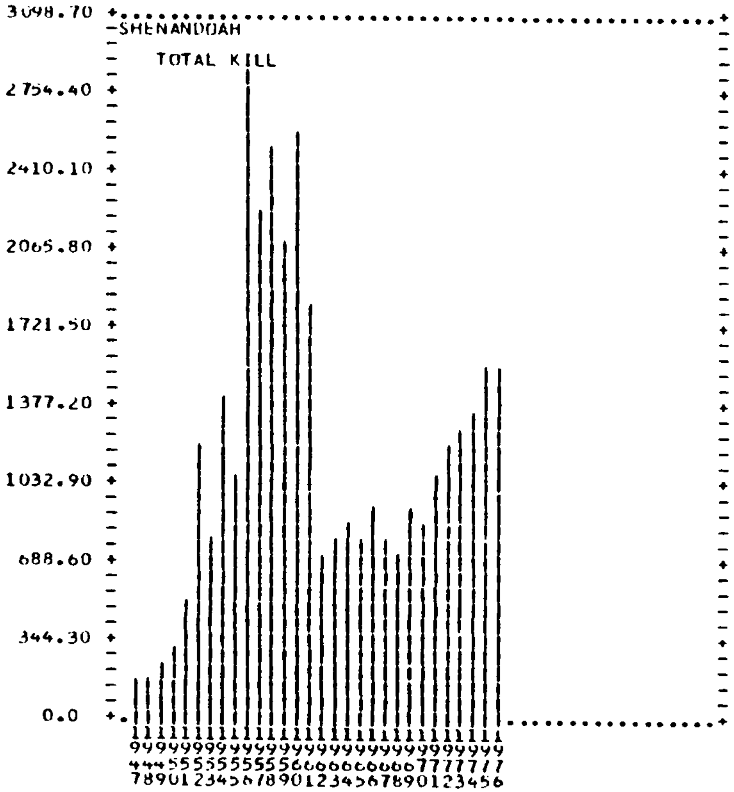
SEASON TYPE CODE
1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. E.S. AT BEGINNING OF SEASON
4. E.S. AT END OF SEASON
5. NOT A UNIFORM SEASON

FOREST RANGE: 292.6 SQ. MILES

Fig. 7. VADMIS county deer harvest summary for Shenandoah county.

HARVEST PREDICTIONS FOR 1977---SHENANDOAH

SEASON TYPES	1	2	3&4
HUNTING DAYS IN SEASON	0	0	12
LOWER LIMIT	0	0	1041
MEAN	0	0	1499
UPPER LIMIT	0	0	2157



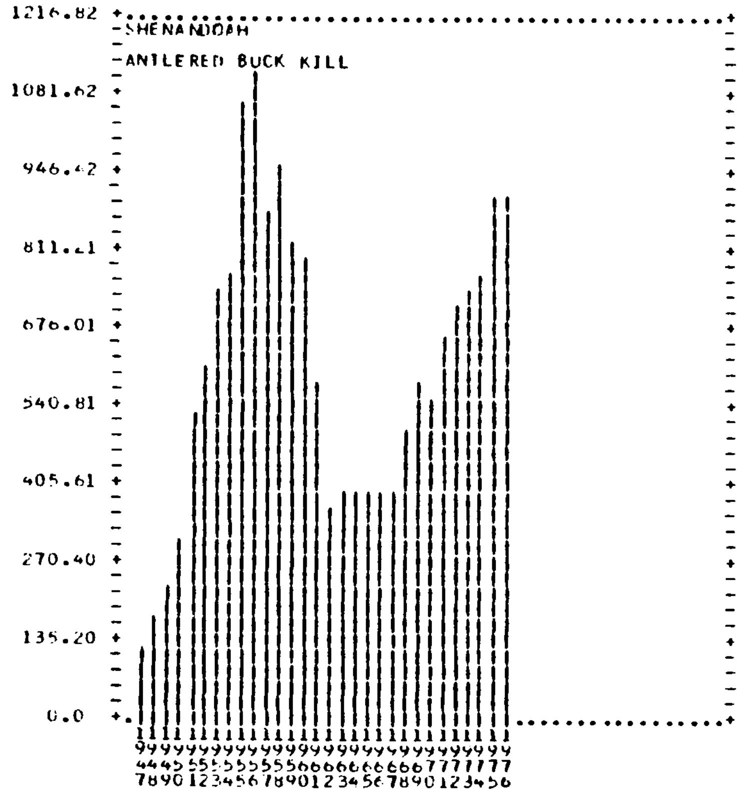


Fig. 7. Continued.

VIRGINIA COUNTY DEER HARVEST SUMMARY
1947-1976

COUNTY: SURRY

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
47	87.	0.4	80.	78.	7.	8.05	40.	0.	2.
48	98.	0.5	98.	98.	0.	0.0	40.	0.	2.
49	119.	0.6	119.	119.	0.	0.0	40.	0.	2.
50	120.	0.6	120.	120.	0.	0.0	41.	0.	2.
51	113.	0.5	113.	113.	0.	0.0	41.	0.	2.
52	208.	0.9	202.	200.	6.	2.88	40.	0.	2.
53	252.	1.2	252.	252.	0.	0.0	40.	0.	2.
54	297.	1.3	285.	281.	12.	4.04	40.	0.	2.
55	243.	1.1	232.	229.	11.	4.53	40.	0.	2.
56	270.	0.8	193.	170.	77.	28.52	42.	5.	4.
57	317.	0.9	225.	197.	92.	29.02	42.	5.	4.
58	333.	1.0	233.	203.	100.	30.03	45.	5.	4.
59	462.	1.1	291.	240.	171.	37.01	44.	15.	4.
60	279.	1.2	266.	262.	13.	4.66	40.	0.	2.
61	284.	1.3	270.	266.	14.	4.93	41.	0.	2.
62	798.	1.6	443.	337.	355.	44.49	42.	42.	1.
63	824.	1.7	473.	368.	351.	42.60	42.	42.	1.
64	919.	1.7	493.	365.	426.	46.35	44.	44.	1.
65	835.	1.7	467.	357.	368.	44.07	45.	45.	1.
66	586.	1.1	310.	227.	276.	47.10	40.	40.	1.
67	240.	1.1	239.	239.	1.	0.42	41.	0.	2.
68	325.	1.5	325.	325.	0.	0.0	42.	0.	2.
69	640.	1.9	450.	393.	190.	29.69	42.	12.	4.
70	743.	2.0	503.	431.	240.	32.30	44.	12.	4.
71	714.	2.0	499.	435.	215.	30.11	45.	12.	4.
72	951.	2.4	610.	508.	341.	35.86	41.	12.	4.
73	942.	2.8	673.	592.	269.	28.56	42.	12.	4.
74	1323.	3.3	849.	707.	474.	35.83	42.	12.	4.
75	1536.	2.9	826.	613.	710.	46.22	43.	43.	1.
76	1297.	2.7	740.	573.	557.	42.95	45.	45.	1.
HARVEST CHANGES									
73-74	40.45%	19.33%	26.15%	19.33%	76.21%	7.27			
74-75	16.10%	-13.27%	-2.71%	-13.27%	49.79%	10.40			
75-76	-15.56%	-6.54%	-10.41%	-6.54%	-21.55%	-3.28			

HARVEST PREDICTION HISTORY

YEAR	SEASON TYPE	PREDICTED KILL	ACTUAL KILL	DIFF.	% DIFF.
1972	4.	760.	951.	-191.3	-20.1
1973	4.	852.	942.	-90.4	-9.6
1974	4.	1062.	1323.	-261.2	-19.7
1975	1.	1501.	1536.	-34.7	-2.3
1976	1.	1359.	1297.	61.7	4.8
		AVERAGE-----		127.9	11.3

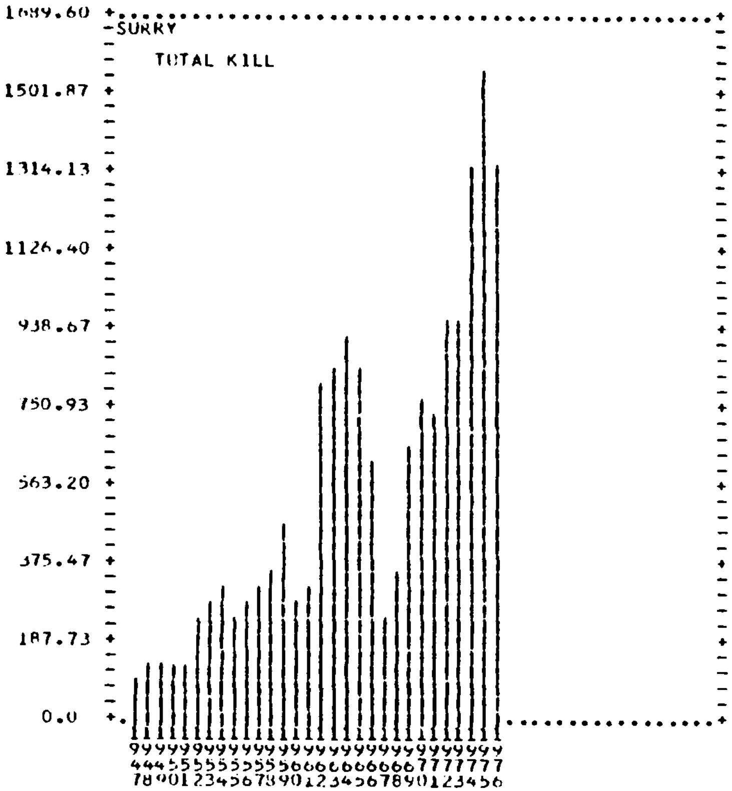
SEASON TYPE CODE
1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. E.S. AT BEGINNING OF SEASON
4. E.S. AT END OF SEASON
5. NOT A UNIFORM SEASON

FOREST RANGE: 212.0 SQ. MILES

Fig. 8. VADMIS county deer harvest summary for Surry county.

HARVEST PREDICTIONS FOR 1977---SURRY

SEASON TYPES	1	2	3&4
HUNTING DAYS IN SEASON	45	45	45
LOWER LIMIT	917	422	757
MEAN	1283	590	1059
UPPER LIMIT	1793	825	1481



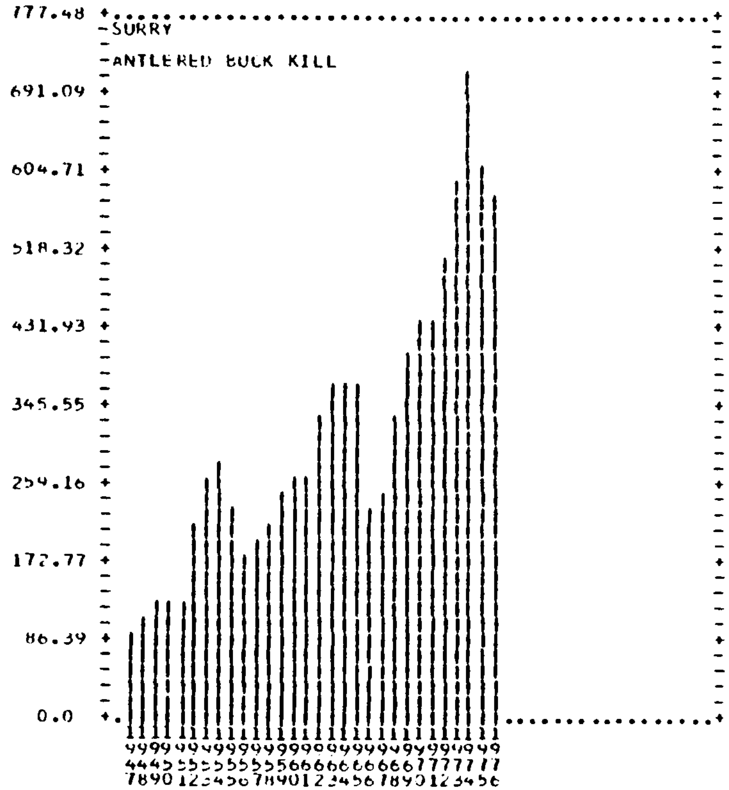


Fig. 8. Continued.

7) Number of hunting days in the season
8) Number of any-deer days in the season
9) Type of season

The type of season is coded within the table and a legend interpreting the season type code is provided below the table. The estimated square miles of forested deer range in the county is also provided below the table.

Observed changes in the six harvest statistics for the last 3 years are summarized immediately below the respective data columns. These changes are expressed as percentages except for changes in the percent does in the total kill. Actual numerical changes are reported for the percent does in the total kill to avoid confusion with percent changes in a percentage statistic.

Below the table summarizing annual harvest data, harvest predictions for the past 5 years are summarized and compared with the actual observed harvests for those years. For each of the 5 years, whenever a prediction was made for the season type which was actually held, then the season type which was held, the predicted harvest, the actual harvest, the numerical difference between predicted and actual harvests, and the percentage difference are presented. If a prediction was not possible for the season type which was held in any one year, then no comparison is made and a message is printed indicating that a prediction was not made for the appropriate season type. Predictions were not possible in some cases due to, for example, a recent change in a season type and thus there were insufficient data, or years of "experience" for the regression. The average absolute differences (numerical and percentage) for the past 5 years are presented at the bottom of the harvest prediction history table. The absolute differences are used to preclude the erroneous averaging of compromising positive and negative differences between the predicted and actual harvests.

A small table at the top of the second page of output for each county presents the harvest predictions for the next year. Included in this table are the number of hunting days in the season for which the prediction is being made, upper and lower limits for the harvest prediction, and the mean, or expected, harvest for each of the three season types for which predictions may be made. If predictions are not made for any of the three season types, an appropriate message is printed. The anticipated use of this table is by biologists who may select the type of season that most likely will provide the county deer harvest that is desired to acheive an appropriate county deer population density.

Histograms illustrating annual county harvest statistic trends immediately follow the harvest predictions; the first one or two histograms are printed on the same page as the harvest predictions. If three or four histograms are requested, the next one or two histograms are printed on the following page. Two county histograms are printed on a single page when possible. If one or three histograms are requested, the odd histogram is centered on the page. Printing of one or two histograms utilizes otherwise unused space while printing three or four histograms will add an additional page of output for each county.

County deer harvest summaries produced for the game biologist and game commissioner differ only in that deer harvest predictions are not produced for the commissioner. The decision to withhold deer harvest predictions from the game commissioner was based largely upon the conditions currently surrounding the season-setting methodology used by the Game Commission. At present, the game commissioners largely rely upon, and accept, the advice and season-setting decisions made by the game biologists. Normally, the game commissioners will investigate the consequences of implementing alternative season types only upon request by local or county public interest groups or when radical season type changes are proposed.

This process of game commissioner approval of biologist-selected county season types may not be everlasting. The game commissioners may find it desirable to be provided with alternative season types and the associated consequences of each to select the one which meets best the overall objectives of the Game Commission.

A second factor which influenced the decision to withhold deer harvest predictions from the game commissioner was the poor accuracy of some of the harvest predictions. Given both the VADMIS harvest predictions and the predictions and recommendations of the biologists, the game commissioners may be confronted with conflicting information. The game commissioners then likely would be inclined to accept the experienced advice and predictions of the biologist over the VADMIS predictions. The game commissioners confidence in the VADMIS predictions would be greatly reduced and the information provided by other components of the VADMIS system may be discredited.

Output produced for the land-use planner includes only the annual county harvest data summary table.

District Harvest Summary

Following county harvest summaries, tables and histograms presenting district deer harvest data are produced. Fig. 9 illustrates the output produced. The sample is from the Virginia North Piedmont district. The first district table summarizes annual district harvest data from 1947 to the last year of data available. Columnar data for each year include:

1) Total kill
2) Antlered buck kill per square mile forested deer range
3) Buck kill

VIRGINIA DISTRICT DEER HARVEST SUMMARY--1947 TO 1976

DISTRICT: NORTH PIEDMONT DISTRICT

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL
47	376.	0.0	263.	229.	113.	30.05
48	398.	0.0	262.	221.	136.	34.17
49	504.	0.1	344.	296.	160.	31.75
50	268.	0.1	268.	268.	0.	0.0
51	410.	0.1	408.	407.	2.	0.49
52	897.	0.1	656.	584.	241.	26.87
53	1240.	0.2	955.	870.	285.	22.98
54	1406.	0.2	1051.	945.	355.	25.25
55	1798.	0.3	1400.	1281.	398.	22.14
56	2048.	0.3	1490.	1323.	558.	27.25
57	3507.	0.4	2214.	1826.	1293.	36.87
58	4082.	0.4	2486.	2007.	1596.	39.10
59	4367.	0.4	2583.	2048.	1784.	40.85
60	7206.	0.7	4157.	3242.	3049.	42.31
61	6148.	0.6	3554.	2776.	2594.	42.19
62	7710.	0.6	4079.	2990.	3631.	47.09
63	7138.	0.6	3972.	3022.	3166.	44.35
64	4770.	0.6	3275.	2826.	1495.	31.34
65	3383.	0.4	2483.	2213.	900.	26.60
66	3089.	0.5	2713.	2600.	376.	12.17
67	3307.	0.5	2771.	2610.	536.	16.21
68	5061.	0.7	3970.	3643.	1091.	21.56
69	5997.	0.9	4712.	4326.	1285.	21.43
70	6826.	0.9	5104.	4587.	1722.	25.23
71	8094.	1.1	6136.	5549.	1958.	24.19
72	9029.	1.3	6972.	6355.	2057.	22.78
73	12319.	1.4	8303.	7098.	4016.	32.60
74	11659.	1.5	8416.	7443.	3243.	27.82
75	11195.	1.5	8382.	7538.	2813.	25.13
76	11675.	1.6	8786.	7919.	2889.	24.75
HARVEST CHANGES						
71-72	11.55%	14.59%	13.62%	14.53%	5.06%	-1.41
72-73	36.44%	11.75%	19.09%	11.70%	95.24%	9.82
73-74	-5.36%	4.91%	1.36%	4.86%	-19.25%	-4.78
74-75	-3.98%	1.33%	-0.40%	1.28%	-13.26%	-2.69
75-76	4.29%	5.11%	4.82%	5.06%	2.70%	-0.38
TEN YEAR MEANS						
57-66	5140.0	0.5	3151.6	2555.1	1988.4	36.29
67-76	8516.2	1.2	6355.2	5706.9	2161.0	24.17

Fig. 9. District deer harvest summary for the Virginia North Piedmont district produced by VADMIS.

DISTRICT DEER HARVEST SUMMARY BY COUNTIES; 1976

NORTH PIEDMONT DISTRICT

COUNTY	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
ALBEMARLE	1027.	1.76	825.	764.	202.	19.67	45.	3.	4.
AMHERST	567.	1.29	474.	446.	93.	16.40	12.	1.	5.
CAROLINE	1773.	2.29	1151.	964.	622.	35.08	45.	12.	4.
CULPEPER	315.	1.40	255.	237.	60.	19.05	45.	3.	4.
FAIRFAX	13.	0.05	10.	9.	3.	23.08	45.	3.	4.
FAUQUIER	791.	2.02	617.	565.	174.	22.00	45.	3.	4.
FLUVANNA	1150.	3.61	802.	698.	348.	30.26	45.	3.	4.
GOOCHLAND	644.	2.29	500.	457.	144.	22.36	45.	3.	4.
GREENE	91.	0.86	88.	87.	3.	3.30	45.	1.	4.
HANOVER	284.	0.73	240.	227.	44.	15.49	45.	3.	4.
HENRICO	283.	1.52	230.	214.	53.	18.73	45.	3.	4.
LOUDOUN	761.	3.18	555.	493.	206.	27.07	45.	3.	4.
LOUISA	894.	1.68	679.	615.	215.	24.05	45.	3.	4.
MADISON	107.	0.48	97.	94.	10.	9.35	45.	1.	4.
NELSON	543.	1.16	453.	426.	90.	16.57	45.	3.	5.
ORANGE	401.	1.48	317.	292.	84.	20.95	45.	3.	4.
PRINCE WILLIAM	371.	1.16	255.	220.	116.	31.27	45.	3.	4.
RAPPAHANNOCK	477.	2.20	370.	338.	107.	22.43	45.	3.	4.
SPOTSYLVANIA	526.	1.31	429.	400.	97.	18.44	45.	3.	4.
STAFFORD	657.	1.81	439.	374.	218.	33.18	45.	3.	4.
TOTALS	11675.	1.61	8786.	7919.	2889.	24.75			

SEASON TYPE CODE

1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. EITHER SEX AT BEGINNING OF SEASON
4. EITHER SEX AT END OF SEASON
5. NOT A UNIFORM SEASON (SPLIT, TWO SEASON TYPES, ETC.)

Fig. 9. Continued.

DISTRICT DEER HARVEST SUMMARY: NORTH PIEDMONT DISTRICT

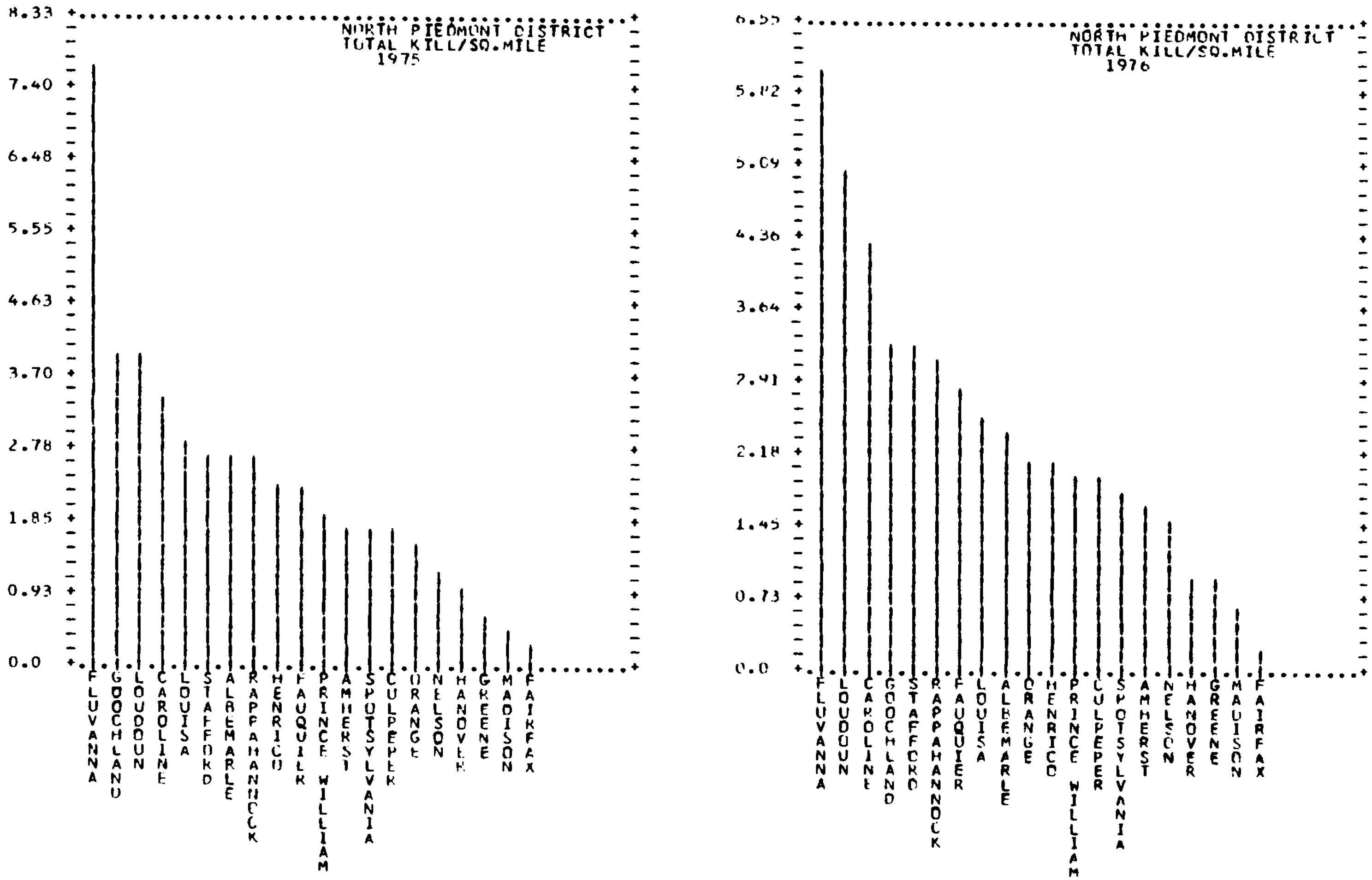


Fig. 9. Continued.

4) Antlered buck kill
5) Doe kill
6) Percent doe in the total kill

Observed changes in each of these harvest statistics over the last 5 years are summarized at the base of the table. Changes in district harvest statistics are expressed as percentages except for changes in the statistic of percent does in the total kill which are presented as actual numerical changes. Ten-year means, for two different 10-year periods, are presented for each of the district harvest statistics.

A second table on the following page of output, Fig. 9, presents the most recent year of harvest data for each county in the district. Columnar data items are identical to those presented in the county harvest summaries. Individual county data items in this table may also be found in the county harvest summary tables but are combined in this table for quick access to county harvest data for counties within a particular district. District totals are printed at the bottom of the table for convenience.

Two histograms are produced for each harvest variable selected in the data input option 'HIST'. District histograms presenting total kill per square mile of forested deer range for the North Piedmont district are shown in Fig. 9. One histogram presents county harvest density data for the most recent year and the other histogram presents county harvest density data for the previous year. County data for each year are ranked in descending order and plotted by county. Ranked county data for the 2 years are plotted side by side for comparison and identification of county harvest characteristic changes relative to other counties in the same district.

District summaries produced for the game commissioner are identical to those produced for the game biologist, only no histograms are provided. District harvest data are not summarized for the land-use planner, but district totals are used for comparison with county harvest data.

Region Harvest Summary

Regional deer harvest summaries, Fig. 10, include a single table for each region which summarizes regional deer harvest statistics from 1947 to the last year of data available, summarizes changes in each harvest statistic over the past 5 years, and provides 10-year means for two different 10-year periods for each harvest statistic. Columnar data items included in the region summary table are identical to those included in the district harvest summary table. Regional summaries produced for the game biologist and game commissioner are identical. Regional data are not supplied to land-use planners.

VIRGINIA REGIONAL DEER HARVEST SUMMARY--1947 TO 1976

REGION: TIDEWATER

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL
47	1745.	0.3	1561.	1506.	184.	10.54
48	2277.	0.4	1906.	1795.	371.	16.29
49	3575.	0.5	2662.	2388.	913.	25.54
50	2527.	0.5	2239.	2153.	288.	11.40
51	2904.	0.6	2569.	2468.	335.	11.54
52	3670.	0.6	3024.	2830.	646.	17.60
53	4478.	0.8	3877.	3697.	601.	13.42
54	4373.	0.8	3626.	3402.	747.	17.08
55	4725.	0.8	3912.	3668.	813.	17.21
56	6388.	0.8	4189.	3529.	2199.	34.42
57	6516.	0.8	4299.	3634.	2217.	34.02
58	7461.	0.9	4911.	4146.	2550.	34.18
59	6862.	0.9	4700.	4051.	2162.	31.51
60	8275.	1.1	5535.	4713.	2740.	33.11
61	8453.	1.2	5943.	5190.	2510.	29.69
62	12885.	1.2	7016.	5255.	5869.	45.55
63	13298.	1.3	7621.	5918.	5677.	42.69
64	11007.	1.1	6264.	4841.	4743.	43.09
65	9576.	1.1	6020.	4953.	3556.	37.13
66	7324.	1.0	5242.	4617.	2082.	28.43
67	7068.	1.0	5184.	4619.	1884.	26.66
68	8193.	1.3	6211.	5616.	1982.	24.19
69	9492.	1.4	7035.	6298.	2457.	25.88
70	10737.	1.5	7701.	6790.	3036.	28.28
71	11220.	1.6	7946.	6964.	3274.	29.18
72	13727.	1.8	9442.	8156.	4285.	31.22
73	15830.	2.0	10424.	8802.	5406.	34.15
74	16362.	2.0	10680.	8975.	5682.	34.73
75	15752.	1.9	10154.	8475.	5598.	35.54
76	15198.	1.9	10085.	8551.	5113.	33.64
HARVEST CHANGES						
71-72	22.34%	17.19%	18.83%	15.01%	30.88%	2.04
72-73	15.32%	7.97%	10.40%	6.84%	26.16%	2.93
73-74	3.36%	2.02%	2.46%	1.66%	5.11%	0.58
74-75	-3.73%	-5.53%	-4.93%	-4.69%	-1.48%	0.81
75-76	-3.52%	0.96%	-0.68%	0.75%	-8.66%	-1.90
TEN YEAR MEANS						
57-66	9165.7	1.1	5755.1	4731.9	3410.6	35.94
67-76	12357.9	1.7	8486.2	7324.7	3871.7	30.35

Fig. 10. A representative VADMIS regional deer harvest summary from the Tidewater region of Virginia.

State Harvest Summary

Annual deer harvest statistics for the whole state, from 1947, are summarized in a table, Fig. 11, similar to the summary tables produced for districts and regions, including the same columnar data items for each year. Changes in each of the statistics are summarized and 10-year means are provided.

Histograms illustrating state-wide annual deer harvest trends are produced for those harvest statistics specified with the data input option 'HIST'.

A table summarizing county deer harvest statistics and season regulations for the most recent year, Fig. 12, is presented as a quick reference table to recent harvest and season regulation information for all counties within the state. State-wide totals for each harvest statistic are provided below the table. Totals for East of the Blue Ridge and West of the Blue Ridge regions are also provided when program default districts and regions are used.

The most recent 2 years of county deer harvest density data for the entire state are ranked in descending order for four harvest density statistics (per square mile of forested deer range); 1) total kill, 2) buck kill, 3) antlered buck kill, and 4) doe kill. Fig. 13 illustrates four of the eight tables which are produced by the program to present ranked county harvest density statistics. The first two

VIRGINIA STATE DEER HARVEST SUMMARY--1947 TO 1976

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL
47	4014.	0.1	3716.	3627.	298.	7.42
48	5153.	0.2	4488.	4288.	665.	12.91
49	6909.	0.2	5623.	5237.	1286.	18.61
50	5699.	0.2	5285.	5161.	414.	7.26
51	7226.	0.3	6701.	6543.	525.	7.27
52	10873.	0.3	8596.	7913.	2277.	20.94
53	11797.	0.4	10814.	10519.	983.	8.33
54	14079.	0.4	11307.	10475.	2772.	19.69
55	14227.	0.5	12705.	12248.	1522.	10.70
56	20855.	0.5	13857.	11758.	6998.	33.56
57	22473.	0.5	14897.	12624.	7576.	33.71
58	26841.	0.6	17588.	14812.	9253.	34.47
59	28969.	0.6	18696.	15614.	10273.	35.46
60	36165.	0.7	21856.	17563.	14309.	39.57
61	32875.	0.6	20261.	16477.	12614.	38.37
62	38843.	0.7	22085.	17058.	16758.	43.14
63	38391.	0.7	22816.	18143.	15575.	40.57
64	31161.	0.7	20390.	17159.	10771.	34.57
65	27983.	0.7	19325.	16728.	8658.	30.94
66	26156.	0.7	19138.	17033.	7018.	26.83
67	24934.	0.7	18891.	17078.	6043.	24.24
68	28041.	0.8	22960.	21436.	5081.	18.12
69	34150.	1.0	27541.	25558.	6609.	19.35
70	38138.	1.0	29393.	26769.	8745.	22.93
71	42369.	1.2	32588.	29654.	9781.	23.09
72	48775.	1.3	36967.	33425.	11808.	24.21
73	60798.	1.4	42327.	36786.	18471.	30.38
74	61989.	1.5	44190.	38850.	17799.	28.71
75	63433.	1.6	45543.	40176.	17890.	28.20
76	63671.	1.6	46316.	41109.	17355.	27.26
HARVEST CHANGES						
71-72	15.12%	12.64%	13.44%	12.72%	20.72%	1.12
72-73	24.65%	9.98%	14.50%	10.06%	56.43%	6.17
73-74	1.96%	5.54%	4.40%	5.61%	-3.64%	-1.67
74-75	2.33%	3.34%	3.06%	3.41%	0.51%	-0.51
75-76	0.38%	2.25%	1.70%	2.32%	-2.99%	-0.95
TEN YEAR MEANS						
57-66	30985.7	0.6	19705.2	16321.0	11280.5	35.76
67-76	46629.8	1.2	34671.6	31084.1	11958.2	24.65

Fig. 11. VADMIS state deer harvest summary, Virginia, 1947-1976.

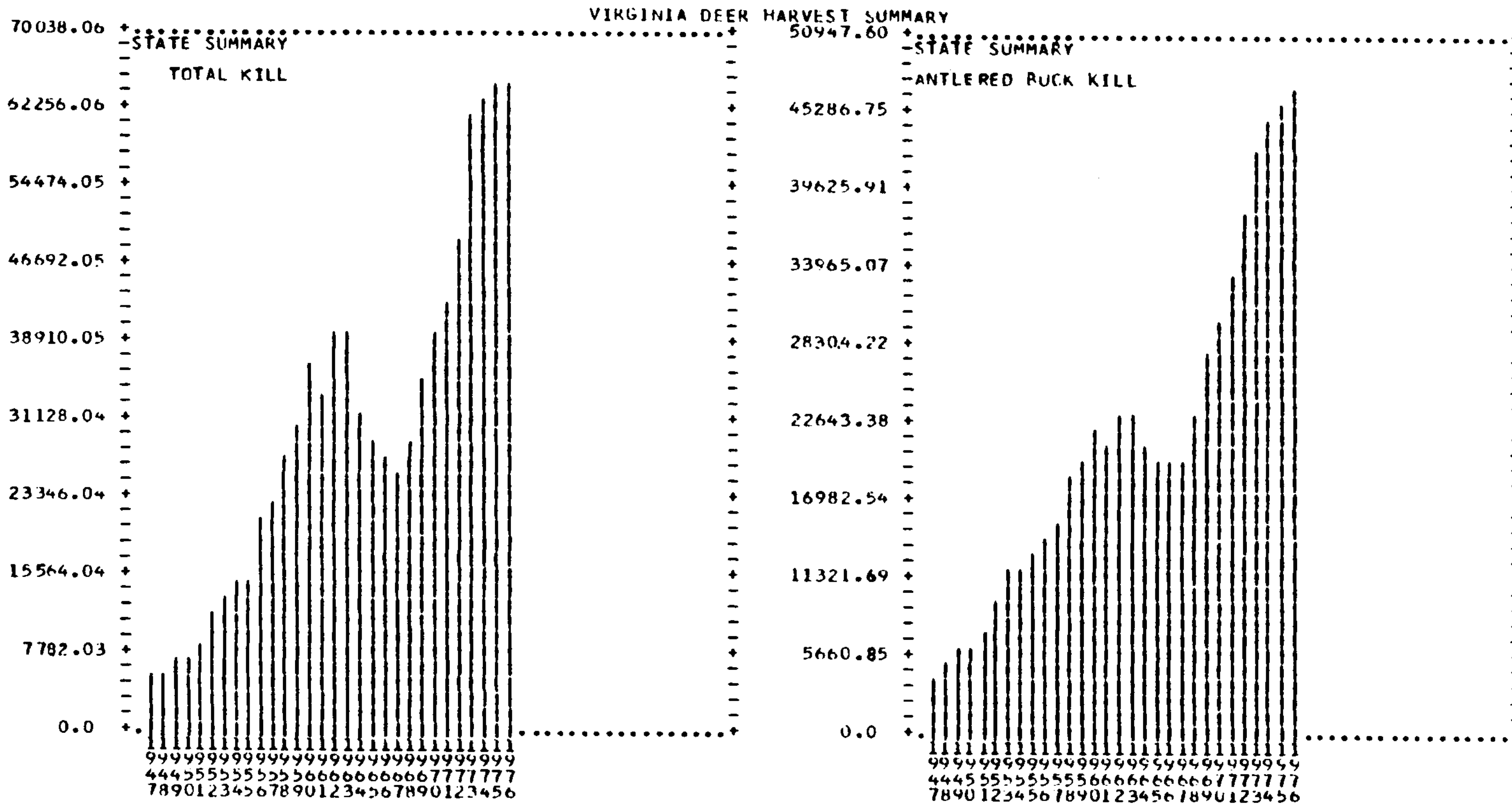


Fig. 11. Continued.

VIRGINIA DEER HARVEST SUMMARY---1976

COUNTY	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
ACCOMACK	188.	1.01	165.	158.	23.	12.23	45.	3.	4.
ALBEMARLE	1027.	1.76	825.	764.	202.	19.67	45.	3.	4.
ALLEGHANY	930.	1.79	760.	709.	170.	18.28	12.	1.	4.
AMELIA	1816.	3.41	1124.	916.	692.	38.11	45.	6.	4.
AMHERST	567.	1.29	474.	446.	93.	16.40	12.	1.	5.
APPOMATOX	880.	2.36	660.	594.	220.	25.00	45.	3.	4.
AUGUSTA	1501.	1.92	1145.	1038.	356.	23.72	12.	1.	4.
BATH	2388.	3.38	1806.	1631.	582.	24.37	12.	1.	4.
BEDFORD	655.	0.99	530.	493.	125.	19.08	12.	1.	4.
BLAND	668.	1.48	487.	433.	181.	27.10	12.	1.	4.
BOTETOURT	1179.	1.92	888.	801.	291.	24.68	12.	1.	4.
BRUNSWICK	880.	1.25	642.	571.	238.	27.05	45.	6.	4.
BUCHANAN	0.	0.0	0.	0.	0.	0.0	0.	0.	0.
BUCKINGHAM	1804.	2.73	1345.	1207.	459.	25.44	45.	3.	4.
CAMPBELL	196.	0.48	178.	173.	18.	9.18	45.	1.	5.
CAROLINE	1773.	2.29	1151.	964.	622.	35.08	45.	12.	4.
CARROLL	107.	0.38	107.	107.	0.	0.0	12.	0.	2.
CHARLES CITY	699.	3.74	553.	509.	146.	20.89	45.	3.	4.
CHARLOTTE	348.	1.01	324.	317.	24.	6.90	45.	1.	4.
CHESAPEAKE	397.	1.22	295.	264.	102.	25.69	51.	3.	4.
CHESTERFIELD	961.	1.64	661.	571.	300.	31.22	45.	6.	4.
CLARKE	271.	3.65	202.	181.	69.	25.46	12.	1.	4.
CRAIG	970.	2.39	729.	657.	241.	24.85	12.	1.	4.
CULPEPER	315.	1.40	255.	237.	60.	19.05	45.	3.	4.
CUMBERLAND	1234.	3.82	863.	752.	371.	30.06	45.	3.	4.
DICKENSON	14.	0.05	13.	13.	1.	7.14	12.	0.	5.
DINWIDDIE	1171.	1.88	835.	734.	336.	28.69	45.	6.	4.
ESSEX	179.	0.66	120.	102.	59.	32.96	45.	12.	4.
FAIRFAX	13.	0.05	10.	9.	3.	23.08	45.	3.	4.
FAUQUIER	791.	2.02	617.	565.	174.	22.00	45.	3.	4.
FLOYD	82.	0.38	81.	81.	1.	1.22	12.	0.	2.
FLUVANNA	1150.	3.61	802.	698.	348.	30.26	45.	3.	4.
FRANKLIN	249.	0.52	246.	245.	3.	1.20	12.	0.	2.
FREDERICK	979.	2.86	747.	677.	232.	23.70	12.	1.	4.
GILES	791.	1.91	567.	500.	224.	28.32	12.	1.	4.
GLOUCESTER	322.	1.29	228.	200.	94.	29.19	45.	12.	4.
GOOCHLAND	644.	2.29	500.	457.	144.	22.36	45.	3.	4.
GRAYSON	1272.	2.86	881.	764.	391.	30.74	12.	1.	4.
GREENE	91.	0.86	88.	87.	3.	3.30	45.	1.	4.
GREENESVILLE	794.	1.79	479.	385.	315.	39.67	45.	45.	1.
HALIFAX	544.	0.90	502.	489.	42.	7.72	45.	1.	4.
HAMPTON	233.	0.92	129.	98.	104.	44.64	45.	6.	4.
HANOVER	284.	0.73	240.	227.	44.	15.49	45.	3.	4.
HENRICO	283.	1.52	230.	214.	53.	18.73	45.	3.	4.
HENERY	33.	0.11	32.	32.	1.	3.03	12.	0.	2.
HIGHLAND	1409.	3.09	1051.	944.	358.	25.41	12.	1.	4.
ISLE OF WIGHT	737.	2.26	493.	420.	244.	33.11	49.	6.	4.
JAMES CITY	181.	1.46	167.	163.	14.	7.73	45.	3.	4.
KING AND QUEEN	437.	1.05	301.	260.	136.	31.12	45.	12.	4.
KING GEORGE	357.	1.53	233.	196.	124.	34.73	45.	12.	4.

Fig. 12. 1976 county deer harvest and season regulation summary for Virginia.

VIRGINIA DEER HARVEST SUMMARY---1976

COUNTY	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
KING WILLIAM	454.	1.43	326.	288.	128.	28.19	45.	12.	4.
LANCASTER	421.	3.60	284.	243.	137.	32.54	45.	12.	4.
LEE	82.	0.28	79.	78.	3.	3.66	12.	0.	2.
LOUDOUN	761.	3.18	555.	493.	206.	27.07	45.	3.	4.
LOUISA	894.	1.68	679.	615.	215.	24.05	45.	3.	4.
LUNENBURG	631.	1.44	499.	459.	132.	20.92	45.	3.	4.
MADISON	107.	0.48	97.	94.	10.	9.35	45.	1.	4.
MATHEWS	75.	1.21	60.	56.	15.	20.00	45.	3.	4.
MECKLENBURG	358.	0.71	299.	281.	59.	16.48	45.	3.	4.
MIDDLESEX	102.	0.78	74.	66.	28.	27.45	45.	12.	4.
MONTGOMERY	130.	0.51	128.	127.	2.	1.54	12.	0.	2.
NANSEMOND - SUFF	437.	1.26	357.	333.	80.	18.31	51.	3.	5.
NELSON	543.	1.16	453.	426.	90.	16.57	45.	3.	5.
NEW KENT	672.	2.84	523.	478.	149.	22.17	45.	3.	4.
NORTHHAMPTON	44.	0.80	39.	38.	5.	11.36	45.	3.	4.
NORTHUMBERLAND	422.	1.77	264.	217.	158.	37.44	45.	12.	4.
NOTTOWAY	986.	3.19	722.	643.	264.	26.77	45.	3.	4.
ORANGE	401.	1.48	317.	292.	84.	20.95	45.	3.	4.
PAGE	408.	1.49	327.	303.	81.	19.85	12.	1.	4.
PATRICK	207.	0.51	196.	193.	11.	5.31	12.	0.	2.
PITTSYLVANIA	590.	0.90	560.	551.	30.	5.08	45.	1.	5.
POWHATAN	1737.	4.40	1045.	837.	692.	39.84	45.	6.	4.
PRINCE EDWARD	606.	2.08	514.	486.	92.	15.18	45.	3.	4.
PRINCE GEORGE	825.	2.81	628.	569.	197.	23.88	45.	3.	4.
PRINCE WILLIAM	371.	1.16	255.	220.	116.	31.27	45.	3.	4.
PULASKI	410.	1.54	301.	268.	109.	26.59	12.	1.	4.
RAPPAHANNOCK	477.	2.20	370.	338.	107.	22.43	45.	3.	4.
RICHMOND	435.	1.86	283.	237.	152.	34.94	45.	12.	4.
ROANOKE	63.	0.33	61.	60.	2.	3.17	12.	0.	2.
ROCKBRIDGE	949.	1.61	721.	653.	228.	24.03	12.	1.	4.
ROCKINGHAM	2274.	2.71	1561.	1347.	713.	31.35	12.	1.	4.
RUSSELL	55.	0.22	55.	55.	0.	0.0	12.	0.	2.
SCOTT	98.	0.28	98.	98.	0.	0.0	12.	0.	2.
SHENANDOAH	1493.	3.01	1022.	881.	471.	31.55	12.	1.	4.
SMYTH	671.	1.50	476.	418.	195.	29.06	12.	1.	4.
SOUTHHAMPTON	2802.	3.50	1726.	1403.	1076.	38.40	45.	45.	1.
SPOTSYLVANIA	526.	1.31	429.	400.	97.	18.44	45.	3.	4.
STAFFORD	657.	1.81	439.	374.	218.	33.18	45.	3.	4.
SURRY	1297.	2.70	740.	573.	557.	42.95	45.	45.	1.
SUSSEX	1487.	2.19	993.	845.	494.	33.22	45.	45.	1.
TAZEWELL	106.	0.33	105.	105.	1.	0.94	12.	0.	2.
VIRGINIA BEACH	109.	1.12	86.	79.	23.	21.10	51.	3.	4.
WARREN	520.	2.85	410.	377.	110.	21.15	12.	1.	4.
WASHINGTON	203.	0.65	192.	189.	11.	5.42	12.	0.	2.
WESTMORELAND	205.	0.83	134.	113.	71.	34.63	45.	12.	4.
WISE	57.	0.16	57.	57.	0.	0.0	12.	0.	2.
WYTHE	832.	2.26	611.	545.	221.	26.56	12.	1.	4.
YORK	887.	3.52	405.	260.	482.	54.34	45.	6.	4.
WEST OF B. R.	20912.	1.53	15668.	14095.	5244.	25.08			
EAST OF B. R.	42759.	1.64	30648.	27015.	12111.	28.32			
TOTALS	63671.	1.60	46316.	41109.	17355.	27.26			

SEASON TYPE CODES: 1-E.S. ALL SEASON, 2-BUCKS ONLY, 3-E.S. AT START OF SEASON, 4-E.S. AT END, 5- NON-UNIFORM SEASON

Fig. 12. Continued.

VIRGINIA DEER HARVEST SUMMARY
TOTAL KILL PER SQ. MILE FOREST RANGE
IN DESCENDING ORDER - 1975

COUNTY	HARVEST PER SQUARE MILE	COUNTY	HARVEST PER SQUARE MILE
YORK	14.20	BLAND	2.19
POWHATAN	7.68	PRINCE EDWARD	2.18
FLUVANNA	7.57	FAUQUIER	2.17
SURRY	7.25	HAMPTON	2.10
CUMBERLAND	6.79	KING WILLIAM	2.08
SOUTHHAMPTON	6.32	NANSEMOND - SUFF	1.90
LANCASTER	6.16	PRINCE WILLIAM	1.89
CHARLES CITY	6.01	PAGE	1.87
NEW KENT	5.99	CHESAPEAKE	1.81
AMELIA	5.63	BRUNSWICK	1.77
NOTTOWAY	5.50	AMHERST	1.70
SHENANDOAH	5.12	SPOTSYLVANIA	1.66
BUCKINGHAM	4.96	CULPEPER	1.66
GRAYSON	4.82	KING AND QUEEN	1.61
PRINCE GEORGE	4.73	WESTMORELAND	1.45
ROCKINGHAM	4.61	ORANGE	1.41
BATH	4.61	ACCOMACK	1.38
FREDERICK	4.55	LUNENBURG	1.33
WYTHE	4.15	VIRGINIA BEACH	1.32
HIGHLAND	4.12	BEDFORD	1.32
SUSSEX	3.97	ESSEX	1.32
GOOCHLAND	3.96	MATHEWS	1.28
WARREN	3.96	CHARLOTTE	1.24
LOUDOUN	3.90	MIDDLESEX	1.20
CLARKE	3.83	NELSON	1.12
NORTHUMBERLAND	3.71	HANOVER	1.00
CRAIG	3.56	NORTHHAMPTON	0.93
ISLE OF WIGHT	3.48	PATRICK	0.86
CAROLINE	3.30	PITTSYLVANIA	0.82
BOTETOURT	3.25	HALIFAX	0.79
DINWIDDIE	3.24	WASHINGTON	0.73
SMYTH	3.14	MECKLENBURG	0.67
RICHMOND	3.12	GREENE	0.64
GILES	3.09	CAMPBELL	0.55
CHESTERFIELD	2.90	FRANKLIN	0.48
LOUISA	2.86	FLOYD	0.45
JAMES CITY	2.84	MONTGOMERY	0.43
APPOMATOX	2.77	MADISON	0.40
AUGUSTA	2.75	ROANOKE	0.36
STAFFORD	2.68	CARROLL	0.33
GREENESVILLE	2.64	LEE	0.29
ALBEMARLE	2.59	TAZEWELL	0.29
RAPPAHANNOCK	2.56	WISE	0.25
ROCKBRIDGE	2.43	SCOTT	0.21
GLOUCESTER	2.39	RUSSELL	0.15
PULASKI	2.39	FAIRFAX	0.13
HENRICO	2.31	HENERY	0.09
ALLEGHANY	2.30	DICKENSON	0.05
KING GEORGE	2.28	BUCHANAN	0.0
		EAST OF B. R.	2.84
		WEST OF B. R.	2.27
		STATEWIDE	2.66

VIRGINIA DEER HARVEST SUMMARY
BUCK KILL PER SQ. MILE FOREST RANGE
IN DESCENDING ORDER - 1975

COUNTY	HARVEST PER SQUARE MILE	COUNTY	HARVEST PER SQUARE MILE
YORK	6.70	BLAND	1.61
POWHATAN	5.00	GLOUCESTER	1.53
FLUVANNA	4.84	PAGE	1.53
CUMBERLAND	4.60	KING GEORGE	1.47
SOUTHHAMPTON	4.12	NANSEMOND - SUFF	1.45
CHARLES CITY	3.96	AMHERST	1.45
SURRY	3.90	SPOTSYLVANIA	1.44
AMELIA	3.89	CHESAPEAKE	1.42
NOTTOWAY	3.81	CULPEPER	1.39
LANCASTER	3.80	KING WILLIAM	1.39
NEW KENT	3.73	PRINCE WILLIAM	1.36
FREDERICK	3.58	BRUNSWICK	1.29
SHENANDOAH	3.52	LUNENBURG	1.23
BUCKINGHAM	3.37	ORANGE	1.23
GRAYSON	3.34	KING AND QUEEN	1.19
PRINCE GEORGE	3.27	MATHEWS	1.15
BATH	3.25	CHARLOTTE	1.13
LOUDOUN	3.19	ACCOMACK	1.11
HIGHLAND	3.15	HAMPTON	1.10
ROCKINGHAM	3.06	BEDFORD	1.07
WARREN	3.00	NELSON	1.00
CLARKE	2.89	WESTMORELAND	0.94
WYTHE	2.88	VIRGINIA BEACH	0.91
GOOCHLAND	2.72	MIDDLESEX	0.90
CRAIG	2.56	ESSEX	0.89
SUSSEX	2.46	NORTHHAMPTON	0.76
NORTHUMBERLAND	2.42	PITTSYLVANIA	0.76
BOTETOURT	2.41	HANOVER	0.73
ISLE OF WIGHT	2.40	HALIFAX	0.73
APPOMATOX	2.37	WASHINGTON	0.71
GILES	2.29	PATRICK	0.66
CAROLINE	2.26	MECKLENBURG	0.62
DINWIDDIE	2.23	GREENE	0.57
JAMES CITY	2.16	CAMPBELL	0.50
SMYTH	2.16	FRANKLIN	0.48
RAPPAHANNOCK	2.12	FLOYD	0.45
AUGUSTA	2.11	MONTGOMERY	0.41
GREENESVILLE	2.05	MADISON	0.40
LOUISA	1.99	ROANOKE	0.35
CHESTERFIELD	1.96	CARROLL	0.32
ALBEMARLE	1.95	LEE	0.29
RICHMOND	1.94	TAZEWELL	0.28
ROCKBRIDGE	1.93	WISE	0.24
PRINCE EDWARD	1.92	SCOTT	0.20
STAFFORD	1.86	RUSSELL	0.15
FAUQUIER	1.83	HENERY	0.09
HENRICO	1.77	FAIRFAX	0.06
ALLEGHANY	1.74	DICKENSON	0.05
PULASKI	1.72	BUCHANAN	0.0
		EAST OF B. R.	1.95
		WEST OF B. R.	1.68
		STATEWIDE	1.87

Fig. 13. VADMIS county rankings for total kill per square mile and buck kill per square mile of forested deer range in 1975 and 1976.

VIRGINIA DEER HARVEST SUMMARY
TOTAL KILL PER SQ. MILE FOREST RANGE
IN DESCENDING ORDER - 1976

COUNTY	HARVEST PER SQUARE MILE	COUNTY	HARVEST PER SQUARE MILE
YORK	11.99	KING WILLIAM	2.26
POWHATAN	9.13	HAMPTON	2.18
SOUTHHAMPTON	6.99	GLOUCESTER	2.07
AMELIA	6.75	ORANGE	2.03
CUMBERLAND	6.27	HENRICO	2.01
LANCASTER	6.23	PAGE	2.00
SURRY	6.12	LUNENBURG	1.98
FLUVANNA	5.95	PRINCE WILLIAM	1.96
CLARKE	5.45	BRUNSWICK	1.93
CHARLES CITY	5.14	CULPEPER	1.86
SHENANDOAH	5.10	CHESAPEAKE	1.84
BATH	4.95	KING AND QUEEN	1.76
LOUDOUN	4.90	SPOTSYLVANIA	1.72
NOTTOWAY	4.89	NANSEMOND - SUFF	1.65
GRAYSON	4.76	AMHERST	1.64
HIGHLAND	4.61	MATHEWS	1.63
ROCKINGHAM	4.57	JAMES CITY	1.63
CAROLINE	4.22	VIRGINIA BEACH	1.54
FREDERICK	4.13	WESTMORELAND	1.51
PRINCE GEORGE	4.08	NELSON	1.48
BUCKINGHAM	4.08	BEDFORD	1.32
NEW KENT	3.99	MIDDLESEX	1.21
ISLE OF WIGHT	3.97	ACCOMACK	1.20
WARREN	3.93	ESSEX	1.16
SUSSEX	3.86	CHARLOTTE	1.11
GREENESVILLE	3.69	HALIFAX	1.00
CRAIG	3.54	PITTSYLVANIA	0.96
APPOMATOX	3.49	NORTHHAMPTON	0.94
NORTHUMBERLAND	3.45	HANOVER	0.91
WYTHE	3.45	MECKLENBURG	0.91
RICHMOND	3.40	GREENE	0.90
GOOCHLAND	3.23	WASHINGTON	0.70
STAFFORD	3.19	CAMPBELL	0.55
RAPPAHANNOCK	3.10	PATRICK	0.55
GILES	3.02	MADISON	0.54
DINWIDDIE	3.00	FRANKLIN	0.52
FAUQUIER	2.83	MONTGOMERY	0.52
BOTETOURT	2.82	FLOYD	0.38
KING GEORGE	2.79	CARROLL	0.38
AUGUSTA	2.77	ROANOKE	0.34
CHESTERFIELD	2.76	TAZEWELL	0.33
PRINCE EDWARD	2.59	LEE	0.29
LOUISA	2.45	SCOTT	0.28
SMYTH	2.40	RUSSELL	0.22
ALBEMARLE	2.37	WISE	0.16
PULASKI	2.36	HENERY	0.12
ALLEGHANY	2.35	FAIRFAX	0.07
ROCKBRIDGE	2.34	DICKENSON	0.05
BLAND	2.28	BUCHANAN	0.0
		EAST OF B. R.	2.83
		WEST OF B. R.	2.27
		STATEWIDE	2.65

VIRGINIA DEER HARVEST SUMMARY
BUCK KILL PER SQ. MILE FOREST RANGE
IN DESCENDING ORDER - 1976

COUNTY	HARVEST PER SQUARE MILE	COUNTY	HARVEST PER SQUARE MILE
POWHATAN	5.49	HENRICO	1.63
YORK	5.47	KING WILLIAM	1.62
CUMBERLAND	4.38	PAGE	1.61
SOUTHHAMPTON	4.31	ORANGE	1.60
LANCASTER	4.20	LUNENBURG	1.57
AMELIA	4.18	CULPEPER	1.51
FLUVANNA	4.15	JAMES CITY	1.50
CHARLES CITY	4.07	GLOUCESTER	1.47
CLARKE	4.06	BRUNSWICK	1.41
BATH	3.75	SPOTSYLVANIA	1.40
NOTTOWAY	3.58	AMHERST	1.37
LOUDOUN	3.57	CHESAPEAKE	1.37
SHENANDOAH,	3.49	NANSEMOND - SUFF	1.35
SURRY	3.49	PRINCE WILLIAM	1.35
HIGHLAND	3.44	MATHEWS	1.30
GRAYSON	3.30	NELSON	1.24
FREDERICK	3.15	VIRGINIA BEACH	1.22
ROCKINGHAM	3.14	KING AND QUEEN	1.21
NEW KENT	3.11	HAMPTON	1.21
PRINCE GEORGE	3.11	BEDFORD	1.07
WARREN	3.10	ACCOMACK	1.05
BUCKINGHAM	3.04	CHARLOTTE	1.03
CAROLINE	2.74	WESTMORELAND	0.99
CRAIG	2.66	HALIFAX	0.92
ISLE OF WIGHT	2.66	PITTSYLVANIA	0.91
APPOMATOX	2.62	MIDDLESEX	0.88
SUSSEX	2.57	GREENE	0.87
WYTHE	2.53	NORTHHAMPTON	0.83
GOOCHLAND	2.51	ESSEX	0.78
RAPPAHANNOCK	2.41	HANOVER	0.77
GREENESVILLE	2.22	MECKLENBURG	0.76
RICHMOND	2.21	WASHINGTON	0.66
FAUQUIER	2.21	PATRICK	0.52
PRINCE EDWARD	2.20	FRANKLIN	0.52
GILES	2.17	MONTGOMERY	0.51
NORTHUMBERLAND	2.16	CAMPBELL	0.50
DINWIDDIE	2.14	MADISON	0.49
STAFFORD	2.13	CARROLL	0.38
BOTETOURT	2.12	FLOYD	0.38
AUGUSTA	2.11	TAZEWELL	0.33
ALLEGHANY	1.92	ROANOKE	0.33
ALBEMARLE	1.90	LEE	0.26
CHESTERFIELD	1.90	SCOTT	0.26
LOUISA	1.86	RUSSELL	0.22
KING GEORGE	1.82	WISE	0.16
ROCKBRIDGE	1.78	HENERY	0.11
PULASKI	1.73	FAIRFAX	0.06
SMYTH	1.71	DICKENSON	0.05
BLAND	1.66	BUCHANAN	0.0
		EAST OF B. R.	1.98
		WEST OF B. R.	1.71
		STATEWIDE	1.90

Fig. 13. Continued.

tables in Fig. 13 contain the county rankings for total kill per square mile and buck kill per square mile for 1975. The last two tables contain the county rankings for the same two data items for 1976. Averages for counties east of the Blue Ridge, counties west of the Blue Ridge, and the whole state are presented at the bottom of each table.

Ranked county data for the most recent year are plotted in a histogram as shown in Fig. 14. The histogram illustrates and aids users to visualize the magnitude of differences among counties in harvest density statistics. Histograms are produced for those variables designated by the data input option 'HIST'. Histograms are produced only for the game biologist. Tables of the ranked counties are produced for the game biologist and the game commissioner.

Harvest statistics for counties over the last 11 years are summarized in tables like the one shown in Fig. 15. Four tables are produced summarizing 11 years of county harvest statistics for total kill, buck kill, antlered buck kill, and percent doe in the total kill. A 10-year average for the first 10 years in the table for each county is provided for convenient comparison with recent harvest statistics. State-wide totals for each year are provided at the bottom of the table along with totals for east and west of the Blue Ridge when default districts and regions are

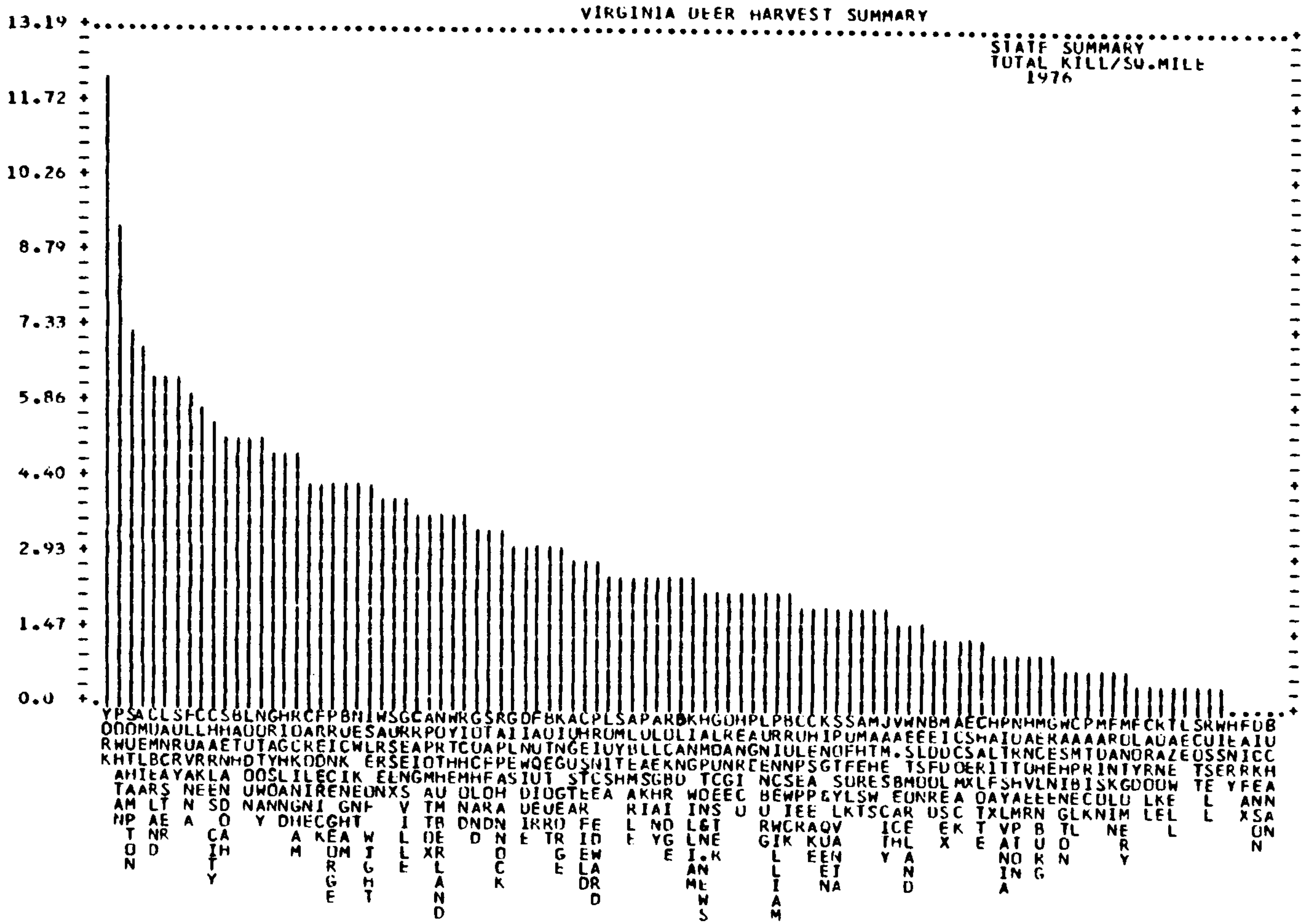


Fig. 14. VADMIS histogram of the 1976 county rankings for total kill per square mile of forested deer range.

VIRGINIA DEER HARVEST SUMMARY

TOTAL KILL

1966-1976

COUNTY	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	10 YR. AVERAGE	1976
ACCOMACK	52.	61.	84.	96.	103.	92.	112.	162.	224.	218.	120.	188.
ALBEMARLE	296.	245.	392.	417.	377.	531.	682.	816.	854.	1126.	574.	1027.
ALLEGHANY	664.	626.	705.	801.	852.	922.	739.	895.	985.	912.	810.	930.
AMELIA	251.	276.	350.	511.	789.	977.	1223.	1748.	1832.	1511.	947.	1616.
AMHERST	234.	241.	141.	185.	187.	244.	285.	411.	406.	586.	292.	567.
APPOMATTOX	124.	123.	195.	264.	286.	324.	412.	613.	741.	698.	376.	680.
AUGUSTA	1266.	1133.	941.	1245.	1221.	1270.	1095.	1314.	1381.	1491.	1236.	1501.
BATH	1818.	1803.	1544.	1962.	1881.	1777.	1686.	1771.	2247.	2222.	1871.	2388.
BEDFORD	70.	75.	74.	103.	136.	156.	245.	409.	475.	658.	240.	655.
BLAND	236.	117.	190.	224.	221.	251.	272.	292.	328.	641.	277.	668.
BOTETOURT	675.	737.	762.	946.	922.	1004.	1165.	1170.	1212.	1356.	995.	1179.
BRUNSWICK	144.	144.	288.	412.	297.	341.	431.	800.	752.	804.	441.	880.
BUCHANAN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BUCKINGHAM	533.	549.	658.	756.	1324.	1547.	1784.	2623.	2641.	2192.	1461.	1804.
CAMPBELL	37.	36.	42.	42.	63.	86.	94.	160.	179.	197.	94.	196.
CAROLINE	502.	784.	1032.	1256.	1325.	1743.	1348.	1621.	1318.	1390.	1232.	1773.
CARROLL	51.	59.	44.	32.	34.	54.	74.	54.	62.	93.	56.	107.
CHARLES CITY	209.	234.	281.	367.	489.	708.	717.	972.	1084.	818.	588.	699.
CHARLOTTE	24.	40.	45.	73.	61.	110.	125.	212.	307.	388.	139.	348.
CHESAPEAKE	526.	165.	203.	228.	198.	222.	282.	334.	357.	392.	291.	397.
CHESTERFIELD	227.	293.	372.	405.	651.	712.	1003.	1431.	1401.	1012.	751.	961.
CLARKE	89.	86.	113.	103.	71.	104.	87.	179.	221.	191.	124.	271.
CRAIG	950.	963.	789.	871.	873.	786.	932.	1067.	969.	976.	918.	970.
CULPEPER	61.	67.	108.	120.	158.	184.	236.	300.	275.	281.	179.	315.
CUMBERLAND	260.	294.	357.	481.	745.	992.	1221.	1801.	1660.	1340.	915.	1234.
DICKENSON	24.	11.	9.	6.	6.	10.	8.	13.	21.	15.	12.	14.
DINWIDDIE	261.	291.	360.	434.	779.	932.	1151.	1486.	1501.	1261.	846.	1171.
ESSEX	89.	88.	121.	169.	156.	114.	139.	118.	190.	204.	139.	179.
FAIRFAX	14.	8.	4.	22.	3.	15.	17.	1.	12.	23.	12.	13.
FAUQUIER	188.	203.	324.	373.	403.	450.	566.	616.	696.	605.	442.	791.
FLOYD	30.	23.	24.	31.	31.	38.	60.	69.	61.	97.	46.	82.
FLUVANNA	326.	470.	988.	925.	987.	1205.	1531.	2332.	1882.	1462.	1211.	1150.
FRANKLIN	67.	58.	95.	60.	88.	110.	152.	203.	209.	229.	127.	249.
FREDERICK	540.	466.	550.	596.	511.	703.	799.	899.	959.	1078.	710.	979.
GILES	558.	541.	433.	600.	521.	520.	542.	327.	321.	809.	517.	791.
GLOUCESTER	89.	143.	211.	261.	239.	232.	315.	384.	370.	371.	262.	222.
GOOCHLAND	150.	155.	227.	263.	303.	474.	572.	916.	903.	790.	475.	644.
GRAYSON	333.	406.	212.	296.	360.	365.	467.	549.	547.	1279.	481.	1272.
GREENL	43.	28.	32.	35.	58.	44.	59.	81.	75.	65.	52.	91.
GREENSVILLE	416.	339.	272.	255.	317.	402.	449.	480.	598.	569.	410.	794.
HALIFAX	37.	69.	76.	130.	139.	153.	206.	287.	425.	430.	195.	544.
HAMPTON&N.NEWS	49.	115.	252.	211.	213.	201.	227.	260.	272.	225.	203.	233.
HANOVER	104.	94.	118.	123.	193.	196.	202.	262.	362.	313.	197.	284.
HENRICO	34.	52.	73.	110.	133.	229.	215.	423.	336.	324.	193.	283.
HENRY	2.	1.	5.	2.	1.	5.	7.	11.	16.	25.	8.	33.
HIGHLAND	717.	725.	672.	897.	780.	852.	908.	1168.	1179.	1260.	916.	1409.
ISLE OF WIGHT	389.	356.	303.	322.	398.	435.	569.	693.	656.	647.	477.	737.
JAMES CITY	175.	156.	229.	234.	223.	271.	441.	590.	440.	316.	308.	181.
KING & QUEEN	190.	185.	239.	277.	288.	291.	297.	280.	369.	398.	281.	437.
KING GEORGE	266.	249.	333.	398.	304.	287.	347.	384.	338.	290.	320.	357.
KING WILLIAM	178.	299.	371.	372.	416.	446.	451.	489.	533.	418.	397.	454.
LANCASTER	293.	532.	312.	293.	228.	291.	282.	369.	441.	420.	349.	421.

Fig. 15. VADMIS 11-year (1966-1976) summary of Virginia county total kill data.

VIRGINIA DEER HARVEST SUMMARY

TOTAL KILL

1966-1976

COUNTY	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	10 YR. AVERAGE	1976
LEE	36.	37.	37.	38.	65.	46.	57.	60.	73.	81.	53.	82.
LOUDOUN	111.	94.	148.	247.	228.	338.	410.	466.	602.	605.	325.	761.
LOUISA	144.	138.	285.	270.	472.	591.	628.	1237.	1137.	1044.	595.	894.
LUNENBURG	55.	86.	90.	132.	126.	166.	221.	266.	356.	424.	192.	631.
MADISON	37.	22.	32.	25.	34.	38.	64.	67.	102.	79.	50.	107.
MATHEWS	26.	40.	71.	57.	65.	24.	35.	55.	56.	59.	49.	75.
MECHLENBURG	46.	42.	46.	55.	79.	97.	130.	181.	239.	264.	118.	358.
MIDDLESEX	49.	62.	75.	78.	84.	81.	78.	65.	88.	101.	76.	102.
MONTGOMERY	13.	26.	20.	38.	41.	73.	78.	107.	87.	107.	59.	130.
SUFFOLK	495.	300.	251.	318.	286.	308.	416.	458.	457.	503.	379.	437.
NELSON	97.	79.	126.	123.	159.	187.	250.	348.	415.	409.	219.	543.
NEW KENT	205.	220.	293.	348.	449.	657.	797.	917.	899.	1009.	579.	672.
NORTHAMPTON	0.	0.	0.	0.	0.	0.	11.	12.	26.	44.	9.	44.
NORTHUMBERLAND	242.	457.	344.	337.	309.	338.	384.	487.	514.	453.	387.	422.
NOTTOWAY	175.	179.	246.	324.	595.	733.	781.	1129.	1007.	1112.	628.	986.
ORANGE	78.	83.	142.	144.	167.	201.	262.	277.	290.	280.	192.	401.
PAGE	309.	207.	206.	285.	312.	339.	351.	332.	385.	381.	311.	408.
PATRICK	249.	223.	140.	185.	180.	219.	252.	360.	356.	323.	249.	207.
PITTSYLVANIA	63.	63.	72.	106.	133.	163.	202.	305.	386.	506.	200.	590.
POWHATAN	219.	183.	303.	423.	689.	841.	1051.	1693.	1694.	1464.	856.	1737.
PRINCE EDWARD	53.	79.	101.	143.	188.	194.	304.	364.	494.	511.	243.	606.
PRINCE GEORGE	253.	293.	354.	392.	803.	867.	1084.	1668.	1259.	955.	793.	825.
PRINCE WILLIAM	147.	141.	286.	342.	460.	349.	388.	463.	326.	360.	326.	371.
PULASKI	185.	84.	132.	128.	124.	135.	154.	194.	189.	415.	174.	410.
RAPPAHANNOCK	149.	43.	86.	347.	207.	194.	297.	408.	359.	393.	248.	477.
RICHMOND	169.	149.	220.	183.	198.	240.	225.	330.	353.	398.	247.	435.
ROANOKE	3.	9.	18.	19.	25.	27.	46.	71.	40.	66.	32.	63.
ROCKBRIDGE	624.	516.	555.	724.	728.	711.	786.	802.	887.	984.	732.	949.
ROCKINGHAM	1423.	1177.	1219.	1595.	1593.	1701.	1902.	2201.	2235.	2290.	1734.	2274.
RUSSELL	6.	3.	12.	23.	11.	27.	22.	28.	47.	37.	22.	55.
SCOTT	93.	53.	52.	70.	54.	52.	57.	53.	51.	73.	61.	98.
SHENANDOAH	875.	768.	707.	877.	826.	1048.	1190.	1247.	1276.	1497.	1031.	1493.
SMYTH	376.	206.	235.	302.	314.	342.	345.	376.	334.	873.	370.	671.
SOUTHAMPTON	1211.	1033.	1379.	1742.	2153.	2063.	2783.	2900.	2723.	2533.	2052.	2802.
SPOTSYLVANIA	128.	138.	208.	266.	260.	472.	515.	682.	766.	508.	394.	526.
STAFFORD	246.	222.	309.	404.	712.	409.	502.	592.	543.	552.	449.	657.
SURRY	586.	240.	325.	640.	743.	714.	951.	942.	1323.	1536.	800.	1297.
SUSSEX	735.	791.	965.	1067.	1280.	1190.	1393.	1633.	1731.	1532.	1232.	1487.
TAZEWELL	60.	40.	56.	76.	55.	71.	75.	91.	91.	91.	71.	106.
VA. BEACH	62.	21.	24.	23.	30.	30.	40.	71.	84.	95.	48.	109.
WARREN	367.	305.	241.	375.	338.	409.	456.	516.	428.	524.	396.	520.
WASHINGTON	159.	106.	104.	133.	97.	118.	140.	163.	154.	211.	139.	203.
WESTMORELAND	65.	70.	120.	124.	119.	116.	151.	139.	164.	197.	127.	205.
WISE	31.	13.	11.	20.	16.	29.	90.	55.	46.	88.	40.	57.
WYTHE	335.	209.	279.	307.	343.	413.	441.	504.	481.	999.	431.	832.
YORK	305.	470.	561.	700.	646.	600.	751.	608.	813.	1051.	651.	887.
EAST OF B. R.	13310.	13479.	17169.	20530.	24912.	28172.	33751.	44231.	44692.	42296.	28254.	42759.
WEST OF B. R.	12846.	11455.	10872.	13620.	13226.	14197.	15024.	16567.	17297.	21137.	14624.	20912.
STATEWIDE	26156.	24934.	28041.	34150.	38138.	42369.	48775.	60798.	61989.	63433.	42878.	63671.

Fig. 15. Continued.

used.

<u>Season Regulation Changes Summary</u>

A series of tables are produced to summarize the effects of recent county season regulation changes on county deer harvests. Each table, Fig. 16, summarizes harvest changes for all counties that experienced a particular regulation change over the last 2 years, or experienced the same regulations both years.

The first table, illustrated in Fig. 16, lists those counties which had 6 days of either-sex hunting at the end of the season in 1975 and 3 days of either-sex hunting at the end of the season in 1976. The second table illustrated in Fig. 16 identifies those counties which had 1 day of either-sex hunting at the end of the season in 1975 and in 1976. The third table in Fig. 16 contains counties which had 1 day of either-sex hunting in 1975 and 3 days of either-sex hunting in 1976.

For each county in the tables, harvest statistics provided for both years include; 1) number of hunting days in the season, 2) buck kill, 3) doe kill, 4) total kill, 5) percent does in the total kill, and 6) antlered buck kill. County statistics for both years are summed and the changes in each statistic, as percentage change, for all counties together are presented. At the bottom of the table a statement describing the change in the total harvest for

VIRGINIA COUNTY DEER SEASON REGULATION CHANGES SUMMARY--1975-1976

TABLE 2

1975-1976 SEASON TYPE	1975-1976 SEASON ES DAYS		1976-1977 SEASON TYPE	1976-1977 SEASON ES DAYS
4.	6.	TO	4.	3.

COUNTY	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS
ALBEMARLE	43.	848.	278.	1126.	24.7	765.	45.	825.	202.	1027.	19.7	764.
BUCKINGHAM	43.	1488.	704.	2192.	32.1	1277.	45.	1345.	459.	1804.	25.4	1207.
CHARLES CITY	43.	538.	280.	818.	34.2	454.	45.	553.	146.	699.	20.9	509.
CUMBERLAND	43.	907.	433.	1340.	32.3	777.	45.	863.	371.	1234.	30.1	752.
FLUVANNA	43.	934.	528.	1462.	36.1	776.	45.	802.	348.	1150.	30.3	698.
GOOCHLAND	43.	543.	247.	790.	31.3	469.	45.	500.	144.	644.	22.4	457.
HANOVER	43.	228.	85.	313.	27.2	203.	45.	240.	44.	284.	15.5	227.
HENRICO	43.	249.	75.	324.	23.1	227.	45.	230.	53.	283.	18.7	214.
JAMES CITY	43.	240.	76.	316.	24.1	217.	45.	167.	14.	181.	7.7	163.
LOUISA	43.	726.	318.	1044.	30.5	631.	45.	679.	215.	894.	24.0	615.
NEW KENT	43.	629.	380.	1009.	37.7	515.	45.	523.	149.	672.	22.2	478.
NOTTOWAY	43.	772.	340.	1112.	30.6	670.	45.	722.	264.	986.	26.8	643.
PRINCE GEORGE	43.	661.	294.	955.	30.8	573.	45.	628.	197.	825.	23.9	569.
TOTALS		8763.	4038.	12801.	30.4	7552.		8077.	2606.	10683.	22.1	7295.
							% CHANGE--	-7.8	-35.5	-16.5	-27.1	-3.4

1976 TOTAL KILL DECREASED BY 2118 DEER OR 16.5% OF 1975

SEASON TYPE CODES

1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. EITHER SEX AT BEGINNING OF SEASON
4. EITHER SEX AT END OF SEASON
5. NOT A UNIFORM SEASON

Fig. 16. VADMIS summary of season regulation changes, 1975-1976.

VIRGINIA COUNTY DEER SEASON REGULATION CHANGES SUMMARY--1975-1976

TABLE 3

1975-1976 SEASON TYPE	1975-1976 ES DAYS		1976-1977 SEASON TYPE	1976-1977 ES DAYS
4.	1.	TO	4.	1.

COUNTY	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS
ALLEGHANY	11.	690.	222.	912.	24.3	623.	12.	760.	170.	930.	18.3	709.
AUGUSTA	11.	1142.	349.	1491.	23.4	1037.	12.	1145.	356.	1501.	23.7	1038.
BATH	11.	1566.	656.	2222.	29.5	1369.	12.	1806.	582.	2388.	24.4	1631.
BEDFORD	11.	534.	124.	658.	18.8	497.	12.	530.	125.	655.	19.1	493.
BLAND	11.	470.	171.	641.	26.7	419.	12.	487.	181.	668.	27.1	433.
BOTETOURT	11.	1006.	350.	1356.	25.8	901.	12.	888.	291.	1179.	24.7	801.
CHARLOTTE	43.	353.	35.	388.	9.0	343.	45.	324.	24.	348.	6.9	317.
CLARKE	11.	144.	47.	191.	24.6	130.	12.	202.	69.	271.	25.5	181.
CRAIG	11.	702.	274.	976.	28.1	620.	12.	729.	241.	970.	24.8	657.
FREDERICK	11.	848.	230.	1078.	21.3	779.	12.	747.	232.	979.	23.7	677.
GILES	11.	598.	211.	809.	26.1	535.	12.	567.	224.	791.	28.3	500.
GRAYSON	11.	886.	393.	1279.	30.7	768.	12.	881.	391.	1272.	30.7	764.
GREENE	43.	57.	8.	65.	12.3	55.	45.	88.	3.	91.	3.3	87.
HALIFAX	43.	396.	34.	430.	7.9	386.	45.	502.	42.	544.	7.7	489.
HIGHLAND	11.	963.	297.	1260.	23.6	874.	12.	1051.	358.	1409.	25.4	944.
MADISON	43.	78.	1.	79.	1.3	78.	45.	97.	10.	107.	9.3	94.
PAGE	11.	311.	70.	381.	18.4	290.	12.	327.	81.	408.	19.9	303.
PULASKI	11.	298.	117.	415.	28.2	263.	12.	301.	109.	410.	26.6	268.
ROCKBRIDGE	11.	781.	203.	984.	20.6	720.	12.	721.	228.	949.	24.0	653.
ROCKINGHAM	11.	1531.	759.	2290.	33.1	1303.	12.	1561.	713.	2274.	31.4	1347.
SHENANDOAH	11.	1031.	466.	1497.	31.1	891.	12.	1022.	471.	1493.	31.5	881.
SMYTH	11.	600.	273.	873.	31.3	518.	12.	476.	195.	671.	29.1	418.
WARREN	11.	397.	127.	524.	24.2	359.	12.	410.	110.	520.	21.2	377.
WYTHE	11.	695.	304.	999.	30.4	604.	12.	611.	221.	832.	26.6	545.
TOTALS		16077.	5721.	21798.	23.0	14361.		16233.	5427.	21660.	22.2	14605.
							% CHANGE--	1.0	-5.1	-0.6	-3.2	1.7

1976 TOTAL KILL DECREASED BY 138 DEER OR 0.6% OF 1975

SEASON TYPE CODES

1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. EITHER SEX AT BEGINNING OF SEASON
4. EITHER SEX AT END OF SEASON
5. NOT A UNIFORM SEASON

Fig. 16. Continued.

VIRGINIA COUNTY DEER SEASON REGULATION CHANGES SUMMARY--1975-1976

TABLE 5

1975-1976 SEASON TYPE	1975-1976 ES DAYS		1976-1977 SEASON TYPE	1976-1977 ES DAYS
4.	1.	TO	4.	3.

COUNTY	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS	DAYS IN SEASON	BUCKS	DOES	TOTAL	%DOES	ANTL. BUCKS
APPOMATOX	43.	596.	102.	698.	14.6	565.	45.	660.	220.	880.	25.0	594.
CULPEPER	43.	236.	45.	281.	16.0	223.	45.	255.	60.	315.	19.0	237.
FAIRFAX	43.	11.	12.	23.	52.2	7.	45.	10.	3.	13.	23.1	9.
FAUQUIER	43.	510.	95.	605.	15.7	482.	45.	617.	174.	791.	22.0	565.
LOUDOUN	43.	496.	109.	605.	18.0	463.	45.	555.	206.	761.	27.1	493.
LUNENBURG	43.	392.	32.	424.	7.5	382.	45.	499.	132.	631.	20.9	459.
MECKLENBURG	43.	245.	19.	264.	7.2	239.	45.	299.	59.	358.	16.5	281.
ORANGE	43.	244.	36.	280.	12.9	233.	45.	317.	84.	401.	20.9	292.
PRINCE EDWARD	43.	450.	61.	511.	11.9	432.	45.	514.	92.	606.	15.2	486.
PRINCE WILLIAM	43.	258.	102.	360.	28.3	227.	45.	255.	116.	371.	31.3	220.
RAPPAHANNOCK	43.	326.	67.	393.	17.0	306.	45.	370.	107.	477.	22.4	338.
SPOTSYLVANIA	43.	441.	67.	508.	13.2	421.	45.	429.	97.	526.	18.4	400.
STAFFORD	43.	384.	168.	552.	30.4	334.	45.	439.	218.	657.	33.2	374.
TOTALS		4589.	915.	5504.	18.9	4314.		5219.	1568.	6787.	22.7	4749.
							% CHANGE--	13.7	71.4	23.3	20.4	10.1

1976 TOTAL KILL INCREASED BY 1283 DEER OR 23.3% OVER 1975

SEASON TYPE CODES

1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. EITHER SEX AT BEGINNING OF SEASON
4. EITHER SEX AT END OF SEASON
5. NOT A UNIFORM SEASON

Fig. 16. Continued.

those counties in the table is printed. A legend interpreting the season type code used in the table heading is also presented at the base of each table.

Counties which had split seasons, two different sets of season regulations, or counties which were closed to hunting are summarized in a table which provides harvest statistics for each county. Harvest changes for these counties are not summarized.

<u>Check Station Data Summary</u>

Harvest data collected at 15 deer check stations are summarized by tables such as the one illustrated in Fig. 17. These data are collected at sample check stations west of the Blue Ridge and are not collected state-wide. Check station data from 1947 are presented for each check station. Annual data presented in the table include; three age classes for bucks and does, total bucks, total does, grand total, percent spikes in the total reported harvest, and average weight of yearling bucks.

Population indicators calculated by the program and presented in the table include; 1) percent fawns in the antlerless harvest, 2) percent fawns in the total buck harvest, 3) percent fawns in the total doe harvest, 4) percent yearlings (age 1 1/2) in the total adult buck harvest, and 5) percent yearlings in the total adult doe harvest.

VIRGINIA DEER CHECK STATION DATA
1947-1976

COUNTY: ALLEGHANY — TRIANGLE SERVICE STATION

YEAR	BUCKS 0.5	BUCKS 1.5	BUCKS 2.5+	BUCKS TOTAL	DOES 0.5	DOES 1.5	DOES 2.5+	DOES TOTAL	GRAND TOTAL	% SPIKES	AVG. WGT. 1.5	% FAWNS IN ANTL-LESS DEER	% FAWNS IN TOTAL BUCKS	% FAWNS IN TOTAL DOES	% 1.5 IN TOTAL ADULT BUCKS	% 1.5 IN TOTAL ADULT DOES
47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
57	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
62	2.	9.	14.	25.	3.	5.	7.	15.	40.	78.00	86.	29.41	8.00	20.00	39.13	41.67
63	5.	16.	15.	36.	2.	2.	12.	16.	52.	81.00	83.	33.33	13.89	12.50	51.61	14.29
64	5.	9.	6.	20.	4.	4.	8.	16.	36.	44.00	93.	42.86	25.00	25.00	60.00	33.33
65	7.	4.	12.	23.	6.	4.	11.	21.	44.	50.00	82.	46.43	30.43	28.57	25.00	26.67
66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.0
67	11.	34.	32.	77.	13.	9.	20.	42.	119.	44.00	76.	45.28	14.29	30.95	51.52	31.03
68	11.	12.	20.	43.	11.	3.	13.	27.	70.	25.00	87.	57.89	25.58	40.74	37.50	18.75
69	12.	26.	21.	59.	24.	17.	5.	46.	105.	61.00	92.	62.07	20.34	52.17	55.32	77.27
70	7.	30.	24.	61.	12.	7.	7.	26.	87.	43.00	89.	57.58	11.48	46.15	55.56	50.00
71	8.	45.	20.	73.	9.	14.	9.	32.	105.	47.00	101.	42.50	10.96	28.13	69.23	60.87
72	11.	36.	27.	74.	21.	7.	22.	50.	124.	39.00	79.	52.46	14.86	42.00	57.14	24.14
73	14.	26.	25.	65.	14.	31.	11.	56.	121.	46.00	81.	40.00	21.54	25.00	50.98	73.81
74	9.	37.	11.	57.	4.	20.	6.	30.	87.	46.00	88.	33.33	15.79	13.33	77.08	76.92
75	11.	20.	8.	39.	11.	27.	3.	41.	80.	30.00	90.	42.31	28.21	26.83	71.43	90.00
76	8.	28.	12.	48.	8.	18.	7.	33.	81.	36.00	87.	39.02	16.67	24.24	70.00	72.00

Fig. 17. VADMIS deer check station summary, Triangle Service Station, Alleghany county, Virginia.

Optimum Deer Management Regions

Optimum deer management regions calculated by the VADMIS program are identified in the table and SYMAP computer map illustrated in Fig. 18. Seven regions are delineated based upon county similarity with respect to total harvest per number of hunting days per square mile of forested deer range. Counties within each region are listed in alphabetical order below the appropriate region heading. Table headings for each region include the SYMAP symbolism used to represent that region in the SYMAP computer map. Because Accomack and Northampton counties are not contiguous to other counties of the state, region 1 will always include only these two counties.

Contour Computer Maps

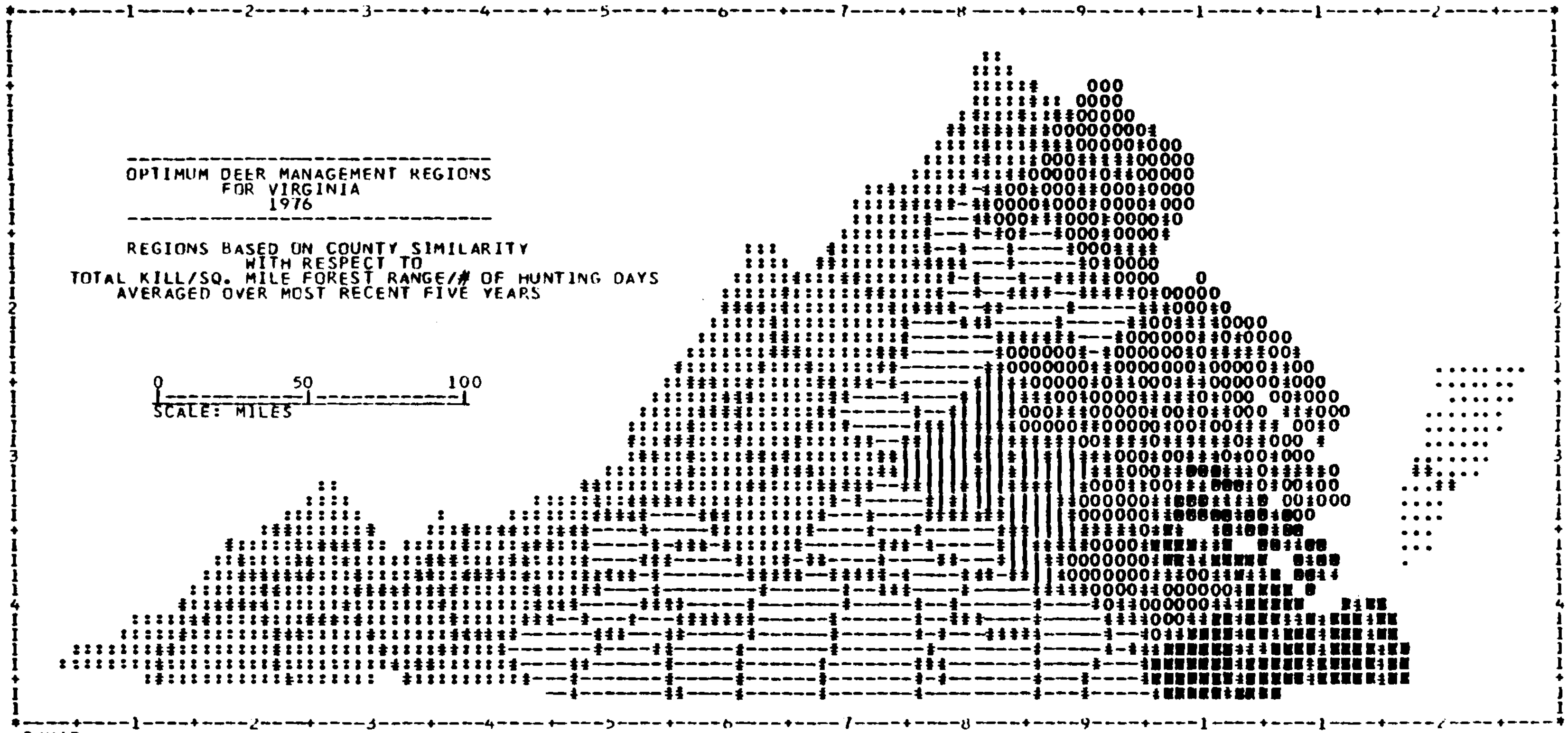
County deer harvest density data (total kill per square mile of forested deer range) for 3 years are utilized to produce three contour computer maps, Figs. 19, 20, and 21. Contour lines separating seven harvest density levels are determined by interpolation among individual county harvest density figures. The seven equal contour intervals cover a range of harvest densities from 0 to 15 harvested deer per square mile of forested deer range. The range of data values represented by each level of symbolism, the data value extremes, the number of counties lying within each level, and the symbolism legend are printed on the page

OPTIMUM DEER MANAGEMENT REGIONS
FOR VIRGINIA--1976

REGIONS BASED ON COUNTY SIMILARITY
WITH RESPECT TO
TOTAL KILL/SQ. MILE FOREST RANGE/# OF HUNTING DAYS

REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6	REGION 7
ACCUMACK	ALBEMARLE	ALLEGHANY	AMELIA	CAROLINE	CHARLES CITY	CHESAPEAKE
NORTHHAMPTON	APPOMATOX	AMHERST	BUCKINGHAM	CHESTERFIELD	HAMPTON	ISLE OF WIGHT
	BRUNSWICK	AUGUSTA	CUMBERLAND	DINWIDDIE	JAMES CITY	NANSEMOND - SUFF
	CAMPBELL	BATH	FLUVANNA	ESSEX	NEW KENT	PRINCE GEORGE
	CARROLL	BEDFORD	NOTTOWAY	FAIRFAX	YORK	SOUTHHAMPTON
	CHARLOTTE	BLAND	POWHATAN	FAUQUIER		SURRY
	CULPEPER	BOTETOURT		GLOUCESTER		VIRGINIA BEACH
	FLOYD	BUCHANAN		GOOCHLAND		
	FRANKLIN	CLARKE		HANOVER		
	GREENE	CRAIG		HENRICO		
	GREENESVILLE	DICKENSON		KING AND QUEEN		
	HALIFAX	FREDERICK		KING GEORGE		
	HENERY	GILES		KING WILLIAM		
	LUNENBURG	GRAYSON		LANCASTER		
	MADISON	HIGHLAND		LOUDOUN		
	MECKLENBURG	LEE		LOUISA		
	MONTGOMERY	PULASKI		MATHEWS		
	NELSON	ROCKBRIDGE		MIDDLESEX		
	ORANGE	ROCKINGHAM		NORTHUMBERLAND		
	PAGE	RUSSELL		PRINCE WILLIAM		
	PATRICK	SCOTT		RAPPAHANNOCK		
	PITTSYLVANIA	SHENANDOAH		RICHMOND		
	PRINCE EDWARD	SMYTH		STAFFORD		
	ROANOKE	TAZEWELL		SUSSEX		
	SPOTSYLVANIA	WARREN		WESTMORELAND		
		WASHINGTON				
		WISE				
		WYTHE				

Fig. 18. VADMIS optimum deer management regions for Virginia, 1976.

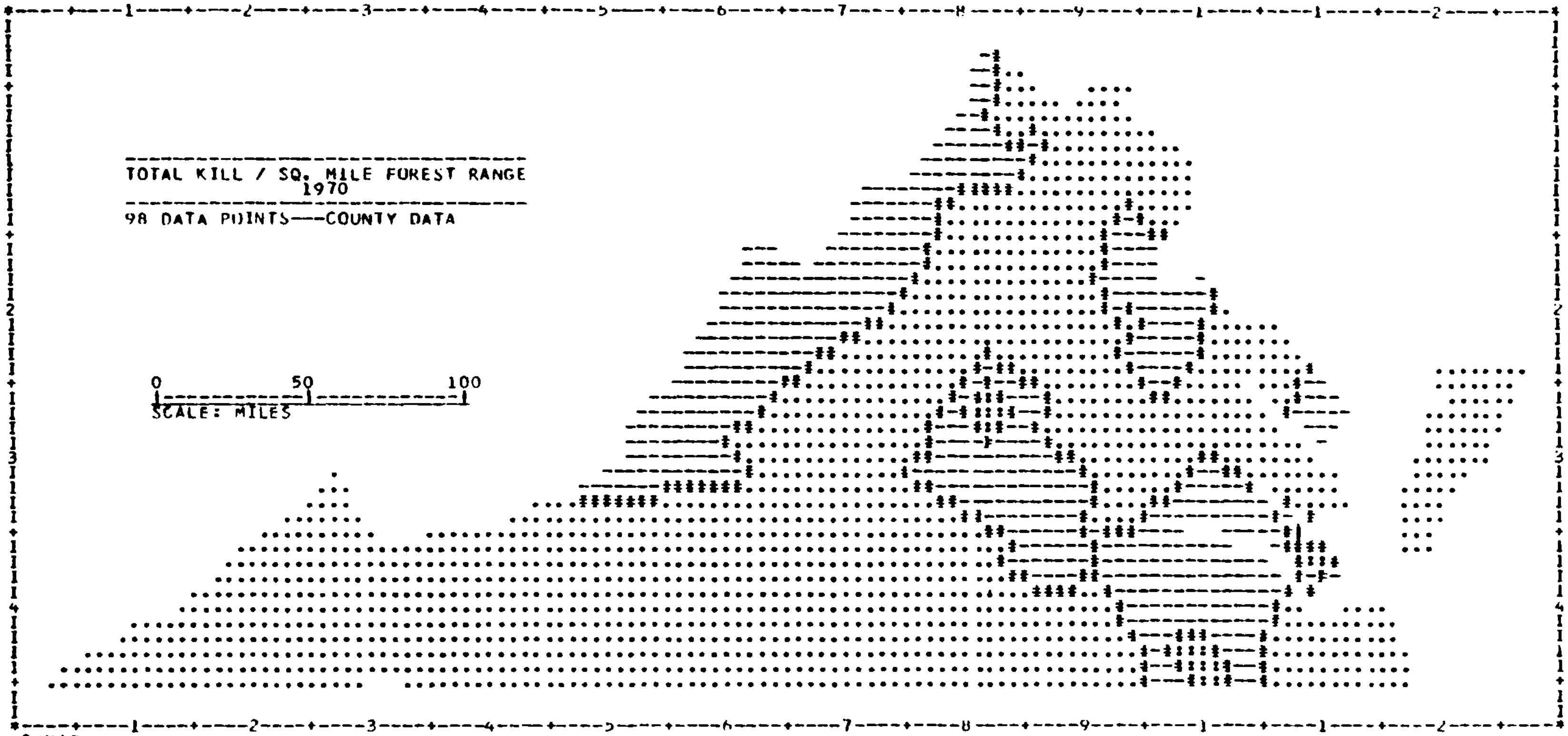


SYMAP

0.055667 MINUTES FOR MAP

REGIONALIZATION DATA

Fig. 18. Continued.



SYMAP

0.070167 MINUTES FOR MAP

VIRGINIA DEER HARVEST

TOTAL KILL / SQ. MILE FOREST RANGE

Fig. 19. SYMAP contour map of the 1970 Virginia county total kill per square mile of forested deer range.

DATA VALUE EXTREMES ARE 0.0 8.73

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.0	2.14	4.29	6.43	8.57	10.71	12.86
MAXIMUM	2.14	4.29	6.43	8.57	10.71	12.86	15.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

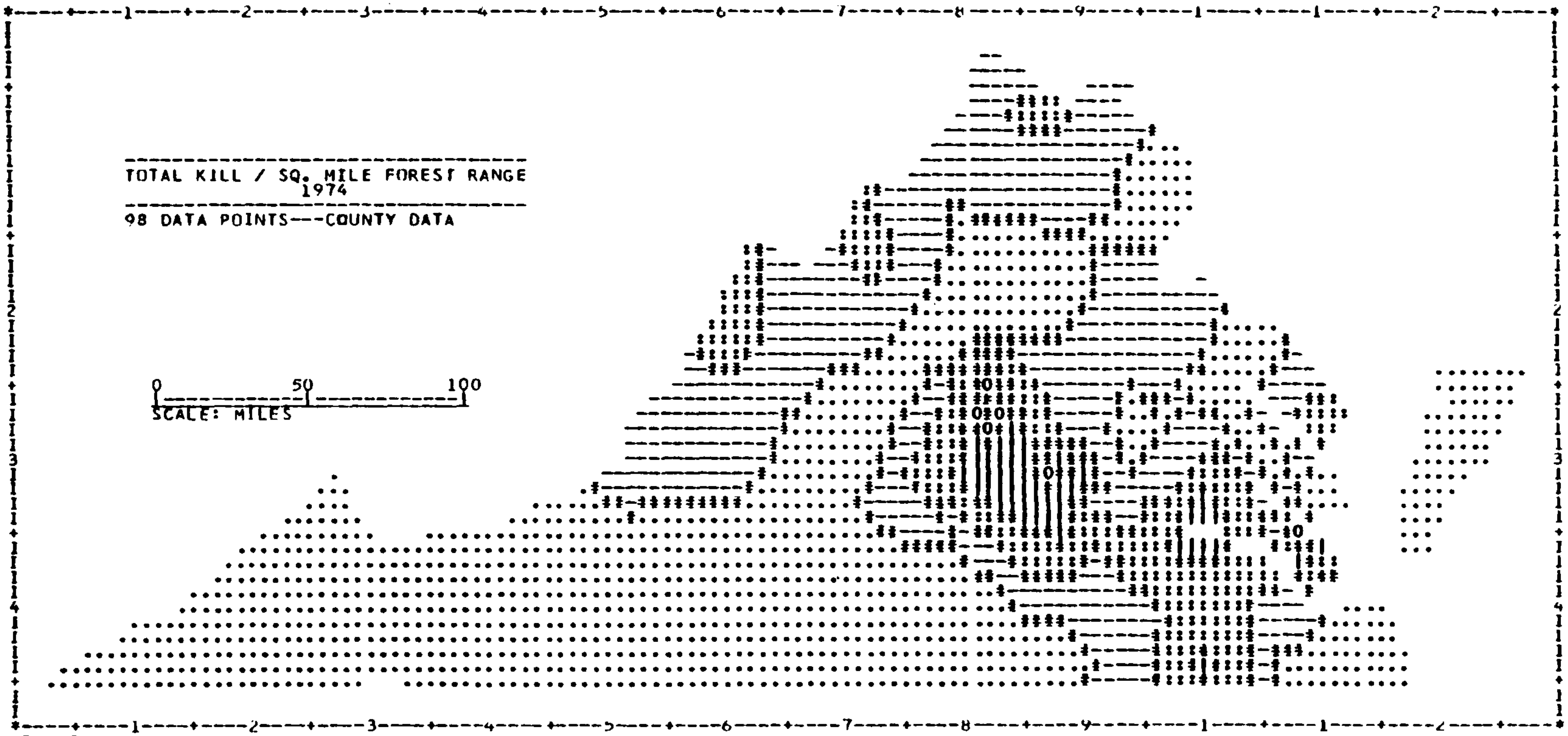
14.29	14.29	14.29	14.29	14.29	14.29	14.29

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5	6	7
SYMBOLS	....	---------	:::::::::	|||||||||	000000000	■■■■■■■■■	■■■■■■■■■
FREQ.	69	26	2	0	1	0	0

0.002833 MINUTES FOR HISTOGRAM

Fig. 19. Continued.



SYMAP

0.076000 MINUTES FOR MAP

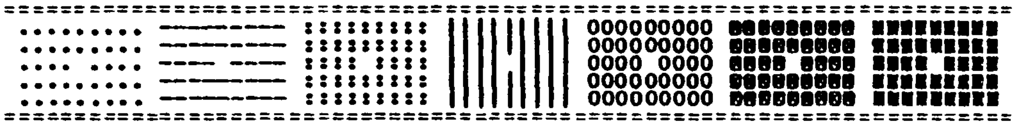
VIRGINIA DEER HARVEST

TOTAL KILL / SQ. MILE FOREST RANGE

Fig. 20. SYMAP contour map of the 1974 Virginia county total kill per square mile of forested deer range.

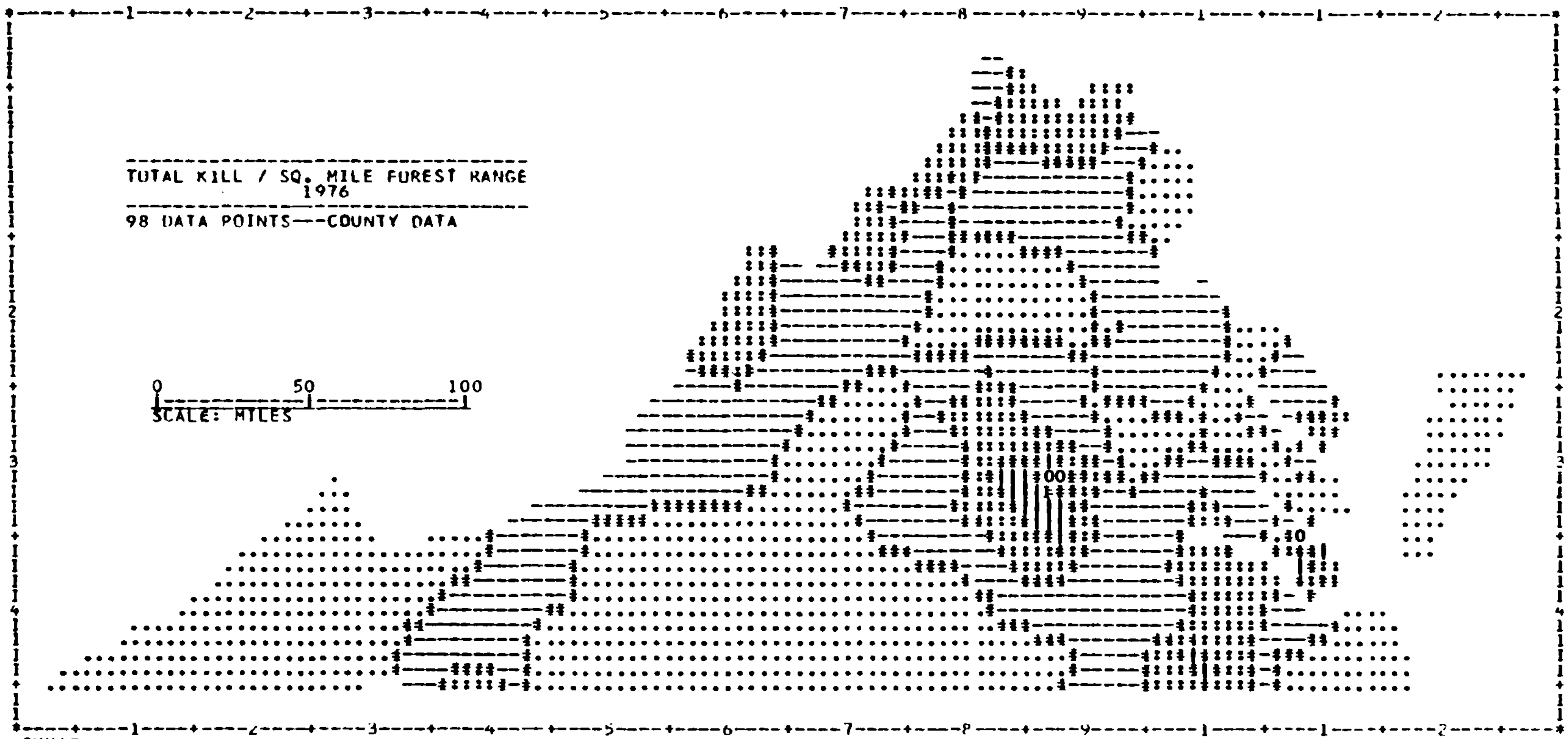
```
DATA VALUE EXTREMES ARE          0.0        10.99


ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
       ('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

  MINIMUM       0.0       2.14       4.29       6.43       8.57      10.71      12.86
  MAXIMUM       2.14      4.29       6.43       8.57      10.71      12.86      15.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

               14.29     14.29      14.29      14.29      14.29      14.29      14.29

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL
  LEVEL         1         2          3          4          5          6          7
```

  SYMBOLS



```
  FREQ.        51        28         12          4          2          1          0
 0.002833 MINUTES FOR HISTOGRAM
```

Fig. 20. Continued.



SYMAP

0.077500 MINUTES FOR MAP

VIRGINIA DEER HARVEST

TOTAL KILL/ SQUARE MILE FOREST RANGE

Fig. 21. SYMAP contour map of the 1976 Virginia county total kill per square mile of forested deer range.

```
DATA VALUE EXTREMES ARE          0.0          11.99


ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
      ('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

  MINIMUM       0.0        2.14       4.29       6.43       8.57      10.71      12.86
  MAXIMUM       2.14       4.29       6.43       8.57      10.71      12.86      15.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

               14.29      14.29      14.29      14.29      14.29      14.29      14.29

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL
  LEVEL         1          2          3          4          5          6          7
            ==========================================================================
             .........  ---------  :::::::::  |||||||||  000000000  888888888  XXXXXXXXX
             .........  ---------  :::::::::  |||||||||  000000000  888888888  XXXXXXXXX
  SYMBOLS    ....  ....  ----  ----  ::::  ::::  ||||  ||||  0000  0000  8888  8888  XXXX  XXXX
             .........  ---------  :::::::::  |||||||||  000000000  888888888  XXXXXXXXX
             .........  ---------  :::::::::  |||||||||  000000000  888888888  XXXXXXXXX
            ==========================================================================
  FREQ.        47         34         13          2          1          1          0
 0.002667 MINUTES FOR HISTOGRAM
```

Fig. 21. Continued.

following each map, Figs. 19, 20, and 21. The contour maps may be interpreted in the same manner as a contour topographic map; darker symbols represent higher harvest densities. Maps are produced from the most recent harvest data (year t), data from 2 years earlier (year t-2), and data from 6 years prior to the most recent year of harvest data (year t-6). Maps are produced only when the game biologist is specified as the user.

Game Commissioner

The output produced for the game commissioner is similar to that produced for the game biologist with the following exceptions:

1) Harvest predictions are not made
2) Histograms of ranked counties are not made for district summaries
3) Histograms of ranked counties for the entire state are not made
4) 11-year county summaries are provided only for total kill and antlered buck kill
5) Season regulation changes are not summarized
6) Check station data are not summarized
7) Optimum deer management regions are not delineated
8) Computer maps are not produced

Land-use Planner

When the land-use planner is designated as the user, the program produces a report, Fig. 22, containing an introduction to white-tailed deer management principles and county deer harvest and land-use (habitat) summaries for each county requested. The introduction to deer management

INTRODUCTION TO
WHITE-TAILED DEER
MANAGEMENT PRINCIPLES

MUCH IS KNOWN ABOUT THE WHITE-TAILED DEER AND ITS MANAGEMENT, AND A FEW IMPORTANT FACTS ARE INCLUDED HERE FOR YOUR CONSIDERATION. FOR ADDITIONAL INFORMATION YOU MAY WISH TO READ WALTER TAYLORS' BOOK, THE DEER OF NORTH AMERICA, PUBLISHED BY THE STACKPOLE COMPANY OF HARRISBURG, PA.

EASTERN WHITE-TAILED DEER CAN LIVE UNDER A WIDE VARIETY OF FORESTED CONDITIONS AS LONG AS THEIR REQUIREMENTS FOR FOOD,WATER, AND COVER ARE MET, AND PROTECTION FROM POACHERS AND OTHER HARASSMENT IS PROVIDED.

FOOD

ONCE THOUGHT TO BE PRIMARILY BROWSERS, SOUTHERN DEER CONSUME, IN ADDITION TO WOODY BROWSE AND LEAVES, LARGE QUANTITIES OF FRUITS, MUSHROOMS, AND HERBACEOUS MATERIAL SUCH AS GRASS AND FORBS. ACORNS, NUTS, AND FLESHY FRUITS ARE ALSO IMPORTANT. GREEN BROWSE AND HERBAGE ARE THE PRINCIPAL SPRING AND SUMMER FOODS. MAST IS HEAVILY UTILIZED WHEN IT IS AVAILABLE AND MAY SUSTAIN THE DEER THROUGHOUT THE WINTER. MANY AGRICULTURAL CROPS ARE CONSUMED BY DEER, AND CROP DAMAGE CAN BE SIGNIFICANT WHERE DEER ARE ABUNDANT.

WATER

ALTHOUGH DEER NEED FREE WATER, LACK OF THIS RESOURCE IS RARELY A LIMITING FACTOR IN THE SOUTHEAST. THEIR WATER NEEDS ARE PARTIALLY SATISFIED BY THE MOISTURE CONTENT OF SUCCULENT VEGETATION.

Fig. 22. VADMIS-generated report for the land-use planner summarizing deer management principles and county deer harvests and habitat for Shenandoah county, Virginia.

COVER

DEER REQUIRE AREAS OF DENSE COVER FOR CONCEALMENT AND PROTECTION FROM THE ELEMENTS. PATCHES OF SMALL CONIFERS OR HONEYSUCKLE, LAUREL, AND RHODODENDRON THICKETS, OR ANY DENSE EVERGREEN WELL DISTRIBUTED THROUGHOUT THE FORESTED AREAS WILL PROVIDE ADEQUATE COVER.

POPULATIONS--HARVEST

A HEALTHY DEER HERD CAN BE EXPECTED TO MAINTAIN AN ANNUAL INCREASE OF 25-30 PERCENT. ALTHOUGH DEER NEED PROTECTION FROM POACHING AND HARASSMENT BY FREE-RUNNING DOGS, IT IS EQUALLY IMPORTANT THAT THIS YEARLY INCREASE BE HARVESTED. WITHOUT SUCH ANNUAL REDUCTION, DEER RANGE CAN RAPIDLY BECOME OVERPOPULATED. OVERCROWDING INCREASES THE DANGER OF DISEASE, CAN CAUSE EXTENSIVE DAMAGE TO THE HABITAT THROUGH OVERBROWSING, AND CAN INCREASE FOREST, ORCHARD, AND AGRICULTURAL LOSSES.

AS A GENERAL RULE OF THUMB, 20 PERCENT OF A DEER POPULATION MAY BE REMOVED THROUGH HUNTING WITHOUT IMPAIRING THE REPRODUCTIVE CAPABILITIES OF THE HERD. POPULATION REDUCTION MAY BE ACHEIVED BY HARVESTING MORE THAN 20 PERCENT OF THE POPULATION, WHILE HARVESTS OF LESS THAN 20 PERCENT ALLOW THE DEER HERD TO GROW. WILDLIFE BIOLOGISTS MAY BE CONTACTED FOR MORE PRECISE HARVEST RECOMMENDATIONS.

DEER HARVESTS IN VIRGINIA ARE CONTROLLED BY REGULATING THE LENGTH OF THE SEASON, THE NUMBER OF EITHER SEX DAYS IN THE SEASON, AND HUNTER BAG LIMITS. WEAPON RESTRICTIONS AND REGULATING HUNTING WITH DOGS MAY ALSO BE USED AS CONTROL MEASURES. PUBLIC ACCESS TO HUNTING AREAS IS ALSO AN IMPORTANT FACTOR INFLUENCING HUNTER DISTRIBUTION AND THE TOTAL DEER HARVEST.

Fig. 22. Continued.

HABITAT MANAGEMENT

BECAUSE THE WHITE-TAILED DEER IS A FOREST SPECIES, ITS MANAGEMENT IS CLOSELY ASSOCIATED WITH FOREST MANAGEMENT. SMALL (LESS THAN 40 ACRES) FOREST CLEARINGS AND EARLY FOREST REGENERATION BENEFIT DEER BY PROVIDING ADDITIONAL FOOD AND ADJACENT COVER. OLD APPLE ORCHARDS, AREAS OF HONEYSUCKLE, GRAPEVINES, GREENBRIAR, LAUREL, AND OTHER EVERGREEN COVER SHOULD BE MAINTAINED AND PROTECTED. IN A PINE FOREST, SMALL, WELL-DISTRIBUTED GROUPS OF MAST (ACORN, NUT, & FRUIT) PRODUCERS ARE IMPORTANT.

LOGGING ROADS, OLD SKID TRAILS, AND SMALL IRREGULAR FOREST OPENINGS CAN BE PLANTED WITH SUCH SPECIES AS PERENNIAL RYEGRASS, BLUEGRASS, ORCHARDGRASS, FESCUES, VETCH, HONEYSUCKLE, AND CLOVERS. MAN-MADE OR NATURAL OPENINGS IN FOREST STANDS SHOULD BE MAINTAINED BY CHEMICALS, BURNING, OR MOWING. SUCH OPENINGS COMPENSATE FOR YEARLY FLUCTUATIONS IN FOOD SUPPLY, ESPECIALLY MAST.

PROBABLY THE MOST IMPORTANT CONSIDERATION IN DEER MANAGEMENT IS THE MAINTENENCE OF WELL-DISTRIBUTED AND DIVERSE HABITAT CONDITIONS. THE EXTENT OF FOREST CUTTING, THE TYPES OF SPECIES, AND THE CUTTING PATTERNS USED ALL SIGNIFICANTLY INFLUENCE SUCH CONDITIONS. PAST CUTTING PRACTICES ARE THE BASIS FOR PREDICTING FUTURE FOOD SUPPLIES AND THUS POTENTIAL DEER POPULATIONS. BY KNOWING THESE POTENTIAL POPULATONS THEN PLANS CAN BE MADE TO IMPROVE CITIZENS' SATISFACTIONS FROM THE RESOURCE. THE PLANNER CAN USE SUCH KNOWLEDGE TO INFLUENCE LAND USE CHANGE, TO BETTER ESTIMATE COUNTY INCOME FROM HUNTERS, AND TO PREDICT WILDLIFE INFLUENCE ON THE AGRICULTURAL ECONOMY AS WELL AS WORKLOADS ASSOCIATED WITH COMPLAINTS AND DAMAGE CLAIMS.

LOSS OF AVAILABLE DEER RANGE TO CITIES, LAKES, ROADS, AND OTHER DEVELOPMENTS CAN SIGNIFICANTLY INFLUENCE COUNTY DEER POPULATIONS.

Fig. 22. Continued.

SHENANDOAH COUNTY

HABITAT CHARACTERISTICS

SHENANDOAH COUNTY HAS A TOTAL LAND AREA OF 1313.2 SQUARE KILOMETERS (507.0 SQ. MILES). FARMED LAND COMPRISES 45.8% OF THE TOTAL LAND AREA OR 603.0 SQUARE KILOMETERS (232.8 SQ. MILES). THERE ARE AN ESTIMATED 1022 FARMS IN THE COUNTY WITH AN AVERAGE SIZE OF 58.7 HECTARES (145.0 ACRES).

THERE ARE APPROXIMATELY 229.9 SQUARE KILOMETERS (88.8 SQ. MILES) OF CROPLAND, 320.9 SQUARE KILOMETERS (123.9 SQ. MILES) OF PASTURELAND, AND 403.5 SQUARE KILOMETERS (155.8 SQ. MILES) OF FORESTLAND IN THE COUNTY. NATIONAL FOREST LAND INCLUDES 233.5 SQUARE KILOMETERS (90.2 SQ. MILES) IN THE COUNTY AND THERE ARE AN ESTIMATED 757.9 SQUARE KILOMETERS (292.6 SQ. MILES) OF FORESTED DEER RANGE.

DEER HARVEST CHARACTERISTICS

IN 1976, 1493 WHITE-TAILED DEER WERE HARVESTED IN SHENANDOAH COUNTY, WHICH WAS A HARVEST OF 4 LESS DEER THAN WERE HARVESTED IN 1975. THE AVERAGE DEER HARVEST IN THE COUNTY FOR THE YEARS 1972 THROUGH 1976 IS 1340 DEER.

THE TOTAL DEER HARVEST PER SQUARE MILE OF FORESTED DEER RANGE IN SHENANDOAH COUNTY IN 1976 WAS 5.1. THE AVERAGE TOTAL HARVEST PER SQUARE MILE FORESTED DEER RANGE FOR THE YEARS 1972 THROUGH 1976 IS 4.6.

THE 1976 AVERAGE TOTAL DEER HARVEST PER SQUARE MILE OF FORESTED DEER RANGE FOR COUNTIES WITHIN THE NORTH MOUNTAIN DISTRICT IS 3.7. THE AVERAGE TOTAL HARVEST PER SQUARE MILE FORESTED DEER RANGE FOR THE NORTH MOUNTAIN DISTRICT OVER THE YEARS 1972 THROUGH 1976 IS 3.4.

Fig. 22. Continued.

VIRGINIA COUNTY DEER HARVEST SUMMARY
1947-1976

COUNTY: SHENANDOAH

YEAR	TOTAL KILL	ANTLERED BUCK KILL/ SQ.MI.RANGE	BUCK KILL	ANTLERED BUCK KILL	DOE KILL	% DOE IN TOTAL KILL	HUNTING DAYS IN SEASON	ANY DEER DAYS IN SEASON	TYPE OF SEASON
47	104.	0.4	104.	104.	0.	0.0	3.	0.	2.
48	171.	0.6	171.	171.	0.	0.0	3.	0.	2.
49	221.	0.8	221.	221.	0.	0.0	3.	0.	2.
50	298.	1.0	298.	298.	0.	0.0	3.	0.	2.
51	512.	1.8	512.	512.	0.	0.0	5.	0.	2.
52	1196.	2.1	741.	605.	455.	38.04	6.	1.	4.
53	743.	2.6	743.	743.	0.	0.0	6.	0.	2.
54	1381.	2.6	897.	752.	484.	35.05	6.	1.	4.
55	1052.	3.6	1044.	1042.	8.	0.76	6.	0.	2.
56	2817.	3.8	1501.	1106.	1316.	46.72	6.	2.	4.
57	2175.	2.9	1161.	857.	1014.	46.62	6.	2.	4.
58	2491.	3.3	1306.	951.	1185.	47.57	6.	2.	4.
59	2065.	2.8	1097.	807.	968.	46.88	6.	3.	4.
60	2536.	2.7	1184.	778.	1352.	53.31	6.	3.	3.
61	1779.	1.9	844.	564.	935.	52.56	6.	3.	3.
62	719.	1.2	426.	338.	293.	40.75	6.	1.	3.
63	763.	1.3	457.	365.	306.	40.10	6.	1.	3.
64	820.	1.3	485.	385.	335.	40.85	12.	1.	3.
65	787.	1.3	479.	387.	308.	39.14	12.	1.	3.
66	875.	1.3	493.	378.	382.	43.66	13.	1.	3.
67	768.	1.3	474.	386.	294.	38.28	13.	1.	3.
68	707.	1.7	537.	486.	170.	24.05	12.	1.	4.
69	877.	1.9	631.	557.	246.	28.05	11.	1.	4.
70	826.	1.8	600.	532.	226.	27.36	12.	1.	4.
71	1048.	2.2	744.	653.	304.	29.01	12.	1.	4.
72	1190.	2.4	808.	693.	382.	32.10	12.	1.	4.
73	1247.	2.5	846.	726.	401.	32.16	12.	1.	4.
74	1276.	2.6	880.	761.	396.	31.03	12.	1.	4.
75	1497.	3.0	1031.	891.	466.	31.13	11.	1.	4.
76	1493.	3.0	1022.	881.	471.	31.55	12.	1.	4.

SEASON TYPE CODE

1. EITHER SEX ALL SEASON
2. BUCKS ONLY
3. EITHER SEX AT BEGINNING OF SEASON
4. EITHER SEX AT END OF SEASON
5. NOT A UNIFORM SEASON (SPLIT, TWO SEASON TYPES, ETC.)

Fig. 22. Continued.

principles summarizes the food, water, and cover requirements of white-tailed deer, deer population and harvest characteristics, and habitat management considerations.

The county habitat and harvest summaries provide county land-use information and county deer harvest characteristics. Land-use information, presented as square kilometers and square miles, includes:

1) Total land area
2) Percentage farmed land
3) Number of farms
4) Average farm size
5) Area in cropland
6) Area in pastureland
7) Area in forestland
8) Area in National Forests
9) Area of forested deer range

County deer harvest characteristic summaries provide comparisons between recent county deer harvests, past county deer harvests, and the average deer harvests of counties within the same geographic district as determined by default or specified in the input option DIST. County deer harvest statistics and season regulations dating back to 1947 are summarized in a table following the county habitat and harvest summary.

Program Test Results

After the programming of the VADMIS system was completed, the program was tested to assure that it would operate properly when subjected to all possible combinations of data input options and atypical data. Artificial data were supplied to the program to test and subsequently confirm the proper operation of the program.

The size of the data base used by the regression routine to predict county deer harvests was varied to determine the size of data base which produced the most accurate predictions and to test the sensitivity of the regression routine to changes in the data base. Data bases of 5, 8, 10, 12, and 15 years were implemented and county harvest predictions for the years 1962 through 1976 were made from each data base. Harvest predictions were compared with actual harvests to determine their accuracy.

The 15-year data base provided the most accurate harvest predictions for the years 1962 through 1976 while the 5-year data base provided the poorest predictions for the same time period. For 1,076 county harvest predictions made from the 15-year data base, the predictions averaged 25.4 percent above or below the actual harvests. Over the same period of time, the 5-year data base provided 644 harvest predictions which averaged 33.3 percent above or below the actual harvests. Average percentage differences for 8, 10, and 12-year data bases were 27.3, 26.0, and 25.7 percent, respectively.

With the 15-year data base, 55.2 percent of all county harvest predictions made from 1962 to 1976 were within 20 percent of the actual harvests and 82.7 percent were within 40 percent of the actual harvests. Over the same period, 51.8 percent of the harvest predictions from the 5-year data base were within 20 percent of the actual harvests and 78.4 percent were within 40 percent of the actual harvests.

The 15-year data base was employed in the final VADMIS system because it produced the most accurate harvest predictions and also provided more harvest predictions per county per year than the other four data bases tested. To make a prediction for any one season type, the regression routine requires that the particular season type occurs a minimum of three times in the years covered by the data base. The probability of any one season type occurring three or more times in 15 years is greater than that for 5 years.

Harvest predictions were consistently accurate for some counties, consistently poor for some, and inconsistent for others. Counties in which the hunting season regulations remained unchanged over many years produced the best predictions while those counties having frequent changes in hunting season regulations produced less accurate predictions. Counties with a highly irregular deer harvest history also tended to produce poor harvest predictions.

DISCUSSION

Utility of the System

Much of the information produced and presented by the VADMIS system is similar to that which has been included in the Game Commission's annual progress reports. Each year, Game Commission biologists spend many hours compiling information and producing tables for inclusion in the annual progress reports. Most of the same information and tables may be produced by the computerized VADMIS system on the same day that the county deer harvest data become available. Both time and money are saved by utilizing the capabilities of the computer through the VADMIS system. The time and money saved likely could be spent elsewhere more effectively and efficiently.

The probability of error in analyzing large amounts of data by hand or desk calculator can be greatly reduced and virtually eliminated by computerized analysis. The VADMIS program repeatedly revealed errors in the Game Commission's county deer harvest and season regulation data which otherwise likely would have gone undetected. The computerized VADMIS system also serves as an accurate permanent record of county, district, region, and state deer harvest and season regulation data. Once the correct annual county harvest and regulation data have been supplied to the computer, they will never be subject to accidental alteration or loss and may be retrieved quickly and easily.

The deer biologist and game commissioner would likely be annual users, requiring the services of the VADMIS system once each year following the deer hunting season. Output components of the system could be separated or reproduced and distributed to the appropriate district biologists and field personnel. Each district biologist could be supplied with the harvest summaries and analyses pertinent to the counties in his jurisdiction.

Game Commission research biologists Jack V. Gwynn and Joe L. Coggin and Commissioner Ralph Weaver demonstrated considerable interest in many components of the VADMIS system. Their interest was directed largely toward the amount of time that the system could save them and in the speed in which annual deer harvest data could be compiled, analyzed, and presented. Their cooperation and apparent sincere willingness to assist in the development of the VADMIS system indicated their awareness of the potential utility of the system. The practical utility of the VADMIS system may be demonstrated by the Game Commissions' acceptance which may materialize slowly over time as the Game Commission gains familiarity with and confidence in the system.

Virginia counties are required by state law to have county plans by the year 1980. In the course of developing a county plan, the county planners must evaluate the countie's natural resources and plan for the future natural resource development and/or protection. As a popular recreational activity, deer hunting is economically beneficial to many counties and should be incorporated into any comprehensive county plan.

An elaborate computerized planning aid called Dynaplan (Giles 1976) is currently being developed at Virginia Polytechnic Institute and State University. The Dynaplan system, when complete, will be capable of producing comprehensive land-use plans for counties, determining the likely consequences of specific management decisions, evaluating alternatives, and providing general planning recommendations. County deer harvest and habitat information produced by the VADMIS system for land-use planners may be incorporated into the Dynaplan system as a supplement to other environmental factors and considerations which influence, or are influenced by, land-use planning decisions. Although deer management may not rank among the highest priorities concerning the county land-use planner, Giles (1976) has identified 16 factors that influence, or are potentially influenced by, deer populations and deer management practices.

Harvest Predictions

The Game Commission, with the assistance of the

Southeastern Cooperative Fish and Game Statistics Project (SCFGSP), predicts deer harvests for nine districts by obtaining harvest predictions from district biologists and the deer study leader. These predictions are then corrected using a computer regression technique based on a comparison of past predictions with known harvests. In the 4 years that predictions have been made in this manner, beginning in 1972, the district biologists and the deer study leader have consistently underestimated the harvest. The computerized regression technique thus adds a correction factor onto the biologist's predictions to compensate for their consistent underestimation. As long as Virginia deer harvests continue to increase and biologists continue to underestimate harvests, this technique will likely continue, as it has in the past, to provide state-wide deer harvest predictions within 10 percent of the actual reported state-wide harvest (90 percent accuracy). Deer harvests in many counties have begun to decline or level off in recent years and the regression technique has overcompensated for the biologists' past underestimation of harvests.

Individual county deer harvest predictions, at present, are not made by the Game Commission. Gwynn (1976B) quoted David W. Turner, assistant statistician for the SCFGSP, "Now that we have four years of estimates we plan to explore the usefullness of producing separate prediction equations for each county. It is likely that with so few points many of the regressions will not be significant and the equations may not be useful for predicting but with the build up of historical data individual county predictions may become useful."

The average accuracy of the VADMIS county harvest predictions over 15 years was within 25.4 percent of the actual reported harvest (74.6 percent accuracy). The 90 percent accuracy obtained by the Game Commission applies to predicted state-wide total harvests and cannot be compared to the 74.6 percent accuracy of the VADMIS predictions which applies to individual county predictions. Because the VADMIS system makes predictions for three different season types and does not make predictions for several counties, it is impossible to predict a state-wide total harvest. Also, several counties have small deer harvests and even small differences between the predicted and actual harvests result in large percentage differences. The 74.6 percent accuracy provided by the VADMIS system is thus conservative and does not accurately reflect the true accuracy obtainable if data outliers (extremes) were excluded from the calculation of the average percentage accuracy.

The level of accuracy required before the county predictions are useful to the Game Commission may be subject to debate (How important to the Game Commission are harvest predictions?). Gwynn (1976B) explained that the Game Commission predictions are made in response to annual outdoor writer requests for upcoming deer season harvest comments (predictions). At present, harvest predictions are not actively employed by the Game Commission in the season-setting process. Game Commission predictions are made after county seasons have been set and are made for the actual season types which are to be observed.

The anticipated use of the VADMIS harvest predictions is as a decision-aid which would provide the biologist with alternatives in determining county deer season regulations. Whether or not the accuracy of the VADMIS predictions is adequate for this purpose, the basic framework for an advanced, improved harvest prediction routine is provided. The VADMIS program could be modified to utilize a procedure similar to that currently used by the Game Commission, employing past county harvest predictions by the biologists and/or deer study leader.

The value of input from the district biologist should not be underestimated. The knowledge and experience of the district biologist may act as a valuable substitute for quantitative deer population and habitat data. Predictions made by district biologists are likely to reflect their first-hand observations and professional judgements of population size and habitat condition.

The VADMIS system was programmed to predict future county deer harvests from knowledge of past county deer harvests. Performing a regression on annual (noncontinuous) data, such as deer harvests, is subject to justifiable criticism. Harvest data represent samples from a dynamic population which is changing in size and is characterized by changing characteristics, e.g. sex ratio, physical condition, and natality and mortality rates. The sampling method, hunting, is also subject to changing characteristics as influenced by weather conditions, length of season, economic conditions, etc. An advantage of predicting deer harvests from past deer harvest data is that predictions can be made for several season types, providing explicit statements of the consequences of each season type. The biologist is thus provided with information pertaining to all of the season type alternatives available to him.

One problem with the harvest predictions made by the VADMIS system arises from the inability of the regression routine to account for different numbers of either-sex hunting days in the season. Harvest predictions are made for any season with one or more days of either-sex hunting at the beginning or end of the season; a season with 1 day of either-sex hunting is considered equivalent to a season with 6 days of either-sex hunting. To consider each season with a different number of either-sex hunting days as a separate season would be impractical because the data base for each season would then, in most counties, be insufficient to perform the regression and produce predictions.

A potential methodology for differentiating between seasons with different numbers of either-sex hunting days may be to make predictions for seasons with one day of either-sex hunting and calculate the additional harvest which could be expected from each additional day of either-sex hunting. The relationship between harvests and the number of either-sex days is not linear and an exact functional relationship could not be determined. The relation between harvests and either-sex hunting days was extremely variable between counties and indistinct for many individual counties. The absence of a known relationship would also prevent harvest predictions for seasons with one either-sex day in counties which never held an either-sex type of season or any county which never held a season with one either-sex day.

Predicting harvests for hunting seasons with an undisclosed number of either-sex days at the beginning or end of the season, as the VADMIS system does, requires that the user refer to past season regulation data for a particular county to identify the characteristics of the seasons used in making the harvest prediction for that county. The harvest prediction for Charles City county, Fig. 5, for a season with either-sex hunting at the beginning or end of the season (types 3 and 4) is 701 deer. The data used to make this prediction were from seasons with 3 days and 6 days of either-sex hunting at the end of the season. The predicted harvest of 701 deer is thus for a season with between 3 and 6 either-sex days at the end of the regular bucks-only season.

The response of the harvest prediction routine employed by VADMIS to changes in county harvest trends is often surprisingly rapid. When deer harvests in any particular county begin to decline, the predicted harvest for the first year of the decline is high and reflects an extension of the past increasing harvest trend. The prediction routine responds quickly and the prediction in the next year, while often still too high, is lowered to account for the decline in the previous year. This pheromena is well illustrated by Charles City county, Fig. 5. The total harvest in Charles City county dropped from 1084 deer in 1974 to 818 deer in 1975. The predicted harvest in 1974 was 897 deer and the predicted harvest for 1975 was 1070 deer, well above the actual harvest of 818 deer. In 1976, the reported deer harvest declined to 699 deer. Accounting for the large decline in the harvest in 1975, the harvest prediction routine predicted a harvest of 553 deer. In this instance the prediction routine had actually overestimated the rate of decline and underestimated the actual harvest in 1976.

For many counties, when predictions are made for season types which have not been held for 10 years or more, the predictions are often quite accurate. In Surry County the predicted harvest for a type 1 season (either-sex hunting all season) in 1975 was 1501 deer. The last type 1 season in Surry county was held in 1966 in which 586 deer were harvested. The actual harvest for the 1975 season, 9 years later, was 1536 deer, only 35 deer more than the predicted harvest of 1501 deer. In 1976 another type 1 season was held and the actual reported harvest dropped by 239 deer to 1297. The predicted harvest for 1976 was 1359 deer, only 62 deer more than the actual harvest. The harvest predictions for Surry county illustrate only the capability of the auto-regression routine to provide accurate predictions for season types which have not been held in recent years. The same level of accuracy is not normally acheived in other counties under similar season regulation histories, though the accuracy obtained in Surry county is not exceptional.

An important factor not considered by the harvest prediction routine is the influence of weather conditions during the hunting season on the deer harvest. Predicting weather conditions during the upcoming season would be impossible and quantitative data pertaining to past weather conditions are rarely available. District biologists do, however, report the general weather conditions during county deer seasons. Using the district biologists reports, the weather conditions might be subjectively rated as good, average, or poor and incorporated into the predictive regression routine to account for some of the variability in the harvest data due to weather conditions. A prediction could then be made for a season under average or normal weather conditions. Similarly, subjective ratings for hunter density and mast crops might be usefully employed if adequate data are, or become, available.

Estimated Deer Range

County estimates of the square miles of forested deer range are made only at 10 year intervals. The first estimates were made in 1956 and the last estimates available are those made for 1966. The Game Commission utilizes the 1956 estimates as estimates for the years 1947 through 1961 and the 1966 estimates for 1962 to present, or 1962 to 1971 when the 1976 estimates are available (Jack V. Gwynn Pers. Comm.). Employing these deer range estimates in the VADMIS system resulted in awkward changes in the harvest density statistics, as though the amount of available deer range had changed suddenly in 1962. To avoid this awkward change, a regression was performed on the two available county deer range estimates, assuming the change occurred gradually and at a constant rate. This assumption may not be completely true in all counties but by making the assumption the sudden change in deer range is avoided and comparisons of annual harvest density statistics are made more easily. The regression performed on the 1956 and 1966 data was used to extrapolate the data to provide deer range estimates for the years 1947 to 1955 and from 1967 to 1986. Basing the regression on only two data points is certainly questionable but when the 1976 estimates become available, the county deer range estimates can be updated. Remote sensing is likely to provide new precision to such data.

District and Region Definition

Counties often are combined into districts and regions for managerial purposes based upon manpower availability and distribution and county habitat and deer population characteristics. Districts and regions also are delineated for research purposes to study and compare the harvest or population characteristics of counties which are similar in some respect, e.g. management objectives, hunting season regulations, and habitat characteristics.

The delineation of managerial and/or research districts and regions likely will change over time as the interests and information requirements of the deer biologists and commissioners change. The VADMIS program was designed and programmed to allow the user to delineate specific districts and regions (groups of districts). In providing the user with the opportunity to specify special districts and regions, the utility of the VADMIS system is increased and the system will not become outdated over time as the interests and information needs of its users change. The provision to define districts and regions also makes the system more adaptable for use by other states and for other species.

Optimum Deer Management Regions

Graf (1973) developed the basic methodology used in the VADMIS program to delineate optimum deer management regions. Graf's methodology was modified slightly to enable the calculation of seven optimum deer management regions. Graf's original methodology allows the user to determine the optimum number of regions as well as the optimum configuration of counties. To determine the optimum number of regions requires a subjective judgement about the importance of simplicity (few regions) and explanatory ability (many regions). Because this subjective judgement is difficult to make and the number of regions is often limited or determined by the availability and distribution of Game Commission personnel, a fixed number of regions, seven, was settled upon for the VADMIS system. Seven regions provided a convenient number for computer mapping

(SYMAP) and approximated the optimum number of regions that likely would be obtained if a conservative judgement was made about the importance of simplicity and explanatory ability; i.e. simplicity being considered of equal importance to explanatory ability. The true optimum number of regions and their county composition could easily be found by using Graf's original methodology if desired.

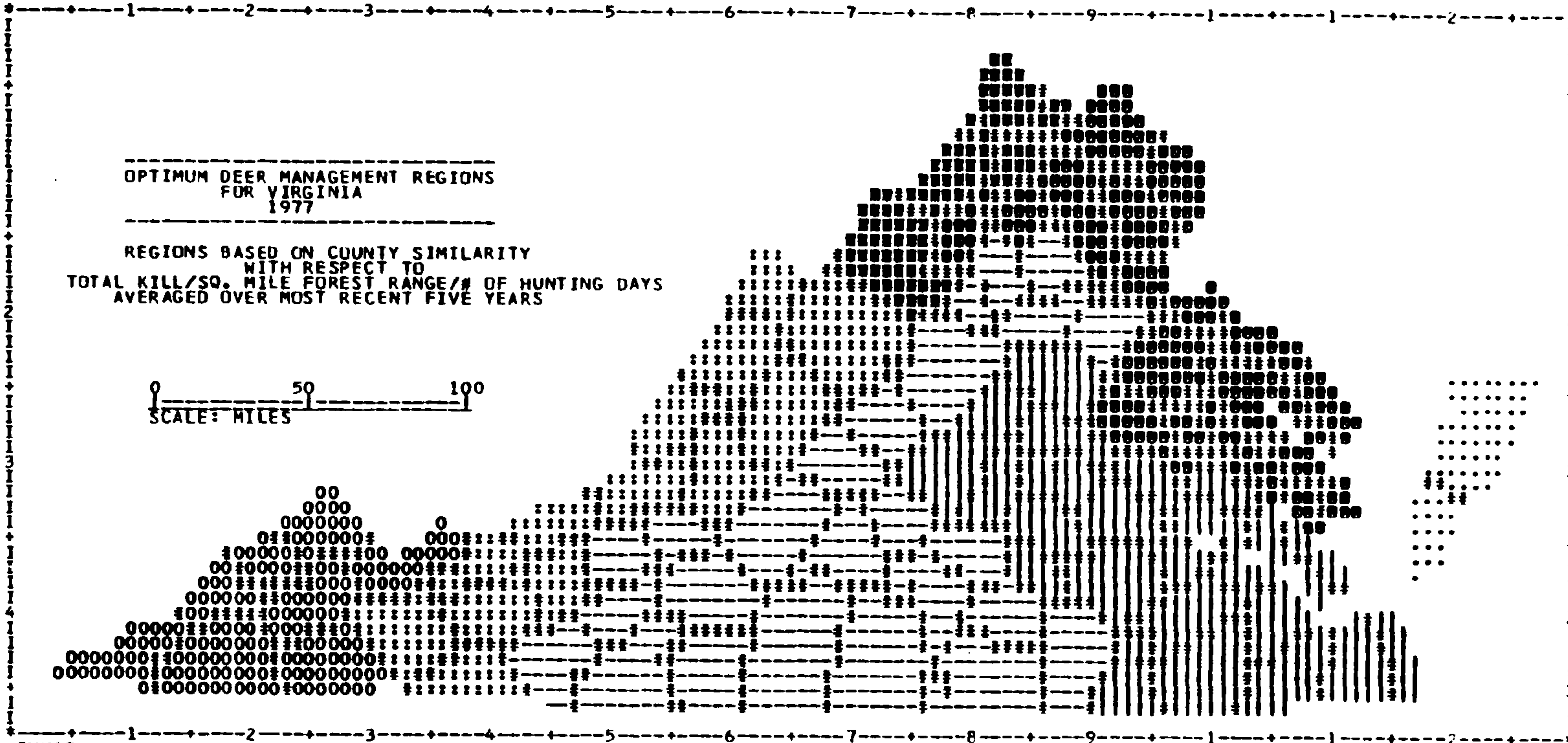
Delineating optimum deer management regions serves the purpose of identifying groups of counties which are most similar with respect to any chosen criteria. The criteria for defining deer management regions should reflect county deer population, habitat, and hunting characteristics. The criteria for determining county similarity used by the VADMIS system includes total deer harvest as a population indicator, square miles of forested deer range as a habitat indicator, and harvest per hunting day as an indicator of hunting pressure. The resultant county criteria, or index (total kill per square mile of forested deer range per hunting day) thus reflects county deer population, habitat, and hunting pressure.

Indices for 5 years were calculated and averaged for each county and used in the grouping process to reduce the natural annual variability in the data. Averaging county indices for the last 5 years reduces much of the annual variability but the program remained responsive to changes in annual county harvest statistics. VADMIS was supplied with hypothetical data for 1977 in which the 1976 total county harvests in all counties were increased by 10 percent. The addition of the hypothetical 1977 data caused a significant change in the optimum deer management regions. The 1976 optimum deer management regions are illustrated in Fig. 18 and the optimum regions resulting from the hypothetical 1977 data are illustrated in Fig. 23. A 10 percent increase in county deer harvests state-wide is not realistic but illustrates the sensitivity of the regionalization routine to changes in county deer harvest statistics. Actual observed harvest changes produce less significant changes in the optimum regions and often reflect no fundamental habitat change but changes in county hunting season regulations.

Using county deer harvests as a deer population indicator and as a basis for determining optimum deer management regions may present a problem of optimum regions reflecting past deer management (season setting) decisions rather than county deer population characteristics. Season regulations in themselves, however, often reflect county deer population characteristics or the game biologists' perception of the county deer population.

Contour Computer Maps

The contour computer (SYMAP) maps produced from 3 years



SYMAP

0.062500 MINUTES FOR MAP

REGIONALIZATION DATA

Fig. 23. 1977 optimum deer management regions resulting from hypothetical harvest data for 1977 produced by the 1976 county harvest data being increased by 10 percent for each county.

of county deer harvest data may be used to identify and/or illustrate long-term deer harvest trends across the state. A comparison of the maps for 1974 and 1976, Figs. 20 and 21 respectively, clearly illustrates the increase in county deer harvests which has been observed in southwestern Virginia counties. The frequency distributions following each map show that in 1976 fewer counties (four) had harvests of more than 6.43 deer per square mile of forested deer range than in 1974 when seven counties had harvest densities above 6.43 deer per square mile. The state-wide trend of increasing deer harvest densities is clearly illustrated by making comparisons between the 1974 and 1976 maps and the map produced for 1970, Fig. 19.

Extensions

Many simulation models have been developed, many specifically for deer, and several were considered for inclusion in the VADMIS system. A population simulation component would provide the system with the capability of analyzing management alternatives and determining the probable effects of specific management decisions or actions. The present lack of quantitative deer population and habitat (forage) data was the primary factor preventing the inclusion of a simulation component in the VADMIS system.

Joe L. Coggin, Game Commission research biologist, warned about conducting life table analyses on deer check station data collected west of the Blue Ridge mountains. Game Commission biologists analyze deer check station data very cautiously, making knowledgeable assumptions about the data and pooling the data differently from year to year. The analyses conducted by the biologists vary greatly and are dependent largely upon intangible information about the populations from which the data were collected and how the data were collected (accuracy). At most check stations west of the Blue Ridge, too few data are collected to allow any reasonable life table analyses without pooling the data for several check stations.

Population reconstruction techniques (Downing, In press) possibly could be used to analyze the check station data if a necessary assumption could be satisfied. Population reconstruction requires that the two oldest age classes are subject to equal mortality rates. Age data for three age classes, fawns, yearlings, and adults, are collected in Virginia. Yearling and adult bucks are rarely subject to equal mortality rates thus making reconstruction of the buck population impossible. Yearling and adult does are more likely to be subject to equal mortality rates but making this assumption may be hazardous. Small sample sizes at most of the deer check stations also discourage the use of population reconstruction techniques at present.

Quantitative habitat and forage data for Virginia counties may soon become available from the Earth Resources Technological Satellite photographs. The ERTS data may provide information needed to estimate or predict potential county deer population levels based on habitat which might enable the production of more accurate county deer harvest predictions and aid in implementing a simulation component to the VADMIS system in the future.

SUMMARY AND CONCLUSIONS

The computerized data-analysis and information system, named VADMIS (Virginia Deer Management Information System), developed in this study was designed to serve as a deer management decision aid to three distinct users: the game biologist, the game commissioner, and the land-use planner. County, district, region, and state deer harvest data from 1947 to present are summarized and analyzed to provide each decision-maker with the information he needs to make wise management, policy, and planning decisions.

A computerized data-analysis and information system, such as VADMIS, could save the biologist, or other decision-maker, valuable time and expense. Time saved compiling and analyzing data and generating tables and figures for annual progress reports and the like often could be spent elsewhere more effectively and efficiently. Time and economic constraints often prohibit the comprehensive data analysis that is desired and preclude needed research and management programs. The capabilities of the modern computer to store, sort, and analyze large quantities of data also enable more comprehensive data analyses enhancing the efficient utilization of available data.

The VADMIS system employs an auto-regression system to predict county deer harvests for three types of hunting seasons; bucks-only, either-sex hunting at the beginning or end of a bucks-only season, and either-sex hunting all season. The auto-regression routine utilizes 15 years of past county deer harvest data, (total kill, buck kill, and number of hunting days), to derive each county regression equation. A different regression equation is derived for each county. Predictions are made only for those season types which have been held at least three times in the last 15 years.

County deer harvest predictions are enhanced by the provision of harvest predictions for the most recent 5 years. Past predictions are compared with the actual reported harvests for the same 5 years to provide a county harvest prediction history, or "index" of predictive reliability within each county. The average accuracy of 1,076 county predictions made by VADMIS between 1962 and 1976, inclusive, was 74.6 percent. The county deer harvest predictions made by VADMIS provide the biologist with alternatives from which he can select the season type which most likely will provide the county deer harvest that is desired to achieve an optimum deer population density.

The VADMIS system also summarizes changes in recent county, district, region, and state deer harvests; produces histograms to illustrate county, district, and state harvest trends; summarizes changes in county season regulations and the associated changes in county deer harvests; summarizes harvest data collected at 15 deer check stations west of the Blue Ridge mountains; determines optimum deer management regions based on an index of deer population, habitat, and hunting pressure; and produces contour computer maps to illustrate and identify state-wide deer harvest trends.

The VADMIS system was designed to facilitate ease of operation, maintenance (data update), and future improvements, modifications, and extensions. Although the VADMIS system was developed for Virginia, in particular, it may be modified for use by other states and for other game species.

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APPENDIX TABLE 1. VADMIS PROGRAM LISTING.

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==========================================================================
C*************************************************************************
C*************************************************************************
C
C                                  VADMIS
C
C               VIRGINIA DEER MANAGEMENT INFORMATION SYSTEM
C
C*************************************************************************
C*************************************************************************
C
C     VARIABLE DESCRIPTIONS
C
C     *********************
C
C     GENERAL
C     -------
C
C  ABREV      ARRAY CONTAINING COUNTY NAMES FOR HISTOGRAM TITLES (NEEDED
C             TO ENABLE MANIPULATION OF SINGLE CHARACTERS FOR INPUT INTO
C             HISTOGRAM MATRIX.)
C  CONOST  |
C  CONO1   |
C  CONO2   |--VECTORS OF COUNTY NUMBERS USED TO KEEP TRACK OF COUNTIES
C  CONO3   |   WHEN RANKING DATA AND MAKING HISTOGRAMS.
C  CONO4   |
C  COUNTY     VECTOR OF COUNTIES IN WHICH PLANNER(IUSER=3) IS INTERESTED
C  FIPS       VECTOR(COMPLEX*16) CONTAINING COUNTY NAMES
C  IUSER      USER: 1-BIOLOGIST, 2-COMMISSIONER, 3-PLANNER
C  TYEARS     NUMBER OF YEARS FOR WHICH DATA EXISTS(DATA YEARS)E.G.1-30
C  NBEGYR     1ST YEAR OF DATA MINUS 1 (46). TO CONVERT REAL YEARS TO
C              DATA YEARS.(1947 (47) IS 1ST YEAR OF DATA)
C  NCOUNT     NUMBER OFCOUNTIES IN STATE
C  NEWREG     INDICATES IF NEW DISTRICTS AND REGIONS ARE USED.
C  NODIST     NUMBER OF DISTRICTS
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C   NOREG        NUMBER OF REGIONS
C   TITLES       ARRAY CONTAINING HARVEST VARIABLES, DISTRICT, AND REGION
C                 NAMES FOR TABLE HEADINGS AND HISTOGRAMS.
C   YR           VECTOR CONTAINING 'REAL' YEARS; E.G. 47-76
C
C
C      VARIABLES PERTAINING TO COUNTY DATA AND SUMMARIES
C      -------------------------*****------------------
C
C   ABK          ANTLERED BUCK KILL FOR COUNTY
C   ABKCHG       % CHANGE IN ANTLERED BUCK KILL (3 YEARS)
C   ABKSCH       % CHANGE IN ANTLERED BUCK KILL/SQ. MILE (3 YEAR)
C   ABKSM        ANTLERED BUCK KILL PER SQUARE MILE FOR COUNTY
C   ABKSUM       SUM OF ANTL. BUCK KILL OVER 10 YEARS FOR AVERAGE IN 11
C                YEAR COUNTY SUMMARIES
C   ACRES        ACRES OF FORESTED DEER RANGE
C   BK           BUCK KILL FOR COUNTY
C   BKCHG        % CHANGE IN BUCK KILL (3 YEARS)
C   BKSM         BUCK KILL/SQ. MILE FOR COUNTY
C   BKSUM        SUM OF BUCK KILL OVER 10 YEARS FOR AVERAGE IN 11 YEAR
C                COUNTY SUMMARIES
C   CAVABK       COUNTY 10 YEAR AVERAGE ANTL. BUCK KILL FOR 11 YEAR
C                COUNTY SUMMARIES
C   CAVBK        COUNTY 10 YEAR AVERAGE BUCK KILL FOR 11 YEAR COUNTY
C                SUMMARIES
C   CAVPDK       COUNTY 10 YEAR AVERAGE PERCENT DOE KILL FOR 11 YEAR
C                COUNTY SUMMARIES
C   CAVTK        COUNTY 10 YEAR AVERAGE TOTAL KILL FOR 11 YEAR COUNTY
C                SUMMARIES
C   DAYS         TOTAL DAYS IN SEASON
C   DKCHG        % CHANGE IN DOE KILL (3 YEARS)
C   DK           DOE KILL FOR COUNTY
C   DKSM         DOE KILL PER SQUARE MILE FOR COUNTY
C   ESDAYS       NUMBER OF EITHER-SEX DAYS IN SEASON FOR COUNTY
```

APPENDIX TABLE 1. (CONTINUED)

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==================================================================================
C   HDAYS       NUMBER OF HUNTING DAYS IN SEASON FOR COUNTY
C   ICN         COUNTY NUMBER (ON DISK, NOT USED BY PROGRAM)
C   NSUN        NUMBER OF SUNDAYS IN SEASON FOR COUNTY(NO HUNTING DAYS)
C   PDK         PERCENT DOE KILL(% DOE IN TOTAL KILL) FOR COUNTY
C   PDKCHG      CHANGE IN PERCENT DOE IN TOTAL KILL (3 YEARS)
C   PDKSUM      SUM OF PERCENT DOE IN TOTAL KILL OVER 10 YEARS TO FIND
C               AVERAGE IN 11 YEAR COUNTY SUMMARIES
C   SEASON      TYPE OF SEASON
C                    0. NO SEASON
C                    1. EITHER-SEX ALL SEASON
C                    2. BUCKS ONLY
C                    3. E.S. AT BEGINNING OF SEASON
C                    4. E.S. AT END OF SEASON
C                    5. NOT A UNIFORM SEASON
C   SQMI        SQUARE MILES OF FORESTED DEER RANGE IN COUNTY
C   TK          TOTAL KILL FOR COUNTY
C   TKCHG       % CHANGE IN TOTAL KILL (3 YEARS)
C   TKSM        TOTAL KILL/SQ. MILE FOR COUNTY
C   TKSUM       SUM OF TOTAL KILL OVER 10 YEARS FOR AVERAGE IN 11 YEAR
C               COUNTY SUMMARIES
C   TYPES       SEASON DATES INFORMATION
C                    0. NO SEASON
C                    1. ONE SET OF DATES
C                    2. TWO SETS OF DATES
C                    3. ONLY PART OF COUNTY OPEN
C                    4. SPLIT SEASON
C   VAR1        VECTOR OF DOE KILL DATA FOR COUNTY (FROM DISK)
C   VAR2        VECTOR OF TOTAL KILL FOR COUNTY (FROM DISK)
C   VAR3        ARRAY OF HUNTING SEASON INFORMATION (FROM DISK),DATES,ETC.
C
C
C     VARIABLES PERTAINING TO DISTRICT DEER HARVEST DATA AND SUMMARIES
C     ------------------------*******-----------------------------------
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
C   DABKSC     DISTRICT CHANGE IN ANTL. BUCK KILL/SQ. MILE (5 YEARS)
C   DCABK      ANTLERED BUCK KILL FOR DISTRICT BY COUNTY
C   DCABKS     ANTLERED BUCK KILL/SQ.MILLE FOR DISTRICT BY COUNTY
C   DCBK       BUCK KILL FOR DISTRICT BY COUNTY
C   DCDK       DOE KILL FOR DISTRICT BY COUNTY
C   DCPDK      PERCENT DOE KILL FOR DISTRICT BY COUNTY
C   DCTK       TOTAL KILL FOR DISTRICT BY COUNTY
C   DESDYS     EITHER-SEX DAYS FOR COUNTIES IN DISTRICT
C   DHDYS      HUNTING DAYS FOR COUNTIES IN DISTRICT
C   DISTPT     VECTOR IDENTIFYING WHICH DISTRICT EACH COUNTY IS IN.
C   DSTP       SEASON TYPE FOR COUNTIES IN DISTRICT
C   DYABK      ANTLERED BUCK KILL BY YEAR FOR DISTRICT
C   DYABKC     DISTRICT CHANGE IN ANTL. BUCK KILL ( 5 YEARS)
C   DYABKS     ANTLERED BUCK KILL/SQ.MILE BY YEAR FOR DISTRICT
C   DYBK       BUCK KILL BY YEAR FOR DISTRICT
C   DYBKCH     DISTRICT CHANGE IN BUCK KILL (5 YEARS)
C   DYDK       DOE KILL BY YEAR FOR COUNTY
C   DYDKCH     DISTRICT CHANGE IN DOE KILL ( 5 YEARS)
C   DYPDK      PERCENT DOE KILL BY YEAR FOR DISTRICT
C   DYPDCH     DISTRICT CHANGE IN PERCENT DOE KILL (5 YEARS)
C   DYTK       TOTAL KILL BY YEAR FOR DISTRICT
C   DYTKCH     DISTRICT CHANGE IN TOTAL KILL (5 YEARS)
C   SABK       SUM OF ANTL. BUCK KILL IN DISTRICT FOR 10 YEAR MEANS
C   SABKS      SUM OF ANTL. BUCK KILL/SQ.MILE IN DISTRICT FOR 10 YEAR
C              MEANS
C   SBK        SUM OF BUCK KILL IN DISTRICT FOR 10 YEAR MEANS
C   SDK        SUM OF DOE KILL IN DISTRICT FOR 10 YEAR MEANS
C   SPDK       SUM OF PERCENT DOE KILL IN DISTRICT FOR 10 YEAR MEANS
C   SQMA       TOTAL SQUARE MILES OF FORESTED DEER RANGE IN DISTRICT
C   STK        SUM OF TOTAL KILL IN DISTRICT FOR 10 YEAR MEANS
C   TABK       DISTRICT 10 YEAR MEANS FOR ANTLERED BUCK KILL
C   TABKS      DISTRICT 10 YEAR MEANS FOR ANTL. BUCK KILL/SQ. MILE
C   TBK        DISTRICT 10 YEAR MEANS FOR BUCK KILL
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C   TDK          DISTRICT 10 YEAR MEANS FOR DOE KILL
C   TPDK         DISTRICT 10 YEAR MEANS FOR PERCENT DOE KILL
C   TTK          DISTRICT 10 YEAR MEANS FOR TOTAL KILL
C
C
C     VARIABLES PERTAINING TO REGIONS HARVEST DATA AND SUMMARIES
C     --------------------------*******-------------------------------
C
C
C   AVABKS       EAST AND WEST OF B.R. COUNTY AVERAGE ANTL. BUCK KILL/SQ.
C                MILE (2 YEARS)
C   AVBKS        EAST AND WEST OF B.R. COUNTY AVERAGE BUCK KILL/SQ.MILE
C                (2 YEARS)
C   AVDKS        EAST AND WEST OF B.R. COUNTY AVERAGE DOE KILL/SQ.MILE
C                (2 YEARS)
C   AVTKS        EAST AND WEST OF B.R. COUNTY AVERAGE TOTAL KILL/SQ.MILE
C                (2 YEARS)
C   EBABCH       CHANGE IN EAST OF B.R. ANTLERED BUCK KILL (5 YEARS)
C   EBABKS       ANTLERED BUCK KILL/SQ. MILE EAST OF BLUE RIDGE
C   EBABMN       EAST OF B.R. ANTLERED BUCK KILL 10 YEAR MEAN
C   EBABSC       CHANGE IN EAST OF B.R. ANTLERED BUCK KILL/SQ.MILE(5 YEARS)
C   EBABSM       EAST OF B.R. ANTLERED BUCK KILL/SQ.MILE 10 YEAR MEAN
C   EBBKCH       CHANGE IN EAST OF B.R. BUCK KILL (5 YEARS)
C   EBBKMN       EAST OF B.R. BUCK KILL 10 YEAR MEAN
C   EBDKCH       CHANGE IN EAST OF B.R. DOE KILL (5 YEARS)
C   EBDKMN       EAST OF B.R. DOE KILL 10 YEAR MEAN
C   EBPDCH       CHANGE IN EAST OF B.R. PERCENT DOE KILL (5 YEARS)
C   EBPDMN       EAST OF B.R. PERCENT DOE KILL 10 YEAR MEAN
C   EBRABK       ANTLERED BUCK KILL EAST OF THE BLUE RIDGE
C   EBRBK        BUCK KILL EAST OF THE BLUE RIDGE
C   EBRDK        DOE KILL EAST OF THE BLUE RIDGE
C   EBRPDK       PERCENT DOE KILL EAST OF THE BLUE RIDGE
C   EBRTK        TOTAL KILL EAST OF THE BLUE RIDGE
C   EBTKCH       CHANGE IN EAST OF B.R. TOTAL KILL (5 YEARS)
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C   EBTKMN      EAST OF B.R. TOTAL KILL 10 YEAR MEAN
C   EBTYAB      SUM OF ANTLERED BUCK KILL FOR EAST OF B.R. 10 YEAR MEANS
C   EBTYBK      SUM OF BUCK KILL FOR EAST OF B.R. 10 YEAR MEAN
C   EBTYDK      SUM OF DOE KILL FOR EAST OF B.R. 10 YEAR MEAN
C   EBTYPD      SUM OF % DOE KILL FOR EAST OF B.R. 10 YEAR MEAN
C   EBTYTK      SUM OF TOTAL KILL FOR EAST OF B.R. 10 YEAR MEAN
C   ETYABS      SUM OF ANTL.BUCK KILL/SQ.MILE FOR EAST OF B.R. 10 YR. MEAN
C   RABSCH      CHANGE IN REGION ANTL. BUCK KILL/SQ.MILE(5 YEARS)
C   REABK       ANTLERED BUCK KILL FOR REGION
C   REABKC      CHANGE IN REGION ANTL. BUCK KILL (5 YEARS)
C   REABKS      ANTLERED BUCK KILL/SQ. MILE FOR REGION
C   REBK        BUCK KILL FOR REGION
C   REBKCH      CHANGE IN REGION BUCK KILL (5 YEARS)
C   REDK        DOE KILL FOR REGION
C   REDKCH      CHANGE IN REGION DOE KILL (5 YEARS)
C   REGPT       VECTOR ASSIGNING DISTRICTS TO APPROPRIATE REGIONS
C   REPDK       PERCENT DOE KILL FOR REGION
C   REPDCH      CHANGE IN REGION PERCENT DOE KILL (5 YEARS)
C   RETK        TOTAL KILL FOR REGION
C   RETKCH      CHANGE IN REGION TOTAL KILL(5 YEARS)
C   RRABK       SUM OF ANTL. BUCK KILL FOR REGION 10 YEAR MEANS
C   RRABKS      SUM OF ANTL. BUCK KILL/SQ.MILE FOR REGION 10 YR MEANS
C   RRBK        SUM OF BUCK KILL FOR REGION 10 YEAR MEANS
C   RRDK        SUM OF DOE KILL FOR REGION 10 YEAR MEANS
C   RRPDK       SUM OF PERCENT DOE KILL FOR REGION 10 YEAR MEANS
C   RRTK        SUM OF TOTAL KILL FOR REGION 10 YEAR MEANS
C   SEABK       REGION 10 YEAR MEAN FOR ANTLERED BUCK KILL
C   SEABKS      REGION 10 YEAR MEAN FOR ANTL. BUCK KILL/SQ. MILE
C   SEBK        REGION 10 YEAR MEAN FOR BUCK KILL
C   SEDK        REGION 10 YEAR MEAN FOR DOE KILL
C   SEPDK       REGION 10 YEAR MEAN FOR PERCENT DOE KILL
C   SETK        REGION 10 YEAR MEAN FOR TOTAL KILL
C   SQMEBR      SQUARE MILES FORESTED RANGE FOR EAST OF THE BLUE RIDGE
C   SQMR        SQUARE MILES OF FORESTED DEER RANGE FOR REGION
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
C   TAEABK        EAST OF B.R. 10 YEAR AVERAGE FOR ANTL. BUCK KILL 11 YEAR
C                 COUNTY SUMMARY
C   TAEBK         EAST OF B.R. 10 YEAR AVERAGE FOR BUCK KILL 11 YEAR COUNTY
C                 SUMMARY
C   TAEPDK        EAST OF B.R. 10 YEAR AVERAGE FOR PERCENT DOE KILL 11 YEAR
C                 COUNTY SUMMARY
C   TAETK         EAST OF B.R. 10 YEAR AVERAGE FOR TOTAL KILL 11 YEAR COUNTY
C                 SUMMARY
C   TAWABK        WEST OF B.R. 10 YEAR AVERAGE FOR ANTL. BUCK KILL 11 YEAR
C                 COUNTY SUMMARY
C   TAWBK         WEST OF B.R. 10 YEAR AVERAGE FOR BUCK KILL 11 YEAR COUNTY
C                 SUMMARY
C   TAWPDK        WEST OF B.R. 10 YEAR AVERAGE FOR PERCENT DOE KILL 11 YEAR
C                 SUMMARY
C   TAWTK         WEST OF B.R. 10 YEAR AVERAGE FOR TOTAL KILL 11 YEAR COUNTY
C                 SUMMARY
C
C
C       VARIABLES PERTAINING TO STATE DATA AND SUMMARY
C       --------------------------*****-----------------
C
C
C   ABKS          ANTLERED BUCK KILL 10 YEAR MEAN FOR STATE
C   ABKSS         ANTL. BUCK KILL/SQ.MILE 10 YEAR MEAN FOR STATE
C   ASABK         ANTLERED BUCK KILL FOR STATE
C   ASABKS        ANTLERED BUCK KILL/SQ. MILE FOR STATE
C   ASBK          BUCK KILL FOR STATE
C   ASDK          DOE KILL FOR STATE
C   ASPDK         PERCENT DOE KILL FOR STATE
C   ASTK          TOTAL KILL FOR STATE
C   AVABK         STATEWIDE 10 YEAR AVERAGE FOR ANTL. BUCK KILL/SQ. MILE FOR
C                 11 YEAR COUNTY SUMMARY
C   AVBK          STATEWIDE 10 YEAR AVERAGE FOR BUCK KILL FOR 11 YEAR COUNTY
C                 SUMMARY
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
C   AVPDK      STATEWIDE 10 YEAR AVERAGE FOR PERCENT DOE KILL FOR 11 YEAR
C              COUNTY SUMMARY
C   AVTK       STATEWIDE 10 YR AVERAGE FOR TOTAL KILL FOR 11 YEAR COUNTY
C              SUMMARY
C   BKS        BUCK KILL 10 YEAR MEAN FOR STATE
C   DKS        DOE KILL 10 YEAR MEAN FOR STATE
C   PDKS       PERCENT DOE KILL 10 YEAR MEAN FOR STATE
C   SABKCH     CHANGE IN ANTLERED BUCK KILL FOR STATE
C   SABSCH     CHANGE IN ANTL. BUCK KILL/SQ.MILE FOR STATE
C   SBKCH      CHANGE IN BUCK KILL FOR STATE
C   SCAABS     STATEWIDE COUNTY AVERAGE ANTL. BUCK KILL/SQ.MILE FOR
C              CURRENT YEAR
C   SCABKS     STATEWIDE COUNTY AVERAGE BUCK KILL/SQ.MILE FOR CURRENT YR
C   SCADKS     STATEWIDE COUNTY AVERAGE DOE KILL/SQ.MILE FOR CURRENT YEAR
C   SCATKS     STATEWIDE COUNTY AVERAGE TOTAL KILL/SQ.MILE FOR CURRENT YR
C   SDKCH      CHANGE IN DOE KILL FOR STATE
C   SPDKCH     CHANGE I PERCENT DOE KILL FOR STATE
C   SQMS       SQUARE MILES OF FORESTED DEER RANGE IN STATE
C   STKCH      CHANGE IN TOTAL KILL FOR STATE
C   TKS        TOTAL KILL 10 YEAR MEAN FOR STATE
C
C
C        VARIABLES PERTAINING TO REGRESSION--HARVEST PREDICTIONS
C        -----------------------**********---------------------
C
C
C   ACTKL      ACTUAL KILL (FOR PREDICTION HISTORY)
C   ACTSN      ACTUAL SEASON TYPE HELD(FOR PREDICTION HISTORY)
C   ASEASN     VECTOR OF ACTUAL SEASONS HELD FOR PREDICTION HISTORY
C   ATKILL     VECTOR OF ACTUAL KILLS FOR PREDICTION HISTORY
C   AVGDFF     AVERAGE DIFFERENCE FOR PREDICTION HISTORY
C   AVGPCT     AVERAGE PERCENT DIFFERENCE FOR PREDICTION HISTORY
C   BKILL      BUCK KILL FOR PREVIOUS YEAR
C   DIFSUM     SUM OF DIFFERENCES FOR PREDICTION HISTORY
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C   HFAC         HUNTING DAYS IN SEASON FOR YEAR
C   IFOOT        FOOTNOTE INDICATOR-WHEN NO PREDICTIONS HAD BEEN MADE
C   IRANK        ARRAY CONTAINING THE SEASON TYPES(1,2,3) BEING USED
C   ITEST        PAST/FUTURE PREDICTION INDICATOR
C   MINMUM       THE MINIMUM NUMBER OF YEARS A SEASON TYPE MUST OCCUR IN
C                ORDER TO BE USED FOR REGRESSION
C   NFYEAR       FIRST YEAR OF DATA THAT WILL BE USED FOR PREDICTIONS
C   NUMDUM       NUMBER OF DUMMY VARIABLES
C   NUMVAR       NUMBER OF VARIABLES
C   PCTSUM       SUM OF PERCENT DEFFERENCE FOR PREDICTION HISTORY
C   PRDIFF       VECTOR OF DIFFERENCE BETWEEN PREDICTED AND ACTUAL KILLS
C                FOR PREDICTION HISTORY
C   PRED         ARRAY OF PREDICTIONS RETURNED FROM SUBROUTINE 'REGRE'
C   PRKL         PREDICTED KILL (FOR PREDICTION HISTORY)
C   PRPCT        VECTOR OF % DIFFERENCES BETWEEN PREDICTED AND ACTUAL KILLS
C                FOR PREDICTION HISTORY
C   PTR          ARRAY CONTAINING YEARS BEING USED FOR REGRESSION.  A YEAR
C                IS USED IF ITS SEASON TYPE IS BEING USED
C   SCOUNT       (SEASON COUNT) NUMBER OF YEARS EACH SEASON TYPE OCCURRED
C   TKILL        TOTAL KILL FOR PREVIOUS YEAR
C   TKILY        TOTAL KILL FOR YEAR
C   USING        TRUE IF REGRESSION USES SEASON TYPE. FALSE OTHERWISE
C
C   X            ARRAY CONTAINING THE VALUES FOR THE REGRESSION
C
C            THE X ARRAY IS FILLED AS FOLLOWS:
C            OBSERVATIONS ON VARIABLE 1
C            OBSERVATIONS ON VARIABLE 2
C            .                        .
C            OBSERVATIONS ON DEPENDENT VARIABLE
C
C            FOR ALL REGRESSIONS:
C            VARIABLE 1 = ALOG(TKILL)
C            VARIABLE 2 = ALOG(BKILL)
```

APPENDIX TABLE 1. (CONTINUED)

```
========================================================================
C           VARIABLE 3 = ALOG(HDAYS)
C
C           FOR REGRESSIONS ON ONLY ONE SEASON TYPE:
C           VARIABLE 4 = ALOG(TKILY)
C
C           FOR REGRESSIONS ON TWO SEASON TYPES:
C           VARIABLE 4 = 1 IF SEASON IS FIRST ONE USED
C                        0 OTHERWISE
C           VARIABLE 5 = ALOG(TKILY)
C
C           FOR REGRESSION ON ALL THREE (1,2,3&4) SEASON TYPES
C           VARIABLE 4 = 1 IF SEASON = 2
C                        0 OTHERWISE
C           VARIABLE 5 = 1 IF SEASON = 1
C                        0 OTHERWISE
C           VARIABLE 6 = ALOG(TKILY)
C
C           SEASON   VARIABLE 4   VARIABLE 5
C                1            0            1
C                2            1            0
C                3            0            0
C
C EQUATION FOR REGRESSION ON 1 SEASON TYPE:
C KILL = INTERCEPT + B(1)*V1 + B(2)*V2 + B(3)*V3 +/- ERROR
C
C EQUATION FOR REGRESSION ON 2 SEASON TYPES:
C KILL = INTERCEPT + B(1)*V1 + B(2)*V2 + B(3)*V3 + B(4)*DUMMY +/- ERROR
C
C EQUATION FOR REGRESSION ON ALL 3 SEASON TYPES:
C KILL = INTERCEPT + B(1)*V1 + B(2)*V2 + B(3)*V3 + B(4)*DUMMY
C                  + B(5)*DUMMY +/- ERROR
C
C     BEFORE CALLING REGRE:
C     V1 = ALOG(TOTAL KILL FOR YEAR)
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
C      V2 = ALOG(BUCK KILL FOR YEAR)
C      V3 = HUNTING DAYS FOR YEAR
C      (V3 IS AN INTEGER SO THAT HUNTING DAYS MAY BE PRINTED. IT IS LATER
C      CONVERTED TO A REAL NUMBER AND THE LOG IS THEN TAKEN.)
C      (REGRESSION USES SAME NUMBER OF HUNTING DAYS AS CURRENT YEAR.
C      THE REASON IS TO PREDICT WHAT WILL HAPPEN IF NO CHANGES ARE MADE
C      IN THE LENGTH OF THE HUNTING SEASON
C
C      ONE PROBLEM WITH THE REGRESSION IS THAT THE BETA VALUE
C      CORRESPONDING TO HUNTING DAYS IS SOMETIMES NEGATIVE, I.E.
C      INCREASING HUNTING DAYS MIGHT RESULT IN A LOWER PREDICTED KILL
C      WHILE DECREASING HUNTING DAYS MIGHT RESULT IN A HIGHER PREDICTED
C      KILL. THUS REGRESSION IS MADE ON ONLY ONE NUMBER OF HUNTING DAYS
C      (THE NUMBER OF HUNTING DAYS IN IYEAR).
C
C
C
C
C      VARIABLES PERTAINING TO HISTOGRAM CONSTRUCTION
C      -----------------------*********-------------
C
C
C   A            VECTOR OF COUNTY ANTL. BUCK KILL/SQ. MILE DATA FOR STATE
C                HISTOGRAMS
C   B            VECTOR OF COUNTY BUCK KILL/SQ. MILE DATA FOR STATE HISTO-
C                GRAMS
C   CNAM1    |
C   CNAM2    |
C   CNAM3    |--VECTORS OF COUNTY NUMBERS OF KEEP TRACK OF COUNTIES DURING
C   CNAM4    |  RANKING, PLOTTING, ETC.
C   CTYNO1   |
C
C   CYHIST       ARRAY OF DATA FOR COUNTY HISTOGRAMS
C   D            VECTOR OF COUNTY DOE KILL/SQ. MILE  DATA FOR STATE HISTO-
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C                GRAMS
C   DENS1 |
C   DENS2 |----VECTORS CONTAINING DATA TO BE SENT TO HISTOGRAM SUBROUTINE
C
C
C   DTHIST       ARRAY OF DATA FOR DISTRICT HISTOGRAMS
C   IEVEN        CHECK FOR EVEN NUMBER OF COUNTIES TO PRINT OUT STATE
C                RANKINGS
C   IHCNT        PAGINATION INDICATOR TO PROPERLY ALIGN HISTOGRAMS
C   IVID         COUNTER INDICATING THE NUMBER OF GRAPHS TO BE MADE
C   IVTYP        VECTOR IDENTIFYING WHICH VARIABLES ARE TO BE GRAPHED AND
C                IN WHICH ORDER
C   STHIST       ARRAY OF DATA FOR STATE HISTOGRAMS
C   T            VECTOR OF COUNTY TOTAL KILL/SQ.MILE DATA FOR STATE
C                HISTOGRAMS
C
C
C*************************************************************************
C
C       THE ACTUAL MAIN PROGRAM READS THE CONTROL DATA PARAMETERS
C       THE MAIN BODY OF THE PROGRAM IS CALLED AS A SUBROUTINE.
C
C
C       SUBROUTINES REQUIRED BY VADMIS (FOR USERS INDICATED)
C
C
C            VADMIS (1,2,3)---MAIN BODY OF PROGRAM
C            BLOCK DATA (1,2,3)---INITIALIZES DATA VARIABLES
C            REGRE (1)---HARVEST PREDICTIONS ARE MADE
C            DATA (1)---SSP PACKAGE REQUIRES AN EMPTY SUBRT. NAMED DATA)
C            GRAPH (1,2) |
C            RANK (1,2) |
C            TYTEL (1,2) |---SUBROUTINES CREATING AND PRINTING HISTOGRAMS
C            XAXIS (1,2) |
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
C           HISTO  (1,2)  |
C           COMBN  (1,2)  |
C           GRAF  (1)---GROUPS COUNTIES INTO MANAGEMENT REGIONS
C           SEACH  (1)---SUMMARIZES SEASON CHANGES
C           CHECK  (1)---SUMMARIZES CHECK STATION DATA
C           INTRO  (3)---INTRODUCTION TO DEER MANAGEMENT PRINCIPLES
C           VACIS  (3)---SUMMARIZES COUNTY DEER HARVEST & HABITAT
C                        CHARACTERISTICS
C           CHGSYM  (1)---CHANGES YEAR NUMBERS ON SYMAP MAPS
C
C
C****************************************************************************
C
      REAL BDATA(3,40),DDATA(3,40),SPIKES(40),AVGWT(40)
      INTEGER DISK,COUNTY(100),YEAR
      INTEGER*2 ABREV(16,98),TITLES(30,24)
      COMMON/HPLOT/ABREV,TITLES
C
      DIMENSION ICON(99,99),VAR1(40),VAR2(40),VAR3(6,40)
      DATA VAR1,VAR2,VAR3/40*0.,40*0.,240*0./
      INTEGER*2 REGPT(10),DISTPT(100)
C
      COMMON/INIT/IYEARS,IUSER,NCOUNT,NBEGYR,IV1,IV2,IV3,IV4,ICON,
     _DISTPT,REGPT,NEWREG,COUNTY,NCDIST,NOREG
C
      INTEGER FIND(10)/'TITL','CONT','DIST','HIST','YEAR','UPDA','USER',
     _'COUN','CHEC','YES '/
      INTEGER WHICH
C
      DEFINE FILE 10(98,1284,L,DISK), 25(15,1284,L,ID)
      ID=1
      DISK=1
      NCOUNT=98
      IUSER=1
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
      NEWREG=0
      IV1=1
      IV2=0
      IV3=1
      IV4=0
      NODIST=6
      NOREG=3
C**************************************************************************
C      1ST YEAR OF DATA STORED ON DISK IS 1947.  NBEGYR IS USED TO
C          CONVERT REAL YEAR TO DATA YEAR.
C
      NBEGYR=46
C
C**************************************************************************
C
C
C       BEGIN READING DATA FROM VARIABLE ORDER INPUT.
C       TITLE CARD IS READ TO IDENTIFY THE DATA THAT FOLLOWS IT.
C
C
 3000 READ(5,2997,END=4000) WHICH
2997  FORMAT(A4)
      DO 2998 I=1,9
      IGO=I
      IF(WHICH .EQ. FIND(I))GO TO 2996
      GO TO 2998
 2996 GO TO (3001,3002,3003,3004,3005,3006,3007,3008,3009), IGO
 2998 CONTINUE
      WRITE(6,2999)
 2999 FORMAT('1', 15X,'DATA ERROR ENCOUNTERED',//16X,'CHECK SPELLING OF
     _DATA HEADING CARDS.',/16X,'(ONLY 1ST FOUR LETTERS ARE REQUIRED)',
     _//16X,'CORRECT SPELLINGS:',//16X,'TITL    CONT    DIST    HIST',
     _//16X,'    YEAR    UPDA    USER    COUN    CHEC')
      STOP 13
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
C
 3001 CONTINUE
C
C     READ TITLES FOR HISTOGRAMS AND TABLES....1ST READ TO CHECK FOR
C     NEW DISTRICTS AND REGIONS(IF NEW REGIONS ARE DESIRED THEN
C     ENTER  YES     IN COLUMNS 1 THRU 3 OF FIRST DATA CARD FOLLOWING
C     TITL  DATA HEADER CARD....THEN THE NUMBER OF DISTRICTS AND REGIONS
C     ON THE NEXT CARD ACCORDING TO THE FORMAT (I2,1X,I2).   TITLES ARE
C     THEN READ FROM INDIVIDUAL CARDS.    IF NEW REGIONS AREN'T DESIRED
C     THEN A BLANK CARD IS INSERTED AFTER THE HEADER CARD FOLLOWED BY
C     THE TITLES.  DISTRICT TITLES PRECEDE REGION TITLES.
C
      READ(5,3020)NEW
 3020 FORMAT(A4)
      IF(NEW .EQ. FIND(10)) READ(5,3021) NODIST,NOREG
 3021 FORMAT(I2,1X,I2)
      NOTITL=NOREG + NODIST + 10
C
C     IF NEW REGIONS AREN'T USED THEN THERE ARE 20 TITLE TO BE READ.
C
      IF(NEW .NE. FIND(10))  NOTITL=20
      DO 3023 J=1,NOTITL
      READ(5,3022) (TITLES(J,L),L=1,24)
 3022 FORMAT(24A1)
 3023 CONTINUE
      GO TO 3000
C
C
3002  CONTINUE
C
C     READ CONTIGUITY MATRIX FOR COUNTY GROUPING PROGRAM(GRAF)
C     FIRST READ THE NUMBER OF COUNTIES IN STATE.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      READ(5,3031)NCOUNT
 3031 FORMAT(I3)
      DO 3033 J=1,NCOUNT
      READ(5,3032)(ICON(J,K),K=1,98)
C****************************************
C****************************************
C         IMPORTANT   NOTE
C     THIS FORMAT IS VIRGINIA SPECIFIC
C      FOR 98 COUNTIES.   IT MUST BE ADJUSTED
C     TO ACCOMODATE DIFFERENT NUMBER OF COUNTIES.
C
3032  FORMAT(80I1/18I1)
C
C****************************************
C****************************************
C
3033  CONTINUE
      GO TO 3000
C
C
 3003 CONTINUE
C
C     READ COUNTY-DISTRICT & DISTRICT-REGION ASSIGNMENTS(DISTPT,REGPT)
C     IF NEW DISTRICTS AND REGIONS ARE BEING USED.
C
C     FIRST READ THE NUMBER OF COUNTIES, DISTRICTS, AND REGIONS.
C     THENREAD COUNTY-DISTRICT ASSIGNMENTS----10 COUNTIES PER DATA CARD
C         WITH FORMAT(10I5). THEN READ DISTRICT-REGION ASSIGNMENTS
C         IN THE SAME MANNER.
C
      READ(5,3040)NCOUNT,NODIST,NOREG
 3040 FORMAT(3I3)
      READ(5,3041)(DISTPT(J),J=1,NCOUNT)
 3041 FORMAT(10I5)
```

```
================================================================================
      READ(5,3041)(REGPT(J),J=1,NODIST)
      NEWREG=1
      GO TO 3000
C
C
 3004 CONTINUE
C     READ HISTOGRAM OPTIONS;  IV(1,2,3,4)=1 THEN MAKE HISTO FOR THAT
C      VARIABLE.  IV1=TOTAL KILL, IV2=BUCK KILL, IV3=ANTL. BUCK KILL,
C      IV4=DOE KILL OR PERCENT DOE KILL
C
      READ(5,3050)IV1,IV2,IV3,IV4
 3050 FORMAT(4I2)
      GO TO 3000
C
C
3005  CONTINUE
C     READ YEAR  (19__)
C
      READ(5,3060)YEAR
 3060 FORMAT(2X,I2)
      IYEARS=YEAR-NBEGYR
      GO TO 3000
C
C
 3006 CONTINUE
C     IF UPDATE DATA HEADER CARD WAS INCLUDED THEN UPDATE IS TO BE MADE.
C
C     FOLLOWING THE UPDATE HEADER CARD THERE MUST BE ONE CARD WITH THE
C     YEAR OF THE DATA BEING PROVIDED AND THE NUMBER OF COUNTIES IN THE
C     STATE.  FOLLOWING THIS THERE MUST BE 98 (NCOUNT) COUNTY DATA CARDS
C
      READ(5,3070)YEAR,NCOUNT
 3070 FORMAT(2X,I2,1X,I3)
      IYEARS=YEAR - NBEGYR
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
C      IF UPDATE IS MADE...COUNTY DATA IS READ FROM CARDS AND WRITTEN ON
C      DISK FILE.  98 DATA CARDS MUST BE PROVIDED.(VIRGINIA)
C
       DO 70 K=1,NCOUNT
       READ (10'K) ICN,VAR1,VAR2,VAR3
       READ(5,1200) VAR1(IYEARS),VAR2(IYEARS),(VAR3(L,IYEARS),L=1,2),DUMM
      1Y,(VAR3(L,IYEARS),L=4,6)
 1200  FORMAT(2F7.2,6F9.0)
C
C      DUMMY = DUMMY VARIABLE FOR ACREAGE OF COUNTY FOREST RANGE.
C
C      ACREAGES WERE CALCULATED AND PREDICTED FROM A REGRESSION ON
C      RECORDED ACREAGES IN 1947 AND 1969.  IF NEW OR ALTERNATE ACREAGES
C      ARE DESIRED FOR THE YEAR OF THE DATA BEING SUBMITTED THEN INSERT:
C                  '  VAR3(3,IYEARS)=DUMMY  '
C      BEFORE THE DATA IS WRITTEN ONTO DISK (STATEMENT NO. 70).
C      DESIRED ACREAGE DATA IS PUNCHED ON UPDATE CARDS IN COLS. 36-41.
C       ACREAGES HAVE BEEN CALCULATED THRU THE YEAR 1996.
C
   70  WRITE (10'K) ICN,VAR1,VAR2,VAR3
C
       GO TO 3000
C
C
 3007  CONTINUE
C
C      READ USER TYPE: 1= BIOLOGIST, 2= COMMISSIONER, 3=PLANNER
C
       READ(5,3080)IUSER
 3080  FORMAT(I1)
       IF(IUSER .NE. 3) GO TO 3000
C
C      IF IUSER=3(PLANNER) THEN READ COUNTY NUMBERS OF COUNTIES FOR WHICH
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
C      HARVEST SUMMARIES ARE DESIRED.  FIRST READ THE NUMBER OF COUNTIES
C      NEEDED---THEN READ COUNTY NUMBERS;ONE CARD PER COUNTY...(I3)FORMAT
C
       READ(5,3081)NOCNTY
 3081  FORMAT(I3)
C
       DO 3082 K=1,NOCNTY
       READ(5,3081)COUNTY(K)
 3082  CONTINUE
       GO TO 3000
C
 3008  CONTINUE
C
C      READ THE NUMBER OF COUNTIES IN STATE(DEFAULT=98(VIRGINIA))
C
       READ(5,3090)NCOUNT
 3090  FORMAT(I3)
       GO TO 3000
C
 3009  CONTINUE
C      IF 'CHEC' DATA HEADER CARD IS READ THEN THE CHECK STATION DATA
C      (15 STATIONS) ARE TO BE UPDATED.  FOLLOWING THE HEADER CARD IS A
C      CARD WITH THE YEAR OF THE DATA BEING SUBMITTED, 19-- (2X,I2)
C      15 DATA CARDS FOLLOW...( 1 CARD FOR EACH CHECK STATION).
C
       READ(5,3060)YEAR
       I=YEAR-NBEGYR
       DO 3092 J=1,15
       READ(25'J)ISTA,BDATA,DDATA,SPIKES,AVGWT
       READ(5,3091)(BDATA(K,I),K=1,3),(DDATA(K,I),K=1,3),SPIKES(I),
      _AVGWT(I)
 3091  FORMAT(8F10.0)
       WRITE(25'J)ISTA,BDATA,DDATA,SPIKES,AVGWT
 3092  CONTINUE
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      GO TO 3000
C
C
 4000 CONTINUE
C
C     READ COUNTY NAMES (ABREVIATIONS) FOR GRAPHICS. A1 FORMAT
C
      DO 50 I=1,NCOUNT
      READ(8,40) (ABREV(J,I),J=1,16)
   40 FORMAT(16A1)
   50 CONTINUE
      IYEARS=YEAR - NBEGYR
      CALL VADMIS
C
C     IF USER IS COMMISSIONER OR PLANNER THEN SYMAP MAPS ARE NOT
C     DESIRED AND THE SECOND STEP IS ABORTED.(13 IS A RETURN CODE)
C
      IF(IUSER .EQ. 2 .OR. IUSER .EQ. 3) STOP 13
      STOP
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
      BLOCK DATA
      COMPLEX*16 FIPS(99)
      DIMENSION TK(98,40),BK(98,40),ABK(98,40),DK(98,40),PDK(98,40),
     _HDAYS(98,40),ESDAYS(98,40),SEASON(98,40),ABKSM(98,40)
      DIMENSION ICON(99,99)
      INTEGER COUNTY(100)
      INTEGER*2 ABREV(16,98),TITLES(30,24)
      COMMON/HPLOT/ABREV,TITLES
      COMMON/HARVST/TK,ABKSM,BK,ABK,DK,PDK,HDAYS,ESDAYS,SEASON,FIPS
      COMMON/INIT/IYEARS,IUSER,NCOUNT,NBEGYR,IV1,IV2,IV3,IV4,ICON,
     _DISTPT,REGPT,NEWREG,COUNTY,NODIST,NOREG
      INTEGER*2 REGPT(10)/1, 1, 2, 2, 3, 3, 0, 0, 0, 0/
      INTEGER*2 DISTPT(100)/
     1    5,  3,  1,  4,  3,  4,  1,  1,  4,  2,
     2    2,  4,  2,  4,  4,  3,  2,  5,  4,  6,
     3    4,  1,  2,  3,  4,  2,  4,  5,  3,  3,
     4    2,  3,  4,  1,  2,  5,  3,  2,  3,  6,
     5    4,  5,  3,  3,  4,  1,  6,  5,  5,  5,
     6    5,  5,  2,  3,  3,  4,  3,  5,  4,  5,
     7    2,  6,  3,  5,  5,  5,  4,  3,  1,  4,
     8    4,  4,  4,  6,  3,  2,  3,  5,  2,  1,
     9    1,  2,  2,  1,  2,  6,  3,  3,  6,  6,
     A    2,  6,  1,  2,  5,  2,  2,  5,  0,  0/
      DATA FIPS/'ACCOMACK','ALBEMARLE','ALLEGHANY','AMELIA','AMHERST',
     1'APPOMATOX','AUGUSTA','BATH','BEDFORD','BLAND','BOTETOURT',
     2'BRUNSWICK','BUCHANAN','BUCKINGHAM','CAMPBELL','CAROLINE',
     3'CARROLL','CHARLES CITY','CHARLOTTE','CHESAPEAKE','CHESTERFIELD',
     4'CLARKE','CRAIG','CULPEPER','CUMBERLAND','DICKENSON','DINWIDDIE',
     5'ESSEX','FAIRFAX','FAUQUIER','FLOYD','FLUVANNA','FRANKLIN',
     6'FREDERICK','GILES','GLOUCESTER','GOOCHLAND','GRAYSON','GREENE',
     7'GREENESVILLE','HALIFAX','HAMPTON','HANOVER','HENRICO','HENERY',
     8'HIGHLAND','ISLE OF WIGHT','JAMES CITY','KING AND QUEEN',
     9'KING GEORGE','KING WILLIAM','LANCASTER','LEE','LOUDOUN',
     1'LOUISA','LUNENBURG','MADISON','MATHEWS','MECKLENBURG',
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
     2'MIDDLESEX','MONTGOMERY','NANSEMOND - SUFF','NELSON',
     3'NEW KENT','NORTHHAMPTON','NORTHUMBERLAND','NOTTOWAY',
     4'ORANGE','PAGE','PATRICK','PITTSYLVANIA','POWHATAN',
     5'PRINCE EDWARD','PRINCE GEORGE','PRINCE WILLIAM','PULASKI',
     6'RAPPAHANNOCK','RICHMOND','ROANOKE','ROCKBRIDGE','ROCKINGHAM',
     7'RUSSELL','SCOTT','SHENANDOAH','SMYTH','SOUTHHAMPTON',
     8'SPOTSYLVANIA','STAFFORD','SURRY','SUSSEX','TAZEWELL',
     9'VIRGINIA BEACH','WARREN','WASHINGTON','WESTMORELAND',
     1'WISE','WYTHE','YORK','     '/
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      SUBROUTINE VADMIS
C
C
C     THIS SUBROUTINE CONSTITUTES THE MAJOR PORTION OF THE
C     VADMIS SYSTEM.
C
      REAL T(98),B(98),A(98),D(98)
      REAL AVTKS(2,2),AVBKS(2,2),AVABKS(2,2),AVDKS(2,2)
      REAL CAVTK(98),CAVBK(98),CAVABK(98),CAVPDK(98)
      REAL SCATKS(2),SCABKS(2),SCAABS(2),SCADKS(2)
      LOGICAL USING
      REAL ATKILL(6),ASEASN(6),PREKIL(6)
      REAL NSUN(40),X(300)
C
      REAL PEDIFF(6),PRPCT(6),DENS1(98),DENS2(98)
      REAL DCTK(20,50),DCBK(20,50),DCDK(20,50),DCABK(20,50)
      REAL DCABKS(20,50),DCPDK(20,50)
      REAL DSTP(20,50),DESDYS(20,50),DHDYS(20,50)
      REAL CYHIST(4,40),DTHIST(20,4,50,2),STHIST(4,98)
      REAL DYTK(20,40),DYBK(20,40),DYABK(20,40),DYDK(20,40),
     _DYABKS(20,40)
C
C
      REAL DYPDK(20,40),EBRTK(40),EBRBK(40),EBABKS(40),EBRABK(40)
      REAL EBRPDK(40),EBRDK(40)
      INTEGER*2 CONOST(98),CTYNO1(98),CTYNO2(98),CONO(20,50)
      INTEGER*2 CONO1(98),CONO2(98),CONO3(98),CONO4(98)
      INTEGER*2 CNAM1(98),CNAM2(98),CNAM3(98),CNAM4(98)
      INTEGER COUNTY(100),YEAR,RUN,RI,SL,YR(40),V3
      INTEGER PRED(3,5),KNTD(20),YAR,IVTYP(4)
      INTEGER*2 PTR(50),SCOUNT(5)
      INTEGER*2 ABREV(16,98),TITLES(30,24)
      COMMON/HPLOT/ABREV,TITLES
      COMMON/INIT/IYEARS,IUSER,NCOUNT,NBEGYR,IV1,IV2,IV3,IV4,ICON,
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
     _DISTPT,REGPT,NEWREG,COUNTY,NODIST,NOREG
      COMMON/VADEFP/ IRANK(3),USING(5),V1,V2,V3
      COMMON/HARVST/TK,ABKSM,BK,ABK,DK,PDK,HDAYS,ESDAYS,SEASON,FIPS
C
      DIMENSION V(15,99),ICON(99,99)
      DIMENSION ABK(98,40),ABKS(2),ABKSM(98,40),ABKSUM(98),
     _ACRES(40),ASABK(40),ASBK(40),ASABKS(40),ASDK(40),ASPDK(40),ASTK(40
     _),BK(98,40),BKS(2),BKSM(98,40),
     _ABKSS(2),BKSUM(98),DAYS(40),DK(98,40),DKS(2),DKSM(98,40),
     _ESDAYS(98,40),HDAYS(98,40),JK(2),KYEARS(2),MAX(98),
     _PDK(98,40),PDKS(2),PDKSUM(98),
     _REABK(10,40),REBK(10,40),
     _REABKS(10,40),REDK(10,40),REPDK(10,40),RETK(10,40),
     _RRABK(10,2),RRBK(10,2),RRABKS(10,2),RRDK(10,2),RRPDK(10,2),
     _RRTK(10,2),SABK(20,2),SBK(20,2),SABKS(20,2),SEABK(10,2),
     _SEASON(98,40),SEBK(10,2),SEABKS(10,2),SEDK(10,2),SEPDK(10,2),
     _SETK(10,2),SDK(20,2),SPDK(20,2),SQMA(20,40),SQMI(98,40),SQMR(10,40
     _),SQMS(40),STK(20,2),TABK(20,2),TBK(20,2),TABKS(20,2),TDK(20,2),
     _TK(98,40),TKS(2),TKSM(98,40),TKSUM(98),TPDK(20,2),TTK(20,2),
     _TYPES(40),VAR1(40),VAR2(40),VAR3(6,40)
C
      DIMENSION TKCHG(5),ABKSCH(5),BKCHG(5),ABKCHG(5),DKCHG(5),PDKCHG(5)
     _,DYTKCH(20,5),DABKSC(20,5),DYBKCH(20,5),DYABKC(20,5),DYDKCH(20,5),
     _DYPDCH(20,5),RETKCH(10,5),RABSCH(10,5),REBKCH(10,5),REABKC(10,5),
     _REDKCH(10,5),REPDCH(10,5)
      DIMENSION EBTYTK(2),ETYABS(2),EBTYBK(2),EBTYAB(2),EBTYDK(2),
     _EBTYPD(2),EBTKMN(2),EBABSM(2),EBBKMN(2),EBABMN(2),EBDKMN(2),
     _EBPDMN(2),EBTKCH(5),EBABSC(5),EBBKCH(5),EBABCH(5),EBDKCH(5),
     _EBPDCH(5),STKCH(5),SABSCH(5),SBKCH(5),SABKCH(5),SDKCH(5),
     _SPDKCH(5)
C
C
      COMPLEX*16 FIPS(99)
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      DATA VAR1,VAR2,VAR3/40*0.,40*0.,240*0./
      DATA ABKS/2*0./, ABKSUM/98*0./, ASABK/40*0./, ASBK/40*0./,
     _ASABKS/40*0./, ASDK/40*0./, ASPDK/40*0./, ASTK/40*0./, BKS/2*0./,
     _ABKSS/2*0./,BKSUM/98*0./,DKS/2*0./,
     _PDKS/2*0./,PDKSUM/98*0./,BRABK/20*0./,BRBK/20*0./,BRABKS/20*0./,
     _BRDK/20*0./, BRPDK/20*0./, BRTK/20*0./, SABK/40*0./, SBK/40*0./,
     _SABKS/40*0./, SDK/40*0./, SPDK/40*0./, SQMS/40*0./, STK/40*0./,
     _TKS/2*0./, TKSUM/98*0./,SQMA/800*0./
C
      INTEGER*2 BEGPT(10),DISTPT(100)
C
C
      IF(IUSER .EQ. 3)GO TO 2
      CALL VADFIG
      GO TO 3
    2 CALL DYHEAD
    3 CONTINUE
      USING(5)=.FALSE.
C
C      CREATE A VECTOR CONTAINING ACTUAL YEAR NUMBERS (YR(1)=47)
C
C
      N=NBEGYR
      DO 60 J=1,IYEARS
      YR(J)=N+1
      N=YR(J)
   60 CONTINUE
C
C***********************************************************************
C
C     COUNTY BASE DATA IS READ FROM DISK, NEEDED PARAMETERS ARE
C     CALCULATED AND THEN STORED FOR FUTURE USE.
C
      IPLANR=1
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
      I=0
   90 I=I+1
C
C     READ DATA FOR COUNTY I FROM DISK (UNIT 10).
C
      READ (10'I) ICN,VAR1,VAR2,VAR3
      CONOST(I)=I
      CONO1(I)=I
      CONO2(I)=I
      CONO3(I)=I
      CONO4(I)=I
C
      DO 130 K=1,IYEARS
C
C     SEASON REGULATION INFORMATION
C
      TYPES(K)=VAR3(1,K)
      DAYS(K)=VAR3(2,K)
      ACRES(K)=VAR3(3,K)
      SEASON(I,K)=VAR3(4,K)
      ESDAYS(I,K)=VAR3(5,K)
      NSUN(K)=VAR3(6,K)
      HDAYS(I,K)=DAYS(K)-NSUN(K)
      IF (ESDAYS(I,K).EQ.DAYS(K)) GO TO 100
      GO TO 110
  100 ESDAYS(I,K)=ESDAYS(I,K)-NSUN(K)
  110 SQMI(I,K)=ACRES(K)/640.
C
C     HARVEST DATA INFORMATION
C
      TK(I,K)=VAR2(K)
      TKSM(I,K)=VAR2(K)/SQMI(I,K)
      DK(I,K)=VAR1(K)
      DKSM(I,K)=VAR1(K)/SQMI(I,K)
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
      BK(I,K)=TK(I,K)-DK(I,K)
      BKSM(I,K)=BK(I,K)/SQMI(I,K)
C
C**** ANTLERED BUCK KILL IS CALCULATED BY SUBTRACTING 30% OF THE DOE
C**** KILL FROM THE BUCK KILL.  IF OTHER THAN 30 PERCENT IS DESIRED
C**** OR NEW METHODOLOGY OF CALCULATING ANTLERED BUCK KILL IS TO
C**** BE USED THEN ONLY THE ONE STATEMENT FOLLOWING THESE COMMENTS MUST
C**** BE CHANGED.
C
      ABK(I,K)=BK(I,K)-0.3*DK(I,K)
      ABKSM(I,K)=ABK(I,K)/SQMI(I,K)
      IF(TK(I,K).LE.0.0)GO TO 120
      PDK(I,K)=(DK(I,K)/TK(I,K))*100.
      GO TO 130
 120  PDK(I,K)=0.0
 130  CONTINUE
C
C     CALCULATE COUNTY HARVEST CHANGES(E.G. 73-74,74-75,75-76)
C
      IY=IYEARS-3
      IZ=IYEARS-1
      LCNT=0
      DO 170 J=IY,IZ
      LCNT=LCNT + 1
      IF(TK(I,J) .LE. 0.0)GO TO 131
      TKCHG(LCNT)=((TK(I,J+1)-TK(I,J))/TK(I,J))*100.
      GO TO 132
 131  TKCHG(LCNT)=0.0
 132  IF(ABKSM(I,J) .LE. 0.0)GO TO 133
      ABKSCH(LCNT)=((ABKSM(I,J+1)-ABKSM(I,J))/ABKSM(I,J))*100.
      GO TO 134
 133  ABKSCH(LCNT)=0.0
 134  IF(BK(I,J) .LE. 0.0)GO TO 135
      BKCHG(LCNT)=((BK(I,J+1)-BK(I,J))/BK(I,J))*100.
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
      GO TO 136
 135  BKCHG(LCNT)=0.0
 136  IF(ABK(I,J) .LE. 0.0)GO TO 137
      ABKCHG(LCNT)=((ABK(I,J+1)-ABK(I,J))/ABK(I,J))*100.
      GO TO 138
 137  ABKCHG(LCNT)=0.0
 138  IF(DK(I,J) .LE. 0.0)GO TO 139
      DKCHG(LCNT)=((DK(I,J+1)-DK(I,J))/DK(I,J))*100.
      GO TO 140
 139  DKCHG(LCNT)=0.0
 140  CONTINUE
      PDKCHG(LCNT)=PDK(I,J+1)-PDK(I,J)
 170  CONTINUE
C
C     COUNTY 10 YR. AVERAGE FOR 11 YR. SUMMARY TABLES.
C
      IDIFF = IYEARS-10
      JA = IDIFF
      JB = JA + 9
      DO 161 J=JA,JB
      TKSUM(I)=TKSUM(I)+TK(I,J)
      BKSUM(I)=BKSUM(I)+BK(I,J)
      ABKSUM(I)=ABKSUM(I)+ABK(I,J)
 161  PDKSUM(I)=PDKSUM(I)+PDK(I,J)
      CAVTK(I)=TKSUM(I)/10.
      CAVBK(I)=BKSUM(I)/10.
      CAVABK(I)=ABKSUM(I)/10.
      CAVPDK(I)=PDKSUM(I)/10.
C
C
C     IF USER=3 (PLANNER) THEN COUNTY SUMMARY IS NOT PRINTED.
C
      IF(IUSER .EQ. 3)GO TO 605
C
```

APPENDIX TABLE 1. (CONTINUED)

```
========================================================================
C      PRINT COUNTY DEER HARVEST SUMMARY: COUNTY I.
C
C      IF ONLY A FEW COUNTY SUMMARIES ARE DESIRED THEN THE FOLLOWING
C      TEST CARD CAN BE USED TO BYPASS THE PRINTING OF ALL 98 COUNTIES
C      ONLY COUNTIES 56,83,84, AND 95 WILL BE PRINTED WITH THE
C      FOLLOWING CARD.  A SECOND TEST CARD IS THEN REQUIRED LATER IN THE
C      PROGRAM TO PREVENT PRINTING 98 HISTOGRAMS.
C
C*************************PROGRAM TEST CARD*************************
C      IF(I.NE.56 .AND. I.NE.83 .AND. I.NE.84 .AND. I.NE.95)GO TO 530
C****************************
       WRITE(6,1210)YR(IYEARS),FIPS(I)
C
       DO 190 K=1,IYEARS
       IF (TYPES(K).GT.1) SEASON(I,K)=5
 190   WRITE (6,1220) YR(K),TK(I,K),ABKSM(I,K),BK(I,K),ABK(I,K),DK(I,K),P
      1DK(I,K),HDAYS(I,K),ESDAYS(I,K),SEASON(I,K)
       WRITE(6,1229)
 1229  FORMAT(10X,104('-')/6X,'HARVEST CHANGES')
       IT=3
       DO 195 J=1,3
       IM=IT-1
       WRITE(6,1239) YR(IYEARS-IT),YR(IYEARS-IM),TKCHG(J),ABKSCH(J),
      _BKCHG(J),ABKCHG(J),DKCHG(J),PDKCHG(J)
 1239  FORMAT(' ',8X,I2,'-',I2,3X,F6.2,'%',3X,F6.2,'%',7X,F6.2,'%',
      _5X,F6.2,'%',4X,F6.2,'%',4X,F6.2)
       IT=IT-1
 195   CONTINUE
C
C      IF USER IS COMMISSIONER(IUSER=2)THEN BYPASS PREDICTIONS.
C
       IF(IUSER .EQ. 2)GO TO 196
       GO TO 198
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
C      PRINT SEASON TYPE CODE FOR USFP=2
C
 196   WRITE(6,197)
 197   FORMAT('0',9X,104('-')/15X,'SEASON TYPE CODE'//15X,'1. EITHER SEX
      _ALL SEASON'/15X,'2. BUCKS ONLY'/15X,'3. EITHER SEX AT BEGINNING OF
      _ SEASON'/15X,'4. EITHER SEX AT END OF SEASON'/15X,'5. NOT A UNIFOR
      _M SEASON (SPLIT, TWO SEASON TYPES, ETC.)')
       GO TO 530
 198   CONTINUE
C
C***********************************************************************
C
C
C      CALCULATE HARVEST PREDICTIONS....FOR PAST 5 YEARS AND NEXT YEAR
C
       IFOCT=0
       ITEST=6
       IYERE=IYEARS-5
C
C              THE X VECTOR IS FILLED FOR THE REGRESSIONS.
C              FIRST....REGRESSIONS ARE MADE TO PROVIDE AN "INDEX
C              OF RELIABILITY" UTILIZING PAST PREDICTIONS AND HARVESTS.
C              SECOND....(WHEN ITEST=1)A REGRESSION IS MADE TO PREDICT
C              NEXT YEARS HARVEST.
C
C         REGRESSION BEGINS WITH DATA FROM FIFTEEN YEARS BACK.
 200   NRYEAR=IYERE-15
C
C      INITIALIZE SCOUNT, USING, AND PRED
C
       DO 220 JP=1,3
       USING(JP)=.FALSE.
       DO 210 KP=1,5
       SCOUNT(KP)=0
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      PRED(JP,KP)=0
 210  CONTINUE
 220  CONTINUE
      MINNUM=3
C
C     COUNT NUMBER OF YEARS EACH SEASON OCCURED (IGNORE ZEROS)
C
      DO 230 ID=NRYEAR,IYERE
      I1=SEASON(I,ID)
      IF (I1.NE.0) SCOUNT(I1)=SCOUNT(I1)+1
 230  CONTINUE
C
C     COUNT SEASON TYPE 4 AS A 3
C
      SCOUNT(3)=SCOUNT(3)+SCOUNT(4)
C
C     FIND HOW MANY SEASON TYPES WILL BE USED, SUM NUMBER OF
C     OBSERVATIONS, AND RANK SEASON TYPE IF IT IS BEING USED
C     (THIS IS NECESSARY FOR REGRESSION ON TWO SEASON TYPES)
C
      K=0
      NOBS=0
C
      DO 240 L=1,3
      IF (SCOUNT(L).LT.MINNUM) GO TO 240
      USING(L)=.TRUE.
      K=K+1
      IRANK(K)=L
      NOBS=NOBS+SCOUNT(L)
 240  CONTINUE
C
C     TEST FOR  PREDICTION---IF NO PREDICTION CAN BE MADE THEN GO TO
C     STATEMENT 510 IF PREDICTION IS FOR NEXT YEAR; OR GO TO 350 IF
C     PREDICTION IS(WAS)TO BE A PART OF THE PREDICTION HISTORY.
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      IF (K.GT.0) GO TO 250
      IF(ITEST.EQ.1)GO TO 510
      ACTSN=10000.
      GO TO 350
C
 250  CONTINUE
      NUMDUM=K-1
      NUMVAR=NUMDUM+4
C     TESTING AGAIN FOR PREDICTIONS AND THEN PRINTING APPROPRIATE TABLE.
      IF (NOBS.GE.NUMVAR+1)  GO TO 260
      IF(ITEST.EQ.1)GO TO 510
      ACTSN=10000.
      GO TO 350
 260  USING(4)=USING(3)
      M=0
C
C     SET PTR TO THOSE YEARS WHICH ARE BEING USED
C
      DO 270 ID=NFYEAR,IYERE
      I1=SEASON(I,ID)
      IF(I1.EQ.0 .OR. .NOT. USING(I1)) GO TO 270
      M=M+1
      PTR(M)=ID
 270  CONTINUE
C
C     FILL X ARRAY
C
      DO 320 N=1,M
      II1 = PTR(N) - 1
      II2 = M + N
      II3 = (NUMVAR-1)*M + N
      II4 = N+M+M
      II5 = II1 + 1
      TKILI = TK(I,II1)
```

APPENDIX TABLE 1. (CONTINUED)

```
      IF(TKILL .LE. 0) X(N) = 1.
      IF(TKILL .GT. 0) X(N) = ALOG(TKILL)
      BKILL = BK(I,II1)
      IF(BKILL .LE. 0) X(II2) = 1.
      IF(BKILL .GT. 0) X(II2) = ALOG(BKILL)
      TKILY = TK(I,II5)
      IF(TKILY .LE. 0) X(II3) = 1.
      IF(TKILY .GT. 0) X(II3) = ALOG(TKILY)
      HFAC = HDAYS(I,II5)
      IF(HFAC .LE. 0) X(II4) = 1.
      IF(HFAC .GT. 0) X(II4) = ALOG(HFAC)
      IF (NUMDUM.EQ.0) GO TO 320
      IS=SEASON(I,PTR(N))
      IF (IS.EQ.4) IS=3
      K=(3*NOBS)+N
C
      IF (NUMDUM.EQ.2) GO TO 280
      X(K) = 1
      IF (IS.NE.IRANK(1)) X(K)=0
      GO TO 320
C
 280  GO TO (290,300,310), IS
 290  X(K)=0
      X(K+NOBS)=1
      GO TO 320
C
 300  X(K)=1
      X(K+NOBS)=0
      GO TO 320
C
 310  X(K)=0
      X(K+NOBS)=0
C
 320  CONTINUE
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C
      V1=TK(I,IYERE)
      IF (V1.GT.0) V1=ALOG(V1)
      IF (V1.LE.0) V1=1.
      V2=BK(I,IYERE)
      IF (V2.GT.0) V2=ALOG(V2)
      IF (V2.LE.0) V2=1.
      V3=HDAYS(I,IYERE)
C
C     IF ITEST=1 THEN ACTUAL KILL AND SEASON TYPE ARE NOT AVAILABLE
C     AS PREDICTIONS ARE FOR NEXT YEAR.
C
      IF(ITEST.EQ.1)GO TO 330
      ACTKL=TK(I,IYERE+1)
      ATKILL(ITEST)=ACTKL
      ACTSN=SEASON(I,IYERE+1)
      ASEASN(ITEST)=ACTSN
      IF(ACTSN.EQ.4.)ACTSN=3.
      GO TO 340
 330  ACTKL=0.
      ACTSN=0.
C
 340  CALL REGRE(X,NOBS,NUMVAR,ACTKL,ACTSN,PRKL,ITEST,PRED)
C
C     IF ITEST =1 THEN SET ACTSN =0 TO INSURE THAT PROPER TABLE IS MADE.
C
      IF(ITEST.EQ.1)ACTSN=0.0
C
C     IF ITEST = 1, THEN GO TO 480 TO PRINT PREDICTION FOR NEXT YEAR.
C
      IF(ITEST.EQ.1)GO TO 480
 350  CONTINUE
C
C     STORE ACTUAL KILL,SEASON TYPE, & PREDICTED KILL FOR LAST 5 YEARS.
```

APPENDIX TABLE 1. (CONTINUED)

```
=================================================================
C
      PRDIFF(ITEST)=ACTKL
      PRPCT(ITEST)=ACTSN
      PREKIL(ITEST)=PRKL
      ITEST=ITEST-1
      IYERR=IYERR+1
C
C     IF PREDICTIONS FOR 5 YEARS HAVE BEEN MADE THEN PRINT PRED HISTORY.
C
      IF(ITEST.EQ.1)GO TO 360
      GO TO 200
 360  CONTINUE
C
C     PRINT PREDICTION HISTORY TABLE.
C
      WRITE(6,370)
 370  FORMAT('0',10X,56('-'),14X,'SEASON TYPE CODE',/25X,'HARVEST PREDIC
     _TION HISTORY',31X,'1. EITHER SEX ALL SEASON',/11X,56('-'),15X,'2.
     _BUCKS ONLY',/18X,'| SEASON   PREDICTED   ACTUAL',9X,'|',25X,'3. E.
     _S. AT BEGINNING OF SEASON',/13X,'YEAR |  TYPE',7X,'KILL      KILL
     _   DIFF. | % DIFF.',17X,'4. E.S. AT END OF SEASON',/11X,56('-'),15
     _X,'5. NOT A UNIFORM SEASON')
      DIFSUM=0.
      PCTSUM=0.
      INOR=0
      DO 410 LP=1,5
      IYR=5-LP
      ITT=7-LP
      IF(PRPCT(ITT).GE.9999.)GO TO 390
      DIFSUM=DIFSUM+ABS(PRDIFF(ITT))
      PCTSUM=PCTSUM+ABS(PRPCT(ITT))
      INOR=INOR+1
      WRITE(6,380)YR(IYEARS-IYR),ASEASN(ITT),PREKIL(ITT),ATKILL(ITT),
     _PRDIFF(ITT),PRPCT(ITT)
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
 380   FORMAT(13X,'19',I2,' |    ',F2.0,6X,F5.0,7X,F5.0,2X,F6.1,' | ',F6.1
      _)
       GO TO 410
 390   WRITE(6,400)YR(IYEARS-IYF)
 400   FORMAT(13X,'19',I2,' |---* NO PREDICTION',19('-'),'|',10('-'))
C
C      FOOTNOTE INDICATOR SET 'ON' TO ADD FOOTNOTE TO PREDICTION TABLE
C
       IFOOT=1
 410   CONTINUE
       WRITE(6,420)SQMI(I,IYEARS)
 420   FORMAT(' ',10X,56('-'),10X,'FOREST RANGE: ',F7.1,'  SQ. MILES')
       IF(INOR.EQ.0) GO TO 430
       AVGDFF=DIFSUM/INOR
       AVGPCT=PCTSUM/INOR
       GO TO 440
 430   AVGDFF=0.
       AVGPCT=0.
 440   CONTINUE
       WRITE(6,450)AVGDFF,AVGPCT
 450   FORMAT(35X,'AVERAGE-----',2X,F6.1,' |  ',F5.1)
       WRITE (6,460)
 460   FORMAT(11X,56('-'))
       IF(IFOOT.EQ.1)WRITE(6,470)
 470   FORMAT(12X,'* NO PREDICTION FOR SEASON TYPE HELD')
C
C      RETURN TO 200 TO PREDICT NEXT YEARS HARVEST.
C
       GO TO 200
C
 480   CONTINUE
C      IF ACTSN IS .GE. 9999. THEN NO PREDICTION WAS MADE AND NO
C      PREDICTIONS WILL BE PRINTED.
       IF(ACTSN.GE.9999.)GO TO 510
```

```
================================================================================
      IRAEY=IYEARS + 47
C
C     PRINT HARVEST PREDICTIONS FOR NEXT YEAR.
C
      WRITE(6,490)IRAEY,FIPS(I)
 490  FORMAT('1',16X,'HARVEST PREDICTIONS FOR 19',I2,'---',2A8,/12X,51('
     _-'),/23X,'SEASON TYPES|    1    |    2    |   3&4    |',/12X,51('-'))
      WRITE(6,500)((PRED(J,K),J=1,3),K=2,5)
 500  FORMAT(12X,'HUNTING DAYS IN SEASON | ',I5,'  | ',I5,'  | ',I5,'  |
     _',/12X,'LOWER LIMIT',12X,'| ',I5,'  | ',I5,'  | ',I5,'  |',/12X,'M
     _EAN',19X,'|-',I5,' -|-',I5,' -|-',I5,' -|',/12X,'UPPER LIMIT',12X,
     _'| ',I5,'  | ',I5,'  | ',I5,'  |',/12X,51('-')//)
      GO TO 530
 510  CONTINUE
C     PREDICTION TABLE THAT IS PRODUCED WHEN NO PREDICTION IS MADE.
      IRAEY=IYEARS + 47
      WRITE(6,490)IRAEY,FIPS(I)
      WRITE(6,520)
 520  FORMAT(12X,'HUNTING DAYS IN SEASON |',26X,'|',/12X,'LOWER LIMIT',1
     _2X,'|',26X,'|',/12X,'MEAN',19X,'|-NO PREDICTIONS POSSIBLE -|',/12X
     _,'UPPER LIMIT',12X,'|',26X,'|',/12X,51('-')//)
 530  CONTINUE
C--------PREPARATIONS FOR COMPUTING COUNTY,DISTRICT,AND STATE HISTOGRAMS
C          IVID-------VARIABLE INDICATOR....INDICATES HOW MANY
C                     VARIABLESARE TO BE GRAPHED
C         IVTYP.....VARIABLE INDICATOR; IDENTIFIES THE RELATIVE
C                     POSITION IN THE STORAGE ARRAYS(__HISTS) OF THE
C                     VARIABLES TO BE GRAPHED.
C                         IVTYP(1)=1....1ST HISTOGRAM IS TOTAL KIL
C                         IVTYP(1)=2...1ST HISTCGRAM IS BUCK KILL
C         CYHIST(GRAPH NO.,YEAR)----COUNTY
C         STHIST(GRAPH NO.,COUNTY)----STATE
C         DTHIST(DISTRICT,GRAPH NO.,COUNTY POINTER)----DISTRICT
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      IVID=0
C
C     IPTR = DISTRICT OF COUNTY I
C
      IPTR=DISTPT(I)
C
C     KNTD = SUMS (COUNTS) NO. OF COUNTIES IN DISTRICT IPTR
C
      KNTD(IPTR)=KNTD(IPTR)+1
C
C     ND = (ND)TH COUNTY IN DISTRICT IPTR
C
      ND=KNTD(IPTR)
C
C     CONO KEEPS TRACK OF COUNTIES FOR PRINTING NAMES.
C
      CONO(IPTR,ND)=I
C
C
C     IF IV1=1, TOTAL KILL HISTOGRAM IS DESIRED.
C
      IF(IV1.NE.1)GO TO 550
      IVID=IVID+1
      IVTYP(IVID)=1
      DO 540 IY=1,IYEARS
 540  CYHIST(IVID,IY)=TK(I,IY)
      STHIST(IVID,I)=TKSM(I,IYEARS)
      DTHIST(IPTR,IVID,ND,1)=TKSM(I,IYEARS-1)
      DTHIST(IPTR,IVID,ND,2)=TKSM(I,IYEARS)
C
C     IF IV2=1, BUCK KILL HISTO IS DESIRED
C
 550  IF(IV2.NE.1)GO TO 570
      IVID=IVID+1
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
      IVTYP(IVID)=2
      DO 560 IY=1,IYEARS
 560  CYHIST(IVID,IY)=BK(I,IY)
      STHIST(IVID,I)=BKSM(I,IYEARS)
      DTHIST(IPTR,IVID,ND,1)=BKSM(I,IYEARS-1)
      DTHIST(IPTR,IVID,ND,2)=BKSM(I,IYEARS)
C
C     IF IV3=1, ANTL. BUCK KILL HISTO IS DESIRED
C
 570  IF(IV3.NE.1)GO TO 590
      IVID=IVID+1
      IVTYP(IVID)=3
      DO 580 IY=1,IYEARS
 580  CYHIST(IVID,IY)=ABK(I,IY)
      STHIST(IVID,I)=ABKSM(I,IYEARS)
      DTHIST(IPTR,IVID,ND,1)=ABKSM(I,IYEARS-1)
      DTHIST(IPTR,IVID,ND,2)=ABKSM(I,IYEARS)
C
C     IF IV4=1, DOE KILL HISTO IS DESIRED
C
 590  IF(IV4.NE.1)GO TO 605
      IVID=IVID+1
      IVTYP(IVID)=4
      DO 600 IY=1,IYEARS
 600  CYHIST(IVID,IY)=DK(I,IY)
      STHIST(IVID,I)=DKSM(I,IYEARS)
      DTHIST(IPTR,IVID,ND,1)=DKSM(I,IYEARS-1)
      DTHIST(IPTR,IVID,ND,2)=DKSM(I,IYEARS)
 605  CONTINUE
C
C     IF USER IS PLANNER THEN BYPASS COUNTY HISTOGRAMS.
C
      IF(IUSER .EQ. 3 .AND. I .LT. NCOUNT)GO TO 90
      IF(IUSER .EQ. 3  .AND.  I .GE. NCOUNT)GO TO 700
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
C
C      THE FOLLOWING CARD MAY BE USED TO PRINT COUNTY SUMMARIES FOR
C      ONLY A FEW SELECTED COUNTIES.  USED IN COMBINATION WITH
C      TEST CARD EARLIER IN PROGRAM.
C
C************************PROGRAM TEST CARD**************************
C      IF(I.NE.56 .AND. I.NE.83 .AND. I.NE.84 .AND. I.NE.95)GO TO 690
C************************
C
C      BEGIN COUNTY HISTOGRAMS.....
C      IF IVTYP(1)=0 NO GRAPHS WILL BE MADE.
C
 610   IF(IVTYP(1).EQ.0)GO TO 690
       YAR=IYEARS
       DO 620 IY=1,YAR
       DENS1(IY)=CYHIST(1,IY)
 620   CONTINUE
C
C      IF IVTYP(2)=0....ONLY 1 GRAPH IS TO BE MADE.
C
       IF(IVTYP(2).EQ.0)GO TO 640
       DO 630 IY=1,YAR
       DENS2(IY)=CYHIST(2,IY)
 630   CONTINUE
       ID1=IVTYP(1)
       ID2=IVTYP(2)
C
C--------IHCNT....INDICATES IF THE GRAPH IS THE SECOND GRAPH SO A
C             NEW PAGE CAN BE BEGUN.IHCNT=1..FIRST GRAPH; =2...NEW PAGE
C
C      IF USER IS BIOLOGIST THEN HISTOGRAMS MAY OCCUR ON SAME PAGE AS
C      THE DEER HARVEST PREDICTIONS.    IF USER IS THE COMMISSIONER THEN
C      HISTOGRAMS MUST BEGIN ON A NEW PAGE.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
      IHCNT=1
      IF(IUSER .EQ. 2)IHCNT=2
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,YAR,YAR,I,2,0,IHCNT)
      GO TO 650
  640 ID1=IVTYP(1)
      ID2=IVTYP(2)
      IHCNT=1
      IF(IUSER .EQ. 2)IHCNT=2
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,YAR,YAR,I,1,0,IHCNT)
      GO TO 690
  650 CONTINUE
C     IF IVTYP(3)=0 THEN NO MORE GRAPHS ARE TO BE MADE.
      IF(IVTYP(3).EQ.0) GO TO 690
      DO 660 IY=1,YAR
      DENS1(IY)=CYHIST(3,IY)
  660 CONTINUE
C     IF IVTYP(4)=0 THEN ONLY ONE GRAPH (ON 2ND PAGE) WILL BE MADE.
      IF(IVTYP(4).EQ.0) GO TO 680
      DO 670 IY=1,YAR
      DENS2(IY)=CYHIST(4,IY)
  670 CONTINUE
      ID1=IVTYP(3)
      ID2=IVTYP(4)
      IHCNT=2
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,YAR,YAR,I,2,0,IHCNT)
      GO TO 690
  680 ID1=IVTYP(3)
      ID2=IVTYP(4)
      IHCNT=2
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,YAR,YAR,I,1,0,IHCNT)
  690 CONTINUE
C
C     RETURN TO BEGINNING OF COUNTY SUMMARY TO START NEXT COUNTY.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
      IF(I .LT. NCOUNT) GO TO 90
C
C
 700  CONTINUE
C
C*************************************************************************
C
C     DISTRICT SUMMARIES
C
C*************************************************************************
C
C     SUM COUNTY DATA BY YEAR FOR EACH DISTRICT
C
      DO 715 I=1,NCOUNT
      IPTR=DISTPT(I)
      DO 710 J=1,IYEARS
      DYTK(IPTR,J)=DYTK(IPTR,J)+TK(I,J)
      SQMA(IPTR,J)=SQMA(IPTR,J)+SQMI(I,J)
      DYBK(IPTR,J)=DYBK(IPTR,J)+BK(I,J)
      DYABK(IPTR,J)=DYABK(IPTR,J)+ABK(I,J)
      DYDK(IPTR,J)=DYDK(IPTR,J)+DK(I,J)
      IF(DYTK(IPTR,J).LE.0.0)GO TO 705
      DYPDK(IPTR,J)=(DYDK(IPTR,J)/DYTK(IPTR,J))*100.
 705  DYABKS(IPTR,J)=DYABK(IPTR,J)/SQMA(IPTR,J)
 710  CONTINUE
 715  CONTINUE
C
C     TEN YEAR MEANS FOR DISTRICTS.
C
      IDIFF=IYEARS - 19
      DO 720 J=1,NODIST
      DO 720 LL=1,2
      JA = (LL-1) * 10  +  IDIFF
      JB = JA + 9
```

APPENDIX TABLE 1. (CONTINUED)

```
============================================================================
      DO 720 K=JA,JB
      STK(J,LL)=STK(J,LL)+DYTK(J,K)
      SABKS(J,LL)=SABKS(J,LL)+DYABKS(J,K)
      SBK(J,LL)=SBK(J,LL)+DYBK(J,K)
      SABK(J,LL)=SABK(J,LL)+DYABK(J,K)
      SDK(J,LL)=SDK(J,LL)+DYDK(J,K)
      SPDK(J,LL)=SPDK(J,LL)+DYPDK(J,K)
      TTK(J,LL)=STK(J,LL)/10.
      TABKS(J,LL)=SABKS(J,LL)/10.
      TBK(J,LL)=SBK(J,LL)/10.
      TABK(J,LL)=SABK(J,LL)/10.
      TDK(J,LL)=SDK(J,LL)/10.
 720  TPDK(J,LL)=SPDK(J,LL)/10.
C
C     CALCULATE DISTRICT HARVEST CHANGES FOR LAST THREE YEARS
C
      IY=IYEARS-5
      IM=IYEARS-1
      DO 721 J=1,NODIST
      LCNT=0
      DO 718 K=IY,IM
      LCNT=LCNT+1
      DYTKCH(J,LCNT)=((DYTK(J,K+1)-DYTK(J,K))/DYTK(J,K))*100.
      DABKSC(J,LCNT)=((DYABKS(J,K+1)-DYABKS(J,K))/DYABKS(J,K))*100.
      DYBKCH(J,LCNT)=((DYBK(J,K+1)-DYBK(J,K))/DYBK(J,K))*100.
      DYABKC(J,LCNT)=((DYABK(J,K+1)-DYABK(J,K))/DYABK(J,K))*100.
      DYDKCH(J,LCNT)=((DYDK(J,K+1)-DYDK(J,K))/DYDK(J,K))*100.
      DYPDCH(J,LCNT)=DYPDK(J,K+1)-DYPDK(J,K)
 718  CONTINUE
 721  CONTINUE
C
C     IF USER IS PLANNER THEN BYPASS DISTRICT SUMMARIES AND BEGIN
C     PRINTING DYNAPLAN CHAPTER.
C
```

```
==============================================================================
      IF(IUSER .EQ. 3)GO TO 4010
C
C
C     PRINT DISTRICT SUMMARIES: BY YEAR, BY COUNTY, AND MAKE HISTOGRAMS
C
      DO 920 I=1,NODIST
C
C     PRINT DISTRICT SUMMARY, TOTALS BY YEAR.
C
C     MD IS A VARIABLE POINTER WHICH IDENTIFIES THE PROPER DISTRICT
C     TITLE.  FIRST DISTRICT TITLE IS 11TH TITLE CARD READ INTO 'TITLES'
C
      MD=I + 10
      WRITE (6,1260) YR(IYEARS),(TITLES(MD,K),K=1,24)
      WRITE(6,1290) (YR(K),DYTK(I,K),DYABKS(I,K),DYBK(I,K),DYABK(I,K),DYD
     1K(I,K),DYPDK(I,K),K=1,IYEARS)
      WRITE(6,726)
 726  FORMAT(15X,91('-'))
      WRITE(6,722)
 722  FORMAT(11X,'HARVEST CHANGES'/)
      IT=5
      DO 724 J=1,5
      IM=IT-1
      WRITE(6,723)YR(IYEARS-IT),YR(IYEARS-IM),DYTKCH(I,J),DABKSC(I,J),
     _DYBKCH(I,J),DYABKC(I,J),DYDKCH(I,J),DYPDCH(I,J)
 723  FORMAT(' ',14X,I2,'-',I2,5X,F6.2,'%',10X,F6.2,'%',7X,F6.2,'%',
     _7X,F6.2,'%',6X,F6.2,'%',7X,F6.2)
      IT=IT-1
 724  CONTINUE
C
      JK(1)=YR(IYEARS-19)
      JK(2)=YR(IYEARS-9)
      KYEARS(1)=YR(IYEARS-10)
      KYEARS(2)=YR(IYEARS)
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
C
C
      WRITE (6,1300)
      WRITE(6,1310)  (JK(L),KYEARS(I),TTK(I,L),TABKS(I,L),TBK(I,L),TABK(I
     1,L),TDK(I,L),TPDK(I,L),I=1,2)
C
C     PREPARE FOR DISTRICT SUMMARY: BY COUNTY FOR CURRENT YEAR.
C
      IDC=0
      DO 725 J=1,NCOUNT
      IF(DISTPT(J).NE.I)GO TO 725
      IDC=IDC+1
      DCTK(I,IDC)=TK(J,IYEARS)
      DCABKS(I,IDC)=ABKSM(J,IYEARS)
      DCBK(I,IDC)=BK(J,IYEARS)
      DCABK(I,IDC)=ABK(J,IYEARS)
      DCDK(I,IDC)=DK(J,IYEARS)
      DCPDK(I,IDC)=PDK(J,IYEARS)
      DSTP(I,IDC)=SEASON(J,IYEARS)
      DESDYS(I,IDC)=ESDAYS(J,IYEARS)
      DHDYS(I,IDC)=HDAYS(J,IYEARS)
 725  CONTINUE
C
C     PRINT DISTRICT SUMMARY BY COUNTY FOR CURRENT YEAR.
C
      WRITE(6,780)YR(IYEARS),(TITLES(MD,K),K=1,24)
 780  FORMAT('1',32X,'DISTRICT DEER HARVEST SUMMARY BY COUNTIES;  19',I2
     _,//45X,24A1//)
      WRITE(6,790)
 790  FORMAT(5X,115('-'))
      WRITE(6,800)
 800  FORMAT(' ',31X,'ANTLERED',52X,'HUNTING  ANY DEER',/23X,'TOTAL   BU
     _CK KILL/',15X,'ANTLERED',15X,'% DOE IN    DAYS IN    DAYS IN   TYP
     _E OF',/10X,'COUNTY',8X,'KILL  SQ.MI.RANGE   BUCK KILL   BUCK KILL
```

APPENDIX TABLE 1. (CONTINUED)

```
========================================================================
     _   DOE KILL  TOTAL KILL    SEASON    SEASON     SEASON',/5X,115('-'
     _))
C
      JNUM=KNTD(I)
      DO 820 J=1,JNUM
      ICT=CONO(I,J)
      WRITE(6,810)FIPS(ICT),DCTK(I,J),DCABKS(I,J),DCBK(I,J),DCABK(I,J),D
     _CDK(I,J),DCPDK(I,J),DHDYS(I,J),DFSDYS(I,J),DSTP(I,J)
 810  FORMAT(5X,2A8,F7.0,5X,F6.2,6X,F6.0,6X,F6.0,6X,F6.0,5X,F6.2,7X,F4.0
     _,6X,F4.0,7X,F3.0)
 820  CONTINUE
      WRITE(6,790)
      WRITE(6,830)DYTK(I,IYEARS),DYABKS(I,IYEARS),DYBK(I,IYEARS),
     _DYABK(I,IYEARS),DYDK(I,IYEARS),DYPDK(I,IYEARS)
 830  FORMAT(' ', 9X,'TOTALS',5X,F7.0,5X,F6.2,5X,F7.0,5X,F7.0,5X,F7.0,5X
     _,F6.2)
      WRITE(6,197)
C
C     IF USER=2 (COMMISSIONER) THEN SKIP DISTRICT HISTOGRAMS.
C
      IF(IUSER .EQ. 2)GO TO 910
C
C
C     BEGIN DISTRICT HISTOGRAMS
C     WHEN IVTYP(X)=0 NO MORE GRAPHS ARE TO BE MADE.
C
      IF(IVTYP(1) .EQ. 0)GO TO 910
      DO 840 J=1,JNUM
      DENS1(J)=DTHIST(I,1,J,1)
      DENS2(J)=DTHIST(I,1,J,2)
      CTYNO1(J)=CONO(I,J)
 840  CONTINUE
      ID1=IVTYP(1)+4
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID1,JNUM,IYEARS,0,4,I,IHCNT)
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
      IF(IVTYP(2).EQ.0) GO TO 910
      DO 850 J=1,JNUM
      DENS1(J)=DTHIST(I,2,J,1)
      DENS2(J)=DTHIST(I,2,J,2)
      CTYNO1(J)=CONO(I,J)
  850 CONTINUE
      ID1=IVTYP(2)+4
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID1,JNUM,IYEARS,0,4,I,IHCNT)
C
      IF(IVTYP(3).EQ.0) GO TO 910
      DO 860 J=1,JNUM
      DENS1(J)=DTHIST(I,3,J,1)
      DENS2(J)=DTHIST(I,3,J,2)
      CTYNO1(J)=CONO(I,J)
  860 CONTINUE
      ID1=IVTYP(3)+4
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID1,JNUM,IYEARS,0,4,I,IHCNT)
C
      IF(IVTYP(4).EQ.0) GO TO 910
      DO 870 J=1,JNUM
      DENS1(J)=DTHIST(I,4,J,1)
      DENS2(J)=DTHIST(I,4,J,2)
      CTYNO1(J)=CONO(I,J)
  870 CONTINUE
      ID1=IVTYP(4)+4
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID1,JNUM,IYEARS,0,4,I,IHCNT)
C
  910 CONTINUE
  920 CONTINUE
C
C*********************************************************************
C
C     REGION SUMMARIES---MOUNTAIN,PIEDMONT, & TIDEWATER
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
C
C***************************************************************************
C      SUM DISTRICTS INTO APPROPRIATE REGIONS
C
      DO 730 IDIST=1,NODIST
      J=REGPT(IDIST)
      DO 730 I=1,IYEARS
      RETK(J,I)=RETK(J,I)+DYTK(IDIST,I)
      SQMR(J,I)=SQMR(J,I)+SQMA(IDIST,I)
      REBK(J,I)=REBK(J,I)+DYBK(IDIST,I)
      REABK(J,I)=REABK(J,I)+DYABK(IDIST,I)
      REABKS(J,I)=REABK(J,I)/SQMR(J,I)
      REDK(J,I)=REDK(J,I)+DYDK(IDIST,I)
  730 REPDK(J,I)=REDK(J,I)/RETK(J,I)*100.
C
C      TEN YEAR MEANS FOR REGIONS
C
      DO 740 K=1,NOREG
      DO 740 RL=1,2
      JA = (RL-1) * 10 + IDIFF
      JB = JA + 9
      DO 735 I=JA,JB
      RRTK(K,RL)=RRTK(K,RL)+RETK(K,I)
      RRABKS(K,RL)=RRABKS(K,RL)+REABKS(K,I)
      RRBK(K,RL)=RRBK(K,RL)+REBK(K,I)
      RRABK(K,RL)=RRABK(K,RL)+REABK(K,I)
      RRDK(K,RL)=RRDK(K,RL)+REDK(K,I)
  735 RRPDK(K,RL)=RRPDK(K,RL)+REPDK(K,I)
      SETK(K,RL)=RRTK(K,RL)/10.
      SEABKS(K,RL)=RRABKS(K,RL)/10.
      SEBK(K,RL)=RRBK(K,RL)/10.
      SEABK(K,RL)=RRABK(K,RL)/10.
      SEDK(K,RL)=RRDK(K,RL)/10.
  740 SEPDK(K,RL)=RRPDK(K,RL)/10.
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C
C      CALCULATE RECENT REGIONAL HARVEST CHANGES
C
       IY=IYEARS-5
       IM=IYEARS-1
       DO 742 J=1,NOREG
       LCNT=0
       DO 741 I=IY,IM
       LCNT=LCNT+1
       RETKCH(J,LCNT)=((RETK(J,I+1)-RETK(J,I))/RETK(J,I))*100.
       RABSCH(J,LCNT)=((REABKS(J,I+1)-REABKS(J,I))/REABKS(J,I))*100.
       REBKCH(J,LCNT)=((REBK(J,I+1)-REBK(J,I))/REBK(J,I))*100.
       REABKC(J,LCNT)=((REABK(J,I+1)-REABK(J,I))/REBK(J,I))*100.
       REDKCH(J,LCNT)=((REDK(J,I+1)-REDK(J,I))/REDK(J,I))*100.
       REPDCH(J,LCNT)=REPDK(J,I+1)-REPDK(J,I)
 741   CONTINUE
 742   CONTINUE
C
C      PRINT REGION SUMMARIES
C
       IRSTPT=NODIST + 11
       DO 930 I=1,NOREG
       ITITL=IRSTPT + I - 1
       WRITE (6,1270) YR(IYEARS),(TITLES(ITITL,K),K=1,24)
       WRITE(6,1290) (YR(K),RETK(I,K),REABKS(I,K),REBK(I,K),REABK(I,K),RED
      1K(I,K),REPDK(I,K),K=1,IYEARS)
       WRITE(6,726)
       WRITE(6,722)
       IT=5
       DO 743 J=1,5
       IM=IT-1
       WRITE(6,723)YR(IYEARS-IT),YR(IYEARS-IM),RETKCH(I,J),RABSCH(I,J),
      _REBKCH(I,J),REABKC(I,J),REDKCH(I,J),REPDCH(I,J)
       IT=IT-1
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
 743  CONTINUE
      IRD=IRD+1
      WRITE (6,1300)
      WRITE(6,1310) (JK(L),KYEARS(L),SETK(I,L),SEABKS(I,L),SEBK(I,L),SEAB
     1K(I,L),SEDK(I,L),SEPDK(I,L),I=1,2)
 930  CONTINUE
C
C     IF NEW REGIONS ARE USED THEN EAST AND WEST OF BLUE RIDGE ARE
C     MEANINGLESS AND MUST BE BYPASSED.  IF NEWREG=1 THEN NEW REGIONS
C     ARE BEING USED.
C
      IF(NEWREG .EQ. 1) GO TO 5000
C
C
C     EAST OF BLUE RIDGE TOTALS...(WEST OF B.R. = REGION 1)
C
      DO 746 I=1,IYEARS
      EBRTK(I)=RETK(2,I)+RETK(3,I)
      EBRBK(I)=REBK(2,I)+REBK(3,I)
      EBRABK(I)=REABK(2,I)+REABK(3,I)
      EBRDK(I)=REDK(2,I)+REDK(3,I)
      EBRPDK(I)=(EBRDK(I)/EBRTK(I))*100.
      SQMEBR=SQMR(2,I)+SQMR(3,1)
      EBABKS(I)=EBRABK(I)/SQMEBR
 746  CONTINUE
C
C     TEN YEAR MEANS FOR EAST OF THE BLUE RIDGE
C
      DO 745 I=1,2
      JA=(I-1)*10 + IDIFF
      JB=JA+9
      DO 744 J=JA,JB
      EBTYTK(I)=EBTYTK(I)+EBRTK(J)
      ETYABS(I)=ETYABS(I)+EBABKS(J)
```

APPENDIX TABLE 1. (CONTINUED)

```
========================================================================
      EBTYBK(I)=EBTYBK(I)+EBRBK(J)
      EBTYAB(I)=EBTYAB(I)+EBRABK(J)
      EBTYDK(I)=EBTYDK(I)+EBRDK(J)
      EBTYPD(I)=EBTYPD(I)+EBRPDK(J)
  744 CONTINUE
      EBTKMN(I)=EBTYTK(I)/10.
      EBABSM(I)=ETYABS(I)/10.
      EBBKMN(I)=EBTYBK(I)/10.
      EBABMN(I)=EBTYAB(I)/10.
      EBDKMN(I)=EBTYDK(I)/10.
      EBPDMN(I)=EBTYPD(I)/10.
  745 CONTINUE
C
C     RECENT HARVEST CHANGES FOR EAST OF THE BLUE RIDGE
C
      IY=IYEARS-5
      IM=IYEARS-1
      LCNT=0
      DO751 I=IY,IM
      LCNT=LCNT+1
      EBTKCH(LCNT)=(EBRTK(I+1)-EBRTK(I))/EBRTK(I)*100.
      EBABSC(LCNT)=(EBABKS(I+1)-EBABKS(I))/EBABKS(I)*100.
      EBBKCH(LCNT)=(EBRBK(I+1)-EBRBK(I))/EBRBK(I)*100.
      EBABCH(LCNT)=(EBRABK(I+1)-EBRABK(I))/EBRABK(I)*100.
      EBDKCH(LCNT)=(EBRDK(I+1)-EBRDK(I))/EBRDK(I)*100.
      EBPDCH(LCNT)=(EBRPDK(I+1)-EBRPDK(I))
  751 CONTINUE
C
C     EAST OF BLUE RIDGE SUMMARY IS PRINTED
C
C     TITLES(20,K) ...WITH CONSTANT 20 IS ALLOWED BECAUSE EAST OF BLUE
C     RIDGE IS ONLY PRINTED WHEN NORMAL REGIONS AND TITLES ARE BEING
C     USED( VIRGINIA).
C
```

```
==========================================================================
      WRITE(6,1270)  YR(IYEARS),(TITLES(20,K),K=1,24)
      WRITE(6,1290) (YR(K),EBRTK(K),EBABKS(K),EBRBK(K),EBRABK(K),
     _EBRDK(K),EBRPDK(K),K=1,IYEARS)
      WRITE(6,726)
      WRITE(6,722)
C
      IT=5
      DO 752 I=1,5
      IM=IT-1
      WRITE(6,723)YR(IYEARS-IT),YR(IYEARS-IM),EBTKCH(I),EBABSC(I),
     _EBBKCH(I),EBABCH(I),EBDKCH(I),EBPDCH(I)
      IT=IT-1
 752  CONTINUE
      WRITE(6,1300)
      WRITE(6,1310) (JK(L),KYEARS(L),EBTKMN(L),EBABSM(L),EBBKMN(L),
     _EBABMN(L),EBDKMN(L),EBPDMN(L),L=1,2)
C
C
C     EAST & WEST OF B.R. COUNTY MEANS....FOR CURRENT YEAR AND LAST YEAR
C
      LYR=IYEARS-1
      DO 749 J=LYR,IYEARS
      L=1
      IF(J .EQ. IYEARS) L=2
      DO 747 I=1,NCOUNT
      K=1
      IF(DISTPT(I).GE.3) K=2
      AVTKS(L,K)=AVTKS(L,K)+TKSM(I,J)
      AVBKS(L,K)=AVBKS(L,K)+BKSM(I,J)
      AVABKS(L,K)=AVABKS(L,K)+ABKSM(I,J)
      AVDKS(L,K)=AVDKS(L,K)+DKSM(I,J)
 747  CONTINUE
      AVTKS(L,1)=AVTKS(L,1)/31.
      AVBKS(L,1)=AVBKS(L,1)/31.
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      AVABKS(L,1)=AVABKS(L,1)/31.
      AVDKS(L,1)=AVDKS(L,1)/31.
      AVTKS(L,2)=AVTKS(L,2)/67.
      AVBKS(L,2)=AVBKS(L,2)/67.
      AVABKS(L,2)=AVABKS(L,2)/67.
      AVDKS(L,2)=AVDKS(L,2)/67.
 749  CONTINUE
C
C     EAST & WEST OF B.R. TEN YEAR AVERAGES..(IYEARS-10 TO IYEARS-1)
C
      KA=IYEARS-1
      JA=IYEARS-10
      DO 748 I=JA,KA
C
      TAETK=TAETK+EBRTK(I)
      TAEBK=TAEBK+EBRBK(I)
      TAEABK=TAEABK+EBRABK(I)
      TAEPDK=TAEPDK+EBRPDK(I)
C
      TAWTK=TAWTK+RETK(1,I)
      TAWBK=TAWBK+REBK(1,I)
      TAWABK=TAWABK+REABK(1,I)
      TAWPDK=TAWPDK+REPDK(1,I)
 748  CONTINUE
      TAETK=TAETK/10.
      TAEBK=TAEBK/10.
      TAEABK=TAEABK/10.
      TAEPDK=TAEPDK/10.
C
      TAWTK=TAWTK/10.
      TAWBK=TAWBK/10.
      TAWABK=TAWABK/10.
      TAWPDK=TAWPDK/10.
C
```

```
==============================================================================
 5000 CONTINUE
C
C
C*****************************************************************************
C
C       PREPARE FOR STATE SUMMARY: BY YEAR
C
C
        DO 760 I=1,IYEARS
        DO 750 K=1,NOREG
        ASTK(I)=ASTK(I)+RETK(K,I)
        SQMS(I)=SQMR(K,I)+SQMS(I)
        ASBK(I)=ASBK(I)+REBK(K,I)
        ASABK(I)=ASABK(I)+REABK(K,I)
        ASDK(I)=ASDK(I)+REDK(K,I)
  750   ASPDK(I)=ASDK(I)/ASTK(I)
        ASABKS(I)=ASABK(I)/SQMS(I)
  760   ASPDK(I)=ASPDK(I)*100.00
C
C       STATE HARVEST CHANGES ARE CALCULATED
C
        LCNT=0
        IY=IYEARS-5
        IM=IYEARS-1
        DO 755 I=IY,IM
        LCNT=LCNT+1
        STKCH(LCNT)=(ASTK(I+1)-ASTK(I))/ASTK(I)*100.
        SABSCH(LCNT)=(ASABKS(I+1)-ASABKS(I))/ASABKS(I)*100.
        SBKCH(LCNT)=(ASBK(I+1)-ASBK(I))/ASBK(I)*100.
        SABKCH(LCNT)=(ASABK(I+1)-ASABK(I))/ASABK(I)*100.
        SDKCH(LCNT)=(ASDK(I+1)-ASDK(I))/ASDK(I)*100.
        SPDKCH(LCNT)=(ASPDK(I+1)-ASPDK(I))
  755   CONTINUE
C
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C      TEN YEAR MEANS FOR STATE
C
       DO 770 SL=1,2
       JA = (SL-1) * 10 + IDIFF
       JB = JA + 9
       DO 765 J=JA,JB
       TKS(SL)=TKS(SL)+ASTK(J)
       ABKSS(SL)=ABKSS(SL)+ASABKS(J)
       BKS(SL)=BKS(SL)+ASBK(J)
       ABKS(SL)=ABKS(SL)+ASABK(J)
       DKS(SL)=DKS(SL)+ASDK(J)
 765   PDKS(SL)=PDKS(SL)+ASPDK(J)
       TKS(SL)=TKS(SL)/10.
       ABKSS(SL)=ABKSS(SL)/10.
       BKS(SL)=BKS(SL)/10.
       ABKS(SL)=ABKS(SL)/10.
       PDKS(SL)=PDKS(SL)/10.
 770   DKS(SL)=DKS(SL)/10.
C
C      STATEWIDE COUNTY AVERAGES FOR CURRENT YEAR.
C
       LYR=IYEARS-1
       DO 774 J=LYR,IYEARS
       L=1
       IF(J .EQ. IYEARS) L=2
       DO 775 I=1,NCOUNT
       SCATKS(L)=SCATKS(L)+TKSM(I,J)
       SCABKS(L)=SCABKS(L)+BKSM(I,J)
       SCAABS(L)=SCAABS(L)+ABKSM(I,J)
       SCADKS(L)=SCADKS(L)+DKSM(I,J)
 775   CONTINUE
       SCATKS(L)=SCATKS(L)/NCOUNT
       SCABKS(L)=SCABKS(L)/NCOUNT
       SCAABS(L)=SCAABS(L)/NCOUNT
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SCADKS(L)=SCADKS(L)/NCOUNT
 774  CONTINUE
C
C
C     STATEWIDE 10 YEAR AVERAGES FOR 11 YEAR COUNTY SUMMARIES.
C
      AVTK=(TKS(2)*10.-ASTK(IYEARS)+ASTK(IYEARS-10))/10.
      AVBK=(BKS(2)*10.-ASBK(IYEARS)+ASBK(IYEARS-10))/10.
      AVABK=(ABKS(2)*10.-ASABK(IYEARS)+ASABK(IYEARS-10))/10.
      AVPDK=(PDKS(2)*10.-ASPDK(IYEARS)+ASPDK(IYEARS-10))/10.
C
C     PRINT STATE SUMMARY: BY YEAR
C
      WRITE (6,1280) YR(IYEARS)
      WRITE(6,1290) (YR(K),ASTK(K),ASABKS(K),ASBK(K),ASABK(K),ASDK(K),ASP
     1DK(K),K=1,IYEARS)
      WRITE(6,726)
      WRITE(6,722)
C
      IT=5
      DO 776 I=1,5
      IM=IT-1
      WRITE(6,723)YR(IYEARS-IT),YR(IYEARS-IM),STKCH(I),SABSCH(I),
     _SBKCH(I),SABKCH(I),SDKCH(I),SPDKCH(I)
      IT=IT-1
 776  CONTINUE
      WRITE (6,1300)
      WRITE(6,1310) (JK(L),KYEARS(L),TKS(L),ABKSS(L),BKS(L),ABKS(L),DKS(L
     1),PDKS(L),L=1,2)
C
C--------MAKING HISTOGRAMS FOR STATE TOTALS/YEAR
C
      IF(IVTYP(1).EQ.0)GO TO 1060
      DO 990 I=1,IYEARS
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
  990 DENS1(I)=ASTK(I)
      IF(IVTYP(2).EQ.0)GO TO 1010
      DO 1000 I=1,IYEARS
1000  DENS2(I)=ASBK(I)
      ID1=IVTYP(1)
      ID2=IVTYP(2)
C
C------- CTYNO IS USED AS A DUMMY FOR YEARS------------
C
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,IYEARS,IYEARS,0,6,0,IHCNT)
      GO TO 1020
1010  ID1=IVTYP(1)
      ID2=0
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,IYEARS,IYEARS,0,5,0,IHCNT)
      GO TO 1060
1020  IF(IVTYP(3).EQ.0)GO TO 1060
      DO 1030 I=1,IYEARS
1030  DENS1(I)=ASABK(I)
      IF(IVTYP(4).EQ.0)GO TO 1050
      DO 1040 I=1,IYEARS
1040  DENS2(I)=ASPDK(I)
      ID1=IVTYP(3)
      ID2=IVTYP(4)
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,IYEARS,IYEARS,0,6,0,IHCNT)
      GO TO 1060
 1050 ID1=IVTYP(3)
      ID2=0
      CALL GRAPH(DENS1,DENS2,CTYNO1,ID1,ID2,IYEARS,IYEARS,0,5,0,IHCNT)
1060  CONTINUE
C
C
C     PRINT STATE SUMMARY: BY COUNTY.
C
      WRITE(6,940)YR(IYEARS)
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
 940  FORMAT('1',47X,'VIRGINIA DEER HARVEST SUMMARY---19',I2)
      WRITE(6,790)
      WRITE(6,800)
      K=IYEARS
      DO 950 I=1,50
      WRITE(6,810)FIPS(I),TK(I,K),ABKSM(I,K),BK(I,K),ABK(I,K),DK(I,K),PD
     _K(I,K),HDAYS(I,K),ESDAYS(I,K),SEASON(I,K)
 950  CONTINUE
      WRITE(6,940)YR(IYEARS)
      WRITE(6,790)
      WRITE(6,800)
      K=IYEARS
      DO 960 I=51,NCOUNT
      WRITE(6,810)FIPS(I),TK(I,K),ABKSM(I,K),BK(I,K),ABK(I,K),DK(I,K),PD
     _K(I,K),HDAYS(I,K),ESDAYS(I,K),SEASON(I,K)
 960  CONTINUE
C
      WRITE(6,790)
C
C     IF NEW REGIONS ARE USED THEN EAST AND WEST OF BLUE RIDGE TOTALS
C     FOR TABLE ARE BYPASSES.
C
      IF(NEWREG .EQ. 1) GO TO 981
C
      K=IYEARS
      WRITE(6,970)RETK(1,K),REABKS(1,K),RFBK(1,K),REABK(1,K),REDK(1,K),R
     _EPDK(1,K)
 970  FORMAT(' ',4X,'WEST OF B. R.    ',F7.0,4X,F7.2,6X,F6.0,6X,F6.0,6X,F
     _6.0,5X,F6.2)
      WRITE(6,980)EBRTK(K),EBABKS(K),EBRBK(K),EBRABK(K),EBRDK(K),EBRPDK(
     _K)
 980  FORMAT(' ',4X,'EAST OF B. R.    ',F7.0,4X,F7.2,6X,F6.0,6X,F6.0,6X,F
     _6.0,5X,F6.2)
      WRITE(6,790)
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
C
 981  CONTINUE
C
      K=IYEARS
      WRITE(6,830)ASTK(K),ASABKS(K),ASBK(K),ASABK(K),ASDK(K),ASPDK(K)
      WRITE(6,982)
 982  FORMAT('0',4X,'SEASON TYPE CODES: 1-E.S. ALL SEASON, 2-BUCKS ONLY,
     _ 3-E.S. AT START OF SEASON, 4-E.S. AT END, 5- NON-UNIFORM SEASON')
C
C
C     PRINT TABLES OF RANKED COUNTY DATA
C     VARIABLE L INDICATES 1ST OR 2ND YEAR TABLE
C
      L=1
      ITYR=IYEARS-2
 1065 ITYR=ITYR+1
      IF(ITYR .EQ. IYEARS)L=2
      DO 1070 I=1,NCOUNT
      T(I)=TKSM(I,ITYR)
      B(I)=BKSM(I,ITYR)
      A(I)=ABKSM(I,ITYR)
      D(I)=DKSM(I,ITYR)
      CNAM1(I)=CONO1(I)
      CNAM2(I)=CONO2(I)
      CNAM3(I)=CONO3(I)
      CNAM4(I)=CONO4(I)
 1070 CONTINUE
      NCNT=NCOUNT
      CALL RANK(T,CNAM1,NCNT)
      CALL RANK(B,CNAM2,NCNT)
      CALL RANK(A,CNAM3,NCNT)
      CALL RANK(D,CNAM4,NCNT)
      I=1
      J=2
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      WRITE(6,1080) (TITLES(I,K),K=1,18),(TITLES(J,K),K=1,18),YR(ITYR),
     _YR(ITYR)
1080  FORMAT('1',18X,'VIRGINIA DEER HARVEST SUMMARY',36X,'VIRGINIA DEER
     _HARVEST SUMMARY',/12X,18A1,' PER SQ. MILE FOREST RANGE',21X,18A1,'
     _ PER SQ. MILE FOREST RANGE',/21X,'IN DESCENDING ORDER - 19',I2,39X
     _,'IN DESCENDING ORDER - 19',I2,/1X,62('-'),5X,62('-'),/19X,'HARVES
     _T PER',21X,'HARVEST PER',24X,'HARVEST PER',20X,'HARVEST PER',/6X,'
     _COUNTY',7X,'SQUARE MILE',8X,'COUNTY',7X,'SQUARE MILE',12X,'COUNTY'
     _,6X,'SQUARE MILE',7X,'COUNTY',7X,'SQUARE MILE',/1X,62('-'),5X,62('
     _-'))
C
C     THE NUMBER OF COUNTIES IS CHECK FOR WHETHER IT IS EVEN OR ODD.
C     THIS IS DONE TO ALLOW THE FORMAT OF THE TABLE TO ALLOW FOR
C     UNEVEN COLUMNS.
C
      IEVEN=0
      IF(NCOUNT/2*2 .EQ. NCOUNT)IEVEN=1
      IHALF=NCOUNT/2
C
C
      DO 1100 I=1,IHALF
      J=I+IHALF
      IC1=CNAM1(I)
      IC2=CNAM1(J)
      IC3=CNAM2(I)
      IC4=CNAM2(J)
      WRITE(6,1090)FIPS(IC1),T(I),FIPS(IC2),T(J),FIPS(IC3),B(I),
     _FIPS(IC4),B(J)
1090  FORMAT(1X,2A8,3X,F9.2,4X,2A8,3X,F9.2,7X,2A8,4X,F9.2,4X,2A8,2X,F9.2
     _)
1100  CONTINUE
C
      IC2=CNAM1(NCOUNT)
      IC4=CNAM2(NCOUNT)
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C
C       IF THERE ARE AN EVEN NUMBER OF COUNTIES THEN PRINT AVERAGES.
C       IF ODD, PRINT LAST(ODD) COUNTY, THEN PRINT AVERAGES.
C
        IF(IEVEN .NE. 0)GO TO 1101
        WRITE(6,1095) FIPS(IC2),T(NCOUNT),FIPS(IC4),B(NCOUNT)
 1095   FORMAT(33X,2A8,3X,F9.2,40X,2A8,2X,F9.2)
C
C       IF NEW REGIONS ARE USED THEN BYPASS EAST & WEST OF BLUE RIDGE
C
 1101   IF(NEWREG .EQ. 1) GO TO 1115
        WRITE(6,1110) AVTKS(L,2),AVBKS(L,2),AVTKS(L,1),AVBKS(L,1),
       _SCATKS(L),SCABKS(L)
1110    FORMAT(37X,'EAST OF B. R.',F11.2,43X,'EAST OF B. R.',F11.2,/37X,'W
       _EST OF B. R.',F11.2,43X,'WEST OF B. R.',F11.2,/40X,'STATEWIDE',F11
       _.2,47X,'STATEWIDE',F11.2)
        GO TO 1119
 1115   CONTINUE
        WRITE(6,1116) SCATKS(L),SCABKS(L)
 1116   FORMAT(40X,'STATEWIDE',F11.2,47X,'STATEWIDE',F11.2)
 1119   WRITE(6,1120)
1120    FORMAT(' ',62('-'),5X,62('-'))
        I=3
        J=9
        WRITE(6,1080) (TITLES(I,K),K=1,18),(TITLES(J,K),K=1,18),YR(ITYR),
       _YR(ITYR)
        DO 1130 I=1,IHALF
        J=I+IHALF
        IC1=CNAM3(I)
        IC2=CNAM3(J)
        IC3=CNAM4(I)
        IC4=CNAM4(J)
        WRITE(6,1090) FIPS(IC1),A(I),FIPS(IC2),A(J),FIPS(IC3),D(I),
       _FIPS(IC4),D(J)
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
1130  CONTINUE
C
      IC2=CNAM3(NCOUNT)
      IC4=CNAM4(NCOUNT)
C
C     IF THERE ARE AN EVEN NO. OF COUNTIES THEN PRINT AVERAGES
C     IF ODD, PRINT LAST (ODD) COUNTY AND THEN PRINT AVERAGES
C
      IF(IEVEN .NE. 0)GO TO 1131
      WRITE(6,1095)FIPS(IC2),A(NCOUNT),FIPS(IC4),B(NCOUNT)
C
C     IF NEW REGIONS ARE USED THEN BYPASS EAST & WEST OF THE B.R.
C
 1131 IF(NEWREG .EQ. 1)GO TO 1135
      WRITE(6,1110)AVABKS(L,2),AVDKS(L,2),AVABKS(L,1),AVDKS(L,1),
     _SCAABS(L),SCADKS(L)
      GO TO 1136
 1135 CONTINUE
      WRITE(6,1116)SCAABS(L),SCADKS(L)
 1136 WRITE(6,1120)
C
C-----RETURN TO 1065 IF 2ND SET OF TABLES (TABLES FOR CURRENT YEAR)
C----- HAVE NOT BEEN MADE.
C
      IF(ITYR .EQ. IYEARS)GO TO 1132
      GO TO 1065
 1132 CONTINUE
C
C     IF USER=2 (COMMISSIONER) THEN SKIP HISTOGRAMS OF RANKED COUNTIES
C
      IF(IUSER .EQ. 2)GO TO 1180
C
C--------HISTOGRAMS FOR STATE BY RANKED COUNTIES
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
      IDYR=IYEARS-1
C
      IF(IVTYP(1).EQ.0)GO TO 1180
C-----PLOT FIRST HISTOGRAM;FOR CURRENT YEAR
      DO 1145 I=1,NCOUNT
 1145 DENS1(I)=STHIST(1,I)
      ID1=IVTYP(1)+4
      CALL GRAPH(DENS1,DENS2,CONOST,ID1,0,98,IYEARS,0,7,0,IHCNT)
C
      IF(IVTYP(2).EQ.0)GO TO 1180
C-----PLOT SECOND HISTOGRAM; FOR CURRENT YEAR
      DO 1155 I=1,NCOUNT
 1155 DENS1(I)=STHIST(2,I)
      ID1=IVTYP(2)+4
      CALL GRAPH(DENS1,DENS2,CONOST,ID1,0,98,IYEARS,0,7,0,IHCNT)
C
      IF(IVTYP(3).EQ.0)GO TO 1180
C-----PLOT THIRD HISTOGRAM FOR CURRENT YEAR
      DO 1165 I=1,NCOUNT
 1165 DENS1(I)=STHIST(3,I)
      ID1=IVTYP(3)+4
      CALL GRAPH(DENS1,DENS2,CONOST,ID1,0,98,IYEARS,0,7,0,IHCNT)
C
      IF(IVTYP(4).EQ.0)GO TO 1180
C-----PLOT FOURTH HISTOGRAM FOR CURRENT YEAR
      DO 1175 I=1,NCOUNT
 1175 DENS1(I)=STHIST(4,I)
      ID1=IVTYP(4)+4
      CALL GRAPH(DENS1,DENS2,CONOST,ID1,0,98,IYEARS,0,7,0,IHCNT)
C
1180  CONTINUE
C
C     PRINT 11 YEAR COUNTY SUMMARIES WITH 10 YR. AVERAGES.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
      JYR=IYEARS-10
      KYR=IYEARS
      LYR=IYEARS-1
C
C     TOTAL KILL TABLE
C
      WRITE(6,2000) (TITLES(1,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KYR
     _)
2000  FORMAT('1',49X,'VIRGINIA DEER HARVEST SUMMARY',//56X,18A1,//59X,'1
     _9',I2,'-19',I2,//13X,104('-'),/103X,'10 YR.',/17X,'COUNTY',6X,
     _10('    19',I2),'    AVERAGE    19',I2,/13X,104('-'))
      DO 2020 I=1,52
      WRITE(6,2010) (ABREV(K,I),K=1,16),(TK(I,J),J=JYR,LYR),CAVTK(I),
     _TK(I,KYR)
2010  FORMAT(14X,16A1,F6.0,9(F7.0),F9.0,F8.0)
2020  CONTINUE
      WRITE(6,2000) (TITLES(1,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KYR
     _)
      DO 2040 I=53,NCOUNT
      WRITE(6,2010) (ABREV(K,I),K=1,16),(TK(I,J),J=JYR,LYR),CAVTK(I),
     _TK(I,KYR)
2040  CONTINUE
      WRITE(6,2045)
2045  FORMAT(14X,104('-'))
C
C     IF NEW REGIONS ARE USED THEN EAST AND WEST OF THE BLUE RIDGE
C      TOTALS ARE BYPASSED.
C
      IF(NEWREG .EQ. 1)GO TO 2055
      WRITE(6,2050) (EBRTK(K),K=JYR,LYR),TAETK,EBRTK(KYR),(RETK(1,K),K=JY
     _R,LYR),TAWTK,RETK(1,KYR),(ASTK(K),K=JYR,LYR),AVTK,ASTK(KYR)
2050  FORMAT(' ',13X,'EAST OF B. R.    ',10(F7.0),F9.0,F8.0,/14X,'WEST OF
     _B. R.   ',10(F7.0),F9.0,F8.0,//14X,'STATEWIDE       ',10(F7.0),F9.0,
     _F8.0,/13X,104('-'))
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
      GO TO 2060
 2055 WRITE(6,2056)(ASTK(K),K=JYR,LYR),AVTK,ASTK(KYR)
 2056 FORMAT(14X,'STATEWIDE       ',10(F7.0),F9.0,F8.0,/13X,104('-'))
 2060 CONTINUE
C
C     IF USER=2 (COMMISSIONER) THEN PRINT ONLY TOTAL KILL AND ANTL.
C       BUCK KILL 11 YEAR COUNTY SUMMARIES.
C
      IF(IUSER .EQ. 2)GO TO 2090
C
C     BUCK KILL TABLE
C
      WRITE(6,2065)
2065  FORMAT('1')
      WRITE(6,2000)(TITLES(2,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KYR
     _)
      DO 2070 I=1,52
      WRITE(6,2010)(ABREV(K,I),K=1,16),(BK(I,J),J=JYR,LYR),CAVBK(I),
     _BK(I,KYR)
2070  CONTINUE
      WRITE(6,2000)(TITLES(2,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KYR
     _)
      DO 2080 I=53,NCOUNT
      WRITE(6,2010)(ABREV(K,I),K=1,16),(BK(I,J),J=JYR,LYR),CAVBK(I),
     _BK(I,KYR)
2080  CONTINUE
      WRITE(6,2045)
C
C     IF NEW REGIONS ARE BEING USED THEN BYPASS EAST & WEST OF B.R.
C
      IF(NEWREG .EQ. 1)GO TO 2085
      WRITE(6,2050)(EBRBK(K),K=JYR,LYR),TAEBK,EBRBK(KYR),(REBK(1,K),K=JY
     _R,LYR),TAWBK,REBK(1,KYR),(ASBK(K),K=JYR,LYR),AVBK,ASBK(KYR)
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      GO TO 2090
 2085 WRITE(6,2056) (ASBK(K),K=JYR,LYR),AVBK,ASBK(KYR)
 2090 CONTINUE
C
C     ANTLERED BUCK KILL TABLE.
C
      WRITE(6,2065)
      WRITE(6,2000)  (TITLES(3,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KY
     _R)
      DO 2100 I=1,52
      WRITE(6,2010) (ABREV(K,I),K=1,16),(ABK(I,J),J=JYR,LYR),CAVABK(I),
     _ABK(I,KYR)
2100  CONTINUE
      WRITE(6,2000)  (TITLES(3,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KY
     _R)
      DO 2110 I=53,NCOUNT
      WRITE(6,2010) (ABREV(K,I),K=1,16),(ABK(I,J),J=JYR,LYR),CAVABK(I),
     _ABK(I,KYR)
2110  CONTINUE
      WRITE(6,2045)
C
C     IF NEW REGIONS ARE USED THEN BYPASS EAST & WEST OF BLUE RIDGE
C
      IF(NEWREG .EQ. 1)GO TO 2115
C
      WRITE(6,2050) (EBRABK(K),K=JYR,LYR),TAEABK,EBRABK(KYR),(REABK(1,K),
     _K=JYR,LYR),TAWABK,REABK(1,KYR),(ASABK(K),K=JYR,LYR),AVABK,ASABK(KY
     _R)
      GO TO 2120
 2115 WRITE(6,2056) (ASABK(K),K=JYR,LYR),AVABK,ASABK(KYR)
C
 2120 CONTINUE
C
C     IF USER=2 (COMMISSIONER), PERCENT DOE KILL TABLE IS NOT WANTED
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C
      IF(IUSER .EQ. 2)GO TO 2150
C
C     PERCENT DOE KILL TABLE.
C
      WRITE(6,2065)
      WRITE(6,2000)  (TITLES(4,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KY
     _R)
      DO 2130 I=1,52
      WRITE(6,2135) (ABBREV(K,I),K=1,16),(PDK(I,J),J=JYR,LYR),CAVPDK(I),
     _PDK(I,KYR)
2135  FORMAT(14X,16A1,F6.2,9(F7.2),F9.2,F8.2)
2130  CONTINUE
      WRITE(6,2000)  (TITLES(4,K),K=1,18),YR(JYR),YR(KYR),(YR(J),J=JYR,KY
     _R)
      DO 2140 I=53,NCOUNT
      WRITE(6,2135) (ABREV(K,I),K=1,16),(PDK(I,J),J=JYR,LYR),CAVPDK(I),
     _PDK(I,KYR)
2140  CONTINUE
      WRITE(6,2045)
C
C     IF NEW REGIONS ARE USED THEN BYPASS EAST & WEST OF THE BLUE RIDGE
C
      IF(NEWREG .EQ. 1)GO TO 2147
C
      WRITE(6,2145) (EBRPDK(K),K=JYR,LYR),TAEPDK,EBRPDK(KYR),(REPDK(1,K),
     _K=JYR,LYR),TAWPDK,REPDK(1,KYR),(ASPDK(K),K=JYR,LYR),AVPDK,ASPDK(KY
     _R)
2145  FORMAT(' ',13X,'EAST OF B. R.   ',10(F7.2),F9.2,F8.2,/14X,'WEST OF
     _B. R.   ',10(F7.2),F9.2,F8.2,//14X,'STATEWIDE       ',10(F7.2),F9.2,
     _F8.2,/13X,104('-'))
      GO TO 2150
 2147 WRITE(6,2148) (ASPDK(K),K=JYR,LYR),AVPDK,ASPDK(KYR)
 2148 FORMAT(14X,'STATEWIDE       ',10(F7.2),F9.2,F8.2,/13X,104('-'))
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
 2150 CONTINUE
C
C
C      IF USER=2 (COMMISSIONER) THEN NO MORE INFORMATION IS NEEDED...STOP
C
       IF(IUSER .EQ.2)GO TO 4020
C
C*******************************************************************
C
C      CALL SEACH TO CALCULATE SEASON REGULATION CHANGES SUMMARY TABLES
C
       CALL SEACH(IYEARS)
C
C
C      PREPARING TO CALCULATE OPTIMUM DEER MANAGEMENT REGIONS.
C
       JYR=IYEARS-4
       DO 2210 I=1,NCOUNT
       L=0
       DO 2200 J=JYR,IYEARS
       L=L+1
       IF(HDAYS(I,J) .LE.0.0)GO TO 2190
       V(L,I)=TKSM(I,J)/HDAYS(I,J)
       GO TO 2200
 2190  V(L,I)=0.0
 2200  CONTINUE
 2210  CONTINUE
C
C      SUBROUTINE CHECK IS CALLED TO SUMMARIZE CHECK STATION DATA.
C
       CALL CHECK(IYEARS)
C
C      SUBROUTINE GRAF IS CALLED TO GROUP COUNTY DATA INTO REGIONS.
C       REGIONALIZATION IS BASED ON TOTAL KILL/SQ.MILE/#OF HUNTING DAYS.
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
C              OR---TKSM(I,J)/HDAYS(I,J)---WHERE I=COUNTY AND J=YEAR.
C                5 YEARS OF DATA ARE USED TO GROUP AVERAGE OVER TIME
C        VARIABLES FOR THE GROUPING PROCESS ARE SENT TO GRAF THROUGH V.
C
      CALL GRAF(V,FIPS,ICON,IYEARS,NCOUNT)
C
C
C     COUNTY DATA FOR TOTAL KILL / SQ. MILE ARE WRITTEN ONTO UNITS
C      13,14,&15 TO BE SENT TO STEP2--SYMAP FOR MAPING.  THREE YEARS
C       OF COUNTY HARVEST DATA ARE MAPPED...YEARS T, T-2, & T-6.
C
      DO 2220 I=1,NCOUNT
      WRITE(13,2222)TKSM(I,IYEARS-6)
      WRITE(14,2222)TKSM(I,IYEARS-2)
      WRITE(15,2222)TKSM(I,IYEARS)
 2222 FORMAT(F20.5)
 2220 CONTINUE
C
C     SUBROUTINE CHGSYM IS CALLED TO CHANGE MAP TILES(YEARS) TO
C     THE CURRENT YEAR AND APPROPRIATE OTHER YEARS THAT ARE BEING MAPPED
C
      CALL CHGSYM(IYEARS)
C
      RETURN
 4010 CONTINUE
      CALL INTRO
      CALL VACIS(IYEARS,TKSM,DYTK,SQMI,SQMA,COUNTY,DISTPT)
 4020 RETURN
C
1210  FORMAT('1',46X,'VIRGINIA COUNTY DEER HARVEST SUMMARY',/61X,'1947-1
     _9',I2,/11X,'COUNTY: ',2A8,//27X,'ANTLERED',51X,'HUNTING  ANY DEER'
     _,/18X,'TOTAL   BUCK KILL/',15X,'ANTLERED',15X,'% DOE IN    DAYS IN
     _   DAYS IN   TYPE OF',/11X,'YEAR     KILL  SQ.MI.RANGE   BUCK KILL
     _  BUCK KILL   DOE KILL  TOTAL KILL    SEASON     SEASON    SEASON')
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
1220  FORMAT(10X,I4,F9.0,F10.1,5X,F9.0,3X,F9.0,3X,F8.0,1X,F10.2,F10.0,F1
     11.0,2X,F7.0)
1230  FORMAT(10X,104(1H-)/6X,14HTEN YEAR MEANS)
1240  FORMAT(10X,I2,1H-,I2,F8.1,F10.1,5X,F9.1,3X,F9.1,3X,F8.1,1X,F10.2)
1260  FORMAT('1',35X,'VIRGINIA DISTRICT DEER HARVEST SUMMARY--1947 TO 19
     1',I2////,15X,10HDISTRICT: ,24A1//40X,'ANTLERED',/40X,10HBUCK KILL/
     2,19X,8HANTLERED,20X,8H% DOE IN/15X,91HYEAR     TOTAL KILL     SQ.M
     3I.RANGE     BUCK KILL     BUCK KILL     DOE KILL     TOTAL KILL)
1270  FORMAT('1',44X,'VIRGINIA REGIONAL DEER HARVEST SUMMARY--1947 TO 19
     1', I2////,15X, 8HREGION: ,24A1//40X, 'ANTLERED',/40X,10HBUCK KILL/
     2,19X,8HANTLERED,20X,8H% DOE IN/15X,91HYEAR     TOTAL KILL     SQ.M
     3I.RANGE     BUCK KILL     BUCK KILL     DOE KILL     TOTAL KILL)
1280  FORMAT('1',44X,'VIRGINIA STATE DEER HARVEST SUMMARY--1947 TO 19',I
     12////,40X,'ANTLERED',/40X,10HBUCK KILL/,19X,8HANTLERED,20X,8H% DOE
     2 IN/15X,91HYEAR     TOTAL KILL     SQ.MI.RANGE     BUCK KILL     B
     3UCK KILL     DOE KILL     TOTAL KILL)
1290  FORMAT(14X,I4,4X,F10.0,4X,F11.1,7X,F9.0,5X,F9.0,5X,F8.0,3X,F10.2)
1300  FORMAT (15X,91(1H-)//11X,14HTEN YEAR MEANS/)
1310  FORMAT (15X,I2,1H-,I2,2X,F10.1,4X,F11.1,7X,F9.1,5X,F9.1,5X,F8.1,3X
     1,F10.2 )
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SUBROUTINE VADFIG
      WRITE(6,2)                                                        DEE10220
    2 FORMAT('1',25('-'),'VV-------VV----AAAAAAA----DDDDDDDD----MM-----DEE10230
     _----MM--IIIIIIIII----SSSSSSS',30('-')/1X,25('-'),'VV-------VV---ADEF10240
     _AAAAAAAA---DDDDDDDDD---MMM-------MMM--IIIIIIIII---SSSSSSSSS',29(DEF10250
     _'-')/1X,25('-'),'VV-------VV--AAA-----AAA--DD------DDD--MMMM-----MDEE10260
     _MMM------II------SSS-----SSS',28('-')/1X,25('-'),'VV-------VV--AA-DEE10270
     _------AA--DD-------DD--MMMMM---MMMMM------II------SS-------SS',28(DEE10280
     _'-')/1X,25('-'),'VV-------VV--AA-------AA--DD-------DD--MM-MMM-MMMDEE10290
     _-MM------II------SSS',36('-')/1X,25('-'),'VV-------VV--AA-------AADEF10300
     _--DD-------DD--MM--MMMMM--MM------II-------SSSSSSSS',30('-')/1X,25DEF10310
     _('-'),'VV-------VV--AAAAAAAAAAA--DD-------DD--MM---MMM---MM------IDEE10320
     _I--------SSSSSSSS',29('-')/1X,25('-'),'VV-------VV--AAAAAAAAAA--DDEF10330
     _D-------DD--MM----M----MM------II--------------SSS',28('-')/1X,25(DEF10340
     _'-'),'VVV-----VVV--AA-------AA--DD-------DD--MM---------MM------IIDEE10350
     _------SS-------SS',28('-')/1X,25('-'),'-VVV---VVV---AA-------AA--DDEF10360
     _D------DDD--MM---------MM------II------SSS-----SSS',28('-')/1X,25(DEF10370
     _'-'),'--VVVVVVV----AA-------AA--DDDDDDDDDD---MM---------MM--IIIIIIDEE10380
     _IIII---SSSSSSSSS',29('-')/1X,28('-'),'VVVVV-----AA-------AA--DDDDDDEE10390
     _DDDD----MM---------MM--IIIIIIIIII----SSSSSSS',30('-'))            DEE10400
      WRITE(6,3)                                                        DEE10410
    3 FORMAT (1X,130('-')/1X,48('-'),'|',28X,'|',52('-')/1X,48('-'),'|',DEE10420
     _28X,'|',52('-')/1X,43('-'),'-----|  VIRGINIA DEER MANAGEMENT  |---DEE10430
     _',49('-')/1X,42('-'), 'XXX---|',28X,'|--XX',48('-')/1X,41('-'),'X DEE10440
     _XX---|      INFORMATION SYSTEM      |--X X',47('-')/1X,41('-'),'X XXDEE10450
     _---|',28X,'|--X  X',46('-')/1X,40('-'),'X  X--X-|',28X,'|--XX  X',DEE10460
     _45('-')/1X,40('-'),'X XX-XX-',30('-'),'---X    X',44('-')/1X,     DEE10470
     _39('-'),'X  X-X X-----X',19('-'),'XX-----X--X   X',43('-')/1X,    DEE10480
     _39('-'),'X  X-X X----XX',19('-'),'X X----XX--X  X',43('-')/1X,    DEE10490
     _39('-'),'X  X-X X---X X',19('-'),'X  X---X X-X  X',43('-')/1X,39('DEE10500
     _-'), 'X  X-X X---X XX---XXX------XXXX---X XX--X X-X  X',43('-')/1XDEE10510
     _, 39('-'),'X  X-X X---X XXXXX XX------XX  XX-X  X--X X-X  X',43('-DEE10520
     _')/1X, 38('-'),'XX  X-X X--XX       XX--------XXX  XX  X--X X-X  X'DEE10530
     _,43('-')/1X,38('-'),'X  XX-XXXXX      XXX',11('-'),'XXX     XXXXX-DEE10540
```

APPENDIX TABLE 1. (CONTINUED)

```
==================================================================================
     _X  X',43('-')/1X,37('-'),'X     XXXX        XXX',16('-'),'XXX      XXXDEF10550
     _-X  X',43('-')/1X,37('-'),'X               XXXX',21('-'),'XX      XX  XDEF10560
     _',44('-')/1X,37('-'),'X       XXXXXX',27('-'),'XX       XX-',43('-')/DEF10570
     _1X,38('-'),'XX  XXX  X',29('-'),'XXX   XX-',44('-')/1X,38('-'),'XXDEF10580
     _  X-X  X--------X',12('-'),'X-------XXX   XX-',44('-'))              DEF10590
      WRITE(6,4)                                                          DEF10600
    4 FORMAT(1X,39('-'),                                                  DEF10610
     _'XX  XXX X--------XX----------X X-----XXX    X',46('-')/1X,40('-')DEF10620
     _,'XX    XXXX-----X X----------X X---XX     XX',47('-')/1X,41('-'),DEF10630
     _'XXX     XXXXXXX X----------X X-XX    XXXX',48('-')/1X,44('-'),'XXDEF10640
     _X      XXX X----------X  X   XXXX',51('-')/1X,47('-'),'XXXXXXX   XDEF10650
     _X---------X      XXX-XXXXXX',46('-')/1X,45('-'),'XXXXXX  XX     X---DEF10660
     _----XX   XX  XXX    XX',45('-')/1X,45('-'),'X     XXXXXX   XXXXXXXXDEF10670
     _X  XX  XX X     XX',45('-')/1X,45('-'),'X     X  XXXXX        XX XDEF10680
     _XXX XX     XX',46('-')/1X,46('-'),'X      XXX XX          XX X  XX DEF10690
     _     XX',47('-')/1X,46('-'),'XX      XX',15(' '),'XXXX      XX',48('DEF10700
     _-')/1X,47('-'),'XX      X    X      X  XX   XXXXX',49('-')/1X,48(DEF10710
     _'-'),'XXXXXX XX    X  X  X     XXXXX',53('-')/1X,53('-'),'XXXXXXX  DEF10720
     _X X X XXXXX',57('-')/1X,54('-'),'-XXX X  X X X X XXX',57('-')/1X, DEF10730
     _55('-'),'-XXXXX  XXX XXXXXX',57('-')/1X,55('-'),'-X       X X      DEF10740
     _X',57('-')/1X,56('-'),'X       XXX       X',57('-')/1X,56('-'),'XX  DEF10750
     _  X   X      X',57('-')/1X,56('-'),'XX   XXX XXX    X',57('-')/1X, DEF10760
     _56('-'),'XX',13(' '),'XX',57('-')/1X,56('-'),'XXX  XXXXXX    XX', DEF10770
     _57('-')/1X,56('-'),'X ',10('X'),' XX XX',56('-')/1X,56('-'),'X  ',DEF10780
     _11('X'),'  XX',56('-')/1X,56('-'),'X  XXX XX XXX   XX',56('-')/1X,DEF10790
     _56('-'),'X   XXXXXXXX   XXX', 56('-'))                             DEF10800
      WRITE(6,5)                                                          DEF10810
    5 FORMAT(1X,55('-'),'XX     XXXXXX    XXX',56('-')/1X,55('-'),        DEF10820
     _'XX  X          X XXX',56('-')/1X,55('-'),'XX X X  X X X  X XX',    DEF10830
     _56('-')/1X,55('-'),'XX X    X  X  X X XX',56('-'))                  DEF10840
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SUBROUTINE DYHEAD
C
C     PRINTS A TITLE PAGE FOR THE DYNAPLAN CHAPTER.
C
      WRITE(6,1)
    1 FORMAT('1',/////////55X,'AN INTRODUCTION TO'/51X,'WHITE-TAILED DEER
     _ MANAGEMENT'//64X,'AND'//57X,'SUMMARY OF COUNTY'/51X,'DEER HARVEST
     _ AND DEER HABITAT'/58X,'CHARACTERISTICS'//56X,19('_')//56X,'A DYNA
     _PLAN DOCUMENT'/56X,19('_')/////57X,'DEVELOPED BY THE'/42X,'DEPARTM
     _ENT OF FISHERIES AND WILDLIFE SCIENCES'/39X,'VIRGINIA POLYTECHNIC
     _INSTITUTE AND STATE UNIVERSITY'/51X,'BLACKSBURG, VIRGINIA    24061
     _'///54X,'FINANCIAL SUPPORT FROM:'/44X, 'A MCINTIRE-STENNIS FORESTR
     _Y RESEARCH GRANT'/47X, 'THE U.S. FISH AND WILDLIFE SERVICE'/39X,
     _'VPI&SU DEPARTMENT OF FISHERIES AND WILDLIFE SCIENCES'/41X,
     _'VIRGINIA COMMISSION OF GAME AND INLAND FISHERIES'///52X,
     _'AUTHOR: RICHARD L. HOLLORAN'///40X, 'THIS DYNAPLAN DOCUMENT IS A
     _PRODUCT OF THE VIRGINIA'/44X,'DEER MANAGEMENT INFORMATION SYSTEM (
     _VADMIS)')
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      SUBROUTINE REGRE(X,N,M,ACTKL,ACTSN,PRKL,ITEST,PRED)
C
C     THIS SUBROUTINE PERFORMS THE MULTIPLE REGRESSIONS USED
C     TO PREDICT VIRGINIA DEER HARVESTS.
C
C     SUBROUTINE REGRE IN SSP PACKAGES MODIFIED FOR VA DEER SYSTEM
C
C     THIS SUBROUTINE WAS ORIGINALLY WRITTEN BY THE COMBINED EFFORT
C     OF BILL CONLIN, STEVE HOEKER, AND ROBERT REYSER (1974) USING
C     THE RESULTS OF STEVE MECHLERS' RESEARCH (1972) IDENTIFYING FACTORS
C     WHICH SIGNIFICANTLY INFLUENCE VIRGINIA DEER HARVESTS.
C     MODIFICATIONS WERE MADE BY RICHARD HOLLORAN, 1977.
C
C     X.....ARRAY CONTAINING VARIABLES FOR REGRESSION
C     N.....NUMBER OF OBSERVATIONS
C     M.....NUMBER OF VARIABLES
C     ACTKL..ACTUAL HARVEST(SENT),DIFFERENCE:PRED KILL - ACTKL(RETURNED)
C     ACTSN...ACTUAL SEASON TYPE HELD(SENT),% DIFFERENCE (RETURNED)
C     PRKL...PREDICTED KILL (RETURNED)
C     ITEST = 2-6 PREDICTIONS FOR 'RELIABILITY TABLE
C             1   PREDICTION FOR NEXT YEAR
C     PRED...ARRAY RETURNING PREDICTIONS FOR NEXT YEAR
C
      REAL INTCPT
      LOGICAL USING
      INTEGER V3,TK1,TK2,TK3,SIGN(3)
      INTEGER PRED(3,5)
      REAL X(180)
      COMMON /VADEER/ IRANK(3),USING(5),V1,V2,V3
      REAL T025(15)/12.706,4.303,3.182,2.776,2.571,2.447,2.365,2.306,2.2
     162,2.228,2.201,2.179,2.160,2.145,2.131/
      DIMENSION XBAR(6), STD(6), D(6), RY(6), ISAVE(6), B(6), SB(6),
     1T(6), W(6), RX(36), R(36), ANS(10)
      IO=1
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
C       REAL ACTSN IS SET TO INTEGER IST
        IST=INT(ACTSN)
        CALL CORRE (N,M,IO,X,XBAR,STD,RX,R,D,B,T)
        NDEP=M
        K=M-1
        DO 1 I=1,M
      1 ISAVE(I)=I
        CALL ORDER (M,R,NDEP,K,ISAVE,RX,RY)
        CALL MINV (RX,K,DET,B,T)
        IF (DET) 3,2,3
C
C       IF DETERMINANT .EQ. 0 THEN NO PREDICTION IS MADE.
C       ACTSN IS SET EQUAL TO 10000. TO INDICATE NO PREDICTION.
C
    2   ACTSN=10000.
        RETURN
3       CALL MULTR (N,K,XBAR,STD,D,RX,RY,ISAVE,B,SB,T,ANS)
C
        INTCPT=ANS(1)
        SY=ANS(3)
        ERROR=T025(N-K-1)*SY
C
        IF (M.GT.4) GO TO 4
        PTK=INTCPT+B(1)*V1+B(2)*V2
        IF(ITEST.NE.1)GO TO 30
C
C       KUD....SEASON TYPE INDICATOR
C
        IF(USING(1))KUD=1
        IF(USING(2))KUD=2
        IF(USING(3))KUD=3
        PRED(KUD,2)=V3
   30   TPTK=(ALOG(FLOAT(V3))*B(3))+PTK
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C      IF PREDICTION IS PART OF PREDICTION HISTORY, GO TO 31
C      IF PREDICTION IS FOR NEXT YEAR, PREDICTION IS STORED IN 'PRED'
C      AND RETURNED TO MAIN PROGRAM.
C
       IF(ITEST.NE.1)GO TO 31
       TK1=EXP(TPTK-ERROR)
       TK2=EXP(TPTK)
       TK3=EXP(TPTK+ERROR)
       PRED(KUD,3)=TK1
       PRED(KUD,4)=TK2
       PRED(KUD,5)=TK3
       RETURN
C
C      BEGIN TESTS TO CHECK IF PREDICTION WAS FOR ACTUAL SEASON TYPE HELD
C      FOR PREDICTION HISTORY---RELIABILITY TABLE.
C
   31  IF(.NOT. USING(1))GO TO 32
       IF(IST.NE.1)GO TO 32
       DIFF=EXP(TPTK)-ACTKL
       IF(ACTKL.LT.1.0)ACTKL=1.0
       PDIFF=(DIFF/ACTKL)*100.
       ACTKL=DIFF
       ACTSN=PDIFF
       PRKL=EXP(TPTK)
       RETURN
   32  IF(.NOT.USING(2))GO TO 33
       IF(IST.NE.2)GO TO 33
       DIFF=EXP(TPTK)-ACTKL
       IF(ACTKL.LT.1.0)ACTKL=1.0
       PDIFF=(DIFF/ACTKL)*100.
       ACTKL=DIFF
       ACTSN=PDIFF
       PRKL=EXP(TPTK)
       RETURN
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
 33   IF(.NOT.USING(3)) GO TO 34
      IF(IST.NE.3)GO TO 34
      DIFF=EXP(TPTK)-ACTKL
      IF(ACTKL.LT.1.0)ACTKL=1.0
      PDIFF=(DIFF/ACTKL)*100.
      ACTKL=DIFF
      ACTSN=PDIFF
      PRKL=EXP(TPTK)
      RETURN
C     WHEN THERE WAS NO PREDICTION FOR ANY SEASON TYPE  OR NO PREDICTION
C     FOR ACTUAL SEASON TYPE HELP....ACTSN=10000.,SIGNALING NO PREDICT.
C
 34   ACTKL=0.0
      ACTSN=10000.
      RETURN
C
C     REGRESSION EQUATIONS FOR MULTIPLE SEASON PREDICTIONS.......
C
4     DO 11 J=1,3
      IF (M.NE.5) GO TO 5
      IF (.NOT.USING(J)) GO TO 11
      IF (J.EQ.IRANK(1)) SIGN(1)=1
      IF (J.NE.IRANK(1)) SIGN(1)=0
      PTK=INTCPT+B(1)*V1+B(2)*V2+SIGN(1)*B(4)
      GO TO 10
C
C     ASSIGNING APPROPRIATE DUMMY VARIABLE VALUES FOR SEASON TYPE.
C
5     GO TO (6,7,8), J
C
C     SEASON TYPE = 1
C
6     SIGN(1)=0
      SIGN(2)=1
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      GO TO 9
C
C     SEASON TYPE = 2
C
7     SIGN(1)=1
      SIGN(2)=0
      GO TO 9
C
C     SEASON TYPE = 3 & 4
C
8     SIGN(1)=0
      SIGN(2)=0
9     PTK=INTCPT+B(1)*V1+B(2)*V2+SIGN(1)*B(4)+SIGN(2)*B(5)
10    CONTINUE
C
C     IF PREDICTION IS FOR NEXT YEAR, STORE IN 'PRED' TO BE RETURNED.
C
      IF(ITEST.NE.1)GO TO 19
      IF(J.EQ.1)PRED(J,1)=1
      IF(J.EQ.2)PRED(J,1)=2
      IF(J.EQ.3)PRED(J,1)=3
      PRED(J,2)=V3
   19 TPTK=(ALOG(FLOAT(V3))*B(3))+PTK
      IF(ITEST.NE.1)GO TO 20
      TK1=EXP(TPTK-ERROR)
      TK2=EXP(TPTK)
      TK3=EXP(TPTK+ERROR)
      PRED(J,3)=TK1
      PRED(J,4)=TK2
      PRED(J,5)=TK3
      GO TO 11
C
C     BEGIN TESTS FOR ACTUAL SEASON TYPE HELD=PREDICTED SEASON FOR
C     PREDICTION HISTORY.
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
C
  20   IF(J.NE.1)GO TO 21
       IF(J.NE.IST)GO TO 11
       DIFF=EXP(TPTK)-ACTKL
       IF(ACTKL.LT.1.0)ACTKL=1.0
       PDIFF=(DIFF/ACTKL)*100.
       ACTKL=DIFF
       ACTSN=PDIFF
       PRKL=EXP(TPTK)
       RETURN
  21   IF(J.NE.2)GO TO 22
       IF(J.NE.IST)GO TO 11
       DIFF=EXP(TPTK)-ACTKL
       IF(ACTKL.LT.1.0)ACTKL=1.0
       PDIFF=(DIFF/ACTKL)*100.
       ACTKL=DIFF
       ACTSN=PDIFF
       PRKL=EXP(TPTK)
       RETURN
  22   IF(J.NE.3)GO TO 11
       IF(J.NE.IST)GO TO 11
       DIFF=EXP(TPTK)-ACTKL
       IF(ACTKL.LT.1.0)ACTKL=1.0
       PDIFF=(DIFF/ACTKL)*100.
       ACTKL=DIFF
       ACTSN=PDIFF
       PRKL=EXP(TPTK)
       RETURN
11     CONTINUE
C
C      NO PREDICTION FOR ACTUAL SEASON HELD.
       ACTKL=0.0
       ACTSN=10000.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
      RETURN
      END


      SUBROUTINE DATA
C
C     REQUIRED FOR SSP PACKAGE
C
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
      SUBROUTINE GRAPH(DENS1,DENS2,CTYNO,V1,V2,L,YR,COUNTY,ITYPE,DIST,N)
C
C     THIS SUBROUTINE IS CALLED TO PRODUCE HISTOGRAMS OF COUNTY,
C     DISTRICT, AND STATE DEER HARVEST DATA.
C
C        V1&V2 = 1 TK         ITYPE = 1....COUNTY....SINGLE VARIABLE
C                2 BK                 2....COUNTY....TWO VARIABLES
C                3 ABK                3....NOT VALID
C                4 PDK                4....DISTRICT....TWO VARIABLES
C                5 TK/SQM             5....STATE....YEARS..ONE VARIABLE
C                6 BK/SQM             6....STATE....YEARS..TWO VARIABLES
C                7 ABK/SQM            7....STATE....BY COUNTY
C                8 DK/SQM
C     DIST = ARGUMENT INDICATING WHICH DISTRICT IS BEING USED
C
      INTEGER L,YR,COUNTY,V1,V2,DIST
      INTEGER*2 CONO(98),CTYNO(L)
      REAL DENS1(L),DENS2(L),TEMP1(98),TEMP2(98),YNUM1(10),YNUM2(10)
      REAL MAX
      INTEGER*2 XLABEL(14,98),TITLE(3,24)
      INTEGER*2 ABREV(16,98),TITLES(30,24),GRAPH1(60,130),GRAPH2(60,130)
      COMMON/HPLOT/ABREV,TITLES
      IF(ITYPE.GE.3)GO TO 200
C
C     CALL PLOTTING ROUTINES TO CREATE COUNTY HISTOGRAMS.
C
      L=YR
      DO 10 I=1,YR
      TEMP1(I)=DENS1(I)
      TEMP2(I)=DENS2(I)
   10 CONTINUE
      CALL RANK(TEMP1,CTYNO,L)
      MAX=TEMP1(1)
      IF(MAX.EQ.0)RETURN
```

APPENDIX TABLE 1. (CONTINUED)

```
======================================================================
      CALL TYTEL(100,V1,TITLE,COUNTY,L)
      CALL XAXIS(0,L,CTYNO,XLABEL)
      CALL HISTO(DENS1,MAX,L,XLABEL,TITLE,GRAPH1,YNUM1)
      IF(ITYPE.EQ.2)GO TO 100
      CALL COMBN(GRAPH1,GRAPH2,100,YNUM1,YNUM2,N)
      RETURN
  100 CALL RANK(TEMP2,CTYNO,I)
      MAX=TEMP2(1)
      IF(MAX.EQ.0)RETURN
      CALL TYTEL(100,V2,TITLE,COUNTY,L)
      CALL XAXIS(0,L,CTYNO,XLABEL)
      CALL HISTO(DENS2,MAX,L,XLABEL,TITLE,GRAPH2,YNUM2)
      CALL COMBN(GRAPH1,GRAPH2,0,YNUM1,YNUM2,N)
      RETURN
  200 IF(ITYPE.GE.5)GO TO 300
C
C     CALL PLOTTING ROUTINES TO CREATE DISTRICT HISTOGRAMS.
C
      DO 205 I=1,L
  205 CONO(I)=CTYNO(I)
      CALL RANK(DENS1,CONO,L)
      IYRONE=YR-1
      CALL TYTEL(DIST,V1,TITLE,COUNTY,IYRONE)
      CALL XAXIS(1,L,CONO,XLABEL)
      CALL HISTO(DENS1,0,L,XLABEL,TITLE,GRAPH1,YNUM1)
      CALL RANK(DENS2,CTYNO,L)
      CALL TYTEL(DIST,V2,TITLE,COUNTY,YR)
      CALL XAXIS(1,L,CTYNO,XLABEL)
      CALL HISTO(DENS2,0,L,XLABEL,TITLE,GRAPH2,YNUM2)
      CALL COMBN(GRAPH1,GRAPH2,DIST,YNUM1,YNUM2,N)
      RETURN
  300 IF(ITYPE.EQ.7)GO TO 400
C
C     CALL PLOTTING ROUTINES TO CREATE STATE HISTOGRAMS;BY YEAR.
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
      DO 305 I=1,L
      TEMP1(I)=DENS1(I)
      TEMP2(I)=DENS2(I)
      CONO(I)=CTYNO(I)
 305  CONTINUE
      CALL RANK(TEMP1,CONO,L)
      MAX=TEMP1(1)
C-----ZERO(0) IS USED AS ARGUMENT TO PREVENT YEAR NUMBER FROM BEING
C----- PRINTED ON HISTOGRAM TITLE.
      CALL TYTEL(200,V1,TITLE,COUNTY,0)
      CALL XAXIS(0,L,CTYNO,XLABEL)
      CALL HISTO(DENS1,MAX,L,XLABEL,TITLE,GRAPH1,YNUM1)
      IF(ITYPE.EQ.6)GO TO 310
      CALL COMBN(GRAPH1,GRAPH2,200,YNUM1,YNUM2,N)
      RETURN
 310  CALL RANK(TEMP2,CONO,L)
      MAX=TEMP2(1)
C-----ZERO(0) IS USED AS ARGUMENT TO PREVENT YEAR NUMBER FROM BEING
C----- PRINTED ON HISTOGRAM TITLE.
      CALL TYTEL(200,V2,TITLE,COUNTY,0)
      CALL XAXIS(0,L,CTYNO,XLABEL)
      CALL HISTO(DENS2,MAX,L,XLABEL,TITLE,GRAPH2,YNUM2)
      CALL COMBN(GRAPH1,GRAPH2,300,YNUM1,YNUM2,N)
      RETURN
C--------HISTOGRAMS FOR THE STATE BY COUNTY
 400  DO 401 I=1,L
 401  CONO(I)=CTYNO(I)
      CALL RANK(DENS1,CONO,L)
      CALL TYTEL(200,V1,TITLE,COUNTY,YR)
      CALL XAXIS(1,L,CONO,XLABEL)
      CALL HISTO(DENS1,0,L,XLABEL,TITLE,GRAPH1,YNUM1)
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
===============================================================================
      SUBROUTINE RANK(VAR,CONO,L)
C
C     THIS SUBROUTINE RANKS, IN DESCENDING ORDER, DATA SENT
C     TO IT IN THE VECTOR 'VAR' AND ALSO REARRANGES THE
C     COUNTY REFERENCE CODES CONTIANED IN THE VECTOR 'CONO'
C     TO CORRESPOND TO THE RANKED DATA.
C
      INTEGER L,C
      REAL VAR(L),TMP
      INTEGER*2 CONO(L)
      DO 1 I=2,L
      C=I
3     IF(VAR(C).LT.VAR(C-1)) GO TO 1
      TMP=VAR(C)
      VAR(C)=VAR(C-1)
      VAR(C-1)=TMP
      TMP=CONO(C)
      CONO(C)=CONO(C-1)
      CONO(C-1)=TMP
      C=C-1
      IF(C.EQ.1) GO TO 1
      GO TO 3
1     CONTINUE
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SUBROUTINE TYTEL(IX,IY,TITIF,COUNTY,IYEAR)
C       THIS SUBROUTINE PREPARES TITLES FOR THE VARIOUS
C          HISTOGRAMS. VARIABLES IX AND IY ARE ARGUMENTS
C         INDICATING THE TYPE OF GRAPH TO BE MADE.
C        IX = 1-6...DISTRICTS
C           = 100....COUNTY
C           = 200....STATE
C        IY = 1...TK
C           = 2...BK
C           = 3...ABK
C           = 4...PDK
C           = 5...TK/SQM
C           =6...BK/SQM
C           = 7...ABK/SQM
C           = 8...DK/SQM
      INTEGER IX,IY,ID,COUNTY,YR
      INTEGER*2 TITLE(3,24),TITLES(30,24),ABREV(16,98)
      INTEGER*2 NUM(10)/'00','11','22','33','44','55','66','77','88','99
     _'/
      INTEGER*2 BLNK/'  '/
      COMMON/HPLOT/ABREV,TITLES
      DO 9 I=1,3
      DO 10 J=1,24
      TITLE(I,J)=BLNK
   10 CONTINUE
    9 CONTINUE
      IF(IX .EQ. 100)GO TO 6
      YR=IYEAR+46
      IDIG1=YR/10
      IDIG2=YR-IDIG1*10
      DO 5 I=1,24
      IF(IX.EQ.200)GO TO 2
      TITLE(1,I)=TITLES(IX+10,J)
      GO TO 3
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
    2   TITLE(1,I)=TITLES(10,I)
    3   IF(IYEAR.EQ.0)GO TO 15
        TITLE(2,I)=TITLES(IY,I)
        TITLE(3,4)=NUM(2)
        TITLE(3,5)=NUM(10)
        TITLE(3,6)=NUM(IDIG1+1)
        TITLE(3,7)=NUM(IDIG2+1)
        GO TO 5
   15   TITLE(3,I)=TITLES(IY,I)
    5   CONTINUE
        RETURN
    6   ID=COUNTY
        DO 7 I=1,14
        TITLE(1,I)=ABREV(I,ID)
    7   CONTINUE
        DO 8 I=1,24
        TITLE(3,I)=TITLES(IY,I)
    8   CONTINUE
        RETURN
        END
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      SUBROUTINE XAXIS(LID,L,CONO,XLABEL)
C
C     THIS SUBROUTINE PREPARES THE X-AXIS LABELS FOR ALL
C     HISTOGRAMS...EITHER YEARS OR COUNTY NAMES.
C
C     IF LID=1 THEN THE X-AXIS SHOULD CONTAIN THE COUNTY NAMES
C     REFERRED TO IN VECTOR 'CONO'...OTHERWISE YEARS ARE ASSUMED.
C
      INTEGER LID,L
      INTEGER*2 TITLES(30,24)
      INTEGER*2 CONO(L),ABREV(16,98),XLABEL(14,98)
      COMMON/HPLOT/ABREV,TITLES
      INTEGER*2 BLNK/'  '/
      INTEGER*2 NUM(10)/'00','11','22','33','44','55','66','77','88','99
     A'/
      DO 1 I=1,L
      DO 2 J=1,14
      XLABEL(J,I)=BLNK
    2 CONTINUE
    1 CONTINUE
      IF(LID.EQ.1)GO TO 100
      DO 10 I=1,53
      XLABEL(1,I)=NUM(2)
      XLABEL(2,I)=NUM(10)
   10 CONTINUE
      DO 20 I=1,3
      XLABEL(3,I)=NUM(5)
   20 CONTINUE
      M=3
      DO 40 I=1,5
      DO 30 J=1,10
      M=M+1
      XLABEL(3,M)=NUM(I+5)
   30 CONTINUE
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
   40   CONTINUE
        DO 50 I=7,9
        K=I-6
        XLABEL(4,K)=NUM(I+1)
   50   CONTINUE
        M=3
        DO 70 I=1,5
        DO 60 J=1,10
        K=J-1
        M=M+1
        XLABEL(4,M)=NUM(K+1)
   60   CONTINUE
   70   CONTINUE
        RETURN
  100   DO 120 I=1,14
        DO 110 J=1,L
        ID=CONO(J)
        XLABEL(I,J)=ABREV(I,ID)
  110   CONTINUE
  120   CONTINUE
        RETURN
        END
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      SUBROUTINE HISTO(DENS,CTYMAX,L,XLABEL,TITLE,GRAPH,YNUMB)
C
C     THIS SUBROUTINE CREATES THE AXES AND PLOTS THE DATA FOR
C     THE HISTOGRAMS.  THE HISTOGRAM IS PUT INTO AN ARRAY 'GRAPH'
C     DIMENSIONED (60,130).  TITLES ARE ALSO PLACED IN THE 'ARRAY'
C     AS WELL AS THE X-AXIS LABELS (YEARS OR COUNTY NAMES).
C     THE HISTOGRAM IS SCALED TO ALLOW 10% OF THE TOTAL RANGE OF
C     THE DATA TO BE ADDED ONTO THE TOP TO AVOID OVERPRINTING
C@    BY THE TITLES.
C
      INTEGER L,TOP,IDN
      INTEGER IONE,ITWO,ITRES,IFOUR,IFIVE,LSTRT,LBGN,LEND,LBT
      INTEGER*2 XLABEL(14,98)
      INTEGER*2 GRAPH(60,130),TITLE(3,24)
      INTEGER*2 AST/'||'/,DEC/'..'/,POS/'++'/,MIN/'--'/
      INTEGER*2 BLNK/'  '/
      REAL CTYMAX,YNUMB(10)
      REAL MAX,DENS(L),DOWN
      REAL Z,YFIND,YTOP,YINCR,YTP
      DO 3 I=1,60
      DO 4 J=1,130
      GRAPH(I,J)=BLNK
4     CONTINUE
3     CONTINUE
      IF(L.GT.24)GO TO 6
      LT=50
      GO TO 7
    6 LT=L+4
      IF(LT.LT.50)LT=50
  7   CONTINUE
C-------Y-AXES--------
      DO 10 I=1,41,5
      GRAPH(I,1)=POS
      GRAPH(I,LT)=POS
```

```
==========================================================================
      DO 5 J=1,4
      K=I+J
      GRAPH(K,1)=MIN
      GRAPH(K,LT)=MIN
5     CONTINUE
10    CONTINUE
      GRAPH(46,1)=POS
      GRAPH(46,LT)=POS
C-----X-AXIS------------
      LBT=LT-1
      DO 20 I=2,LBT
      GRAPH(1,I)=DEC
      GRAPH(46,I)=DEC
20    CONTINUE
C
C-------CALCULATING SCALE FOR GRAPH-----------------
C
      MAX=DENS(1)
      IF(CTYMAX.GT.0.0) MAX=CTYMAX
      Z= MAX + MAX*0.1
      MAX=Z
      YINCR=Z/9.
      DO 21 I=1,9
      YNUMB(I)=Z
      Z=Z-YINCR
  21  CONTINUE
      YNUMB(10)=0.0
C
C-------PLOT HISTOGRAM------------
      K=3
      YFIND=45./MAX
      DO 35 I=1,L
      DOWN = DENS(I) * YFIND
      IDN=INT(DOWN+0.5)
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      TOP = 46-IDN
      DO 30 J=TOP,46
      GRAPH(J,K)=AST
      IF(TOP.EQ.46) GRAPH(J,K)=DEC
30    CONTINUE
      IF(L.GT.24)GO TO 31
      K=K+2
      GO TO 35
  31  K=K+1
35    CONTINUE
C--------TITLE GRAPH-----------
      IF(CTYMAX.NE.0.0) LT=27
      LSTRT=LT-26
      LBGN=LT-25
      LEND=LT-2
      DO 45 I=LBGN,LEND
      K=I-LSTRT
      DO 46 J=1,3
      M=J+1
      GRAPH(M,I)=TITLE(J,K)
  46  CONTINUE
45    CONTINUE
C------LABELS X/AXES---------
      N=3
      DO 55 I=1,L
      DO 50 J=47,60
      K=J-46
      GRAPH(J,N)=XLABEL(K,I)
  50  CONTINUE
      IF(L.GT.24)GO TO 51
      N=N+2
      GO TO 55
  51  N=N+1
   55 CONTINUE
```

APPENDIX TABLE 1. (CONTINUED)

```
      IF(L.LE.40) RETURN
      WRITE(6,70)
   70 FORMAT('1',50X,'VIRGINIA DEER HARVEST SUMMARY')
      K=0
      DO 90 I=1,9
      K=K+1
      WRITE(6,80)YNUMB(I),(GRAPH(K,N),N=1,120)
   80 FORMAT(1X,F7.2,1X,120A1)
      DO 85 J=1,4
      K=K+1
      WRITE(6,82) (GRAPH(K,N),N=1,120)
   82 FORMAT(9X,120A1)
   85 CONTINUE
   90 CONTINUE
      WRITE(6,80) YNUMB(10),(GRAPH(46,N),N=1,120)
      DO 100 I=47,60
      WRITE(6,82) (GRAPH(I,N),N=1,120)
  100 CONTINUE
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      SUBROUTINE COMBN(X,Y,ID,YNUM1,YNUM2,NH)
C        THIS SUBROUTINE IS CALLED WHEN 2 HISTOGRAMS MAY BE PLACED ON A
C           SINGLE PAGE.    HISTOGRAMS IN X AND Y ARRAYS ARE COMBINED,OR
C           ONLY X IS PRINTED WHEN Y IS EMPTY.    ALL HISTOGRAMS SENT TO
C           THIS SUBROUTINE MUST BE LESS THAN 50 CHARACTERS WIDE.
C           SUBROUTINE HISTO PRINTS FULL PAGE HISTOGRAMS.
C        X & Y----ARRAYS CONTAINING HISTOGRAMS FROM HISTO
C        ID---IDENTIFIER = 0...2 HISTOGRAMS...COUNTY
C                          100...1 HISTOGRAM..COUNTY
C                          1>6...DISTRICTS..2 HISTOGRAMS
C                          200....STATE..YEARS...1 HISTOGRAM
C                          300....STATE..YEARS..2 HISTOGRAMS
C        YNUM1 & YNUM2--VECTORS CONTAINING Y-AXES NUMBERS FOR X&Y,RESP.
      INTEGER*2 X(60,130),Y(60,130),GRAPH(60,130)
      INTEGER*2 TITLES(30,24),TITLE(24),ABREV(16,98)
      REAL YNUM1(10),YNUM2(10)
      COMMON/HPLOT/ABREV,TITLES
C        IF NOT A DISTRICT HISTOGRAM BYPASS TITLES
C        IF COUNTY GRAPH AND IS SECOND PAGE THEN START NEW PAGE
      IF(ID.EQ.0 .AND. NH.EQ.2) WRITE(6,42)
      IF(ID.EQ.100 .AND. NH.EQ.2) WRITE(6,42)
   42 FORMAT('1')
C        IF ONLY ONE GRAPH/-----GO TO 100
      IF(ID.EQ.100) GO TO 100
C        IF TWO GRAPHS GO TO 41
      IF(ID.EQ.0) GO TO 41
C        IF A STATE HISTOGRAM GO TO 200 TO PRINT TITLE
      IF(ID.GE.200)  GO TO 200
      K=IABS(ID)+10
      DO 25 I=1,24
      TITLE(I)=TITLES(K,I)
   25 CONTINUE
      WRITE(6,30) (TITLE(I),I=1,24)
   30 FORMAT('1',42X,'DISTRICT DEER HARVEST SUMMARY: ',24A1//)
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
C        IF ONLY ONE GRAPH FOR DISTRICT THEN GO TO 100
      IF(ID.LT.0)GO TO 100
C        PRINTING Y-AXIS NUMBERS AND HISTOGRAMS FOR TWO GRAPHS
   41 K=0
      DO 60 I=1,9
      K=K+1
      WRITE(6,45)YNUM1(I),(X(K,L),I=1,50),YNUM2(I),(Y(K,L),L=1,50)
   45 FORMAT(3X,F9.2,1X,50A1,3X,F9.2,1X,50A1)
      DO 55 J=1,4
      K=K+1
      WRITE(6,50)(X(K,L),L=1,50),(Y(K,L),I=1,50)
   50 FORMAT(13X,50A1,13X,50A1)
   55 CONTINUE
   60 CONTINUE
      WRITE(6,45)YNUM1(10),(X(46,L),L=1,50),YNUM2(10),(Y(46,L),L=1,50)
C        IF X-AXIS IS YEARS THEN GO TO 80----ONLY 4 LINES IS REQUIRED
C          THIS IS DONE TO PROPERLY ALIGN PRINTOUT AND PROHIBIT SKIPPING
C             POSSIBLE EXTRA PAGES THAT COULD OCCUR.
      IF(ID.EQ.0)GO TO 80
      DO 75 I=47,60
      WRITE(6,50)(X(I,J),J=1,50),(Y(I,J),J=1,50)
   75 CONTINUE
      RETURN
   80 DO 87 I=47,50
      WRITE(6,50)(X(I,J),J=1,50),(Y(I,J),J=1,50)
   87 CONTINUE
      RETURN
C        BEGIN PRINT OF SINGLE HISTOGRAM WITH Y-AXIS NUMBERING
  100 K=0
      DO 90 I=1,9
      K=K+1
      WRITE(6,82)YNUM1(I),(X(K,I),L=1,50)
   82 FORMAT(35X,F9.2,1X,50A1)
      DO 85 J=1,4
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
      K=K+1
      WRITE(6,83) (X(K,L),L=1,50)
   83 FORMAT(45X,50A1)
   85 CONTINUE
   90 CONTINUE
      WRITE(6,82)YNUM1(10),(X(46,L),I=1,50)
C        IF XAXIS IS YEARS, GO TO 110   ONLY 4 LINES ARE NEEDED
      IF(ID.GE.100)GO TO 110
      DO 105 I=47,60
      WRITE(6,83) (X(I,L),L=1,50)
  105 CONTINUE
      RETURN
  110 DO 115 I=47,50
      WRITE(6,83) (X(I,L),L=1,50)
  115 CONTINUE
      RETURN
  200 WRITE(6,201)
  201 FORMAT('1',50X,'VIRGINIA DEER HARVEST SUMMARY')
C        IF ONLY ONE HISTOGRAM GO TO 100 TO PRINT
      IF(ID.EQ.200)GO TO 100
C        IF 2 HISTOGRAMS, SET ID=0,THEN GO TO 41 TO PRINT
      ID=0
      GO TO 41
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SUBROUTINE GRAF(V,FIPS,ICON,IYEARS,NCOUNT)
C
C     THIS SUBROUTINE DETERMINES THE OPTIMUM DEER MANAGEMENT REGIONS
C     FOR VIRGINIA BASED ON 5 YEARS OF COUNTY DATA.......
C            TOTAL KILL / SQ.MILE FOREST RANGE / # HUNTING DAYS
C
C     THIS SUBROUTINE WAS MODIFIED FROM A PROGRAM WRITTEN BY
C     RUDOLPH GRAF (1973), VPI&SU.
C
      INTEGER GRP(50,50),CNT(50)
      DIMENSION DSTPT(98)
      DIMENSION ICON(99,99),V(15,99),CASES(99),NBINE(99,99),JOHN(99),
     1X(99),Y(99)
      COMPLEX*16 FIPS(99)
      DO 410 I=1,10
      DO 405 J=1,30
      GRP(I,J)=99
 405  CONTINUE
 410  CONTINUE
C     2 ISLANDS
      IS=2
C     98 COUNTIES
      NI=NCOUNT
C     5 VARIABLES TO BE USED IN GROUPING PROCESS
      NDIM=5
C     LIMIT REGIONS TO NO MORE THAN 25 COUNTIES EACH
      NSIZE=25
C     7 REGIONS ARE TO BE MADE
      NUMGRP=7
      NOGRP=NI-NUMGRP
      JIM=NSIZE*2
      DO 203 JB=1,NI
  203 JOHN(JB)=1
      JACK=0
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
      DO 31 L1=1,NI
      DO 30 L2=1,NI
   30 NBINE(L1,L2)=0
      NBINE(L1,L1)=L1
   31 CONTINUE
      DO 101 IJ=1,NI
  101 CASES(IJ)=1.0
C
C
C  DETERMINING SINGLE OR MULTIVARIABLE
C
      IF(NDIM.EQ.1) GO TO 500
C
C    DETERMINING MEAN, STANDARD DEVIATION, STANDARD SCORE
C
      DO 1001 I=1,NDIM
      SUM = 0.0
      DO 1002 J=1,NI
 1002 SUM = SUM +V(I,J)
      RNI=NI
      RMEAN=SUM/RNI
      SUMSQ=SUM**2/RNI
      SUM1=0.0
      DO 1003 K=1,NI
 1003 SUM1=SUM1+V(I,K)**2
      S=SQRT((SUM1-SUMSQ)/(RNI-1.0))
      DO 1004 M=1,NI
      IF(S.EQ.0.0) GO TO 1013
      V(I,M)=(RMEAN-V(I,M))/S
      GO TO 1004
 1013 V(I,M) = 0.0
 1004 CONTINUE
 1001 CONTINUE
      W=0.0
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
      GO TO 10
C
C     SINGLE VARIABLE COMPUTATIONS AND COMPUTING GRAND MEAN (W)
C
  500 SUM=0.0
      DO 5 II=1,NI
    5 SUM=SUM+V(NDIM,II)
      FNI = NI
      W=SUM/FNI
C
C     DETERMINING DENOMINATOR OF 'G' FORMULA
C
   10 BOTTOM=0.0
      DO 502 J=1,NDIM
      DO 503 K=1,NI
  503 BOTTOM=BOTTOM+(V(J,K)-W)**2
  502 CONTINUE
C
C     BEGINNING GROUPING PROCESS THRU MATRICES
C
 1000 NI1=NI-IS
      DO 11 MACK=1,NI1
 9999 GMAX=0.0
C
C     COMBINING CLASS I WITH CLASS J
C
      DO 6 I=1,NI
      I1=I+1
      IF(I1.GT.NI) GO TO 6
      DO 7 J=I1,NI
      G=0.0
C
C     TESTING FOR CONTIGUITY
C
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
      IF(ICON(I,J).EQ.0) GO TO 7
C
C     DETERMINING THE NO. OF AREAS GROUPED TOGETHER
C
      DO 204 JC=1,NI
      IF(JOHN(JC).LT.NSIZE) GO TO 205
  204 CONTINUE
      GO TO 19
  205 IF((JOHN(I)+JOHN(J)).GT.NSIZE) GO TO 7
C
C     DETERMINING NUMERATOR OF 'G' FORMULA
C
   19 CASE=CASES(J)+CASES(I)
      TOP=0.0
      DO 2002 M=1,NDIM
 2002 TOP=CASE*((V(M,I)+V(M,J))/CASE-W)**2+TOP
      DO 2000 II=1,NDIM
      DO 2001 JJ=1,NI
      IF(JJ.EQ.J) GO TO 2001
      IF(JJ.EQ.I) GO TO 2001
      IF(CASES(JJ).EQ.0.0) GO TO 2001
      TOP=CASES(JJ)*(V(II,JJ)/CASES(JJ)-W)**2+TOP
 2001 CONTINUE
 2000 CONTINUE
C
C     DETERMINING 'G' VALUE
C
 3000 G=TOP/BOTTOM
C
C     FINDIN MAXIMUM 'G' VALUE
C
      IF(G.LT.GMAX) GO TO 7
      IF(G.EQ.GMAX.AND.G.NE.0.0) GO TO 7
      GMAX=G
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      IMAX=I
      JMAX=J
    7 CONTINUE
    6 CONTINUE
C
C     CHECKING TO SEE IF THE MAX. NO. OF NSIZE GROUPS HAVE BEEN REACHED
C
      IF(GMAX.EQ.0.0.AND.MACK.GE.NI1) GO TO 12
      IF(GMAX.NE.0.0) GO TO 12
      NSIZE=NSIZE+1
      IF(NSIZE.GE.JIM) NSIZE=NI+2
      GO TO 9999
   12 DO 14 KJ=1,NI
C
C     REDUCING MATRIX BY ONE ROW AND ONE COLUMN
C
      ICON(KJ,IMAX)=ICON(KJ,IMAX)+ICON(KJ,JMAX)
   14 ICON(IMAX,KJ)=ICON(IMAX,KJ)+ICON(JMAX,KJ)
      DO 114 KJ=1,NI
      ICON(KJ,JMAX)=0
  114 ICON(JMAX,KJ)=0
      DO 3001 KL=1,NDIM
      V(KL,IMAX)=V(KL,IMAX)+V(KL,JMAX)
 3001 V(KL,JMAX)=0.0
      CASES(IMAX)=CASES(IMAX)+CASES(JMAX)
      CASES(JMAX)=0.0
C
C     WRITING HEADINGS, TRIAL, GMAX VALUE
C
C     WRITE(6,100)
C 100 FORMAT('0',1X,'TRIAL',2X,'G-VALUE ')
      X(MACK)=MACK
      Y(MACK)=GMAX
C  16 WRITE(6,15) MACK, GMAX
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C   15 FORMAT(2X,I3,F10.5)
       NBINE(IMAX,IMAX)=IMAX
       NBINE(IMAX,JMAX)=JMAX
       DO 39 KK=1,NI
       IF(NBINE(IMAX,KK).NE.NBINE(JMAX,KK)) GO TO 38
       IF(NBINE(IMAX,KK).NE.0) GO TO 39
   38  NBINE(IMAX,KK)=NBINE(IMAX,KK)+NBINE(JMAX,KK)
   39  CONTINUE
       DO 17 IZERO=1,NI
       NBINE(JMAX,IZERO)=0
   17  CONTINUE
C
C     DETERMINING THE SIZE OF EACH GROUP
C
       JACK=0
       DO 202 K=1,NI
       IF(NBINE(IMAX,K).EQ.0) GO TO 202
       JACK=JACK+1
  202  CONTINUE
       JOHN(IMAX)=JACK
       JOHN(JMAX)=NSIZE
       IF(MACK.GE.NOGRP) GO TO 6000
   11  CONTINUE
6000   CONTINUE
C
C      PREPARATIONS FOR LISTING FINAL GROUPINGS......ONLY IF REGION
C        NUMBER LIMIT WAS SPECIFIED.
C
C
C      GROUPED AREAS ARE TRANSFERRED FROM MATRIX NBINE AND STORED BY
C       REGION IN MATRIX GRP(L,K); WITH L GROUPS AND K AREAS IN EACH.
C
       L=1
       DO 300 I=1,NI
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      CNT(L)=0
      K=0
      DO 400 J=1,NI
      IF(NBINE(I,J).LE.0)GO TO 400
      K=K+1
      GRP(L,K)=NBINE(I,J)
      IJ=GRP(L,K)
      DSTPT(IJ)=FLOAT(L)
      CNT(L)=CNT(L)+1
 400  CONTINUE
      IF(CNT(L).GE.1)L=L+1
 300  CONTINUE
C
C     LISTING OF FINAL GROUPINGS IS PRINTED.(ONLY IF A REGION SIZE
C           LIMIT WAS SPECIFIED.)
C
      WRITE(6,414)
 414  FORMAT('1')
      WRITE(6,415)
 415  FORMAT('0',49X,30('-'))
      WRITE(6,416)
 416  FORMAT(' ',49X,'OPTIMUM DEER MANAGEMENT REGIONS')
      LYEAR=IYEARS+46
      WRITE(6,417)LYEAR
 417  FORMAT(' ',55X,'FOR VIRGINIA--19',I2)
      WRITE(6,415)
      WRITE(6,418)
 418  FORMAT('0',47X,'REGIONS BASED ON COUNTY SIMILARITY')
      WRITE(6,419)
 419  FORMAT(' ',57X,'WITH RESPECT TO')
      WRITE(6,420)
 420  FORMAT(' ',39X,'TOTAL KILL/SQ. MILE FOREST RANGE/# OF HUNTING DAYS
     X')
      WRITE(6,421)
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
 421   FORMAT('0',2X,126('-'))
       WRITE(6,422)
 422   FORMAT(' ',14X,'....  |',11X,'----  |',11X,'::::  |',11X,'||||  |'
      _,11X,'0000  |',11X,'0000  |',11X,'0000')
       WRITE(6,423)
 423   FORMAT('+',104X,'XXXX',14X,'XXXX')
       WRITE(6,424)
 424   FORMAT('+',122X,'AAAA')
       WRITE(6,425)
 425   FORMAT('+',122X,'VVVV')
       WRITE(6,422)
       WRITE(6,423)
       WRITE(6,424)
       WRITE(6,425)
       WRITE(6,426)
 426   FORMAT(' ',4X,'REGION 1  ....  |  REGION 2 ----  |  REGION 3 ::::
      _ |  REGION 4 ||||  |  REGION 5 0000  |  REGION 6 0000  |  REGION 7
      _ 0000')
       WRITE(6,423)
       WRITE(6,424)
       WRITE(6,425)
       WRITE(6,421)
       DO 330 J=1,30
       IG1=GRP(1,J)
       IG2=GRP(2,J)
       IG3=GRP(3,J)
       IG4=GRP(4,J)
       IG5=GRP(5,J)
       IG6=GRP(6,J)
       IG7=GRP(7,J)
       WRITE(6,340)FIPS(IG1),FIPS(IG2),FIPS(IG3),FIPS(IG4),FIPS(IG5),
      +FIPS(IG6),FIPS(IG7)
 340   FORMAT(' ',2X,2A8,'  | ',2A8,'| ',2A8,'| ',2A8,'| ',2A8,'| ',2A8,'
      +| ',2A8)
```

APPENDIX TABLE 1. (CONTINUED)

```
==================================================================================
 330   CONTINUE
       WRITE(6,421)
C
C       REGION DATA IS WRITTEN ONTO UNIT 12(TEMPORARY DISK PAK FILE)
C        TO BE SENT TO STEP2---SYMAP, FOR MAPPING.
C
       DO 351 I=1,98
       WRITE(12,350) DSTPT(I)
 350   FORMAT(F20.5)
 351   CONTINUE
       RETURN
       END
```

249

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
      SUBROUTINE SEACH(IYEARS)
C
C     THIS SUBROUTINE SORTS COUNTIES INTO GROUPS WITH SIMILAR SEASON
C      REGULATION CHANGES; YEARS YR-1 TO YR.
C      SEASON TYPE & NUMBER OF EITHER SEX DAYS ARE USED FOR THE
C       COMPARISON TO DETERMINE SIMILARITY OF REGULATION CHANGES,
C     A TABLE IS PRINTED SUMMARIZING EACH GROUP OF SIMILAR COUNTIES.
C
C     SORTING STARTS WITH ACCOMACK COUNTY----REMAINING COUNTIES ARE
C       THEN TESTED FOR SIMILARITY AND POINTERS ARE SET TO IDENTIFY THE
C       GROUP.  THEN THE NEXT UNGROUPED COUNTY IS TAKEN AND COMPARISONS
C       ARE MADE WITH THE FOLLOWING COUNTIES.  COUNTIES ALREADY ASSIGNED
C       TO GROUPS ARE IGNORED.  PROCEDURE CONTINUES UNTIL ALL POINTERS
C       HAVE BEEN SET.
C
      REAL A(98,4),ABKSM(98,40)
      INTEGER PTR(98),YR,YR1,YR2,YR3
      DIMENSION TK(98,40),BK(98,40),ABK(98,40),DK(98,40),PDK(98,40)
      DIMENSION HDAYS(98,40),ESDAYS(98,40),SEASON(98,40)
      COMPLEX*16 FIPS (99)
      COMMON/HARVST/TK,ABKSM,BK,ABK,DK,PDK,HDAYS,ESDAYS,SEASON,FIPS
      YR=IYEARS
C     COUNTY SEASON REGULATION DATA IS STORED IN ARRAY A.
C     A(I,1)&A(I,2)------LAST SEASONS REGULATIONS.
C     A(I,3)&A(I,4)------THIS SEASONS REGULATIONS.
C
      DO 500 I=1,98
      A(I,1)=SEASON(I,YR-1)
      A(I,2)=ESDAYS(I,YR-1)
      A(I,3)=SEASON(I,YR)
      A(I,4)=ESDAYS(I,YR)
      PTR(I)=0
  500 CONTINUE
C
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
C      BEGIN SORTING PROCEDURE--SETTING POINTERS TO INDICATE GROUPS.
C
       L=1
       DO 530 I=1,98
C
C      IF COUNTY I HAD A UN-UNIFORM SEASON EITHER YEAR THEN GO TO 529
C       TO IDENTIFY WITH CORRECT POINTER NUMBER(100)
C
       IF(A(I,1).EQ.5..OR.A(I,3).EQ.5.)GO TO 529
C
C      IF COUNTY WAS CLOSED EITHER YEAR THEN GO TO 528 TO SET POINTER.
C
       IF(A(I,1).EQ.0..AND.A(I,3).EQ.0.)GO TO 528
C
C      TESTING TO SEE IF COUNTY POINTER HAS ALREADY BEEN SET.
C
       IF(PTR(I).NE.0)GO TO 530
       PTR(I)=L
       M=1
       N=I+1
C
C      TEST ALL COUNTIES AFTER COUNTY I FOR SIMILAR SEASON REGULATIONS
C
       DO 520 J=N,98
C-----TEST FOR COUNTIES ALREADY GROUPED.
       IF(PTR(J).NE.0)GO TO 520
C
C      COMPARE REGULATION CHANGES OF COUNTY J WITH THOSE OF COUNTY I.
C      IF ALL REGULATIONS ARE THE SAME THEN POINTER IS SET TO GROUP L.
C
       DO 510 K=1,4
       IF(A(J,K).NE.A(I,K))GO TO 520
 510   CONTINUE
       PTR(J)=L
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
 520  CONTINUE
C-----IF A GROUP WAS FORMED THEN INCREMENT L  FOR POINTER.
      IF(M.EQ.1)L=L+1
      GO TO 530
C-----PTR=200 INDICATES CLOSED SEASON.
 528  PTR(I)=200
      GO TO 530
C-----PTR=100 INDICATES UN-UNIFORM SEASON.
 529  PTR(I)=100
 530  CONTINUE
      NGRPS=L-1
      K=0
C
C     YR1--CURRENT YEAR; YR2--LAST YEAR; YR3--NEXT YEAR;(FOR TABLE HEAD)
C
      YR1=YR+46
      YR2=YR1-1
      YR3=YR1+1
C
C-----BEGIN SORTING COUNTIES BY GROUPS FORMED ABOVE...CALCULATING
C     TOTALS AND PERCENT CHANGES.
C
 531  K=K+1
      TKSUM1=0.0
      TKSUM2=0.0
      BK1SUM=0.0
      BK2SUM=0.0
      DK1SUM=0.0
      DK2SUM=0.0
      ABK1SM=0.0
      ABK2SM=0.0
      PDK1SM=0.0
      PDK2SM=0.0
      WRITE(6,532)YR2,YR1,K
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
 532  FORMAT('1',35X,'VIRGINIA COUNTY DEER SEASON REGULATION CHANGES SUM
     _MARY--19',I2,'-19',I2,///71X,'TABLE ',I2)
      WRITE(6,535)YR2,YR1,YR1,YR3
 535  FORMAT(//45X,'19',I2,'-19',I2,38X,'19',I2,'-19',I2)
      WRITE(6,536)
 536  FORMAT(47X,'SEASON',41X,'SEASON')
      WRITE(6,537)
 537  FORMAT(44X,'TYPE    ES DAYS',15X,'TO',16X,'TYPE    ES DAYS')
      WRITE(6,538)
 538  FORMAT(44X,'----    -------',33X,'----    -------')
      ICNT=0
      DO 555 I=1,98
C-----IF COUNTY I NOT IN GROUP K THEN GO TO NEXT COUNTY AND TEST.
      IF(PTR(I).NE.K)GO TO 555
      ICNT=ICNT+1
C-----IF NOT FIRST COUNTY IN GROUP THEN DON'T PRINT TABLE HEADING.
      IF(ICNT.NE.1)GO TO 545
C
C-----PRINT TABLE HEADINGS.
C
      WRITE(6,540)A(I,1),A(I,2),A(I,3),A(I,4)
 540  FORMAT(45X,F2.0,6X,F3.0,36X,F2.0,6X,F3.0)
      WRITE(6,539)
 539  FORMAT(//10X,112('-'))
      WRITE(6,541)
 541  FORMAT(27X,'DAYS IN',33X,'ANTL.   |   DAYS IN',33X,'ANTL.')
      WRITE(6,542)
 542  FORMAT(12X,'COUNTY',10X,'SEASON  BUCKS   DOES   TOTAL   %DOES   BU
     XCKS  |   SEASON  BUCKS   DOES   TOTAL   %DOES   BUCKS')
      WRITE(6,543)
 543  FORMAT(10X,112('-')/)
C
C     SUMMING COUNTY DATA IN TOTALS FOR GROUP.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
 545  CONTINUE
      TKSUM1=TKSUM1+TK(I,YR-1)
      TKSUM2=TKSUM2+TK(I,YR)
      BK1SUM=BK1SUM+BK(I,YR-1)
      BK2SUM=BK2SUM+BK(I,YR)
      DK1SUM=DK1SUM+DK(I,YR-1)
      DK2SUM=DK2SUM+DK(I,YR)
      ABK1SM=ABK1SM+ABK(I,YR-1)
      ABK2SM=ABK2SM+ABK(I,YR)
      PDK1SM=PDK1SM+PDK(I,YR-1)
      PDK2SM=PDK2SM+PDK(I,YR)
C
C-----WRITE COUNTY HARVEST DATA---2 YEARS.
C
      WRITE(6,550)FIPS(I),HDAYS(I,YR-1),BK(I,YR-1),DK(I,YR-1),
     _TK(I,YR-1),PDK(I,YR-1),ABK(I,YR-1),HDAYS(I,YR),BK(I,YR),DK(I,YR),
     _TK(I,YR),PDK(I,YR),ABK(I,YR)
 550  FORMAT(10X,2A8,F6.0,F9.0,F7.0,F8.0,F8.1,F8.0,'  |',F7.0,F9.0,F7.0,
     _F8.0,F8.1,F8.0)
 555  CONTINUE
      WRITE(6,570)
 570  FORMAT(36X,'-----   ----   -----   -----   -----  |',11X,'-----
     _----   -----   -----   -----')
C
C     TOTAL PERCENT DOE KILL IS CALCULATED.
C
      PCTDK1=PDK1SM/ICNT
      PCTDK2=PDK2SM/ICNT
C
C     PRINT TOTALS
C
      WRITE(6,571) BK1SUM,DK1SUM,TKSUM1,PCTDK1,ABK1SM,BK2SUM,DK2SUM,TKSU
     _M2,PCTDK2,ABK2SM
 571  FORMAT(10X,'TOTALS',16X,F9.0,F7.0,F8.0,F8.1,F8.0,'  |',7X,F9.0,F7.
```

APPENDIX TABLE 1. (CONTINUED)


```
==========================================================================
      _0,F8.0,F8.1,F8.0)
C
C     PERCENT CHANGES IN HARVEST PARAMETERS ARE CALCULATED.
C
      IF(BK1SUM.EQ.0.0) BK1SUM=1.0
      BKDELT=((BK2SUM-BK1SUM)/BK1SUM)*100.
      IF(DK1SUM.EQ.0.0) DK1SUM=1.0
      DKDELT=((DK2SUM-DK1SUM)/DK1SUM)*100.
      IF(PCTDK1.EQ.0.0) PCTDK1=1.0
      PDKDEL=((PCTDK2-PCTDK1)/PCTDK1)*100.
      IF(ABK1SM.EQ.0.0) ABK1SM=1.0
      ABKDEL=((ABK2SM-ABK1SM)/ABK1SM)*100.
      IF(TKSUM1.EQ.0.0) TKSUM1=1.0
      PRCNT=((TKSUM2-TKSUM1)/TKSUM1)*100.
      WRITE(6,575)BKDELT,DKDELT,PRCNT,PDKDEL,ABKDEL
 575  FORMAT(/75X,'% CHANGE--',F6.1,F7.1,F8.1,F8.1,F8.1)
C-----IF TOTAL KILL DECREASED THEN GO TO 560 TO PRINT RESULTS
      IF(TKSUM1.GT.TKSUM2)GO TO 560
C-----INCREASE IN TOTAL KILL IS CALCULATED.
      IDIFF=TKSUM2-TKSUM1
      WRITE(6,556)YR1,IDIFF,PRCNT,YR2
 556  FORMAT(//13X,'19',I2,' TOTAL KILL INCREASED BY ',I4,' DEER OR ',F5
     _.1,'% OVER 19',I2)
      WRITE(6,543)
      WRITE(6,566)
      GO TO 590
C-----DECREASE IN TOTAL KILL IS CALCULATED
 560  IDIFF=TKSUM1-TKSUM2
      PRCNT=ABS(PRCNT)
      WRITE(6,565)YR1,IDIFF,PRCNT,YR2
 565  FORMAT(//13X,'19',I2,' TOTAL KILL DECREASED BY ',I4,' DEER OR ',F5
     _.1,'% OF 19',I2)
      WRITE(6,543)
      WRITE(6,566)
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
 516  FORMAT('0',15X,'SEASON TYPE CODES'//15X,'1. EITHER SEX ALL SEASON'
     _/15X,'2. BUCKS ONLY'/15X,'3. EITHER SEX AT BEGINNING OF SEASON'/
     _15X,'4. EITHER SEX AT END OF SEASON'/15X,'5. NOT A UNIFORM SEASON'
     _)
C
C     IF ALL REGULAR SEASON CHANGE GROUPS HAVE BEEN PRINTED THEN
C        GO TO 598.  IF NOT THEN GO TO 531 AND START TO SORT NEXT GROUP.
C
 590  IF(K.EQ.NGRPS)GO TO 598
      GO TO 531
C
C-----COUNTIES WITHOUT UNIFORM SEASONS ARE IDENTIFIED AND PRINTED.
C
 598  K=K+1
      WRITE(6,532)YR2,YR1,K
      WRITE(6,580)
 580  FORMAT(//53X,'COUNTIES NOT HAVING A UNIFORM SEASON (TYPE=5)'/)
      WRITE(6,535)YR2,YR1,YR1,YR3
      WRITE(6,536)
      WRITE(6,543)
      WRITE(6,541)
      WRITE(6,542)
      WRITE(6,543)
      K=100
      DO 585 I=1,98
      IF(PTR(I).NE.K)GO TO 585
      WRITE(6,550)FIPS(I),HDAYS(I,YR-1),BK(I,YR-1),DK(I,YR-1),
     _TK(I,YR-1),PDK(I,YR-1),ABK(I,YR-1),HDAYS(I,YR),BK(I,YR),
     _DK(I,YR),TK(I,YR),PDK(I,YR),ABK(I,YR)
 585  CONTINUE
C
C-----COUNTIES WITH CLOSED SEASONS ARE IDENTIFIED AND PRINTED.
C
      WRITE(6,543)
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
      K=200
      WRITE(6,595)
 595  FORMAT(///15X,'THE FOLLOWING COUNTIES HAD CLOSED SEASONS;'//)
      DO 587 I=1,98
      IF(PTR(I).NE.K)GO TO 587
      WRITE(6,586) FIPS(I)
 586  FORMAT(30X,2A8)
 587  CONTINUE
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
=========================================================================
      SUBROUTINE CHECK(IYEARS)
C
C     THIS SUBROUTINE SUMMARIZES THE DEER CHECK STATION DATA
C     COLLECTED AT 15 CHECK STATIONS WEST OF THE BLUE RIDGE.
C
C     DATA IS READ FROM DISK(UNIT 25) AND THEN CALCULATIONS ARE MADE
C     AND THE DATA IS PRINTED OUT BY CHECK STATION.
C
      DIMENSION BDATA(3,40),DDATA(3,40),SPIKES(40),AVGWT(40)
      DIMENSION BFAWNS(40),DFAWNS(40),BYRLNG(40),DYRLNG(40),
     _B2PLUS(40),D2PLUS(40),TOTBUC(40),TOTDOE(40),GRDTOT(40),
     _PFANTL(40),PFTOTB(40),PFTOTD(40),PYRTAB(40),PYRTAD(40)
      COMPLEX*16 CTYNAM(15)/'ALLEGHANY','AUGUSTA','AUGUSTA',
     _'BATH','BATH','CRAIG','CRAIG','GILES','GILES','HIGHLAND',
     _'ROCKBRIDGE','ROCKINGHAM','SHENANDOAH','SMYTH','WYTHE'/
      COMPLEX*16 STANAM(15)/'TRIANGLE SERVICE','     BUFFALO GAP',
     _'    WEST AUGUSTA','     MOUNT GROVE','    WARM SPRINGS',
     _'          MAGGIE','      NEW CASTLE','          DISMAL',
     _'    STONEY CREEK','      HEADWATERS','  WEST LEXINGTON',
     _'       FULKS RUN','   MOUNT JACKSON','     SUGAR GROVE',
     _'       SPEEDWELL'/
      DEFINE FILE 25(15,1284,L,ID)
      ID=1
      DO 100 I=1,15
      READ(25'I)ISTA,BDATA,DDATA,SPIKES,AVGWT
      DO 70 J=1,IYEARS
      BFAWNS(J)=BDATA(1,J)
      BYRLNG(J)=BDATA(2,J)
      B2PLUS(J)=BDATA(3,J)
      DFAWNS(J)=DDATA(1,J)
      DYRLNG(J)=DDATA(2,J)
      D2PLUS(J)=DDATA(3,J)
      TOTBUC(J)=BFAWNS(J)+BYRLNG(J)+B2PLUS(J)
      TOTDOE(J)=DFAWNS(J)+DYRLNG(J)+D2PLUS(J)
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
      GRDTOT(J)=TOTBUC(J)+TOTDOE(J)
C
      DIVIDE=TOTDOE(J)+BFAWNS(J)
      IF(DIVIDE .LE. 0.0)GO TO 10
      PFANTL(J)=((BFAWNS(J)+DFAWNS(J))/DIVIDE)*100.
      GO TO 15
   10 PFANTL(J)=0.0
C
   15 IF(TOTBUC(J) .LE. 0.0) GO TO 20
      PFTOTB(J)=(BFAWNS(J)/TOTBUC(J))*100.
      GO TO 25
   20 PFTOTB(J)=0.0
C
   25 IF(TOTDOE(J) .LE. 0.0)GO TO 30
      PFTOTD(J)=(DFAWNS(J)/TOTDOE(J))*100.
      GO TO 35
   30 PFTOTD(J)=0.0
C
   35 DIVIDE=BYRLNG(J)+B2PLUS(J)
      IF(DIVIDE .LE. 0.0)GO TO 40
      PYRTAB(J)=(BYRLNG(J)/DIVIDE)*100.
      GO TO 45
   40 PYRTAB(J)=0.0
C
   45 DIVIDE=DYRLNG(J)+D2PLUS(J)
      IF(DIVIDE .LE. 0.0)GO TO 50
      PYRTAD(J)=(DYRLNG(J)/DIVIDE)*100.
      GO TO 55
   50 PYRTAD(J)=0.0
   55 CONTINUE
   70 CONTINUE
C
      IYR=IYEARS+46
      WRITE(6,75)IYR,CTYNAM(I),STANAM(I)
```

APPENDIX TABLE 1. (CONTINUED)

```
======================================================================
  75   FORMAT('1',49X,'VIRGINIA DEER CHECK STATION DATA',/61X,'1947-19',
      _I2,//31X,'COUNTY: ',2A8,24X,2A8,' STATION',/1X,132('-'),/115X,
      _'% 1.5        % 1.5',/73X,'AVG.       % FAWNS     % FAWNS     % FAWNS
      _IN TOTAL    IN TOTAL',/15X,'BUCKS',20X,'DOES',12X,'GRAND      %
      _ WGT.     IN ANTL-    IN TOTAL    IN TOTAL      ADULT        ADULT')
       WRITE(6,76)
  76   FORMAT('+',6X,22('_'),3X,21('_'))
       WRITE(6,77)
  77   FORMAT(' ','YEAR   0.5   1.5   2.5+  TOTAL   0.5   1.5   2.5+  TOTAL
      _ TOTAL    SPIKES    1.5     LESS DEER       BUCKS         DOES          BUCKS
      _        DOES',/1X,132('-'))
       DO 85 J=1,IYEARS
       IYR=J+46
       WRITE(6,80) IYR,BFAWNS(J),BYRLNG(J),B2PLUS(J),TOTBUC(J),DFAWNS(J),
      _DYRLNG(J),D2PLUS(J),TOTDOE(J),GRDTOT(J),SPIKES(J),AVGWT(J),
      _PFANTL(J),PFTOTB(J),PFTOTD(J),PYRTAB(J),PYRTAD(J)
  80   FORMAT(2X,I2,4X,F4.0,2F5.0,2F7.0,2F5.0,F7.0,F8.0,F9.2,F7.0,5F11.2)
  85   CONTINUE
       WRITE(6,87)
  87   FORMAT(1X,132('-'))
 100   CONTINUE
       RETURN
       END
```

APPENDIX TABLE 1. (CONTINUED)

```
================================================================================
      SUBROUTINE INTRO
C
C     THIS SUBROUTINE SIMPLY PRINTS AN INTRODUCTION TO THE
C     PRINCIPLES OF WHITE-TAILED DEER MANAGEMENT.
C
      WRITE(6,10)
   10 FORMAT('1',58X,'INTRODUCTION TO'/'+',58X,15('_')//58X,'WHITE-TAILE
     _D DEER'/'+',57X,17('_')//56X,'MANAGEMENT PRINCIPLES'/'+',55X,21('_
     _')/)
      WRITE(6,20)
   20 FORMAT('0',/40X,'MUCH IS KNOWN ABOUT THE WHITE-TAILED DEER AND ITS
     _ MANAGEMENT,'//35X,'AND A FEW IMPORTANT FACTS ARE INCLUDED HERE FO
     _R YOUR CONSIDERATION.'//35X,'FOR ADDITIONAL INFORMATION YOU MAY WI
     _SH TO READ WALTER TAYLORS'' BOOK,'//35X,'THE DEER OF NORTH AMERICA
     _, PUBLISHED BY THE STACKPOLE COMPANY OF'/'+',34X,25('_')//35X,'HAR
     _RISBURG, PA.')
      WRITE(6,40)
   40 FORMAT('0',/40X,'EASTERN WHITE-TAILED DEER CAN LIVE UNDER A WIDE V
     _ARIETY OF'//35X,'FORESTED CONDITIONS AS LONG AS THEIR REQUIREMENTS
     _ FOR FOOD,WATER,'//35X,'AND COVER ARE MET, AND PROTECTION FROM POA
     _CHERS AND OTHER HARASSMENT'//35X,'IS PROVIDED.')
      WRITE(6,45)
   45 FORMAT('0',/64X,'FOOD'/'+',63X,'____')
      WRITE(6,50)
   50 FORMAT('0',/40X,'ONCE THOUGHT TO BE PRIMARILY BROWSERS, SOUTHERN D
     _EER CONSUME,'//35X,'IN ADDITION TO WOODY BROWSE AND LEAVES, LARGE
     _QUANTITIES OF FRUITS,'//35X,'MUSHROOMS, AND HERBACEOUS MATERIAL SU
     _CH AS GRASS AND FORBS. ACORNS,'//35X,'NUTS, AND FLESHY FRUITS ARE
     _ALSO IMPORTANT. GREEN BROWSE AND'//35X,'HERBAGE ARE THE PRINCIPAL
     _SPRING AND SUMMER FOODS. MAST IS HEAVILY'//35X,'UTILIZED WHEN IT I
     _S AVAILABLE AND MAY SUSTAIN THE DEER THROUGHOUT'//35X,'THE WINTER.
     _ MANY AGRICULTURAL CROPS ARE CONSUMED BY DEER, AND CROP'//35X,'DAM
     _AGE CAN BE SIGNIFICANT WHERE DEER ARE ABUNDANT.')
      WRITE(6,55)
```

APPENDIX TABLE 1. (CONTINUED)

```
===========================================================================
 55   FORMAT('0',/63X,'WATER'/'+',62X,5('_'))
      WRITE(6,60)
 60   FORMAT('0',/40X,'ALTHOUGH DEER NEED FREE WATER, LACK OF THIS RESOU
     _RCE IS RARELY'//35X,'A LIMITING FACTOR IN THE SOUTHEAST. THEIR WAT
     _ER NEEDS ARE PARTIALLY'//35X,'SATISFIED BY THE MOISTURE CONTENT OF
     _ SUCCULENT VEGETATION.')
      WRITE(6,65)
 65   FORMAT('1',62X,'COVER'/'+',62X,5('_'))
      WRITE(6,70)
 70   FORMAT('0',/40X,'DEER REQUIRE AREAS OF DENSE COVER FOR CONCEALMENT
     _ AND PROTECTION'//35X,'FROM THE ELEMENTS. PATCHES OF SMALL CONIFER
     _S OR HONEYSUCKLE, LAUREL,'//35X,'AND RHODODENDRON THICKETS, OR ANY
     _ DENSE EVERGREEN WELL DISTRIBUTED'//35X,'THROUGHOUT THE FORESTED A
     _REAS WILL PROVIDE ADEQUATE COVER.')
      WRITE(6,75)
 75   FORMAT('0',/57X,'POPULATIONS--HARVEST'/'+',56X,20('_'))
      WRITE(6,80)
 80   FORMAT('0',/40X,'A HEALTHY DEER HERD CAN BE EXPECTED TO MAINTAIN A
     _N ANNUAL'//35X,'INCREASE OF 25-30 PERCENT. ALTHOUGH DEER NEED PROT
     _ECTION FROM'//35X,'POACHING AND HARASSMENT BY FREE-RUNNING DOGS, I
     _T IS EQUALLY IMPORTANT'//35X,'THAT THIS YEARLY INCREASE BE HARVEST
     _ED. WITHOUT SUCH ANNUAL REDUCTION,'//35X,'DEER RANGE CAN RAPIDLY B
     _ECOME OVERPOPULATED. OVERCROWDING INCREASES '//35X,'THE DANGER OF
     _DISEASE, CAN CAUSE EXTENSIVE DAMAGE TO THE HABITAT'//35X,    'THRO
     _UGH OVERBROWSING, AND CAN INCREASE FOREST, ORCHARD, AND'//35X,'AGR
     _ICULTURAL LOSSES.')
      WRITE(6,85)
 85   FORMAT('0',/40X,'AS A GENERAL RULE OF THUMB, 20 PERCENT OF A DEER
     _POPULATION MAY BE'//35X,'REMOVED THROUGH HUNTING WITHOUT IMPAIRING
     _ THE REPRODUCTIVE'//35X,'CAPABILITIES OF THE HERD. POPULATION REDU
     _CTION MAY BE ACHEIVED BY'//35X,'HARVESTING MORE THAN 20 PERCENT OF
     _ THE POPULATION, WHILE HARVESTS OF LESS'//35X,'THAN 20 PERCENT ALL
     _OW THE DEER HERD TO GROW. WILDLIFE BIOLOGISTS MAY BE'//35X,'CONTAC
     _TED FOR MORE PRECISE HARVEST RECOMMENDATIONS.')
```

APPENDIX TABLE 1. (CONTINUED)

```
=======================================================================
      WRITE(6,90)
   90 FORMAT('0',/40X,'DEER HARVESTS IN VIRGINIA ARE CONTROLLED BY REGUL
     _ATING THE'//35X,'LENGTH OF THE SEASON, THE NUMBER OF EITHER SEX DA
     _YS IN THE SEASON,'//35X,'AND HUNTER BAG LIMITS. WEAPON RESTRICTION
     _S AND REGULATING HUNTING'//35X,'WITH DOGS MAY ALSO BE USED AS CONT
     _ROL MEASURES. PUBLIC ACCESS TO'//35X,'HUNTING AREAS IS ALSO AN IMP
     _ORTANT FACTOR INFLUENCING HUNTER'//35X,'DISTRIBUTION AND THE TOTAL
     _ DEER HARVEST.')
      WRITE(6,95)
   95 FORMAT('1',57X,'HABITAT MANAGEMENT'/'+',57X,18('_'))
      WRITE(6,100)
  100 FORMAT('0',/40X,'BECAUSE THE WHITE-TAILED DEER IS A FOREST SPECIES
     _, ITS  '//35X,  'MANAGEMENT IS CLOSELY ASSOCIATED WITH FOREST MANA
     _GEMENT. SMALL'//35X,'(LESS THAN 40 ACRES) FOREST CLEARINGS AND EAR
     _LY FOREST REGENERATION'//35X,'BENEFIT DEER BY PROVIDING ADDITIONAL
     _ FOOD AND ADJACENT COVER. OLD'//35X,'APPLE ORCHARDS, AREAS OF HONE
     _YSUCKLE, GRAPEVINES, GREENBRIAR, LAUREL,'//35X,'AND OTHER EVERGREE
     _N COVER SHOULD BE MAINTAINED AND PROTECTED. IN'//35X,'A PINE FORES
     _T, SMALL, WELL-DISTRIBUTED GROUPS OF MAST (ACORN, NUT, & FRUIT)'//
     _35X,'PRODUCERS ARE IMPORTANT.')
      WRITE(6,105)
  105 FORMAT('0',/40X,'LOGGING ROADS, OLD SKID TRAILS, AND SMALL IRREGUL
     _AR FOREST'//35X,'OPENINGS CAN BE PLANTED WITH SUCH SPECIES AS PERE
     _NNIAL RYEGRASS,'//35X,      'BLUEGRASS, ORCHARDGRASS, FESCUES, VET
     _CH, HONEYSUCKLE, AND'//35X,'CLOVERS. MAN-MADE OR NATURAL OPENINGS
     _IN FOREST STANDS SHOULD BE'//35X,'MAINTAINED BY CHEMICALS, BURNING
     _, OR MOWING. SUCH OPENINGS COMPENSATE'//35X,'FOR YEARLY FLUCTUATIO
     _NS IN FOOD SUPPLY, ESPECIALLY MAST.')
      WRITE(6,110)
  110 FORMAT('0',/40X,'PROBABLY THE MOST IMPORTANT CONSIDERATION IN DEER
     _ MANAGEMENT'//35X,'IS THE MAINTENANCE OF WELL-DISTRIBUTED AND DIVE
     _RSE HABITAT CONDITIONS.'//35X,'THE EXTENT OF FOREST CUTTING, THE T
     _YPES OF SPECIES, AND THE CUTTING'//35X,'PATTERNS USED ALL SIGNIFIC
     _ANTLY INFLUENCE SUCH CONDITIONS. PAST'//35X,'CUTTING PRACTICES ARE
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
     _ THE BASIS FOR PREDICTING FUTURE FOOD SUPPLIES'//35X,'AND THUS POT
     _ENTIAL DEER POPULATIONS. BY KNOWING THESE POTENTIAL'//35X,'POPULAT
     _ONS, THEN PLANS CAN BE MADE TO IMPROVE CITIZENS'' SATISFACTIONS'//
     _35X,'FROM THE RESOURCE. THE PLANNER CAN USE SUCH KNOWLEDGE TO INFL
     _UENCE'//35X,'LAND USE CHANGE, TO ESTIMATE COUNTY INCOME FROM HUNTE
     _RS,'//35X,'AND TO PREDICT WILDLIFE INFLUENCE ON THE AGRICULTURAL E
     _CONOMY AS'//35X,     'WELL AS WORKLOADS ASSOCIATED WITH COMPLAINTS
     _ AND DAMAGE CLAIMS.')
      WRITE(6,115)
 115  FORMAT('0',/40X,'LOSS OF AVAILABLE DEER RANGE TO CITIES, LAKES, RO
     _ADS, AND OTHER'//35X,'DEVELOPMENTS CAN SIGNIFICANTLY INFLUENCE COU
     _NTY DEER POPULATIONS.')
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      SUBROUTINE VACIS(IYR,TKSM,DYTK,SQMI,SQMA,COUNTY,DISTPT)
C
C     THIS SUBROUTINE PRODUCES COUNTY HARVEST AND HABITAT
C     SUMMARIES FOR USER=3 (PLANNER).  THE DATA BASE FOR
C     THE VIRGINIA COUNTY INFORMATION SYSTEM IS ACCESSED
C     TO OBTAIN THE REQUIRED LAND-USE INFORMATION.
C
C     COUNTY CODES (NUMBERS) ARE DIFFERENT FOR THE
C     VACIS DATA BASE, THUS THE ARRAY CCODE IS USED
C     TO TRANSLATE VACIS COUNTY CODES INTO VADMIS CODES.
C
      COMPLEX*16 DIST(6)/'NORTH MOUNTAIN','SOUTH MOUNTAIN',
     _'NORTH PIEDMONT','SOUTH PIEDMONT','NORTH TIDEWATER',
     _'SOUTH TIDEWATER'/
      COMPLEX*16 FIPS(99)
      INTEGER*2 DISTPT(100)
      INTEGER*2 CCODE(100)/
     _  1,   2,   3,   4,   5,   6,  -1,   7,   8,   9,
     _ 10,  11,  12,  13,  14,  15,  16,  17,  18,  19,
     _ 21,  22,  23,  24,  25,  26,  27,  28,  29,  30,
     _ 31,  32,  33,  34,  35,  36,  37,  38,  39,  40,
     _ 41,  43,  44,  45,  46,  47,  48,  50,  49,  51,
     _ 52,  53,  54,  55,  56,  57,  58,  59,  60,  61,
     _ 63,  64,  65,  66,  67,  68,  69,  70,  71,  72,
     _ 73,  74,  75,  76,  77,  78,  79,  80,  81,  82,
     _ 83,  84,  85,  86,  87,  88,  89,  90,  91,  93,
     _ 94,  95,  96,  97,  98,  42,  42,  62,  92,  20/
      REAL TK(98,40),TKSM(98,40),AFKSM(98,40),BK(98,40),ABK(98,40),
     _DK(98,40),PDK(98,40),HDAYS(98,40),ESDAYS(98,40),SEASON(98,40),
     _DYTK(20,40),SQMA(20,40),SQMI(98,40)
C
      REAL NATFOR,NOFRMS,NFORKL,NFORMI
      INTEGER COUNTY(100),YR(40)
      INTEGER MOLESS(2)/'MORE','LESS'/
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      COMMON/HARVST/TK,ABKSM,BK,ABK,DK,PDK,HDAYS,ESDAYS,SEASON,FIPS
C
C
C     BEGIN COUNTY HABITAT-HARVEST SUMMARY
C
C     IJ = INDEX POINTER FOR VARIABLE VECTOR COUNTY(100)
C
      IJ=1
      DO 100 ID=1,100
C
C     COUNTY DATA FOR COUNTY ID (CCC CODE) IS READ FROM DISK....MASTER
C      FILE FOR VACIS( VIRGINIA COUNTY INFORMATION SYSTEM) DEVELOPED
C      BY MCDONALD (1977) AT VIRGINIA TECH; DEPT. FISH. & WILDL. SCI.
C
      READ(20,1,ERR=500)TOTACR,NATFOR,NOFRMS,FRMACR,PCTFRM,AVSIAC,CROP,
     _PAST,FOR
    1 FORMAT(44X,3(100X),10(100X),F7.0,18X,F6.0,53X,6(100X),F5.0,F7.0,
     _F4.1,F6.1,127X,10(100X),3F8.1)
      GO TO 499
  500 WRITE(6,501)ID,CCODE(ID)
  501 FORMAT('0',10X,'READ ERROR AT COUNTY NO. ',I3,2X,I3)
  499 CONTINUE
C
C     COUNTY NUMBER IS CONVERTED TO VADMIS COUNTY CODE (HOLLCODE)
C
      IHOLL=CCODE(ID)
      DO 3 J=1,100
      IF(IHOLL .EQ. COUNTY(J))GO TO 4
    3 CONTINUE
      GO TO 100
    4 CONTINUE
      IJ=IJ+1
C
C     TOTAL LAND AREA....IN KILOMETERS AND MILES
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
C
      TOKILO=TOTACR/247.1
      TOSQMI=TOTACR/640.
C
C     AVERAGE FARM SIZE....ACRES TO HECTARES
C
      AVSIHT=AVSIAC/2.471
C
C     AREA IN FARMS....IN KM AND MILES
C
      FRMKIL=FRMACR*1000./247.1
      FRMMI2=FRMACR*1000./640.
      NFARMS=NOFRMS
C
C     AREA IN CROPLAND.....KM AND MILES
C
      CROPKL= CROP*1000./247.1
      CROPMI= CROP*1000./640.
C
C     AREA IN PASTURE
C
      PSTKIL= PAST*1000./247.1
      PSTMI2= PAST*1000./640.
C
C     AREA IN FOREST
C
      FORKIL= FOR*1000./247.1
      FORMI2=FOR*1000./640.
C
C     AREA OWNED BY NATIONAL FORESTS
C
      NFORKL=NATFOR/247.1
      NFORMI=NATFOR/640.
C
```

APPENDIX TABLE 1. (CONTINUED)

```
======================================================================
C       ESTIMATED DEER RANGE
C
        DEERKL=SQMI(IHOLL,IYR)*2.59
        DEERMI=SQMI(IHOLL,IYR)
C
        IYR1=IYR+42
        IYR2=IYR+45
        IYR3=IYR+46
        IY2=IYR-1
        IY1=IYR-4
        DO 2 IY=1,IYR
        YR(IY)=IY+46
    2   CONTINUE
C
        TKILL=TK(IHOLL,IYR)
        TKDIFF=TK(IHOLL,IYR)-TK(IHOLL,IY2)
        IF(TKDIFF .LT. 0.0)GO TO 5
        IML=1
        GO TO 10
    5   IML=2
        TKDIFF=ABS(TKDIFF)
   10   CONTINUE
C
        NKILL=TKILL
        NDIFF=TKDIFF
C
        CTKM2=TKSM(IHOLL,IYR)
C
        TKSUM=0.
        DO 15 J=IY1,IYR
        TKSUM=TKSUM+TK(IHOLL,J)
   15   CONTINUE
        AVTK=TKSUM/5.
        NAVTK=AVTK
```

APPENDIX TABLE 1. (CONTINUED)

```
=====================================================================
C
      TKSUM=0.
      DO 20 J=IY1,IYR
      TKSUM=TKSUM+TKSM(IHOLL,J)
   20 CONTINUE
      CAVTKS=TKSUM/5.
C
C
C     IDENTIFY DISTRICT NUMBER OF COUNTY
C
      KD=DISTPT(IHOLL)
      DTKM2=DYTK(KD,IYR)/SQMA(KD,IYR)
      DTKSUM=0.
      DO 25 J=IY1,IYR
      DTKSUM=DTKSUM+DYTK(KD,J)/SQMA(KD,J)
   25 CONTINUE
      DAVTKS=DTKSUM/5.
C
C     BEGIN PRINTING COUNTY SUMMARIES
C
      WRITE(6,30) FIPS(IHOLL)
   30 FORMAT('1',53X,2A8,' COUNTY',/'+',53X,23('_'))
      WRITE(6,35)
   35 FORMAT('0',/54X,'HABITAT CHARACTERISTICS',/'+',53X,23('_'))
      WRITE(6,40) FIPS(IHOLL),TOKILO,TOSQMI,PCTFRM,FRMKIL,FRMMI2,NFARMS,
     _AVSIHT,AVSIAC
   40 FORMAT('0',/40X,2A8,' COUNTY HAS A TOTAL LAND AREA OF ',F6.1,
     _' SQUARE'//35X,'KILOMETERS (',F6.1,' SQ. MILES). FARMED LAND COMPR
     _ISES ',F4.1,'% OF THE'//35X,'TOTAL LAND AREA OF ',F6.1,' SQUARE KI
     _LOMETERS (',F6.1,' SQ. MILES). THERE'//35X,'ARE AN ESTIMATED ',I5,
     _' FARMS IN THE COUNTY WITH AN AVERAGE SIZE OF'//35X, F5.1,' HECTA
     _RES (',F5.1,' ACRES).')
      WRITE(6,45)CROPKL,CROPMI,PSTKIL,PSTMI2,FORKIL,FORMI2,NFORKL,
     _NFORMI,DEERKL,DEERMI
```

APPENDIX TABLE 1. (CONTINUED)

```
==========================================================================
 45   FORMAT('0',/40X,'THERE ARE APPROXIMATELY ',F5.1,' SQUARE KILOMETER
     _S (',F5.1,' SQ. MILES)'//35X,'OF CROPLAND, ',F5.1,' SQUARE KILOMET
     _ERS (',F5.1,' SQ. MILES) OF PASTURELAND,'//35X,'AND ',F6.1,' SQUAR
     _E KILOMETERS (',F5.1,' SQ. MILES) OF FORESTLAND IN THE'//35X,'COUN
     _TY. NATIONAL FOREST LAND INCLUDES ',F5.1,' SQUARE KILOMETERS'//35X
     _,'(',F5.1,' SQ. MILES) IN THE COUNTY AND THERE ARE AN ESTIMATED ',
     _F6.1//35X,'SQUARE KILOMETERS (',F5.1,' SQ. MILES) OF FORESTED DEER
     _ RANGE.')
      WRITE(6,50)
 50   FORMAT('0',/53X,'DEER HARVEST CHARACTERISTICS',/'+',52X,27('_'))
      WRITE(6,55)IYR3,NKILL,FIPS(IHOLL),NDIFF,MOLESS(IML),IYR2,IYR1,
     _IYR3,NAVTK
 55   FORMAT('0',/40X,'IN 19',I2,',',  I6,' WHITE-TAILED DEER WERE HARVE
     _STED IN'//35X,2A8,' COUNTY, WHICH WAS A HARVEST OF ',I5,' ',A4,
     _' DEER'//35X,'THAN WERE HARVESTED IN 19',I2,'. THE AVERAGE DEER HA
     _RVEST IN THE COUNTY'//35X,'FOR THE YEARS 19',I2,' THROUGH 19',I2,
     _' IS ',I5,' DEER.')
      WRITE(6,60)FIPS(IHOLL),IYR3,CTKM2,IYR1,IYR3,CAVTKS
 60   FORMAT('0',/40X,'THE TOTAL DEER HARVEST PER SQUARE MILE OF FORESTE
     _D DEER RANGE IN'//35X,2A8,' COUNTY IN 19',I2,' WAS ',F4.1,'. THE A
     _VERAGE TOTAL HARVEST'//35X,'PER SQUARE MILE OF FORESTED DEER RANGE
     _ FOR THE YEARS 19',I2,' THROUGH 19',I2//35X,'IS ',F4.1,'.')
      WRITE(6,65)IYR3,DIST(KD),DTKM2,DIST(KD),IYR1,IYR3,DAVTKS
 65   FORMAT('0',/40X,'THE 19',I2,' AVERAGE TOTAL DEER HARVEST PER SQUAR
     _E MILE OF FORESTED'//35X,'DEER RANGE FOR COUNTIES WITHIN THE ',2A8
     _,' DISTRICT IS'//35X,F6.1,'. THE AVERAGE TOTAL HARVEST PER SQUARE
     _MILE OF FORESTED DEER'//35X,'RANGE FOR THE ',2A8,' DISTRICT OVER T
     _HE YEARS 19',I2,' THROUGH'//35X,'19',I2,' IS ',F4.1,'.')
      WRITE(6,70)FIPS(IHOLL),IYR3
 70   FORMAT(' ',/40X,'A TABLE SUMMARIZING THE DEER HARVEST HISTORY FOR
     _',2A8//35X,'COUNTY FROM 1947 TO 19',I2,' FOLLOWS.')
C
C     PRINT COUNTY DEER HARVEST HISTORY: 1947 TO 19(IYR)
C
```

APPENDIX TABLE 1. (CONTINUED)

```
==============================================================================
      WRITE(6,1210) YR(IYR),FIPS(IHOLL)
      I=IHOLL
C
      DO 190 K=1,IYR
 190  WRITE (6,1220) YR(K),TK(I,K),ABKSM(I,K),BK(I,K),ABK(I,K),DK(I,K),P
     1DK(I,K),HDAYS(I,K),ESDAYS(I,K),SEASON(I,K)
      WRITE(6,197)
 197  FORMAT('0',9X,104('-')/15X,'SEASON TYPE CODE'//15X,'1. EITHER SEX
     _ALL SEASON'/15X,'2. BUCKS ONLY'/15X,'3. EITHER SEX AT BEGINNING OF
     _ SEASON'/15X,'4. EITHER SEX AT END OF SEASON'/15X,'5. NOT A UNIFOR
     _M SEASON (SPLIT, TWO SEASON TYPES, ETC.)')
 1210 FORMAT('1',46X,'VIRGINIA COUNTY DEER HARVEST SUMMARY',/61X,'1947-1
     _9',I2,/11X,'COUNTY: ',2A8,//27X,'ANTLERED',51X,'HUNTING  ANY DEER'
     _,/18X,'TOTAL   BUCK KILL/',15X,'ANTLERED',15X,'% DOE IN    DAYS IN
     _   DAYS IN   TYPE OF',/11X,'YEAR    KILL  SQ.MI.RANGE   BUCK KILL
     _  BUCK KILL   DOE KILL  TOTAL KILL   SEASON    SEASON    SEASON')
 1220 FORMAT(10X,I4,F9.0,F10.1,5X,F9.0,3X,F9.0,3X,F8.0,1X,F10.2,F10.0,F1
     11.0,2X,F7.0)
 100  CONTINUE
      RETURN
      END
```

APPENDIX TABLE 1. (CONTINUED)

```
=============================================================================
      SUBROUTINE CHGSYM(IYEARS)
C
C     THIS SUBROUTINE CHANGES THE YEAR NUMBERS ON THE SYMAP MAP TITLES
C     SYMAP TITLES ARE IN THE C-LEGENDS PACKAGE WHICH IS ON DISK WITH
C     THE A-CONFORMOLINES,A-OUTLINES,E-VALUES,AND F-MAP PACKAGES.
C     DSN= A20101.SYMAP.DATA,UNIT=SYSDA,VOL=SER=USERPK,DISP=(OLD,KEEP)
C
      DEFINE FILE 16(976,80,L,ID)
      ID=1
      IYRS=IYEARS+46
C
      I=873
      INEW=IYRS
      READ(16'I,100)IDO,IOVER,IY,IYEAR
  100 FORMAT(3X,I2,3X,I2,22X,I2,I2)
      WRITE(16'I,100)IDO,IOVER,IY,INEW
C
      I=907
      INEW=IYRS-6
      READ(16'I,200)IDO,IOVER,IY,IYEAR
  200 FORMAT(3X,I2,3X,I2,10X,I2,I2)
      WRITE(16'I,200)IDO,IOVER,IY,INEW
C
      I=939
      INEW=IYRS-2
      READ(16'I,200)IDO,IOVER,IY,IYEAR
      WRITE(16'I,200)IDO,IOVER,IY,INEW
C
      I=959
      INEW=IYRS
      READ(16'I,200)IDO,IOVER,IY,IYEAR
      WRITE(16'I,200)IDO,IOVER,IY,INEW
      RETURN
      END
```

Appendix Table 2. List of Virginia counties and the counties contiguous to each.

Code	County	Contiguous Counties
1.	Accomack	1, 65
2.	Albemarle	2, 7, 14, 32, 39, 55, 63, 68, 81
3.	Alleghany	3, 8, 11, 23, 80
4.	Amelia	4, 21, 25, 27, 67, 72, 73
5.	Amherst	5, 6, 9, 15, 63, 80
6.	Appomatox	5, 6, 14, 15, 19, 63, 73
7.	Augusta	2, 7, 8, 46, 63, 80, 81
8.	Bath	3, 7, 8, 46, 80
9.	Bedford	5, 9, 11, 15, 33, 71, 79
10.	Bland	10, 35, 76, 85, 91, 97
11.	Botetourt	3, 9, 11, 23, 79, 80
12.	Brunswick	12, 27, 40, 56, 59, 67
13.	Buchanan	13, 26, 82, 91
14.	Buckingham	2, 6, 14, 25, 32, 63, 73
15.	Campbell	5, 6, 9, 15, 19, 41, 71
16.	Caroline	16, 28, 43, 49, 50, 51, 87
17.	Carroll	17, 31, 38, 70, 76, 97
18.	Charles City	18, 21, 44, 48, 64
19.	Charlotte	6, 15, 19, 41, 56, 59, 73
20.	Chesapeake	20, 62, 92
21.	Chesterfield	4, 18, 21, 27, 44, 72, 74
22.	Clarke	22, 30, 34, 54, 93
23.	Craig	3, 11, 23, 35, 61, 79
24.	Culpeper	24, 30, 57, 68, 77, 88
25.	Cumberland	4, 14, 25, 32, 37, 72, 73
26.	Dickenson	13, 26, 82, 96
27.	Dinwiddie	4, 12, 21, 27, 40, 67, 74, 90
28.	Essex	16, 28, 49, 60, 95
29.	Fairfax	29, 54, 75
30.	Fauquier	24, 30, 54, 75, 77, 88, 93
31.	Floyd	17, 31, 33, 61, 70, 76, 79
32.	Fluvanna	2, 14, 25, 32, 37, 55
33.	Franklin	9, 31, 33, 45, 70, 71, 79
34.	Frederick	22, 34, 84, 93
35.	Giles	10, 23, 35, 61, 76
36.	Glouchester	36, 49, 58, 60
37.	Goochland	25, 32, 37, 43, 44, 55, 72
38.	Grayson	17, 38, 85, 97
39.	Greene	2, 39, 57, 68, 69, 81
40.	Greenesville	12, 27, 40, 86, 90
41.	Halifax	15, 19, 41, 59, 71
42.	Hampton & N.News	42, 48, 98
43.	Hanover	16, 37, 43, 44, 51, 55, 64
44.	Henrico	18, 21, 37, 43, 44, 64

Appendix Table 2. (Continued).

Code	County	Contiguous Counties
45.	Henry	33, 45, 70, 71
46.	Highland	7, 8, 46
47.	Isle of Wight	47, 62, 86, 89
48.	James City	18, 42, 48, 64, 98
49.	King and Queen	16, 28, 36, 49, 51, 60
50.	King George	16, 28, 50, 88, 95
51.	King William	16, 43, 49, 51, 64
52.	Lancaster	52, 66, 78
53.	Lee	53, 83, 96
54.	Loudoun	22, 29, 30, 54, 75
55.	Louisa	2, 32, 37, 43, 55, 68, 87
56.	Lunenburg	12, 19, 56, 59, 67, 73
57.	Madison	24, 39, 57, 68, 69, 77
58.	Mathews	36, 58
59.	Mecklenburg	12, 19, 41, 56, 59
60.	Middlesex	28, 36, 49, 60
61.	Montgomery	23, 31, 35, 61, 76, 79
62.	Suffolk	20, 47, 62, 86
63.	Nelson	2, 5, 6, 7, 14, 63, 80
64.	New Kent	18, 43, 44, 48, 51, 64
65.	Northampton	1, 65
66.	Northumberland	52, 66, 78, 95
67.	Nottoway	4, 12, 27, 56, 67, 73
68.	Orange	2, 24, 39, 55, 57, 68, 87
69.	Page	39, 57, 69, 77, 81, 84, 93
70.	Patrick	17, 31, 33, 45, 70
71.	Pittsylvania	9, 15, 33, 41, 45, 71
72.	Powhatan	4, 21, 25, 37, 72
73.	Prince Edward	4, 6, 14, 19, 25, 56, 67, 73
74.	Prince George	21, 27, 74, 89, 90
75.	Prince William	29, 30, 54, 75, 88
76.	Pulaski	10, 17, 31, 35, 61, 76, 97
77.	Rappahannock	24, 30, 57, 69, 77, 93
78.	Richmond	52, 66, 78, 95
79.	Roanoke	9, 11, 23, 31, 33, 61, 79
80.	Rockbridge	3, 5, 7, 8, 9, 11, 63, 80
81.	Rockingham	2, 7, 39, 69, 81, 84
82.	Russell	13, 26, 82, 83, 85, 91, 94, 96
83.	Scott	53, 82, 83, 94, 96
84.	Shenandoah	34, 69, 81, 84, 93
85.	Smyth	10, 38, 82, 85, 91, 94, 97
86.	Southampton	40, 47, 62, 86, 90
87.	Spotsylvania	16, 24, 55, 68, 87, 88
88.	Stafford	16, 24, 30, 50, 75, 87, 88

Appendix Table 2. (Continued).

Code	County	Contiguous Counties
89.	Surry	47, 74, 89, 90
90.	Sussex	27, 40, 74, 86, 89, 90
91.	Tazewell	10, 13, 82, 85, 91
92.	Virginia Beach	20, 92
93.	Warren	22, 30, 34, 69, 77, 84, 93
94.	Washington	82, 83, 85, 94
95.	Westmoreland	28, 50, 66, 78, 95
96.	Wise	26, 53, 82, 83, 96
97.	Wythe	10, 17, 38, 76, 85, 97
98.	York	42, 48, 98

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A WHITE-TAILED DEER HARVEST
DATA-ANALYSIS AND INFORMATION
SYSTEM FOR VIRGINIA

by

Richard Lee Holloran

(ABSTRACT)

A computerized data-analysis and information system, VADMIS (Virginia Deer Management Information System), was developed to summarize and analyze Virginia county, district, region, and state deer harvest data.

Published wildlife literature and state wildlife agency progress reports were reviewed to identify and evaluate potential methods of analyzing and presenting deer harvest data. Meetings and correspondence with Virginia Commission of Game and Inland Fisheries biologists provided significant information regarding current data analysis techniques and information needs of the Game Commission. Data analysis methodologies and computer programs developed during prior graduate research studies at VPI&SU were also reviewed.

An auto-regression system was developed to predict county deer harvests for three season types; bucks-only, either-sex at the beginning or end of a bucks-only season; and either-sex hunting all season. The average accuracy of 1,076 county predictions made between 1962 and 1976,

inclusive, was 74.6 percent.

The VADMIS system also summarizes changes in recent county, district, region, and state harvests; produces histograms to illustrate county, district, and state harvest trends; summarizes changes in county season regulations and the associated changes in county deer harvests; summarizes harvest data collected at 15 check stations west of the Blue Ridge mountains; determines optimum deer management regions; and produces contour computer maps to illustrate and identify state-wide harvest trends.

The VADMIS system was designed to facilitate ease of operation, maintenance (data update), and future improvements, modifications, and extensions. Although the VADMIS system was developed for Virginia, in particular, it may be modified for use by other states.