

---

---

**Final Report**

**A DECISION SUPPORT SYSTEM FOR  
IDENTIFYING AND PRIORITIZING CONSERVATION RISKS  
MERGING GAP ANALYSIS WITH SOCIOECONOMIC STATISTICS**

**CMI-HDD-03-01  
Submitted: September 23, 2003**

Prepared for  
National Gap Analysis Program

.....

Prepared by:

Julie A. McClafferty, Human Dimensions Division, &  
Laura Roghair, GIS and Remote Sensing Division  
Conservation Management Institute  
Virginia Tech, College of Natural Resources  
1900 Kraft Drive  
Blacksburg, VA 24061-0534  
(540) 231-7348  
<ftp://www.cmiweb.org>



---

## EXECUTIVE SUMMARY

The Gap Analysis Program has made great strides in addressing the biological aspect of conservation prioritization, but thus far lacks the socioeconomic and demographic context needed for practical and effective implementation. Socioeconomics not only present major risk factors to biodiversity, but also pose unique obstacles and opportunities to conservation efforts.

To address this need and assist managers in identifying high-priority/high-risk sites based on both biological and socioeconomic factors, we developed a *Decision Support System* (DSS) based on a gap analysis foundation. In addition to the biological data provided by Virginia's Gap Analysis Project, we integrated socioeconomic (census) data and cultural (survey) data into an ArcGIS database and created a reporting feature that summarizes the different types of risks and values presented by alternate conservation sites. In the process of building this system, we defined a series of risk/value indices based on biological criteria and a suite of socioeconomic and cultural statistics. These rating systems rank potential conservation sites on a scale of 1 (low risk/value) to 5 (high risk/value) for each factor in the report, allowing decision makers to compare alternatives easily and objectively. Biological measures included in the reporting process include biodiversity, land cover, and current level of protection. Socioeconomic factors (from the U.S. Census Bureau) include human population density, human population growth rate, and agricultural land conversion rates. Cultural factors were derived from previously collected general public survey data and include support for additional land acquisition, interest in becoming involved with local wildlife conservation activities, current level of outdoor recreation involvement, and potential for future involvement in outdoor recreation by current non-participants.

We recognize that this system is simple in form, and there are many enhancements that might be attractive and useful to potential end users. These include increased flexibility in index definitions, expanded geographic applicability (currently only Virginia), expanded reporting capabilities and flexibility, and additional mapping flexibility. However, the prototype DSS we've created in this project is an important step in the integration of biological and socioeconomic information into a conservation decision-making tool. The information provided by the special functions and through the databases it contains lends a novel approach to objective priority setting. We hope this approach will be attractive to, and adapted by, natural resource professionals, land planners, and other critical decision makers.

---

**TABLE OF CONTENTS**

EXECUTIVE SUMMARY.....	II
TABLE OF CONTENTS .....	III
LIST OF TABLES .....	IV
LIST OF FIGURES .....	V
I. INTRODUCTION .....	1
Objectives .....	2
II. THE DECISION SUPPORT SYSTEM .....	3
Building the Decision Support System.....	4
<i>Data Development</i> .....	4
<i>System Development</i> .....	6
Using the Decision Support System .....	13
<i>The Default Display</i> .....	13
<i>Generating DSS Reports</i> .....	15
III. THE FUTURE OF CONSERVATION RISK ASSESSMENTS.....	20
APPENDIX A KEY TO SOCIOECONOMIC (CENSUS) TABLES .....	22
APPENDIX B KEY TO SURVEY DATA TABLES .....	26

---

**LIST OF TABLES**

Table 1: Conservation risk scores for VDGIF management regions as determined by the percentage of the total land area currently protected in Gap Status 1-3 lands.....	8
Table 2. Conservation risk scores for varying levels of biodiversity within taxa groups. Ranges represent the average number of species predicted to occur within a candidate conservation site. ....	8
Table 3. Conservation risk scores assigned to land cover types within each VDGIF management region. Regions 2 and 3 occur on the Piedmont Plateau, and Regions 4 and 5 both occur in the mountains, hence the common index scales within the physiographic provinces. ....	9
Table 4. Conservation risk scores according to the human population density in and around the candidate conservation site. ....	10
Table 5: Conservation risk scores according to the human population growth rate in and around the candidate conservation site. ....	10
Table 6: Conservation risk scores according to the rate of agricultural land conversion (1990-2000) in and around the candidate conservation site. ....	11
Table 7. Cultural value scores according to the support among residents for additional land acquisition as reported by a general public survey. ....	12
Table 8. Conservation value scores according to the interest among residents in becoming active in local wildlife conservation efforts as reported by a general public survey. ....	12
Table 9. Conservation value scores according to the activity among residents in wildlife watching or photography (percent who have participated in the last 2 years) as reported by a general public survey. ....	12
Table 10. Conservation value scores according to the interest in wildlife watching or photography (percent interested) among residents who did not take such a trip in the past 2 years as reported by a general public survey.....	13

## LIST OF FIGURES

- Figure 1. Management regions for the Virginia Department of Game and Inland Fisheries. The general public survey data used in the DSS is summarized and mapped according to these regions. These regions were thus used as a reference system for many of the DSS features. The regions are: 1 = Tidewater, 2 = Piedmont, 3 = Northern Virginia, 4 = Shenandoah, and 5 = Southwest Virginia..... 5
- Figure 2. The default display is seen when the Decision Support System is loaded. Data layers illustrated include Stewardship Lands, Test Polygons, and Counties and Regions. To execute the polygon comparison, load a coverage with the site of interest outline as polygons, highlight the polygons to evaluate, and click on the “Evaluate Sites” button at the top of the screen..... 14
- Figure 3. The “General Info” tab displayed automatically after the DSS “Evaluate Sites” operation is executed. Information provided here includes general descriptive statistics (area), the management region where the polygons of interest are located, the Region Risk Score (reflecting current protection levels), and the Distance Score (representing the distance from the polygon to the nearest stewardship lands. When a candidate site intersects more than 1 region, each region is listed in the report along the percentage of the site that occurs within each listed region. The Region score is determined from the region with the largest polygon component (in this case Region 5 score is used for Polygon 1). The Overall Score sums the 10 individual risk/value ratings listed in the report. This score ranges from 10 to 50, with 50 (100%) representing the highest possible risk and conservation value. A higher percentage in the Overall Score indicates a higher priority conservation site. .... 16
- Figure 4. The “Ecological Risks” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes risk created by predicted biodiversity levels and existing land cover. The Landcover Summary gives information on the land cover within the candidate sites (i.e., The Ecological Risk score summarizes these statistics (using the “all taxa” Biodiversity Risk score) with a simple sum ranging from 2 (relatively low risk) to 10 (relatively high risk). 17
- Figure 5. The “Socioeconomic Risks” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes risk determined by the human population density, the human population growth rate, and the agriculture to non-agriculture land conversion rate. Negative numbers represent either a declining population or a gain in agricultural lands. The Socioeconomic Risk score summarizes these statistics with a simple sum ranging from 3 (relatively low risk) to 15 (relatively high risk)..... 18
- Figure 6. The “Cultural Values” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes public support for land acquisition, general public interest in becoming involved in local wildlife conservation efforts, activity level in non-consumptive recreation, and potential for increased non-consumptive recreation. The Cultural Value score summarizes these

statistics with a simple sum and ranges from 4 (relatively low value) to 20 (relatively high value). ..... 19

## I. INTRODUCTION

Determining the risk of biodiversity loss (and therefore prioritizing its conservation) involves 2 critical factors: the biological resource (i.e., level and type of biodiversity, current level of protection) and the socioeconomic context within which it exists (human population growth, land use trends, cultural values). The USGS Gap Analysis Program has made great strides in addressing the biological aspect of conservation prioritization, but thus far lacks the socioeconomic and demographic context needed for practical and effective implementation. This interaction of biological and social factors is often the biggest stumbling block in conservation efforts, largely because socioeconomic data is difficult to obtain and even more difficult to interpret relevant to the case at hand. Techniques that facilitate this integration will make gap analysis an invaluable planning tool for various reasons.

1. Socioeconomic trends (population, land use) and characteristics (public goals and interests) are primary risk factors for the loss of biodiversity and degradation of ecosystems. Without considering these socioeconomic parameters, it is impossible to assign risk levels, predict future trends in biodiversity, or prioritize conservation objectives effectively.
2. Management agencies responsible for selecting, acquiring, and managing conservation lands have mission statements and legal mandates that dictate a commitment both to the biological resource and to the public. Conservation must always be performed within certain socioeconomic constraints – which vary with the agency and present both obstacles and opportunities for conservation.
3. Natural resources conservation can be abundantly successful when it works with the human dimension rather than independent of or against it. If the resource manager can identify ways in which conservation will complement the goals and interests of the community, not only will that particular conservation effort be highly successful, the conservation initiative in general will reap the rewards of good public relations as well.

Gap analysis has provided natural resource managers with innovative tools to help them answer the biological questions of “Where are the highest biodiversity areas?” and “How does our current protected lands network line up with this biodiversity distribution?” The biodiversity maps, land cover maps, and stewardship maps that result from each gap analysis project all help managers to answer these questions and serve as building blocks for more sophisticated models. However, these maps and products cannot answer other pressing questions such as “Why are these sites at risk?” “What areas are likely to be at risk in the future?” “What conservation options will work best at each unique site?” and “How can we make the most of our conservation dollars given our multifaceted missions?”

In this project, we have created a Decision Support System (DSS) to address these questions and assist managers in identifying high-priority and/or high-risk sites based on both biological and socioeconomic factors. The DSS is built on the gap analysis

foundation, and Virginia's Gap Analysis Project (VA-GAP) provided the preliminary user-interface and necessary biological/ecological information. Upon this base, we built a spatial database of socioeconomic data (including demographics and a recently completed public survey) and used the entire system to design a rating system that prioritizes potential conservation areas (candidate sites) in order of most important/highest risk to least important/lowest risk.

## **Objectives**

The primary goal of this project was to develop and test a Decision Support System (DSS) for the Commonwealth of Virginia that assists planners, biologists, managers, administrators, and constituents in identifying, rating, and prioritizing conservation needs through the integration of biological and socioeconomic parameters.

Meeting this goal involved the fulfillment of two objectives:

1. Data Development: Building a spatially explicit socioeconomic geographic information system based on census data, land use patterns, and public attitudes and goals toward natural resources and the management of fish and wildlife, and integrating these data with the gap analysis' biological databases. Designing a user-friendly interactive mapping program that makes these data easily accessible and understandable to a variety of land use planners.
2. System Development: Identifying relationships that indicate levels of risk and conservation importance and building a decision support system from this interactive database to identify conservation needs, rate the relative risk to selected candidate sites, and prioritize them relative to agency goals.

This report summarizes the steps we have taken to meet these objectives, describes the data involved, and outlines the procedures for using the Decision Support System. A brief discussion of the system components and the construction of the DSS, a description of the resulting system and its use, and a consideration of the appropriate avenues for implementation and directions for further development of the DSS are included in subsequent chapters.



## II. THE DECISION SUPPORT SYSTEM

This section discusses the development of the Decision Support System (DSS), the indices that comprise it, and the ArcGIS™ (ESRI, Redlands, California) interface with which users will interact. This chapter of the report is designed to serve as a User's Guide to the DSS, and can serve as a stand-alone manual for individuals using the system to help them make decisions about conservation alternatives.

Natural resource professionals, land planners, and other decision makers can use this DSS to compare candidate conservation sites in terms of their risk level (i.e., risk of future loss) and cultural value. We designed this system based on the assumption that the socioeconomic characteristics of a region often determine the best or most feasible way to conserve lands. Consider a hypothetical, but realistic example: a manager is considering 2 potential conservation sites (candidate sites). Funds currently are only available to purchase one. They are the same price but in different parts of the state. The manager must decide 1) which candidate site to purchase, and 2) what steps to take in the conservation of the second site. Traditional GAP data is already able to answer some questions in this decision-making process such as which site has a higher biodiversity and how the sites fit into the existing land ownership and management patterns. This information certainly is valuable, and gives initial direction for this decision and for conservation plans in general. However, traditional GAP data cannot answer other, more applied questions relating to the cost or social feasibility of these various conservation options. Perhaps one of those candidate sites is in an area where public land acquisitions are disapproved of (i.e., education and outreach about conservation land use practices or conservation easement programs may be more feasible), or perhaps one is in an area where residents desire more recreational opportunities (i.e., acquiring additional public land is especially complimentary). A system such as the one designed here provides this information, in addition to traditional GAP information, so that land planners working with limited funds and a diverse constituency can make the best decisions overall.

This system will help the manager rate and prioritize potential conservation lands so that the decision yields efficient biological protection (e.g., the sites conserved will be important additions to the reserve system) and allows for effective implementation (e.g., minimizing socioeconomic conflicts and maximizing support/cooperation). Scores are assigned to candidate sites based on their biological achievement potential (e.g., how likely is that site to meet the biological conservation objective as compared to other sites) and socioeconomic feasibility (i.e., how at risk is that site as compared to other sites, how closely do the conservation objectives match the attitudes of the community as compared to other communities). The manager can then weigh these rankings, and the best overall management decision can be identified. In this way, different management options can be compared objectively both quantitatively and qualitatively.

## Building the Decision Support System

### *Data Development*

Raw data for this project was obtained from three sources. Virginia's Gap Analysis Project (VAGAP) was completed in December 2000<sup>1</sup> and provided the necessary biological databases including land cover, land stewardship, and species distributions by major taxa (i.e., mammals, birds, reptiles, amphibians, and all taxa combined). All other integrated databases were designed to align with the VAGAP data through appropriate georeferencing.

Socioeconomic data were obtained from two sources – the U.S. Census Bureau and a recently completed public survey. County-level census data was the primary source of spatially explicit demographic data, including human population data (e.g., number of people, population density), land use trends, average income and education levels, property values, and many other census topics. Sequential census data sets (e.g., 1970-2000) were used in combination so that trends (i.e., population growth rates) could be determined. We summarized these data into 3 tables:

1. County Profile: contains general information about the county including population, income, and education highlights, property values, and other summary statistics.
2. Population Statistics: contains detailed data on the population level and trends including gender, age, and race ratios for current and historical census periods.
3. Agriculture Statistics: contains detailed data on the current and historical agricultural land use of the county including the number of farms, size of farms, total land area (in acreage and as a percentage of total land), types of farming performed, farming income, etc.

Reference tables that define the field names and explain the data contained in these databases are included on the project CD and as hardcopies here in *Appendix A*. This information is also included in the metadata for each ArcGIS coverage.

The second source of socioeconomic data was a public survey completed in Spring 2000 by Dr. Steve McMullin of Virginia Tech's department of Fisheries and Wildlife under contract with the Virginia Department of Game and Inland Fisheries (VDGIF). In cooperation with Mark Duda of Responsive Management and Dr. Brett Wright of George Mason University, Dr. McMullin completed 5 separate telephone surveys<sup>2</sup> targeting different populations in Virginia including hunters, anglers, non-consumptive users, boaters, and the general public. Just over 4,000 Virginia residents were surveyed (approximately 800 for each group) stratified into one of the 5 management regions in

---

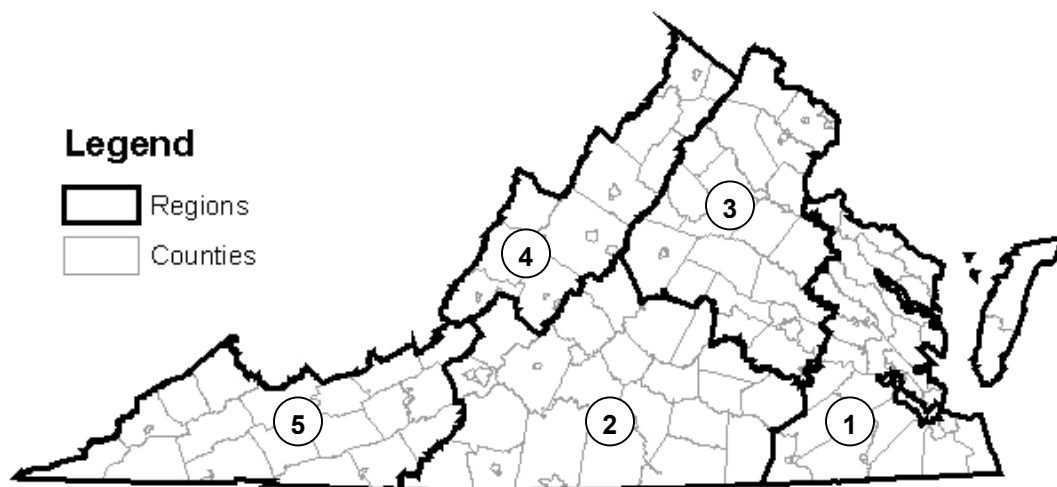
<sup>1</sup> Klopfer, S.D. and J.A. McClafferty. 2001. The Virginia Gap Analysis Final Report. 100 pp + appendices.

<sup>2</sup> McMullin, S. L., M. D. Duda, and B. A. Wright. 2000. House Bill 38 and future directions for the Department of Game and Inland Fisheries. Results of constituent and staff studies and recommendations for future action. Virginia Polytechnic Institute and State University. Blacksburg. 29p.

Virginia. Statewide, this represents a 95% confidence interval of +/- 3.5% for each group. Regionally, this represents a 95% confidence interval of +/- 7.8%.

Survey questions were focused on 3 objectives: 1) level of knowledge about who manages the fish and wildlife resources of Virginia, 2) priorities for future fish and wildlife management and natural resource conservation programs, and 3) opinions of how well the VDGIF has addressed their concerns in the past. Depending on the audience, up to 90 questions were asked of respondents, not including demographic questions. While all data for each audience is included and available within the DSS, questions addressing the second objective are clearly most relevant to this project. For the illustrative purposes of this project, 4 representative questions from the general public survey were specifically used in the calculation of cultural value scores. These include: “Do you feel that acquiring additional lands and water for fish and wildlife is an important or unimportant activity for the Department,” “Would you be interested in information on how to become active with local wildlife conservation efforts,” “Have you taken a trip in Virginia in the past 2 years for the primary purpose of watching or photographing wildlife,” and “Would you be interested in taking such a trip in Virginia?”

By using the data gathered during these surveys, we mapped public attitudes and priorities by management region. Since the management regions defined by the VDGIF (Figure 1) consist of groups of counties, we were able to create databases that are spatially compatible with the county-based Census databases. From these data, we thus created 5 ArcGIS coverages, one for each audience surveyed: General Public, Hunters, Anglers, Wildlife Watchers, and Landowners. As with the Census data, reference tables defining the field names and explaining the data contained are included on the project CD, as hardcopies here in *Appendix B*, and in the metadata for each ArcGIS coverage.



**Figure 1. Management regions for the Virginia Department of Game and Inland Fisheries. The general public survey data used in the DSS is summarized and mapped according to these regions. These regions were thus used as a reference system for many of the DSS features. The regions are: 1 = Tidewater, 2 = Piedmont, 3 = Northern Virginia, 4 = Shenandoah, and 5 = Southwest Virginia.**

Once the spatial socioeconomic databases were created, we integrated them with VAGAP data (diversity, land cover, and stewardship) in ArcGIS software. All socioeconomic databases were georeferenced to be compatible with the VAGAP products and imported into a common project. Legends were created to display the major coverage features and orient the user. Database links and/or joins were created where needed to facilitate the next steps of the DSS development.

*NOTE: This prototype DSS was developed in order to illustrate the potential utility of such a tool. As such, this project was conducted using only readily available data. No new data was collected in the development of this prototype DSS. Furthermore, the data collected was used "as is". No further manipulations other than basic recoding was performed. This factor limited the resolution of the calculated scores and the types of information that could be obtained. In later stages of DSS development, the developer will no doubt wish to collect additional, more precise socioeconomic data at the regional and/or county level (questions will depend on objectives of the user) and perform additional GIS manipulations on the land cover, stewardship, and biodiversity datasets.*

### *System Development*

With this combined socio-biological GIS, new ways of identifying conservation priorities become available and quantitative risk assessment on candidate conservation sites can be performed from a variety of different perspectives. Information on the location of biologically diverse sites or unprotected habitats can be combined with demographic and survey data to assess the risk of future loss due to development, population growth, and other factors.

We embarked on designing the Decision Support System with the user in mind. In a likely scenario, a natural resource manager would come to the DSS with two or more sites for potential conservation (such as through acquisition or conservation easements) in mind, knowing only the size of the site, the location, and the cost associated with it (such as the purchase price). He/she would be looking to get an objective comparison of the sites based on a wide variety of characteristics including how at-risk the biological resources are, the demographic trends and characteristics that may determine future risk, and the cultural context within which they exist that may affect the success of any conservation initiatives. We've designed this DSS to help this manager obtain this information.

To further facilitate this process and achieve the necessary objectivity into the decision-making process, we created a series of pre-defined relative risk indices from a set of selected database fields. The risk indices we developed are divided here into four categories, General, Ecological, Socioeconomic, and Cultural. The system takes two candidate conservation sites selected by the user, queries the underlying databases, and calculates and reports a series of scores to indicate the relative conservation risk and/or value held by those sites relative to other areas in Virginia.

For ALL risk indices developed here, we use a scale of 1 to 5, with 1 representing lowest risk and/or least conservation value and 5 representing highest risk and/or most conservation value. As a disclaimer, we would like to reiterate here that all scores are **relative**. A score of "1" does not signify "No Risk" or "No Value", but rather that the

site is at a lower perceived risk than other sites in Virginia based on that particular variable. It is assumed that all sites have some level of risk associated with them, and our goal in creating this DSS was to help prioritize those risks based on some objective measures.

*NOTE: This is especially true of the data obtained from the telephone surveys. The low precision obtained at the regional level on these surveys led to a low resolution and inability to note significant differences between management regions. In order to illustrate the potential utility of this system, we were required to use these less than optimal data and rank management regions even though their values did not vary by more than 10-20% out of 100%. To maximize the illustrative power of the DSS prototype, we ranked the regions in order and assigned values of 1-5 to each.*

Because the DSS is designed to give feedback to decision-makers on potential conservation sites, we created a new coverage containing 20 random ellipses ranging in size from 500-50,000 acres to 1) serve as “test” candidate conservation sites the creation of the Decision Support System, 2) serve as demonstration sites for the finished product, and 3) provide a template for training and self-led user learning.

*NOTE: from this point forward, we assume that the user is working with pre-defined polygons (either those supplied with the DSS in the test coverage or those loaded into the system by the user as potential conservation sites). While point indices can certainly be obtained from the DSS we've developed, the values may not be meaningful to the decision-maker because of the inherent variations at the micro scale and increased potential for error at the point level. Scores for polygons are more useful and more reliable because they consider the local landscape and rely on a group of closely related values rather than a single point estimate. In most cases, decision makers will start with 2 polygons representing candidate conservation sites and wish to compare the risk factors in each.*

*NOTE: Indices listed below that are marked with asterisks (10 total) are measures that are included in the Overall Score calculated by the reporting process for each candidate polygon.*

### General Risk Scores

\*\*\*1. Region Score: We assigned regional risk scores to each of the 5 VDGIF management regions (Figure 1) based on the percentage of land area currently protected by conservation stewardship areas (as determined by the VAGAP Stewardship layer). We selected VDGIF regions as a basis for these scores because they are a good approximation of the major land cover and land use patterns found in Virginia. The percentage of total land in each region occurring within existing conservation stewardship lands was converted to a risk index (Table 1). The region with the most protected lands received a score of “1” (signifying relatively low future risk) and the region with the least protected lands received a score of 5 (signifying high future risk). Other regions were scored accordingly. When the DSS is executed, the candidate conservation sites are assigned the region score corresponding to the region in which the site occurs. When a candidate site intersects more than 1 region, the score from the region with the largest site component was used.

**Table 1: Conservation risk scores for VDGIF management regions as determined by the percentage of the total land area currently protected in Gap Status 1-3 lands.**

<b>Risk Score</b>	<b>Management Region</b>	<b>% Protected (Status 1-3)</b>
1 (Very Low)	Region 4 (Shenandoah)	30.7%
2 (Low)	Region 3 (North VA)	13.4%
3 (Moderate)	Region 5 (SW VA)	5.7%
4 (High)	Region 2 (Piedmont)	4.6%
5 (Very High)	Region 1 (Tidewater)	4.1%

2. Distance Score: Calculated as the straight-line distance (in miles) from the edge of the candidate conservation site to the edge of the nearest stewardship land from the VA-GAP Stewardship coverage. This straight-line distance is reported by the DSS as a simple linear measurement (in miles). No further coding is performed on this measure.

3. Overall Score: This statistic is a simple sum of all the individual risk/value rating (total of 10, marked in this list by three asterisks) calculated by the DSS. This score combines biological, socioeconomic, and cultural factors into one index, ranging from 10 (low risk/value) to 50 (high risk/value), with 50 (100%) representing the highest possible risk. A higher percentage in the Overall Score indicates a higher priority conservation site.

#### Ecological Risk Scores (Averaged Point Measures)

\*\*\*4. Biodiversity Risk: Calculated as the average predicted biodiversity level (number of species) within the candidate conservation site converted to a relative risk score. This score is calculated both on an overall basis (using predicted distributions for all taxa combined) and on an individual taxa (i.e., mammals, birds) basis resulting in four additional scores (five total biodiversity scores), one each for mammals, birds, reptiles, and amphibians. The values for each biodiversity score were classified into unique risk indices using the “natural breaks” method in ArcGIS to reflect the actual values occurring in the coverage. The biodiversity risk scores and their corresponding diversity levels are listed in Table 2.

**Table 2. Conservation risk scores for varying levels of biodiversity within taxa groups. Ranges represent the average number of species predicted to occur within a candidate conservation site.**

	<b>Risk Score</b>				
	<b>1 (Very Low)</b>	<b>2 (Low)</b>	<b>3 (Moderate)</b>	<b>4 (High)</b>	<b>5 (Very High)</b>
<b>All Taxa</b>	$x \leq 60$	$60 < x \leq 88$	$88 < x \leq 103$	$103 < x \leq 130$	$130 < x \leq 197$
<b>Mammals</b>	$x \leq 5$	$5 < x \leq 24$	$24 < x \leq 34$	$34 < x \leq 43$	$43 < x \leq 57$
<b>Birds</b>	$x \leq 23$	$23 < x \leq 34$	$34 < x \leq 53$	$53 < x \leq 80$	$80 < x \leq 108$
<b>Reptiles</b>	$x \leq 6$	$6 < x \leq 16$	$16 < x \leq 21$	$21 < x \leq 31$	$31 < x \leq 43$
<b>Amphibians</b>	$x \leq 3$	$3 < x \leq 16$	$16 < x \leq 19$	$19 < x \leq 24$	$24 < x \leq 32$

\*\*\*5. Land Cover Risk: Determined from an overlay of the Land cover and the Stewardship layers, as performed in VAGAP. Based on this overlay, critical land cover types were identified within each management region. Critical land cover types are types that are not well protected in current stewardship lands within the region. Land cover risk indices were created for each management region according to the physiographic province within which they occur (Table 3). When a user queries the DSS, percentages of coverage by these land cover types are calculated for each polygon of interest, and a weighted average land cover risk score is calculated.

**Table 3. Conservation risk scores assigned to land cover types within each VDGIF management region. Regions 2 and 3 occur on the Piedmont Plateau, and Regions 4 and 5 both occur in the mountains, hence the common index scales within the physiographic provinces.**

Land Cover Type	Region 1 (Tidewater)	Region 2 (Piedmont)	Region 3 (NOVA)	Region 4 (Shen)	Region 5 (SWVA)
Coniferous Forest	5	5		3	
Deciduous Forest	5	5		3	
Mixed Forest	5	5		3	
Woodland/Savannah	3	3		3	
Shrubland	2	2		2	
Forested Wetland	2	5		5	
Herbaceous Wetland	2	5		5	
Herbaceous	3	5		5	
Inland Water	4	4		4	
Row Crop	2	3		3	
Res. /Low Density Dvlpmt	1	1		1	
Urban/Developed	1	1		1	
Non-vegetated	1	1		1	

6. Ecological Risk: A summary score calculated as the sum of the Biodiversity Risk Score (all taxa) and the Land Cover Risk Score (#4 and #5 above). This index ranges from 2 to 10, with 2 representing low relative risk and/or low conservation value and 10 representing the highest relative risk and/or most conservation value.

#### Socioeconomic Risk Scores (Scored by County)

\*\*\*7. Population Density Risk: Assigned according to the human population density occurring in and around the candidate site. Risk scores are assigned according to a logical scale determined from the range of county-level values across the state of Virginia (i.e., the range in values from the least population dense county to the most population dense county) (Table 4). All county values were then classified into 1 of 5 risk scores, and candidate sites then received a Population Density Risk Score corresponding to the county in which it is located. If a candidate site intersects more than one county, the site score defaults to the most population dense county in the intersection in order to err on the conservative side.

**Table 4. Conservation risk scores according to the human population density in and around the candidate conservation site.**

<b>Population Density Risk Score</b>	<b>Population Density (People/mi<sup>2</sup>)</b>
1 (Very Low)	$0 \leq x \leq 20$
2 (Low)	$20 < x \leq 40$
3 (Moderate)	$40 < x \leq 60$
4 (High)	$60 < x \leq 100$
5 (Very High)	$x > 100$

\*\*\*8. Population Growth Risk: Assigned based on the 10-year (1990-2000) trend in human population density according to Table 5. Risk scores are assigned according to a logical scale determined from the range of county-level values across the state of Virginia (i.e., the range in values from the fastest growing county to the fastest declining county) (Table 5). All county values were then classified into 1 of 5 risk scores, and candidate sites receive a Population Growth Risk Score corresponding to the county in which it is located. If a candidate site intersects more than one county, the site score defaults to the fastest growing county in the intersection in order to err on the conservative side.

**Table 5: Conservation risk scores according to the human population growth rate in and around the candidate conservation site.**

<b>Population Growth Risk Score</b>	<b>Population Growth Rate (% Change, 1990-2000)</b>
1 (Very Low)	0.0%
2 (Low)	$0.0\% < x \leq 5.0\%$
3 (Moderate)	$5.0\% < x \leq 10.0\%$
4 (High)	$10.0\% < x \leq 20.0\%$
5 (Very High)	$x > 20.0\%$

\*\*\*9. Land Conversion Risk: Assigned based on the county-level 10-year (1990-2000) trend in agricultural land use as a percentage of total land according to Table 6. Conversion rates (i.e., the rate of conversion of agricultural lands to something else) were used as a surrogate for land development rates under the assumption that most agricultural conversion results in residential subdivisions, commercial development, or other non-vegetated, highly developed land uses. Therefore, counties with high conversion rates would also most likely be subject to a rapid loss of land to development. Conversion rates were determined by subtracting the percentage of total land under agricultural use in 1990 from the corresponding figure in 2000. Risk scores were assigned according to a logical scale determined from the range of conversion rates across the state of Virginia (i.e., the range in values from the county with the most loss of agricultural lands to the county with greatest gain in agricultural lands) (Table 6). All county values



were then classified into 1 of 5 risk scores, and candidate sites then received a Land Conversion Risk Score corresponding to the county in which it is located. If a candidate site intersects more than one county, the site score defaults to that of the county with the greatest loss of agricultural lands in the intersection in order to err on the conservative side.

**Table 6: Conservation risk scores according to the rate of agricultural land conversion (1990-2000) in and around the candidate conservation site.**

<b>Land Conversion Risk Score</b>	<b>Land Conversion Rate (% Change, 1990-2000)</b>
1 (Very Low)	$x < 0.0\%$
2 (Low)	$x = 0.0\%$
3 (Moderate)	$0.0\% < x \leq 4.0\%$
4 (High)	$4.0\% < x \leq 8.0\%$
5 (Very High)	$x > 8.0\%$

10. Socioeconomic Risk: A summary score for the candidate conservation site calculated as the sum of the Population Density Risk, Population Growth Risk, and Land Conversion Risk scores (#7-9 above) assigned to the site. This index ranges from 3 to 15, with 3 representing low relative risk and/or low conservation value and 15 representing the highest relative risk and/or most conservation value.

#### Cultural Value Scores (Scored by Management Region)

NOTE: Cultural scores are interpreted here as “value” rather than “risk” scores because they represent the values placed on the resource by residents rather than the risks presented by them. High value scores represent regions with high levels of support and/or interest in conservation or outdoor recreation. We treat high value scores similarly to high risk scores in this model. For alternative interpretations of these scores, see Chapter 3.)

\*\*\*11. Acquisition Support: Scores based on regional responses to general public survey asking respondents “Do you feel that acquiring additional land and water for fish and wildlife is an important or unimportant activity for the Department of Game and Inland Fisheries?” Regional scores represent the sum of “Very Important” and “Somewhat Important” responses and are listed in Table 7. Regions were ordered according to increasing levels of support (indicated by higher percentages of Somewhat or Very Important responses), and were then assigned scores of 1-5, 5 representing the highest level of support. Regions with higher level of support received higher cultural value ratings to represent potentially higher levels of public support for and cooperation for conservation activities.

**Table 7. Cultural value scores according to the support among residents for additional land acquisition as reported by a general public survey.**

<b>Acquisition Support Value Score</b>	<b>Acquisition Support (% Very or Somewhat Imp.)</b>	<b>Region</b>
1 (Very Low)	80.0%	2 (Piedmont)
2 (Low)	84.0%	5 (SW VA)
3 (Moderate)	87.0%	4 (Shenandoah)
4 (High)	90.1%	3 (North VA)
5 (Very High)	91.4%	1 (Tidewater)

\*\*\*12. Stewardship Interest: Scores based on regional responses to general public survey asking respondents “Would you be interested in information on how to become active with local wildlife conservation efforts?” Regional scores represent the percentage of “Yes” responses and are listed in Table 8. Regions with higher level of interest received higher conservation value ratings to represent potentially higher levels of public support for and cooperation for conservation activities.

**Table 8. Conservation value scores according to the interest among residents in becoming active in local wildlife conservation efforts as reported by a general public survey.**

<b>Stewardship Interest Value Score</b>	<b>Stewardship Interest (% Yes)</b>	<b>Region</b>
1 (Very Low)	36.4%	5 (SW VA)
2 (Low)	44.7%	3 (North VA)
3 (Moderate)	45.0%	2 (Piedmont)
4 (High)	49.4%	1 (Tidewater)
5 (Very High)	50.3%	4 (Shenandoah)

\*\*\*13. Active Viewers: Scores based on regional responses to general public survey asking respondents “Have you taken a trip in Virginia in the past 2 years for the primary purpose of watching or photographing wildlife?” Regional scores represent the percentage of “Yes” responses and are listed in Table 9. Regions with higher levels of activity received higher conservation value ratings to represent potentially higher levels of public support for and cooperation for conservation activities.

**Table 9. Conservation value scores according to the activity among residents in wildlife watching or photography (percent who have participated in the last 2 years) as reported by a general public survey.**

<b>Active Viewers Value Score</b>	<b>Active Viewers (% Yes)</b>	<b>Region</b>
1 (Very Low)	11.3%	2 (Piedmont)
2 (Low)	18.6%	3 (North VA)
3 (Moderate)	19.8%	1 (Tidewater)
4 (High)	22.2%	4 (Shenandoah)
5 (Very High)	30.4%	5 (SW VA)

\*\*\*14. Potential Viewers: Scores based on regional responses to general public survey asking respondents who did not take trips in Virginia to view or photograph wildlife in the past 2 years, “Would you be interested in taking such a trip in Virginia?” Regional scores represent the percentage of “Yes” responses and are listed in Table 10. Regions with higher levels of interest received higher conservation value ratings to represent potentially higher levels of public support for and cooperation for conservation activities.

15. Cultural Value: A summary score calculated as the sum of the Acquisition Support, Stewardship Interest, Active Viewers, and Potential Viewers (#10-13 above). This index ranges from 4 to 20, with 4 representing low relative risk and/or low conservation value and 20 representing the highest relative risk and/or most conservation value.

**Table 10. Conservation value scores according to the interest in wildlife watching or photography (percent interested) among residents who did not take such a trip in the past 2 years as reported by a general public survey.**

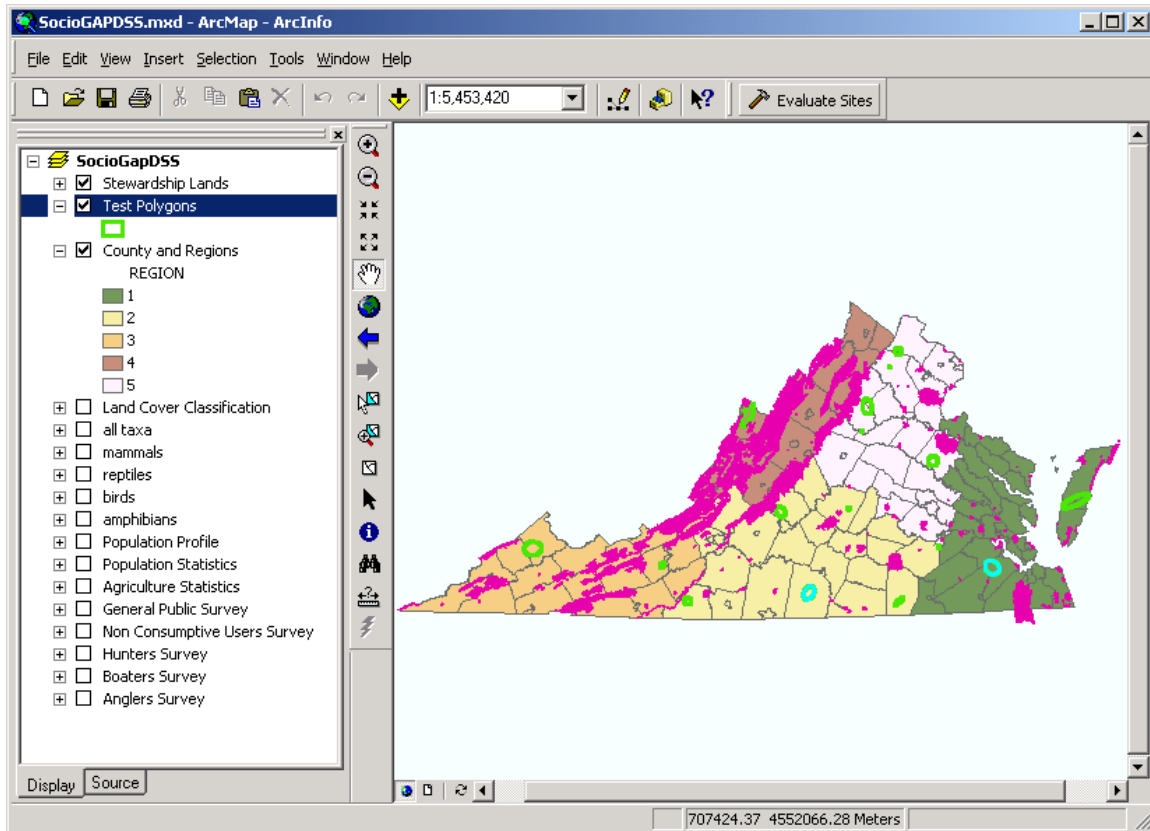
<b>Active Viewers Value Score</b>	<b>Potential Viewers (% Yes)</b>	<b>Region</b>
1 (Very Low)	38.4%	4 (Shenandoah)
2 (Low)	42.7%	3 (North VA)
3 (Moderate)	44.4%	2 (Piedmont)
4 (High)	46%	5 (SW VA)
5 (Very High)	51.5%	1 (Tidewater)

### Using the Decision Support System

Because the DSS is presented in ArcGIS, the new standard in GIS software, it is compatible with the existing systems of many potential users, and it’s use it rather self-explanatory for regular ArcGIS users. For this reason, we cover only the operations that are specific to this DSS here in this Guide. All database queries, legend applications, and layouts are performed as in any other ArcGIS project file.

#### *The Default Display*

When the system (*SocioGAPDSS.mxd*) is opened in ArcGIS, the default display is loaded (Figure 2). The user will see a map of Virginia in the center of the screen with county boundaries outlined, VDGIF management regions shaded, and existing stewardship lands (from VAGAP) highlighted. Down the left side of the screen will be all the data layers that are either included in the system or that contain complementary data to those integrated in the system. The data layers include:



**Figure 2.** The default display is seen when the Decision Support System is loaded. Data layers illustrated include Stewardship Lands, Test Polygons, and Counties and Regions. To execute the polygon comparison, load a coverage with the site of interest outline as polygons, highlight the polygons to evaluate, and click on the “Evaluate Sites” button at the top of the screen.

- Stewardship Lands – those lands included in the Virginia Gap Analysis Project, including Status 1-3 lands.
- Test Polygons – a data layer containing sample polygons (candidate conservation sites) used to test the system and used as samples for users to learn the system.
- Counties and Regions – Political county boundaries and the combination of counties into management regions as defined by the Virginia Department of Game and Inland Fisheries. Table also includes risk scores for each region assigned during the development of the DSS (see Table 1).
- Land Cover Classification – A simplified version of the Land Cover classification developed during the Virginia Gap Analysis Project. Table also includes risk scores assigned during the development of the DSS (see Table 3).
- Biodiversity Maps (mammals, all taxa, reptiles, birds, amphibians): Rasters whose values represent the number of species of the specified taxa predicted to occur at specific points. Table also include risk scores for each diversity level assigned during the development of the DSS (see Table 2)

- Census Maps (Population Profile, Population Statistics, Agricultural Statistics): Data tables containing selected fields from the U.S. Census Bureau files. Abbreviated field names and the data they contain are explained in Appendix A.
- Survey Maps (General Public, Non-consumptive Users, Hunters, Boaters, Anglers): Data tables containing data from the general public survey conducted by McMullin and Duda in 2000. Abbreviated field names and the data they contain are explained in Appendix B

### *Generating DSS Reports*

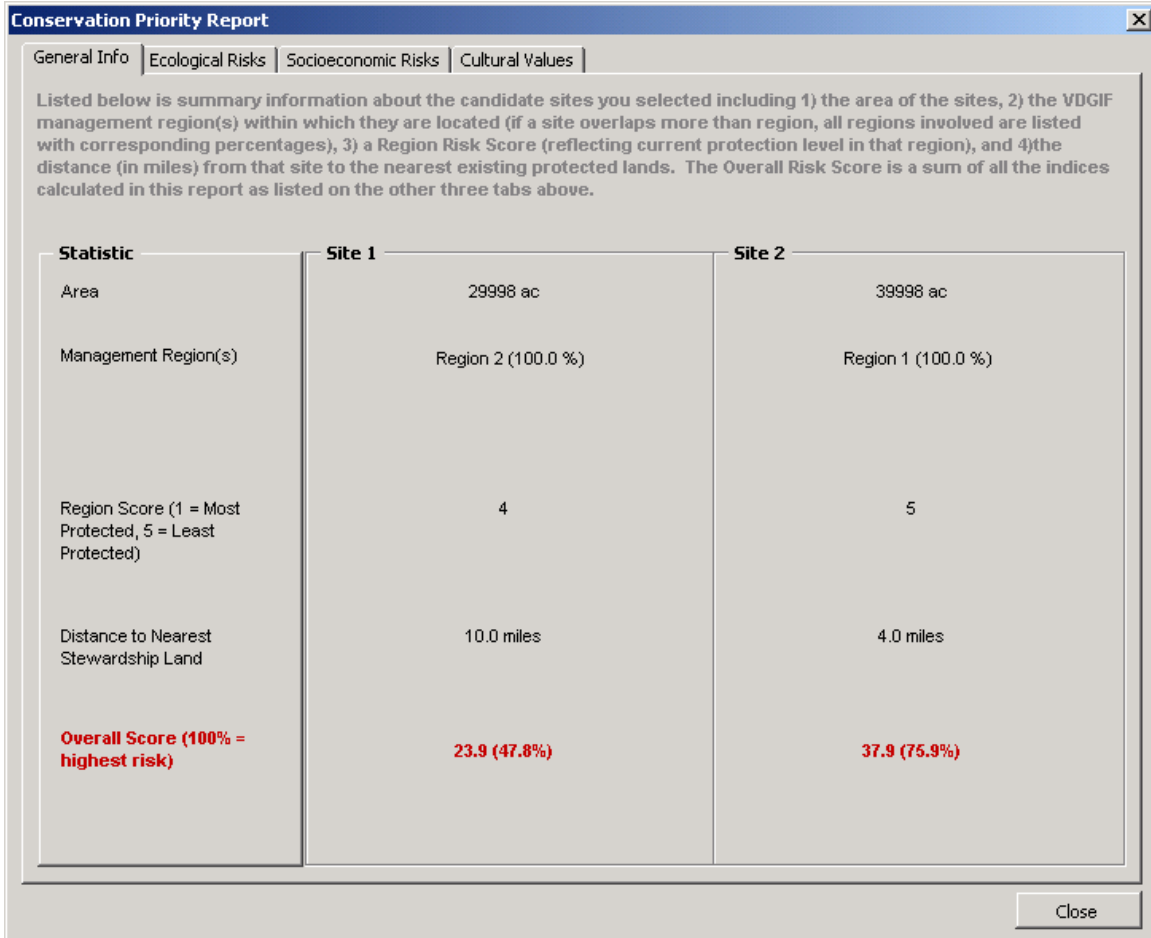
The DSS user can learn a great deal about various parts of Virginia simply by exploring these data layers and displaying various fields contained in the tables. However, the main function of the system comes when the user loads his/her potential conservation sites into the system to generate reports.

Generally, the user would come to the system with two or more potential conservation sites in mind that he/she wishes to evaluate. When this is the case, the user would simply:

1. Load a vector coverage containing the potential sites as polygons into the DSS,
2. Select (make active) the polygon(s) in that coverage that he/she wishes to evaluate (maximum of 2), and
3. Click on the “Evaluate Sites” button on the toolbar at the top of the screen.

This process will initiate the GAP DSS to generate a Conservation Priority Report of all the indices described above under System Development. The on-screen report generated contains four tabs, labeled “General Info” (#1-2 under System Development, Figure 3), “Biological Risks” (#3-5 under System Development, Figure 4), “Socioeconomic Risks” (#6-9 under System Development, Figure 5), and “Cultural Values” (#10-14 under System Development, Figure 6). Click on each tab header to view the complete report. To exit the report and go back to the default DSS display, click on “Close” at the bottom of the report window.

*Note: The reports generated below are the output for the two selected candidate sites in Figure 2 above (i.e., the two sites are “highlighted” in green).*



**Figure 3.** The “General Info” tab displayed automatically after the DSS “Evaluate Sites” operation is executed. Information provided here includes general descriptive statistics (area), the management region where the polygons of interest are located, the Region Risk Score (reflecting current protection levels), and the Distance Score (representing the distance from the polygon to the nearest stewardship lands). When a candidate site intersects more than 1 region, each region is listed in the report along the percentage of the site that occurs within each listed region. The Region score is determined from the region with the largest polygon component (in this case Region 5 score is used for Polygon 1). The Overall Score sums the 10 individual risk/value ratings listed in the report. This score ranges from 10 to 50, with 50 (100%) representing the highest possible risk and conservation value. A higher percentage in the Overall Score indicates a higher priority conservation site.

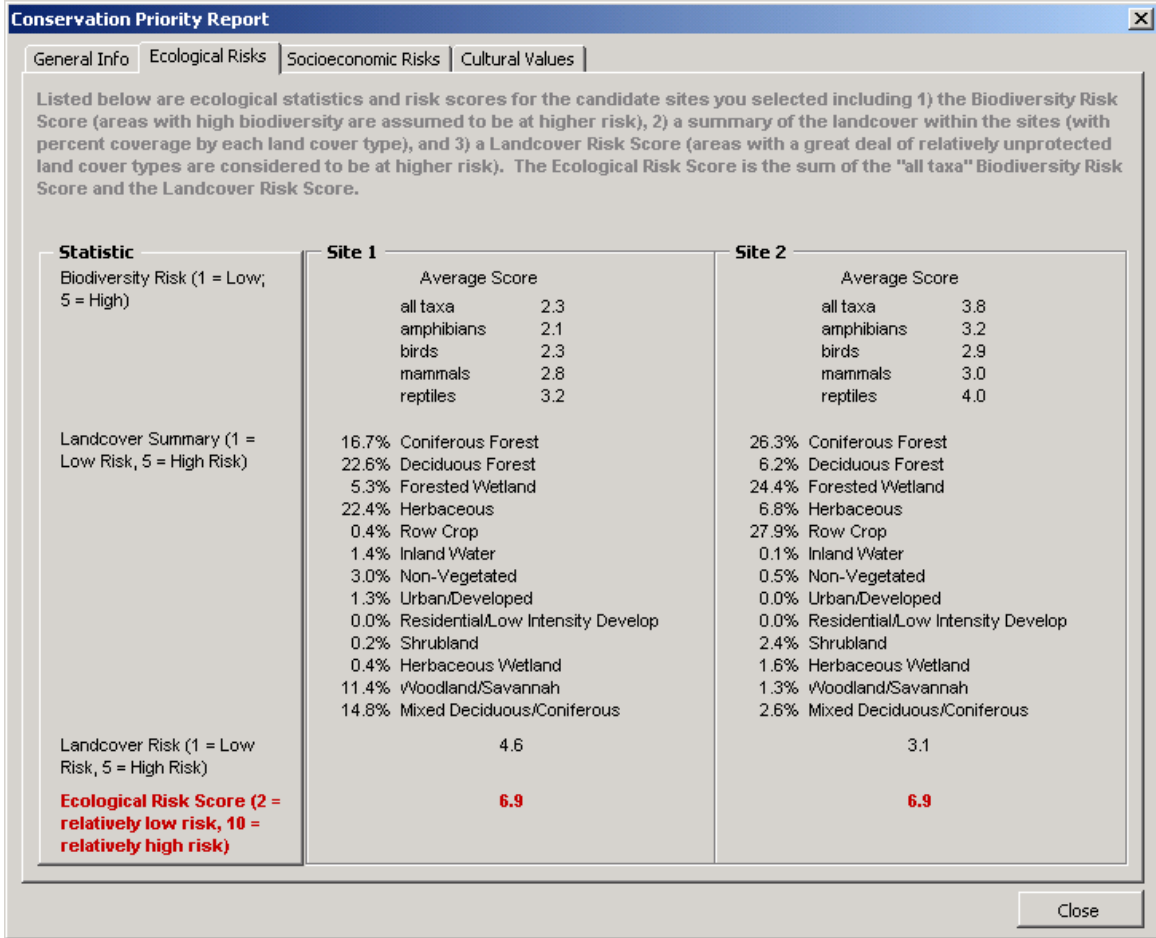
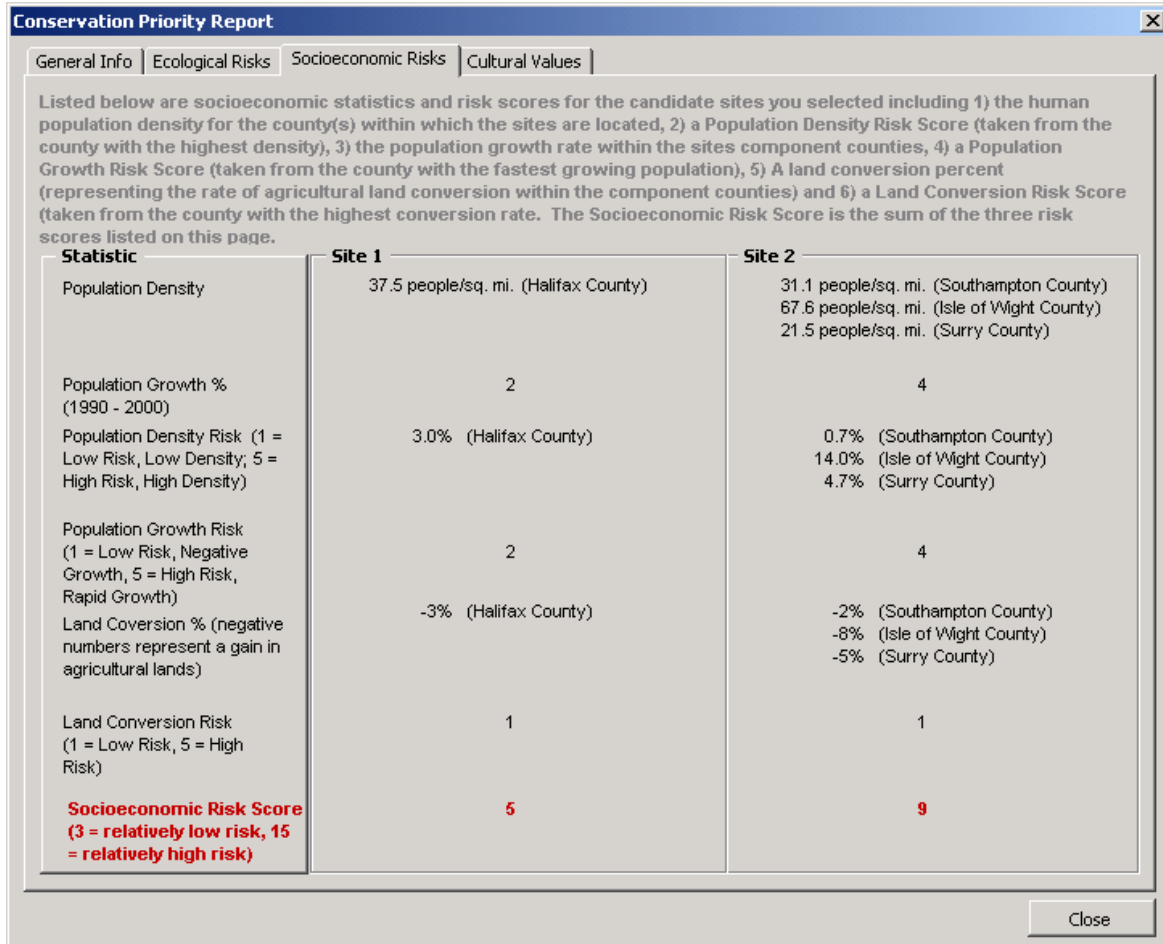


Figure 4. The “Ecological Risks” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes risk created by predicted biodiversity levels and existing land cover. The Landcover Summary gives information on the land cover within the candidate sites (i.e., The Ecological Risk score summarizes these statistics (using the “all taxa” Biodiversity Risk score) with a simple sum ranging from 2 (relatively low risk) to 10 (relatively high risk).



**Figure 5. The “Socioeconomic Risks” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes risk determined by the human population density, the human population growth rate, and the agriculture to non-agriculture land conversion rate. Negative numbers represent either a declining population or a gain in agricultural lands. The Socioeconomic Risk score summarizes these statistics with a simple sum ranging from 3 (relatively low risk) to 15 (relatively high risk).**



Conservation Priority Report			
General Info	Ecological Risks	Socioeconomic Risks	Cultural Values
<p>Listed below are cultural value scores for the candidate sites you selected including measures of 1) local support for land acquisition 2) local interest in becoming involved in stewardship activities, 3) the number of active wildlife viewers, and 4) the number of potential wildlife viewers. Each score ranges from 1 (relatively low cultural value) to 5 (relatively high cultural value). The Cultural Value Score is the sum of the four risk scores listed on this page.</p>			
Statistic	Site 1	Site 2	
Support for Acquisition	1	5	
Stewardship Interest	3	4	
Active Viewers	1	3	
Potential Viewers	3	5	
<b>Cultural Value Score (4 = relatively low risk, 20 = relatively high risk)</b>	<b>8</b>	<b>17</b>	
Close			

**Figure 6.** The “Cultural Values” tab of the report generated after the DSS “Evaluate Sites” operation is executed. Information provided here includes public support for land acquisition, general public interest in becoming involved in local wildlife conservation efforts, activity level in non-consumptive recreation, and potential for increased non-consumptive recreation. The Cultural Value score summarizes these statistics with a simple sum and ranges from 4 (relatively low value) to 20 (relatively high value).

### III. THE FUTURE OF CONSERVATION RISK ASSESSMENTS

As stated in the introduction, determining the risk of biodiversity loss (and therefore prioritizing its conservation) involves 2 critical factors: the biological resource (i.e., level and type of biodiversity, current level of protection) and the socioeconomic context within which it exists (human population growth, land use trends, cultural values). This interaction of biological and social factors is often the biggest stumbling block in conservation efforts, largely because socioeconomic data is difficult to obtain and even more difficult to interpret relevant to the case at hand. Gap analysis has provided natural resource managers with innovative tools to help them address the biological side of this dilemma and create a starting point for conservation decision making. However, it is necessary to integrate cultural and socioeconomic factors into this process as well in order to place conservation into the context of the communities and political perspective within which managers work.

The Decision Support System we've created through this project is an important step in the integration of biological and socioeconomic information into conservation decision-making. The information provided by the special functions and through the databases it contains lends a novel approach to objective priority setting, an approach that we hope will be attractive to and eventually adapted by natural resource professionals, land planners, and other critical decision makers.

While we have taken critical steps to integrate biological data with socioeconomic data in this Decision Support System, there are several important limitations that the current version possesses. Future work on this system will be invaluable to extending the applicability of this system and improving its adaptability. The limitations that should be addressed in future work include:

- 1) **Applicability:** The current system contains data only for Virginia, and thus will only operate with candidate sites that are located within Virginia. Further, the data used in this project comes from limited sources (i.e. the VA-GAP and the limited public survey conducted on behalf of the VDGIF) and hence have limited applicability and predictability for specific populations and for specific agencies. Data for the ecological risk scores are available in other states through other GAP projects, and census data for the socioeconomic risk scores are easily available through the U.S. Census Bureau. Thus, these aspects of the DSS can be expanded geographically with relative ease. However, the survey data used for the cultural value scores will be more difficult to expand geographically due to the lack of data availability in many states, and the lack of consistent data collection procedures across states. A large scale data collection efforts would need to be undertaken in order for the cultural and ecological aspects of this system to be fully functional.
- 2) **Static indices:** In the current system, the indices are defined through a hard-coded program for simplicity. Any user that comes to the system and makes queries will be using the same index system, with each index defined just as

they are in this report. Ideally, the user would have a certain level of flexibility in the definition of these indices so that the output best suits the user's mission and objectives. Upgrading the system to allow for this flexibility would require more extensive and complex programming as well as the collaboration of multiple potential users from different decision-making agencies to determine the range of potential needs. Areas where flexibility can and should be incorporated include allowing managers to decide which species or groups of species to focus on in biodiversity scores, which land use types are considered critical (e.g., forest vs. agriculture), which land stewardship types or stewards are considered in distance calculations (e.g., Status 1& 2 vs. Status 1-3, or all stewardship lands vs. only Forest Service lands), how to rank public opinion or population growth relative to other factors, and how cultural value scores are interpreted (e.g., are low support levels to be interpreted as a negative point for ease of execution or a positive point representing a special outreach need?).

- 3) Static reporting: The current system provides data for only 2 candidate sites at a time. Managers may come to the system with 3, 5, or more potential sites in mind, and the current system would force them to do several different analyses, while recording the data for each in a separate database. With some additional programming, this system could be adapted to analyze a number of potential conservation sites simultaneously with the risk and values scores being output into a database rather than as an on-screen report.
- 4) Static mapping: Besides helping natural resource professionals, land planners, and other decision makers make better decisions, a decision support system such as the one presented here can also be very useful for helping these individuals defend those decisions to legislative groups and the general public. The DSS system we've designed allows for map preparation through the standard functions, commands, and limitations of ArcGIS. A final future improvement that would benefit the DSS and improve its usefulness is to expand on these visual aid producing abilities, automate the production of these visual aids with each execution of the system, and again provide flexibility for user-defined features of the maps and layouts produced.

In conclusion, we hope that future enhancements of this system will go a long way in helping natural resource decision makers accomplish the daunting task of integrating very different types of data (biological, socioeconomic, and cultural) into their decision-making processes. Not only will this facilitate the actual decision-making process, it will also help assure a degree of objectivity throughout the process, and give decision-makers a foundation on which to publicize and defend their ultimate decisions to the legislature and the general public.

**APPENDIX A**  
**KEY TO SOCIOECONOMIC (CENSUS) TABLES**

**Table A1. Key to field names in the Profile.dbf data table. Descriptions from the U.S. Census Bureau.**

<b>Field Name</b>	<b>Description</b>
Pop Total 1997	Population - total, 1997
Pop Total 1990	Population - total, 1990
Pop Total 1980	Population - total, 1980
% Change 1990-97	Population - percent change, 1990 to 1997
% Change 1980-90	Population - percent change, 1980 to 1990
White 1996	Population - white, 1996
% White	Population - percent white, 1996
Black 1996	Population - black, 1996
% Black	Population - percent black, 1996
Hispanic 1996	Population - Hispanic (may be of any race), 1996
% Hispanic	Population - percent Hispanic (may be of any race), 1996
High School Grads	Educational attainment - percent persons 25 years and over high school graduates, 1990
College Grads	Educational attainment - percent persons 25 years and over college school graduates, 1990
Property Taxes	Local government finances - per capita property taxes (dollars), 1992
Unemployment 1996	Civilian labor force (BLS) - unemployment rate, 1996
Unemployment 1990	Civilian labor force (BLS) - unemployment rate, 1990
Income/capita 1994	Personal income (BEA) - per capita (dollars), 1994
Income/capita 1990	Personal income (BEA) - per capita (dollars), 1990
Median Income 1993	Money income - median household income (dollars), 1993
Median Income 1989	Money income - median household income (dollars), 1989
Poverty 1993	Poverty - percent persons below poverty, 1993
Poverty 1989	Poverty - percent persons below poverty, 1989
New Housing 1997	New private housing units authorized by building permits - total, 1997
New Housing 1990	New private housing units authorized by building permits - total, 1990
Valuation 1997	New private housing units authorized by building permits - valuation (\$1000), 1997
Valuation 1990	New private housing units authorized by building permits - valuation (\$1000), 1990
Retail Sales/capita	Retail trade - per capita retail sales (dollars), 1992

**Table A2. Key to field names in the Agriculture.dbf data table. Descriptions from the U.S. Census Bureau.**

<b>Field Name</b>	<b>Description</b>
# farms 1978	Farms - number 1978
# farms 1982	Farms - number 1982
# farms 1987	Farms - number 1987
# farms 1992	Farms - number 1992
Acres 1978	Land in farms 1978 (acres)
Acres 1982	Land in farms 1982 (acres)
Acres 1987	Land in farms 1987 (acres)
Acres 1992	Land in farms 1992 (acres)
% Land 1982	Land in farms as a percent of total land, 1982
% Land 1987	Land in farms as a percent of total land, 1987
% Land 1992	Land in farms as a percent of total land, 1992
Average Size 1978	Average size of farm 1978 (acres)
Average Size 1982	Average size of farm 1982 (acres)
Average Size 1987	Average size of farm 1987 (acres)
Average Size 1992	Average size of farm 1992 (acres)
Value/farm 1978	Average value of land and buildings per farm, 1978
Value/farm 1982	Average value of land and buildings per farm, 1982
Value/farm 1987	Average value of land and buildings per farm, 1987
Value/farm 1992	Average value of land and buildings per farm, 1992
Value/acre 1978	Average value of land and buildings per acre 1978
Value/acre 1982	Average value of land and buildings per acre 1982
Value/acre 1987	Average value of land and buildings per acre 1987
Value/acre 1992	Average value of land and buildings per acre 1992

**Table A3. Key to field names in the Population.dbf data table. Descriptions from the U.S. Census Bureau.**

<b>New Field Name</b>	<b>Description</b>
Pop 1930	Resident population (April 1) 1930
Pop 1940	Resident population (April 1) 1940
Pop 1950	Resident population (April 1) 1950
Pop 1960	Resident population (April 1) 1960
Pop 1970 revised	Resident population (April 1 - revised) 1970
Pop 1980	Resident population (April 1 - revised) 1980
Pop 1990 revised	Resident population (April 1 - revised) 1990
Net Chng 1990-97	Components of change - net change 1990 to 1997
% Chng 1990-97	Components of change - percent change 1990 to 1997
Pop/sq mile 1980	Population (100%) per square mile 1980
Pop/sq mile 1990	Population (100%) per square mile 1990
Urban 1980	Urban population 1980 (100%)
Rural 1980	Rural population 1980 (100%)

**APPENDIX B**  
**KEY TO SURVEY DATA TABLES**



**Table B1. Key to field names in the General\_Public.dbf data table. Each field corresponds to a question from the survey. "Data" column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
crime	Do you think funding for programs to COMBAT CRIME is important or unimportant?	Percent Very / Somewhat Important
tourism	Do you think funding for programs to PROMOTE TOURISM is important or unimportant?	Percent Very / Somewhat Important
funded	Do you think funding for EDUCATION is important or unimportant?	Percent Very / Somewhat Important
fundcons	What about funding for FISH AND WILDLIFE PROGRAMS?	Percent Very / Somewhat Important
funchild	What about funding for programs to help LOW INCOME FAMILIES WITH CHILDREN?	Percent Very / Somewhat Important
wldexist	Is it important or unimportant to you to know that wildlife exists in Virginia?	Percent Very / Somewhat Important
wldhome	Is it important or unimportant to you to know that you have wildlife around your home?	Percent Very / Somewhat Important
wldintf	How about to be sure that wildlife doesn't interfere with your other activities?	Percent Very / Somewhat Important
givmgt	Is it important or unimportant to you to know that fish and wildlife populations are being properly cared for in Virginia?	Percent Very / Somewhat Important
vafish	Is it important or unimportant to you to know that people have the opportunity to FISH in Virginia?	Percent Very / Somewhat Important
vahunt	Is it important or unimportant to you to know that people have the opportunity to HUNT in Virginia?	Percent Very / Somewhat Important
vaboat	Is it important or unimportant to you to know that people have the opportunity to BOAT in Virginia?	Percent Very / Somewhat Important
vatrip	Is it important or unimportant to you to know that people have the opportunity to VIEW WILDLIFE in Virginia?	Percent Very / Somewhat Important
wildheal	In your view, would you generally say Virginia's wildlife populations are very healthy, somewhat healthy, slightly healthy, or not healthy at all?	Very/Somewhat Healthy
fresheal	In your view, would you generally say Virginia's freshwater fish populations are very healthy, somewhat healthy, slightly healthy, or not healthy at all?	Very/Somewhat Healthy
deerpopi	In your opinion, should the DEER population in your county be increased, remain the same, or decreased?	Percent Increase
dearpopd	In your opinion, should the DEER population in your county be increased, remain the same, or decreased?	Percent Decrease
geesei	And in your opinion, should the CANADA GOOSE population in your county be increased, stay the same, or decreased?	Percent Increase

Table B1. continued

geesed	And in your opinion, should the CANADA GOOSE population in your county be increased, stay the same, or decreased?	Percent Decrease
leghunt	In general, do you approve or disapprove of legal hunting?	Strongly/Somewhat Approve
legfish	In general, do you approve or disapprove of legal, recreational fishing?	Strongly/Somewhat Approve
legtrap	In general, do you approve or disapprove of legal trapping?	Strongly/Somewhat Approve
hntcont	Do you agree or disagree that hunting should continue to be a legal activity in Virginia?	Strongly/Somewhat Agree
noanimal	Do you agree or disagree that animals SHOULD NOT BE USED IN ANY WAY, such as for food, clothing, or for medical testing?	Strongly/Somewhat Approve
nopain	Do you agree or disagree that animals can be used by humans AS LONG AS THE ANIMAL DOES NOT EXPERIENCE UNDO PAIN AND SUFFERING?	Strongly/Somewhat Approve
allanim	Do you agree or disagree THAT ANIMALS CAN BE USED BY PEOPLE REGARDLESS of a concern for the animal's welfare?	Strongly/Somewhat Approve
agency01	What state agency do you feel is responsible for managing and protecting wild animals in Virginia?	Percent Correct
deptsat	Overall, are you satisfied or dissatisfied with the Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very / Somewhat Satisfied
mngresor	What is your GENERAL opinion of the overall performance of the Department in managing and protecting the state's fish and wildlife resources?	Percent Excellent/Good
outrec	Okay, and what is your GENERAL opinion of the overall performance of the Department in providing outdoor recreation such as fishing, boating, hunting, and wildlife viewing opportunities?	Percent Excellent/Good
laws	Do you feel that enforcing fishing, hunting and boating laws and regulations is an important or unimportant activity for the Department of Game and Inland Fisheries?	Percent Very / Somewhat Important
lawhabit	Do you feel that enforcing laws that protect fish and wildlife habitat is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
mgnon	Do you feel that managing nongame fish and wildlife, or those species which are not hunted or fished for, such as hawks, owls, amphibians, and reptiles is an important or unimportant activity for the Department?	Percent Very / Somewhat Important

**Table B1. continued**

huntopp	Do you feel that providing hunting opportunities is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
skeet	Do you feel that providing recreational shooting range opportunities, such as trap, skeet, and sporting clays is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
fishopp	Do you feel that providing fishing opportunities is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
boatopp	Do you feel that providing boating opportunities is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
viewopp	Do you feel that providing wildlife viewing opportunities is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
urban	Do you feel that providing fish and wildlife programs and services to urban and suburban residents is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
wilded	Do you feel that providing wildlife and environmental education is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
boated	Do you feel that providing boating safety education is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
hunted	Do you feel that providing hunter safety education is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
maps	Do you feel that providing information on fish and wildlife-associated recreation, such as maps and descriptions of facilities is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
addition	Do you feel that acquiring additional land and water for fish and wildlife is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
ruraltec	Do you feel that providing technical assistance to rural landowners on how to manage wildlife on their properties is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
urbantec	Do you feel that providing technical assistance to urban and suburban landowners on how to manage wildlife on their properties is an important or unimportant activity for the Department?	Percent Very / Somewhat Important

**Table B1. continued**

urbanize	Do you feel that reviewing and commenting on proposed developments to minimize effects of urbanization and industrial development on fish and wildlife habitats is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
tne	Do you feel that protecting threatened and endangered species is an important or unimportant activity for the Department?	Percent Very / Somewhat Important
mandboat	Would you support or oppose instituting a mandatory 6 to 8 hour boating safety course that boaters must take before operating a boat in Virginia?	Strongly/Somewhat Support
sunday	Do you support or oppose Sunday hunting in Virginia during the legal hunting season?	Strongly/Moderately Support
nuisance	Did you have problems with any wild animals within the last two years?	Percent Yes
car	In the past two years, have you or any other member of your household had a vehicle collision with a deer on Virginia's roads or highways?	Percent Yes
topics1	Would you be interested in information on enjoy wildlife around your home?	Percent Yes
topics2	Would you be interested in information on what to do with injured wildlife?	Percent Yes
topics3	Would you be interested in information on information about wildlife viewing?	Percent Yes
topics4	Would you be interested in information on managing farms and forests for wildlife?	Percent Yes
topics5	Would you be interested in information on dealing with nuisance wildlife?	Percent Yes
topics6	Would you be interested in information on how to become active with local wildlife conservation efforts?	Percent Yes
topics7	Would you be interested in information on information about hunting?	Percent Yes
topics8	Would you be interested in information on information about fishing?	Percent Yes
topics9	Would you be interested in information on information on boating?	Percent Yes
dhunt	Have you been hunting in Virginia in the past 2 years?	Percent Yes
inthunt	Would you be interested in going hunting in Virginia?	Percent Yes
dtrip	Have you taken a trip in Virginia in the past 2 years for the primary purpose of watching or photographing wildlife; please do not include trips to the zoo or museum.	Percent Yes

**Table B1. continued**

intrip	Would you be interested in taking such a trip in Virginia?	Percent Yes
dboat	Have you personally participated in any type of boating or jet skiing in Virginia in the past 2 years?	Percent Yes
intboat	Would you be interested in participating in boating in Virginia?	Percent Yes

**Table B2. Key to field names in the Hunters.dbf data table. Each field corresponds to a question from the survey. "Data" column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
buy98	Did you purchase a Virginia hunting license for the 1998/99 hunting season?	Percent Yes
intent	Do you intend to purchase a Virginia hunting license for next year's hunting season?	Percent Yes
huntsat	In general, are you satisfied or dissatisfied with your hunting experiences in Virginia over the past two years?	Percent Very/Somewhat Satisfied
regen	In general, are you satisfied or dissatisfied with the current hunting regulations in Virginia?	Percent Very/Somewhat Satisfied
clear	Do you agree or disagree that Virginia's hunting regulations are clear and easy to understand?	Percent Strongly/Somewhat Agree
publice	Would you say access to PUBLIC hunting lands is excellent, good, fair, or poor?	Percent Excellent
publicp	Would you say access to PUBLIC hunting lands is excellent, good, fair, or poor?	Percent Poor
longpubb	Over the past 5 years, do you think access to PUBLIC hunting lands has gotten better, remained the same, or gotten worse?	Percent Better
longpubw	Over the past 5 years, do you think access to PUBLIC hunting lands has gotten better, remained the same, or gotten worse?	Percent Worse
prive	Would you say that access to PRIVATE hunting lands is excellent, good, fair, or poor?	Percent Excellent
privp	Would you say that access to PRIVATE hunting lands is excellent, good, fair, or poor?	Percent Poor
longprib	Over the past 5 years, do you think access to PRIVATE hunting lands has gotten better, remained the same, or gotten worse?	Percent Better
longpriw	Over the past 5 years, do you think access to PRIVATE hunting lands has gotten better, remained the same, or gotten worse?	Percent Worse
qualhd	In the last five years, do you think the quality of hunting in Virginia has declined, remained about the same, improved, or do you not know?	Percent Declined
qualhi	In the last five years, do you think the quality of hunting in Virginia has declined, remained about the same, improved, or do you not know?	Percent Improved
levdeerm	Would you say there are too many deer, about the right amount, or too few deer in the area in Virginia, where you hunt most often?	Percent Too Many
levdeerf	Would you say there are too many deer, about the right amount, or too few deer in the area in Virginia, where you hunt most often?	Percent Too Few

**Table B2. continued**

deer	In general, were you satisfied or dissatisfied with your DEER hunting in Virginia during the 1997/98 season?	Percent Very/Somewhat Satisfied
pubpriva	When hunting in Virginia during the past 2 years, would you say you mostly hunted on public land, on private land, or both about the same?	Percent Public Land
pubprivb	When hunting in Virginia during the past 2 years, would you say you mostly hunted on public land, on private land, or both about the same?	Percent Private Land
pubprivc	When hunting in Virginia during the past 2 years, would you say you mostly hunted on public land, on private land, or both about the same?	Percent Both
knodeptg	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Great Deal
knodeptn	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Nothing
deptsat	Overall, are you satisfied or dissatisfied with the Virginia Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very/Somewhat Satisfied
incorpe	In general, how well does the Department do with incorporating hunters' wants and needs into the management of the state's wildlife?	Percent Excellent
incorpp	In general, how well does the Department do with incorporating hunters' wants and needs into the management of the state's wildlife?	Percent Poor
ratehune	In general, how would you rate the Department's efforts to provide hunting opportunities?	Percent Excellent
ratehunp	In general, how would you rate the Department's efforts to provide hunting opportunities?	Percent Poor
suph2	Do you think they should provide more, the same, or less effort on opportunities for FALL TURKEY HUNTING?	Percent Much/Somewhat More
suph3	Do you think they should provide more, the same, or less effort on opportunities for SPRING TURKEY HUNTING?	Percent Much/Somewhat More
suph4	Should they provide more, the same, or less effort on opportunities for BEAR HUNTING?	Percent Much/Somewhat More

**Table B3. Key to field names in the Anglers.dbf data table. Each field corresponds to a question from the survey. "Data" column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
frshsat	In general, are you satisfied or dissatisfied with your Virginia FRESHWATER fishing experiences in the past two years?	Very/Somewhat Satisfied
regen	In general, are you satisfied or dissatisfied with the current fishing regulations in Virginia?	Very/Somewhat Satisfied
clear	Do you agree or disagree that Virginia's fishing regulations are clear and easy to understand?	Strongly/Somewhat Agree
shoree	Do you feel that SHORELINE ACCESS in places where fish is excellent, good, fair, or poor?	Percent Excellent
shorep	Do you feel that SHORELINE ACCESS in places where fish is excellent, good, fair, or poor?	Percent Poor
rampse	Would you say the NUMBER AND SIZE OF BOAT RAMPS at places where you fish can be rated as excellent, good, fair, or poor?	Percent Excellent
rampsp	Would you say the NUMBER AND SIZE OF BOAT RAMPS at places where you fish can be rated as excellent, good, fair, or poor?	Percent Poor
mainrame	How would you rate the MAINTENANCE OF THE PUBLIC BOAT RAMPS in the area where you fish most often?	Percent Excellent
mainramp	How would you rate the MAINTENANCE OF THE PUBLIC BOAT RAMPS in the area where you fish most often?	Percent Poor
qualfi	In the last five years, do you think the quality of fishing in Virginia has declined, remained about the same, improved, or do you not know?	Percent Increased
qualfd	In the last five years, do you think the quality of fishing in Virginia has declined, remained about the same, improved, or do you not know?	Percent Decreased
catchrk	When freshwater fishing in Virginia during the past 2 years, would you say you mostly keep the fish you catch, mostly release the fish you catch, or do you do both about the same?	Percent Keep
catchrr	When freshwater fishing in Virginia during the past 2 years, would you say you mostly keep the fish you catch, mostly release the fish you catch, or do you do both about the same?	Percent Release
catchre	When freshwater fishing in Virginia during the past 2 years, would you say you mostly keep the fish you catch, mostly release the fish you catch, or do you do both about the same?	Percent Both Equally



**Table B3. continued**

knodeptg	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Great Deal
knodeptn	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Nothing
deptsat	Overall, are you satisfied or dissatisfied with the Virginia Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very/Somewhat Satisfied
incorpe	In general, how well does the Department do with incorporating anglers' wants and needs into the management of the state's fisheries?	Percent Excellent
incorpep	In general, how well does the Department do with incorporating anglers' wants and needs into the management of the state's fisheries?	Percent Poor
ratefise	In general, how would you rate the Department's efforts to provide fishing opportunities?	Percent Excellent
ratefisp	In general, how would you rate the Department's efforts to provide fishing opportunities?	Percent Poor
supf2	Do you think they should provide more, the same, or less effort on opportunities for RIVER AND STREAM FISHING?	Percent Much More
supf4	Do you think the Dept. should provide more, the same, or less effort on CATCH AND RELEASE FISHING?	Percent Much More
pubaces	Do you think the Dept. should provide more, the same, or less effort on PUBLIC ACCESS AREAS for fishing?	Percent Much More
landopen	Do you think the Dept. should provide more, the same, or less effort on ENCOURAGING PRIVATE LANDOWNERS TO OPEN ACCESS TO THEIR WATERS to anglers for more fishing use?	Percent Much More
morearea	Do you think the Dept. should provide more, the same, or less effort on ACQUIRING MORE PUBLIC AREAS to increase opportunities to fish?	Percent Much More

**Table B4. Key to field names in the Boaters.dbf data table. Each field corresponds to a question from the survey. "Data" column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
btsat	Okay first, in general, are you satisfied or dissatisfied with your Virginia boating experiences in the past two years?	Percent Very/Somewhat Satisfied
regs	In general, are you satisfied or dissatisfied with the current boating regulations in Virginia?	Percent Very/Somewhat Satisfied
qualfi	In the last five years, do you think the quality of boating in Virginia has declined, remained about the same, improved, or do you not know?	Percent Improved
qualfd	In the last five years, do you think the quality of boating in Virginia has declined, remained about the same, improved, or do you not know?	Percent Declined
safe	Do you think that boating on Virginia's waters is safe or dangerous?	Percent Very/Somewhat Dangerous
facpub	Are the boating facilities, such as launch ramps, you use while boating at this area public or private facilities?	Percent Public
facpv	Are the boating facilities, such as launch ramps, you use while boating at this area public or private facilities?	Percent Private
facilite	Overall, would you rate the BOATER ACCESS FACILITIES at the area in Virginia where you boat most often as excellent, good, fair, or poor?	Percent Excellent
facilitp	Overall, would you rate the BOATER ACCESS FACILITIES at the area in Virginia where you boat most often as excellent, good, fair, or poor?	Percent Poor
rampse	Would you rate the LAUNCH RAMPS at the Virginia area where you boat most often as excellent, good, fair, poor, or are there no launch ramps at all?	Percent Excellent
rampsp	Would you rate the LAUNCH RAMPS at the Virginia area where you boat most often as excellent, good, fair, poor, or are there no launch ramps at all?	Percent Poor
lakaces	Do you think the Dept. should provide more, the same, or less effort on LAKES AND RESERVOIRS?	Percent Much More
tidal	Do you think the Dept. should provide more, the same, or less effort on TIDAL SALTWATER?	Percent Much More
knodeptg	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Great Deal
knodeptn	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Nothing
deptsat	Overall, are you satisfied or dissatisfied with the Virginia Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very/Somewhat Satisfied

**Table B4. continued**

depboate	In general, how would you rate the Department's performance with incorporating boaters' wants and needs into the management of the state's recreational boating?	Percent Excellent
depboatp	In general, how would you rate the Department's performance with incorporating boaters' wants and needs into the management of the state's recreational boating?	Percent Poor
deptope	In general, how would you rate the Department's efforts to provide boating opportunities? Would you say they do an excellent, good, fair, or poor job?	Percent Excellent
deptopp	In general, how would you rate the Department's efforts to provide boating opportunities? Would you say they do an excellent, good, fair, or poor job?	Percent Poor
deptfshe	Generally, how would you rate the Department's management of the state's freshwater fisheries?	Percent Excellent
deptfshp	Generally, how would you rate the Department's management of the state's freshwater fisheries?	Percent Poor
landfee	Do you support or oppose requiring all users, such as motor-boaters, canoers, and outfitters, of Department-owned boat landings to pay a fee for their upkeep?	Strongly/Somewhat Support

**Table B5. Key to field names in the Non\_Consumptive\_Users.dbf data table. Each field corresponds to a question from the survey. "Data" column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
nonscren	In the past 2 years in Virginia, did you take any trips or outings of at least 1 mile away from your home for the primary purpose of observing, photographing, or feeding wildlife?	Percent Yes
consider	Would you consider taking a trip to watch wildlife in Virginia over the next two years?	Percent Yes
rescreen	During the past 2 years in Virginia, did you take a SPECIAL INTEREST in wildlife AROUND YOUR HOME, that is, closely observing, feeding, or trying to identify wildlife within 1 mile of your home?	Percent Yes
considhm	Would you consider taking a special interest in wildlife around your home within the next 2 years?	Percent Yes
noloct01	Of the trips taken over the past 2 years in Virginia, were any of these taken in Northern Virginia?	Percent Yes
noloct02	Of the trips taken over the past 2 years in Virginia, were any of these taken in the Eastern Shore?	Percent Yes
noloct03	Of the trips taken over the past 2 years in Virginia, were any of these taken in the Tidewater Area?	Percent Yes
noloct04	Of the trips taken over the past 2 years in Virginia, were any of these taken in Central Virginia?	Percent Yes
noloct05	Of the trips taken over the past 2 years in Virginia, were any of these taken in the Southwestern Highlands?	Percent Yes
noloct06	Of the trips taken over the past 2 years in Virginia, were any of these taken in the Shenandoah Valley?	Percent Yes
nonInd01	Did any of the outings taken in Virginia during the past 2 years for wildlife viewing occur on federal land such as natl forests, parks or wildlife refuges?	Percent Yes
nonInd02	Did any of the outings taken in Virginia during the past 2 years for wildlife viewing occur on state wildlife management areas?	Percent Yes
nonInd03	Did any of the outings taken in Virginia during the past 2 years for wildlife viewing occur on other state-owned land such as state parks and forests?	Percent Yes
nonInd04	Did any of the outings taken in Virginia during the past 2 years for wildlife viewing occur on locally-owned public areas such as city or county parks?	Percent Yes
nonInd05	Did any of the outings taken in Virginia during the past 2 years for wildlife viewing occur on privately-owned lands?	Percent Yes
nonsat	In general, how satisfied or dissatisfied were you with your wildlife viewing trips taken in Virginia during the past 2 years?	Percent Very/Somewhat Satisfied

**Table B5. continued**

nonopin	What is your general opinion of the opportunity available to you to take trips or outings for the primary purpose of photographing, observing, or feeding wildlife in Virginia?	Percent Excellent/Good
nonlevi	Generally speaking, in the last two years in Virginia, would you say the number of trips or the level of your wildlife viewing activity has increased, remained the same, or decreased?	Percent Increase
nonlevd	Generally speaking, in the last two years in Virginia, would you say the number of trips or the level of your wildlife viewing activity has increased, remained the same, or decreased?	Percent Decrease
emphas1	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes Region 1
emphas2	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes Region 2
emphas3	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes Region 3
emphas4	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes Region 4
emphas5	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes Region 5
emphasst	Are there any places in Virginia where you would like to see the Department place more emphasis in regard to wildlife viewing opportunities?	Percent Yes State-Wide
tripinte	What is your general opinion of the opportunity available to you to take trips or outings for the primary purpose of photographing, observing, or feeding wildlife in Virginia?	Percent Excellent
tripintp	What is your general opinion of the opportunity available to you to take trips or outings for the primary purpose of photographing, observing, or feeding wildlife in Virginia?	Percent Poor
knodeptg	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Great Deal
knodeptn	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Percent Nothing

**Table B5. continued**

deptsat	Overall, are you satisfied or dissatisfied with the Virginia Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very/Somewhat Satisfied
deptwant	In general, how would you rate the Department's performance with incorporating wildlife viewers' and nongame enthusiasts' wants and needs into the management of the state's fish and wildlife?	Percent Excellent/Good
deptatt	In general, how would you rate the Department's performance with incorporating wildlife viewers' and nongame enthusiasts' wants and needs into the management of the state's fish and wildlife?	Percent Strongly/ Somewhat Agree

**Table B6. Key to field names in the Landowners.dbf data table. Each field corresponds to a question from the survey. “Data” column describes which statistics are included in the DSS data table.**

<b>Field Name</b>	<b>Question</b>	<b>Data</b>
leghunt	In general, do you approve or disapprove of legal hunting?	Strongly/Somewhat Approve
legfish	In general, do you approve or disapprove of legal, recreational fishing?	Strongly/Somewhat Approve
legtrap	In general, do you approve or disapprove of legal trapping?	Strongly/Somewhat Approve
hntcont	Now I have a few statements and I would like to know whether you AGREE or DISAGREE with each: OK, first, do you agree or disagree that hunting should continue to be a legal activity in Virginia?	Strongly/Somewhat Approve
hntsaf	Do you agree or disagree that, generally, hunting is a safe recreational activity.	Strongly/Somewhat Agree
valuhome	Is it important or unimportant to you to know that you have wildlife around your home?	Very/Somewhat Important
givlife	To know that you, personally, can participate in habitat for fish and wildlife?	Very/Somewhat Important
voppfish	To know that people have the opportunity to FISH in Virginia?	Very/Somewhat Important
voppht	To know that people have the opportunity to HUNT in Virginia?	Very/Somewhat Important
vopptrip	And how about that people have the opportunity VIEW WILDLIFE in Virginia?	Very/Somewhat Important
timb	First, for this tract of land, is TIMBER PRODUCTION very important, somewhat important, or not important at all to you?	Very/Somewhat Important
farm	And for this tract of land, is FARMING very important, somewhat important, or not important at all to you?	Very/Somewhat Important
hunt	For this tract of land, is HUNTING very important, somewhat important or not important at all to you?	Very/Somewhat Important
fish	For this tract of land, is FISHING very important, somewhat important or not important at all to you?)	Very/Somewhat Important
wildv	For this tract of land, is WILDLIFE VIEWING very important, somewhat important or not important at all to you?)	Very/Somewhat Important
care	For this tract of land, is CARING FOR AND PROTECTING FISH AND WILDLIFE AND THEIR HABITATS very important, somewhat important or not important at all to you?	Very/Somewhat Important
lethunt	On this tract of land, do you allow hunting?	Percent Yes
everhunt	Did you ever allow hunting on this tract of land?	Percent Yes
sunday	Do you support or oppose Sunday hunting in Virginia during the legal hunting season?	Strongly support
allfish	Do you allow fishing on this tract of land?	Percent Yes
evfish	Did you ever allow fishing on this property?	Percent Yes

**Table B6. continued**

allwild	Do you allow WILDLIFE VIEWING on this tract of land?	Percent Yes
evwild	Did you ever allow WILDLIFE VIEWING on this tract of land?	Percent Yes
deerpopi	In your opinion, should the deer population on this land be increased, remain the same, or decreased?	Percent Increase
deerpopd	In your opinion, should the deer population on this land be increased, remain the same, or decreased?	Percent Decrease
commerc	Did you have problems with any wild animal within the last two years on your land used for BUSINESS OR COMMERCIAL REASONS?	Percent Yes
damag	OK. Now, I would like to talk to you about deer damage. During the past two years, have you experienced any damage to this property caused by deer?	Percent Yes
damlv	Would you say the total damage done this past year by deer to this property was severe, moderate, or light?	Severe/Moderate
deera	Generally, which ONE of the following statements best describes your feeling about having deer on your land?	Percent Enjoy Seeing Deer
deerb	Generally, which ONE of the following statements best describes your feeling about having deer on your land?	Percent Enjoy A Few Deer
deerc	Generally, which ONE of the following statements best describes your feeling about having deer on your land?	Percent Deer is Nuisance
deerd	Generally, which ONE of the following statements best describes your feeling about having deer on your land?	Percent No Feelings
knodept	Before this survey, would you say you knew a great deal, a moderate amount, a little, or nothing about the activities of the Virginia Department of Game and Inland Fisheries?	Great/Moderate
agensat	Overall, are you satisfied or dissatisfied with the Virginia Department of Game and Inland Fisheries as a governmental agency in Virginia, or do you not know?	Percent Very/Somewhat Satisfied