
Final Report

**OPPORTUNITIES AND BARRIERS
TO GAP IMPLEMENTATION
A REVIEW AND ANALYSIS**

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National Gap Analysis Program

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EXECUTIVE SUMMARY

The primary goal of the Gap Analysis Program (GAP) is to provide information and protocols to conservationists and help them make wise and effective decisions. The information provided by GAP, including land cover information, predicted species distributions, species richness indices, and land stewardship maps are invaluable building blocks of an effective and efficient conservation initiative. In this sense, GAP has met its objectives admirably. However, there exists a disconnect between the data provision and the data application – between the products of GAP and the natural resources managers for whom they were meant. Simply put, GAP data are not being used by managers to their fullest potential. The question we asked and sought to answer in this project was “Why?”

We explored this issue through a mail questionnaire and a series of focus group meetings involving natural resource professionals in Virginia. The results and recommendations from this study can be incorporated into state and regional gap programs so that products and processes are compatible with user needs and ready for incorporation into decision-making processes with minimal “in house” processing.

Mail Questionnaire

A questionnaire was sent to 69 volunteer natural resource professionals in Virginia. Forty-nine responses were received.

Barriers to Implementation

- Before receiving the questionnaire, 38 (80%) of the natural resource professionals had heard of gap analysis or the Gap Analysis Program. Since respondents were from a self-selected group of professionals, this proportion is likely lower among the general population of natural resource managers
- Of those who had previously heard of a gap analysis or the Gap Analysis Program, only 53% correctly identified the mission of GAP as identifying gaps in the protection of biodiversity.
- Only 14 respondents had ever used GAP data before, most often using only the land cover data. Many of these GAP data users were not aware that other GAP products were available, many users applied GAP data at an inappropriate county or sub-county level, and only half of these users correctly identified the objective of GAP. These statistics could indicate a high level of misuse or misapplication.
- The primary obstacles preventing the use of GAP products were an inappropriate scale or resolution and because GAP simply doesn't provide the needed data. Other obstacles commonly cited include not knowing how to obtain or use GAP data, not having the time to incorporate GAP data, and the lack of timeliness in GAP data.

Opportunities for Implementation

- Thirty-nine percent of respondents indicated that they were currently working on or planned to work on projects where GAP products would be useful. In addition, 45% of respondents were uncertain (for a total of almost 95%). These statistics highlight a large potential for increased integration of GAP products.
- Specific potential applications listed by respondents included planning for wildlife management corridors, prioritization of lands for acquisition or protection, forest disturbance monitoring, invasive vegetation management planning, insect management planning, fire risk modeling, comprehensive conservation planning, and habitat availability modeling.
- The most important catalysts for more complete usage of GAP data were having additional information about how GAP data can be used, having the data available at a different scale or resolution, having more or different data products available, and having additional information about what GAP is.

Focus Group Meetings

Three focus group meetings were held in various parts of Virginia, with 5-7 natural resource professionals participating in each.

Barriers to Implementation

- Lack of Information: Potential users need to know what is available, how to obtain it, how to use it, how it can be applied, and what the limitations of the data are. State-level GAP data needs to be presented in a user-friendly, interactive way on the web, so that in-house GIS is not a prerequisite in order to benefit from the data. In addition, managers need credible, real-life examples of projects successfully using GAP information.
- Data Quality: Data timeliness and scale (large minimum mapping unit) are insufficient for many applications.
- Data Flexibility: Lack of standardized protocols both among the state and regional GAP programs and between federal and state data producing agencies limits GAP data utility; Managers need the ability to map different aspects of biodiversity by querying specific fields, such as all threatened or endangered species or all grassland species; Manager also need increased flexibility in assigning risk to species/habitats.
- Limited Predictive Ability: Managers need to be able to look at habitat **quality** and population **size** (rather than simple presence/absence) by using HSI-like models that incorporate such factors as patch size, connectivity, proximity, distribution, and productivity.

Opportunities for Implementation

- Risk Assessment: Potential applications of GAP data include assessing risk-of-loss by habitat type and region along with an examination of high priority species (similar to the stated mission of the Gap Analysis Program), conservation corridor planning; aquatic systems management; and fire risk modeling and planning
- Monitoring & Modeling: A host of potential applications were identified including monitoring and predicting habitat and land use changes and stewardship patterns over time; monitoring and predicting habitat quality, carrying capacity, and species abundance; planning and modeling management prescriptions; predicting, modeling, and monitoring wildlife-related crop damage and wildlife-vehicle collisions; monitoring wildlife disease implications and planning mitigation measures; monitoring and predicting the effects of invasive species; and modeling and predicting dispersal patterns (e.g., elk).
- Strategic Planning: GAP data can assist managers in carrying out strategic planning processes by helping them to set management objectives to include biodiversity conservation as well as recreational planning, endangered species management, cultural preservation, military training, etc. and by identifying and developing plans for Species of Concern to include both pro-active and re-active approaches.
- Socioeconomics and Outreach: Managers saw a large potential for GAP data to improve their outreach and human dimensions components by helping them to communicate stewardship information and biodiversity needs to the public and the legislature to further the conservation mission, promote and defend land acquisition and management efforts to the public and to the legislature, communicate conservation actions and success stories to the public to improve agency image and garner public support, and Plan and model recreational experiences.

Recommendations

1. Develop and publicize sample applications.
2. Increase general awareness about GAP among natural resource professionals.
3. Provide access to GAP data from a central web server.
4. Provide affordable training.
5. Develop improved flexibility in GAP products.
6. Maintain GAP as a dynamic data producer.

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I. INTRODUCTION & METHODS

The primary goal of the Gap Analysis Program (GAP) is to provide information and protocols to conservationists and help them make wise and effective decisions. The information provided by GAP, including land cover information, predicted species distributions, species richness indices, and land stewardship maps are invaluable building blocks of an effective and efficient conservation initiative. In this sense, GAP has met its objectives admirably. However, there exists a disconnect between the data provision and the data application – between the products of GAP and the natural resources managers for whom they were meant. Simply put, GAP data are not being used by managers to their fullest potential.

GAP data are available, at least in draft form, for most states and regions of the country. Yet very few conservation entities, government, private, or otherwise, are taking full advantage of them. The question we asked and sought to answer in this project was “Why?” There are many possible reasons for this discrepancy, including inadequate technological equipment and knowledge among managers, lack of knowledge about the presence and/or utility of gap analysis products, mismatched data provision and manager needs, and conflicts between gap analysis objectives and manager directives, among others. In order for gap analysis to evolve into a fully functional decision support system applied by managers in all different agencies, these obstacles must be revealed and resolved.

We explored this issue through a mail questionnaire and a series of focus group meetings involving natural resource professionals in Virginia. The results and recommendations from this study can be incorporated into state and regional gap programs so that products and processes are compatible with user needs and ready for incorporation into decision-making processes with minimal “in house” processing.

Project Scope

The primary goal of this project was to obtain and analyze user input in order to review the familiarity and validity of the GAP concept to decision-makers and identify opportunities and obstacles to its implementation. Such an analysis is useful to each GAP effort, both state and regional, and is instrumental in achieving wide scale use of GAP products.

The secondary goal of this project is to perform a detailed study for the state of Virginia. We focused our efforts on land stewards and decision makers that have jurisdiction or responsibilities within Virginia state boundaries, including federal, state, and private agencies. Although this provides the best information for Virginia, it also is applicable nationwide due to the high degree of user agency overlap (e.g., Forest Service, National Park Service, NGOs) and the similar mission statements of other user agencies (i.e., state agencies).

In order to fulfill these goals, four objectives were outlined. Specifically, this project aimed to:

1. Determine the level of awareness among potential users about GAP products, processes, and applicability,
2. Identify user needs and desires relevant to GAP products and processes and ways that state and regional gap programs can address these needs,
3. Identify avenues and opportunities for successful implementation of GAP data and processes in various agencies, and
4. Determine the ability of various users to make practical use of GAP data based on current technological equipment and ability.

Methods

We completed this project in 2 phases: a mailed questionnaire phase, and a focus group meeting phase. Both phases were executed by social scientists from the Human Dimensions Division of the Conservation Management Institute.

Phase I: Mail Questionnaire

The Conservation Management Institute drafted a questionnaire using a combination of closed- and open-ended questions. Specific topics addressed in the questionnaire included:

1. Level of awareness about GAP products (e.g., their availability, why they were created, how to get them),
2. Ways that respondents currently use GAP products (if at all),
3. Reasons that GAP products are not used more frequently or to a higher degree,
4. Aspects of GAP where respondents see the need for revisions or additions,
5. Areas where respondents see the potential for increased use of GAP products,
6. Ways that GAP fits in with and/or conflicts with the mission of the respondent's agency, and
7. The technological capabilities and resources available to respondents.

To create the mailing list, a list of potential gap users was composed by contacting natural resource entities with jurisdiction within the state of Virginia including the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation, Virginia Department of Forestry, Virginia Planning District Commissions, Virginia Geographic Information Network, academic institutions, non-governmental organizations (e.g., The Nature Conservancy, Western Virginia Land Trust), and private consulting firms. Individuals that work with data either directly or indirectly were identified within each agency. Each individual on the list was then contacted by phone

and given background information about this study and why their participation was being requested. Only those individuals agreeing to participate were included in the final sample. This procedure resulted in questionnaires being sent to 69 individuals stratified among the identified groups.

The draft questionnaire was reviewed by GAP coordinators and pre-tested on a sample of six natural resource professionals (four from Virginia, two from other states) not included in the questionnaire sample. Reviewers were asked to consider the clarity of the questions, flow of the questionnaire, clarity of instructions, and the length of time required to complete it. Once comments were received, necessary revisions were made to produce the final instrument (Appendix A). The estimated completion time per participant was 20 minutes.

This phase followed a modified Dillman (1978¹) Total Design Method in terms of questionnaire design and mailing sequence. An initial mailing (cover letter, questionnaire, business reply envelope), sent on March 12, 2002, was followed by a reminder postcard sent on March 19, 2002 and a second mailing (cover letter, questionnaire, and business reply envelope) sent on April 2, 2002.

Responses were summarized and analyzed using Survey Pro software (V. 3.0, Apian Software). Frequency distributions for all closed-ended questions are listed in Appendix B. The results of this phase aided in the development of recommendations and served as a scoping mechanism for focus group meeting agenda development.

Phase II: Focus Group Meetings

Once questionnaire results had been compiled and analyzed, we held a series of three focus group meetings across the state. The purpose of these workshops was to further define the limitations, opportunities, and validity of gap analysis and its implementation in actual applications. The discussions used a modified nominal group technique to encourage participation and ensure equal and fair representation of those in attendance. Each meeting was facilitated by a trained social scientist from the Conservation Management Institute.

Discussion topics for the workshops were determined both by the objectives of this study and by the results of the mail questionnaire. A sample agenda is included in this report as Appendix C. Each meeting was kicked off with an introductory slide show explaining the gap process and presenting the results of Virginia GAP. Two brainstorming and discussion sessions followed this presentation. The first session asked participant to think about their own work and how GAP can interface with that work – either in current projects or in projects that they would like to be able to do in the future. The second session asked participants to review the notes from the first session and think about the things that they would need GAP to provide to them in order to achieve the goals stated in Session 1. They were asked to think about needs in relation to the data available, the presentation and packaging of that data, and general informational needs that

¹ Dillman, D. A. 1978. *Mail and Telephone Surveys: The Total Design Method*. John Wiley & Sons, New York. 325 pages.

accompanies the use of those data. Notes were taken on an easel during both sessions to document the points brought up in the discussion. Each workshop lasted a half-day (3 hours). Refreshments were provided during meeting, and all participants were promised a copy of the Virginia GAP CD once they become available.

Workshop participants were initially identified as a subgroup of questionnaire respondents. The last question in the questionnaire asked participants if they'd be interested in participating in a workshop in their region. Respondents who indicated such interest were contacted to attend the workshop closest to their location. If contacted individuals were unable to participate, they often provided contact information for others in their office who could participate in their stead. The 35 questionnaire respondents expressing interest in the workshops resulted in 21 individuals registering for one of the three workshops, and 18 actually attending one. Each of the three meetings was attended by 5-7 individuals from a variety of agencies. Lists of participants at each meeting are included in Appendix D along with a presentation of each meeting's products.

Meeting results were summarized for each session, and results from each meeting were combined (e.g., all Sessions 1s and all Session 2s) to allow a comprehensive analysis. Implications presented in Chapter 4 are based on both questionnaire and meeting results.

II. MAILED QUESTIONNAIRE

The first phase of this project was a questionnaire that was mailed to a volunteer sample of Virginia's natural resource professionals. This section highlights the important results from this questionnaire. A complete listing of all question response frequencies can be found in Appendix B.

Respondent Profile

Of the 69 volunteers to whom the questionnaire was mailed, 46 returned a completed response for a final response rate of 66%. Questionnaire respondents represented a range of different natural resource entities and included 18 state government employees, 14 federal government employees, three regional government (sub-state level) employees, five private consultants, two academic affiliates, and three non-governmental (non-profit) organizations.

Respondents also presented a range of experience levels, responsibility levels, backgrounds, and job missions. Twenty-seven percent of respondents had less than 5 years of experience in natural resources, while 34% had accumulated more than 20 years of experience. Respondents also included 23 management/supervisory positions, 20 technical positions, and 2 administrative positions. Educational attainment ranged from a 2-year technical degree (1 respondent) through a doctoral degree (4 respondents) with 20 respondents falling into each of the Bachelor's and Master's degree categories. The most common fields of study were biology/ecology (20 respondents), geography (8 respondents), and environmental science (6 respondents). Forestry and geology were each represented by 2 respondents. Fields of study with only one respondent included accounting, agriculture/horticulture, environmental planning, fisheries/marine science, forestry/wildlife, forestry/recreation, geology/oceanography, political science, and statistics.

Job mission descriptions as indicated by respondents filled a broad spectrum of goals, including education & outreach, endangered species management, landscape planning, economic development, and cultural/historical preservation. Table 1 presents each mission descriptor, its rating statistics, and an overall mean among questionnaire respondents.

General Data Usage

External data sources (defined here as data obtained for a project from outside the agency performing the project) are Very Important to 33 of 46 respondents (72%), and Somewhat Important to an additional 10 respondents (22%). These data needs cover a wide range of data types and sources, including:

- Imagery (e.g., Landsat TM, DOQs, USGS DLGs, NRCS photos, other aerial photos),
- Cadastral (e.g., county parcel boundaries, conserved lands, stewardship, US Census)

Table 1: The importance of various mission descriptors to the job of questionnaire respondents. Each descriptor was rated on a scale of 1 (Not Important at All) to 5 (It's a Top Priority). Missions are presented here in order of decreasing average rating.

Mission Descriptors	Mean	Not Important at All					It's a Top Priority	Totals	N
		1	2	3	4	5			
Education/Outreach	3.7	4.4%	8.9%	20.0%	44.4%	22.2%	100.0%	45	
Endangered Species Management	3.5	17.8%	8.9%	17.8%	20.0%	35.6%	100.0%	45	
Environmental Impact Assessment	3.4	8.9%	17.8%	22.2%	28.9%	22.2%	100.0%	45	
Multiple Species (i.e., Community) Management	3.4	17.8%	6.7%	20.0%	33.3%	22.2%	100.0%	45	
Ecosystem Management	3.4	11.1%	8.9%	31.1%	24.4%	24.4%	100.0%	45	
Biodiversity Conservation	3.3	13.3%	13.3%	24.4%	28.9%	20.0%	100.0%	45	
Public Involvement	3.3	11.1%	6.7%	33.3%	35.6%	13.3%	100.0%	45	
Research	3.2	15.9%	6.8%	34.1%	29.5%	13.6%	100.0%	44	
Regulatory Compliance	3.1	18.2%	15.9%	22.7%	22.7%	20.5%	100.0%	44	
Client Services	3.1	22.2%	13.3%	17.8%	28.9%	17.8%	100.0%	45	
Environmental Impact Mitigation	2.9	15.9%	22.7%	29.5%	22.7%	9.1%	100.0%	44	
Cultural/Historical Preservation	2.8	20.5%	22.7%	22.7%	20.5%	13.6%	100.0%	44	
Landscape Planning	2.8	20.0%	22.2%	28.9%	20.0%	8.9%	100.0%	45	
Human/Public Services	2.8	27.3%	13.6%	20.5%	25.0%	13.6%	100.0%	44	
Single Species Management	2.7	22.2%	20.0%	33.3%	13.3%	11.1%	100.0%	45	
People Management	2.7	22.2%	20.0%	33.3%	17.8%	6.7%	100.0%	45	
Economic Development	2.4	31.8%	25.0%	20.5%	13.6%	9.1%	100.0%	44	
Other*	4.8	0.0%	0.0%	0.0%	22.2%	77.8%	100.0%	9	

* Participants indicated that Community Planning, Land Stewardship and Recreation, Regional Planning, Human Services, and Firefighting were also missions of their position.

- Topographic (e.g., USGS DEMs)
- Land cover/land use (NWI, NOAA, LULC)
- Soils (e.g., SSURGO)
- Transportation (e.g., Tiger, USGS, VDOT)
- Hydrography (e.g., USGS, NHD)

These data come from a wide variety of sources, including federal government (Fish and Wildlife Service, US Geological Service, US Census Bureau, Environmental Protection Agency), state and local government (Virginia Department of Transportation, Department of Game and Inland Fisheries, Division of Conservation and Recreation, Virginia Department of Mines and Minerals, counties), academic (University of Virginia, Virginia Tech, Virginia Commonwealth University), and private (Shell Oil, The Nature Conservancy) organizations.

Overall, respondents were satisfied with the quality and usefulness of these external data sources, with 64% indicating they were Very Satisfied and 14% indicating they were Somewhat Satisfied. However, 37% of respondents said that they are disappointed or frustrated at least half of the time because they often cannot find a dataset to suit their needs. Only one respondent indicated that he/she was never disappointed. Reasons why

respondents have been disappointed with these external data are numerous, and include (frequency of response in parenthesis):

- Inadequate spatial resolution and/or scale (12)
- Missing or incomplete metadata (10)
- Incomplete coverage (9)
- Out of date data (8)
- Lack of information about availability (e.g., who to call, how to obtain) (5)
- Poor positional accuracy (4)
- Data not available in digital format (3)
- Data in uncommon, unusable formats or projections (e.g., SDTS) (3)
- Slow data transfer or unavailable web sites (2)
- Cost (2)

Forty-two respondents indicated that they work with Geographic Information Systems (GIS) in their work. Almost all of these respondents use ESRI products, with 98% using ArcView, 76% using ArcInfo, and 43% using other ESRI products. Twenty-four percent of respondents described their job as primarily cartographic, 22% as primarily analytical, and 54% described their job as a combination of cartographic and analytical work.

Familiarity with GAP

Before receiving the questionnaire, 38 (80%) of the natural resource professionals responding to the questionnaire had heard of gap analysis or the Gap Analysis Program. Since respondents were from a self-selected group of professionals, this proportion is likely lower among the general population of natural resource managers. In addition, of those who had previously heard of a gap analysis or the Gap Analysis Program, only 53% correctly identified the mission of GAP as identifying gaps in the protection of biodiversity (Table 2). Other frequently cited GAP missions were to create land cover maps of each state (24%) and to identify and study “gaps” in habitats (16%)

Table 2: Frequencies for perceived GAP mission. Based on what you’ve heard or read about gap analysis, would you say the primary objective of the GAP Analysis Program is to...

Gap Objectives	Count	Percents
Identify "gaps" in the protection of biodiversity	20	52.6%
Create land cover maps of each state	9	23.7%
Identify and study "gaps" in habitats	6	15.8%
* Characterize the forest cover types with a bent toward identifying gaps (fragments) in same.	1	2.6%
* Identify gaps between any set of data layers and analyze results	1	2.6%
* Plot bird species' ranges and diversity	1	2.6%
Identify land stewards	-	0.0%
Don't know	-	0.0%
Totals	38	100.0%

* Responses volunteered

Only ten respondents (27% of those familiar with GAP) knew that the Virginia Gap Analysis Project had been completed, with an additional 14 (38%) indicating that it had been started but not yet completed. One respondent indicated that it had not yet been started, and 12 (32%) reported that they didn't know the status of VA-GAP. Finally, only 20 respondents (53% of those familiar with GAP) knew that the products of completed GAP projects were available for free online.

Many respondents who were familiar with GAP first learned about the program through a coworker or colleague. This was indicated by 18 respondents. Nine respondents first learned of GAP through a professional meeting or conference, six first learned of GAP through a professional publication, two first heard of it through college coursework, and one first heard of GAP through a professional e-mail list.

GAP Data Usage

Of the 38 respondents who were familiar with GAP, only 14 had actually used a GAP product in one of their projects. This includes seven respondents who correctly identified the mission of GAP, four respondents who believed the mission was to create land cover maps, and three who believed the mission was to identify and study “gaps” in habitats. This misunderstanding among GAP data users could indicate potential erroneous use of the data.

Respondents most often applied the GAP data to projects at the regional (multi-county or size equivalent) level, with seven out of the 14 respondents working at this level. Other common scales of application were statewide and county-level projects with six respondents working at each of these scales. Four respondents indicated using GAP data at the town/city level (sub-county or size equivalent) and two indicated using GAP data at the individual parcel level. No respondents used GAP data at a multi-state level. These statistics present a special concern, in that VA-GAP data were not designed for use at the county-level (or below) scale, yet it frequently is being used at this level.

Of all of the products of GAP, the land cover maps were the most widely used by respondents, with all 14 GAP data users having used them in their work. Eight respondents each had used the species distribution maps and the gap analysis approach, and five each had used the habitat models, the stewardship maps, and the written GAP reports.

When respondents were asked about the helpfulness of the various GAP products, the land cover maps were rated as being the most helpful (mean 1.5) with the species distribution maps and the gap analysis approach being rated as only slightly less helpful (mean = 1.9 for each) (Table 3). Interestingly, these are also the data sets used most frequently. It is impossible to say, however, if increased knowledge and usage of the other data sets (without modification to the data sets) would improve their perceived usefulness. Respondents indicated that the most critical factor that went into their decision to use GAP data in their projects was that it was free (Table 4). Less important reasons were because it was the only dataset they could find, and because GAP data were easy to obtain. Perhaps if reasons such as data accuracy or perceived utility in

comparison to other data sets were rated higher, then usage and perceived helpfulness would increase accordingly.

Table 3: Perceived helpfulness of various GAP products as indicated by current users of GAP data responding to the questionnaire. Mean scores are calculated based on coded responses (1 = Very helpful, 2 = Somewhat helpful, 3 = Not very helpful, 4 = Not at all Helpful). Data presented in each shaded column represent the number of respondents in each category.

Gap Product	Mean	Very helpful	Somewhat helpful	Not very helpful	Not at all helpful	Frequency of Use
Land cover maps	1.5	8	6	1	-	14/14
Species distribution maps	1.9	3	4	-	1	8/14
Gap analysis approach/methodology	1.9	2	5	1	-	8/14
Habitat models	2.2	-	4	1	-	5/14
Final GAP reports (written portion)	2.4	1	1	3	-	5/14
Stewardship maps	2.6	-	2	3	-	5/14

Table 4: Reasons respondents used GAP data in their projects. Mean scores are calculated based on coded responses (1 = Most important, 2 = Very important, 3 = Somewhat important, 4 = Of little importance, 5 = Not a factor at all). The midpoint is 3.0. Data presented in each shaded column represent the number of respondents in each category.

Why use gap data...	Mean	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	N
They were free	1.9	5	6	2	1	-	14
It was the only dataset of its kind that I could find for the area	2.2	3	6	3	1	-	13
They were easy to obtain	2.3	2	7	4	1	-	14
They were more accurate than other available data	2.5	1	8	2	1	1	13
They were more appropriate for my needs than other available data	2.6	1	5	6	2	-	14
My employer requested that I use them	4.3	1	1	-	2	8	12

Projects in which respondents have used GAP data include Environmental Impact Studies, Endangered Species Planning, Landscapes or Land Use Planning, Infrastructural Planning (Smart Growth Analysis), Fire Planning, Species-Habitat Associations, Land Acquisition Planning, and Habitat Management Planning.

Barriers to Implementation

In general, respondents indicated that the primary obstacles preventing them from making better use of GAP products are because the scale or resolution is not appropriate for their

needs and or because it simply doesn't provide the data that they need (Table 5). These two concerns were considered at least somewhat important by over 70% of respondents. Other commonly cited obstacles include not knowing how to obtain or use GAP data, not having the time to incorporate GAP data, and the lack of currentness in GAP data.

Respondents cited a variety of other problem as well. These included not having an appropriate Internet connection (e.g., fast enough) to download efficiently, not knowing about the different layers that are available (other than land cover), lack of expert review, lack of central location from which to obtain data (e.g., www.gapanalysis.gov), the costs associated with obtaining and learning to use GAP data (training, support, etc.), and the perceived lack of reliability of land cover classifications.

Table 5: Factors preventing the use of GAP products among natural resource professionals in Virginia. Mean scores are calculated based on coded responses (1 = Most important, 2 = Very important, 3 = Somewhat important, 4 = Of little importance, 5 = Not a factor at all). The midpoint is 3.0. Data presented in each shaded column represent the number of respondents in each category.

Why Gap is not used more	Mean	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	N
The scale or resolution is not appropriate	2.9	5	7	12	5	5	34
It doesn't have the data I need	3.0	4	8	12	2	7	33
I don't know how to obtain it	3.4	4	10	4	2	15	35
The data is not up-to-date enough	3.5	2	5	9	9	9	34
I don't have time	3.6	1	5	13	3	13	35
I don't how it can be used	4.0	2	3	6	7	17	35
I didn't know it existed	4.1	3	3	4	2	23	35
I don't have the computer training that I would need	4.4	1	-	6	5	23	35
I don't have the computer equipment or software needed to use it	4.6	1	-	2	6	25	34
I'm required to use another data set by my employer	4.8	-	1	1	1	29	32

Opportunities for Implementation

After providing questionnaire respondents with some background information on gap analysis, the methods employed, and the data it provides, all respondents (including those who have never used GAP data or had not previously heard of GAP) were asked to consider the potential for increased usage of GAP products in their work. Thirty-nine percent of respondents indicated that they were currently working on or planned to work on projects where GAP products would be useful. In addition, 45% of respondents were uncertain (for a total of almost 95%). These statistics highlight a large potential for increased integration of GAP products, especially among those individuals expressing uncertainty. It is likely that additional information about the potential applications of GAP data can illustrate to them its applicability and encourage its use.

Specific potential applications listed by respondents included planning for wildlife management corridors, prioritization of lands for acquisition or protection, forest disturbance monitoring, invasive vegetation management planning, insect management planning, fire risk modeling, comprehensive conservation planning, and habitat availability modeling.

Respondents were next asked to rank several scenarios in terms of the likeliness that each one would encourage them to use GAP data more often (Table 6). The most important factors were having additional information about how GAP data can be used, providing that data at a different scale or resolution, having more or different data products available (although many respondents assumed that land cover was the only GAP product), and having additional information about what GAP is. Two of these top four factors are dependent only on the amount of information delivered to potential end users regarding the data and its possible applications, with the other two directly related to the data itself.

Table 6: Factors that may encourage natural resource professional to make better use of GAP data. Mean scores are calculated based on coded responses (1 = Very Likely, 2 = Somewhat Likely, 3 = Not at all Likely. The midpoint is 2.0. “Don’t Know” responses were ignored in mean calculation. Data presented in each shaded column represent the number of respondents in each category.

How likely would you be to use GAP data more if...	Mean	Very Likely	Somewhat Likely	Not at all Likely	Don't Know	N
If I had more information about how to use GAP data	2.0	10	19	11	1	41
If the data were provided at a different scale or resolution	2.0	11	6	11	13	41
If more or different data products were available	2.1	6	17	8	9	40
If I had more information about what GAP is	2.2	9	15	15	2	41
If the data were easier to obtain	2.2	9	10	14	8	41
If I had more computer training	2.6	1	11	24	4	40
If I had better computer equipment	2.7	4	4	28	6	42
If my employer were more supportive of using this data	2.8	1	4	21	14	40
If the data were provided in a different format	2.8	-	5	19	15	39

A Note About Sample Bias

The sample of professionals obtained for this questionnaire is based on a self-selected, volunteer procedure (rather than a random selection). Therefore, no confidence interval or level of statistical accuracy can be calculated and the results of the questionnaire are not necessarily generalizable to the entire population of Virginia’s natural resource professionals. It is likely that our sampling procedure, and the subsequent response pattern, led to a significant level of avidity bias, meaning that respondents are likely more knowledgeable of, more experience with, or more interested in GAP than is the general

population of natural resource professionals. Most people that we contacted prior to the questionnaire agreed to participate in the study and expressed interest in the questionnaire (with less than five individuals refusing to participate). However, of the 69 volunteers, only 46 returned completed questionnaires. When non-respondents were later contacted to ascertain their interest in participating in a focus group workshop (See Phase II), only 2 agreed (and 1 then did not show up). It is likely that these nonrespondents (and hence the general population of natural resource professionals) are either less likely to use GAP data in their work, or are less knowledgeable about GAP data and its applications than are the respondents in this study. The level of this bias is impossible to calculate. Further, since the large majority (70%) of respondents to this questionnaire are either state or federal employees, these results best represent the characteristics of these subgroups. Overall, the results from this questionnaire best serve in identifying the range of potential responses and in providing a foundation upon which the focus groups and subsequent studies can be built.

III. FOCUS GROUP WORKSHOPS

The questionnaire discussed in the previous section provided us with a good baseline from which to begin holding focus group workshops. The focus groups allowed us to explore further the idea of opportunities and barriers to GAP data implementation among natural resource professionals in Virginia. These workshops resulted in a variety of ideas and suggestions for increasing the utility and utilization of this valuable data set.

Note: As with the questionnaire, the selection procedure for workshop participants was a voluntary, self-selecting procedure. Although the participants come from a variety of backgrounds, including state, federal, regional, and private (for-profit and non-profit) entities, the purpose of these workshops was to stimulate discussion and generate ideas – not to provide a statistically generalizable analysis. Because each meeting included a mix of participant backgrounds and objectives, the ideas and discussions generated were highly productive. However, the lists of ideas generated certainly are not exclusive nor exhaustive.

Opportunities for Implementation

Risk Assessment

Two of the most frequently stated potential uses for GAP data was in the performance of risk assessments and the process of risk mitigation planning. In fact, workshop participants identified quite a range of different types of risk analyses that GAP data could contribute to.

Participants at each meeting identified a potential application of GAP data for analyzing risks to biodiversity, and several approaches were proposed. All related to the idea of identifying priorities for land acquisition and easement planning. First, the possibility of assessing risk-of-loss by both habitat type (community types rather than individual species) and region of the state was mentioned, along with an examination of high priority species. More specifically, managers would like to be able to answer the questions, “Are there enough protected lands to meet the needs of at risk species, and if not, is there enough land out there (protected or unprotected) that these needs are able to be met in the future?” and “If so, where should we most concentrate our efforts at expanding the protected lands network?” Along with this analysis would be an examination of the quality of existing protected lands in order to maximize their contributions. This application of GAP is very close to the stated mission of the Gap Analysis Program.

Conservation corridor planning was another type of risk assessment and mitigation where managers were interested in GAP data’s utility. Gap data was seen as a possible tool for identifying corridors between protected lands and identifying opportunities and needs for additional protection. This includes the identification of target land acquisition and easement prospects and the delineation of potential mitigation sites to complete, improve, or expand existing corridors.

A third type of risk assessment, related to the first two, in which managers identified a possible use for GAP data is in aquatic systems management. Gap data could be helpful in providing land cover and stewardship information for areas surrounding at-risk aquatic communities. Information on these riparian buffers is necessary both to manage aquatic systems and to assess the relative habitat quality and level of risk among a group of aquatic systems. Also, being able to identify hydrological units with high pollutant loads (often partially dependent on surrounding land use and soil types) can further contribute to a risk analysis and help identify species and habitats exposed to particularly high risk.

Another class of risk assessment identified by managers where GAP data might be useful is in fire management. The Department of Forestry in particular (as well as the National Park Service, to a degree), has a great deal of data to help them assess and model the risk of fire in forested areas, but requires similar information in non-forested areas and on private lands. This type of information would help managers to identify both habitat types and human communities (such as woodland home communities and communities occurring at the urban/woodland interface) that require protection from wild-fires. Similarly, it can help managers identify habitat types that are dependent on or adapted to wild-fire for better management prescriptions.

Participants believed that case-by-case risk assessments, such as those performed in environmental reviews (e.g., Environmental Impact Assessments), could also benefit from the information provided by GAP by incorporating species richness and habitat factors into the review process in addition to endangered species occurrences.

Monitoring & Modeling

Monitoring existing resources and modeling processes is another area where opportunities for GAP data implementation were identified. The ability to monitor and predict habitat and land use changes as well as stewardship patterns over time was identified as a key need among managers and is critical to many of the risk assessment projects discussed above. This includes being able to calculate rates of change for various land cover types, especially as they relate to forest conservation, agricultural conversion, and urban sprawl.

In addition to this time-based monitoring and modeling, managers identified a need to monitor and predict habitat quality, carrying capacity, and species abundance using GAP data at a large scale. Some managers identified neo-tropical migrant songbirds as a species group where this approach is especially needed. Essentially, managers need to be able to model, predict, and manage at the population level. This often requires the addition of more site-specific data such as understory information to existing land cover data.

Planning and modeling of management prescriptions is another area where GAP data might potentially be useful. Managers would like to be able to model specific management actions and successional processes at the local or regional level in order see in advance how species distributions, abundances and richness would be affected. This

approach would be useful in many areas, including in the identification of areas that need fire to maintain diversity, areas that need protection from fire, and the costs and benefits to biodiversity of timber cutting for viewshed purposes.

A range of other interesting, potentially useful applications of GAP data were identified that perhaps had not been considered before. These include 1) predicting, modeling, and monitoring wildlife-related crop damage and wildlife-vehicle collisions to minimize negative wildlife-human interactions; 2) monitoring wildlife disease implications (e.g., Chronic Wasting Disease) by tracking occurrences, identifying potential “weak spots” in the landscape, and planning mitigation where protective measures are most needed; and 3) monitoring and predicting the effects of invasives such as the woolly adelgid, the gypsy moth, and other wildlife/plant diseases of concern to create mitigation plans. Finally, managers would like to be able to model habitat and species distribution/abundance to the point where dispersal patterns can be predicted (e.g., for elk) and appropriate management plans can be outlined.

Strategic Planning

With the concept of strategic planning for natural resource agencies being stressed at all levels of management, there is a real need for tools to assist managers and agencies in long term planning not only of specific management actions, but also of overall goals, missions, philosophies and approaches. Two general areas of potential GAP data implementation were identified related to this strategic planning concept.

First, in looking at overall agency missions, some managers expressed an interest in using GAP data products to justify adding biodiversity conservation as a primary objective of management actions to already listed objectives such as recreational planning, endangered species management, cultural preservation, military training, etc.

Second, defining priority species and habitats is a challenging task, and one with many potential results, depending on the mission of the agency. Managers expressed an interest in using GAP data products and processes to assist them in identifying and developing plans for Species of Concern (a major component of the currently required State Comprehensive Wildlife Conservation Plans). A major reason to incorporate GAP data into this process is to facilitate the integration of both pro-active and re-active approaches to biodiversity conservation and focus not only on threatened or endangered species, but also species that may be declining, have a limited distribution, or be at risk due to habitat loss.

Socioeconomics and Outreach

Finally, the use of GAP data in outreach and education efforts and combining it with socioeconomic information was identified as an area where assistance is needed. Overall, GAP data can assist agencies in communicating stewardship information and biodiversity needs to the public and the legislature to further the conservation mission. Two benefits of this approach were identified. First, GAP can provide managers with solid scientific support and eye-catching visual aides to use in promoting and defending land acquisition

and management efforts to the public and to the legislature. By utilizing a combination of GAP (biodiversity) and other (community profiles, socio-demographics, etc.) information, these projects can be tackled from many different directions, and necessary projects can have a better chance of being approved. Second, this information can communicate conservation actions and success stories to the public in order to improve the image of the agency and garner additional public support.

Another interesting, perhaps not previously considered, potential use for GAP data is in recreational planning and modeling. Managers would like to be able to model the type of recreational experiences available based on landscape and sociological factors and use this information in management plans and outreach programs. In order to obtain public support for many programs carried out by natural resources managers, managers need to also be able to manage the “public experience” to help the public get the most out of their time.

Barriers to Implementation

Several barriers were identified that make it difficult for managers to incorporate GAP data in current projects. These barriers are classified in the headings listed below: lack of information, data quality issues, data flexibility issues, limited predictive ability, and additional data needed.

Lack of Information

Perhaps the most serious barrier to the widespread implementation of GAP data in conservation projects is a lack of information about what is available, how to obtain it, how to use it, how it can be applied, and what the limitations of the data are. In general, managers need more information about what coverages are available and how they can be obtained. It was suggested that the metadata for the GAP products be made available on the Virginia Geographic Information Network’s website, since many of Virginia’s natural resource professionals who work with GIS rely on this database for information cataloging and the metadata can help them determine if GAP data fits their needs.

A second suggestion was that state-level GAP data be presented in a user-friendly, interactive way on the web, so that in-house GIS is not a prerequisite in order to benefit from the data (for agencies with limited technical resources). This system should allow the user to perform web-based queries on the GAP data and download just the maps or pieces of data that they need to work with their own data. Of course, many users would like to simply download the GIS layers and perform analyses on their own systems, and this option should be available on this website as well.

Third, managers have a need for credible, real examples of projects successfully using GAP information. This not only would help them to realize how they could use it in their own applications, it would also provide grounds for obtaining the financial and technical support that agencies need to take full advantage of this data. These projects should be published on the web, through local presentations at state meetings, and in public forums such as newspapers. Ideally, these model projects would focus on issues that an

executive/legislative government branch would consider important (e.g., hot topics such as brush fire modeling and mitigation, crop damage, etc.).

Data Quality

Two of the most critical data quality issues that managers brought up in reference to the GAP data are the lack of data timeliness, and the small scale of the data (large minimum mapping unit). Managers realized that the current GAP land cover maps are based on imagery from the early 1990s – which makes the information 10 years old. They need more up-to-date data in order to plan their management and produce strategic goals. Further, by updating the land cover maps, managers will have the ability to compare a time series of data to perform change analyses and predictions and better target their conservation energies. It was therefore suggested that GAP outline and publicize a schedule of updates, perhaps at a 10-year interval.

Most natural resource managers do not operate at a state level. Most operate at a regional, county, or local level. Therefore, it is important that they have data that is both useful and accurate at these finer scales. It was suggested by workshop participants that GAP look into providing its data (especially the land cover data) at a scale that allows the manager to capture fragmentation of habitat patches and to analyze the quality of the resultant habitat patches. This would require larger scale mapping using new/higher resolution photography in order to achieve a smaller minimum mapping unit. This aspect of data quality is also important when users try to incorporate GAP data into existing models already in use.

Data Flexibility

The development of standardized protocols both among the state and regional GAP programs and between federal and state data producing agencies was identified as an essential step in ensuring the applicability of GAP data in existing programs. GAP data needs to be compatible with, or easily overlaid with non-GAP data such as tax maps and aerial photos. Inter-state standardization is needed for GAP data compatibility and cooperation across states. A related reason why standardized protocols are required is so that habitat and species inventory data from different agencies can be combined to improve land cover detail and species distribution models and to prevent “re-invention of the wheel” during inter-agency efforts.

Other aspects of data flexibility identified during the workshops include flexibility in the data presentation. First, managers are interested in being able to identify and delineate “Critical Habitat Areas” without extensive programming or research. Ideally, the GAP program would design a protocol that defines these areas under GAP objectives, and provide these results as standard product of GAP. Second, managers need to be able to map different aspects of biodiversity by querying specific fields, such as all threatened or endangered species or all grassland species. This could easily be integrated into existing GAP products and would provide a useful tool for managers dealing with specific species guilds or communities.

Finally, managers need more flexibility in the GAP process itself. Two areas where this was specifically discussed are in the definition of the stewardship statuses and in the overall objective of GAP to “keep common species common.” First, the definitions of stewardship types (GAP Status 1-4) need to be re-examined, made more flexible (perhaps so that users can classify parcels themselves amongst a range of pre-defined protection levels), and made more appropriate for the state/region in question (eastern and western U.S. lands are managed very differently). Second, natural resource management agencies have a wide range of missions and objectives ranging from recreational planning, to threatened and endangered species management, to human safety and environmental health. In order for GAP data to be widely used, its data must be compatible with a variety of objectives. Specifically, information needs to be provided without bias and with the ability to adapt to the agencies own goals. One way to accomplish this without compromising the original mission of GAP is to provide intermediary data sets (i.e., before Gap Status codes are imposed) in addition to the final products.

Limited Predictive Ability

The limited predictive ability of the GAP data was identified with reference to the species habitat models, which rely on the land cover models. While presence/absence and species richness information is certainly helpful, managers really need to be able to look at habitat **quality** and population **size** in order to accurately determine relative risk and plan appropriate management. Such factors as patch size, connectivity, proximity, distribution, and productivity can be very helpful in achieving these goals. Ideally, these species models would incorporate more quantitative factors into explicit, separate, HSI-like models that are scale and data independent so that they can be applied directly to or easily adapted for other in-house data sets. It was suggested by several managers that expert review be incorporated into these species models, and that the species models be created **first** in the gap analysis process so that land cover maps can be designed to suit them, rather than vice versa. In short, managers see the need to “develop a modeling capability rather than a model, per se.”

Additional Data Needed

There are also data that managers wish they had, and this “wish list” never seems to shrink despite the ever-lengthening list of data that is available. However, workshop participants did identify several specific additional data types that they wish GAP could provide to them in addition to the standard data sets. These include maps of land use (e.g., lot size/density, permeability, residential/commercial/industrial), in addition to land cover and air/water quality information (e.g., acid rain deposition) to predict impacts on habitats and further facilitate risk assessments.

VI. IMPLICATIONS & RECOMMENDATIONS

Clearly, there is a host of potential applications for GAP and GAP-like data in the current and future projects of many natural resource professionals. However, there are also obvious barriers that prevent GAP data from being used to its fullest potential. We reached a wide range of professionals in this study, from single species managers to game and watchable wildlife managers, from wildlife specialists to water quality specialists, and from private land easement coordinators to National Park managers. There really is something for everyone in GAP, and if some of the issues identified in this report are addressed, the implementation of GAP will certainly become much more widespread.

Opportunities for Implementation

Through the mailed questionnaires and the focus group workshops, a wide variety of potential applications for GAP data were identified including a host of risk assessment projects, natural process monitoring and modeling, management scenario modeling, conservation corridor planning, strategic planning and the identification of priority habitats/species, education and outreach programs for the public and legislative bodies, and even projects involving socioeconomic analyses.

Many of the projects identified here currently are impossible to do because either the necessary data is not available (or managers are not aware of it being available) or because the financial and technical support is not available. GAP products can go a long way in addressing both these needs by providing the data to perform the projects and providing the documentation and visual aides to obtain the support.

Barriers to Implementation

The final products of the Virginia gap analysis project have only been available for a few months, which is likely a major reason why they have not yet been implemented to their fullest potential. However, the Gap Analysis Program and the process of gap analysis has been around since at least the late 1980s, and the lack of general knowledge about its objectives and outcomes among natural resource professionals signifies a critical communication breakdown.

Several key needs were identified during this project. They are summarized here as Information Needs and Data Needs.

Information is perhaps the most critical need. Communication between GAP and the end users is critical to illustrate the range of applications, ensure adequate training, and to guarantee that users are able to get to the data when they need it. If managers do not have adequate information, they will not be able to use the data no matter how good it is. Not only is metadata and awareness of the data layers important, but an understanding of how and why the data was created and how it can be used also is a prerequisite to making full use of the GAP products. More resources should be allocated to packaging this information and getting it out in print or on the web or on conference agendas where these natural resource professionals are likely to encounter it regularly. In-person

workshops and training sessions would also be helpful, as long as the cost is not prohibitive to financially strapped agencies.

In terms of data needs, important obstacles to GAP implementation are timeliness, flexibility, and predictive ability. Timeliness of the data is a precursor to its applicability – and regular updates to the data will allow users to look at trends in addition to current information. Trends analyses are often key in conservation risk assessments – a primary objective of the GAP program. In short, GAP needs to schedule and carry out updates. Data flexibility is important to allow users to incorporate GAP data into existing in-house data sets and in-progress projects. Also, the ability to incorporate GAP data into a variety of agency missions requires the provision of data sets without the application of an overriding set of objectives together with the capability to perform multiple types of queries. This is only way that full GAP implementation will be possible across the range of natural resource agencies. Finally, predictive ability is a major need among natural resource professionals, and one that so far has not been met at a large scale for multiple species by any other data sets. Improved species/habitat models can provide potential users with a unique dataset that has never before been available. The potential applications for this type of information have only begun to be explored, but are undoubtedly significant.

Recommendations

1. Develop and publicize sample applications. Create reports, web-sites, slideshows, and prototypes from real-life projects that have tackled pressing conservation needs by applying GAP data. Get this information in the hands of potential users as well as legislative bodies whose support is required to obtain funding and staffing.
2. Increase general awareness about GAP among natural resource professionals through peer reviewed journal articles, conference presentations, web-site development, and direct mailing (or emailing).
3. Provide access to GAP data from a central web server, with user-friendly online querying and downloading capabilities. Users should have the option of using online or in-house GIS tools. As a companion to this web site, online technical support can ensure proper usage of GAP data and assist managers in taking full advantage of the resources available.
4. Provide affordable training in the fundamentals of mapping, thematic classification, data quality issues, and GIS applications as they relate to the GAP process and products.
5. Develop improved flexibility in GAP products. Managers need to use GAP data to meet a variety of missions, at a variety of scales, and together with a variety of other data sources. Keep this in mind when preparing and packaging GAP products.

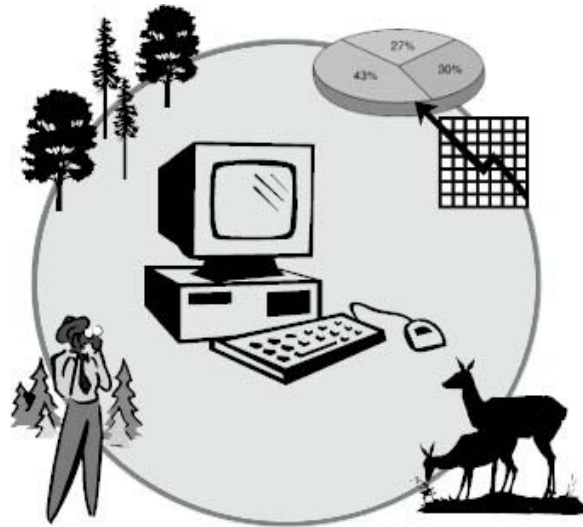
6. Maintain GAP as a dynamic data producer. Ensure that regular updates are available for GAP products, and that new technological and procedural tools are integrated into these updates. Strive to continually improve and build upon GAP products to further develop predictive ability and flexibility.

In conclusion, it is important to recognize that gap analysis is a process, not a project. It really will never be finished. First, natural resources information is inherently dynamic, and up-to-date, cutting edge information is critical to carrying out conservation objectives effectively. Further, working relationships between the GAP program and target end users must be established and actively maintained, as needs change frequently, funding levels fluctuate, and staff recruitment and turnover occurs frequently. GAP does not end with the production of a final report and CD – it is really just beginning.

APPENDIX A:
QUESTIONNAIRE

Patterns of Data Use and Data Needs among Virginia's Natural Resource Professionals

With an emphasis on gap analysis data



Questionnaire prepared and conducted by:
The Conservation Management Institute
at Virginia Tech's College of Natural Resources

In cooperation with:
The U.S. Geological Survey
Biological Resources Division, Gap Analysis Program

Before asking specific questions about the Gap Analysis Program or gap analysis, we would like to know about your general data and information use patterns.

There are many types and sources of data available for use by natural resource professionals, including data created by and/or distributed by government agencies, non-governmental organizations, private businesses, and academic institutions. These datasets can be the result of specific single-site projects or large-scale data collection efforts. Usually, users obtain these data from outside sources via order forms, Internet downloading, special requests, etc.

In this survey, we call this type of data "external" to distinguish them from "internal" data sources, which would be ones that you or others in your agency have created. Natural resource professionals may use such external data as road maps, topographical maps, land use maps, and aerial photos. These can be either hardcopy or in digital format.

1. How important would you say are external data sources and information such as those described above in your ability to complete projects in your work?

Very Important
 Somewhat Important
 Little Importance
 Not Needed

2. Please list the sources of external data that you use or have used. (Be as specific as possible)

3. Of course, external data sources vary greatly in the quality of data that they provide. In general, from all the external data sources that you use, *how satisfied have you been with the quality of these data?*

Very Satisfied
 Somewhat Satisfied
 Neither Satisfied nor Dissatisfied
 Somewhat Dissatisfied
 Very Dissatisfied

4. *How often* have you tried to obtain external natural resource data for a particular purpose and been *frustrated or disappointed* when you could not find a suitable dataset?

Almost all the time
 At least half the time
 Less than half the time
 Almost never
 Never (I am always satisfied)

5. Can you please explain the types of issues that have caused you to be dissatisfied or frustrated with these data?

6) How important are each of the below factors to you in determining the quality of external data?

	Most important	Very important	Somewhat important	Of little importance	Not a factor at all
Scale of the data (i.e., How large or small of an area the data covers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resolution of the data (i.e., The size of the minimum mapping unit)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Timeliness of the data (i.e., How up-to-date it is)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The methodology used to create the data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Producer of the data (i.e., The reputation of the producer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of accompanying metadata	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7) Are there any factors not listed above that contribute to your perception of data quality for these external data sources? No Yes (please specify below)

8) At what geographic scale do you generally work? (Check all that apply)

- Individual Parcel (sub-county or size equivalent)
- County (or size equivalent)
- Regional (multi-county or size equivalent)
- Statewide
- Other: _____

9) Do you use Geographic Information Systems (GIS) in your work? Yes No
If "No", Skip to #10

What GIS platforms do you have access to? (Check all that apply)

- ESRI ArcInfo
- ESRI ArcView
- Other ESRI Product
- GRASS
- Idrisi
- Other: _____

10) What operating system do you most commonly use?

- Mac O/S
- Unix
- Windows 3.x
- Windows 98
- Windows NT/2000
- Other: _____

11) What type of computer platform do you most often work with? (Please fill in the blanks)

Check here if you don't know your computer's specifications

Processor Speed (e.g., 400MHz)

RAM Amount (e.g., 156 MB)

Hard Drive Capacity (e.g., 20 GB)

Monitor Size (e.g., 19 inches)

12) Do you have Internet access from this computer?

- Yes No
If "No" Skip to #13

What type of Internet connection do you have?

- Modem
- Cable
- T1 Line
- Ethernet
- DSL
- T3 Line
- Other: _____

13) In what year was this computer purchased? _____



Now that we have an idea of your general data needs and use patterns, we'd like to learn a little more about your familiarity with one particular data source - the Gap Analysis Program (GAP).



14) Before receiving this questionnaire, had you ever heard of gap analysis or the Gap Analysis Program? Yes No
If "No", Skip to Page 10

15) How did you first learn about the Gap Analysis Program? (Check one and specify as appropriate)

- Professional journal (specify journal) _____
- Presentation at professional meeting/conference (specify conference) _____
- Professional e-mail mailing list (specify list) _____
- Co-worker/Colleague (check if applicable) _____
- Other: _____

16) Based on what you've heard or read about gap analysis, would you say the primary objective of the Gap Analysis Program is to : (Check one)

- Don't Know
- Create land cover maps of each state
- Identify and study "gaps" in habitats
- Identiy "gaps" in the protection of biodiversity
- Identify land stewards
- Other: _____

17) What is the status of the gap analysis project in Virginia? (Check one)

- It has not yet been started
- It has been started, but not yet completed
- It has been completed
- Don't Know

18) Did you know that the products of completed GAP projects are available to the public for free online? Yes No

Given that you are at least minimally familiar with the Gap Analysis Program, the following questions explore your use of GAP data products in your work.

19) Have you ever used a GAP product in one of your projects? Yes Uncertain No
If "Uncertain" or "No" Skip to #26 on Page 9

20) At what scale have these projects been conducted? (Check all that apply)

Individual Parcel (sub-county or size equivalent)
 County (or size equivalent)
 Regional (multi-county or size equivalent)
 Statewide
 Other: _____

21) How helpful have the following aspects of the gap analysis data and process have been to you in completing your projects?

	Very helpful	Somewhat helpful	Not very helpful	Not at all helpful	Never tried to use
Land cover maps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stewardship maps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Species distribution maps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gap analysis approach/methodology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Final GAP reports (written portion)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22) What other types of data have you used in these projects? (Please specify in each category)

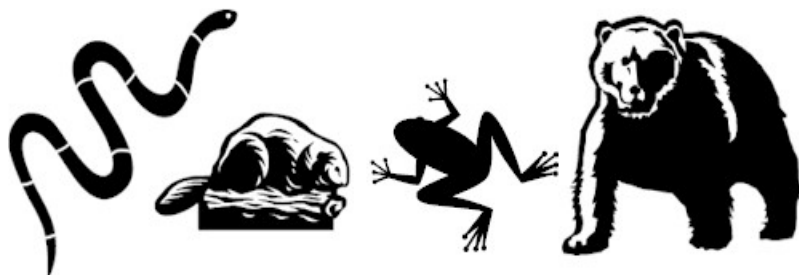
- Other external land cover/use maps _____
- Other external stewardship/cadastral) maps _____
- Other external species maps _____
- External infrastructure maps (e.g., roads, utilities) _____
- External hydrographical maps (e.g., streams, rivers) _____
- External topographical maps (e.g., elevation) _____
- Internal data generated from field data _____



23) How important were each of the following factors in your decision to use GAP data products in your projects?

	Most important	Very important	Somewhat important	Of little importance	Not a factor at all
It was easy to obtain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It was free	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It was more accurate than other available data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It was more appropriate for my needs than other available data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It was the only data of its kind that I could find	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My employer requested that I use it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24) What other factors went into your decision to use GAP data products in your projects?



25) Can you briefly describe the types of projects in which you have used GAP products? (check the boxes that describe the types of projects you do, and then provide a brief description of the work you perform in each category)

Environmental Impact Studies...

Endangered Species Planning...

Economic Studies or Services...

Landscape or Land Use Planning...

Infrastructural Planning...

Cultural or Historical Studies...

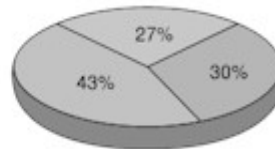
Other (projects that don't fit into one of the categories above)...

The Gap Analysis Project was undertaken in order to fill a perceived void in the information available to natural resource professionals. A major objective of this questionnaire is to see if the GAP data is being used as much as anticipated. Questions 26 and 27 explore the reasons that you may have for not using GAP data more than you do.

26) How important are each of the following factors in preventing you from using GAP data or using it to a higher degree?

	Most important	Very important	Somewhat important	Of little importance	Not a factor at all
I don't know how to obtain it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't know how it can be used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't have the computer equipment or software needed to use it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't have the computer training that I would need	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It doesn't have the I need	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The data is not up-to-date enough	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The scale or resolution is not appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I'm required to use another data set by my employer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27) If there are any other factors that prevent you from using GAP data or using it to a higher degree, please list them here.



*Below is a brief description of the Gap Analysis Program (GAP), the gap analysis process, and the types of data that are produced. **Please read this section before proceeding to the next group of questions.***

The mission of the Gap Analysis Program is to provide broad geographic information on biological diversity to help natural resource professionals make informed decisions. GAP data and analytical tools are designed for use in a multitude of applications: including basic scientific research, land management, conservation planning, and business/industrial development.

The primary objective of gap analysis as a scientific method is to identify "gaps" in the present day network of conservation lands. These "gaps" are animal species and plant communities that occupy areas currently receiving little or no protection. This technique helps reveal conservation problems in the making, before they become acute, and helps land stewards take a systematic and proactive approach to biodiversity management.

Although technically challenging, the basic idea of GAP is simple. For a given area such as a state, researchers create a series of databases and corresponding digital maps. These are the "products" of GAP, and include:

1) **Vegetation maps:** These are made using high resolution satellite imagery, along with data from aerial photographs and on-the-ground measurements. Plant communities are classified according to a national set of standards.

2) **Predicted distributions of vertebrate species:** These are distribution maps for all known mammals, birds, reptiles, and amphibians that are native to the region of concern. Computer modeling techniques are used to produce these maps identifying specific areas where each species is likely to occur, based on its habitat preferences and the data provided by the vegetation layer. These **habitat models** are another valuable product of gap analysis.

3) **GAP management status:** This data set is a synthesis of information about **land ownership, stewardship philosophy, and management policy**. GAP status for a given tract of land can range from 1 (mandated biodiversity management) to 4 (no management mandate).

With these maps, natural resource professionals can analyze patterns of biodiversity and land use and quickly identify those species and habitat that may need further protection.

GAP products and data are available on CD-ROM and on the Internet at the national GAP web site (www.gapanalysis.gov), individual state project sites, or through the NBII (www.nbii.gov).

28) Are there other projects that you are currently working on where GAP products *in their current state* might be useful? Yes Uncertain No
If "Yes" please describe below

29) Are there other projects that you are currently working on where GAP products *in a revised state* might be useful? Yes Uncertain No
If "Yes" please describe below

30) How likely would each of the following factors or possible data revisions be in encouraging you to use GAP data more often in your current work?

	<input type="checkbox"/> Very Likely	<input type="checkbox"/> Somewhat Likely	<input type="checkbox"/> Not at all Likely	<input type="checkbox"/> Don't Know
If I had more information about what GAP is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I had more information about how to use GAP data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the data were easier to obtain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I had better computer equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I had more computer training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the data were provided in a different format	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the data were provided at a different scale or resolution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If more or different data products were available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If my employer were more supportive of using this data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31) Can you please give specific examples of the types of changes that would make GAP data more suitable for use by you or or organization?

Finally, data needs and data use patterns will inevitable vary widely from organization to organization, and from person to person. This last set of questions will gather general information about you and your organization so that we can better characterize your data needs.

32) What type of agency do you work for? (Check one)

- | | |
|--|--|
| <input type="checkbox"/> Federal government | <input type="checkbox"/> Private consulting |
| <input type="checkbox"/> State government | <input type="checkbox"/> Environmental organization (non-governmental) |
| <input type="checkbox"/> County government | <input type="checkbox"/> Academic |
| <input type="checkbox"/> Regional government | |
| <input type="checkbox"/> Other: _____ | |

33) In describing the "mission" of your agency and the goal of your position, how important would you say each of the following factors are? (Circle a rating for each)

	Not important at all				It's a top priority
	1	2	3	4	5
Research	1	2	3	4	5
Education	1	2	3	4	5
Regulatory Compliance	1	2	3	4	5
Environmental Impact Assessment	1	2	3	4	5
Environmental Impact Mitigation	1	2	3	4	5
Cultural/Historical Preservation	1	2	3	4	5
Economic Development	1	2	3	4	5
Landscape Planning	1	2	3	4	5
Client Services	1	2	3	4	5
Human/Public Services	1	2	3	4	5
"People Management"	1	2	3	4	5
Public Involvement	1	2	3	4	5
Other _____	1	2	3	4	5

34) From which data source are you and your coworkers MOST likely to obtain information about the Gap Analysis Program and the data it produces? (Check one)

- | | |
|--|---|
| <input type="checkbox"/> Professional journal | <input type="checkbox"/> Professional e-mail mailing list |
| <input type="checkbox"/> Presentation at professional meeting/conference | <input type="checkbox"/> Direct Mail |
| <input type="checkbox"/> Other: _____ | <input type="checkbox"/> Internet |

35) What type of position do you hold within your organization? (Check one)

- Management Technical Administrative

36) How long have you worked in your current field (including other positions you've held) _____

37) What is the highest level of formal education you've attained? (Check one)

- Less than high school (Skip to #39)
 High school (Skip to #39)
 Some college
 Technical (2-year) degree
 Bachelor's degree
 Master's degree
 Doctoral degree

38) If you attended college, in what field was you major?

- Biology/Ecology
 Geography
 Environmental Science
 Computer Science
 Other: _____

39) We plan on following up this survey with a series of regional 1/2 day workshops to get a better idea of the data needs that people like yourself have. Is it OK if we contact you with additional information about the meeting we hold in your area to see if you'd be willing to participate?

- Yes, I'd like to know more** **No, I don't think I'd be interested**

Thank You!!! We appreciate the time you've taken to complete this questionnaire. Please use the space below and on the back on this booklet to provide any addition comments or ideas you have about your data needs or use patterns that you think may be helpful to us.

If you have any questions or comments, feel free to write or call. Thank you again your participation.

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Virginia Tech
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APPENDIX B:
FREQUENCY DISTRIBUTIONS FOR ALL
CLOSED-ENDED ITEMS

F r e q u e n c y D i s t r i b u t i o n s f o r A l l C l o s e d - e n d e d I t e m s

Q1: How important are external data sources in your ability to complete projects in your work?

Importance of external data			
	Counts	Percents	Percents
			0 100
Very Important	33	71.7%	<div style="width: 71.7%; background-color: black;"></div>
Somewhat Important	10	21.7%	<div style="width: 21.7%; background-color: black;"></div>
Of Little Importance	3	6.5%	<div style="width: 6.5%; background-color: black;"></div>
Not Needed	0	0.0%	
Totals	46	100.0%	
Mean	1.35		

Q2: PLease list the sources of external data that you use or have used. (Be as specific as possible)

2. Please list the sources of external data that you use or have used. (Be as specific as possible.)

- DOQQs; NWI (Va is a poor data set); NRCS photos among others.
- County parcel layers, road maps, aeriels, topography, soils, watersheds, rivers/streams.
- NWI data, digital orthophotography, soils data, USGS DEM
- USGS, LULC, NCRC, SSURGO, EPA, BASINS, FWS, NWI,
- USGS topo quads, VDOT roads, UVA landuse data, 303(d) TMDL abvers, DCR conserved lands, Va. Outdoors Foundation Conservation Easements, County parcel data
- USGS digital live graphs, rasters, images, DEMs, VDOT planimetrics, US census, Tiger data
- USGS and Land use, NCCO, NED, DOQQ, DEM, Landsat TM Imagery, NRCS - soils, VDOT - roads, NHD - hydrology
- VDOT - Roads, Census, CACI Business, SCC, USGS, Misc. State Agencies.
- Maps, photos, County ortho-photo quads
- USGS - Topo GIS, VA DCR - National Heritage mapping and text web accessed aerial photography (free)
- USGS, NED, VDOT Roads, Tiger Roads and Railroads, USGS NAT. Hydrography Dataset, DOQQs, PRGs of USGS, 1:24 k Quads, County parcel data.
- VDOT data, EPA, USGS, U.S. Census, Albemarle County and various other "County" data.
- Breeding bird surveys, Christmas bird count, GIS data layers (roads, aerial photos, watersheds, etc.), museum records, research data (Jenkins Fish of Va.)
- USGS 7.5 minute DRG's
- O.D.U., Virginia Tech, etc. Research References, Virginia Beach City Library, Internet Search Engine, USGS Topo. Maps, Aerial Photos, GIS, Gap Analysis (NCT VA), USDA - SCS, Other Professionals in State and Federal Agencies.
- Hydrology, Hypsography, Orthophotography
- USGS DLG - hydrography, roads, place names, Tiger - hydrography, census, NOAA - ccays, lu/lc, NWI, EMAP - lu/lc; NRCS - soils
- I have >75 external data sources
- USGS, VA GAP, VDOT, Shell Oil, USFS
- USGS, DRG's, DOQ's, MRLC, DLG's, EPA, Landuse, Landcourse
- Road maps, topo maps, aerial photos
- USFWS, UPIASV, VCU, USGS, PEQ, Chesapeake Bay Program, EPA, USDA, Contractors
- NWI maps (USGS website); DRG's from Radford Univ. Geography Dept. website, Geocommunity website.

- GAP Analysis, National Landcover Data, SSURGO Soils, 10 m Spot Imagery, Consultant Data Sets, Tiger Data.
- Topo maps, orthophotography, statsgo data, roads, misc. planimetric data.
- None at the present time.
- Air photos, NRCS Soils Maps, USGS cartographic data, water quality data (EMAD, STORET), museum data, TNC heritage data, breeding bird data.
- Products (veg maps) provided by the contracting agency to do a job.
- VDOT roads, EPA RF2, RF3, County boundaries, USGS and NRCS, hydrologic units, USGS place names, USGS topo quads and DRG's, DOQQ's, DEM, NHD, NWI, Historic resources (from DMR), soils - etc.
- USGS, DRGS, DOQQS, TNC land classification, agency boundaries, Census, Tiger
- Nature Net, www.fws.gov, www.abl.org
- USGS, USFS, DEQ, VA Dept. of Mines and Minerals.
- USGS -Digital Elevation Models, USDA - Soils, USGS - wetlands.
- Forestry Statistics, VDF, AG Statistics, USDA, Va Pop. Demographic Statistics.
- State Heritage Program Data, Specific Research Studies/Publications from VIMS/VA Tech
- DOQQ's (orthos), DRG topo quad data, czdastal data from localities, ICAs road centerlines, USDA - NRCS SSURGO soils data, etc. etc.
- TIGER (Census) Data, DOQQ, DRG, DEM
- 1. Land use composition (e.g. % forests) by county.2. Land ownership (e.g. % public) by county.3. Landset to categorize habitat types4. Weather dmt
- GAP, DRG, DOQQ, Requested shapefiles and associated data bases
- Federal Govt., Census uses, Misc. State Agencies (VEDP, DCR, DIT), Private (GDT, CACI, ESCI)
- topographical maps, county tax maps, aerial maps
- Statewide DRG's of USGS 1:24000 quads. VDOT Network Level Basemap
- 94,200 spot imagery, TM imagery, 94-96 USGS DOQQS, USGS LULC, MRLC/NLCD, USGS NHD, DCR Hydrol Units, VDOT Roads, STATSGO/SSURGO, 1990 Census, 2000 Census, NWI




Q3: From all the external data sources that you use, how satisfied have you been with the quality of these data?

General satisfaction with external data				
	Counts	Percents	Percents	
			0	100
Very Satisfied	6	14.3%		
Somewhat Satisfied	27	64.3%		
Neither Satisfied nor Dissatisfied	5	11.9%		
Somewhat Dissatisfied	3	7.1%		
Very Dissatisfied	1	2.4%		
Totals	42	100.0%		
Mean	2.19			

Q4: How often have you tried to obtain external natural resource data for a particular purpose and been frustrated of disappointed when you couldnot find a suitable dataset?

Frequency of dissapointment with external data				
	Counts	Percents	Percents	
			0	100
Almost all the time	2	4.7%		
At least half the time	14	32.6%		

[Continuing table]

Frequency of dissatisfaction with external data				
	Counts	Percents	Percents	
			0	100
Less than half the time	20	46.5%		
Almost never	6	14.0%		
Never (I am always satisfied)	1	2.3%		
Totals	43	100.0%		
Mean	2.77			

Q5: Can you please explain the types of issues that have caused you to be dissatisfied or frustrated with these data?

5. Can you please explain the types of issues that have caused you to be dissatisfied or frustrated with these data?

- Va NWI data were the very earliest and now only a small portion is in current, digitized format.
- Slow data transfer, websites down, poor spatial resolution.
- Resolution and scale of data is not suitable
- Not enough people/localities/agencies are investing adequate energy into data creation, phasing out outdated systems, and/or maintenance.
- Positional accuracy and course resolution of geometry, missing/gaps in data extents
- Incomplete coverage (e.g. soils). Resolution not as high as desired: e.g. NHD, NED
- Ability to obtain, who to contact, at what cost
- Free sources out-dated beyond use. Websites temporarily down or moved. Our particular need not available.
- Not dissatisfied - have inhouse coverage
- Difficulty in locating data. Data in uncommon formats - Data conversion (such as USGS NHD Data).
- Simply not being able to find data, not finding data that is compatible with existing data.
- Datasets are often not geographically referenced or are too general. Data on populations often not specific enough. Water chemistry data often not available for enough areas.
- GIS maps of reguges features, Historical distributions of submerged aquatic vegetation of Back Bay.
- Scales are too large. No datasets for my area.
- Data availability. Data "mining" - tracking down data among agencies which do not document their data holdings well
- Registration problems, lack of detail in ecological, lack of metadata, current
- Unavailable for certain areas of the South, or out of date.
- Maps are too far out of data.
- Do you want to know if we were "frustrated or dissatisfied", or whether or not we could find suitable data?
- Scale too gross or fine, data are in obscure/ uncommon projections, little or no accompanying metadata.
- The need for low resolution land use data, and aerial photography.
- poor data integrity, lack of usable attribute information.
- No data obtained from outside sources.
- Lack of data standardization, poor/no metadata, incomplete data sets.
- Incomplete data (e.g. only part of state complete); problems with coverage (e.g. connectivity in RF3), lack of attribution (RF3); out of date; not available (geology); accuracy problems, resolution not fine enough.
- Date no available, or not at proper scale.
- We rarely use natural resource data.
- The Va. Forestry data has not been updated since 1992 (10 yrs).
- Data unavailable or incomplete or most likely in hard copy or out-of-date
- Ignorance of sources of external data.
- 1. Format of the data2. Ease of use3. Interpretation of data - concerns
- Resolution of DOQQ's, poor data bases associated with shape files, lack of fine scale habitat breakdowns.
- Data too generalized (small scale), poor attribution
- Tax maps are not always drawn to surveyed borders.

- Not being able to find needed data, not having the right info to reproject data, clipped .tif images not being seamless
- Lack of completeness (Statewide), lack of timely update, sometimes resolution/scale too coarse



Q6: How important to you are each of the following factors in determining the quality of external data?

How important are each of the below factors to you in determining this level of quality?	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	Totals	Replies	Mean
Geographic extent of the data (i.e., How large or small of an area the data covers)	9.0	25.0	11.0	0.0	0.0	45.0	45.0	2.04
Detail of the data (i.e., The size of the minimum mapping unit)	13.0	26.0	6.0	0.0	0.0	45.0	45.0	1.84
Timeliness of the data (i.e., How up-to-date it is)	5.0	34.0	5.0	1.0	0.0	45.0	45.0	2.04
The methodology used to create the data	4.0	22.0	15.0	3.0	1.0	45.0	45.0	2.44
Producer of the data (i.e., The reputation of the producer)	1.0	15.0	25.0	3.0	1.0	45.0	45.0	2.73
The availability of accompanying metadata	6.0	22.0	14.0	2.0	0.0	44.0	44.0	2.27

[Continuing table]

How important are each of the below factors to you in determining this level of quality?	Mean	
	1	5
Geographic extent of the data (i.e., How large or small of an area the data covers)		
Detail of the data (i.e., The size of the minimum mapping unit)		
Timeliness of the data (i.e., How up-to-date it is)		
The methodology used to create the data		
Producer of the data (i.e., The reputation of the producer)		
The availability of accompanying metadata		













Q7: Are there any factors not listed above that contribute to your perception of data quality for these external data sources?

Other factors in data quality?			
	Counts	Percents	Percents
			0 100
No	23	74.2%	
Yes (please specify below)	8	25.8%	
Totals	31	100.0%	
Mean	--		

Other quality determinants

- GAP data are great for timber/forest detail but often virtually ignore non-woody covers
- Lack of accuracy assessment - e.g. GAP, NLCD. Classification categories - GAP, NCCD.
- Quality and extent of metadata records
- Being sole to register with existing layers.
- 1
- Accuracy/Precision, Level of attribution
- Cost of Data
- Amount of time taken to gather that particular data.
- Lack of metadata
- Cost

Q8: At what geographic extent do you generally work? (Check all that apply)

Scale of work - General			
	Counts	Percents	Percents
			0 100
County (or size equivalent)	29	63.0%	
Regional (multi-county or size equivalent)	27	58.7%	
Individual Parcel	24	52.2%	
Statewide	19	41.3%	
Town/City (sub-county or size equivalent)	18	39.1%	
Multi-state	6	13.0%	
watershed	2	4.3%	
All of the above	1	2.2%	
Army installations	1	2.2%	
Ecosystem and Watershed	1	2.2%	
Federal Refuge Only	1	2.2%	
Nat'l Forest	1	2.2%	

[Continuing table]

Scale of work - General			
	Counts	Percents	Percents
			0 100
Watershed or less	1	2.2%	
Other	0	0.0%	
Totals	46	n/a	
Mean	--		

Q9: Do you use Geographic Information Systems (GIS) in your work?

9) Do you use Geographic Information Systems (GIS) in your work?			
	Counts	Percents	Percents
			0 100
Yes	42	93.3%	
No	3	6.7%	
Totals	45	100.0%	
Mean	1.93		

Q10: What GIS software do you have access to? (Check all that apply)

GIS platforms			
	Counts	Percents	Percents
			0 100
ESRI ArcView	41	97.6%	
ESRI ArcInfo	28	66.7%	
Other ESRI Product	18	42.9%	
ERDAS Imagine	3	7.1%	
Arc GIS	2	4.8%	
All GIS map info, Auto Cad map, Auto Desk World	1	2.4%	
ArcGIS	1	2.4%	
Auto CAD	1	2.4%	
AutoBound	1	2.4%	
ERDAS	1	2.4%	
ERDAS Imagine, PC-GPS	1	2.4%	
MapInfo	1	2.4%	
VirGIS	1	2.4%	
GRASS	0	0.0%	

[Continuing table]

GIS platforms			
	Counts	Percents	Percents
			0 100
Idrisi	0	0.0%	
Other	0	0.0%	
Totals	42	n/a	
Mean	--		

Q11: What data format do you prefer to work with? (Check all that apply)

11) What data format do you prefer to work with? (Check all that apply)			
	Counts	Percents	Percents
			0 100
Shapefile	36	83.7%	
Vector	25	58.1%	
Image	24	55.8%	
Raster	23	53.5%	
Coverage	20	46.5%	
Graphics	3	7.0%	
AutoCAD dwg's	1	2.3%	
Depends on project and analysis required	1	2.3%	
Geodatabase (ArcView 8.1 format)	1	2.3%	
I don't - Our carto section does	1	2.3%	
personal geodatabase	1	2.3%	
SDE layers	1	2.3%	
Other	0	0.0%	
Totals	43	n/a	
Mean	--		







Q12: Would you describe your GIS work as predominantly analytical or cartographic?

GIS Type of Work			
	Counts	Percents	Percents
			0 100
Both	22	53.7%	
Cartographic	10	24.4%	
Analytical	9	22.0%	












[Continuing table]

GIS Type of Work			
	Counts	Percents	Percents
			0 100
Totals	41	100.0%	
Mean	--		






Q13: What operating system do you most commonly use?

















Operating System			
	Counts	Percents	Percents
			0 100
Windows NT/2000	29	64.4%	
Windows 98	10	22.2%	
Unix/Linux	3	6.7%	
Windows 3.x	1	2.2%	
Windows 2002	1	2.2%	
Windows 95	1	2.2%	
Mac O/S	0	0.0%	
Other	0	0.0%	
Totals	45	100.0%	
Mean	--		


Q14: What type of computer platform do you most often work with?

Processor Speed (e.g., 400MHz)			
	Counts	Percents	Percents
			0 100
450	3	9.1%	
1000 MHz	2	6.1%	
750	2	6.1%	
750 MHz	2	6.1%	
1 GHz	1	3.0%	
1 GIG	1	3.0%	
1.0 MHz	1	3.0%	
1.26 Hz	1	3.0%	
1.5 gz	1	3.0%	
1300 MHz	1	3.0%	
1500	1	3.0%	

[Continuing table]

Processor Speed (e.g., 400MHz)			
	Counts	Percents	Percents
			0 100
1G	1	3.0%	
200	1	3.0%	
2x 1.7 G	1	3.0%	
300	1	3.0%	
Other	13	39.4%	
Totals	33	100.0%	
Mean	--		

RAM Amount (e.g., 256 MB)			
	Counts	Percents	Percents
			0 100
256	10	28.6%	
512	3	8.6%	
1 GB	2	5.7%	
128 MB	2	5.7%	
256 MB	2	5.7%	
512 MB	2	5.7%	
1 G	1	2.9%	
1.3 MB	1	2.9%	
130	1	2.9%	
2 GB	1	2.9%	
256-512	1	2.9%	
261	1	2.9%	
384 MB	1	2.9%	
48 MB	1	2.9%	
500	1	2.9%	
Other	5	14.3%	
Totals	35	100.0%	
Mean	--		

Hard Drive Capacity (e.g., 20 GB)			
	Counts	Percents	Percents
			0 100
20 GB	7	18.9%	

[Continuing table]

Hard Drive Capacity (e.g., 20 GB)			
	Counts	Percents	Percents
			0 100
40 GB	2	5.4%	
60 GB	2	5.4%	
00	1	2.7%	
1 TB	1	2.7%	
10	1	2.7%	
10 GB	1	2.7%	
140 GB	1	2.7%	
18 GB	1	2.7%	
2 GB	1	2.7%	
20	1	2.7%	
3.41 + 5	1	2.7%	
30	1	2.7%	
30 +	1	2.7%	
30 GB	1	2.7%	
Other	14	37.8%	
Totals	37	100.0%	
Mean	--		

Monitor Size (e.g., 19 inches)			
	Counts	Percents	Percents
			0 100
21	7	18.4%	
17	6	15.8%	
17"	4	10.5%	
19	3	7.9%	
19"	3	7.9%	
15	2	5.3%	
21"	2	5.3%	
1	1	2.6%	
14	1	2.6%	
14 in.	1	2.6%	
15"	1	2.6%	
17 in.	1	2.6%	
19 in	1	2.6%	

[Continuing table]

Monitor Size (e.g., 19 inches)			
	Counts	Percents	Percents
			0 100
19 in.	1	2.6%	
19 inch	1	2.6%	
Other	3	7.9%	
Totals	38	100.0%	
Mean	--		

Q15: Do you have internet access from this computer?

15) Do you have Internet access from this computer?			
	Counts	Percents	Percents
			0 100
Yes	44	97.8%	
No	1	2.2%	
Totals	45	100.0%	
Mean	1.98		

What type of internet connection do you have?

What type of Internet connection do you have?			
	Counts	Percents	Percents
			0 100
T1 Line	16	38.1%	
Modem	7	16.7%	
ISDN	5	11.9%	
Ethernet	3	7.1%	
DSL	2	4.8%	
T3 Line	1	2.4%	
3-T1 lines	1	2.4%	
56 K Frame Relay	1	2.4%	
All of our modems are SLOW, 22,500 I type	1	2.4%	
Gov't DOI internet has been down since Oct. due to illegal hussel with Dept. Justice	1	2.4%	
LAN modem	1	2.4%	
Line of sight wireless to fractional T1.	1	2.4%	
Shared T2	1	2.4%	

[Continuing table]

What type of Internet connection do you have?			
	Counts	Percents	Percents
			0 100
Unknown	1	2.4%	
Cable	0	0.0%	
Other	0	0.0%	
Totals	42	100.0%	
Mean	--		

Q16: In what year was this computer purchased?

16) In what year was this computer purchased?			
	Counts	Percents	Percents
			0 100
1997	2	5.0%	
1998	4	10.0%	
1999	2	5.0%	
2000	16	40.0%	
2001	14	35.0%	
2002	2	5.0%	
Totals	40	100.0%	
Mean	--		

Q17: Before receiving this questionnaire, had you ever heard of a "gap analysis" or the Gap Analysis Program?

17) Before receiving this questionnaire, had you ever heard of a "gap analysis" or the Gap Analysis Program?			
	Counts	Percents	Percents
			0 100
Yes	36	80.0%	
No	9	20.0%	
Totals	45	100.0%	
Mean	1.80		


Q18: How did you first learn about the GAP Analysis Program?

Media Sources			
	Counts	Percents	Percents
			0 100
Co-worker/Colleague	15	39.5%	
Presentation at professional meeting/conference (specify conference)	9	23.7%	
Professional journal/publication/book (specify title)	6	15.8%	
Professional e-mail mailing list (specify list)	1	2.6%	
Did work for PA GAP while at Penn State.	1	2.6%	
Don't remember	1	2.6%	
Graduate student at Tech	1	2.6%	
I worked at FWIE	1	2.6%	
Not Sure	1	2.6%	
Referred to in college course work	1	2.6%	
Working on the project for VA	1	2.6%	
Other	0	0.0%	
Totals	38	100.0%	
Mean		--	





Q19: Based on what you've heard or read about gap analysis, would you say the primary objective of the Gap Analysis Program is to:

Gap Objectives			
	Counts	Percents	Percents
			0 100
Identify "gaps" in the protection of biodiversity	20	52.6%	
Create land cover maps of each state	9	23.7%	
Identify and study "gaps" in habitats	6	15.8%	
Characterize the forest cover types with a bent toward identifying gaps (fragments) in same.	1	2.6%	
Identify gaps between any set of data layers and analyze results	1	2.6%	



[Continuing table]

Gap Objectives			
	Counts	Percents	Percents
			0 100
Plot bird species' ranges and diversity	1	2.6%	
Identify land stewards	0	0.0%	
Don't know	0	0.0%	
Other	0	0.0%	
Totals	38	100.0%	
Mean	--		




Q20: What is the status of the gap analysis program in Virginia?

Project status			
	Counts	Percents	Percents
			0 100
It has been started, but not yet completed	14	37.8%	
Don't know	12	32.4%	
It has been completed	10	27.0%	
It has not yet been started	1	2.7%	
Totals	37	100.0%	
Mean	--		






Q21: Before receiving this questionnaire, did you know that the products of of completed GAP projects are available for free online?

21) Before receiving this questionnaire, did you know that the products of completed GAP projects are available to the public for free online?			
	Counts	Percents	Percents
			0 100
Yes	20	52.6%	
No	18	47.4%	
Totals	38	100.0%	
Mean	1.53		

Q22: Have you ever used a GAP product in one of your projects?

22) Have you ever used a GAP product in one of your projects?			
	Counts	Percents	Percents
			0 100
Yes	14	36.8%	
Uncertain	6	15.8%	
No	18	47.4%	
Totals	38	100.0%	
Mean	1.89		

Q23: At what geographic extent have these projects been conducted? (Check all that apply)

Scale of Work			
	Counts	Percents	Percents
			0 100
Regional (multi-county or size equivalent)	7	43.8%	
County (or size equivalent)	6	37.5%	
Statewide	6	37.5%	
Town/City (sub-county or size equivalent)	4	25.0%	
Individual Parcel	2	12.5%	
Multi-state	0	0.0%	
Other	0	0.0%	
Totals	16	n/a	
Mean	--		

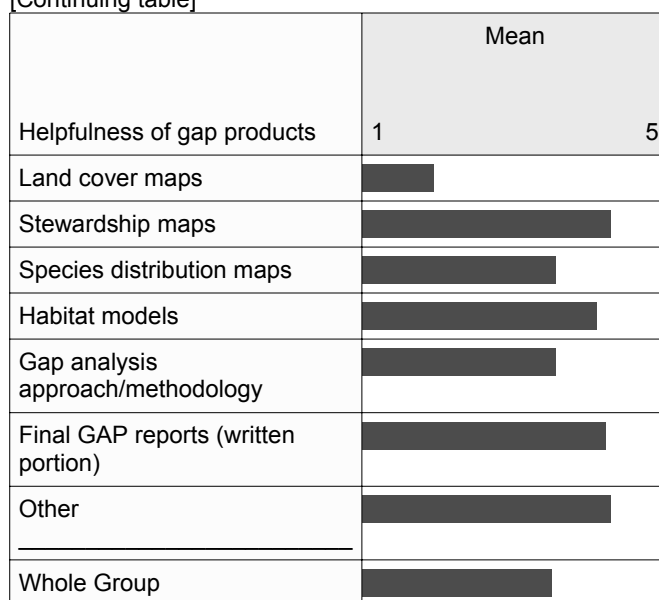
Q24: How helpful have the following aspects of the gap analysis data and process been to you in completing your projects?

	Very helpful	Somewhat helpful	Not very helpful	Not at all helpful	Never tried to use	Totals	Replies	Mean
Helpfulness of gap products								
Land cover maps	8.0	6.0	1.0	0.0	2.0	17.0	17.0	1.94
Stewardship maps	0.0	2.0	3.0	0.0	11.0	16.0	16.0	4.25
Species distribution maps	3.0	4.0	0.0	1.0	9.0	17.0	17.0	3.53
Habitat models	0.0	4.0	1.0	0.0	10.0	15.0	15.0	4.07

[Continuing table]

Helpfulness of gap products	Very helpful	Somewhat helpful	Not very helpful	Not at all helpful	Never tried to use	Totals	Replies	Mean
Gap analysis approach/methodology	2.0	5.0	1.0	0.0	9.0	17.0	17.0	3.53
Final GAP reports (written portion)	1.0	1.0	3.0	0.0	11.0	16.0	16.0	4.19
Other	0.0	1.0	0.0	0.0	3.0	4.0	4.0	4.25
Whole Group	2.7	3.9	1.6	0.1	8.7	17.0	17.0	3.48




[Continuing table]











Q25: What other types of external and internal spatial data have you used in these projects?






Other external land cover/use maps			
	Counts	Percents	Percents
			0 100
x	2	20.0%	
DOQQ's, requested land cover	1	10.0%	
DRG's, DEM's, DOQQ's	1	10.0%	
Local landuse	1	10.0%	
LULC - Federal	1	10.0%	
MRLC, EPA	1	10.0%	

[Continuing table]






Other external land cover/use maps				
	Counts	Percents	0	100
National Land Cover Data	1	10.0%		
NLCD	1	10.0%		
NVC, EMAP, CMAP	1	10.0%		
Totals	10	n/a		
Mean	--			










Other external stewardship/cadastral) maps				
	Counts	Percents	0	100
local parcel maps	1	33.3%		
State-owned lands	1	33.3%		
USGS	1	33.3%		
Totals	3	n/a		
Mean	--			









Other external species maps				
	Counts	Percents	0	100
ABI, VDGIF, VDNM	1	20.0%		
DGIF - species	1	20.0%		
FLA, GFC - Greedways - FNAI, Nature Cons.	1	20.0%		
none-use our own-VDGIF	1	20.0%		
State F + W & Heritage	1	20.0%		
Totals	5	n/a		
Mean	--			

External infrastructure maps (e.g., roads, utilities)				
	Counts	Percents	0	100
Federal Hwys, VDOT	1	10.0%		
Free shapefiles in EOD or TARGZ	1	10.0%		
Roads, Ownership	1	10.0%		
TIGIR - VDOT	1	10.0%		
USGS	1	10.0%		


[Continuing table]









External infrastructure maps (e.g., roads, utilities)				
	Counts	Percents	Percents	
			0	100
USGS, Counties in VA	1	10.0%		
VDOT roads	1	10.0%		
VDOT Roads/ Utilities, VEDP	1	10.0%		
VDOT, Tiger	1	10.0%		
x	1	10.0%		
Totals	10	n/a		
Mean	--			

External hydrographical maps (e.g., streams, rivers)				
	Counts	Percents	Percents	
			0	100
EPA	1	11.1%		
NHD	1	11.1%		
NWI, Free shapefiles EOD	1	11.1%		
Tiger	1	11.1%		
TIGIR - USGS	1	11.1%		
USGS streams	1	11.1%		
USGS, Counties in VA	1	11.1%		
Watersheds, soils	1	11.1%		
x	1	11.1%		
Totals	9	n/a		
Mean	--			

External topographical maps (e.g., elevation)				
	Counts	Percents	Percents	
			0	100
USGS	4	33.3%		
DEM DRG	1	8.3%		
DEM, DRG	1	8.3%		
DRGs - Radford University	1	8.3%		
Elevation	1	8.3%		
Map Tech, Top Maps	1	8.3%		
NED	1	8.3%		
USGS, Counties in VA	1	8.3%		

[Continuing table]

External topographical maps (e.g., elevation)				
	Counts	Percents	Percents	
			0	100
x	1	8.3%		
Totals	12	n/a		
Mean	--			

Internal data generated from field data				
	Counts	Percents	Percents	
			0	100
x	2	22.2%		
Collections, BOVA (distribution)	1	11.1%		
GPS - Park and Recreation Sites	1	11.1%		
Requested shapefiles	1	11.1%		
Roads, timber inventory points (GPS)	1	11.1%		
Species Dist.	1	11.1%		
Veg, Species, Rare, Threatened, and Endangered, Fuels, Fire History, Roads, Trails	1	11.1%		
Yes, harvest/reforestation, forest stand maps	1	11.1%		
Totals	9	n/a		
Mean	--			

Q26: How important were each of the following factors in your decision to use GAP data products in your projects?

	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	Totals	Replies	Mean
Why use gap data								
They were easy to obtain	2.0	7.0	4.0	1.0	0.0	14.0	14.0	2.29
They were free	5.0	6.0	2.0	1.0	0.0	14.0	14.0	1.93
They were more accurate than other available data	1.0	8.0	2.0	1.0	1.0	13.0	13.0	2.46
They were more appropriate for my needs than other available data	1.0	5.0	6.0	2.0	0.0	14.0	14.0	2.64
It was the only dataset of its kind that I could find for the area	3.0	6.0	3.0	1.0	0.0	13.0	13.0	2.15
My employer requested that I use them	1.0	1.0	0.0	2.0	8.0	12.0	12.0	4.25

[Continuing table]

Why use gap data	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	Totals	Replies	Mean
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Whole Group	2.3	6.1	2.8	1.3	1.5	14.0	14.0	2.55

[Continuing table]

Why use gap data	Mean	
	1	5
They were easy to obtain		
They were free		
They were more accurate than other available data		
They were more appropriate for my needs than other available data		
It was the only dataset of its kind that I could find for the area		
My employer requested that I use them		
Other		
Whole Group		

Q27: What other factors went into your decision to use GAP data products in your projects?

27) What other factors went into your decision to use GAP data products in your projects?

- It gave us the format to fill in some blanks in the GAP data.
- At the time, it was the only game in town. (Mass GAP)
- Review of data by experts, landcover available and its applicability to land use planning.
- Available for a large geographic area.
- Knowledge of the project and its objectives. Affiliation with individuals working on the project.
- Potential use for habitat analysis
- Contract
- Explanation of product by GAP staff.
- Only thing available until I found 1 m Doqq's. Doqq have better resolution but will check my interpretation with GAP data.

Q28: Can you briefly describe the types of projects in which you have used GAP products?

- Environmental Impact Studies...
 - Reviewing impacts from large development projects and road planning.
 - x
 - EA's and EI's, Forest Plans
 - Don't currently use for this but plan to use after models are re-run
 - x
 - Refuge mgmt. comprehensive conservation planning

- Endangered Species Planning...
 - Included in county comprehensive plan
 - Have occasionally used land cover to attempt to model where specific T + E species are likely to occur - for survey purposes. Plan to use this more after models are re-run with our updated habitat association inputs
 - x
 - Recovery/mgmt. plan

- Social/Economic Studies or Services...

- Landscape or Land Use Planning...
 - Used the format and other resources of the GAP team to see if it was possible to delineate/identify quail habitat and get a baseline of quantity.
 - Forest land use estimates, forest fragmentation analysis.
 - See above
 - Landscape
 - Forest Planning
 - Developing forest mgmt. plans for landowners. Used landcover and species distribution data.
 - Smart Growth Analysis
 - Open space planning in the Roanoke Valley - General Reference Map.
 - Land conservation & acquisition proposals

- Infrastructural Planning...
 - Smart Growth Analysis

- Cultural/Historical Studies...

- Other (projects that don't fit into one of the categories above)...
 - Wildlife management area master plans.
 - Fire Planning
 - Species - Habitat Associations
 - Land acquisition - provide land cover data to land acquisition staff in form of maps and images for presentations to the board to get approved for acquisition.
 - Habitat mgmt. plans
 - Studies involving land cover/habitat type and bird communities.

Q29: How important are each of the following factors in preventing you from using GAP data or using it to a higher degree?

Why Gap is not used more	Most important	Very important	Somewhat important	Of little importance	Not a factor at all	Totals	Replies	Mean
I don't know how to obtain it	4.0	10.0	4.0	2.0	15.0	35.0	35.0	3.40
I don't know how it can be used	2.0	3.0	6.0	7.0	17.0	35.0	35.0	3.97
I don't have the computer equipment or software needed to use it	1.0	0.0	2.0	6.0	25.0	34.0	34.0	4.59
I don't have the computer training that I would need	1.0	0.0	6.0	5.0	23.0	35.0	35.0	4.40
I don't have time	1.0	5.0	13.0	3.0	13.0	35.0	35.0	3.63
It doesn't have the data I need	4.0	8.0	12.0	2.0	7.0	33.0	33.0	3.00
The data is not up-to-date enough	2.0	5.0	9.0	9.0	9.0	34.0	34.0	3.53
The scale or resolution is not appropriate	5.0	7.0	12.0	5.0	5.0	34.0	34.0	2.94
I'm required to use another data set by my employer	0.0	1.0	1.0	1.0	29.0	32.0	32.0	4.81
I didn't know it existed	3.0	3.0	4.0	2.0	23.0	35.0	35.0	4.11
Whole Group	2.6	5.9	7.3	4.3	16.8	37.0	37.0	3.72

[Continuing table]




Why Gap is not used more	Mean
Why Gap is not used more	1 5
I don't know how to obtain it	
I don't know how it can be used	
I don't have the computer equipment or software needed to use it	
I don't have the computer training that I would need	
I don't have time	
It doesn't have the data I need	
The data is not up-to-date enough	
The scale or resolution is not appropriate	
I'm required to use another data set by my employer	
I didn't know it existed	
Whole Group	

Q30: If there are any other factors that prevent you from using GAP data or using it to a higher degree, please list them here.

30) If there are any other factors that prevent you from using GAP data or using it to a higher degree, please list them here.

- Our decent computer is not connected to internet. All of our internet connections are SLOW in this office. Last time I downloaded a DOQQ it took 15 + minutes! Maybe longer. We just got ArcView in our office 2-3 months ago.
- Did not know that it included geographics
- Insufficient accuracy
- Waiting for DGIF to finish the final product. What is currently posted is not expert reviewed
- Not that sure of all layers available.
- WWW.GAPANALYSIS.GOV doesn't exist. Searching www.ngii.gov for GAP ANALYSIS results in no hits.
- Scale too broad.
- Only 1 project I've had has focused on GAP. I've had no other opportunities.
- As mentioned earlier, the habitat association data is being revised and expert-reviewed as required by National GAP, to provide greater accuracy
- Not accurate enough. The pieces I need are not available.
- I am unfamiliar with exactly what data are available from GAP.
- In addition to no extra time for utilizing GAP, there are also no additional resources (\$) to add support to projects.
- Cost - How much does it cost to obtain, including appropriate training?
- Believe classes identified are unreliable b/c methodology doesn't allow for such detailed ID of landscape

Q31: Are there other projects that you are currently working on or plan to work on where GAP products might be useful?

31) Are there other projects that you are currently working on or plan to work on where GAP products might be useful?			
	Counts	Percents	Percents
			0 100
Yes	16	38.1%	
Uncertain	19	45.2%	
No	7	16.7%	
Totals	42	100.0%	
Mean	2.21		

potential current projects

- Now that we finally have the software to begin to use GIS data, there may be some places where herbaceous cover type layers would be quite useful.
- Wildlife management corridors
- Currently we are working to create a GIS that is capable of analyzing what land is most important to protect, mainly with respect to agriculture and water quality.
- Forest type distribution, forest disturbance monitoring
- Invasive veg. planning, insect management planning.
- Veg. mapping, related lands studies, conservation fund projects.
- Comprehensive conservation planning (CCP) for Back Bay NWR (including surrounding landscape).
- SE Fire Risk Assessment

- I am a land surveyor. I survey property boundaries. You need to contact some of our wildlife/fisheries biologists who might need or use this type of info.
- Habitat Analysis, Forest Fragmentation
- Create predicted species lists for protected areas, gather documented records (vouchers) and evaluate contribution of protected area to species protection, and indicate areas of high biodiversity.
- 1. Integrate GAP products into the Virginia Fish and Wildlife Information Service (VA FWIS) available on the web
- 2. Integrate GAP products into VDGIF's process for reviewing projects for impacts to wildlife resources.
- 3. Prioritizing habitats and species for research and management activities.
- 4. Surveys of WMAs (Wildlife Management Areas)
- Development of models for prioritizing land protection and acquisition
- Regional planning maps
- Making mgmt. decisions with the knowledge of adjacent landowners activities and intentions
- 2
- Forest management on state WMA's, Capital inventory management on WMA's, Land acquisition.
- To monitor habitat availability for species (e.g. corridors for bear, early successional habitat for grouse)
- Many biological surveys and studies
- Mapping of conservation easements lands in the state of Virginia

Q32: How likely would each of the following factors or possible data revisions be in encouraging you to use GAP data more often?

	Very Likely	Somewhat Likely	Not at all Likely	Don't Know	Totals	Replies	Mean
Helpfulness of data revisions							
If I had more information about what GAP is	9.0	15.0	15.0	2.0	41.0	41.0	2.24
If I had more information about how to use GAP data	10.0	19.0	11.0	1.0	41.0	41.0	2.07
If the data were easier to obtain	9.0	10.0	14.0	8.0	41.0	41.0	2.51
If I had better computer equipment	4.0	4.0	28.0	6.0	42.0	42.0	2.86
If I had more computer training	1.0	11.0	24.0	4.0	40.0	40.0	2.78
If the data were provided in a different format	0.0	5.0	19.0	15.0	39.0	39.0	3.26
If the data were provided at a different scale or resolution	11.0	6.0	11.0	13.0	41.0	41.0	2.63
If more or different data products were available	6.0	17.0	8.0	9.0	40.0	40.0	2.50
If my employer were more supportive of using this data	1.0	4.0	21.0	14.0	40.0	40.0	3.20
Other	2.0	1.0	0.0	2.0	5.0	5.0	2.40
Whole Group	6.8	10.3	16.8	8.1	42.0	42.0	2.62

[Continuing table]

	Mean	
Helpfulness of data revisions	1	4
If I had more information about what GAP is	[REDACTED]	

[Continuing table]

	Mean	
	1	4
Helpfulness of data revisions		
If I had more information about how to use GAP data		
If the data were easier to obtain		
If I had better computer equipment		
If I had more computer training		
If the data were provided in a different format		
If the data were provided at a different scale or resolution		
If more or different data products were available		
If my employer were more supportive of using this data		
Other		
Whole Group		

Q33: Can you please give specific examples of the types of changes that would make GAP data more suitable for use by you or your organization?

33) Can you please give specific examples of the types of changes that would make GAP data more suitable for use by you or your organization?

- Better knowledge of the specific data sets/products available.
- Essentially, as a private engineering consulting firm, we mainly deal with parcel conversion, and utility data, emergency zones, centerlines, etc. There is not a need for GAP landcover info.
- Larger scale and smaller resolution.
- I am not sure that it is useful to my organization.
- ESRI format in popular projector/coord/NAD
- Simplified habitat classification system with higher degree of accuracy.
- Not familiar enough to adequately answer.
- Easily locatable web page. I just searched for "Gapanalysis.gov" and no web page was found. Then "Gap Analysis" and no easy-to-find web page.
- Canned coverages which could be incorporated into ArcView.
- Small enough scale to look at newly acquired refuge lands around Back Bay.
- Improved data resolution is key. There are plenty of data sources mapped from satellite imagery. Spatial scales approaching 1-2 m are much more desirable.
- One website for search and download, Higher resolution data.
- Land ownership detail, lu/lc classifications aligning with needs of our programs.
- The scale is too large in a lot of cases, not applicable to the locality size.
- More delay for undeveloped areas.
- Updated land cover Revised and expert-reviewed inputs to species distribution models
- More products
- Geologic info.
- We do not use much natural resource data. Interested in land cover, land cover change, and impermeable surfaces.
- Accessibility to data and maps or photos given digital or hard copy.
- Don't Know
- Better fine scale resolution. Complete GAP analyses and make all datasets available online.

- N/A
- If it was offered free, easy to find and acquire, and I could learn how to use it within a minimal amount of time.












Q34: How do you prefer to receive or acquire data?

34) How do you prefer to receive or acquire data?				
	Counts	Percents	Percents	
			0	100
Download over internet	20	47.6%		
No preference	12	28.6%		
Archive media (e.g., CDs, tapes) via mail	10	23.8%		
Totals	42	100.0%		
Mean	--			

Q35) In what forms do you prefer to receive data? (Check all that apply)

35) In what formats do you prefer to receive data? (Check all that apply)				
	Counts	Percents	Percents	
			0	100
Zipped	34	85.0%		
Arc Export	28	70.0%		
TIFF Images	17	42.5%		
Unzipped	7	17.5%		
Shapefile	3	7.5%		
SDTS	2	5.0%		
.img files	1	2.5%		
.jpg	1	2.5%		
Any	1	2.5%		
Anything that doesn't require purchasing and extension to ArcView	1	2.5%		
ASCII file	1	2.5%		
Basically any way I can get it	1	2.5%		
gzip, Mr. SID (lizard tech)	1	2.5%		
Other	0	0.0%		
Totals	40	n/a		
Mean	--			

Q36: What type of agency do you work for?

36) What type of agency do you work for? (Check one)			
	Counts	Percents	Percents
			0 100
State government	17	37.8%	
Federal government	14	31.1%	
Private consulting	4	8.9%	
Environmental organization (non-governmental)	2	4.4%	
Academic	2	4.4%	
Regional government	1	2.2%	
Non-profit land trust	1	2.2%	
Planning District Commission	1	2.2%	
Quasi-state agency - The mission of my agency is vastly different than the goal of my position.	1	2.2%	
Regional Planning Agency	1	2.2%	
Self Employed	1	2.2%	
County government	0	0.0%	
Other	0	0.0%	
Totals	45	100.0%	
Mean		--	

Q37: In describing the "mission" of your agency and the goal of your position, how important would you say each of the following factors are?

mission descriptors	Rated 1	Rated 2	Rated 3	Rated 4	Rated 5	Totals	Replies	Mean
Research	15.9%	6.8%	34.1%	29.5%	13.6%	100.0%	44.0	3.18
Education/Outreach	4.4%	8.9%	20.0%	44.4%	22.2%	100.0%	45.0	3.71
Regulatory Compliance	18.2%	15.9%	22.7%	22.7%	20.5%	100.0%	44.0	3.11
Environmental Impact Assessment	8.9%	17.8%	22.2%	28.9%	22.2%	100.0%	45.0	3.38
Environmental Impact Mitigation	15.9%	22.7%	29.5%	22.7%	9.1%	100.0%	44.0	2.86
Single Species Management	22.2%	20.0%	33.3%	13.3%	11.1%	100.0%	45.0	2.71
Multiple Species (i.e., Community) Management	17.8%	6.7%	20.0%	33.3%	22.2%	100.0%	45.0	3.36
Endangered Species Management	17.8%	8.9%	17.8%	20.0%	35.6%	100.0%	45.0	3.47
Ecosystem Management	11.1%	8.9%	31.1%	24.4%	24.4%	100.0%	45.0	3.42









[Continuing table]

mission descriptors	Rated 1	Rated 2	Rated 3	Rated 4	Rated 5	Totals	Replies	Mean
Biodiversity Conservation	13.3%	13.3%	24.4%	28.9%	20.0%	100.0%	45.0	3.29
Cultural/Historical Preservation	20.5%	22.7%	22.7%	20.5%	13.6%	100.0%	44.0	2.84
Economic Development	31.8%	25.0%	20.5%	13.6%	9.1%	100.0%	44.0	2.43
Landscape Planning	20.0%	22.2%	28.9%	20.0%	8.9%	100.0%	45.0	2.76
Client Services	22.2%	13.3%	17.8%	28.9%	17.8%	100.0%	45.0	3.07
Human/Public Services	27.3%	13.6%	20.5%	25.0%	13.6%	100.0%	44.0	2.84
"People Management"	22.2%	20.0%	33.3%	17.8%	6.7%	100.0%	45.0	2.67
Public Involvement	11.1%	6.7%	33.3%	35.6%	13.3%	100.0%	45.0	3.33
Other	0.0%	0.0%	0.0%	22.2%	77.8%	100.0%	9.0	4.78




[Continuing table]

mission descriptors	Mean	
	1	5
Research		
Education/Outreach		
Regulatory Compliance		
Environmental Impact Assessment		
Environmental Impact Mitigation		
Single Species Management		
Multiple Species (i.e., Community) Management		
Endangered Species Management		
Ecosystem Management		
Biodiversity Conservation		
Cultural/Historical Preservation		
Economic Development		
Landscape Planning		
Client Services		
Human/Public Services		
"People Management"		
Public Involvement		
Other		

Q38: From which data source are you and your coworkers MOST likely to obtain information about the Gap Analysis Program and the data it produces?

38) From which data source are you and your coworkers MOST likely to obtain information about the Gap Analysis Program and the data it produces? (Check one)			
	Counts	Percents	0 Percents 100
Internet	15	34.1%	
Presentation at professional meeting/conference	11	25.0%	
Professional e-mail mailing list	6	13.6%	
Professional journal/publication/book	4	9.1%	
Direct Mail	4	9.1%	
Special GAP Training Workshop	2	4.5%	
Directly from Conservation Management Institute	1	2.3%	
phone call to CMI	1	2.3%	
Other	0	0.0%	
Totals	44	100.0%	
Mean	--		

Q39: What type of position do you hold within your organization?

39) What type of position do you hold within your organization? (Check one)			
	Counts	Percents	0 Percents 100
Management/Supervisory	23	51.1%	
Technical	20	44.4%	
Administrative	2	4.4%	
Totals	45	100.0%	
Mean	--		

Q40: How long have you worked in your current field (including other positions you've held)

40) How long have you worked in your current field (including other positions you've held)			
	Counts	Percents	Percents
			0 100
From 0	12	26.7%	
From 5	6	13.3%	
From 10	5	11.1%	
From 15	6	13.3%	
From 20	11	24.4%	
From 25	2	4.4%	
From 35 to 40	2	4.4%	
Other	1	2.2%	
Totals	45	100.0%	
Mean	13.76		

Q41: What is the highest level of formal education you've completed?

Education			
	Counts	Percents	Percents
			0 100
Less than high school (Skip to #39)	0	0.0%	
High school (Skip to #39)	0	0.0%	
Some college	0	0.0%	
Technical (2-year) degree	1	2.2%	
Bachelor's degree	20	44.4%	
Master's degree	20	44.4%	
Doctoral degree	4	8.9%	
Totals	45	100.0%	
Mean	5.60		

Q42: If you attended college, in what field was your major?

Major			
	Counts	Percents	Percents
			0 100
Biology/Ecology	20	44.4%	

[Continuing table]

Major	Counts	Percents	Percents	
			0	100
Geography	8	17.8%		
Environmental Science	6	13.3%		
Forestry	2	4.4%		
Geology	2	4.4%		
Accounting	1	2.2%		
Ag./horticulture	1	2.2%		
Environmental Planning	1	2.2%		
Fisheries/Marine Science	1	2.2%		
Forestry and Wildlife	1	2.2%		
Forestry/Recreation	1	2.2%		
Geol. Oceanography	1	2.2%		
Geology/Ocean.	1	2.2%		
Political Science	1	2.2%		
Statistics	1	2.2%		
Other	2	4.4%		
Totals	45	n/a		
Mean	--			

43) We plan on following up this survey with a series of regional 1/2 day workshops to get a better idea of the data needs that people like yourself have. Would you be interested in receiving informat

	Counts	Percents	Percents	
			0	100
Yes, I'd like to know more	35	79.5%		
No, I don't think I'd be interested	9	20.5%		
Totals	44	100.0%		
Mean	--			

Comments

- 29) I don't have computer equipment - Now somewhat resolved but SLOW internet a problem
- 14) Processor - x 86 Family 6 Model 8 Stepping 3,
- 16) The other computers are newer and have better specs., 18) 3 - Va - GIS, 38) 3 also
- 38) Also likely to use Internet
- 37) other - community planning
- 13) Unix/Linux is Second most commonly used
- 38) Also obtain information from Professional emailing list and direct mail

- 11) Image - orthophoto quad, 14) RAM Amount - Unsure 38) Profess. emailing list and internet
- 18) 2 - FWS RTNCF Ecosystem Biol. Meeting and "4", 19) 1 - And wildlife dist. and "3", 38) 3 and 4
- `
- 16) 1998-2002, 18) 3(GIS listserv Va), 4, & 5, 38) Also direct mail
- 13) Unix/Linux and Windows NT/2000 are an integrated system, 18) 3 - VAGIS Listserv
- 13) Also Windows NT/2000, 16) 1998-2002 - Several Computers, 18) ESA & TWS, 38) 2 & 5
- 34) Also prefer archive media
- 32) other - classifications more suitable to tasks, 37) other - Land stewardship and recreation
- 38) Also internet
- 18) The State Wildlife Society
- 13) Also Windows NT/2000
- NOTE: I don't use GAP products much. I create data layers that can be used in GAP as contracted
- 9) My staff does, 20) CMI has completed draft -working on revision, 24) Spp. dist. maps not used - VDGIF revising habitat associations, 38) 2,3, & 5
- 18) J. Wildlife Mgmt.
- 13) Also WXP, 15) Also Modem, 38) Also internet and GAP training workshop
- 18) 1997 - Can't remember, 37) other - Regional Planning
- 22) The only use is that I had Becky WAJDA mail me about 10 copies of the statewide land cover map over 5 years ago.
- 26) Time is a limiting factor for planning., 41) Two Master's degrees.
- 16) 2000 or 2001, 38) Also a special GAP training workshop
- 14) slow processor, 16) 1997?, 32) More time and resources to incorporate GAP
- 24) Road, water, other boundaries
- 13) Also use Unix/Linux, 38) Also emailing list and internet
- 13) Also Windows 98, 34) Also Archive Media
- I would find it helpful if there was a website which provides training for FAQ's, for free. You need to know what certain applications will do. To find Training is just as hard as finding data.
- 16) 2000 or 2001, 19) not positive, but pretty sure, 37) Human Services - firefighting

APPENDIX C:
WORKSHOP AGENDA

**Data Issues in Natural Resource Management
Regional Focus Group Meeting**

AGENDA

Date & Time

Location

Thank you for attending! We hope that you enjoy participating and that you go home with a better understanding of the gap analysis process and products, and that you also get to learn a little bit about what others in your region are working on. Remember, YOU are the potential end user of this information, and this is your chance to let the leaders of the program know what you need!

This meeting is organized into 2 informal brainstorming/discussion sessions with the goal of providing the GAP program coordinators and project leaders with a range of objectives and suggestions for improving the applicability and implementation of their products.

- | | |
|------------|--|
| 30 minutes | Welcome
Overview of Gap Analysis (PowerPoint presentation) |
| 90 minutes | SESSION 1:
GAP and your work – how can they interface? (aka. – what do you need/want to be able to do?) |
| 60 minutes | SESSION 2:
What do you need GAP to do/provide in order for you to be able to meet these objectives? |
| | Adjourn |

PARTICIPANTS

Julie McClafferty, CMI (facilitator)

(List of Participants and Affiliations for each meeting was included here)

APPENDIX D:
WORKSHOP SUMMARIES

Note: For each workshop, the participants are listed followed by the results of each discussion session. Session 1 in each workshop asked participants to reflect on their own work and the mission of their agency and envision ways that the GAP products and processes can interface with those activities. Simply put, participants were asked about how they saw GAP fitting into current and future work and the types of things they would like to be able to do with GAP data. Session 2 in each workshop re-examined the list created in Session 1 and asked participants to identify specific needs that the Gap Program would need to meet to allow them to accomplish those stated goals. Ideas are presented here in list form in the order they were brought up during the discussions.

WORKSHOP 1: BLACKSBURG, VA, JULY 25 2002

Participants:

Alan Boynton, Virginia Department of Game & Inland Fish
Roger Holnback, Western Virginia Land Trust
Garrett Jackson, Planning District Commission #3
Matt Knox, Virginia Department of Game & Inland Fish
David Kramer, Anderson Associates, Inc.
Dave Stephen, Virginia Department of Game & Inland Fish

Session 1: Opportunities for GAP Implementation

- Plan conservation corridors (identify target properties for protection—usually small properties)
- Obtain solid, “eye-catching” supporting data and visual aids to defend & promote land acquisition efforts to public and legislature
- Monitor habitat changes over time and predict habitat quality (rather than simple presence/absence)
- Predicting, modeling, and monitoring wildlife-related crop damage and wildlife-vehicle collisions
- Predict wildlife dispersal patterns (e.g., elk) by identifying habitat corridors
- Monitor wildlife disease implications (e.g., CWD): tracking occurrences and planning mitigation. Where are the “weak spots?” Where are protective measures most needed?
- As a planning tool for site-specific management actions
- Monitor land use changes, especially forest conversion and urban sprawl, and calculate rates of change (useful for conservation prioritization). Need regular updates to map.
- Recreation planning and modeling (including viewshed modeling). Need to be able to manage the “public experience” and help people get the most out of their time – includes sociological values. Would like to be able to model types of experiences based on landscape factors.
- Outreach – communicating stewardship info & biodiversity needs to public and legislature to further conservation mission. This is especially needed to communicate conservation actions and “success-stories” to the

public and to communicate land use changes over time (i.e., needs identification).

- Manage/predict/model at the population level. Estimate carrying capacities, determine habitat **quality** in addition to presence/absence, incorporate understory information into habitat descriptions
- Risk analysis by habitat type and region of the state
- Incorporate community and socio-demographic information to 1) help carry out land acquisition priorities and 2) subjectively defend conservation projects (cannot always depend on a biodiversity “scapegoat” as the primary purpose for conservation)

Session 2: Identification of Needs from GAP

- Credible/real examples of using GAP info that an executive/legislative branch can relate to and would consider important to help agencies get money and technical support they need for using GAP data (e.g., hot topics such as brush fires, crop damage, vehicle damage). Need to “publish” these project via the Web and through local presentation at state meetings.
- Present data in user-friendly way on the web (so you don’t need GIS software) with web-based queries and ability to download just the maps or pieces of data they need to work with their own data. Would allow multiple types of users with varying needs to utilize data. Need to serve data at the state level rather than at the national level. “Conservation is local.”
- Improved mathematical habitat models, including both qualitative and quantitative info; move beyond presence/absence and into habitat quality/HIS; incorporate expert review and adaptability. Perhaps develop species models first, and then base the landcover map on the models. Need to develop modeling capability rather than a model, per se.
- Regularly scheduled re-mapping (updates) for current info and trends analysis
- Maps of land **use** in addition to land **cover** (e.g., lot size/density, residential/commercial/industrial, permeability)
- Need easy compatibility with other non-GAP data (e.g., tax maps, aerial photos). It has to be fast and easy to use.
- Need to communicate better the uses and limitations of GAP data (i.e., forest can be natural or plantation).
- Need level of detail to capture fragmentation and quality of patches.
- Ability to simulate management prescriptions
- Either higher resolution, more detailed maps, or the ability to incorporate existing maps into user models.

WORKSHOP 2: RICHMOND, VA, AUGUST 27 2002**Participants:**

Richard Easterbrook, National Park Service (Petersburg NB)
Dave Morton, Virginia Department of Game & Inland Fisheries
Adam Phelps, Virginia Department of Game & Inland Fisheries
Andrea Styles, Virginia Department of Conservation & Recreation
Alex Zendel, Virginia Department of Forestry

Session 1: Opportunities for GAP Implementation

- Land acquisition planning and justification for management and strategic planning objectives (esp. within the NPS, Game Department, NHP, Dept of Forestry, and private easement programs)
- Justification and explanation for better integrating ecological and cultural preservation (esp. on lands managed primarily for cultural/historical/military purposes.)
- Justification for and modeling of land management practices (e.g., converting forest to field for viewing purposes – what are the positive/negative implications for biodiversity?)
- Measure/model pollutant production (N, P, sediment) by different land cover types to minimize impacts
- Surveying – planning species survey needs and concentrating survey efforts to create the best species distribution models possible
- Fire risk modeling and assessment, esp. in non-forested areas where existing data are lacking. (Dept of Forestry, NPS)
- Identify areas needing protection from wild-fires (i.e., woodland home communities with no fire fighting resources, communities at the urban/woodland interface. Would like to consider both ecological factors and community factors in determining risk.
- Identify fire-dependent and fire-adapted habitats to better prescribe management (i.e., determine areas that need fire vs. areas that need protection from fire)
- Species habitat modeling (moving from presence/absence to quality/abundance)
- Environmental Review – incorporating species richness into review process in addition to endangered species locations
- Identifying hydrological units with high pollutant loads for conservation planning – what species need to be protected?
- Aquatic GAP – using land use and stewardship information as predictors for aquatic habitat quality and risk assessment
- Comprehensive Wildlife Conservation Plans: GAP products and processes should be used in developing plans for Species of Concern – perhaps we shouldn't be focusing only on those species currently listed.

Session 2: Identification of Needs from GAP

- Documentation (metadata) available on web to help people determine if GAP data fits their needs
- Larger scale mapping for property planning – using newer/higher resolution photography to achieve a smaller minimum mapping unit
- Species models that are scale and data independent and include more quantitative factors (explicit, separate, user-friendly species/habitat models that can be used with other data such as GIS-friendly HSI models)
- Updated land cover maps
- Improved accuracy of species/habitat models (quality vs. presence/absence). Include factors such as patch size, connectivity, proximity, and distribution for population/metapopulation management
- A delineation/identification of “Critical Habitat Areas” for natural resource managers who are non-wildlife biologists to use in guiding their land management decisions.
- Ability to map different aspects of biodiversity, such as T&E species or grassland species by selecting species with common habitat or status attributes. (More flexibility in species mapping).
- Ability in incorporate existing in-house data with GAP data. (Provide GIS layers rather than .jpps.)

WORKSHOP 3: RICHMOND, VA, AUGUST 28 2002**Participants:**

James Akerson, National Park Service (Shenandoah NP)
Kent Burtner, Virginia Department of Game & Inland Fisheries
Tony Caselton, Hampton Roads Planning District Commission
John Gallegos, US Fish and Wildlife Service (Back Bay NWR)
Cara Kaufman, Virginia Geographic Information Network
Shelley Miller, Virginia Department of Game & Inland Fisheries
Kathy Quindlen, Virginia Department of Game & Inland Fisheries

Session 1: Opportunities for GAP Implementation

- Share species distribution/survey data between GAP and other agencies to improve both data sets and to assess compatibility of survey protocols between agencies
- Protection of neo-tropical migrants – determine habitat presence/absence and quality (i.e., forest interior)
- Conservation corridors/habitat connectivity – identifying opportunities and needs
- Identify mitigation sites within conservation corridors (i.e., wetlands)
- Identify priorities for land acquisition and easement needs – especially to complete/expand conservation corridors.
- Perform trends analysis - especially in land cover and stewardship patterns
- Risk assessment for aquatic species (based on % of watershed in various landcover types and land uses within riparian barriers.
- Analyze the quality of existing protected lands (e.g., invasive species monitoring)
- Monitor and predict effects of invasives such as woolly adelgid and gypsy moth and other similar threats (e.g., wildlife/plant diseases of concern); create management prescriptions for mitigating the effects
- Conservation planning – identifying species and habitats of concern; identify land management and acquisition needs; adding biodiversity as a management goal to existing recreational goals/missions.
- Looking at species distribution differently by incorporating predicted species distributions and stewardship data from GAP into state database. Providing this info to others (agencies, schools, public, etc.) for planning, education, and environmental impact analysis purposes.
- Development of standardized methods for data collection and storage
- Examine populations of high priority species – do we have enough lands to meet their needs? Use GAP to assess habitat availability as well as protection status. Is there enough land out there to protect the species needing protection?
- Defining priority species and habitats. T&E? Declining but not yet endangered? Others? Use GAP to coordinate both pro-active and re-active objectives
- Modeling management scenarios – how will it change species distributions? (Includes being able to model successional processes)

Session 2: Identification of Needs from GAP

- Need metadata and information about what is available on VGIN's (Virginia Geographic Information Network) website
- Updated land cover information with more specific land cover classes
- Availability of GIS coverages and data for integration with other data
- Need more information on what coverages are available
- Need more information on schedule of updates (is there an intent to update?)
- Assessment of habitat quality for species/populations (information on population levels)
- Facilitation of inter-agency sharing of data
- Incorporate habitat inventory data from various agencies to 1) improve landcover detail and 2) facilitate landscape planning (to prevent "re-invention of the wheel" and allow coordination of inter-agency efforts.
- Standard protocols across states are needed for a more regional focus. Need product compatibility and cooperation across states
- Incorporate air quality info (e.g., acid rain deposition) to predict impacts on habitats
- Re-examine conservation status definitions (i.e., Gap Status 1-4) to be more flexible, be more appropriate for the state/region in question, and consider more than ownership patterns.
- Re-evaluation of GAP objectives to make products more applicable to multiple-use objectives; provide information without bias towards a particular mission and make information adaptable so that agencies can set their own goals. Providing intermediary datasets, rather than just the products, can help with this.