A SURVEY

of

GEOGRAPHIC INFORMATION SYSTEMS

— for natural resources decision making

The American Farmland Trust
1717 Massachusetts Avenue, N.W.
Washington, D.C. 20036

SURVEY OF GEOGRAPHIC INFORMATION SYSTEMS
For Natural Resources Decision Making
at the Local Level

Published By

THE AMERICAN FARMLAND TRUST
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The American Farmland Trust is a national, non-profit organization concerned with farmland protection, soil erosion and public policy

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PREFACE

As pressures for the conversion of natural, economic and cultural resources increase in our rural communities, there is a parallel growing awareness about the need to protect our most valuable agricultural resources.

In addition, declining federally supported local programs have increased responsibilities of local officials to more carefully evaluate decisions affecting natural resources allocations.

While interest in protecting our best farming resources mounts, there is an unprecedented concern that federal government farm programs have been encouraging the conversion of fragile erosion-prone lands and natural wetlands to croplands. New conservation elements in the 1985 Farm Bill including "Sodbuster", "The Conservation Reserve", and the "Swampbuster" provisions will rely upon local identification of these lands for program applications.

These new developments have heightened our interest in finding ways to ensure that local decisions affecting the protection of natural resources are based on the best available information, and thus are technically and legally defensible.

This report is the first major product of a program we recently instituted to bring the technical assistance of federal agencies and the private sector together, to serve the increasing needs of local officials in order to enhance their capacity to develop reasoned and defensible public policy.

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Our project Steering Committee provided valuable insight and guidance.

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We also thank the hundreds of individuals who contributed to this publication by providing information about geographic information systems software and for confirming our belief that the demand for such technologies is growing rapidly.

The cover of this report shows a detailed soil survey in color at a scale of 1"=2,000 ft. It was produced by one of the micro-computer-based systems documented here and generously provided by the vendor. Property boundaries are shown on the transparent overlay.

INTRODUCTION

The need to conserve productive agricultural resources for american agriculture and environmentally sensitive areas for resource regeneration while accommodating continued population growth poses an inescapable dilemma for rural officials.

Rural counties are rapidly becoming 'preferred locations' for landfills, hazardous waste sites, and energy development. The need to limit transportation costs often places such land uses in direct conflict with the needs of farming enterprises in non-metropolitan agricultural counties that are close to urban centers.

Conflicts over resources allocations are particularly acute in rural counties who are struggling to protect an agricultural land base (and an agricultural industry) in the face of sprawl from adjoining counties, resource degradation and increased economic pressures.

In fact, the nation's best farming counties are experiencing first-hand, pressures from expanding urban areas. We recently completed a study (Maizel, 1984) of the agriculturally significant counties within each state. Of the 619 counties identified, 143 were Metropolitan Statistical Areas (MSA's) in 1970, and of the non-metropolitan counties, 80% were adjoining MSA's or were contiguous with adjoining agriculturally significant counties. By 1980, forty of the non-metropolitan counties had become new MSA's and 108 of the agricultural counties, overall, had moved into a more urban status.

Furthermore, this analysis also showed that the non-metropolitan farming counties have decidely limited economic and other resources to apply in coping with the problem. Typically in the last decade they had average populations of 50,000, yearly budgets of $20 million and spent $30,000 on their natural resources (Soil and Water Conservation Districts and Extension Services) annually.

The fact these communities are often struggling with such limited fiancial and technical resources to

weigh the importance of agriculture in terms of its productivity, contributions to local tax bases, and value-added in off-site earnings in the food distribution chain, for instance is of major concern to us. Even more difficult is their task of projecting the impacts of proposed changes in natural resource uses compared with retaining those resources as open space or for farming.

As pressures for natural and economic resources allocations mount, many local jurisdictions do react by developing resources conservation policies. We are increasingly concerned however, that conservation decisions are being challenged in the courts and that public officials may be personally liable for the consequences of their policies. At the root of this conflict is the real possibility that decisions are not being made with adequate recourse to available information.

We firmly believe that these, and other conflicts could be resolved if decisions were made in the context of valid natural and cultural resources information concerning development trends which might adversely affect the resource base or co-opt its use for another purpose.

Ironically, much of the most detailed and relevant information needed is already available in local county court clerk's, taxation and assessment, and planning and zoning offices; local Agricultural Stabilization and Conservation offices, and offices of the Soil Conservation Service, USDA, for instance. State Departments of Agriculture, Natural Resources Offices, Wildlife and Fish and Game Commissions and agencies of the federal Department of the Interior such as the US Geological Survey, Bureau of Land Management, and others often have needed information.

Without question until now, putting such varied and vast amounts of information together on a common base and in a useable format has been nearly impossible.

All of this has prompted us to initiate a new program to enhance the capacity of local units of government and others to develop reasoned and defensible conservation policy.

The ultimate objective of this project is to help

deliver affordable, cost-effective, easy-to-use, computer-based Geographic Information System (GIS) technologies to local decisionmakers. Such technologies include methods to assemble needed data from many different sources. Our focus is upon those agriculturally significant communities who retain the most options for resources allocations, and whose economic and technical capabilities may be limited, but who nevertheless in our view, need this capability most.

This survey report which documents 64 different attributes of existing GIS software packages and their operating environments is the first major product of this program.

GEOGRAPHIC INFORMATION SYSTEMS: "What are they?"

A Geographic Information System (GIS) is a computer-based methodology including hardware, software and graphics that encodes, analyses and displays multiple data layers derived from various sources. Analyses can be expressed in tabular, graphic, and most importantly, in geographically coordinated, mapping format. Information about property ownership, assessment and taxation for instance, can be directly related to water resources, soils, agricultural productivity of farms, wildlife habitats, historic sites, property boundaries and other natural, economic and cultural attributes of the land in computer-drawn maps.

During the last decade, great advances have been made in the use of automated techniques to store, evaluate and display geographically-referenced information. While hand-drafted maps are frequently out-of-date, at inconvenient scales or in the wrong format for a particular need. Resource information, once entered into a GIS, can be easily and quickly analysed and re-drafted by the computer in different scales and in different combinations with varying kinds of other information needed for day-to-day decisionmaking.

Three or more data layers in hand-drawn maps are difficult to compare but a GIS can integrate multi-layered information - each differentially weighted if necessary - and express the analysis in the form of tables, graphic displays on a monitor, and of course, in maps.

A Simple Example of a GIS Application

For nearly fifty years, the Soil Conservation Service has been developing detailed soils surveys for use at the local level. However, managing and using the tremendous amounts of information contained in these surveys has been only recently possible through the growing capacity of computers and in particular, GISs.

A typical approach which uses only some of the elements of such a soils survey to assess soil erosion hazard in a GIS is illustrated below (Figure 1).

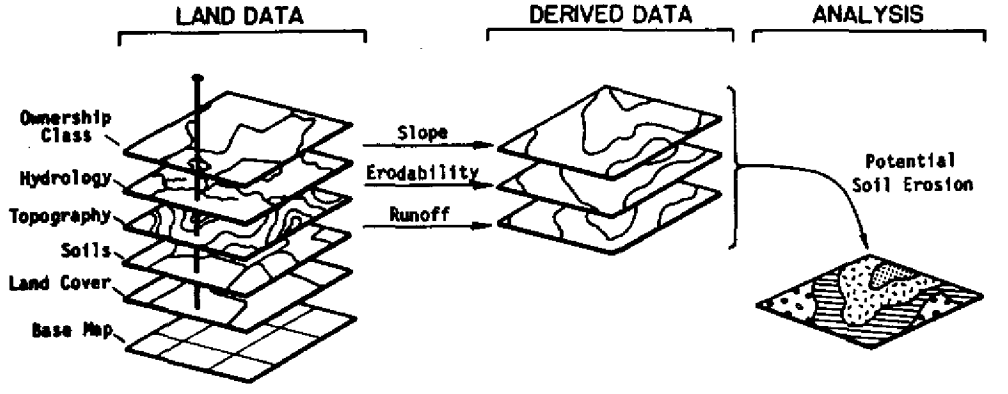

Figure 1. A Geographic Information System for Assessment of Soil Erosion Hazard.

In this example, a resource manager wants to determine the potential for soil erosion in a large watershed. He or she instructs the GIS to evaluate land cover, slopes, rainfall, soils characteristics, conservation practices and other factors affecting the erodability of soils in the area. The computer responds by selecting and combining the needed information. The combined information is analysed by the computer to derive a new data set. Statistical summaries of findings are printed out in tables and/or in graphs. The analysis is also presented in maps defining those geographical areas with a potential for soil erosion.

With such analyses in hand, policymakers may decide to limit the density of development on highly erodible soils in the watershed to protect a public water supply and at the same time, find areas which could safely accommodate development densities greater than planned without danger to water resources. The need for special applications of Local Erosion and Sedimentation Control Laws may be indicated in some areas but not be needed in other parts of the watershed.

In Wisconsin, a statewide Erosion and Sedimentation Control directive to local governments is generating the need for just this kind of analysis.

Though our principal interest is in GIS applications to illustrate the viability of agricultural resources, the few layers of a digital (computer-encoded) data base used to describe erosion hazards can be used together with many other data layers to address a broad range of social, political and environmental resource concerns.

SURVEY OBJECTIVES

Scope of the Survey

Our main objective in this report is to identify and document the characteristics of existing GISs which could be used to evaluate the agricultural viability of farmland and the importance of conserving natural resources. The basic data in such systems are those which comprise natural resources information systems (detailed soils, water resources, topographic, geologic data, for example). The most useful mapping unit is the US Geological Survey's planimetric 'quad' sheet, covering approximately 50 square miles per sheet.

While many automated land information systems have been described (see for instance, Lincoln Land Institute, 1983; Hysom and Ruth, 1984), most reside in large, expensive computer networks in affluent urban areas and municipalities. Approximately 22 of these urban systems are operational GISs. However, in these cases natural resources data sets are generally less important than the accurately surveyed property boundaries for instance, that constitute part of the basic foundation of the multi-purpose cadastre (National Research Council, 1980, 1983).

In practical terms, rural natural resources systems are useable to accuracies of $\pm$ 60-70ft and should be applied only to areas greater than 2 acres in size. Urban systems can demand accuracies on the order of inches or less. This is not to say that rural land information systems should not be up-gradable to the more stringent standards demanded by urban systems when the need arises.

In concentrating on those systems which can manage natural resources information at the rural county level, we believe this survey fulfills a currently unmet need.

Every effort has been made to identify and contact all vendors/developers of GISs, but the results are, of course limited to those who responded to this survey.

The results of the survey represent the

state-of-the-art of available systems at the time the survey was completed (June, 1985). However, computer technology is changing rapidly and vendors are bringing new systems on line every day. We have made every effort to release these results in a timely fashion and recognize that additional and/or improved systems will undoubtedly be forthcoming in the near future.

A Long-term Strategy for Technology Transfer

This report is an initial product of a proposed multi-year effort to assist local jurisdictions to assemble existing resource information and to acquire and utilize GIS technologies. Later phases of the project will focus on:

- evaluating systems in local decisionmaking environments
- Establishing standards for systems applications in rural counties
- Establishing systems in counties with varying natural resources bases and policy needs
- Technology transfer, training and support with emphasis on county-level problem-solving
- Demonstrating methodologies for technical assistance for systems development and support to rural governments by federal and state agencies

A basic premise underlying this strategy is our conviction that GISs must be installed within the county, not at a facility off-site so that users will have "hands-on" access to the system for day-to-day decisions. We firmly believe that in this way, public policy will be more specific, thus more legally defensible, and also more innovative. Such conservation policies are indeed in growing demand. A recent survey, (Toner, 1985) shows that state and local farmland protection programs have doubled since their first documentation by the National Agricultural Lands Study (NALS) in 1980 (USDA, 1980).

A Model to Define GIS Functions Needed to Assess the Agricultural Viability of Farms.

Specific attention is given in this report, to those functions in existing GISs which can be used to assess the viability of agricultural lands and farms and the importance of associated natural resources. For a comprehensive description of GIS capabilities, see (Clarke, 1983).

The Land Evaluation and Site Assessment (LESA) system (USDA, 1983; Wright et al, 1983) described by USDA provides a very convenient model to illustrate and define such requirements. Even the effective application of LESA itself requires capabilities of a GIS. Early in 1982, the need for automation of LESA systems was recognized in Clarke County, Virginia when the LESA system was used to establish a single, 23,000-acre Agricultural District. Mapping work alone for the Land Evaluation component of LESA required 115 hours. Indeed, the Utah State Department of Agriculture is using a LESA-related system, UCLES (see Appendix IV) which is not a GIS, but which facilitates evaluations of agricultural lands.

While LESA is designed primarily for use at the local level, it is flexible enough to accommodate needs at the regional or state level as well. In all cases, however, LESA evaluations require integration of multiple data sets for single site analyses as well as analysis of other complicated elements in a broad network of off-site factors that affect the viability of farms. For example, the Land Evaluation (LE) component requires data on land capability classification, identification of important farmlands (Prime, Unique, Statewide and Locally Important Farmlands), soil productivity and soils potential ratings. All of these are derived from SCS soil surveys and from soils interpretations, also known as SOILS-5 or SOILS-6 data.

The Site Assessment (SA) component of LESA must account for factors - other than soils - that contribute to the suitability of an area for agricultural use. (e.g., percentage of area adjacent to the site in agricultural uses, size of farm, agricultural support system, etc.). The evaluation is further complicated by the need to assign different weights to various data sets determined locally.

Dissecting LESA to Derive GIS Functions

In order to focus upon those GISs which could be

most effectively used in rural counties, functions needed by a GIS in applying LESA to agricultural lands were selected from a typical LESA system (Appendix II) and used to design the survey instrument (Appendix III) used for this report. For glossaries of definitions, see (Barr, 1983; Clarke, 1983; and Tessar, 1980).

SURVEY METHODOLOGY AND RESULTS

In order to achieve the broadest possible number of contacts, a two-stage survey process combining a public information program with direct mailing of questionnaires was used for this study.

Brochure

A brochure describing the purpose of the project was included with all questionnaires. In addition to outlining the objectives of the survey, the brochure also included a brief description of a GIS, identified some applications of such systems for natural resources planning and management, and requested assistance in identifying GIS software and users. This brochure provided a convenient means of distributing information about the study to the survey population and to others making inquiries about the project.

Announcements in Newsletters

In order to save costs in directly contacting the several thousand local units of policymakers - (e.g., local governments, Soil and Water Conservation Districts local and State Parks, and wildlife conservation areas) in an effort to notify as many people as possible about the study, press releases were sent to several newsletters representing societies or groups having an interest in the use of computer-based technologies or in planning at local levels.

Announcements were included in Urban and Regional Information Systems Association (URISA) News, The Western Planner, Resources Development Journal, The National Association of Conservation District's Tuesday Letter, the National Association of State Departments of Agriculture's Farmland Notes, and the National Association of Counties' County News. All provoked useful contacts.

The Preliminary Survey

A Preliminary Survey (Appendix I) was sent to more than 1,523 individuals believed to be either possible contributors of information about systems developers and/or vendors and also about users of GISs. The list was supplemented by approximately 500 personal and professional contacts and others identified in a previous survey by the KARS Program of natural resources data bases at state levels of government (University of Kansas, 1984). These included:

- USDA Soil Conservation Service (SCS) State Conservationists
- State Departments of Agriculture
- State offices of the National Associations of Counties
- Non-Profit Farmland Protection Organizations
- County Planning Directors
- Representatives of federal agencies involved in, or concerned with natural resources
- Members of several professional organizations including the Urban and Regional Information Systems Association (URISA), the Association of American Geographers (AAG), American Planning Association (APA), and the American Society for Photogrammetry and Remote Sensing, (ASPRS).

This survey was designed to:

(1) Identify individuals developing or selling GIS software
(2) Identify users of GIS software
(3) Request assistance in identifying other individuals who might be developing or using GIS software
(4) Inform others who might be interested in this work

The questionnaire was kept brief to enhance the return rate. Each questionnaire was mailed with a personalized letter requesting a response, a brochure. and a stamped, self-addressed envelope in which to return the survey to the KARS program. Whenever referrals were made, copies of the preliminary survey and accompanying materials were mailed to these individuals as well.

Unreturned surveys indicated that the individual contacted either had no information or was not interested in the project.

All contacts were documented and maintained in a computerized file for follow-ups (for example, date questionnaire was mailed, telephone conversations, and follow-up contacts).

Responses to the Preliminary Survey

Table I describes the groups surveyed to identify systems, the sources used for mailing lists, and the responses received from each group.

PRELIMINARY SURVEY RESPONSES

GROUP SURVEYED	Contact Source	Response Category: Sell, Develop GISs	Use GISs	Plan to Use	No GIS, Keep on Mailing	Delete From Mailing	Response Total	Total Surveyed	% Response
(1) State Conservationists	SCS[1]	0	2	15	28	1	46	51	90
(2) State Departments of Agriculture + some Soil and Water Commissions	NASDA[2]	0	0	6	25	2	33	54	61
(3) Tribal Councils	BIA[3]	0	2	9	47	0	58	347	17
(4) State Associations of Counties	NACo[4]	0	0	0	5	1	6	48	10
(5) County, Regional Planning Offices	APA,PROF[5]	0	49 (24)*	81	178	11	319	700	46
(6) Private, Non-profit Conservation Organizations	NASDA[6]	0	0	5	27	3	35	86	36
(7) State Cartographers		0	0	0	4	0	4	4	100
(8) Others - Individuals at Universities, State/Federal Offices, Private Organizations	PROF	---113---				3	426	1100	39
VENDORS		--- 84--- ---(54)**							64
Totals		---218---		167	417	21	928	2023	46

* On review, 24 non-urban jurisdictions likely had GISs

** Responded to follow-up survey Described 61 software packages

[1] Soil Conservation Service
State Conservationists mailing list
[2] National Association of State Departments of Agriculture
Mailing List
[3] Bureau of Indian Affairs, Department of the Interior
Tribal Council Mailing List
[4] National Association of Counties
State Associations Mailing List
[5] American Planning Association and other Professional Associations
[6] National Association of State Departments of Agriculture
Directory of Conservation Organizations (1984)

Table I. Responses to the Preliminary Survey

Nine hundred and twenty-eight individuals responded to the preliminary questionnaire, or to newsletter articles describing the project. Only 21 (2%

of those surveyed) asked to be deleted from the mailing list. In most cases this was because they identified themselves as being inappropriate contacts.

Though the responses to the preliminary survey were primarily used to find users and producers of GISs, the distribution of responses among categories 1 through 6 do suggest that GIS technologies are rather widely understood and used among agencies of the federal government, and that planning and technical staff at the local level are greatly interested in acquiring GIS capabilities.

By far, the greatest response (90%) was received from State Conservationists offices of the Soil Conservation Service, USDA. Two offices (in New York State, and Oklahoma) reported they are using GISs, but it was of great interest to us that another 15 state Conservationists plan to use GISs in the future. Further, SCS has recently established GIS Coordinators in each State office to oversee and provide technical support in using this capability in the work of their local offices.

We are most encouraged that six State Departments of Agriculture plan to use GISs, and it is particularly interesting to us that five private conservation organizations indicated they are planning to acquire GIS capabilities also.

Of course, we can only generalize from this survey since there is a possibility that we may not have contacted individuals who are most knowledgeable about agency programs.

County-level Users

While this survey suggests that local planning staff contacted through APA and other professional associations are generally aware of GIS technologies and applications, the greatest need to extend GIS technologies appears to be among local elected officials.

A review of the 49 surveys returned by local jurisdictions showed that only 24 were indeed using natural resources-based systems of the kind described here. The remainder were either judged to represent highly urbanized/metropolitan counties -among the 22

jurisdictions employing large computer systems/software and consequently outside the scope of this study, or had responded erroneously (e.g., identified spreadsheet or word processing software packages).

Systems used by the seventeen counties who responded to a follow-up survey are included in this report. Even though our survey may have missed a number of local jurisdictions, the fact that only 24 non-urban governments out of the 3,041 counties, 16,734 townships and 6,232 Natural Resources Special Districts in the country (Bureau of the Census, 1982 definitions) have acquired GISs, underscores the great need to address their special requirements.

A more detailed report describing systems and their applications in these local jurisdictions will be published later.

DETAILED SURVEY OF GIS SOFTWARE

Designing the Detailed Survey

In order to acquire detailed information about Geographic Information Systems software identified through the Preliminary Questionnaire, a follow-up survey was developed (Appendix III). This survey addresses the following aspects of each software package:

(1) General information, including availability, cost, user friendliness, training options, and related information;
(2) Operating environment, including any computers upon which the software has been successfully installed, operating system of the computer, and a list of required or optional data storage devices, peripheral hardware, and specialized software; and
(3) Capabilities, including data entry, editing, retrieval and analysis, graphic/cartographic output, and other display options.

To keep the survey to a manageable length, it was not possible to include questions for more than a representative number of GIS software features. For a detailed description of GIS Capabilities, see (Clarke, 1983). The purpose of this survey was to characterize the software sufficiently so that potential users might understand the range of capabilities that exist, and could at least begin narrowing down choices on the basis of these capabilities.

Questions were designed to represent those of importance to local level decisionmakers who need to be able to evaluate the agricultural significance of their natural resources. All questions in the survey were phrased as a user might ask them (i.e., they were non-technical). Respondents were encouraged to provide additional information regarding unique features of their software which may not have been addressed by the survey.

The following functions derived from the LESA model (Appendix II) were included in the survey questions.

- Sort attributes based on a specific value
- Locate data attributes within a specific area
- Calculate distance between two points
- Summarize attributes by cell or polygon
- Compute statistics by collection of cells or polygons
- Compute statistics by interactively entered data
- Nearest neighbor analysis
- Proximity analysis
- Summarize the number of points within a polygon
- Calculate slope from elevation data
- Calculate length of slope
- Define boundaries of watershed based on topographic data
- Computer number of acres within specified parcel or group of parcels
- Selectively assign different weights to different data (layer) categories as an indication of varying importance
- Coincidence, union, exclusion, multiple exclusion operations
- Overlay (polygon or grid)

Please note that not all of these capabilities are necessarily required to implement LESA. This list merely represents those functions that may be used to conduct various analyses for the site assessment component based on a single, rather than a comprehensive scenario.

These analytical capabilities, matched with examples of applications were incorporated into the survey (Appendix III), and used to characterize the Geographic Information Systems software (Appendix IV).

Identifying the Vendors

A review of the 113 contacts identified as developers and vendors in the preliminary survey showed that 84 were likely to be actually producing GIS software. Detailed surveys were sent to these 84 contacts, and 54 were returned describing 61 individual software packages. Most of the other responses indicated they were either not actually producing GIS packages, but may in the future, or simply did not respond.

Information from these surveys was compiled into tables included in Appendix IV.

In addition, a Directory of Developers/Vendors responding to this survey is included in Appendix V. Some known systems developers who did not respond to this survey are not included in this directory since it was not possible to document their systems' capabilities.

WHAT DECISIONMAKERS IN RURAL COUNTIES SHOULD LOOK FOR IN GISs

Given the systems' capabilities documented here, and using the demographic, agricultural and economic profiles we developed for non-metropolitan, agriculturally significant counties described above, we devised several minimal but realistic criteria which should be applied by rural jurisdictions in selecting GISs which may meet their needs:

(1) Low cost - a basic, fully functional system (hardware and software) should sell for no more than $40,000. Such a system should minimally provide digitizing, interactive color display, data storage and hardcopy output capabilities.

(2) Full GIS capabilities - The system should not be designed simply for automated mapping, but should allow at a minimum, overlaying of multiple data sets, spatial modeling and area measurement. Furthermore, all functions should be generic (i.e., not be restricted to any particular application). It should have sufficient data storage capability on tapes or hard disc to handle "county-size" data sets at operationally required resolutions.

For example, the average county encompasses 12 USGS quad sheets (approximately 600 square miles). The most detailed soils surveys can contain up to 3,000 polygons per 'quad' sheet. Digitizing by the line segment method requires 4 megabytes of memory per quad or a total of 50 mBytes of storage (Gale TeSelle, SCS; personal communication) for the average sized county. However, much greater memory capacities than those currently available on hard disks are expected to be available in the near future. Alternatives to waiting include cell digitizing with 1-2-acre resolution. This can cut both memory and digitizing costs for the user.

(3) Packaged in an Integrated System - The system should be sold "off-the-shelf" as a unit (hardware and software) requiring no exceptional expertise for assembly and operation. Maintenance and service should be easily available, and no unusual operating environment should be required.

(4) Flexibility - The system should lend itself to enhancement through the purchase of additional software modules and/or hardware, implementation of special models developed "in-house" or via contract, and networking.

(5) High Quality Graphics - The system should possess graphics capabilities (color and black and white) of sufficient quality needed for day-to-day decisionmaking, for publication, and for public and administrative presentations.

(6) User-friendly Operation - The system should not require operators to have a background in computer science in order to be used effectively.

Why Micro-computers?

Systems costs are a major controlling factor for rural governments. This could effectively limit present applications to micro-computer-based systems although future developments in "micro-mini's" may bring the latter systems within economic reach of rural governments.

What Are Counties Using Now?

Collectively, the seventeen counties responding to our survey employed the following software packages:

(1) IRIS GIS by IRIS International Inc.
(1 multi-county area)
(2) AUTOGIS by Autometric, Inc.
(1 county)
(3) BLISSMAP by Bliss Associates
(2 counties)
(4) COMPIS by Comarc Systems
(1 county)
(5) ARC/INFO by Environmental Systems Research Institute (2 counties)
(6) AERI by Environmental Systems Research Institute (1 county)
(7) IMGRID by Harvard University
(2 counties)
(8) MSDAMP by Iowa State University
(1 county)

(9) Computer Aid for Planning Programs (CAPP)- A package developed in-house
(1 county)
(10) Site Evaluation Location System (SELS)
(1 county)
(11) Geographics by Werle & Associates
(2 counties)
(12) Custom Installations
(2 counties)

Two of these package (AERI and IMGRID) were early versions of newer packages and are no longer supported. One, (SELS) is not a GIS but was developed as a business package. One system (CAPP), was developed in-house and is not available. One, MSDAMP, is not reviewed in this survey because our contact did not respond. Other systems are custom installations.

This leaves 7 commercially available systems in use by 10 counties. The great majority of these counties are metropolitan communities with populations greater than 100,000. Only 2 fall within our profile outline for agricultural counties based on population alone. Neither of these are using micro-based systems, however. More detailed descriptions of applications of these systems will be published at a later date.

Computer Hosts

Nearly all of the GIS software packages listed above are installed on mini-computers or mainframes. Where mainframes served as the host computer, the county frequently accessed the system external to its offices. Only one system in use -GIS-100- is a micro-based system. This was acquired only recently and is under development. One county reported they are also planning to acquire an ERDAS GIS (see Appendix IV) in the near future.

These findings, and many discussions with vendors and local officials, have helped us identify three major obstacles to broader systems applications among local jurisdictions. These are:

(1) high systems costs
(2) lack of technical understanding among local governments, and
(3) failure by systems suppliers (vendors) to link systems capabilities with natural resource

-based policy needs.

Increasingly, systems which can be installed on microcomputers are being developed. While none of these systems has all of the capabilities needed at the local level, they deserve particular attention due to costs benefits and because they should become a particular focus for more specific improvements by vendors.

What is Available for Implementation on Micro-computers?

Sixteen GIS software packages which may be installed on micro-computers have been identifed by this survey. They are:

(1) GIS-100 by Aeronca Electronics, Inc.
(2) AUTOGIS by Autometric, Inc.
(3) Comarc family (CIMS, COMPIS and GDMS) by Comarc Systems
(4) LANDTRAK by Criterion, Inc.
(5) ERDAS GIS and Image Processing System by Earth Resources Data Analysis Systems
(6) A GIS Overlay for RIPS Image Processing System
(7) STRINGS by Geobased Systems
(8) Professional Map (pMAP) by Spatial Information Systems
(9) Intergraph family (DTM, GPPU, GDU) by Intergraph Corporation
(10) PRO/GIS by St. Regis Paper Company
(11) MICRO/GIS by Towson State University
(12) Geographics by Werle and Associates
(13) Un-named package developed by the University of Iowa
(14) Map and Image Processing System (MIPS) by the University of Nebraska-Lincoln
(15) MicroSieve by Utah State University
(16) Areal Design and Planning Tool (ADAPT) by W.E. Gates and Associates

Complete summaries of these software packages are contained in Appendix IV. Some features of these systems of particular interest are summarized in Tables IIA - IIC.

It is clear that not all of the software packages

for which surveys were completed are capable of performing certain spatial data analysis functions which may be needed for applications in natural resources conservation and management. For example, several packages are not able to perform overlay and analysis of multiple map layers. Nevertheless, these packages have been included in our data compilation because many of them provide capabilities adequate for certain applications - frequently at a very affordable price.

Though several micro-computer-based systems currently being marketed appear to meet many of the six general criteria listed above, no one system presently appears to have all of the attributes that may be needed. In addition, optimal combinations of data base management and overlaying capabilities of polygonally- and cell-derived digital data sets have not reached degrees of sophistication of existing mini-computer and mainframe-based systems. By every indication however, vendors are expressing interest in addressing these needs.

We believe that this publication will help rural and other local officials to evaluate syystems which might meet some of their needs. It cannot, however substitute for direct contact with systems vendors. Reciprocally, the speed with which systems suppliers address the potential local level micro-computer-based GIS market will depend on the demand generated for such systems that such better understanding could generate.

The tremendous growth of local agricultural conservation programs (Toner, 1985) enacted since the National Agricultural Lands Study inventory (USDA, 1980) together with the new "Sodbuster", "Conservation Reserve" and "Swampbuster" conservation provisions likely to be adopted in the 1985 Farm Bill shows that the need for GIS capabilities at the local level has never been greater.

We hope that this survey will help to extend the necessary dialogue between systems suppliers and all potential users of Geographic Information Systems.

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: OPERATING ENVIRONMENTS

SOURCE/SOFTWARE	COMPUTER	OPERATING SYSTEM	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE *
Aeronca Electronics, Inc. GIS-100	IBM PC, PC/XT, PC/AT and compatibles		256 k	Data Storage: OPTIONAL - Disc drive; tape drive. Peripheral Hardware: REQUIRED - Manual (point select or stream) digitizer; dot matrix printer; RGB (color) monitor; color board, PC mouse and monochrome display/printer adapter; OPTIONAL - interface being developed for VGS-300 video digitizer; pen plotter. Specialized Software: OPTIONAL - Digitizing, data base management, plotting and statistical packages.
Autometrics, Inc. AUTOGIS	Data General (all models) VAX 11/730, 750, 780 Hewlett-Packard 9000 Series 200 and 500	AOS or AOS/VS VMS UNIX (Bell)	Data General - 32 k words VAX - 128 k words HP 9000 - 256 k words (virtual)	Data Storage: REQUIRED - Disc drive (30 mb minimum). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Manual (point select or stream) digitizer [Altek, Calcomp, Hitachi, or Summagraphics]; pen plotter [Calcomp, Zeta, Houston Instruments, Hewlett Packard, or Gerber; electrostatic printer [Versatec]; color image display [Lexidata, Seiko, Tektronix 4115B]. Specialized Software: REQUIRED - Data base management and plotting packages (part of AUTOGIS); OPTIONAL - Digitizing package (part of AUTOGIS); statistical package (SPSS or SAS interfaces available).
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Data General (all models including micros)	RDOS, AOS, AOS/VS	512 k	Data Storage: REQUIRED - Disc drive; OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Manual (point select or manual) digitizer [Calcomp, Hitachi]; pen plotter; color image display [Tektronix 4100 series]; various monochromatic graphic CRTs. Specialized Software: None
COMPIS	Data General (all models including micros) IBM 30xx and 43xx [PLN module only]	RDOS, AOS, AOS/VS VM/CMS, MVS/TSO	512 k	Data Storage: REQUIRED - Disc drive (any size). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Pen plotter [Calcomp, Hewlett Packard, Zeta]; dot matrix printer; electrostatic printer [Versatec]; color image display [Tektronix 4100 series; or Jupiter]; various line printers; wide variety of alphanumeric terminals; various monochromatic graphic CRTs. Specialized Software: OPTIONAL - Text editor [Data General]; sort/merge [Data General].
Geographic Data Management System (GDMS)	Data General (all models including micros) IBM 30xx and 43xx PRIME 32-bit series VAX Series	RDOS, AOS, AOS/VS VM/CMS, MVS/TSO PRIMOS VMS	1 mb	Data Storage: REQUIRED - Disc drive. OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Pen plotter [Calcomp, Hewlett Packard, Zeta]; dot matrix printer; electrostatic printer [Versatec]; color image display [Tektronix 4100 series; or Jupiter]; various line printers; wide variety of alphanumeric terminals; various monochromatic graphic CRTs; IBM PC/XT as graphics CRT. Specialized Software: OPTIONAL - Communications software (if IBM PC/XT is used).
Criterion, Inc. LANDTRAK[c]	VAX 11/7xx PRIME IBM IBM PC/AT (available July 1985)	VMS PRIMOS VM/CMS, MVS/TSO	.5 mb	Data Storage: REQUIRED - Disc drive (40 mb); tape drive Peripheral Hardware: REQUIRED - Color image display [Tektronix 41xx, Ramtek 621I, or IBM PC with additional hardware/software]; OPTIONAL - Manual (point select) digitizer, pen plotter [Tektronix 4662]; dot matrix printer [Tektronix 4695]. Specialized Software: None.

* Required for practical use of the GIS software

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: OPERATING ENVIRONMENTS (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Spatial Information Systems Professional MAP (pMAP)	Design environment: IBM PC family		256 k	Data Storage: REQUIRED - Disc drive (5 1/4-inch floppy minimal; 10+ mb hard disc preferred). RAM drive memory and 8087 or 80287 co-processor recommended. Peripheral Hardware: REQUIRED - Dot matrix printer. OPTIONAL - Digitizer (any with x,y flag format and interface to disc); pen plotter; electrostatic printer; color image display; color board. Specialized Software: OPTIONAL - Digitizing package (included in pMAP); data base management package (interfaces under development for d-BASE); plotting package (Golden software -included in pMAP); TelePaint Color Graphics (interfaces under development).
St. Regis Paper Company PRO/GIS	DEC PRO 350 DEC PRO 380	P/OS P/OS	512 k	Data Storage: REQUIRED - Disc drive (5, 10 or 33 mb). Peripheral Hardware: REQUIRED - Digitizer (manual - point select). OPTIONAL - Pen plotter; dot matrix printer; color image display. Specialized Software: REQUIRED - Data base management package [Datatrieve].
Towson State University MICRO/GIS	Apple II	DOS 3.3/PRODOS	64 k	Data Storage: REQUIRED - Two disc drives. Peripheral Hardware: OPTIONAL - Digitizer (manual - point select); pen plotter; dot matrix printer. Specialized Software: None
Uni-Graphic Systems, Inc. Geographics	Tektronix 6000 family IBM PC - software development	UNIX (full); MS DOS optional MS DOS (testing)	Tek 4054 - 64 k 6000 UNIX - 1 mb	Data Storage: Disc drive (40 mb standard with processor) [Tektronix]; tape drive (streaming tape). Peripheral Hardware: Digitizer (manual - point select) [Calcomp 9000]. REQUIRED - Pen plotter [Calcomp series or Hewlett Packard]. OPTIONAL - Dot matrix printer; electrostatic printer [Tektronix 4611 for storage tube displays]; color board [Tektronix]; ink jet copier [Tektronix]. Specialized Software: OPTIONAL - Software development d-BASE III (current part of report package).
University of Iowa (Un-named)	IBM PC/XT	DOS 2.0	256 k	Data Storage: REQUIRED - Disc drive (10 mb hard disc). Peripheral Hardware: OPTIONAL - Digitizer (manual - point select or stream). Specialized Software: REQUIRED - Plotting package [BALO].
University of Nebraska - Lincoln Map and Image Processing System (MIPS)	IBM PC/XT Generic Z80/S100 Bus	PC DOS 2.1 CPM 2.2	IBM PC/XT - 256 k; Z80 - 64 k	Data Storage: REQUIRED - 1.2 mb floppy disc drive. OPTIONAL - 10 mb fixed disc drive; tape drive (1600 bpi open reel). Peripheral Hardware: REQUIRED - Digitizer (24 x 36" flatbed, manual - point select or stream); pen plotter (24 x 36"); color image display; color board [CAT 400 for Z80; Vectrix Model 384 for IBM PC]. OPTIONAL - Dot matrix printer; electrostatic printer. Specialized Software: REQUIRED - Digitizing package; plotting package. OPTIONAL - Statistical package; math library; CONVOLUTION.
Utah University Micro Sieve	Apple II+ (e)	DOS 3.3	--	Data Storage: None Peripheral Hardware: OPTIONAL - Digitizer [Apple Graphics Tablet]; dot matrix printer [Epson (xx)80-supported]. Specialized Software: None

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: OPERATING ENVIRONMENTS (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Earth Resources Data Analysis Systems ERDAS-GIS and Image Processing System PC KIT and Turnkey System	IBM PC/AT, PC/XT Data General MV-Series VAX PDP-11 Prime Gould (SEL)	PC-DOS AOS/VS VMS RSX-11M Primos UNIX	256 k	Data Storage: OPTIONAL - Disc drive (10 -260 mb on the ERDAS PC); tape drive (9-track) Peripheral Devices: REQUIRED - High-resolution RGB image display; color board [ERDAS 512 x 512 x 32-bit; ERDAS 1024 x 1024 available; Gould FD5000 and IP8000 series]. OPTIONAL - Digitizer (flatbed or drum scanner [Calcomp 2'x3'; 3'x4' tablets], video digitizer [ERDAS 512 x 512 x 8-bit], manual - point select); high resolution film writer hard copy, 35 mm, 4"x5", 8"x10" prints; color ink jet printer. Specialized Software: OPTIONAL - Digitizing package [ERDAS Polygon Digitizing], data base management package [ERDAS interface to ARC/INFO and MOSS]; plotting package; statistical package.
GeoGraphics A GIS Overlay for RIPS*	Cromenco IBM PC version (under development by Spectral Data Corporation)	C-DOS	As per RIPS	Data Storage: [Dependent upon CPU] Peripheral Hardware: OPTIONAL - Manual digitizer (stream) [GeoGraphics Digitizing Board Digitizer]; color image display [Spectral Data hardware] Specialized Software: Digitizing package [GeoGraphics Drafting Board Digitizer].
Geobased Systems STRINGS™	PDP 11/73 VAX 11/7xx IBM PC/AT	RT-11 VMS DOS	64 k	Data Storage: REQUIRED - Disc drive (20 mb). OPTIONAL - tape drive. Peripheral Hardware: REQUIRED - Manual digitizer (point select or stream); pen plotter [Calcomp, Hewlitt Packard, or Houston Instruments]; color image display [Tektronix 41xx, or Advanced Electronics Design system]. OPTIONAL - dot matrix printer; electrostatic printer; alphanumeric terminal [VT100, VT220]. Specialized Software: REQUIRED - digitizing package, data base management package, plotting package, corridor generation, polygon analysis, edgematching (these are all components of the STRINGS GIS].
Intergraph Corporation Digital Terrain Model (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	VAX 11/730, 751, 780, 785 VAX MICROVAX II (when available)**	VMS IGDS/DMRS	--	Data Storage: REQUIRED - Disc drive; tape drive (several models offered). Peripheral Hardware: REQUIRED - Digitizer (flatbed or drum scanner, manual - point select or stream). OPTIONAL - pen plotter; dot matrix printer; electrostatic printer; color image display; scanner (several models offered). Specialized Software: REQUIRED - Digitizing package (map feature coding); data base management package [DMRS]; plotting package [IGDS]. OPTIONAL - Intergraph Grid Data Utilities (GDU); Intergraph Digital Terrain Modeling (DTM); Intergraph Graphics Polygon Processing Utilities (GPPU).

* Remote Image Processing System developed by the EROS Data Center (Sioux Falls, SD) and marketed by Spectral Data Corporation (Suite 1000, 1901 North Moore Street, Arlington VA, 22209).

**Scheduled for release mid-May 1985.

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: OPERATING ENVIRONMENT (Continued)

SOFTWARE/SOURCE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
W.E. Gates & Associates Areal Design and Planning Tool (ADAPT)	AMDAHL IBM (any mainframe) VAX (any system) PDP-15 IBM PC/AT COMPAQ HARRIS 700 APPLE (for analyses and modeling through downloading)	Per specific requirements Per specific requirements Per specific requirements Per specific requirements MSDOS MSDOS HARRIS VOS APPLE DOS	256 k	Data Storage: OPTIONAL - Disc drive (standard Winchester discs for microenvironments) (360 k); tape drive (only required with mainframe systems). Peripheral Hardware: REQUIRED - Pen plotter. OPTIONAL - Digitizer (manual - point select or stream); dot matrix printer; electrostatic printer; color image display; color board. Specialized Software: None

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SOFTWARE OVERVIEW

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS*	COMMENTS
Aeronca Electronics, Inc. GIS-100	Basic package: $8,000 Applications modules: $2-300/module	Currently available, for purchase	No	Free for first year; not determined for subsequent years	1	
Autometric, Inc. AUTOGIS	Entire package: $25,000 (includes AMS, MOSS, MAPS, COS, COLOR, RE-FORMAT, PROJECTION, and UTILITY) University price: $8,000	Currently available, for lease or purchase	90% is public domain	Subscription fee: $4,000/year	1	
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Basic package: $15-30,000 (depends on CPU)	Currently available, for lease or purchase	No	1% of purchase price per month	1	Map encoding system including update and display capacity can stand alone as automated mapping system
COMPIS	Varies by type of host CPU; has 3 modules: • PLN (Polygon Processing): $10-30,000 • TOPO (Elevation Data Processing): $5-15,000 • GRIDS (Raster Data Processing): $5-10,000	Currently available, for lease or purchase	No	1% of purchase price per month	1	Three independent analyses programs which use pre-encoded data
Geographic Data Management System (GDMS)	Basic package: $5-90,000 (depends on CPU); includes a report writer module	Currently available, for lease or purchase	No	1% of purchase price per month	1	
Criterion, Inc. LANDTRAK[c]	-- Not provided --	Currently available, for lease	No	10% of lease price per year	1	
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing System PC KIT and Turnkey System	Turnkey System IBM PC/XT: $20,290 Turnkey System IBM PC/AT: $21,835 ERDAS "Kit" (excludes IBM PC): $14,995 Other modules: • Image Processing Software Module: $3,900 • Color Hard Copy Software Module: $3,900 • Polygon Digitizing Software Module: $7,900 • Tapes Software Module: $9,800 • Video-Digitizing Module: $7,200 • Topographic Software Module: $3,900 • Software Tool Kit Module: $1,000	Currently available for lease or purchase (turnkey system or other machines)	No	Subscription fee: $2,000 per year	1	

* Ranked from 1 to 4, where 1 = most user-friendly, and 4 = least user-friendly

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SOFTWARE OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE		SOFTWARE SUPPORT	FRIEND-LINESS*	COMMENTS
GeoGraphics A GIS Overlay for RIPS	Basic package: $2,500	Currently available, for purchase	No	Available	3	
Geobased Systems STRINGS™	Basic package: $50-60,000	Currently available, for purchase (turnkey system or other machines)	No	Subscription fee: $2,400-4,000/year	1	
Intergraph Corporation Digital Terrain Model (DTM)	Basic package: $7,500 Other modules: IGDS and DMRS included with every system					
Graphics Polygon Processing Utilities (GPPU)	Basic package: $5,000 Other modules: IGDS and DMRS included with every system	Currently available, for purchase (turnkey system)	No	Subscription fee	2	
Grid Data Utilities (GDU)	-- Not provided -- Other modules: IGDS and DMRS included with every system					
Spatial Information Systems Professional MAP (pMAP)	Beta Test Version: $695; pMAP Version 2.0: $895	Beta Test Version available for purchase; pMAP Version 2.0 available October 1985	No	Not available except by phone for Beta Site users; may be users support in the future	1	pMAP is a microcomputer implementation of the Map Analysis Package (MAP) developed at Yale; the software is currently being evaluated at Beta Test Sites
St. Regis Paper Company PRO/GIS	-- No response --	Under development, for purchase (available December 1985)	No	Subscription fee: 10% of purchase price/ year	1	
Towson State University MICRO/GIS	To be determined	Under development, for purchase* (available Sept. 1985)		Provided as part of software cost	1	Software developed as an educational tool
Uni-Graphic Systems, Inc. Geographics	Entire package: $18,000 Or purchase each component separately: • Coordinate Geometry Program - $6,000 • Mapping Program - $6,000 • Report Maker - $6,000	Currently available, for purchase	No	Subscription fee: 12% of purchase cost/ year	1	Primarily developed as a parcel-based management system; developed by Werle and Associates
University of Iowa (Un-named)	Not applicable	Under development	No	Not available	3	Grid-cell software developed for suitability analysis; developed as an educational tool
University of Nebraska - Lincoln Map and Image Processing System (MIPS)	Not applicable	Under development	No	Not available	1	

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SOFTWARE OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE		SOFTWARE SUPPORT	FRIEND-LINESS*	COMMENTS
Utah State University MicroSieve	Entire package: $299	Currently available, for purchase	No	No response	1	
W.E. Gates & Associates Areal Design and Planning Tool (ADAPT)	Basic package: $50,000 Other modules: • 50+ programs and/or subroutines available; $500-1,000/module	Currently available, for lease or purchase	No	Subscription fee (all software is fully supported; levels and specific arrangements developed on case-by-case basis with each client)	2	

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SELECT FUNCTIONAL CAPABILITIES*

SOFTWARE/SOURCE	GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZED)	POLYGON DATA ENTRY	REMARKS	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL/POLYGON	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	NEAREST NEIGHBOR	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS IN A POLYGON	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAP LAYERS
Aeronca Electronics, Inc. GIS-100	Y 1/	N	Y 2/	1/Maximum size array upon which operations can be performed: no limit 2/Maximum # of polygons upon which operations can be performed: no limit [Method: whole polygon (line, point)]	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Autometrics, Inc. AUTOGIS	Y 1/		Y 2/	1/Maximum size array upon which operations can be performed: no limit 2/Maximum # of polygons upon which operations can be performed: no limit [Method: arc/node]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Y 1/	Y 1/	Y 2/	1/Digitize as polygons, then convert to grids 2/Maximum # of polygons upon which operations can be performed: 3,000+ [Method: arc/node]						(SEE COMPIS AND GDMS)								
COMPIS	(SEE CIMS)				Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Geographic Data Management System (GDMS)	(SEE CIMS)				N	Y		Y	Y	N	N	Y	Y	Y	N	Y	Y	N
Criterion, Inc. LANDTRAK	N	N	Y 1/	1/Maximum # of polygons upon which operations can be performed: no limit [Method: node at every bend]	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N	Y

* Y = Yes
N = No
Blank = No response

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SELECT FUNCTIONAL CAPABILITIES (Continued)

SOFTWARE/SOURCE	GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZED)	POLYGON DATA ENTRY	REMARKS	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL/POLYGON	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	NEAREST NEIGHBOR	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS IN A POLYGON	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAP LAYERS
Towson State University MICRO/GIS	Y[1/]	Y[1/]	Y[2/]	1/Maximum size array upon which operations can be performed: 40 x 40 2/Maximum # of polygons upon which operations can be performed: 100 [Method: arc/node]	N	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y
Uni-Graphic Systems, Inc. Geographics	N	N	Y[1/]	1/Maximum # of polygons upon which operations can be performed: limited on basis of hardware configuration [Method: arc/node]	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	Y	Y
University of Iowa (Un-named)	Y[1/]	Y	Y[2/]	1/Maximum size array (test version): 25 x 25 2/[Method: point dictionary (converting to chain-node)]	N	Y	Y	N	N	N	Y	Y	N	N	Y	Y	Y	Y
University of Nebraska - Lincoln Map and Image Processing System (MIPS)	N	Y[1/]	Y[1/]	1/Maximum size array, # of polygons: virtual system limited only by recording media	Y	Y	N	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y
Utah State University Micro Sieve	N	Y[1/]	N	1/Maximum size array upon which operations can be performed: 280 x 192	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y
W.E. Gates & Associates Areal Design and Planning Tool (ADAPT)	Y[1/]	Y[1/]	Y	1/Maximum size array upon which operations can be performed: no limit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

MICROCOMPUTER-BASED GEOGRAPHIC INFORMATION SYSTEMS: SELECT FUNCTIONAL CAPABILITIES (Continued)

SOFTWARE/SOURCE	GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZED)	POLYGON DATA ENTRY	REMARKS	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL/POLYGON	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	NEAREST NEIGHBOR	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS IN A POLYGON	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAP LAYERS
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turnkey System	Y 1/	Y 1/	Y 2/	1/Maximum size array: upon which operations can be performed: no limit (only constraint is data storage) 2/Maximum # of polygons upon which operations can be performed: no limit [Method: polygon (map coordinates)]	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
GeoGraphics A GIS Overlay for RIPS	Y 1/	Y 1/	Y	1/Maximum size array upon which operations can be performed: 256 x 240	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y			
Geobased Systems STRINGS™	N	N	Y 1/	1/Maximum # of polygons upon which operations can be performed: no limit [Method: arc/node]	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Intergraph Corporation Digital Terrain Model (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Spatial Information Systems Professional MAP (pMAP)	Y 1/	Y 1/	Y 2/	1/Maximum size array upon which operations can be performed: 100 x 100 2/[Method: line segment defined as (x , y , F), (x , y , F), etc.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
St. Regis Paper Company PRO/GIS	N	Y 1/	Y 2/	1/Maximum size array upon which operations can be performed: limited by disc space 2/Maximum # of polygons upon which options can be performed: limited by disc space	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

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APPENDIX I

Preliminary Questionaire

Please note changes to your address, if necessary.

A SURVEY OF GEOGRAPHIC INFORMATION SYSTEMS FOR LOCAL GOVERNMENTS

The University of Kansas Applied Remote Sensing (KARS) Program is conducting a survey designed to identify geographic information systems either currently in use, or potentially suitable for use, in local units of government (e.g., counties, wildlife refuges, state/national parks). *Of special interest are systems that are:*

- Low in cost,
- Microcomputer-based,
- User friendly, and
- Capable of producing high quality graphics

A *Geographic Information System (GIS)*, as defined here, is a system which allows one to store geographically-referenced data in digital (numerical) format, and to automatically retrieve, overlay and update such data. GIS's provide users with a capability to analyze complex spatial interrelationships in a cost-effective manner (see brochure for details).

We would like to request your help in identifying both geographic information systems software and applications at local levels:

(1) SOFTWARE - *If you design, develop or sell geographic information systems software, we would like to request information about it.*

(2) APPLICATIONS - If you are a GIS user, please indicate which GIS software you use and your primary application(s).

If you have doubts about whether your software/system is of interest to us, please assume that it is.

Please return the completed survey in the stamped self-addressed envelope attached. We may be contacting you again in the near future to acquire additional information. *We will be pleased to send you a summary of results at the completion of the project* (Spring 1985).

Thank you for your help. If you have any questions, please contact any one of the individuals listed below.

Loyola M. Caron, Project Manager
James W. Merchant, Andrew Norton,
or Debora Stewart
Kansas Applied Remote Sensing (KARS) Program
University of Kansas Space Technology Center
2291 Irving Hill Drive - Campus West
Lawrence, Kansas 66045-2969
Telephone: (913) 864-4775

KARS

---

1. *Please check the most appropriate response:*

☐ I/We develop or sell GIS software. *(Please complete Part A below)*

☐ I/We use GIS software for resource management, planning or other applications. *(Please complete Part B on opposite side)*

☐ I/We do not currently use GIS techniques, but plan to in the near future. *(Please turn to question #2)*

☐ I/We do not use GIS techniques, but would like to be retained on your mailing list to receive a summary of the results of your survey. *(Please turn to question #2)*

A. *If you develop/sell GIS software, please provide the following information:*

NAME OF GIS SOFTWARE: _____

(Please attach descriptive materials, if available)

NAME OF PERSON TO CONTACT: _____

TITLE: _____ TELEPHONE: _____

(Over)

B. *If you use GIS software for resource management, planning or other applications, please provide the following information:*

NAME OF GIS SOFTWARE USED AND SOURCE/VENDOR: _____

_____

PRIMARY APPLICATION(S) OF THE SYSTEM: _____

_____

GEOGRAPHIC AREA COVERED: _____

NAME OF PERSON TO CONTACT: _____

TITLE: _____ TELEPHONE: _____

2. *We are also interested in learning about others (outside of your office) who are developing or implementing geographic information systems techniques. Could you please provide names and addresses for anyone with whom you are acquainted, that we might contact for information about their systems?*

NAME: _____ TELEPHONE: _____

ADDRESS: _____

_____

_____

NAME: _____ TELEPHONE: _____

ADDRESS: _____

_____

_____

NAME: _____ TELEPHONE: _____

ADDRESS: _____

_____

_____

(Please attach additional sheets, if necessary)

APPENDIX II

Analytical Functions Required to Implement
the Land Evaluation Site Assessment (LESA) Model

ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO

The LESA model depends on the integration of multiple data sets and analysis of complex spatial interrelationships. The evaluation is further complicated by the need to assign different weights to various classes of data, on the basis of local considerations. The system is difficult to implement manually. This analytical tool was evaluated by KARS staff in an effort to determine the unique analytical functions which might be required to implement the model in an automated fashion. A discussion of this evaluation is included below.

Functional Capabilities Required to Implement Various Aspects of the LESA Model. LESA consists of two parts. The Land Evaluation part rates the soils of a given area and places them into groups ranging from the best to the worst suited for a stated agricultural use (i.e., cropland, forest land, or rangeland). A relative value is determined for each group: the best group is assigned a value of 100 and all other groups are assigned lower values. The land evaluation is based on data from the National Cooperative Soil Survey.

Site Assessment identifies important factors other than soils that contribute to the quality of a site for agricultural use. Each factor selected is stratified into a range of possible values in accordance with local needs and objectives. Total site assessment points for a site will range from 0-200. The criteria considered in this portion of LESA may vary from one community to the next, reflecting local values and differing policies. The total number of both Land Evaluation and Site Assessment points (0-300) represents the agricultural economic viability of the site in question, and can be used to compare sites.

Our evaluation of the LESA model focused on the Site Assessment portion (Stewart and Norton, 1985). The following factors have been used in several committees for assessing sites (USDA, 1983). (Local committees may, however, identify other factors. Consequently, any of the items listed below may or may not be needed/used in the design of a particular LESA system).

(1) Land Use/Agricultural - percentage of area in agricultural use within [x] miles; percentage of site farmed in [x] of the last [x] years; land use adjacent to the site.

(2) Agricultural Economic Viability - size of farm; agricultural support system (infrastructure); land ownership; onsite investments (barns, storage, conservation measures, etc.); impact of proposed conversion on retention of other farmland and the agricultural infrastructure; conservation plan.

(3) Land-Use Regulations and Tax Concessions - zoning for site; zoning for area around site; use of agricultural value assessment or other tax benefits; agricultural districts (right-to-farm legislation).

(4) Alternatives to Proposed Use - unique siting needs for proposed use; suitability of site for proposed use; availability of less agriculturally productive lands with similar attributes for proposed use; number of undeveloped and suitable alternative sites; need for additional land for proposed use.

(5) Impact of Proposed Use - compatibility of proposed use with surrounding existing land uses; impact on flooding; impact on wetlands; impact on historical areas; impact on recreation and open spaces; impact on cultural features; impact on unique vegetation; impact on water quality.

(6) Compatibility with Comprehensive Development Plans - local, municipal and county; regional; economic/social importance of proposed use to the community.

(7) Urban Infrastructure - distance to urban area; central water-distribution system (within [x] miles); central sanitary sewerage system (within [x] miles); investment for urban development; transportation; distance to other urban infrastructure (job centers, schools, shopping, etc.); emergency services.

It is significant that (1) some communities may choose to include only a few of these factors in their site assessment; (2) availability of data will be a primary consideration influencing the manner in which the analysis proceeds, and (3) the method in which each factor is addressed bears tremendously upon the analytical capabilities required to deal with the factor (e.g., evaluation of floodprone areas on the basis of existing maps and/or personal knowledge, vs. development of another model to assess the potential for flooding; clearly, the approach used for defining floodprone areas will influence the analytical capabilities required for arriving at a map of such areas).

In short, it is clear that the strategies (based on needs, data availability, and method) chosen for developing the Site Assessment portion of LESA may vary so greatly from one community to the next that it is not possible to generalize the exact nature of analytical capabilities required to implement this portion of the model. Consequently, our evaluation focused on a possible scenario which a county or community might elect to implement. Each of the factors itemized previously for possible inclusion in the Site Assessment was reviewed in light of likely existing (source) data available for the assessment, and possible strategies for deriving the desired information (see accompanying table). In general, the following analytical functions required to derive the desired information were identified on the basis of the scenario set forth:

- Sort attributes based on a specified value
- Locate data attributes in a specified geographic area
- Calculate distance from one point to another
- Summarize attributes by cell or polygon
- Compute statistics by collection of cells or polygons
- Compute statistics by interactively entered area
- Nearest neighbor analysis
- Proximity analysis
- Summarize number of points within polygon
- Calculate slope from elevation data
- Calculate length of slope
- Define boundaries of watershed based on topographic data
- Compute number of acres within specified parcel or group of parcels
- Selectively assign different weights to different categories as an indication of varying importance
- Coincidence, union, exclusion, multiple exclusion operations
- Overlay (polygon or grid)

In addition to these capabilities, the scenario calls for merging of tabular data, access and merging of census files with the spatial data base and other data entry functions. Please note that not all of these capabilities are necessarily required to implement LESA. This list merely represents functions that may be used to conduct various analyses for site assessment, based on a single, rather comprehensive, scenario. These analytical capabilities were incorporated into the survey developed for characterizing geographic information systems software.

For a more complete discussion of the functional capabilities of GIS software which a user may wish to take into consideration, refer to Clarke (1983).

NATIONAL LAND EVALUATION AND SITE ASSESSMENT SYSTEM
-- ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO* --

SITE ASSESSMENT FACTOR	SOURCE DATA[1/]	ANALYTICAL FUNCTION(S)
Percent of area in agricultural use within [x] miles	Area	- Compute statistics by interactively entered area - Nearest neighbor search
Percent of site farmed in [x] of the last [x] years	Area	- Overlay (polygon or grid): add two or more maps - Compute statistics by collection of cells or polygons
Land use adjacent to site	Area	- Overlay (polygon or grid) - Compute statistics by interactively entered area - Summarize attributes by cell or polygon - Nearest neighbor search
Size of farm	Area, tabular	- Summarize attributes by cell or polygon - Compute statistics by collection of cells or polygons - Compute the number of acres within specified parcel or group of parcels - Merge tabular data
Agricultural support system	Area, point	- Calculate distance from one point to another - Nearest neighbor search - Proximity analysis - Overlay (polygon or grid)
Land ownership	Area, tabular	- Compute statistics by collection of cells or polygons - Compute statistics by interactively entered area - Sort on specified value - Merge tabular data
Onsite investment	Tabular	- Merge tabular data - Summarize attributes by cell or polygon - Compute statistics by collection of cells or polygons

*This scenario was developed to illustrate the diversity of analytical functions that may be used to implement the Site Assessment portion of the Land Evaluation and Site Assessment (LESA) model. (Refer to the text for additional discussion.)

SOURCE: Modified from "Data and Analysis Requirements for a LESA Modeled Geographic Information System Based on User Needs," working paper by D. L. Stewart and P. A. Norton, University of Kansas, 1985.

[1/]Source data were described as areal, linear, point or tabular.

NATIONAL LAND EVALUATION AND SITE ASSESSMENT SYSTEM
-- ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO --
(Continued)

SITE ASSESSMENT FACTOR	SOURCE DATA	ANALYTICAL FUNCTION(S)
Impact of proposed conversion on other farmland and the agricultural infrastructure	Area	- Selectively assign different weights to different categories as an indication of varying importance - Overlay (polygon or grid) - Compute statistics by interactively entered area
Conservation plan	Tabular	- Merge tabular data
Zoning for site	Area	- Overlay (polygon or grid)
Zoning for area around site	Area	- Overlay (polygon or grid) - Summarize attributes by cell or polygon - Compute statistics by interactively entered data
Use of agricultural value assessment or other tax benefits	Tabular, area	- Merge tabular data - Overlay (polygon or grid)
Agricultural districts -- right-to-farm legislation	Tabular, area	- Merge tabular data - Overlay (polygon or grid)
Unique siting needs for proposed use	--	--
Suitability of site for proposed use	Area	- Overlay (polygon or grid) - Coincidence, union, exclusion, multiple exclusion operations - Selectively assign different weights to different categories as an indicator of varying importance
Availability of less agriculturally productive lands with similar attributes for proposed use	Area	- Overlay (polygon or grid) - Coincidence, union, exclusion, multiple exclusion operations - Selectively assign different weights to different categories as an indicator of varying importance - Locate data attributes by area

NATIONAL LAND EVALUATION AND SITE ASSESSMENT SYSTEM
-- ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO --
(Continued)

SITE ASSESSMENT FACTOR	SOURCE DATA	ANALYTICAL FUNCTION(S)
Number of undeveloped and suitable alternative sites	Area	- Overlay (polygon or grid) - Selectively assign different weights to different categories as an indicator of varying importance - Locate data attributes by area
Need for additional land for proposed use	Area, tabular	- Overlay (polygon or grid) - Coincidence, union, exclusion, multiple exclusion operations - Locate data attributes by area - Compute statistics by collection of cells or polygons
Compatibility of proposed use	Area	- Overlay (polygon or grid) - Proximity analysis - Nearest neighbor search - Compute statistics by interactively entered area
Impact on flooding	Area	- Calculate slope from elevation data - Define boundaries of watershed based on topographic data - Compute number of acres within specified parcel or group of parcels - Overlay (polygon or grid)
Impact on wetlands	Area	- Overlay (polygon or grid) - Nearest neighbor search
Impact on historical areas	Point, line, area	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Summarize number of points within polygon - Compute statistics by collection of cells or polygons
Impact on recreation and open spaces	Area	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Compute statistics by collection of cells or polygons

NATIONAL LAND EVALUATION AND SITE ASSESSMENT SYSTEM
-- ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO --
(Continued)

SITE ASSESSMENT FACTOR	SOURCE DATA	ANALYTICAL FUNCTION(S)
Impact on cultural features	Point, line, area	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Summarize number of points within a polygon - Compute statistics by interactively entered area
Impact on unique vegetation	Point, area	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Summarize number of points within a polygon - Compute statistics by collection of cells or polygons
Impact on water quality	Tabular, point, area	- Overlay (polygon or grid): multiply two maps - Calculate distance from one point to another - Define boundaries of watershed based on topographic data - Proximity analysis - Merge tabular data
Compatibility with comprehensive development plans	Area, tabular	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Calculate slope from elevation data - Selectively assign different weights to different categories as an indication of varying importance - Merge tabular data - Access census files - Access Digital Elevation Models (DEMs)
Economic/social importance of proposed use to the community	Area, tabular	- Overlay (polygon or grid) - Selectively assign different weights to different categories as an indicator of varying importance - Merge tabular data - Access census files
Distance to urban area	Area, point, line	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Compute statistics by collection of cells or polygons - Calculate distance from one point to another - Summarize the number of points within a polygon

NATIONAL LAND EVALUATION AND SITE ASSESSMENT SYSTEM
-- ANALYTICAL FUNCTIONS REQUIRED TO IMPLEMENT SITE ASSESSMENT FACTORS: A SCENARIO --
(Continued)

SITE ASSESSMENT FACTOR	SOURCE DATA	ANALYTICAL FUNCTION(S)
Central water distribution system within [x] miles	Area, point, line	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Selectively assign different weights to different categories as an indication of varying importance - Compute statistics by collection of cells or polygons
Central sanitary sewerage system (within [x] miles)	Point, line, area	- Nearest neighbor search - Proximity analysis - Overlay (polygon or grid) - Selectively assign different weights to different categories as an indication of varying importance - Access Digital Elevation Models (DEMs) - Calculate length of slope - Calculate slope from elevation data - Compute statistics by collection of cells or polygons - Compute statistics by interactively entered area - Summarize number of points within polygon
Investment for urban development	Tabular	- Merge tabular data
Transportation	Point, line, tabular	- Merge tabular data - Nearest neighbor search - Overlay (polygon or grid) - Selectively assign different weights to different categories as an indication of varying importance - Compute statistics by collection of cells or polygons - Proximity analysis - Compute statistics by interactively entered area - Summarize number of points within polygon
Distance to other urban infrastructure (job centers, schools, shopping, etc.)	Area, point	- Nearest neighbor search - Proximity analysis - Overlay (polygon or grid) - Compute statistics by collection of cells or polygons - Selectively assign different weights to different categories as an indication of varying importance
Emergency services	Point, area	- Overlay (polygon or grid) - Nearest neighbor search - Proximity analysis - Compute statistics by collection of cells - Selectively assign different weights to different categories as an indication of varying importance

APPENDIX III

Survey of Geographic Information Systems Software

SURVEY OF GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE

NAME OF SOFTWARE: _____

SOFTWARE VENDOR/DEVELOPER:

[Place mailing label here]

Please note changes to your address, if necessary.

Date of response: _____

PART I: SOFTWARE AVAILABILITY/OVERVIEW

1. This software is:

   - ☐ Currently available: only as part of turnkey system
   - ☐ Currently available: for use on machines maintained by others
   - ☐ Under development (Date of availability: _____)
   - ☐ Not available (for in-house use only)

2. This software can be (check both if applicable):

   ☐ Leased ☐ Purchased

3. Is this software in the public domain?

   ☐ Yes ☐ No

4. Please attach a list of organizations which have acquired and are currently using this software.

5. Software support:

   - ☐ Is not available
   - ☐ Available through software support group: _____
   - ☐ Available for subscription fee (cost/year): _____
   - ☐ Other: _____

6. Documentation: *(Please send, if available)*

   ☐ Is available (please attach a copy) ☐ Will be available (Date of availability: _____)
   ☐ Is not available

7. On a scale of 1 to 4, please indicate the degree to which this software can be termed "user friendly" (circle one):

   1 = No special computer skills required to use software (e.g., menus provided, help features)
   2 = Experience with computers required in order to use all capabilities of the software
   3 = Programming skills required to use full capabilities of the software
   4 = Computer science background and knowledge of data structures required to implement software functions, expand capabilities of the software

8. Training:

   ☐ Available on-site (included in purchase cost)
   ☐ Available on-site for a fee
   ☐ Available at another location for a fee
   ☐ Not available
   ☐ Other:_____

9. Can this software be considered to be "application-specific" (e.g., developed exclusively to implement LESA model)?

   ☐ Yes (please specify application[s]):_____
   _____

   ☐ No

10. Was this software developed solely as an educational tool?

    ☐ Yes ☐ No

11. Cost of GIS software:

    Software (basic/core package):_____

    Additional modules (please list each module and its cost separately, if applicable):

    _____

    _____

    _____

    _____

    _____

    _____

PART II: OPERATING ENVIRONMENT OF GIS SOFTWARE

1. Computers on which the software has been or can be installed:

COMPUTER/MODEL	OPERATING SYSTEM

2. User access mode (check both if applicable):

☐ Interactive ☐ Batch

3. GIS (basic/core software) requires a memory of (bytes):_____

Questions 4 and 5 pertain to the basic hardware components required to make practical use of the software. Please identify any hardware that is essential or would be useful for implementing this software (check whether it is required or could be used). It is not necessary to list specific models unless substitutes are not readily available.

4. DATA STORAGE:

Required	*Could be Used*	*Please specify vendor/model, only if substitutes are not readily available*
		Disc Drive_____ Disc capacity required (bytes):_____
		Tape Drive_____

5. SPECIALIZED PERIPHERAL HARDWARE (check all that apply):

Required	Could be Used	
		Please specify vendor/model, only if substitutes are not readily available
		Digitizer (type/range of sizes):
		☐ Flatbed or Drum Scanner_____
		☐ Video Digitizer_____
		☐ Automatic Line Follower_____
		☐ Manual: Point Select (one cursor press = one point) _____
		☐ Manual: Stream (continuous data input based on time or space interval) _____
		☐ Other (please specify): _____
		Pen plotter:_____
		Dot matrix printer:_____
		Electrostatic printer:_____
		Color image display:_____
		Color board:_____
		Other:_____
		Other:_____
		Other:_____
		Other:_____

6. SPECIALIZED SOFTWARE: *Please check any of the software listed below which are required for practical use of the basic GIS software, or which could be used with the basic GIS software, if desired. Please be specific, or if several packages can be used, please list some of the more commonly used packages.*

Required	*Could be Used*	*Software Package(s) (Name/Vendor)*
		Digitizing package:
		Data base management package:
		Plotting (graphics) package:
		Statistical package:
		Math library:
		Other:
		Other:
		Other:
		Other:

PART III: FUNCTIONS AVAILABLE

The remainder of this survey is designed to characterize the capabilities of your GIS software. Feel free to add comments in the margin to clarify any item that you believe requires explanation.

A. DATA ENTRY

	Yes	No
(1)		

Can the user enter spatially referenced features (e.g., land cover parcels, transportation networks) from paper or mylar maps into the system?

If yes, please answer the following:

	Yes	No
(1a)		

Can the user enter grid-cell (raster) data into the system by manually encoding features registered to a superimposed grid?
If yes, please specify the maximum size array (rows, columns) upon which operations can be performed:

_____

(1b)		

Can the user enter grid-cell (raster) data into the system via a digitizing tablet?
If yes, please specify the maximum size array (rows, columns) upon which operations can be performed:

_____

(1c)		

Can the user enter polygon data into the system via a digitizing tablet?
If yes, please specify the maximum number of polygons upon which operations can be performed:_____
Please specify method (e.g., arc/node):

_____

(2)		

Can the software register spatial (map) data to a standard geographic coordinate system (e.g., State Plane Coordinates)?
Please specify systems:

_____

_____

(3)		

Can the user enter maps into the system via a scanning digitizer?

(4)		

Can the user merge tabular data (e.g., a land ownership record), referenced to a given coordinate system, to a base map already residing in the system?

(5)		

Can the user access GBF/DIME files and merge them with the spatial data base, without reformatting the files?

A. DATA ENTRY (continued)

	Yes	No	
(6)			Can the user access Bureau of the Census data files and merge them with the spatial data base, without reformatting the files?
(7)			Can the user access Digital Elevation Models, Digital Line Graphs, or other standard data products provided by the U.S. Geological Survey, and merge them with the spatial data base, without reformatting the files?

Other data entry capabilities (please specify):

_____

_____

_____

B. EDITING/UPDATING

	Yes	No	
(8)			Does the software have automatic error detection of map data entered into the system (e.g, software looks for unclosed polygons, detached grid cells, large x,y deviations)?
(9)			Can the user find and replace single records (either a map record or its associated attributes)?
(10)			Can the user change a map (e.g., merge adjacent polygons/cells, segment a census tract)?

Other editing/updating capabilities (please specify):

_____

_____

_____

C. DATA RETRIEVAL AND ANALYSIS (SPATIAL DATA)

	Yes	No	
(11)			Can the user convert polygon data structures into raster data structures?
(12)			Can the user sort attributes based on a specified value (e.g., sort land parcels by owner)?
(13)			Can the user locate data attributes in a specified geographic area (e.g., forested lands in Madison County)?
(14)			Can the user detect edges (e.g., define the perimeter of a reservoir)?
(15)			Can the user calculate the distance from one point to another (e.g., distance from one town to the next)?

C. DATA RETRIEVAL AND ANALYSIS (continued)

	Yes	No	
(16)			Can the user summarize attributes by cell or polygon (e.g., report all values for a specified parcel)?
(17)			Can the user compute statistics by collection of cells or polygons (e.g., compute average cost/acre of land in Madison County)?
(18)			Can the user compute statistics by interactively entered area (e.g., polygon or a circle around a point)?
(19)			Can the user conduct a "nearest neighbor" search (e.g., find the stock pond closest to a parcel of rangeland)?
(20)			Can the user conduct a proximity analysis (i.e., locate all rangeland within a specified distance of a stock pond)?
(21)			Can the user summarize the number of points within a polygon (e.g., number of oil wells within a specified tract)?
(22)			Can the user calculate slope from elevation data?
(23)			Can the user calculate the length of a slope?
(24)			Can the user define the boundaries of a watershed based on topographic data?
(25)			Can the user determine the aspect of slopes based on topographic data and its position on the landscape?
(26)			Can the user compute the number of acres or square miles of land within a specified parcel or group of parcels (e.g., number of acres of agricultural land within a county, number of acres covered by a body of water)?
(27)			Can the user selectively assign different weights to different categories as an indication of varying importance (e.g., one soil is three times more productive than another soil)?
(28)			Can the user change the size of the grid cell in order to generalize the data (i.e., aggregation of cells)?

Questions 29-32 pertain to functions that can be performed on single map layers.

	Yes	No	
(29)			Can the user perform AND (coincidence) operations (e.g., locate both forests and wetlands on a land cover map)?
(30)			Can the user perform NOT (exclusion) operations (e.g., locate all parcels of land which are non-agricultural)?
(31)			Can the user perform OR (union) operations (e.g., locate all parcels of land which are either federally or state-owned)?
(32)			Can the user perform NOR (multiple exclusion) operations (e.g., locate all parcels of land that are neither cropland nor rangeland)?

C. DATA RETRIEVAL AND ANALYSIS (continued)

Questions 33-35 pertain to functions that can be performed on multiple map layers.

	Yes	No
(33)		

Can the user overlay grid-cell (raster) data from two or more map layers and perform various operations relating these layers to each other?

If yes, please answer the following:

	Yes	No
(33a)		
(33b)		
(33c)		

(33a) Can the user ADD two or more maps together (e.g., add an archaeological site map to a land cover map)?

(33b) Can the user SUBTRACT two maps (e.g., subtract a proposed wildnerness area map from a map of lands designated for oil and gas exploration)?

(33c) Can the user MULTIPLY one map by another (e.g., multiply federally-owned land by forested land by access routes, to generate a map of areas open to the public for cutting firewood)?

	Yes	No
(34)		
(35)		

(34) Can the user calculate the shortest path from one point to another, given various limiting factors such as topography or other barriers (e.g., shortest route for a logging road)?

(35) Can the user perform "corridor analyses" (i.e., determination of the optimum route within a pre-specified corridor)?

Other retrieval and analysis capabilities (please specify):

_____

_____

_____

_____

D. GRAPHIC OUTPUT (Hard Copy)

	Yes	No
(36)		
(37)		
(38)		
(39)		

(36) Can the user generate histograms summarizing data?

(37) Can the user generate piecharts summarizing data?

(38) Can the user generate graphs and scatterplots showing various relationships between data?

(39) Can the user generate textual reports summarizing data?

Other types of graphic output (please specify):

_____

_____

E. CARTOGRAPHIC OUTPUT (Hard Copy)

	Yes	No	
(40)			Can the user produce a grid-cell (raster) map of the data?
(41)			Can the user produce a polygon map of the data?
(42)			Can the user generate maps at various scales?
(43)			Can the user select labels/titles for each map?
(44)			Can the user move, alter, and interactively blow-up a legend to be included on a map product?
(45)			Can the user request a neat line around a map, text or legend?
(46)			Can the user select symbols of different size and/or shape for point features on a map?
(47)			Can the user generate maps showing perspective views (e.g., view of a proposed scenic overlook from a specified point)?
(48)			Can the user draw a grid (e.g. tick marks) over a map?
(49)			Can the user portray synthetic relief (i.e., hill shading)?

Other types of cartographic output (please specify):

_____

_____

_____

_____

F. OTHER DISPLAY OPTIONS

	Yes	No	
(50)			Can the user select a subset of a map and zoom in on it?
(51)			Can a user interactively select points defining a new area for display (i.e., window)?
(52)			Can a user trim the display at its edges to fit a defined window?
(53)			Can the user merge (mosaic) adjacent maps for a specified data layer, and display them as a single map?

Other display options (please specify):

_____

_____

_____

_____

G. OTHER FEATURES/CAPABILITIES: *Please feel free to attach additional information describing other features or capabilities unique to this software package which have not been addressed in this survey.*

APPENDIX IV
Summary of GIS/Related Software

APPENDIX IV

Summary of GIS/Related Software

Part I: Software Overview

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS*	TRAINING OPTIONS	COMMENTS
(No Affiliation) Schools Enrollment Projection Systems	Dependent on cost of modifications required to transfer software	Available (modifications required), for purchase	No	Subscription fee: negotiated	2	Available on-site (included in purchase cost)	Developed for enrollment projections for Seattle Public Schools
Aeronca Electronics, Inc. GIS-100	Basic package: $8,000 Applications modules: $2-300/module	Currently available, for purchase	No	Free for first year; not determined for subsequent years	1	Available on-site or at another location for a fee	
Autometric, Inc. AUTOGIS	Entire package: $25,000 (includes AMS, MOSS, MAPS, COS, COLOR, REFORMAT, PROJECTION, and UTILITY) University price: $8,000	Currently available, for lease or purchase	90% is public domain	Subscription fee: $4,000/year	1	Available on-site (included in purchase price); also offer training at Autometrics in Fort Collins, Colorado	
Bliss Associates BLISSMAP	Entire package: $5,000 (includes installation)	Currently available, for lease or purchase	No	Included in purchase price	2	Available on-site (included in purchase price)	
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Basic package: $15-30,000 (depends on CPU)	Currently available, for lease or purchase	No	1% of purchase price per month	1	Available on-site or at another location for a fee	Map encoding system including update and display capacity can stand alone as automated mapping system
COMPIS	Varies by type of host CPU; has 3 modules: • PLN (Polygon Processing): $10-30,000 • TOPO (Elevation Data Processing): $5-15,000 • GRIDS (Raster Data Processing): $5-10,000	Currently available, for lease or purchase	No	1% of purchase price per month	1	Available on-site or at another location for a fee	Three independent analyses programs which use pre-encoded data
Geographic Data Management System (GDMS)	Basic package: $5-90,000 (depends on CPU); includes a report writer module	Currently available, for lease or purchase	No	1% of purchase price per month	1	Available on-site or at another location for a fee	
Criterion, Inc. LANDTRAK[c]	-- Not provided --	Currently available, for lease	No	10% of lease price per year	1	Available on-site for a fee	
ESL, Inc. GEOMIPS	Turnkey system: starts at $150,000; price for available software negotiated individually; Various modules under development or not available	Currently available, for purchase (turnkey system or other machines)	No	Subscription fee	Varies by module	Available on-site (included in purchase price); available on-site or at another location for a fee	

*Ranked from 1 to 4, where 1 = most user-friendly, 4 = least user friendly

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turnkey System	Turnkey System IBM PC/XT: $20,290 Turnkey System IBM PC/AT: $21,835 ERDAS "Kit" (excludes IBM PC): $14,995 Other modules: • Image Processing Software Module: $3,900 • Color Hard Copy Software Module: $3,900 • Polygon Digitizing Software Module: $7,900 • Tapes Software Module: $9,800 • Video-Digitizing Module: $7,200 • Topographic Software Module: $3,900 • Software Tool Kit Module: $1,000	Currently available for lease or purchase (turnkey system or other machines)	No	Subscription fee: $2,000/year	1	Available on-site or at another location for a fee	
Environmental Research Institute of Michigan ERDC GIS-200	Basic package: $60,000 Other modules: • Digital Image Processing Software: $20,000 • Landsat Geometric Correction Software: $20,000	Currently available, for lease or purchase	No	Subscription fee: $10,000/year	1	Available on-site (included in purchase cost); additional training available on-site, at another location, or in-house (ERIM) for a fee	
Environmental Systems Research Institute ARC/INFO	Basic package: $75,000 Other modules: • NETWORK: $15,000 • COGO: $10,000 • GRID: $30,000 • TIN: $20,000 (Discounts available when purchased as package)	Currently available, for purchase	No	Subscription fee: $8,200/year	1	Available on-site (included in purchase price)	
Environmental Systems Research Institute GRID, GRID/TOPO	Basic package: $30,000 (normally purchased with ARC/INFO - see above)	Currently available, for purchase	No	(Included with ARC/INFO)	1	Available on-site (included in purchase price)	
GIMMS, Inc. GIMMS	Entire package: $500 start-up fee, $1,000 per annum lease	Currently available, for lease only	No	Software support group (GIMMS, Inc.)	1	Available on-site for a fee	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
GeoGraphics A GIS Overlay for RIPS Image Processing System*	Basic package: $2,500	Currently available, for purchase	No	Available	3	Not available	
Geobased Systems STRINGS™	Basic package: $50-60,000	Currently available, for purchase (turnkey system or other machines)	No	Subscription fee: $2,400-4,000/year	1	Available on-site or at another location for a fee	
Geogroup GEO-BASEMAP	Basic package: $8,000	Currently available, for lease only	No	Subscription fee: $800/year	1	Available on-site or at another location for a fee	
Harvard University ODYSSEY Geographic Information System	Universities: $1,500 (one-time fee) Commercial/government: (available from Synercom Technology, Inc.**)	Currently available, one-time fee for universities; annual maintenance fee for commercial/government users	No	Subscription fee (through Synercom Technology, Inc.)	1	Not available from Harvard	
Hennepin County Bureau of Public Service UltiMap	Basic package (Interactive Graphics): cost not yet determined Other modules: • Demographic Modeling • Cadastral Mapping • DOMAIN Distributed DBMS Interface • Geoprocessing • Civil Engineering • Digital Terrain Modeling • Stereodigitizer Interface • Polymorphic Modeling • Network Processing	Under development, for lease or purchase (available last quarter 1985)	No	Subscription fee: to be determined	1	To be provided by marketing vendor	
Holguin Corporation HOLGUIN GIS	Basic package: $50-150,000	Currently available, for lease or purchase (turnkey system or other machines)	No	Subscription fee	2	Available on-site or at another location for a fee	
Interactive Systems Corporation AGIS/GRAMS	Basic package: $100,000 Other modules: • GRAM: $40,000	Currently available, for lease or purchase	No	Subscription fee	1	Available on-site for a fee	

* RIPS (Remote Image Processing System) is a microcomputer system for image analysis and display applications. RIPS, developed at the EROS Data Center, is marketed by Spectral Data Corporation, Suite 1000, 1901 North Moore Street, Arlington, VA 22209.

**ODYSSEY (commercial version) is marketed by Synercom Technology, Inc., 500 Corporate Drive, Sugarland, TX 77478.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
Intergraph Corporation Digital Terrain Model (DTM)	Basic package: $7,500 Other modules: IGDS and DMRS included with every system						
Graphics Polygon Processing Utilities (GPPU)	Basic package: $5,000 Other modules: IGDS and DMRS included with every system	Currently available, for purchase (turnkey system)	No	Subscription fee	2	Available on-site and in schools at Intergraph, depending on application	
Grid Data Utilities (GDU)	-- Not provided -- Other modules: IGDS and DMRS included with every system						
International Imaging Systems System 600 GIS Application Module	-- Not provided -- System 600 core module required; other modules: • System 600 Geographic Data Entry System (GDES) • System 600 Automated Mapping System (AMS) • System 600 Geographic Information System (GIS)	Currently available, for purchase	No	Subscription fee: $11,700/year	1	Available on-site or at another location for a fee	
Jefferson County Planning Computer Aid for Planing Programs (CAPP)	-- No response --	For in-house use (developed by local government but not distributed); could be made available	Yes	Not available	1	Not available	
Jet Propulsion Laboratory Image-Based Information System (IBIS)	Available through COSMIC*	Currently available, for purchase	Yes	Not available	3	Not available	IBIS is a subset of VICAR
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	Available through COSMIC*	Currently available, for purchase	Yes	Not available	1	Not available	
Lincoln Institute of Land Policy SOLIR	Basic package: $350 (one-week training course)	Currently available, for purchase	No	Lincoln Institute of Land Policy software support	1	Available at another location for a fee	
Metrex Systems Corp. MISAR	Not applicable	For in-house use only	No	Not available	4	Not available	Developed to extract and manipulate location and attribute data from Applicon

*COSMIC (Computer Software Management Information Center), University of Georgia, 112 Barrow Hall, Athens, GA 30601.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
Michigan Department of Transportation Environmental Information System	No charge to other State Departments of Transportation (DOTs)	Currently available to State DOTs	Yes	Not available	2	Not available; informal demonstration to interested parties	Developed for highway corridor evaluation
Minnesota Planning Information Center (PIC) Environmental Planning and Programming Language (EPPL)	Basic package: $500 Other modules: • PLOTMAP (dot matrix output program) - $100 • PENPLOT (requires Tektronix IGL)- $100; • DIGUP (digitizer interface) - $50; • RASPOLY (ARC/INFO interface) - $100	Currently available, for purchase	No	Consultation: $20/ hour + expenses	2	Available on-site or at another location for a fee	
Morgan Fairfield, Inc. MICRO-MAP II	Basic package: $650 (or buy half at $350)	Currently available, for purchase	No	Telephone	1	Not available	
NASA/Earth Resources Laboratory Earth Resources Lab-Applications Software (ELAS)	Basic package: $4,000* (from COSMIC*)	Currently available, for purchase	Yes	ELAS User Group	4	Available on-site or at another location for a fee	
National Park Service Systems Applications Geographic Information System (SAGIS)	Free	Currently available	Yes	Free of charge from Park Service	1	Free if willing to travel to Park Service site	
Pacific-Sierra Research Corporation (Un-named)	Not applicable	For in-house use only	No	Not available	3	Not available	Developed for mobile land target searches
Pennsylvania State University Task-Oriented Multi-Purpose Information System (TOMIS)	Entire package: $50 (cost of reproduction for 5 manuals and magnetic tape with 40 k lines FORTRAN source)	Currently available, for purchase	Yes	Consulting basis	2	Available on-site or at another location for a fee	
Planning Data Systems MULTIMAP	Basic package: $495 Other modules: • Map digitizing software: $400 when purchased with basic package	Currently available, for purchase	No	Available from Planning Data Systems with MULTIMAP package	1	Available on-site for a fee	

*COSMIC (Computer Software Management Information Center), University of Georgia, 112 Barrow Hall, Athens, GA 30601

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
Resources Planning Associates LOWLIB/GDBM/ENDECODE	Basic package: $2,500 (parts of this package are also licensed with MAPEDT, MAPOVL, RIVBAS and other RPA software)	Currently available, for purchase	No	Telephone consultation included with purchase; other support on fee basis	3	Available on-site or at another location for a fee	This package is offered separately as a software development tool kit. If offers menuing graphics support, tablet digitizer and joysticks support (not yet device dependent)
MAPEDT	Basic package: $750-1,500 (one-time license fee)	Currently available, for purchase	No	Telephone consultation included with purchase; other support on fee basis	1	Available on-site for a fee	Designed for compatibility with RPA's other software packages (RIVBAS, MAPOVL); limited programming skills required if user wants to merge MAPEDT capabilities into other applications packages
MAPOVL	Basic package: $750-1,500	Currently available, for purchase	No	Telephone consultation included with purchase; other support on fee basis	1	Available on-site or at another location for a fee	Limited programming skills required if user wants to merge into other applications packages
RIVBAS	Basic package: $7,500 (one-time license fee)	Currently available, for purchase	No	Telephone consultation included with purchase; other support on fee basis	1	Available on-site for a fee	Limited in application to river basin management and water resources modeling; RIVBAS allows users to integrate their own modeling capabilities into its interactive data base management system (some programming skills required); works with MAPEDT and MAPOVL
Riley Datashare International Micromap (and subset ADACS)	Basic package: $17,500 Other options: • ADACS: $12,500 • Form generator (includes data base management system): $5,000	Currently available, for lease or purchase	No	Subscription fee: $500/year	1	Available on-site for a fee	ADACS subset developed for assessment
Sammamish Data Systems Desktop Information Display System (DIDS)	Basic package: $1,500 Geographic Coordinate Files: • States/Counties: $100/state • Whole nation: $1,000 • States/MCD's: $250/state • SMSAs/Census Tracts: $25-$500 each • SMSAs/5-digit Zip Codes: $25-500 each • States/Rural 5-digit Zip Codes: $250/state	Currently available, for purchase	No	Telephone support; on-site consulting available	1	Available on-site for a fee	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS/ LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
SecaGraphics Mapping and Graphics Integrated System (M.A.G.I.C.)	Basic package: $65,500 (includes DRAFT/ROUTE/ DESIGN) Other modules: • MAGIC Track: $30,000 • MAGIC Care: $25,000	Currently available, for lease or purchase (turnkey system); portions under development (available 11-1-85)	No	Subscription fee: 1% of purchase price/ month	1	Available at SecaGraphics (included in purchase cost); available on-site for a fee	Software developed for cable, telephone and power industry
South Dakota State University Area Resource Analysis Systems (AREAS)	Entire package: cost of magnetic tape and computer time to create the tape	Currently available, for price of transferring programs	Yes	Limited support from Remote Sensing Institute	2	Available on-site for a fee	
Spatial Information Systems Professional MAP (pMAP)*	Beta Test Version: $695; pMAP Version 2.0: $895	Beta Test Version available for purchase; pMAP Version 2.0 available October 1985	No	Not available except by phone for Beta Site users; may be users support in the future	1	Available on-site or at another location for a fee	pMAP is a microcomputer implementation of the Map Analysis Package (MAP) developed at Yale; the software is currently being evaluated at Beta Test Sites
St. Regis Paper Company PRO/GIS	-- No response --	Under development, for purchase (available December 1985)	No	Subscription fee: 10% of purchase price/ year	1	Available on-site or at another location for a fee	
Strategic Locations Planning ATLAS AMP (Advanced Mapping Package)	Basic package: $449	Currently available, for purchase	No	Free telephone consultation	1	Not available	
System Development Corporation SDCIPS-GIS	Basic package: $15-30,000 object code (estimated)	Under development, for lease or purchase (available June 1985)	No	Available with licensing agreement	1,2	Available on-site or at another location for a fee	
Systemhouse, Ltd. Resource Analysis and Mapping System (RAMS)	Basic package: varies with CPU model (up to $50,000) [U.S. dollars]	Currently available, for purchase (turnkey or other machines)	No	Subscription fee: $500/month or $6,000/ year [U.S. dollars]	1	For operators: available on-site (included in purchase cost); For system managers: available in Ottawa (included in purchase cost)	New GIS product scheduled for release October 1985
Terra-Mar T-base	Basic package with a micro PDP 11/73: $35,000 (will accommodate up to 10 MicroImage workstations)	Under development, for purchase (available July 1985)	No	Terra-Mar MicroImage Users' Group; Subscrip- fee: 1.5% per month	1	Available on site for a fee	T-base is a data base management package; training is not necessary due to ease of use and comprehensive documentation
The Sidwell Company SIGNET™	-- No response --	Currently available, for lease only (turnkey system)	No	Subscription fee (to be determined)	1	Available on-site (included in the purchase cost)	

*Survey completed by Dr. Joe Berry, Yale University, on behalf of Dr. K. L. Reed, Spatial Information Systems.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE - OVERVIEW (Continued)

SOURCE/SOFTWARE	SOFTWARE COST	AVAILABILITY STATUS LEASE OR PURCHASE	PUBLIC DOMAIN	SOFTWARE SUPPORT	FRIEND-LINESS	TRAINING OPTIONS	COMMENTS
Towson State University MICRO/GIS	To be determined	Under development, for purchase (available Sept. 1985)		Provided as part of software cost	1	Available on-site for a fee	Software developed as an educational tool
U.S. Census Bureau TIGER	Not applicable	For in-house use only	Yes	Not available	4	Not available	System developed for the 1990 census and other Bureau requirements
Uni-Graphic Systems, Inc. Geographics	Entire package: $18,000 Or purchase each component separately: • Coordinate Geometry Program - $6,000 • Mapping Program - $6,000 • Report Maker - $6,000	Currently available, for purchase	No	Subscription fee: 12% of purchase cost/ year	1	Available on-site (included in purchase cost); extra per diem and travel	Primarily developed as a parcel-based management system; developed by Werle and Associates
University of California - Berkeley VIPERS	To be determined	Under development, for purchase	Yes	Available on time and materials basis	1	Available at another location for a fee	
University of California - Riverside SIPS	Entire package: $100	Currently available, for purchase	Yes	Not available	2	Not available	
University of Iowa (Un-named)	Not applicable	Under development	No	Not available	3	Not available	Grid-cell software developed for suitability analysis; developed as an educational tool
University of Massachusetts COMLUP/ILPP	Basic package: Universities: $500; Others: $1,000	Currently available, for purchase	No	Telephone consulting only	1,2	Available on-site for a fee	
University of Minnesota County Soil Survey Information System	Basic package: $150; Digitized county maps: cost of duplication	Currently available, for purchase	No	Available through developer	1	Available on-site	
University of Nebraska - Lincoln Map and Image Processing System (MIPS)	Not applicable	Under development	No	Not available	1	Available on-site or at another location for a fee	
Utah State University MicroSieve	Entire package: $299	Currently available, for purchase	No	No response	1	Not required	
W.E. Gates & Associates Areal Design and Planning Tool (ADAPT)	Basic package: $50,000 Other modules: • 50+ programs and/or subroutines available: $500-1,000/module	Currently available, for lease or purchase	No	Subscription fee (all software is fully supported; levels and specific arrangements developed on case-by-case basis with each client)	2	Available on-site (included in purchase cost); available on-site or at another location for a fee	
Yale University Map Analysis Package (MAP)	Entire package: $50	Currently available, for purchase	Yes	Not available	1	Available on-site or at another location for a fee	Developed as an educational tool, but several organizations use it as an operational system

APPENDIX IV

Summary of GIS/Related Software

Part II: Operating Environment

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE*
(No Affiliation) Schools Enrollment Project Systems	IBM 308x - 438x	MVS OS	500 k	Data Storage: REQUIRED - Disc drive (25 mb); tape drive (any 2400' reel). Peripheral Hardware: REQUIRED - Pen plotter. Specialized Software: REQUIRED - Digitizing package; plotting package; DIME-like graphics file.
Aeronca Electronics, Inc. GIS-100	IBM PC, PC/XT, PC/AT and compatibles		256 k	Data Storage: OPTIONAL - Disc drive; tape drive. Peripheral Hardware: REQUIRED - Manual (point select or stream) digitizer; dot matrix printer; RGB (color) monitor; color board, PC mouse and monochrome display/printer adapter; OPTIONAL - interface being developed for VGS-300 video digitizer; pen plotter. Specialized Software: OPTIONAL - Digitizing, data base management, plotting and statistical packages.
Autometrics, Inc. AUTOGIS	Data General (all models) VAX 11/730, 750, 780 Hewlett-Packard 9000 Series 200 and 500	AOS or AOS/VS VMS UNIX (Bell)	Data General - 32 k words VAX - 128 k words HP 9000 - 256 k words (virtual)	Data Storage: REQUIRED - Disc drive (30 mb minimum). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Manual (point select or stream) digitizer [Altek, Calcomp, Hitachi, or Summagraphics]; pen plotter [Calcomp, Zeta, Houston Instruments, Hewlett Packard, or Gerber; electrostatic printer [Versatec]; color image display [Lexidata, Seiko, Tektronix 4115B]. Specialized Software: REQUIRED - Data base management and plotting packages (part of AUTOGIS); OPTIONAL - Digitizing package (part of AUTOGIS); statistical package (SPSS or SAS interfaces available).
Bliss Associates BLISSMAP	VAX 11/780 Hewlett-Packard 3000	VAX/VMS MPE/3000	Less than 1 mb	Data Storage: REQUIRED - Disc drive (3 mb or more); OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Dot matrix printer or line printer. OPTIONAL - Color dot matrix printer. Specialized Software: REQUIRED - Sort/merge utility; Fortran compiler required if customization is desired. (Data base management package internal to software.)
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Data General (all models including micros)	RDOS, AOS, AOS/VS	512 k	Data Storage: REQUIRED - Disc drive; OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Manual (point select or manual) digitizer [Calcomp, Hitachi]; pen plotter; color image display [Tektronix 4100 series]; various monochromatic graphic CRTs. Specialized Software: None
COMPIS	Data General (all models including micros) IBM 30xx and 43xx [PLN module only]	RDOS, AOS, AOS/VS VM/CMS, MVS/TSO	512 k	Data Storage: REQUIRED - Disc drive (any size). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Pen plotter [Calcomp, Hewlett Packard, Zeta]; dot matrix printer; electrostatic printer [Versatec]; color image display [Tektronix 4100 series; or Jupiter]; various line printers; wide variety of alphanumeric terminals; various monochromatic graphic CRTs. Specialized Software: OPTIONAL - Text editor [Data General]; sort/merge [Data General].

*Basic components required to make practical use of the software.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Comarc Systems (cont.) Geographic Data Management System (GDMS)	Data General (all models including micros) IBM 30xx and 43xx PRIME 32-bit series VAX Series	RDOS, AOS, AOS/VS VM/CMS, MVS/TSO PRIMOS VMS	1 mb	Data Storage: REQUIRED - Disc drive. OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Pen plotter [Calcomp, Hewlett Packard, Zeta]; dot matrix printer; electrostatic printer [Versatec]; color image display [Tektronix 4100 series; or Jupiter]; various line printers; wide variety of alphanumeric terminals; various monochromatic graphic CRTs; IBM PC/XT as graphics CRT. Specialized Software: OPTIONAL - Communications software (if IBM PC/XT is used).
Criterion, Inc. LANDTRAK[c]	VAX 11/7xx PRIME IBM IBM PC/AT (available July 1985)	VMS PRIMOS VM/CMS, MVS/TSO	.5 mb	Data Storage: REQUIRED - Disc drive (40 mb); tape drive Peripheral Hardware: REQUIRED - Color image display [Tektronix 41xx, Ramtek 6211, or IBM PC with additional hardware/software]; OPTIONAL - Manual (point select) digitizer, pen plotter [Tektronix 4662]; dot matrix printer [Tektronix 4695]. Specialized Software: None.
ESL, Inc. GEOMIPS	VAX 11/750, 11/780 Hewlett-Packard 3000 (68, 48, 33)	VMS MPE IV, V	--	Data Storage: REQUIRED - Disc drive (400 mb minimum; 1.5 to 3.0 gbytes more useful); tape drive (6250/1600). Peripheral Hardware: REQUIRED - Color image display. OPTIONAL - Digitizer (flatbed or drum scanner, video, manual - point select, or Optronics scanner/recorder); pen plotter, dot matrix printer, electrostatic printer. Specialized Software: REQUIRED - Digitizing package [GES]; data base management package [Relate 3000 (for Hewlett Packard), INGRESS (for VAX)]; plotting package (internal); statistical package [MINITAB (for Hewlett Packard), BMPD (for VAX)]; IDIMS [note: these are all part of GEOMIPS]
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing System PC KIT and Turnkey System	IBM PC/AT, PC/XT Data General MV-Series VAX PDP-11 Prime Gould (SEL)	PC-DOS AOS/VS VMS RSX-11M Primos UNIX		Data Storage: OPTIONAL - Disc drive (10 - 260 mb on the ERDAS PC); tape drive (9-track) Peripheral Devices: REQUIRED - High-resolution RGB image display; color board [ERDAS 512 x 512 x 32-bit; ERDAS 1024 x 1024 available; Gould FD5000 and IP8000 series]. OPTIONAL - Digitizer (flatbed or drum scanner [Calcomp 2'x3'; 3'x4' tablets], video digitizer [ERDAS 512 x 512 x 8-bit], manual - point select); high resolution film writer hard copy, 35 mm, 4"x5", 8"x10" prints; color ink jet printer. Specialized Software: OPTIONAL - Digitizing package [ERDAS Polygon Digitizing]; data base management package [ERDAS interface to ARC/INFO and MOSS]; plotting package; statistical package.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Environmental Research Institute of Michigan ERDC GIS-200	PDP-11 series VAX-11 series	RSX-11M VMS	32 k (PDP 11)	Data Storage: REQUIRED - Disc drive (200-400 mb); tape drive. Peripheral Hardware: REQUIRED - Manual (point select) digitizer required [36 x 48" active surface, .001" resolution, plus or minus .005" accuracy, RS232 output]; color image display; color board. OPTIONAL - Pen plotter, dot matrix printer, electrostatic printer, precision film recorder, color graphics camera system and scanning digitizer optional. Specialized Software: OPTIONAL - Data base management package [DATATRIEVE-11, Oracle]; plotting package [e.g., Versatec].
Environmental Systems Research Institute ARC/INFO	VAX (all models) PRIME (all models) Data General (MV series) IBM	VMS PRIMOS VM/CMS	2 mb recommended	Data Storage: REQUIRED - Disc drive (100+ mb); tape drive (800/1600 bpi). Peripheral Hardware: REQUIRED - Digitizer (Tektronix flatbed or drum scanner, video, automatic line follower, manual - point select or stream). OPTIONAL - pen plotter, dot matrix printer, electrostatic printer, color image display, color board. Specialized Software: REQUIRED - Data base management package [INFO]. OPTIONAL - digitizing package; plotting package [IGL, GIMMS]; statistical package [SPSS, SAS, MINITAB].
Environmental Systems Research Institute GRID, GRID/TOPO	VAX (all models) PRIME	VMS PRIMOS	512 k	Data Storage: REQUIRED - Disc drive (100+ mb); tape drive (800/1600 bpi). Peripheral Hardware: OPTIONAL - Manual digitizer (point select); pen plotter, dot matrix printer, electrostatic printer, color image display, color film recorder Specialized Software: OPTIONAL - Digitizing package [ARC/INFO or GRIDAPPLE]; statistical package [MINITAB].
GIMMS, Inc. GIMMS	VAX IBM PRIME Burroughs Data General CDC CYBER	VMS/UNIX VM/* PRIMOS MCP AOS NOS	750 k	Data Storage: REQUIRED - Disc drive (2-5 mb); tape drive. Peripheral Hardware: OPTIONAL - Digitizer (flatbed or drum scanner, automatic line follower, manual - point select or stream); pen plotter; dot matrix printer; electrostatic printer; color image display; laser plotter; laser printer; photo head plotter. Specialized Software: OPTIONAL - digitizing package; data base management package [ORACLE, RAPPORT]; plotting package [e.g., Calcomp]; statistical package [SPSS, SAS, BMDP].
GeoGraphics A GIS Overlay for RIPS	Cromenco IBM PC version (under development by Spectral Data Corporation)	C-DOS	As per RIPS	Data Storage: [Dependent upon CPU] Peripheral Hardware: OPTIONAL - Manual digitizer (stream) [GeoGraphics Digitizing Board Digitizer]; color image display [Spectral Data hardware] Specialized Software: Digitizing package [GeoGraphics Drafting Board Digitizer].

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Geobased Systems STRINGS™	PDP 11/73 VAX 11/7xx IBM PC/AT	RT-11 VMS DOS	64 k	Data Storage: REQUIRED - Disc drive (20 mb). OPTIONAL - tape drive. Peripheral Hardware: REQUIRED - Manual digitizer (point select or stream); pen plotter [Calcomp, Hewlitt Packard, or Houston Instruments]; color image display [Tektronix 41xx, or Advanced Electronics Design system]. OPTIONAL - dot matrix printer; electrostatic printer; alphanumeric terminal [VT100, VT220]. Specialized Software: REQUIRED - digitizing package, data base management package, plotting package, corridor generation, polygon analysis, edgematching [these are all components of the STRINGS GIS].
Geogroup GEO-BASEMAP	Convergent Technologies Burroughs B20	CTOS BTOS	384 k	Data Storage: REQUIRED - Disc drive (12 mb). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Manual digitizer (point select) [Calcomp, Houston Instruments]. OPTIONAL - pen plotter (Hewlett Packard, HI, or Calcomp); dot matrix printer; electrostatic printer [Benson, Versatec]. Specialized Software: None.
Harvard University ODYSSEY Geographic Information System	VAX 11/780 IBM 360+	VMS CMS	Runs on virtual memory machine	Data Storage: REQUIRED - Disc drive (capacity dependent upon application). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Digitizer (manual - point select or stream); pen plotter; dot matrix printer; color image display [Tektronix 4027, Advanced Electronics Design 512]; direct view storage screen displays (monochrome) [Tektronix 40xx]. Specialized Software: OPTIONAL - digitizing package (as alternative to internal digitizing program); data base management package (Note: such packages are not directly interfaced to ODYSSEY.)
Hennepin County Bureau of Public Service UltiMap	Apollo DN300	Aegis	1.5 mb	Data Storage: REQUIRED - Disc drive (70 mb). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Digitizer (manual - point select). OPTIONAL - Pen plotter; electrostatic printer; color image display; COM plotter. Specialized Software: REQUIRED - Digitizing package [UltiMap Interactive Graphics (UMIGS)]. OPTIONAL - Data base management package [Apollo D3M]; plotting package [UMIGS]; statistical package [UltiMap Geoprocessing]; UltiMap Demographic Modeling; UltiMap Cadastral Mapping (required for Geoprocessing); UltiMap Civil Engineering; UltiMap Digital Terrain Modeling, Stereodigitizer Interface, Polymorphic Modeling, Network Processing.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Holguin Corporation HOLGUIN GIS	WANG VS (for GIS) WANG PC (for base mapping)	VS Wang PC	Runs on virtual memory machine	Data Storage: REQUIRED - Disc drive [Wang]; tape drive. Peripheral Hardware: OPTIONAL - Digitizer (flatbed) [Calcomp]; pe plotter; dot matrix printer; electrostatic printer; color image display. Specialized Software: REQUIRED - Digitizing package [Holguin]. OPTIONAL - Data base management package. (Note: plotting package *included in* HOLGUIN GIS.)
Interactive Systems Corporation AGIS-GRAMS	VAX family	VMS	Runs on virtual memory machine; software addresses 2.5-3.5 million bytes	Data Storage: REQUIRED - Disc drive. OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Digitizer (manual - point select); pen plotter; dot matrix printer; electrostatic printer color image display. Specialized Software: REQUIRED - Data base management package [RIM].
Intergraph Corporation Digital Terrain Model (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	VAX 11/730, 751, 780, 785 VAX MICROVAX II (when available)	VMS IGDS/DMRS	--	Data Storage: REQUIRED - Disc drive; tape drive (several *models offered*). Peripheral Hardware: REQUIRED - Digitizer (flatbed or drum scanner, manual - point select or stream). OPTIONAL - pen plotter; dot matrix printer; electrostatic printer; color image display; scanner (several models offered). Specialized Software: REQUIRED - Digitizing package (map feature coding); data base management package [DMRS]; plotting package [IGDS]. OPTIONAL - Intergraph Grid Data Utilities (GDU); Intergraph Digital Terrain Modeling (DTM); Intergraph Graphics Polygon Processing Utilities (GPPU).
International Imaging Systems System 600 GIS Applications Module	VAX 11/xxx	VMS	--	Data Storage: REQUIRED - Disc drive; tape drive. Peripheral Hardware: REQUIRED - Digitizer (flatbed or drum scanner, video, automatic line follower, manual - point select or stream); pen plotter. OPTIONAL - Dot matrix printer; electrostatic printer; color image display. Specialized Software: REQUIRED - Digitizing package [System 600 GDES]; plotting package [System 600 AMS]. OPTIONAL - Data base management package [Relational Tech. Inc. INGRES]; System 600 Earth Resources Module.
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Honeywell Level 66	Any Honeywell operating system	--	Data Storage: REQUIRED - Disc drive (15 mb minimum for software, data base work area) [Honeywell]; tape drive (for backup purposes only). Peripheral Hardware: None Specialized Software: REQUIRED - Math library [Honeywell utilities]; Honeywell Fortran. OPTIONAL - Statistical package [SPSS].
Jet Propulsion Laboratory Image-Based Information System (IBIS)	All IBM mainframes from 360 series on up	OS, VS	500 k	Data Storage: REQUIRED - Two disc drives (200+ mb); two tape drives. Peripheral Hardware: REQUIRED - Digitizer (manual - point select or stream). OPTIONAL - Dot matrix printer; color image display; digital photo hard copy device. Specialized Software: OPTIONAL - Digitizing package (function is stand-alone interface to system).

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	*OPERATING* SYSTEM(S)	*GIS MEMORY* REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	IBM mainframes	OS, VS	200 mb	Data Storage: REQUIRED - Disc drive (100 mb); tape drive. Peripheral Hardware: REQUIRED - Tektronix 4012 terminal or better. OPTIONAL - Dot matrix *printer; electrostatic* printer. Specialized Software: None
Lincoln Institute of Land Policy SOLIR	IBM PC/XT, PC/AT Radio Shack TRS 80 Model 16	MS-DOS 2.0, 3.0 TRS-DOS 4.2	128 k	Data Storage: *REQUIRED* - Disc drive (12 mb hard disc). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Digitizer (manual - point select) [HIPAD]; *pen plotter [Houston Instruments DMP-29,* Radio Shack 6-pen]. OPTIONAL - Dot matrix printer; electrostatic printer; color image display; color board. Specialized Software: None
MISAR Metrex Systems Corp.	Applicon 2D and 3D	Applicon 2D and 3D	--	NOT PROVIDED
Michigan Department of Transportation Environmental Information System	Burroughs 7700 (for data transformation, processing, graphic output) *Intergraph VAX 785* (for data collection, graphics)	MCP VMS, IGDS	Some modules require up to 300 k	Data Storage: REQUIRED - Disc drive (10 mb minimum); tape drive. Peripheral Hardware: REQUIRED - Digitizer (*manual - point* select or stream); pen plotter; color image display [DeAnza]. Specialized Software: REQUIRED - Digitizing package [Intergraph IGDS]; plotting package [GCS and DI3000 Calcomp].
Minnesota Planning Information Center Environmental Planning *and Programming* Language (EPPL)	PRIME 50 Series	PRIMOS Rev. 18 or 19	1 mb	Data Storage: REQUIRED - Disc drive; tape drive (required for loading the software and thereafter for data backup only). Peripheral Hardware: OPTIONAL - Digitizer (manual - point select); pen plotter; dot matrix printer; electrostatic printer; color image display; Tektronix 4010-style graphics CRT (requires IGL and PENPLOT). Specialized Software: REQUIRED - Fortran 66 or 77 or IV compiler. OPTIONAL - Plotting package [Tektronix IGL].
Morgan Fairfield, Inc. MICRO-MAP II	Apple II+ Apple IIe	DOS DOS	48 k	Data Storage: REQUIRED - Two disc drives. Peripheral Hardware: REQUIRED - Digitizer [Summagraphics Bit Pad One or Apple Graphics Tablet]; *color image display;* color board. OPTIONAL - Dot matrix printer. Specialized Software: None
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications *Software (ELAS)*	Perkin Elmer VAX PRIME Could SEL *PDP*	OS32 7.2 VMS PRIMOS MPX 32 RSX 11	140 k	Data Storage: REQUIRED - Disc drive (300 mb) [CDC]; tape drive [WANG CO Dual-Density]. Peripheral Hardware: REQUIRED - Digitizer (manual - point select) [ALTEK *or Summagraphics]*; dot matrix printer; electrostatic printer; color image display. Specialized Software: OPTIONAL - Statistical package [BMDP].

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
National Park Service Systems Applications Geographic Information System (SAGIS)	CDC CYBER (all models) VAX (under development)	NOS 2.2 VMS	150 k	Data Storage: REQUIRED - Disc drive (10 mb). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Any Tektronix PLOT 10-compatible device. OPTIONAL - Digitizer (flatbed or drum scanner, automatic line follower, manual - point select or stream); pen plotter; color image display. Specialized Software: None (all code built in; no extra software required).
Pacific-Sierra Research Corporation (Un-named)	Gould SEL	UNIX	Varies	Data Storage: REQUIRED - Disc drive. Peripheral Hardware: REQUIRED - Pen plotter. Specialized Software: REQUIRED - Plotting package.
Pennsylvania State University Task-Oriented Multi-purpose Information System (TOMIS)	Mainframe systems running FORTRAN		Adjustable	Data Storage: REQUIRED - Disc drive; tape drive. Peripheral Hardware: REQUIRED - Either a pen plotter or an electrostatic printer. OPTIONAL - Digitizer (manual - point select or stream); extremely helpful but not essential for implementing TOMIS. Specialized Software: OPTIONAL - Statistical package.
Planning Data Systems MULTIMAP	IBM PC, PC/XT, PC/AT and compatibles	MS-DOS	256 k	Data Storage: REQUIRED - Disc drive (360 k floppy - two drives). Peripheral Hardware: REQUIRED - Digitizer (manual - point select). OPTIONAL - Pen plotter; dot matrix printer; color image display; color board. Specialized Software: REQUIRED - Digitizing package, plotting package (both part of MULTIMAP). OPTIONAL - Data base management package [d-BASE, R-BASE, etc.]; statistical package [SPSS, SAS, Stat-Pak (micro), etc.].
Resources Planning Associates LOWLIB/GDBM/ENDECODE	VAX 11/7xx PDP 11	VMS RSX	--	Data Storage: OPTIONAL - Disc drive; tape drive. Peripheral Hardware: REQUIRED - Color image display [Advanced Electronics Design 767]. OPTIONAL - Digitizer (video, manual - point select or stream); dot matrix printer; electrostatic printer; Tektronix 4014 compatible terminal; can be adapted for other raster and vector displays. (Note: Package written in FORTRAN 77 following a SigGraph CORE-like modular structure. Adaptation for GKS compatibility is currently underway.) Specialized Software: None
MAPEDT	VAX 11/7xx PDP 11	VMS RSX	64 k; PDP 11 overlayed	Data Storage: REQUIRED - Disc drive (5-10 mb practically required). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Color image display [Advanced Electronics Design 767]. OPTIONAL - Digitizer (video, manual - point select or stream); dot matrix printer; electrostatic printer; adaptable to wide range of color display systems (GKS-compatible version scheduled for release). Specialized Software: OPTIONAL - RPA's RIVBAS, GDBM.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Resources Planning Associates (cont) MAPOVL	VAX 11/7xx PDP 11	VMS RSX	64 k; PDP 11 overlayed	Data Storage: OPTIONAL - Disc drive; tape drive Peripheral Hardware: REQUIRED - Color image display [Advanced Electronics Design 767]. OPTIONAL - Digitizer (video, manual - point select or stream, joysticks, trackballs, digitizing tablet for manual input); dot matrix printer; electrostatic printer; can be adapted to other display systems (written in FORTRAN 77 and is very modular). Specialized Software: OPTIONAL - RPA's MAPEDT, RIVBAS; requires part of RPA's software development tool-kit, which is included in the price.
RIVBAS	VAX 11/7xx PDP 11	VMS RSX	64 k; PDP 11 overlayed	Data Storage: REQUIRED - Disc drive (10 mb practical minimum). OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Digitizer (manual - point select or stream); color image display [Advanced Electronics Design 767]. OPTIONAL - Video digitizer; dot matrix printer; electrostatic printer; Tektronix 4014 compatible terminal. Specialized Software: OPTIONAL - RPA's MAPEDT, MAPOVL.
Riley Datashare, Intl. Micromap (and subset ADACS)	IBM PC/XT, PC/AT 100% IBM PC compatibles Compaq Portable Desk Pro	DOS 2.0 or better MS-DOS 2.0 or better MS-DOS 2.0 or better MS-DOS 2.0 or better	512 k	Data Storage: OPTIONAL - Disc drive (10+ mb); tape drive (streaming cartridge, for backup). Peripheral Hardware: REQUIRED - Digitizer (manual - point select or stream); pen plotter (hardcopy output for Micromap); dot matrix printer (hardcopy output for ADACS); color image display; color board [IBM color graphics adapter or compatible]; IBM enhanced color graphics adapter. Specialized Software: REQUIRED - Data base management package (for assessment) [KNOWLEDGE MAN]; plotting package (VDI device drivers for graphics printer output required for assessment); VDI device driver for chosen graphic adapter card.
Sammamish Data Systems Desktop Information Display System (DIDS)	IBM PC, PC/XT, PC/AT 100% IBM PC compatibles Zenith Z-100 TI Professional DEC Rainbow	PC-DOS 2.0, 3.0 MS-DOS ZDOS or MS-DOS MS-DOS MS-DOS	128 k minimum 256 k recommended	Data Storage: REQUIRED - Two floppy or hard disc drives (320 k). Peripheral Hardware: REQUIRED - Dot matrix color printer; color board [IBM PC Color Graphics Card, Plantronics, or equivalent]. OPTIONAL - Pen plotter [Hewlett Packard 7470, 7475, or 7550]. Specialized Software: OPTIONAL - Data base management package [d-BASE II or d-BASE III]; statistical package.
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	Alpha Micro	AMOS Under development for any UNIX-based operating system	5 mb storage; (approx. 384 k per module)	Data Storage: REQUIRED - Disc drive (30+ mb) [any Alpha Micro compatible]. OPTIONAL - Tape drive (any 9-track - a VCR could be used). Peripheral Hardware: REQUIRED - 4115 Tektronix display. OPTIONAL - Digitizer (manual - point select) [Summagraphics]; pen plotter [Hewlett Packard Series]; dot matrix printer; electrostatic printer. Specialized Software: REQUIRED - Data base management package [M.A.G.I.C. BASE]. OPTIONAL - Digitizing package [M.A.G.I.C. DRAFT]; plotting package [all M.A.G.I.C. programs]; statistical package [M.A.G.I.C. DESIGN]; math library [Alpha Micro O/S].

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
South Dakota State University Area Resource Analysis Systems (AREAS)	PRIME 400	PRIMOS	--	Data Storage: REQUIRED - Disc drive (312+ k). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Digitizer (manual - point select); pen plotter; dot matrix printer. Specialized Software: REQUIRED - Math library [PRIME vmathlb]. Digitizing package included in AREAS software.
Spatial Information Systems Professional MAP (pMAP)	Design environment: IBM PC family		256 k	Data Storage: REQUIRED - Disc drive (5 1/4-inch floppy minimal; 10+ mb hard disc preferred). RAM drive memory and 8087 or 80287 co-processor recommended. Peripheral Hardware: REQUIRED - Dot matrix printer. OPTIONAL - Digitizer (any with x,y flag format and interface to disc); pen plotter; electrostatic printer; color image display; color board. Specialized Software: OPTIONAL - Digitizing package (included in pMAP); data base management package (interfaces under development for d-BASE); plotting package (Golden software -included in pMAP); TelePaint Color Graphics (interfaces under development).
St. Regis Paper Company PRO/GIS	DEC PRO 350 DEC PRO 380	P/OS P/OS	512 k	Data Storage: REQUIRED - Disc drive (5, 10 or 33 mb). Peripheral Hardware: REQUIRED - Digitizer (manual - point select). OPTIONAL - Pen plotter; dot matrix printer; color image display. Specialized Software: REQUIRED - Data base management package [Datatrieve].
Strategic Locations Planning ATLAS AMP	IBM PC or 100% compatible	PC DOS 2.0 or higher	192 k	Data Storage: REQUIRED - One disc drive and one hard disc, or 2 disc drives. Peripheral Hardware: REQUIRED - RGB color graphics monitor or composite; color board [IBM, Plantronics]. OPTIONAL - Pen plotter [Hewlett Packard, IBM, Andek, Houston Instruments]; dot matrix printer [IBM PC-compatible]. Specialized Software: None
Systems Development Corporation SDCIPS-GIS	VAX 11/7xx series (floating point accelerator preferable) PDP 11 Series	VMS RSX-11M	Runs on virtual memory (minimum would be 1 mb; 2 mb recommended)	Data Storage: REQUIRED - Disc drive (30 k 512 byte blocks minimum; 300-500 mb preferable); tape drive (minimum 9-track 800/1600 bpi). Peripheral Hardware: OPTIONAL - Digitizer (flatbed or drum scanner, video, automatic line follower, manual or other); pen plotter; dot matrix printer; electrostatic printer; color image display; color board; film recorder (note: for each peripheral device added to the system, an interface program must be written). Specialized Software: OPTIONAL - Data base management package [INGRES, ORACLE, S1032, MISTRES]; plotting package [interface to ISSCO]; statistical package [SPSS, BMD, SASS]; math library [IMSL]; 3D Surface Generation [MOVIS, BYU].

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	Hewlett Packard 1000 65 Hewlett Packard 1000 A600, A700 A900	RTE-6NM RTE A RTE A RTE A	512 k	Data Storage: REQUIRED - Disc drive (50 mb+). OPTIONAL - Tape drive (9-track, 1600 bpi). Peripheral Hardware: OPTIONAL - Photogrammetric workstation or digitizing-editing workstation (must select one). Specialized Software: Ditigizing, data base management, plotting, and map generation packages included as part of RAMS. OPTIONAL - ISIF translators; programmatic access.
Terra-Mar T-base	PDP 11 (will interface with any computer via Ethernet)		512 k	Data Storage: REQUIRED - Disc drive (32 mb minimum). OPTIONAL - Tape drive. Peripheral Hardware: OPTIONAL - Digitizer (any type); pen plotter; dot matrix printer; electrostatic printer; color image display; color board. Specialized Software: OPTIONAL - Digitizing package; plotting package; statistical package; math library.
The Sidwell Company SIGNET™	VAX 11/730, 751, 780	VMS	--	Data Storage: REQUIRED - Disc drive; tape drive Peripheral Hardware: OPTIONAL - Digitizer (flatbed or drum scanner, automatic line follower, manual); pen plotter; electrostatic printer; color image display. Specialized Software: REQUIRED - Digitizing package [Intergraph IGDS]; data base management package [Intergraph DMRS]; plotting package [Intergraph]. OPTIONAL - Statistical package; math library.
Towson State University MICRO/GIS	Apple II	DOS 3.3/PRODOS	64 k	Data Storage: REQUIRED - Two disc drives. Peripheral Hardware: OPTIONAL - Digitizer (manual - point select); pen plotter; dot matrix printer. Specialized Software: None
U.S. Census Bureau TIGER	Univac 1100/74	Univac	--	NO RESPONSE
Uni-Graphic Systems, Inc. Geographics	Tektronix 6000 family IBM PC - software development	UNIX (full); MS DOS optional MS DOS (testing)	Tek 4054 - 64 k 6000 UNIX - 1 mb	Data Storage: Disc drive (40 mb standard with processor) [Tektronix]; tape drive (streaming tape). Peripheral Hardware: Digitizer (manual - point select) [Calcomp 9000]. REQUIRED - Pen plotter [Calcomp series or Hewlett Packard]. OPTIONAL - Dot matrix printer; electrostatic printer [Tektronix 4611 for storage tube displays]; color board [Tektronix]; ink jet copier [Tektronix]. Specialized Software: OPTIONAL - Software development d-BASE III (current part of report package).
University of California - Berkeley VIPERS	Data General NOVA 840 Data General ECLIPSE S/230	RDOS RDOS	64 k	Data Storage: REQUIRED - Disc drive (80 mb minimum); tape drive. Peripheral Hardware: REQUIRED - Color image display; standard line printer. OPTIONAL - Digitizer (manual - point select); dot matrix printer. Specialized Software: None

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
University of California - Riverside SIPS	IBM 4341 (originallly on an IBM 360-50) PRIME 750	MVS PRIMOS	220 k	Data Storage: REQUIRED - Disc drive. OPTIONAL - Tape drive. Peripheral Hardware: REQUIRED - Digitizer (manual - point select); pen plotter. Specialized Software: None
University of Iowa (Un-named)	IBM PC/XT	DOS 2.0	256 k	Data Storage: REQUIRED - Disc drive (10 mb hard disc). Peripheral Hardware: OPTIONAL - Digitizer (manual - point select or stream). Specialized Software: REQUIRED - Plotting package [HALO].
University of Massachusetts COMLUP/ILPP	CDC Cyber IBM 3033	NOS MVS SE2	140 k	Data Storage: REQUIRED - Disc drive (2.5 mg); tape drive. Peripheral Hardware: OPTIONAL - Digitizer (flatbed or drum scanner); pen plotter. Specialized Software: None
University of Minnesota County Soil Survey Information System	IBM PC	DOS 2.x	256 k	Data Storage: REQUIRED - Two disc drives (360 k). Peripheral Hardware: REQUIRED - Dot matrix printer; color image display [IBM (RGB) or compatible]; color board [IBM or compatible]. Specialized Software: None
University of Nebraska - Lincoln Map and Image Processing System (MIPS)	IBM PC/XT Generic Z80/S100 Bus	PC DOS 2.1 CPM 2.2	IBM PC/XT - 256 k; Z80 - 64 k	Data Storage: REQUIRED - 1.2 mb floppy disc drive. OPTIONAL - 10 mb fixed disc drive; tape drive (1600 bpi open reel). Peripheral Hardware: REQUIRED - Digitizer (24 x 36" flatbed, manual - point select or stream); pen plotter (24 x 36"); color image display; color board [CAT 400 for Z80; Vectrix Model 384 for IBM PC]. OPTIONAL - Dot matrix printer; electrostatic printer. Specialized Software: REQUIRED - Digitizing package; plotting package. OPTIONAL - Statistical package; math library; CONVOLUTION.
Utah University Micro Sieve	Apple II+ (e)	DOS 3.3	--	Data Storage: None Peripheral Hardware: OPTIONAL - Digitizer [Apple Graphics Tablet]; dot matrix printer [Epson (xx)80-supported]. Specialized Software: None
W.E. Gates & Associates Areal Design and Planning Tool (ADAPT)	AMDAHL IBM (any mainframe) VAX (any system) PDP-15 IBM PC/AT COMPAQ HARRIS 700 APPLE (for analyses and modeling through downloading)	Per specific requirements Per specific requirements Per specific requirements Per specific requirements MSDOS MSDOS HARRIS VOS APPLE DOS	256 k	Data Storage: OPTIONAL - Disc drive (standard Winchester discs for microenvironments) (360 k); tape drive (only required with mainframe systems). Peripheral Hardware: REQUIRED - Pen plotter. OPTIONAL - Digitizer (manual - point select or stream); dot matrix printer; electrostatic printer; color image display; color board. Specialized Software: None

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: OPERATING ENVIRONMENT (Continued)

SOURCE/SOFTWARE	COMPUTER(S)/MODEL	OPERATING SYSTEM(S)	GIS MEMORY REQUIREMENT	SPECIALIZED HARDWARE/SOFTWARE
Yale University Map Analysis Package (MAP)	Developed on IBM 360/370 but now exists in most mainframe/ mini environments; written in FORTRAN IV (1979) - source code provided		Less than 256 k (for maps less than 10,000 cells)	Data Storage: REQUIRED - Mainframe/mini disc packs. Peripheral Hardware: REQUIRED - Line printer or slaved dot matrix printer (page print maps are standard output). OPTIONAL - Digitizer; pen plotter; dot matrix printer; electrostatic printer; color image display. Specialized Software: OPTIONAL - Plotting package [SAS Graph]; statistical package [SAS or SPSS].

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section A: Data Entry

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
(Unaffiliated) Schools Enrollment Projection System	N	N	Y				
Aeronca Electronics, Inc. GIS-100	Y	N	Y 1/	Y 2/	N 3/	Y	1/ Method: whole polygon - line-point 2/ UTM, State Plane Coordinates 3/ Interface being developed for VGS-300 image processing system Other data entry capabilities: Landsat classified data and polygon or grid-cell data
Autometric, Inc. AUTOGIS	Y		Y 1/	Y 2/	Y 3/	Y	1/ Method: arc/node 2/ All State Plane Coordinate systems, all standard map projections 3/ Interfaced at USGS from the Scitex System to MOSS
Bliss Associates BLISSMAP	Y	N	N	Y 1/	N	Y	1/ State Plane Coordinates, UTM
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Y 1/	Y 1/	Y 2/	Y 3/	Y	Y	1/ Digitized as polygons, then converted to raster 2/ Method: arc/node; maximum number of polygons upon which operations can be performed: 3,000 3/ UTM, State Plane Coordinates, latitude/longitude, several others Other data entry capabilities: lines, points, and tables as well as polygons; also topographic data
COMPIS	(Data entry functions available through CIMS)						
Geographic Data Management System (GDMS)	(Data entry functions available through CIMS)					Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Criterion, Inc. LANDTRAK	N	N	Y 1/	Y 2/	N	Y	1/ Method: node placed at every bend 2/ State Plane Coordinates
ESL, Inc. GEOMIPS	Y	Y	Y 1/	Y 2/	Y	Y	1/ Method: arc/node 2/ UTM, latitude/longitude Other data entry capabilities: seismic, aeromagnetic, gravity, any reconnaissance or remote sensing data, geochemical data
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turn-Key System	Y	Y	Y 1/	Y 2/	Y	N	1/ Method: polygon (map coordinates) 2/ UTM, State Plane Coordinates, other planar coordinates
Environmental Research Institute of Michigan ERDC GIS-200	Y	Y	Y 1/	Y 2/	Y	Y	1/ Method: line segments of geographic coordinates 2/ Most standard map projections if the digital image processing software is acquired Other data entry capabilities: any remotely sensed data source (e.g., landsat MSS or TM, radar, aircraft) if the digital image processing software is acquired
Environmental Systems Research Institute ARC/INFO	Y 1/	Y	Y 2/	Y 3/	Y	Y	1/ ESRI grid system 2/ Method: arc/node, spagetti (free-form) 3/ 26 projections, 22 coordinate systems Other data entry capabilities: interface to DLG, SIF, MOSS polygons, PIOS polygons, CALMA files, GeoBase files, Comarc files files, Comarc files
Environmental Systems Research Institute GRID, GRID/TOPO	Y	Y	N 1/	Y	N	N	1/ Polygon data entry requires ARC/INFO or other system Other data entry capabilities: DEM, landsat image files

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
GIMMS, Inc. GIMMS	Y	Y	Y 1/	Y 2/	Y 3/	Y	1/ Method: arc 2/ Any Euclidean system 3/ After conversion Other data entry capabilities: can interface a user-written data entry routine
GeoGraphics A GIS overlay for RIPS *Image Processing*	Y 1/	Y 1/	Y	Y 2/	Y	Y	1/ Maximum size array upon which operations can be performed: 256 x 240 2/ UTM
Geobased Systems STRINGS™	N	N	Y 1/	Y 2/	Y	Y	1/ Method: arc/node 2/ State Plane Coordinates, latitude/longitude, UTM
Geogroup GEO-BASEMAP	Y 1/	Y 1/	Y 2/	Y 3/	N	Y	1/ Maximum size array upon which operations can be performed: 4096 x 4096 2/ Method: arc/node 3/ State Plane Coordinates, UTM
Harvard University ODYSSSEY Geographic Information System	N	N	Y 1/	Y 2/	N	Y 3/	Data entry from maps: VAX version only; IBM version requires hardware-specific installation 1/ Maximum number of polygons upon which operations can be performed: 5,000 in some programs. Method: topological chains (starting/ending node, left/right polygon, variable length chains) 2/ User defined through control points; no non-linear rubber sheeting 3/ Attribute files associated with base map polygons; point-in polygon analysis Other data entry capabilities: ODYSSEY can read "foreign" *data files* if reformatted to ODYSSEY record specification

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Hennepin County Bureau of Public Service UltiMap	Y	Y	Y	Y[1/]	N	Y	1/ Any system (typically State Plane Coordinates) 2/ Via unique geocode on each record (e.g., parcel centroid to PID) Other data entry capabilities: stereo-digitizing aerial photo models; UM Demographic Modelling assists updating DIME File map data
Holguin Corporation Holguin GIS	N	N	Y[1/]	Y[2/]	N	Y[3/]	1/ Maximum number of polygons upon which operations can be performed: 260 billion Method: arc/node or entity format 2/ Any plane coordinate system 3/ Use tabular data in place
Interactive Systems Corporation AGIS-GRAMS	N	N	Y[1/]	Y[2/]	N	Y	1/ Maximum number of polygons upon which operations can be performed: 2 -1. Method: arc/node 2/ Standard USGS GCTP package projections
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	Y[1/]	Y	Y	1/ Can reproject into numerous systems
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y[1/]	Y[2/]	Y	Y	1/ Method: arc/node 2/ State Plane Coordinates, UTM, latitude/longitude, British National Grid, Swedish National Grid, etc. Other data entry capabilities: image processing

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Y 1/	Y 2/	Y 2/	Y 3/	N	N	1/ Maximum size array upon which operations can be performed: 162 x 270 (can be changed in software) 2/ User must provide own conversion software 3/ State Plane Coordinates Other data entry capabilities: interactive data entry
Jet Propulsion Laboratory Image-Based Information System (IBIS)	N	Y 1/	Y 2/	Y 3/	N	Y	1/ Maximum size array upon which operations can be performed: 10,000 x 10,000 2/ Maximum number of polygons upon which operations can be performed: 60,000. Method: node 3/ State Plane Coordinates, UTM, Lambert Conic, Albers Equal Area Other data entry capabilities: Landsat digital imagery in band sequential format
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	N	N	Y	Y 1/	N	Y	1/ State Plane Coordinates
Lincoln Institute of Land Policy SOLIR	N	N	Y 1/	N	N	Y	1/ Maximum number of polygons upon which operations can be performed: 32,000 Method: node-chain-polygon
Metrex Systems Corp. MISAR	Y 1/	Y 1/	Y 2/	Y 3/	N	Y	1/ Maximum size array upon which operations can be performed: 1620 x 1620 2/ Point to point (without "slivers") 3/ Polar and plane transform and rotate to any other plane

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA ENTRY FUNCTIONS

SOURCE/SOFTWARE	GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Michigan Department of Transportation Environmental Information System	Y 1/	N	Y 2/	Y 3/	N	Y	1/ Maximum size array upon which operations can be performed: 250 x 250 2/ Maximum number of polygons upon which operations can be performed: 5,000. Method: arc/node 3/ State Plane Coordinates
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y 1/	Y 1/	N 2/	Y	N	Y	1/ Maximum size array upon which operations can be performed: any # rows, 32,768 columns 2/ Via ARC/INFO interface only (RASPOLY)
Morgan Fairfield, Inc. MICRO-MAP II			Y 1/	N	N	N	1/ Maximum number of polygons upon which operations can be performed: 100
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y 1/	Y 2/	Y 3/	Y 4/	Y 5/	Y	1/ Maximum size array upon which operations can be performed: 10,000 x 10,000 for a 300 mb disc 2/ Maximum size array upon which operations can be performed: varies from module to module 3/ Maximum number of polygons upon which operations can be performed: 5,400. Method: arc/node 4/ Eleven projections 5/ Expected date - May 1985 Other data entry capabilities: several types of remote sensing data; other data sources

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
National Park Service Systems Applications Geographic Information System (SAGIS)	Y[1/]	Y	Y[2/]	Y[3/]	Y	Y	1/ Maximum size array upon which operations can be performed: 322,000 cells-(to be enlarged to 3.2×10^9) 2/ Method: arc/node (stored as polygons) 3/ Any system Other data entry capabilities: interactive point-coordinate entry; general read-in transport utility (vector and raster)
Pacific-Sierra Research Corporation Unnamed	Y[1/]	N	N	Y[2/]	N	Y	1/ Maximum size array upon which operations can be performed: 20 x 20 2/ Latitude/longitude
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	Y	Y	Y[1/]	Y[2/]	N	Y	1/ Method: arc/node, polygon circuit, or line 2/ By least squares polynomials
Planning Data Systems MULTIMAP	N[1/]	N[1/]	Y[2/]	Y[3/]	N	Y[4/]	1/ Point data as independent cartographic entities available 1985 2/ Maximum number of polygons upon which operations can be performed: 2,000 at 256k; 3,500 at 640k. Method: arc/node 3/ Latitude/longitude; State Plane Coordinates available 1985 4/ Via the polygon label
Resources Planning Associates LOWLIB/GDBM/ENDECODE	N	Y	Y	Y	Y	Y	Applications with these data entry functions have been developed, with this package as the basic support routines

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Resources Planning Associates (cont.) MAPEDT	N	Y[1/]	Y[2/]	Y	Y	Y[3/]	1/ Maximum size array upon which operations can be performed: 1,024 x 1,024 2/ Method: arc/node and isolated polygon description 3/ Tabular data can be referenced to/by any base map contained in the Geographic Data Base Mgmt. (GDBM) System
MAPOVL	N	Y[1/]	Y	Y	Y[2/]	N	1/ Maximum size array upon which operations can be performed: 1,024 x 1,024 2/ Separate scanning system required
RIVBAS	N	N	Y	Y	Y[1/]	N	1/ Other RPA package required
Riley Datashare Intl. MICROMAP (and subset ADACS)	N	N	Y[1/]	Y[2/]	N	N	1/ Maximum number of polygons upon which operations can be performed: 1,000. Method: node 2/ UTM
Sammamish Data Systems Desktop Information Display Systems (DIDS)	Y[1/]	N	N	N	N	N	1/ Maximum size array upon which operations can be performed: 680 x 600
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	N	N	Y[1/]	N	N	N	1/ Method: node list, arc sets
South Dakota State University Area Resource Analysis Systems (AREAS)	Y[1/]	Y[2/]	Y[3/]	N	N	N	1/ Change-point encoding scheme used 2/ Maximum size array upon which operations can be performed: approx. 30" x 5" @ 1,000 points/inch resolution 3/ Method: arc/node

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
Spatial Information Systems Professional MAP (pMAP)	Y 1/	Y 1/	Y 2/	N	N	N	1/ Maximum size array upon which operations can be performed: 100 x 100. 2/ Method: line segment defined as (X , Y , F), (X , Y , F) . . . Change in flag indicates new line segment.
St. Regis Paper Company PRO/GIS	N	Y	Y	Y	N	Y	
Strategic Locations Planning ATLAS AMP	N	N	Y 1/	N	N	N	1/ Available spring 1985. Maximum number of polygons upon which operations can be performed: 5,000
Systems Development Corporation SDCIPS-GIS	Y 1/	Y 2/	Y 3/	Y 4/	Y	Y	1/ Maximum size array upon which operations can be performed: 8,192 x 8,192, enlargeable 2/ Maximum size array upon which operations can be performed: 30,000 x 30,000 3/ Maximum number of polygons upon which operations can be performed: 65,000 in one pass. Method: chain length encoding 4/ Any map projection or coordinate system Note: SDCIPS-GIS is a raster-based system; all data entered are converted to raster
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	Y	N	Y 1/	Y 2/	Y	Y	1/ Method: arc 2/ State Plane Coordinates, UTM, MTM, Lambert Conic Conformal
Terra-Mar T-base	Y 1/	Y 1/	Y	Y 2/	Y	Y	1/ Maximum size array upon which operations can be performed: 10,000 x 10,000 2/ UTM Other data entry capabilities: via Micro-

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
The Sidwell Company SIGNET™	Y	Y	Y	Y	Y	Y	
Towson State University MICRO/GIS	Y 1/	Y 1/	Y 2/	N	N	N	1/ Maximum size array upon which operations can be performed: 40 x 40 2/ Maximum number of polygons upon which operations can be performed: 100. Method: arc/node
U.S. Census Bureau TIGER	N	N	N	Y 1/	N	N	1/ Latitude/longitude
Uni-Graphic Systems, Inc. Geographics	N	N	Y 1/	Y 2/	Y	Y	1/ Method: arc/node 2/ User option (often State Plane Coordinates)
University of California - Berkeley VIPERS	N	N	Y	Y	N		Other data entry capabilities: Landsat band sequential CCTs
University of California - Riverside SIPS	Y	Y	Y	Y	N	N	
University of Iowa (Un-named)	Y 1/	Y	Y 2/	N	N	N	1/ Maximum size array upon which operations can be performed: 25 x 25 (test version) 2/ Method: point dictionary, converting to chain-node, summer 1985
University of Massachusetts - Amherst COMLUP/ILPP	Y 1/	Y	Y 2/	N	Y	N	1/ Maximum size array upon which operations can be performed: 500 rows, 1000 columns 2/ Maximum number of polygons upon which operations can be performed: 999 Method: line segments entered once only

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	DATA ENTRY FUNCTIONS: GRID-CELL DATA ENTRY (MANUAL)	GRID-CELL DATA ENTRY (DIGITIZER)	POLYGON DATA ENTRY	REGISTRATION TO STANDARD GEOG. COORDINATE SYSTEMS	CAN ENTER MAP DATA VIA SCANNING DIGITIZER	CAN MERGE TABULAR DATA TO A BASE MAP	REMARKS
University of Minnesota County Soil Survey Information System	N	N	N	N	N	N	
University of Nebraska Map and Image Processing System (MIPS)	N	Y	Y	Y 1/	N	Y	1/ Latitude/longitude
Utah State University MicroSieve	N	Y 1/	N	N	N	N	1/ Maximum size array upon which operations can be performed: 280 x 192
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y 1/	N	Y	1/ State Plane Coordinates, latitude/longitude, UTM
Yale University Map Analysis Package (MAP)	Y	Y	Y	N	N	N	

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section B: Editing/Updating

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	CAN FIND AND REPLACE SINGLE RECORDS	CAN CHANGE A MAP	REMARKS
(Unaffiliated) Schools Enrollment Projection System	Y	Y	Y	
Aeronca Electronics, Inc. GIS-100	N	Y	Y	Other editing/updating capabilities: through tablet or a color monitor
Autometric, Inc. AUTOGIS	Y	Y	Y	Other editing/updating capabilities: split arc, delete arc, delete node and all arcs associated with it, delete polygon, change attributes, add arc, add node, change arc, delete attribute
Bliss Associates BLISSMAP	Y	Y	Y	
Comarc Systems Comarc Intelligent Mapping System (CIMS)	Y	Y	Y	Other editing/updating capabilities: thinning, rubber sheeting, coordinate conversion, windowing, disassemble polygons, use arcs in multiple layers without slivers
COMPIS	Y	Y	Y	Other editing/updating capabilities: delete, merge, window, create polygon on CRT screen, change alphanumeric labels of polygons/points/lines, exclude polygons below specified size, etc.
Geographic Data Management System (GDMS)	- OCCURS IN CIMS AND COMPIS -			
Criterion, Inc. LANDTRAK[c]	Y	Y	Y	Other editing/updating capabilities: can "snap" features to a DIME file or an existing feature
ESL, Inc. GEOMIPS	Y			

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
Earth Resources Data Analysis Systems ERDAS-PC	Y	Y	Y	Other editing/updating capabilities: interactive grid-cell editing (grid cell, vector, polygon modes), keyboard encoding. Ability to subset files and to "cookie cut" areas (using digitized outlines); also can mosaic files or parts of files
Environmental Research Institute of Michigan ERDC GIS-200	N	Y	Y	Other editing/updating capabilities: permits updating or redefinition of data values within an overlay, and interactive cursor editing of data values on a color monitor
Environmental Systems Research Institute ARC/INFO	Y	Y	Y	Other editing/updating capabilities: overshoot/undershoot detection/correction; topological checking, attribute consistency checking, fuzzy tolerance snapping
Environmental Systems Research Institute GRID, GRID/TOPO	Y 1/	Y	Y	1/ Limited Other editing/updating capabilities: interactive row/column editing
GIMMS, Inc. GIMMS	Y	Y	Y	Other editing/updating capabilities: interactive editing and topological checking
GeoGraphics A GIS overlay for RIPS Image Processing				
Geobased Systems STRINGS™	Y	Y	Y	Other editing/updating capabilities: interactive editing of points, points on a line, lines, nodes, polygons, symbols, titles (including adding, deleting, and moving)
Geogroup GEO-BASEMAP	Y	Y	Y	Other editing/updating capabilities: interactive entity moving, addition, removal

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
Harvard University ODYSSEY Geographic Information System	Y	Y	Y	Other editing/updating capabilities: generation of complete chain topology from unstructured line input (spaghetti)
Hennepin County Bureau of Public Service UltiMap	Y	Y	Y	Other editing/updating capabilities: hierarchical work areas permit multiple users to simultaneously work on same rpoject data. Find records by reference number, symbol dictionary description, or map location.
Holguin Corporation Holguin GIS	Y	Y	Y	Other editing/updating capabilities: polygon overlay, polygon dissolve
Interactive Systems Corporation AGIS-GRAMS	Y	Y	N	Other editing/updating capabilities: insert, delete, move, replace layer type, add, connect, intersect
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	Other editing/updating capabilities: edit/update map features while superimposed on image-based data on display
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	N	Y	Y	Other editing/updating capabilities: interactive data editing, "logical" editing operations

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
Jet Propulsion Laboratory Image-Based Information System (IBIS)	N	N	Y	Other editing/updating capabilities: new Landsat imagery, interpreted land use maps can be added
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	Y	Y	Y	
Lincoln Institute of Land Policy SOLIR	Y	Y	Y	Other editing/updating capabilities: delete a polygon (map)
Metrex Systems Corp. MISAR	Y	Y	Y	
Michigan Department of Transportation Environmental Information System	Y	Y	N	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	N	Y	Y	Other editing/updating capabilities: EPPL allows easy insertion of FORTRAN routines
Morgan Fairfield, Inc. MICRO-MAP II	N	Y	Y	
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
National Park Service System Applications Geographic Information System (SAGIS)	Y	Y	Y	Other editing/updating capabilities: extemsove graphic and text editing capabilities
Pacific-Sierra Research Corporation (Unnamed)	N	Y	N	
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	N	Y		
Planning Data Systems MULTIMAP	Y 1/	Y		1/ Full topologic editing Other editing/updating capabilities: sophisticated interactive graphics editing routine for its digital maps
Resources Planning Associates LOWLIB/GDEM/ENDECODE	Y	Y	Y	
MAPEDT	Y 1/	Y 2/	Y	1/ Limited error detection 2/ Limited capabilities
MAPOVL	Y 1/	N	Y	1/ Limited capabilities
RIVBAS	Y	N	Y	
Riley Datashare Intl. MICROMAP (and subset ADACS)	Y	Y	Y	Other editing/updating capabilities: automatic line crossing detection and intersection; use of common boundaries for adjacent polygons

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
Sammamish Data Systems Desktop Information Systems (DIDS)	N	N	N	
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	Y	Y	N	
South Dakota State University Area Resource Analysis System (AREAS)	Y	Y	Y	
Spatial Information Systems Professional MAP (pMAP)	N	Y	Y	?
St. Regis Paper Company PRO/GIS	Y	Y	Y	
Strategic Locations Planning ATLAS AMP	Y	N	Y	
Systems Development Corporation SDCIPS-GIS	Y	Y	Y	
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	Y	Y	Y	
Terra-Mar T-base	N[1/]	Y	Y	1/ Under development

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
The Sidwell Company SIGNET™	Y	Y	Y	
Towson State University MICRO/GIS	Y	Y	Y	
U.S. Census Bureau TIGER	Y	Y	Y	
Uni-Graphic Systems, Inc. Geographics	Y	Y	Y	Other editing/updating capabilities: equipment-supported, aids visual verification; Digitizing program - audio input for verification
University of California - Berkeley VIPERS	N		Y	
University of California - Riverside SIPS	Y	Y	Y	
University of Iowa (Unnamed)	Y	N	N	
University of Massachusetts - Amherst COMLUP/ILPP	Y	N	Y	
University of Minnesota County Soil Survey Information System	N	N	N	
University of Nebraska Map and Image Processing System (MIPS)	Y	Y	Y	Other editing/updating capabilities: direct color-display raster display and directly alter; plot map to scale for overlay on source map(s)

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	EDITING/UPDATING FUNCTIONS: AUTOMATIC ERROR DETECTION OF MAP DATA	EDITING/UPDATING FUNCTIONS: CAN FIND AND REPLACE SINGLE RECORDS	EDITING/UPDATING FUNCTIONS: CAN CHANGE A MAP	REMARKS
Utah State University MicroSieve	N	N	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Other editing/updating capabilities: automatic checking of Network Continuity (particularly relevant for terrain/drainage storage); edit single records for topologic, topographic and any other data
Yale University Map Analysis Package (MAP)	N	Y	Y	

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section C: Retrieval and Analysis

APPENDIX IV

Summary of GIS/Related Software

Part III: *Functions Available*

Section C: Retrieval and Analysis

(Part 1 of 3)

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA TRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
(Unaffiliated) Schools Enrollment Projection System	N	Y	Y	Y	Y	Y	Y	N	N	
Aeronca Electronics, Inc. GIS-100	Y	Y[1/]	Y	Y	Y[2/]	Y	Y	N	Y	1/ Uses boolean operator 2/ By digitizer planimeter
Autometric, Inc. AUTOGIS	Y	Y	Y	Y	Y	Y	Y	Y		
Bliss Associates BLISSMAP	Y[1/]	Y	Y	N	N	Y	Y	N	N	1/ Independent program
Comarc Systems Comarc Intelligent Mapping System (CIMS)										See Comarc COMPIS and GDMS
COMPIS	Y	Y	Y	Y	Y	Y	Y	Y	N	
Geographic Data Management System (GDMS)	N	N	Y	N	N[1/]	Y	Y	N	N	1/ See Comarc COMPIS
Criterion, Inc. LANDTRAK[c]	N	Y	Y	Y	Y	Y	Y	Y	N	
ESL, Inc. GEOMIPS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turnkey System	Y	N	Y	Y	Y	Y	N	Y	N	
Environmental Research Institute of Michigan ERDC GIS-200	Y	Y	Y	Y	Y	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
Environmental Systems Research Institute ARC/INFO	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Environmental Systems Research Institute GRID, GRID/TOPO	Y	Y	Y	Y	N	Y	Y	N	Y	
GIMMS, Inc. GIMMS	Y	Y	Y[1/]		Y	Y[2/]	Y	Y[2/]	N	1/ No alpha sort 2/ With limitations
GeoGraphics A GIS overlay for RIPS Image Processing	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Geobased Systems STRINGS™	Y	Y	Y	Y	Y	Y	Y[1/]		Y	1/ Summary statistics
Geogroup GEO-BASEMAP	Y	Y	Y	Y	Y	Y	Y	N	Y	
Harvard University ODYSSEY Geographic Information System	N	N	Y[1/]	Y[2/]	N	N[3/]	Y[4/]	N	N	1/ Select by numeric code in several columns; may require more than one pass 2/ Via topological structure 3/ Attribute files are standard text files with parcel geocode 4/ Through aggregation only
Hennepin County Bureau of Public Service UltiMap	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Holguin Corporation Holguin GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHICAREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
Interactive Systems Corporation AGIS-GRAMS	N	Y	Y	Y	Y	Y	N	N	Y	
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	N	Y	Y	Y	Y	Y	
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	N 1/	Y	Y	N	N	Y	Y	Y	N	1/ Future enhancement
Jet Propulsion Laboratory Image-based Information System (IBIS)	Y	Y	Y	N	N	Y	Y	N	N	
Jet Propulsion Laboratory Land Use Mapping and Informaiton System (LUMIS)	N	Y	Y	N	N	Y	Y	N	N	
Lincoln Institute of Land Policy SOLIR	N	Y	Y	N	N	Y	Y	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYTON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
Metrex Systems Corp. MISAR	N	Y	Y	Y	Y	Y	Y	Y	Y	
Michigan Department of Transportation Environmental Information System	Y	N	Y	Y	Y	Y	Y	Y	N	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y 1/	Y	Y	Y	Y	Y	Y	Y	Y	1/ Through RASPOLY
Morgan Fairfield, Inc. MICRO-MAP II	N	N			N				N	
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	Y	Y	Y	N	Y	Y	Y	Y	
National Park Service System Applications Geographic Information System (SAGIS)	Y	Y	Y	Y	Y	Y	Y	Y	N	
Pacific-Sierra Research Corporation (Unnamed)	N	N	N	N	N	N	Y	Y	Y	
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	Y	Y	Y			Y		Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
Planning Data Systems MULTIMAP	Y[1/]	Y[2/]	Y[3/]	Y	Y[4/]	N[4/]	Y	N[4/]	N	1/ Mainly for re-display of thematic maps 2/ Using the database management package or MS-DOS utility 3/ Limited, will be expanded in next release 4/ Available in next release
Resources Planning Associates LOWLIB/GDEM/ENDECODE	Y	N	Y	N	Y	Y	Y	Y	N	
MAPEDT	Y	N	Y	N	Y	Y	Y	Y	N	
MAPOVL	Y	N	Y	N	Y	Y	Y	Y	N	
RIVBAS	N	N	N	N	Y	N	N	Y	N	
Riley Datashare Intl. MICROMAP (and subset ADACS)	Y	N	N	N	Y	Y	Y	N	N	
Sammamish Data Systems Desktop Information Systems (DIDS)	Y	N	N	N	N	N	N	N	N	
SecaGraphics (M.A.G.I.C.)	N	N	N	N	N	N	N	N	N	
South Dakota State University Area Resource Analysis System (AREAS)	Y	Y	Y	N	N	N	N	N	N	
Spatial Information Systems Professional MAP (pMAP)	Y[1/]	Y	Y	Y	Y	Y	Y	Y	Y	1/ Converts line segment data structures to raster

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
St. Regis Paper Company PRO/GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Strategic Locations Planning ATLAS AMP	Y	N	N	N	Y	N	Y	N	N	
Systems Development Corporation SDCIPS-GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	Y	Y	Y	Y	Y	Y	Y[1/]	Y	N	1/ User interface provided
Terra-Mar T-base	Y	Y	Y		Y	Y	Y	Y	Y	
The Sidwell Company SIGNET™	N	Y	Y	Y	Y	Y	Y	Y	Y	
Towson State University MICRO/GIS	Y	N	Y	N	N	Y	Y	N	Y	
U.S. Census Bureau TIGER	N	N	N	N	N	N	N	N	N	
Uni-Graphic Systems, Inc.* Geographics	N	Y	Y	Y	Y	Y	Y	Y	N	
University of California - Berkeley VIPERS	Y	N	Y	N	N	Y	Y	Y	N	

*Software utilities to convert files to ESRI format.

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA)

SOURCE/SOFTWARE	POLYGON TO RASTER CONVERSION	SORT ATTRIBUTES BASED ON SPECIFIED VALUE	LOCATE DATA ATTRIBUTES IN SPECIFIED GEOGRAPHIC AREA	EDGE DETECTION	CALCULATE DISTANCE	SUMMARIZE ATTRIBUTES BY CELL OR POLYGON	COMPUTE STATISTICS BY COLLECTION OF CELLS OR POLYGONS	COMPUTE STATISTICS BY INTERACTIVELY ENTERED AREA	NEAREST NEIGHBOR SEARCH	REMARKS
University of California - Riverside SIPS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
University of Iowa (Unnamed)	Y	N	Y	Y	Y	N	N	N	Y	
University of Massachusetts - Amherst COMLUP/ILPP	Y	Y	Y	N	Y	Y	N	Y	Y	
University of Minnesota County Soil Survey Information System	N	Y	Y	Y	N	Y	Y		N	
University of Nebraska Map and Image Processing System (MIPS)	Y	Y	Y	Y	N	Y	Y	Y	N	
Utah State University MicroSieve	N	N	Y		N	N	N	N	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Yale University Map Analysis Package (MAP)	Y	Y	Y	Y	Y	Y	Y	Y	Y	

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section C: Retrieval and Analysis

(Part 2 of 3)

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
(Unaffiliated) Schools Enrollment Projection System	N	Y	N	N	N	N	Y	N	Y	
Aeronca Electronics, Inc. GIS-100	Y	Y	N[1/]	N[1/]	N[1/]	N[1/]	Y	Y	Y[2]	1/ Under development 2/ By re-rasterizing the original polygon data
Autometric, Inc. AUTOGIS	Y	Y	Y	N	Y	Y	Y	Y	N	
Bliss Associates BLISSMAP	N	N	N	N	N	N	Y	Y	Y	
Comarc Systems Comarc Intelligent Mapping System (CIMS)										See Comarc COMPIS and GDMS
COMPIS	Y	Y	Y	N	N	Y	Y	Y	Y	
Geographic Data Management System (GDMS)	Y	Y	N	N	N	N	Y	N	N[1/]	1/ See Comarc COMPIS
Criterion, Inc. LANDTRAK[c]	Y	Y	N	N	N	N	N	N	N	
ESL, Inc. GEOMIPS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turnkey System	Y	Y	Y	N	Y	Y	Y	Y	Y	
Environmental Research Institute of Michigan ERDC GIS-200	Y	Y	Y	Y	N	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
Environmental Systems Research Institute ARC/INFO	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Environmental Systems Research Institute Research Institute GRID, GRID/TOPO	Y	N	Y	N	N	Y	Y	Y	Y	
GIMMS, Inc. GIMMS	Y	Y	N	N	N	N	Y	Y	Y	
GeoGraphics A GIS overlay for RIPS Image Processing	Y	N	N		N	N	Y	Y	N	
Geobased Systems STRINGS™	Y	Y	N	N	N	N	Y	Y	N	
Geogroup GEO-BASEMAP	Y	Y	Y	N	N	Y	Y	Y	Y	
Harvard University ODYSSEY Geographic Information System	N	N	N	N	N	N	Y	N	Y 1/	1/ Aggregates polygons
Hennepin County Bureau of Public Service UltiMap	Y	Y	N 1/	N	Y	Y	Y	Y	Y	1/ Indirectly only; no specific function
Holguin Corporation HOLGUIN GIS	Y	Y	N	N	Y	N	Y	Y		1/ Grid cells are not used
Interactive Systems Corporation AGIS-GRAMS	Y	Y	N	N	N	N	Y	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Y	N	N	N	N	N	Y	Y	N	
Jet Propulsion Laboratory Image-Based Information System (IBIS)	Y	Y	Y	N	N	Y	Y	Y	Y	
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	N	N	N	N	N	N	Y	N	N	
Lincoln Institute of Land Policy SOLIR	N	Y	N	N	N	N	N	Y	N	
Metrex Systems Corp. MISAR	Y	Y	Y	Y	Y		Y	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
Michigan Department of Transportation Environmental Information System	N	N	N	N	N	N	Y	Y	Y	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Morgan Fairfield, Inc. MICRO-MAP II	N						N			
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	Y	Y	N	N	Y	Y	Y	Y	
National Park Service System Applications Geographic Information System (SAGIS)	Y	Y	Y	N	Y	Y	Y	Y	Y	
Pacific-Sierra Research Corporation (Unnamed)	N	N	N	N	N	N	N	Y	Y	
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	Y	Y	N	N	N	N	Y	Y	Y	
Planning Data Systems MULTIMAP	N[1/]	N[1/]	N	N	N	N	N[1/]	N	N	1/ Available in next release

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
Resources Planning Associates LOWLIB/GDEM/ENDECODE	N	N	N	N	N	N	Y	N	N	
MAPEDT	N	N	N 1/	N 1/	N 1/	N 1/	Y	Y		1/ These and other DTM functions have been developed in prototype but are not yet available as RPA capabilities
MAPOVL	N	N	N 1/	N 1/	N 1/	N 1/	Y	N	N	1/ Under development
RIVBAS	N	N	Y	Y	Y	N	Y	N	N	
Riley Datashare Intl. MICROMAP (and subset ADACS)	N	N	N	N	N	N	Y	N	N	
Sammamish Data Systems Desktop Information Display System (DIDS)	N	N	N	N	N	N	N	N	N	
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	N	N	N	N	N	N	N	N	N	
South Dakota State University Area Resource Analysis System (AREAS)	N	N	N	N	N	N	Y	N	Y	
Spatial Information Systems Professional MAP (pMAP)	Y	Y	Y		Y	Y	Y	Y	Y	
St. Regis Paper Company PRO/GIS	Y	Y	Y	N	N	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WEIGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
Strategic Locations Planning ATLAS AMP	N	N	N	N	N	N	N	N	N	
Systems Development Corporation SDCIPS-GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	N	Y	N	Y	Y	N	Y	Y	Y	
Terra-Mar T-base	Y	Y	Y	Y	1/		Y 2/	Y	Y	1/ To be determined 2/ When tied to appropriate classified data
The Sidwell Company SIGNET™	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Towson State University MICRO/GIS	Y	N	Y	Y	N	Y	Y	Y	N	
U.S. Census Bureau TIGER	N	N	N	N	N	N	N	N	N	
Uni-Graphic Systems, Inc. Geographics	Y	N	N	N	N	N	Y	N	N	
University of California - Berkeley VIPERS	N	N	Y	N	N	Y	Y	Y	Y	
University of California - Riverside SIPS	Y	Y	Y		N	N	Y	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	PROXIMITY ANALYSIS	SUMMARIZE NUMBER OF POINTS WITHIN POLYGON	CALCULATE SLOPE FROM ELEVATION	CALCULATE LENGTH OF SLOPE	DEFINE WATERSHED BOUNDARIES BASED ON TOPOGRAPHIC DATA	DETERMINE SLOPE ASPECT	COMPUTE ACREAGE	ASSIGN WIEGHTS TO DIFFERENT CATEGORIES	CHANGE SIZE OF GRID CELL TO GENERALIZE	REMARKS
University of Iowa (Unnamed)	Y	N	N	N	N	N	N	Y	N	
University of Massachusetts - Amherst COMLUP/ILPP	Y	N	N	N	N	N	Y	Y	Y	
University of Minnesota County Soil Survey Information System	N	N	N	N	N	N	Y	N	N	
University of Nebraska Map and Image Processing System (MIPS)	N	N	Y	Y	N	Y	Y	Y	Y	
Utah State University MicroSieve	N	N	N	N	N	N	N	N	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y	Y	Y	Y	Y	Y	ADAPT was a variably-sized aggregated triangular cell. These cells can be automatically aggregated into any combination of cells - based on user-defined attributions - or subdivided by the user to refine representatives, add more data files, etc., as required.
Yale University Map Analysis Package (MAP)	Y	Y	Y		Y	Y	Y	Y	Y	

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section C: Retrieval and Analysis

(Part 3 of 3)

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
(Unaffiliated) Schools Enrollment Projection System	N	N	N	N	N	N	N	Y	Y	
Aeronca Electronics, Inc. GIS-100	Y	Y	Y	Y	Y	Y	Y	N	N	Other retrieval and analysis capabilities: 3-D plots of any file "colored" by another (e.g., elevation colored with areas of environmentally sensitive areas)
Autometric, Inc. AUTOGIS	Y	Y	Y	Y	Y	Y	Y	N	Y	Other retrieval and analysis capabilities: size selection, contiguity selection, point to grid interpolation, analytical hill shading, Boolean attribute retrieval, spread-sheet analysis on attribute data, complex cartographic modelling, zone generation, contouring, profiling, volume analysis, viewshed analysis
Bliss Associates BLISSMAP	Y	Y	Y	Y	Y	Y	Y	N	Y	Dot matrix color maps (grid cells)
Comarc Systems Comarc Intelligent Mapping System (CIMS)	(SEE COMPIS AND GDMS)									

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
COMPIS	Y	Y	Y	Y	Y	Y	1/	N 2/	N 2/	1/ Can perform weighted overlays 2/ Not done automatically; can be done with a few human inputs Other retrieval and analysis capabilities: topography (3-D perspectives, cut/fill, view studies, drainage patterns); grids/raster (raster to polygon conversion, inventory of values of all cells over all maps, CRT displays); polygons (all overlays [polygon on polygon, polygon on line, etc.]), amalgamation of polygons with same label, extracting data by type, size, other ad hoc queries, etc.
Geographic Data Management System (GDMS)	Y	Y	Y	Y	N 1/	N	N	N	N	1/ See COMPIS
Criterion, Inc. LANDTRAK[c]	N	N	N	N	N	N	N	Y	N	
ESL, Inc. GEOMIPS	Y	Y	Y	Y	Y	Y	Y	Y	N	Other retrieval and analysis capabilities: quantitative vs. qualitative models can be specified and driven by a data base

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing System and Turnkey System	Y	Y	Y	Y	Y	Y	Y	N	Y	Other retrieval and analysis capabilities: reassign data values, contiguity analysis for "clumps" meeting specified criteria, analysis program with multiple functions, including diversity, edge delineation predominance, and min/max value determination, analysis program which removes "salt and pepper" effects from clump analysis, proximity analysis on one or several data values at one time, matrix or coincidence analysis for all combinations of two files, overlay up to four files at one time, cross-tabulation for GIS statistics.
Environmental Research Institute of Michigan ERDC GIS-200	Y	Y	Y	Y	Y	Y	Y	N	N	Other retrieval and analysis capabilities: capability/suitability modeling, user-specified and written (FORTRAN) modeling, cooccurrence/matrix analyses, choropleth mapping
Environmental Systems Research Institute ARC/INFO	Y	Y	Y	Y	Y 1/	Y 1/	Y 1/	Y	Y	1/ ESRI grid system
Environmental Systems Research Institute GRID, GRID/TOPO	Y	Y	Y	Y	Y	Y	Y	Y	Y	Other retrieval and analysis capabilities: aggregation of number of features within a distance

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
GIMMS, Inc. GIMMS	Y	Y	Y	Y	Y	Y	Y	N	N	Other retrieval and analysis capabilities: generalization, geographical searching by distance, overlap/inclusion/exclusion of point/line/polygon
GeoGraphics A GIS overlay for RIPS Image Processing	(NO RESPONSE)									
Geobased Systems STRINGS™	Y	Y	Y	Y	N[1/]	N[1/]	N[1/]	N	Y	1/ Can overlay multiple polygon layers
Geogroup GEO-BASEMAP	Y	Y	Y	Y	Y	Y	N	N	N	
Harvard University ODYSSSEY Geographic Information System	Y	Y	Y	Y	N	N	N	N	N	Other retrieval and analysis capabilities: polygon overlay; point-in-polygon
Hennepin County Bureau of Public Service UltiMap	Y	Y	Y	Y	Y	Y	Y	Y	Y	Other retrieval and analysis capabilities: "map layers" - UM Polymorphic Modeling posts data to grid cells for analysis; UM Geoprocessing uses the Dictionary description attached to each map item. Both utilize polygon analysis to assist posting and analyzing data values.
Holguin Corporation HOLGUIN GIS	Y	Y	Y	Y	Y[1/]	Y[1/]	Y[1/]	Y	Y	1/ Grid cells not used
Interactive Systems Corporation AGIS-GRAMS	Y	Y	Y	Y	Y	Y		N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	Y	Y	Y	Y	Y[1/]	Y[1/]	1/ Through interactive operations
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Y	Y	Y	N	Y	Y	Y	N	N	*Other retrieval and analysis capabilities:* cluster analysis (gravity modeling); allocation analysis - allocate to many land uses based on suitability values and demand levels by land use, allocates by "best overall score"; goal achievement - taxes allocation against land use suitability policies and measures achievement (indexes)
Jet Propulsion Laboratory Image-Based Information System (IBIS)	Y	Y	Y	Y	Y	Y	Y	N	N	
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	N	N	N	N	N	N	N	N	N	LUMIS works on tabular files

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
Lincoln Institute of Land Policy SOLIR	Y	Y	Y	Y	N	N	N	Y	N	Other display options: graphic screen display and plotter display are both available
Metrex Systems Corp. MISAR	Y	Y	Y	Y	N	N	N	N	N	
Michigan Department of Transportation Environmental Information System	Y	Y	N	Y	Y	Y		N	Y	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Morgan Fairfield, Inc. MICRO-MAP II	N	N	N	N	N	N	N	N	N	
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Numerous other retrieval and analysis capabilities
National Park Service System Applications Geographic Information System (SAGIS)	Y	Y	Y	Y	Y	Y	Y	N	Y	Other retrieval and analysis capabilities; can use output from a powerful data base management system
Pacific-Sierra Research Corporation (Unnamed)	N	N	N	N	N	N	N	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	Y	Y	Y	Y	Y	Y	Y	N	N	
Planning Data Systems MULTIMAP	1/	1/	1/	1/	N	N	N	N	N	1/ MULTIMAP does not handle the attribute data directly, except for thematic map display. The user will typically do these operations in the micro database package (e.g, d-BASE or R-BASE)
Resources Planning Associates LOWLIB/GDEM/ENDECODE	Y	Y	Y	Y	Y	Y		N	N	Other retrieval and analysis capabilities: offers optimized RLE encoding, arc/node data definition and retrieval, raster data editing, merging, graphic windowing and map registration
MAPEDT	N	N	N	N	Y	Y		N	N	
MAPOVL	Y	Y	Y	Y	Y	Y		N	N	
RIVBAS	N	N	N	N	N	N	N	N	N	
Riley Datashare Intl. MICROMAP (and subset ADACS)	N	N	N	N	N	N	N	N	N	
Sammamish Data Systems Desktop Information Display System (DIDS)	N	N	N	N	N	N	N	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - ontinued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	N	N	N	N	N	N	N	N	N	
South Dakota State University Area Resource Analysis System (AREAS)	Y	Y	Y	Y	Y	Y	Y	N	N	
Spatial Information Systems Professional MAP (pMAP)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
St. Regis Paper Company PRO/GIS	Y	Y	Y	N	Y	Y	Y	Y	N	
Strategic Locations Planning ATLAS AMP	N	N	N	N	N	N	N	N	N	
Systems Development Corporation SDCLPS-GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Other retrieval and analysis capabilities: FFT, Eigen, HSI, digital filtering
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	Y	Y	Y	N	Y	N	N	N	Y	
Terra-Mar T-base	Y	Y	Y	Y	Y	Y		Y	Y	
The Sidwell Company SIGNET	Y	Y	Y	Y	Y	Y	Y	Y	N	
Towson State University MICRO/GIS	Y	Y	Y	Y	Y	Y	Y	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

DATA RETRIEVAL AND ANALYSIS FUNCTIONS (SPATIAL DATA) - Continued

SOURCE/SOFTWARE	"AND" OPERATIONS (SINGLE MAP LAYER)	"NOT" OPERATIONS (SINGLE MAP LAYER)	"OR" OPERATIONS (SINGLE MAP LAYER)	"NOR" OPERATIONS (SINGLE MAP LAYER)	OVERLAY MULTIPLE MAPS: ADD	OVERLAY MULTIPLE MAPS: SUBTRACT	OVERLAY MULTIPLE MAPS: MULTIPLY	SHORTEST PATH CALCULATIONS	CORRIDOR ANALYSIS	REMARKS
U.S. Census Bureau TIGER	N	N	N	N	N	N	N	N	N	
Uni-Graphic Systems, Inc. Geographics	Y	Y	Y	Y	Y 1/	Y 1/	Y 1/	N	N	1/ Can overlay for mapping, not grid cell
University of California - Berkeley VIPERS	Y	Y	Y	Y	Y	Y	Y	N	N	
University of California - Riverside SIPS	N	N	N	N	N	N	N	N	N	
University of Iowa (Unnamed)	Y	Y	Y	Y	Y			N	N	Method of combining maps uses rules of combination to generate resulting layer
University of Massachusetts - Amherst COMLUP/ILPP	Y	Y	Y	N	Y	Y	Y	N	N	
University of Minnesota County Soil Survey Information System	N	N	N	N	N	N	N	N	N	
University of Nebraska Map and Image Processing System (MIPS)	Y	Y	Y	Y	Y	Y	Y	N	N	
Utah State University MicroSieve	Y	Y	N	Y	Y	Y	N	N	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Numerous other retrieval and analysis capabilities
Yale University Map Analysis Package (MAP)	Y	Y	Y	Y	Y	Y	Y	Y	Y	

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section D: Cartographic Output

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	CARTOGRAPHIC OUTPUT (Hard Copy)										REMARKS
	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	
(Unaffiliated) Schools Enrollment Projection System	N	Y	Y	Y	N	Y	Y	N	N	N	
Aeronca Electronics, Inc. GIS-100	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	
Autometric, Inc. AUTOGIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Bliss Associates BLISSMAP	Y	N	Y	Y	N	N	Y	N	N	N	Other types of cartographic output: dot matrix color maps (grid-cell)
Comarc Systems Comarc Intelligent Mapping System (CIMS)	N	Y	Y	Y	Y	Y	Y	N	N	N	Other types of cartographic output: see COMPIS
COMPIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Other types of cartographic output: extensive use of color shading; linear symbols from a menu (e.g., dashed or dotted lines); plot number and alphanumeric data on each polygon, line or point (e.g., soil type)
Geographic Data Management System (GDMS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Other types of cartographic output: see COMPIS
Criterion, Inc. LANDTRAK[c]	N	Y	Y	Y	N	N	Y	N	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

CARTOGRAPHIC OUTPUT (Hard Copy)

SOURCE/SOFTWARE	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	REMARKS
ESL, Inc. GEOMIPS	Y	Y	Y	Y		Y	Y	Y	Y	Y	Other types of cartographic output: output at any scale to Albers equal area, Space Oblique, UTM, Lambert conformal, polygonic, polar stereographic; other projections easy to add
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing System and Turnkey System	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Legends are placed at the bottoms of maps - vertical and horizontal options
Environmental Research Institute of Michigan ERDC GIS-200	Y	Y	Y	Y	Y	Y	N	Y	Y	N	
Environmental Systems Research Institute ARC/INFO	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Other types of cartographic output: proximal map, automatic label placement
Environmental Systems Research Institute GRID, GRID/TOPO	Y	N	Y	N	N	N	N	Y	Y	N	Other types of cartographic output: color film recording
GIMMS, Inc. GIMMS	Y	Y	Y	Y	Y	Y	Y	N[1/]	Y	N	1/ Under development
GeoGraphics A GIS overlay for RIPS Image Processing											

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

CARTOGRAPHIC OUTPUT (Hard Copy)

SOURCE/SOFTWARE	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	REMARKS
Geobased Systems STRINGS™		Y	Y	Y 1/	Y	Y	Y	Y	Y	N	1/ Available July 1985 Other types of cartographic output: can combine as many maps and map layers as the user likes regardless of earth window or original scale; shade polygons based on a query of tabular data base
Geogroup CED-BASEMAP	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	
Harvard University ODYSSEY Geographic Information System	N	Y	Y	Y	Y	Y	N	Y	Y	N	Other types of cartographic output: color and black/white shaded maps; 3-d raised prism maps of polygon data
Hennepin County Bureau of Public Service UltiMap	Y	Y	Y	Y 1/	Y 1/	Y	Y	N	Y	N	1/ Legends and titles are defined as map picture specific; other map data is universal Other types of cartographic output: quantiled chloropleth-shaded, distribution spot-shaded, point symbol spot location maps. Engineering plan, profile, cross-section, contour and mass diagram views
Holguin Corporation HOLGUIN GIS	Y	Y	Y	Y	Y	Y	Y	N	Y	N	
Interactive Systems Corporation AGIS-GRAMS	N	Y	Y	Y	Y	Y	Y	N	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	CARTOGRAPHIC OUTPUT (Hard Copy)										REMARKS
	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Y	N	Y	Y	N		N	N	N	Y 1/	1/ Using grid cells through gray tones
Jet Propulsion Laboratory Image-based Information System (IBIS)	Y 1/	Y	Y	Y	N	Y	Y	N	Y	Y	1/ Limited Other types of cartographic output: various type fonts, colors available
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	N	Y	Y	Y	Y	N	N	N	N	N	
Lincoln Institute of Land Policy SOLIR	N	Y	Y	Y	Y	Y	N	N	N	N	
Metrex Systems Corp. MISAR	N	Y	Y	Y	Y	Y	Y	Y	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	CARTOGRAPHIC OUTPUT (Hard Copy)										REMARKS
	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	neat lines	perspective views	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	
Michigan Department of Transportation Environmental Information System	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y	Y	Y	Y	Y	Y	Y[1/]	Y	Y	Y	1/ With Penplot and PLOTMAP
Morgan Fairfield, Inc. MICRO-MAP II		Y	Y	Y	Y	N	N	N	Y	N	Other types of cartographic output: contour maps
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
National Park Service System Applications Geographic Information System (SAGIS)	Y	Y	Y	Y	Y	N	Y	N		N	Other types of cartographic output: user designed solid-fill (patterns, symbols); transparent overlays
Pacific-Sierra Research Corporation (Unnamed)	Y	N	N	Y	N	Y	Y	N	Y	N	
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)	Y	Y	Y	Y	Y	Y	Y	N	Y	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

CARTOGRAPHIC OUTPUT (Hard Copy)

SOURCE/SOFTWARE	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	REMARKS
Planning Data Systems MULTIMAP	Y[1/]	Y	Y	Y	Y	Y	N[2/]	N	Y	N	1/ Screen dump to dot matrix printer 2/ Available in next release
Resources Planning Associates LOWLIB/GDBM/ENDECODE	Y	Y	Y	Y	N	N	Y	N	Y	N	Other types of cartographic output: color overlays can be generated from videodigitized color mapping and merged to a composite color overlay map
MAPEDT	Y	Y	Y	Y	N	N	Y	N	Y	N	
MAPOVL	Y	Y	Y	Y	N	N	Y	N	Y	N	Other types of cartographic output: see LOWLIB/GDBM/ENDECODE
RIVBAS	N	Y	Y	Y	N	N	N	N	N	N	
Riley Datashare Intl. MICROMAP (and subset ADACS)	Y	Y	Y	Y	Y	Y	Y	N	N	N	Other types of cartographic output: shaded pattern fills in color for polygons
Sammamish Data Systems Desktop Information Display System (DIDS)	Y	Y	Y	Y	Y	Y	Y	N	N	N	Other types of cartographic output: choropleth map output
SecaGraphics (M.A.G.I.C.)	N	N	Y	Y	Y	Y	Y	N	N	N	
South Dakota State University Area Resource Analysis System (AREAS)	Y	Y	Y	Y	N	N	N	N	N	N	
Spatial Information Systems Professional MAP (pMAP)	Y	N	N	Y	N	Y	Y	N[1/]	N	Y	1/ Possible with Golden Software interface

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

CARTOGRAPHIC OUTPUT (Hard Copy)

SOURCE/SOFTWARE	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	REMARKS
St. Regis Paper Company *PRO/GIS*	Y	Y	Y	Y	Y	Y	Y	N	Y	N	
Strategic Locations Planning ATLAS AMP	N	Y	Y	Y	Y	Y	N	N	Y	N	
Systems Development Corporation SDCIPS-GIS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Systemhouse Ltd. Resource Analysis and Mapping System (*RAMS*)	Y	Y	Y	Y	Y	Y	Y	N	Y	N	
Terra-Mar T-base	Y	Y	Y	Y	Y	Y	Y	N	Y	N	
The Sidwell Company SIGNET™	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Towson State University MICRO/GIS	Y	N	N	Y	N	N	N	N	Y	N	
U.S. Census Bureau TIGER	N	N	Y	Y	N	Y	N	N	N	N	
Uni-Graphic Systems, Inc. Geographics	N	Y	Y	Y	Y	Y	Y	N	Y	N	
University of California - *Berkeley* VIPERS	Y	N	Y	N	N	Y	N	N	Y	Y	
University of California - Riverside SIPS	N	Y	Y	Y	N	N	N	N	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

CARTOGRAPHIC OUTPUT (Hard Copy)

SOURCE/SOFTWARE	GRID-CELL MAPS	POLYGON MAPS	GENERATE MAPS AT VARIOUS SCALES	USER-SELECTED LABELS/ TITLES	USER-SELECTED SYMBOLS	USER-SPECIFIED LEGENDS	NEAT LINES	PERSPECTIVE VIEWS	CAN DRAW A GRID OVER A MAP (E.G., TICK MARKS)	PORTRAYAL OF SYNTHETIC RELIEF	REMARKS
University of Iowa (Unnamed)	Y	N	N	Y	N	N	N	N	N	N	
University of Massachusetts - Amherst COMLUP/ILPP	Y	Y	Y	Y	N	N	N	N	N	N	
University of Minnesota County Soil Survey Information System	N	Y	N	N	N	N	N	N	Y	N	
University of Nebraska Map and Image Processing System (MIPS)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Other types of cartographic output: color ink jet to exact scale
Utah State University MicroSieve	Y	N	N	N	N	N	N	N	Y	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y	Y[1/]	Y	Y	Y[2/]	Y	Y	1/ Batch 2/ Via merger with commercially available programs - SYMVU, etc.) Other types of cartographic output: profiles (surface, sub-surface, in-stream loadings and/or water quality conditions); multi-color/multi-patterned shaded plots; 'contouring' of any data, etc.
Yale University Map Analysis Package (MAP)	Y	N	N	Y	N	Y	Y	N	N	Y	1/ Separate FORTRAN program (provided) that can produce a polygon map

APPENDIX IV

Summary of GIS/Related Software

Part III: Functions Available

Section E: Graphic Output/Other Display Options

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOFTWARE/SOURCE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
(Unaffiliated) Schools Enrollment Projection System	N	N	Y	Y		Y	N	N	N	
Aeronca Electronics, Inc. GIS-100	Y	Y	N	Y	Linked to a commercial artist package: DRHALO	Y	Y	Y	Y	
Autometric, Inc. AUTOGIS	Y	N	Y	Y	Other types of graphic output: profiles for digital elevation data, interactive plotting to CRT, color graphics, etc.	Y	Y	Y	Y	
Bliss Associates BLISSMAP	N	N	N	Y		Y	Y	Y	Y	
Comarc Systems Comarc Intelligent Mapping System (CIMS)					See Comarc COMPIS and GDMS	Y	Y	Y	Y	
COMPIS	N	N	N	Y		Y	Y	Y	Y	Other display options: overplot two maps on CRT; extract by data type; set colors interactively on CRT; display numeric data on polygons/lines/points; display 3-d topographic image
Geographic Data Management System (GDMS)	N	N	N	Y		Y	Y	Y	Y	Other display options: see COMPIS
Criterion, Inc. LANDTRAK [c]	N	N	N	Y	Other types of graphic output: copy of map on screen	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
ESL, Inc. GEOMIPS	Y	N	Y	Y		Y	Y	Y	Y	
Earth Resources Data Analysis Systems ERDAS GIS and Image Processing PC KIT and Turnkey System	Y	N	Y	N	Other types of graphic output: color hard copy user specified scale, table of training sample evaluation, number maps, print file header information, print training sample information	Y	Y	Y	Y	Other display options: hardware roam and zoom
Environmental Research Institute of Michigan ERDC GIS-200	Y	N	Y	Y	Other types of graphic output: area tabulations	Y	Y	N	Y	Other display options: "moving window display" with up and down scrolling, relocation, left and right
Environmental Systems Research Institute ARC/INFO	Y	N	N	Y	Other types of graphic output: 3-D displays	Y	Y	Y	Y	
Environmental Systems Research Institute GRID, GRID/TOPO	Y	N	N	N		N	N	Y	Y	
GIMMS, Inc. GIMMS	Y	Y	Y	Y[1/]	1/ With limitations (Note: graphic output can be integrated with cartographic output)	Y	Y	Y	Y	
GeoGraphics A GIS overlay for RIPS Image Processing					Graphic output dependent upon hardware configuration of RIPS					
Geobased Systems STRINGS™	Y	Y	Y	Y		Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
Geogroup GEO-BASEMAP	Y	N	Y	Y		Y	Y	Y	Y	
Harvard University ODYSSSEY Geographic Information System	Y	N	N	Y[1/]	1/ File listings only	Y	Y	Y	Y	Other display options: rotation
Hennepin County Bureau of Public Service UltiMap	N	N	N	Y	*Other types of graphic* output: can digitize layouts and charts	Y	Y	Y	Y	*Other display options:* Specify picture contents using hierarchical dictionary to limit view to item descriptions of interest. Specify any shape of bounded area for viewing. Enter street address - parcel location and surrounding area displayed. Enter assessor use code - locations on base map displayed.
Holguin Corporation HOLGUIN GIS	Y	Y	Y	Y		Y	Y	Y		All maps are continuous for the entire service area
Interactive Systems Corporation AGIS-GRAMS	N	N	N	Y		Y	Y	Y	Y	
Intergraph Corporation Digital Terrain Modeling (DTM) Graphics Polygon Processing Utilities (GPPU) Grid Data Utilities (GDU)	N	Y	N	Y	Image processing functions performed through third party arrangements	Y	Y[1/]	Y	Y[2/]	1/ Any shape window 2/ User may display 32-64 reference files behind active file

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
International Imaging Systems System 600 GIS Applications Module	Y	Y	Y	Y	Other types of graphic output: combined map and image on film and hard copy	Y	Y	Y	Y	
Jefferson County Planning Computer Aid for Planning Programs (CAPP)	Y	N	Y	Y	Other types of graphic output: grid-cell maps (black and white, character and greytone, color character and color tones)	Y	Y	Y	N	
Jet Propulsion Laboratory Image-Based Information System (IBIS)	Y	N	Y	Y	Other types of graphic output: image output	Y[1/]	Y	Y	Y	1/ In batch declaration
Jet Propulsion Laboratory Land Use Mapping and Information System (LUMIS)	N	N	N	Y		Y	Y	Y	Y	
Lincoln Institute of Land Policy SOLIR	Y	N	Y	Y	Other types of graphic output: can stratify scatterplots by colors, symbols, and sizes	Y	Y	Y	Y	Other display options: graphic screen display and plotter display are both available
Metrex Systems Corp. MISAR	Y	Y	Y	Y		Y	Y	Y	Y	
Michigan Department of Transportation Environmental Information System	N	N	N	N		Y	Y	N	N	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)				REMARKS	OTHER DISPLAY OPTIONS				REMARKS
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS		ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	
Minnesota Planning Information Center Environmental Planning and Programming Language (EPPL)	Y 1/	N 2/	N 2/	Y	1/ Can also generate scattergrams 2/ Can dump tables to be loaded into a graphics package Other types of graphic output: supports PLOTMAP and can be converted to an ARC/INFO polygon coverage for use with ARCPLOT	Y	Y	Y	Y	
Morgan Fairfield, Inc. MICRO-MAP II	Y	Y		N		N		N	N	
NASA/Earth Resources Laboratory Earth Resources Laboratory Applications Software (ELAS)	Y	N	Y	Y		Y	Y	Y	Y	Several other display options
National Park Service System Applications Geographic Information System (SAGIS)	N	N	N	N		Y	Y	Y	Y	Other display options: interactive map design
Pacific-Sierra Research Corporation (Unnamed)	N	N	Y	N		N	N	N	N	
Pennsylvania State University Task-Oriented Multipurpose Information System (TOMIS)					Graphics output by interface with a statistical package	Y	Y	Y 1/		1/ Can trim the map but not the associated data

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
SOURCE/SOFTWARE	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
Planning Data Systems MULTIMAP	Y	N	N	Y		Y[1/]	N[2/]	N[2/]	Y	1/ Zoom not interactive; will be interactive in next release 2/ Available in next release
Resources Planning Associates LOWLIB/GDEM/ENDECODE	Y	Y	Y	N		Y	Y	N	Y	
MAPEDT	Y	N	N	N	Other types of graphic output: color displays which illustrate the spatial distributions of overlayed attributes can be generated for film or video-based hardcopy	Y	Y	N	Y	
MAPOVL	Y	N	N	N	Other types of graphic output: tabular data summaries can be presented and saved for hard copy output	Y	Y	N	Y	
RIVBAS	N	N	Y	N		Y	Y	Y	N	
Riley Datashare Intl. MICROMAP (and subset ADACS)	N	N	Y	Y	Other types of graphic output: merged output of text, map and calculated values on a single form on color matrix printer with full graphics support	Y	Y	N	Y	Other display options: full color display with shaded and pattern fills on polygons

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
Sammamish Data Systems Desktop Information Display System (DIDS)	Y	N	N	N		Y	Y	N	N	
SecaGraphics Mapping and Graphics Integrated Computer (M.A.G.I.C.)	N	N	N	Y		Y	Y	Y	Y	
South Dakota State University Area Resource Analysis System (AREAS)	N	N	N	Y		Y	Y	Y	Y	
Spatial Information Systems Professional MAP (pMAP)	N	N	N	N		N	Y[1/]	N	N	1/ Rectangular seed set Other display options: "dump" maps as base ASCII file for input to other software systems (e.g., color graphics, statistical package, etc.)
St. Regis Paper Company PRO/GIS	Y	N	Y	Y		Y	Y	Y	Y	
Strategic Locations Planning ATLAS AMP	Y	N	N	Y		Y	N	Y	N	
Systems Development Corporation SDCIPS-GIS	Y	N	Y	Y	Other types of graphic output: output to display screen, video terminal, line printer, graphics terminal, film recorder	Y	Y	Y	Y	

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

SOURCE/SOFTWARE	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
Systemhouse Ltd. Resource Analysis and Mapping System (RAMS)	N	N	N	Y		Y	Y	Y	Y	
Terra-Mar T-base	Y	Y	Y	Y		Y	Y	Y	Y	
The Sidwell Company SIGNET™	Y	Y	Y	Y		Y	Y	Y	Y	
Towson State University MICRO/GIS	Y	N	N	N		N	N	N	N	
U.S. Census Bureau TIGER	N	N	N	N		Y	Y	Y	Y	
Uni-Graphic Systems, Inc. Geographics	N	N	N	Y		Y	Y	Y	Y	
University of California - Berkeley VIPERS	Y	N	Y	Y		Y	Y	Y	Y	
University of California - Riverside SIPS	Y	N	N	N		N	N	N	N	
University of Iowa (Unnamed)	N	N	N	N		Y	Y	N	N	
University of Massachusetts - Amherst COMLUP/ILPP	N	N	N	Y		Y	Y	Y	N	
University of Minnesota County Soil Survey Information System	N	N	N	Y		N	N	N	N	
University of Nebraska Map and Image Processing System (MIPS)	Y	N	Y	Y	Other types of graphic output: 35mm film size	Y	Y	Y	Y	Other display options: splicing maps of same size

GEOGRAPHIC INFORMATION SYSTEMS SOFTWARE: FUNCTIONS AVAILABLE (Continued)

	GRAPHIC OUTPUT (Hard Copy)					OTHER DISPLAY OPTIONS				
SOURCE/SOFTWARE	HISTOGRAMS	PIECHARTS	GRAPHS/ SCATTERPLOTS	TEXTUAL REPORTS	REMARKS	ZOOM ON MAP SUBSET	DEFINE WINDOW	TRIM DISPLAY TO FIT WINDOW	MOSAIC AND DISPLAY AS SINGLE MAP	REMARKS
Utah State University MicroSieve	N	N	N	N	Other types of graphic output: dot matrix printer maps	N	N	N	N	
W. E. Gates and Assoc. Areal Design and Planning Tool (ADAPT)	Y	Y	Y	Y		Y	Y	Y	Y	
Yale University Map Analysis Package (MAP)	N	N	N	N		N	Y	N	N	

APPENDIX V

Directory of Software Developer/Vendors

DIRECTORY OF VENDORS

Stephen Graham
1138 15th Avenue
Seattle, WA 98122
206-325-8088
SOFTWARE: Schools Enrollment Projection Systems

Charles Killpack
AERONCA Electronics, Inc.
9625 Southern Pine Boulevard
Charlotte, NC 28210
704-523-4808
SOFTWARE: GIS-100

Dr. Carl N. Reed III
Autometric, Inc.
GIS Division Manager
Suite 340
2629 Redwing Rd.
Fort Collins, CO 80526
303-226-3282
SOFTWARE: AUTOGIS

Dr. Norman B. Bliss
Bliss Associates
522 East Maple St.
River Falls, WI 54022
715-425-8776
SOFTWARE: BLISSMAP

Gilbert H. Castle III
Comarc Systems
VP Urban & Regional Planning
150 Executive Park Boulevard
San Francisco, CA 94132
415-467-1300
SOFTWARE: CIMS, COMPIS, GDMS

Bob S. Evatt Jr.
Criterion, Inc.
11100 Roselle
San Diego, CA 92121
619-455-0162
SOFTWARE: LANDTRAK

Gary Gnauck
ESL, Inc.
P.O. Box 3510
Sunnyvale, CA 94088-3510
408-738-2888
SOFTWARE: GEOMIPS

Bruce Q. Rado
Earth Resources Data Analysis Systems
ATDC - Suite N206
430 Tenth Street, N.W
Atlanta, GA 30318
404-872-7327
SOFTWARE: ERDAS, ERDAS-PC

Roger M. Reinhold
Environmental Research Instit. of Michigan (ERIM)
P.O. Box 8618
Ann Arbor, MI 48107
313-994-1200
SOFTWARE: ERDC - GIS 200

Jack P. Dangermond
Environmental Systems Research Institute
380 New York Street
Redlands, CA 92373
714-793-2853
SOFTWARE: ARC/INFO; GRID, GRID/TOPO

Cecilia Magee
GIMMS, Inc.
431 Clark Street
South Orange, NJ 07079
201-762-5622
SOFTWARE: GIMMS

William H. Smith
GeoGraphics
1318 Alms Drive
Champaign, IL 61820
217-351-3154
SOFTWARE: A GIS Overlay for RIPS

Thomas E. Everly
Geobased Systems
P.O. Box 13545
Research Triangle Park
Raleigh, NC 27706
919-361-5717
SOFTWARE: STRINGS

Paul M. Wilson
Geogroup
39 Canyon Rd.
Berkeley, CA 94704
415-845-8044
SOFTWARE: GEO-BASEMAP

Jonathan Corson-Rikert
Harvard University
Laboratory for Computer Graphics
and Spatial Analysis
Graduate School of Design
Cambridge, MA 02138
617-495-2526
SOFTWARE: ODYSSEY

Alexander M. Azemove
Hennepin County Bureau of
Public Service
320 Washington Avenue South
Hopkins, MN 55343
612-935-3381
SOFTWARE: UltiMap

David Claudio
Holguin Corporation
P.O. Box 12990
El Paso, TX 79912
915-581-1171
SOFTWARE: Holguin GIS

Terry Elmore
Interactive Systems Corp.
5500 South Sycamore St.
Littleton, CO 80120
SOFTWARE: AGIS/GRAMS

Eddie Downing
Intergraph Corporation
HQ 003
One Madison Industrial Park
Huntsville, AL 35807-4201
205-772-2222
SOFTWARE: GPPU, DTM, GDU

Steve B. Lytle
International Imaging Systems
1500 Buckeye Dr.
Milpitas, CA 95035
408-262-4444
SOFTWARE: System 600 GIS Applications
Module

Guy R. Groves
Jefferson County Planning
1700 Arapahoe
Golden, CO 80419
303-277-8699
SOFTWARE: Computer Aid for Planning
Programs (CAPP)

Nevin A. Bryant
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109
818-354-7236
SOFTWARE: Image-Based Info. Syst. (IBIS)
Land Use Mapping & Info. Syst. (LUMIS)

Alven Lam
Lincoln Institute of
Land Policy
1000 Massachusetts Avenue
Cambridge, MA 02138
617-661-1152
SOFTWARE: SOLIR

Arthur H. Trinkle
Metrex Systems Corp.
131 N. San Gabriel Blvd.
Pasadena, CA 91107
818-449-8162
SOFTWARE: MISAR

Shyu-tu Lee
Michigan Department of
Transportation
P.O. Box 30050
Lansing, MI 48909
517-373-9050
SOFTWARE: Environmental Information System

Paul A. Tessar
Minnesota Planning Information Center (PIC)
Metro Square Building
7th and Robert Streets
St. Paul, MN 55101
612-297-2487
SOFTWARE: Environmental Planning and Programming Language (EPPL)

Paul Gibson
Morgan Fairfield, Inc.
Suite 300
1923 First Ave.
Seattle, WA 98101
206-682-2879
SOFTWARE: MICROMAP II

Trish Penton
NASA/Earth Resources Lab.
National Space Technology Labs
NSTL Station, MS 39529
601-688-2042
SOFTWARE: Earth Resources Laboratory Applications Software (ELAS)

Harvey Fleet
National Park Service
GIS Field Unit
Denver Service Center-SP
P.O. Box 25287
Denver, CO 80225
303-236-8773
SOFTWARE: Systems Applications Geographic Information System (SAGIS)

David A. Larch
Pacific-Sierra Research Corp.
1401 Wilson Blvd.
Arlington, VA 22209
703-525-9857
SOFTWARE: *Un-named*

Dr. Wayne L. Myers
Pennsylvania State University
School of Forest Resources
University Park, PA 16802
814-865-8911
SOFTWARE: Task-Oriented Multipurpose Information System (TOMIS)

Barry R. Cohen
Planning Data Systems
1616 Walnut St., Suite #2103
Philadelphia, PA 19103
215-732-1300
SOFTWARE: MULTIMAP

Peter French
Resources Planning Associates
231 Langmuir
Cornell Research Park
Ithaca, NY 14850
607-257-4305
SOFTWARE: MAPOVL, RIVBAS, MAPEDT, LOWLIB/GDBM/ENDECODE

Arnold Hartland
Riley Datashare Intl.
1223 31st Avenue N.E.
Calgary, Alberta T2E 7W1
403-230-5942
SOFTWARE: Micromap, subset ADACS

Rick H. Schweitzer
Sammamish Data Systems
1413 177th Ave. NE
Bellevue, WA 98008
206-644-2442
SOFTWARE: Desktop Information Display System (DIDS)

David W. Saxton
SecaGraphics
425 S. Cherry St., Suite 450
Denver, CO 80222
303-778-7700
SOFTWARE: Mapping and Graphics Integrated Computer (M.A.G.I.C.)

Mary DeVries
South Dakota State University
Remote Sensing Institute
Box 507
Wenona Hall
Brookings, SD 57007
605-688-4184
SOFTWARE: Area Resource Analysis Systems (AREAS)

Dr. Kenneth L. Reed
Spatial Information Systems
12359 Franklin Street
Omaha, NE 68154
402-498-0369
SOFTWARE: Professional MAP (pMAP)

Bill Shelley
St. Regis Paper Company
Forest Resource Information System
435 Clark Rd., Suite 411
Jacksonville, FL 32218
904-764-0545
SOFTWARE: PRO/GIS

Susan Fetherolf
Strategic Locations Planning
4030 Moorpark Avenue
Suite 123
San Jose, CA 95117
408-985-7400
SOFTWARE: ATLAS AMP

Ronald G. McLeod
System Development Corporation
5151 Camino Ruiz
Camarillo, CA 93011
805-987-6811
SOFTWARE: SDCIPS-GIS

Robert J. Madill
Systemhouse Ltd.
2827 Riverside Drive
Ottawa, Ontario K1V 0C4
Canada
613-526-0670
SOFTWARE: Resource Analysis and Mapping System (RAMS)

Donn C. Walklet
Terra-Mar
2113 Landings Drive
Mountain View, CA 94043
415-964-6900
SOFTWARE: T-base

Ronald R. Lampe
The Sidwell Company
P.O. Box M
West Chicago, IL 60185
312-231-0206
SOFTWARE: Sidwell Interactive Graphics Network (SIGNET)

Dr. John M. Morgan III
Towson State University
Geography and Environmental Planning
Towson, MD 21204
301-321-2964
SOFTWARE: MICRO/GIS

Joseph Knott
U.S. Census Bureau
Washington, DC 20233
301-763-1794
SOFTWARE: Topologically Integrated Geog. Encoding & Referencing (TIGER)

S. J. Cowdell
Uni-Graphic Systems, Inc.
P.O. Box 520610
Salt Lake City, UT 84152
801-484-0691
SOFTWARE: Geographics

Randy Thomas/Paul Ritter
University of California - Berkeley
260 Space Sciences Lab
Berkeley, CA 94720
415-642-2351
SOFTWARE: Video Image Processing for Environmental Remote Sensing (VIPERS)

Claude Johnson
University of California
- Riverside
Department of Earth Sciences
Riverside, CA 92521
818-354-4321
SOFTWARE: Spatial Information Processing System (SIPS)

Dr. Marc P. Armstrong
University of Iowa
Department of Geography
Iowa City, IA 52242
SOFTWARE: Un-named

Dr. Julius Fabos
University of Massachusetts - Amherst
Department of Landscape Architecture and Regional Planning
Amherst, MA 01002
413-545-2255
SOFTWARE: COMLUP/1LPP

Dr. Pierre Robert
University of Minnesota
Department of Soil Science
1529 Gortner Avenue
St. Paul, MN 55108
612-376-9183
SOFTWARE: County Soil Survey Information System

Dr. Lee D. Miller
University of Nebraska
Nebraska Remote Sensing Center
113 Nebraska Hall
Lincoln, NE 68588-0517
402-472-3471
SOFTWARE: Map and Image Processing System (MIPS)

Dr. John K. Nicholson
Utah State University
LAEP UMC 40
Logan, UT 84322
801-750-3475
SOFTWARE: Micro Sieve

Paul Koch
W. E. Gates and Associates
114 Wooster Pike
Milford, OH 45150
513-248-1996
SOFTWARE: Areal Design and Planning Tool (ADAPT)

Dr. Joseph Berry
Yale University
School of Forestry & Environ. Studies
205 Prospect St.
New Haven, CT 06511
203-436-0440
SOFTWARE: Map Analysis Package (MAP)

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