2000-2001 Annual Report
Center for Advanced Spatial Technologies
University of Arkansas
Fayetteville
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Cover photos (top to bottom, left to right):

- High school students attend the annual EAST Partnership Conference in Little Rock.
- Dr. Fred Limp meets with WAPDD Committee. A community development group from Western Arkansas.
- Brian Culpepper presents demo to sixth and seventh graders from Westville, Oklahoma.
- High school students from Huntsville High School participate in the EAST Initiative.
- CAST's corporate sponsor, SUN Microsystems, provides equipment to CAST.
- CAST staff members provide a GIS demo to UAF Alumni Association.
**Highlights of FY 00-01**

- This year eight externally-funded research grants were awarded to CAST totaling $449,252.00. Many CAST projects, where funding was awarded in previous years, were still active during the fiscal year. The total amount of grants awarded this year, $449,252.00, plus the total of grants still active this year (but not awarded during FY 00-01), $1,343,434.00, equals a total of $1,792,686.00 in active projects during the fiscal year. Many of CAST’s projects were conducted in cooperation with faculty from various departments at the University of Arkansas and other institutions around the state.  

  *Pages 26-41*

- The online digital library, GeoStor, went online to the public in late 2000 and offers more than 1.5 terabytes of data. Although GeoStor has not been online with access to the public for very long, it has already proven to be extremely popular. For the time period December 11, 2000 through June 21, 2001, there were a total of 6,598 downloads, an average of over 240 downloads per week.  

  *Pages 12, 33, 48-50*

- Sun Microsystems continues to support CAST education, research, and public service missions by this year providing three servers, a Raid disk array, a robotic tape backup system, four CPU. Sun has been a corporate sponsor for CAST for several years and established a Center of Excellence in Distributed Computing for Spatial Applications at CAST.  

  *Page 6*

- The EAST high school program served approximately 4,700 middle and high school students last year, and is expected to soon grow to exceed 10,000 students from across 100 districts in six to eight states. CAST’s participation in this program has grown in the number of staff involved, the type of projects established, and the number and variety of training programs.  

  *Pages 19-23, 37*
• Land-use and land-cover project works toward producing a high quality, digital land-cover database for the State of Arkansas. This project is part of an ongoing effort at CAST to maintain an up-to-date picture of Arkansas' landscape.

    Pages 27-29

• ESRI, Inc. and CAST formed a cooperative research and development agreement. Through this agreement, ESRI provided CAST with a variety of ESRI software and training sessions for CAST staff at no cost. ESRI's support will help to expand the knowledge base of students, faculty, and researchers.

    Page 6

• CADIS high school students provide community-based information by creating a high quality GIS for Northwest Arkansas. This project provides an extensive suite of information about the region to the counties, communities, and businesses of the area. This partnership benefits not only the high school students involved, but also benefits the citizen of Northwest Arkansas by providing this on-line area information to anyone with access to the web.

    Page 15-18

CAST's website continues to grow in quality and quantity of data it contains and the ease of access to that data. During the last six months, the number of hits has risen from an average of 13,600 hits per day to an average of 14,613 hits per day. Almost 3,600 other websites link to CAST webpages.

    Pages 43-47

The total number of people working at CAST during FY00-01 was 52, broken down as follows.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time</td>
<td>19</td>
</tr>
<tr>
<td>Hourly</td>
<td>24</td>
</tr>
<tr>
<td>Graduate students</td>
<td>4</td>
</tr>
<tr>
<td>Work-study students</td>
<td>1</td>
</tr>
<tr>
<td>CADIS students</td>
<td>4</td>
</tr>
</tbody>
</table>

    Pages 8, 79-80
Over 360 research and education computer accounts were issued to UAF students, faculty, staff, researchers, and workshop participants during the year. Students and faculty have access to almost 40 different types of software in labs supported by CAST staff. Nine GIS technologies UAF classes were offered in CAST labs this year.

Pages 12-14

- Economic development project in the Arkansas Delta uses a working public-private partnership of state, local, and private entities to develop an online, site location system to address a priority problem facing rural America, economic development.

Pages 29-30

- The NASA scientific data purchase grant provides high-resolution aerial photographs of the Fayetteville area. These images will aid ongoing CAST research into the use of airborne and space-borne digital images for mapping and monitoring land-use and land-cover characteristics in mixed urban-rural environments.

Pages 39-40
The Center for Advanced Spatial Technologies (CAST) focuses on three basic areas: education, research, and service to the public. CAST specializes in serving the academic community through its emphasis on high quality university courses in Geographic Information Systems (GIS), Global Positioning Systems (GPS) education, and related technologies. CAST's research efforts, through multiple grants awarded each year, compliment and greatly benefit its educational and public service focus by allowing staff and students to stay on the leading edge of emerging technologies. CAST staff are also active in a wide range of service to the university, community, state, nation, and are also active internationally.

Education, research, and public service work together to form the backbone of CAST's purpose and its mission. By building upon the expertise of staff; the cooperation of the university community; state, regional, and local governments; the support of corporate sponsors; the assistance of federal agencies; and many others, CAST blends its focus on education, research, and public service to multiply the benefits of all these cooperative efforts.

**Education.** University of Arkansas undergraduate and graduate students have a wide range of GIS/GPS courses available to them at CAST. These courses, taken along with related courses in cartography, remote sensing, image interpretation, photogrammetry, surveying, and spatial statistics, provide the student with a range of career options. GIS/GPS courses are open to students from any discipline who plan to use these technologies in their work and research. In addition to classroom instruction, CAST facilities are used by students in both undergraduate and graduate research projects. The internship program in applied spatial information technologies offers students an opportunity to gain hands-on experience in GIS technologies. The Environmental Dynamics Ph.D. program focuses on human-environmental interactions within recent earth history, and it includes a strong GIS component.

**Research.** CAST staff are actively involved in a wide range of research projects funded by a variety of governmental and business organizations. These include applications, data development, technology transfer, software evaluation, and remote sensing applications. Recent research projects focused on areas such as geospatial data warehousing and distribution, source water protection, environmental impact of population expansion, and the optimization of networking for the public sector in Arkansas.

**Public Service.** CAST is involved in a variety of activities that are of benefit to the citizens of Arkansas. CAST's website offers a multitude of data to the general public on information ranging from different forms of Arkansas' land usage and land cover to locating lakes, streams, highways, cities, etc. CAST's website averages over 14,600 hits per day. CAST’s involvement in the EAST Initiative has helped support EAST high school students and their communities in their efforts to use high tech tools to solve real world problems. An expansion of the EAST Initiative, the CADIS Program, brought together the private and public sector to create a high quality GIS specifically for Northwest Arkansas. Information about EAST and CADIS are available on CAST’s website and in later sections of this report.
**Structure.** CAST is an element of the J. William Fulbright College of Arts and Sciences but has a campus-wide role with the active involvement of the Fulbright College Departments of Anthropology, Biological Sciences, and Geosciences; the Dale Bumpers College of Agriculture, Food and Life Sciences Departments of Agronomy, Rural Sociology, and Entomology; the College of Architecture Department of Landscape Architecture; and the College of Engineering Departments of Biological, Civil, and Industrial Engineering. A Board of Associate Directors, composed of representatives of various colleges, provides guidance to CAST. Dr. Thomas Graff represents Fulbright College, and Dr. Don Scott represents Agriculture.

**RGIS-MidSouth.** Last year, the National Center for Resource Innovations (NCRI) was reorganized and renamed the National Consortium for Rural Geospatial Innovations in America (RGIS). RGIS-Mid-South has been an integral part of CAST since September of 1991. NCRI was established in 1990 as the result of a federal grant through the Cooperative State Research Services (CSRS), U.S. Department of Agriculture, to the Dale Bumpers College of Agriculture, Food and Life Sciences. RGIS-Mid-South is one of eight regional centers located throughout the United States whose mission is to transfer GIS technology to state, county, and local governments.

The association of RGIS with CAST has been highly beneficial to both. The RGIS-Mid-South mission has formed extensive ties with state, county, and local government agencies (an important segment of potential GIS users) and the resources available through CAST has greatly enhanced the RGIS teaching and public service programs. The benefits to RGIS include access to

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**RGIS Regional Offices**

- **RGIS-North West**
  - Ellensburg, Washington

- **RGIS-Great Plains**
  - Grand Forks, North Dakota

- **RGIS-Great Lakes**
  - Madison, Wisconsin

- **RGIS-Chesapeake-Wilkes/Kings**
  - Wilkes-Barre, Pennsylvania

- **RGIS-Chesapeake-Penn State**
  - University Park, Pennsylvania

- **RGIS-South East**
  - Valdosta, Georgia

- **RGIS-Tribal Technical Center**
  - Albuquerque, New Mexico

- **RGIS-Mid-South**
  - Fayetteville, Arkansas
technical expertise from a number of fields, more coordinated support for expanded communications networks (both among campus departments and in the state and region), and formal agreements to share in the acquisition, accessing, and cataloging of new digital data for use in research.

**Corporate Sponsors.**

CAST has developed a series of strong relationships with many of the world’s leading software and hardware companies. These relationships are designed to be of mutual benefit to the companies and the University of Arkansas. All the companies involved in the Center’s research and development efforts receive valuable exposure, and each company has a specific set of activities in which it cooperates with the Center. University students and staff receive access to state-of-the-art systems, internships with world class companies, and the opportunity to cooperate in significant research. The following describes the specific agreements that the Center has with ESRI, Inc., PCI Geomatics, Oracle Corporation, Sun Microsystems, MapInfo Corporation, Intergraph Corporation, and Trimble Navigation Ltd.

**Sun Microsystems.** Last year, Sun Microsystems established a Center of Excellence in Distributed Computing for Spatial Applications at CAST. This center has been established to focus on a set of problem domains that include spatial data warehousing, natural resource management, placed-based decision support, enterprise applications, the development of distributed application services and support for public administration, public health, public safety, and disaster management.

Early this year, SUN Microsystems provided the following equipment to CAST: (1) an Enterprise E4500 mid-range server with eight 400-MHz Ultra Sparc CPUs, (2) a gigabit network StorEdge A5200 Raid disk array with 4800-Gb capacity, (3) StorEdge L3500 Robotic tape backup systems with native (uncompressed) 3500 GB capacity, and (4) two Enterprise E450 departmental servers with four 480-MHz Ultra Sparc CPUs, 4-GbRAM and 144-Gb disk. Corporate support from Sun Microsystems continues to be an important component in the success of CAST's support of researchers, faculty, students, and staff and its ongoing efforts to deliver information to the public. Last year, Sun Microsystems, the world's leading producer of network computing systems and creator of Java technologies, gave a four-processor server worth $237,930 to the University of Arkansas.

**ESRI, Inc.** This year, ESRI (Environmental systems Research Institute, Inc.) and CAST initiated a cooperative research and development agreement (CRADA). This agreement provides CAST with a variety of ESRI software programs at no cost during the initial term of the CRADA for a range of ESRI-supported platforms for use by CAST researchers, students, and staff to be used in noncommercial research and education. ESRI also provided CAST with complimentary seats in ESRI ArcSDE training classes as ESRI deems available, and during the first year of this agreement, CAST will also receive fifty free seats of the ESRI Virtual Campus training program available on the web. ESRI’s support of CAST's education and research mission will help to expand the knowledge base of students, faculty, and researchers.

**PCI Geomatics.** In May of 2000, PCI Geomatics announced the signing of an agreement with CAST for joint cooperation in the areas of remote sensing and geomatics. PCI Geomatics has been developing industry leading geospatial software since 1982 and has
continuously been a tireless supporter for the advanced study of remote sensing, digital
photogrammetry, GIS, cartography, and all earth sciences in academic institutions around the
world. This agreement includes the establishment of a Center of Excellence in Geomatics and
Remote Sensing by PCI at CAST. PCI Geomatics provided CAST with a full range of its remote
sensing and geomatics software and full software maintenance for the hardware platforms in use
at the Center. As its primary contribution to this collaborative, CAST will provide a range of
service-type deliverables, including review and beta testing of PCI Geomatics products, provision
of externally sponsored research opportunities that will test PCI Geomatics technology, and the
implementation of an internship program. Such a program offers qualified students
(undergraduate and graduate) from a wide range of disciplines (including geography,
environmental dynamics, computer science, and business/commerce) the opportunity to work
directly with PCI Geomatics personnel.

Oracle Corporation. In 1999, a high-tech collaboration among CAST and two of the
nation’s largest producers of computer software and hardware extended the reach of the
University of Arkansas by enabling faculty and students to communicate with greater ease with
colleagues around the world. Oracle Corporation, the world’s leading supplier of software for
information management, donated database software worth $580,335.

In January of 1998, Oracle Corporation announced its designation of CAST as its first Center of
Excellence for Spatial Data Management. Oracle is the world’s largest developer of database
management software, with annual revenues of more than $14 billion. CAST is also a member of
Oracle’s Academic Alliance Program and a founding member of Oracle’s Spatial Research
Laboratory. Oracle Corporation continues to provide CAST software and technical support as
part of an ongoing collaboration.

MapInfo Corporation. The Center is awaiting final signatures on an agreement with
MapInfo Corporation of Troy, New York. Under this agreement, MapInfo Corporation will
create a Center of Excellence in Mapping Applications for Decision Support. Under this grant,
CAST receives MapInfo’s complete suite of software products. In addition, a student internship
program has been created. The first internship involved CAST researcher and Geosciences
Graduate Student Shane Covington working with MapInfo to develop cutting-edge web-mapping
geospatial products for the Internet.

Intergraph Corporation. The Intergraph Corporation, a Fortune 500 firm and the
world’s leading vendor of geographic information systems software, selected CAST as one of
only four National Centers of Excellence in the Mapping and GeoSciences. As a result, CAST
has to date received more than $5 million in hardware, software, and support services. In 1999,
the Center received the latest releases of Intergraph’s GeoMedia software suite. GeoMedia is
also being used by the Environmental and Spatial Technology (EAST) Program, and CAST and
Intergraph cooperate in assisting this program.

Trimble Navigation Ltd. Trimble Navigation Ltd. is the world’s largest manufacturer of
GPS hardware. Trimble selected CAST as one of two U.S. Centers of Excellence in Navigation
and GPS. As a result of the selection, CAST has to date received more than $250,000 in Trimble
hardware and software.
Staff.

Since GIS applications encompass a wide range of knowledge from many fields of study, a conscious effort has been made to insure that CAST staff are not only proficient in GIS software, but also represent a broad spectrum of disciplines. CAST staff members represent diverse backgrounds in areas such as architecture, archaeology, agronomy, landscape architecture, surveying, engineering, geology, computer science, remote sensing, photo interpretation, historic preservation, geography, forestry, wildlife biology, and the social sciences (see appendices A and B for listings of staff publications, demonstrations, workshops, etc. and appendix C for a list of CAST staff).
Facilities and Equipment.

Facilities. CAST occupies ten offices, three labs and a library/reading room area in more than 6,000 square feet of Ozark Hall. The facilities include the Rural America 2000 Lab, the Advanced Projects and Interoperability Lab, and the Spatial Technologies Research Lab. CAST also has responsibilities for four teaching laboratories used by students from the Departments of Anthropology, GeoSciences, Environmental Dynamics, and many others. All facilities are carpeted, climate-controlled, and equipped with high quality furnishings through funding provided by Fulbright College.

Rural America 2000 Lab (Ozark Hall, Room 204). Computer technologies are becoming key elements in rural America's county and local governments. These computer systems will be used to maintain tax records, plan community development, and respond to federal environmental regulations. They will be a critical element in almost all local governmental actions. In the same period, USDA farm service agencies (FSA, FmHA, and NRCS) will also be developing similar capabilities to aid in their missions. It is clear that local and rural governments and these farm service agencies could benefit from cooperation in the area of GIS technologies. The Rural America 2000 laboratory is a model facility that provides a working example, today, of what such a cooperative facility might look like by the end of this decade. It is designed to provide local governmental units, the Cooperative Extension Service, and USDA units an opportunity to participate in cooperative projects in a state-of-the-art facility similar to the ones that will be widely available in the next few years. The system has both UNIX and NT systems and a wide range of peripherals.

Advanced Projects and Interoperability Lab (Ozark Hall, Room 111). This lab features some of the highest performance computing systems currently available. These systems are used for state-of-the-art research and to provide a test-bed environment for demonstration of the Open Geodata Interoperability Specification (OGIS) software. OGIS is a developing international software specification that allows software from different vendors to easily access data from other vendors and from a variety of federal and other sources. In addition to the OGIS effort, this facility is used for a variety of other research efforts such as softbench (digital) photogrammetry. In softbench photogrammetry, aerial photography or other stereo photography is digitally converted to a digital elevation model (DEM). In a DEM, individual elevation values are computed for the entire surface of the photo. The system also allows the extraction of feature data from a stereo photo, for example, the height of a building or the route of a highway. These data can then be used in geographic information systems, for maps, other planning, and engineering purposes. In addition to the traditional uses for such photography, the photogrammetry systems are being used in other research projects to document detailed features of human bones and the characteristics of prehistoric pottery and stone tools. Other systems include digital video, extensive remote sensing capabilities, 3D visualization hardware, and large NT servers.

CAST's Server Facility. Center systems administration staff maintained and supported a total of 83 computer systems during FY 00-01. Non-lab systems total 30 NT and 3 UNIX high performance workstations and nine large multiprocessor servers on a fast (100MB/s) ethernet network. CAST has more than a five terabytes of online disk storage with additional optical and tape juke-boxes and a full range of tape drives and CD-ROM systems. There is a full complement of peripherals including dual-headed digitizers, scanners, large format (up to E-
sized) color and black and white plotters and printers. Staff equipment upgrades completed this year include eight desktop machines, two laptops, one server, three black and white laser printers, and one large-scale plotter. Please see sections below for information on computer equipment available in the various labs. Lab equipment upgrades this year include 12 desktop machines, network drops for 44 lab computers, a color laser printer, a color inkjet printer, one black and white laser printer, and a color scanner. Staff software upgrades were made to Corel Freehand, Paint Shop Pro, CartaLynx, Surfer 7, Idrisi 32, and lab software upgrades were made to Norton Antivirus, S-Plus, ArcView, Geomedia, ArcInfo, and PCI.

**Network Capabilities.** The Center is one of the highest consumers of network bandwidth on campus with our remote sensing and GIS applications that often incorporate disk files that exceed one gigabyte in capacity. For several years, our aging computer network infrastructure has impeded progress in many areas. Last year, CAST was fortunate to receive National Science Foundation funds from the Dean of the University of Arkansas Graduate School that enabled us to completely rework the network infrastructure in all of the Center's facilities. Each desktop was rewired with class-5 cabling that enables internal transmission speeds of up to 1 gigabit. Working in conjunction with Craig Brown, Director of Network Services at the University of Arkansas Computer Services Department, CAST obtained high capacity network cards and switches that support high speeds and the delivery of complex data (voice, video, and data) over a single connection. These Asynchronous Transfer Mode (ATM) capabilities opened the door for video conferencing and improved distance learning from the Center's facilities. In addition, with access to the Internet II community, Center researchers can now acquire and share data with colleagues at other Internet II sites at speeds up to 145 megabits per second.

**CAST Supported Teaching Labs.** The Mapping and Geosciences Lab, the Spatial Technologies Research Lab, and the Spatial Technologies Research Lab, all in Ozark Hall, are facilities used for teaching and research by students.

- The Mapping and Geosciences Laboratory (Ozark Hall, Room 208) provides a facility for undergraduate and graduate education as well as professional short-courses, demos, workshops, etc. The facility consists of 10 desktop computers in a classroom configuration. The lab also includes a color laser printer, a black and white laser printer, a color scanner, a large-format black and white scanner, and a dual-headed digitizer.

- The Spatial Technologies Research Lab (Ozark Hall, Room 214) is a general-purpose laboratory housing a number of CAST researchers and graduate students. A range of computer platforms (both UNIX and NT) are available, as are high performance graphics workstations, flat-bed color scanners, and a wide range of GIS and remote sensing software is available in the laboratory.

- The Multipurpose Computer Lab (Ozark Hall, Room 209) provides access to a number of different computer hardware and software systems for purposes of student access and professional courses. The particular configuration and systems available are flexible and dependent on current training and educational needs, but include UNIX and NT systems, digitizers, dye-sublimation, and electrostatic printers. Currently available equipment in this lab includes eight desktop computers, one color ink-jet printer, one black and white laser printer, one color scanner, and one Unix workstation with digitizer.

- The Cartography and Mapping Lab (Ozark Hall, Room 103). This lab is primarily used for GeoSciences courses and research activities. CAST provides systems administrative support
of this lab. The lab contains nine desktop computers, one color high-capacity ink-jet printer, one black and white laser printer, and one color scanner. There is also one Windows server to support this lab and the use of the CAST Unix servers is also available.

- The Geological and Geophysics Computer Lab (Ozark Hall, Room 44). This lab is accessible to GeoSciences students enrolled in classes and those involved in active research. CAST provides systems administrative support for this lab. The lab offers the use of eight desktops computers, one color high-capacity ink-jet printer, one black and white laser printer, one color scanner, and one Windows-based digitizer. There is also one Windows server to support this lab and the use of the CAST Unix servers is also available.
Digital Library Project.

The CAST research project, GeoStor, is one of the key components in the University of Arkansas Digital Library project. GeoStor provides web access to a huge repository of geospatial data for Arkansas. It allows easy search and retrieval to more than 500 different data sets representing more than 1.5 terabytes of data. Students and faculty in classes and in many research projects have been able to utilize GeoStor which has led to a dramatic increase in the speed at which they are able to access data. (For more information and some sample graphics from the GeoStor project, see the Research and Public Service sections of this report.)

University of Arkansas Courses.

University of Arkansas undergraduate and graduate students have a number of GIS/GPS courses available to them at CAST. These courses, taken along with related courses in cartography, remote sensing, image interpretation, photogrammetry, surveying, and spatial statistics, provide the student with a range of career options. GIS/GPS courses are open to students from any discipline who plan to use these technologies in their work and research. In addition to classroom instruction, CAST facilities are used by students in both undergraduate and graduate research projects. Over 360 research and education computer accounts were issued to students this year. Access to CAST’s computer labs is of great benefit to both graduate and undergraduate students who attend GIS/GPS courses.

CAST labs provide students and researchers access to today's most current hardware and software.
Software Access. In addition to providing access to state-of-the-art facilities, CAST also provides access to a wide range of software systems to students and faculty. A partial list of software provided to the students and faculty within the CAST labs and in the Departments of Anthropology, GeoSciences, ENDY, and Soil Physics follows.

- Microsoft Office
- Microsoft Outlook
- Norton Antivirus
- Adobe Acrobat
- Alladin Expander
- Ghostscript
- Internet Explorer
- LeechFTP
- Netscape
- QWS3270
- Terra Term Pro
- ZipCentral
- CBTCampus
- S-Plus 2000
- Pathfinder Office
- Microstation
- ArcView 8.1
- ArcGIS Network Analyst
- ArcGIS Spatial Analyst
- ArcGIS 3D Analyst
- ArcGIS Geostatistical Analyst
- Grassland
- Geomedia
- GeoMedia Pro
- Idris32
- ArcGIS 8.1
- ArcInfo 8.1
- PCI
- GeoMatica 8.0
- Mapmarker
- MFWorks for Geomedia
- Oracle Client
- Corel Draw
- ENVI
- Geoplot
- Golden Software Surfer 7
- Macromedia Freehand
- ArcIMS
- Oracle Enterprise is available to the students via the Oracle Client on the desktop.

Campus-Wide ESRI License. In 2001, CAST staff worked with Dan Pucket of UAF Computing Services to initiate a campus-wide site license for ESRI software. CAST is providing one half of the site license fee and the services of John Wilson as the ESRI technical support person for the campus. During 2002, a series of workshops for campus faculty and students will be held.

Students/Faculty/Researchers Computer Accounts. During the fall 2000 semester, 93 computer accounts were issued to students attending courses in Introduction to Cartography, Introduction to GRASS, Introduction to GIS, Quantitative Technologies, Raster GIS, and Vector GIS. During the spring 2001 semester, 104 accounts were issued to students attending courses in Advanced Raster GIS, Advanced Remote Sensing, Computer Mapping, Introduction to GIS, Introduction to GPS, and Near Surface Prospection. Accounts issued to GeoSciences, Anthropology, and ENDY faculty and/or students doing research totaled 133.

UAF Courses taught during FY 00-01. A list of University of Arkansas courses taught in CAST’s labs during FY 00-01 follows.

- Vector GIS (taught by Dr. Fred Limp). Vector GIS provides an introduction to GIS applications in marketing, transportation, real estate, demographics, urban and regional planning, and related areas. Lectures focus on development of principles, paralleled by
workstation-based laboratory exercises using Arc-node based software and relational databases.

- **Raster GIS and Advanced Raster GIS** (taught by Dr. Ken Kvamme). Raster GIS provides an introduction to spatial analyses in the natural sciences and resource management fields using GIS. Lectures focus on development of principles, paralleled by workstation-based laboratory exercises using raster-based software, relational databases, and exploratory data analysis.

- **Introduction to GRASS Applications** (taught by Malcolm Williamson; coordinated by Dr. Fred Limp). This course is an introduction to GIS problem solving using the Geographic Resource Analysis Support System (GRASS) software.

- **Introduction to Global Positioning System** (taught by Mike Garner; coordinated by Dr. Fred Limp). Introduction to GPS introduces the student to navigation, georeferencing, and digital data collection using GPS receivers, data loggers, and laser technology for natural science and resource management. Components of NavStar GPS are used in the integration of digital information into various GIS platforms with emphasis on practical applications.

- **GIS for Business** (taught by Brian Culpepper and Stephan Pollard; through the College of Business). This introductory course covers the basic concepts of spatial analysis, desktop digital mapping, digital data, geocoding, address matching, relational database design, and cartographic practices employed by today's more progressive companies and marketing firms. This course covers business applications of GIS, industry methods, data sources, and interoperable applications are demonstrated within one specific GIS software. The course also includes a general survey of several different software and data that are designed for geobusiness applications.

- **Near-Surface Prospection** (taught by Dr. Ken Kvamme). Geophysical remote sensing methods are investigated for detecting and mapping subsurface features up to 5m in depth. Magnetometry, resistivity, conductivity, ground-penetrating radar, and other methods are examined with a particular focus on their use for understanding archeological deposits.

- **Quantitative Foundations for GIS** (taught by Dr. Ken Kvamme). Reviews mathematics necessary for understanding GIS functions like interpolation, map coordinate transformation, and derivation of landform measurement theory, spatial data types, probability theory, graphical displays, descriptive statistics, probability distribution, randomization methods, tests for means, variances, spatial pattern, categorical methods, ANOVA, correlation and regression.

- **Geographic Information Systems** (taught by Brian Culpepper, coordinated by Dr. Fred Limp). Computer assisted analysis and display of geographic resource data. Course develops the theory behind spatial data analysis techniques and reinforces the theory with exercises that demonstrate its practical applications.

- **Remote Sensing of Natural Resources** (taught by Dr. Pamela Jansma). Advanced course in remote sensing technology with special emphasis on interpretive techniques for resource management and research.
Educational Projects.

Each year, CAST is actively involved in a variety of educational projects that provide training to students in age brackets ranging from middle school to university level to professionals in the business community and government. These projects also provide the added benefit of being community-based projects, thereby, returning the investment in this education back to Arkansas' citizens.

Community Asset and Development Information System (CADIS) Program. Access to quality information is a key aspect of effective public policy, economic development and community decision-making. Much of this needed information is place-based: Where do I vote? Where is a wetland? Where is the local police station? Where will we need a new school? A second important query is how are these thing related: Is the proposed school on or near a wetland? How far do I need to go to vote? How many parks are within two miles of my home? Computer-based tools are now a necessity in helping communities answer these interlinked, complex questions.

To answer these questions and to provide additional community based information, the CADIS Program brought together the private and public sector to create a high quality GIS for Northwest Arkansas. CAST partners with the National Association of Counties, the National Association of County Engineers, and Intergraph Corporation to provide an extensive suite of information about the region to the counties, communities, and businesses of the area. Computerized map data on transportation, demographics, infrastructure, soils, and many other types of data, along with software to analyze the data, is part of the project. The data is provided over the web at no cost, and the software developer, Intergraph, donated the software. Support from the Bank of Fayetteville allows four high school interns from the EAST programs at local Northwest Arkansas high schools to work on this project, in conjunction with CAST personnel. This partnership benefits not only the high school students involved, but also benefits the citizens of Northwest Arkansas by providing this on-line area information to anyone with access to the web. The CADIS webpage at www.cast.uark.edu/local/cadis was designed and implemented by the CADIS students.

I believe tools like CADIS will revolutionize community-based planning over the next decade.
Mark Schafer, Deputy Assistant Secretary for Water and Science for the U.S. Department of Interior.
A list of agencies currently participating in the CADIS program follows.

- Intergraph Corporation.
- EAST Program.
- Bank of Fayetteville.
- Fayetteville Public School.
- Arkansas Scholarship Information Service.
- Washington County Judge's Office.
- University of Arkansas Department of Landscape Architecture.
- City of Fayetteville.
- Rogers High School.
- Arkansas Single Parent Scholarship Fund.
- GENESIS Technology Incubator.
- Ozark International Consultants.
- Arkansas Department of Information Services.
- Benton County Environmental Health and Safety.
- Wellsco Graphics.
- Fayetteville Planning Department.
- Fayetteville Public Library.
- Springdale Planning Office.
- Southwestern Bell Telephone.
- Washington County Planning Office.
- Northwest Arkansas Council.
- Community Partnership.
- CAST.

A few of the kinds of mapping information developed during the CADIS project follow.

City of Fayetteville 30-year growth projections in 5-year increments.
The CADIS School Modeler map projects areas of population growth to better plan new school construction.

The CADIS Land Finder helps to locate the best place for a new home, business, farm, etc.
The CADIS Land View allows easy web-based viewing of high-resolution aerial photography.

Ease of use is a key ingredient in a land system intended for public use. Usually, a GIS is used to allow comparison of complex geographic criteria. While powerful, these GIS systems are usually complicated to use and require a skilled professional. In the CADIS system, a point-and-click web interface was created that mimics the selection criteria. Each factor can be selected with a mouse click, and once all the criteria are chosen, the user can view a map of the results. After viewing the results, a user can change factors to see how they affect the outcome.

The CADIS system is comprised of four parts: Civic Center, Land Finder, Land View, and School Modeler. All are accessible from the CADIS website, and each provides a different type of information about the community. CADIS is available at http://www.cast.uark.edu/local/cadis. (See Research section of this report for grant information on this project.)
The Environmental and Spatial Technologies (EAST) Program. The EAST Project ([http://www.eastproject.org](http://www.eastproject.org)) is an outgrowth of a highly successful model that was developed by Tim Stephenson of Greenbrier High School. The program began in 1996 with only one school, Greenbrier High School. CAST's first participation in this program was the first EAST GIS/GPS training camp held in CAST labs November 3-7, 1997. Since that time, the program has grown at a phenomenal rate. From the beginning, the EAST project has stressed learning in combination with community service. Students use high tech tools to solve real problems in their own hometowns. High school students in the EAST program have developed emergency response systems for town fire departments, created new economical and efficient bus routes, and designed new parking lots for their schools. Each summer, teachers from Arkansas and surrounding states' high schools attend two-week professional development workshops that includes GIS/GPS components.

During 2000 EAST served more than 4,000 students.

Workshops offered this year included six week-long *Introduction to GIS/GPS* courses, one week-long *Advanced GIS Applications* course, and two day-long *Web Servers and Streaming Media* courses. Total workshop participation was approximately 170 students.

CAST sponsors and administers a list server for all students enrolled in EAST. This year approximately 2,600 students and facilitators participated on the list, discussing topics and issues ranging from the migration of GPS data to GIS, to determining the optimum Windows NT network configuration. CAST staff actively participate in list discussions, and encourage collaboration between EAST students and schools.

During the year 2000, EAST was serving in excess of 4,500 students at 57 educational institutions including middle schools, high schools, two-year colleges, and one site at the University of Arkansas at Little Rock. Since its beginning in 1996, with one school, CAST's support of the EAST Program has greatly increased. Following are a few highlights of the EAST Program's expansion.
1996-1997: One Arkansas school participating with approximately 20 high school students. CAST becomes EAST’s first educational partner, and Wellsco Graphic Solutions becomes EAST’s first corporate sponsor.

1997-1998: Thirteen schools participating with approximately 670 high school students. EAST expanded to 12 new sites with added support from the Arkansas Department Education and increased corporate and education sponsorship.

1998-1999: Thirty-five schools participating with approximately 2,350 students, including two schools from Louisiana and one from Alabama. In March of 1999 the Arkansas State Legislature voted to provide seed funding to increase the number of EAST labs. EAST was featured in Converge magazine in December of 1998 and in the Arkansas Business Weekly in 1999.

1999-2000: Fifty-seven schools participating with approximately 4,700 high school students. EAST hosted its first annual EAST Partnership Conference to celebrate student achievement and to recognize the thirty plus educational and corporate partners that have helped to make EAST successful. During this year EAST and the Arkansas Department of Education became partners in Project LINKS (Learning Improvement by Networking the Knowledge of States), a multi-year effort aimed toward sharing innovative and successful education reforms.

The future: Fall enrollment in the EAST Program is expected to exceed 10,000 students from across 100 districts in six to eight states.

The EAST Program's philosophy is based on the following educational principles: (1) all students have value and deserve the opportunity to demonstrate their value to their school and community, (2) education must be relevant, challenging, purposeful, and student-centered, (3) educators should serve as resource guides and learner facilitators, (4) learning should be self-directed and oriented towards real-world projects, and (5) high expectations must be maintained and must drive all student efforts. Based on these principles, the EAST model has been recognized all over the country as an innovative, relevant, and successful approach to education.

EAST students display their accomplishments at the EAST Partnership Conference this spring.
Due to this phenomenal growth, new EAST training facilities have been established in Harrison and Little Rock, Arkansas. CAST staff members Malcolm Williamson and Heath Wallis work almost full-time to provide technical support and training, including three to four months each year providing on-site visits and workshop training instruction. They also work with the students on the delivery of web-available training materials for this highly successful program. This year, several CAST staff members again participated in the annual EAST Partnership Conference serving as speakers, project judges, workshop presenters, etc. Each year this conference, held in Little Rock, brings together students, educators, local and state leaders, and private industry executives. (See Research section of this report for grant information on this project.)

**EAST Virtual Geospatial Camp.** CAST’s support role of the EAST Initiative (http://www.eastproject.org) has grown from simply supplying data to students at Greenbrier High School six years ago to a multi-person effort involved in everything from student training to school visits. Today there are EAST labs at 150 schools in six states, with the potential of geometric growth looking quite likely. Our existing model for training has consisted of traditional workshops, located at EAST training facilities, which require that students and teachers travel significant distances and incur lodging and meal costs. Although this model has been mostly successful, it does not scale easily or efficiently. A better solution is needed, and is now being developed at CAST: a Web-based, interactive “virtual” camp.

The objective of the EAST Virtual Geospatial Camp is to both replace the existing workshops, and to allow a much greater number of EAST students to learn the material normally conveyed in the workshops. Furthermore, the self-paced nature of Web instruction fits much more closely to the mission of EAST. A secondary benefit of the “virtual camp” approach is that the material can also be used for reference, as well as instruction. In this initial iteration, there are three courses offered through the camp: Introduction to GeoMedia Professional, Mapping with the GeoExplorer 3, and Integrating GPS Data with GeoMedia. The major hurdle for this project is the creation of a suitable framework for the courses. Commercial off-the-shelf solutions were examined, but none seemed to contain all of the attributes that are desired for this Web site. Although several solutions allow the inclusion of on-line assessment, none of these provide for the substantial student interaction that was desired. As a result, several former EAST students were employed on this project to develop the front- and back-ends of the Web site. The result is a secure, scalable framework that allows easy and flexible content development, while incorporating a high level of interactivity and the ability to track student progress. The Virtual Geospatial Camp will provide the basis for future training development, scaling to as many students as necessary, while providing a better fit to the mission and methods of EAST.

EAST Virtual Camp online information is developed by the EAST students.
EAST Cultural/Historical Animation Workshop. This EAST program is a collaboration between the business and education community to provide opportunities to at-risk high school students. Some of the opportunities that are provided are training camps that teach technically advanced subjects which students may not otherwise encounter in the regular high school curriculum. One of the training camps that is available is the Animation camp, which teaches students the basics of 3D animation with leading edge software, such as Softimage. They learn to model and animate objects, scenes and human characters.

CAST provides technological support to EAST and takes the opportunity to enlist the EAST students in various projects to further provide them with more experience. One of the projects that CAST has begun is an animation demonstration for the Arkansas Archeological Survey.

During the summer of 2001, EAST students, Aaron White, Kent Walker, and Harlan Skinner, were enlisted and assigned a project to model and animate the aspects of Parkin Archeological Park which was the Indian town of Casqui. They are lead by CAST’s Web/Graphic Designer, Snow Ballard, to produce a realistic animation of Indian life in 1400 A.D.

The students are using Softimage for the modeling and animation, Adobe Photoshop for image enhancements, and Adobe Premier for final video editing. The final product will be distributed on-line via CAST’s website, by CD, and on videotape.

The subject that the students plan to model will be a Casqui night-guard waking up and preparing for his night duties. The animation will provide rich detail and a realistic scene of the interior of the night-guard’s home and his life. The students are working closely with George Sabo, of the Arkansas Archeological Survey, to ensure that the animation reflects correctly the lives of the Casqui. Detail and accuracy become a major factor in the animation because of its potential to be used for educational purposes.

The overall goal of the project is to show the Department of Parks the resources available through the EAST program to create, at low cost, Hollywood-type animated visualizations that can be used by the Department of Parks for tourist education. (See Research section of this report for grant information on this project.)

To add realism to an animation, textures are created in Adobe Photoshop that will be graphed onto the object models in the scene. At right is a screen-shot of some of the textures the students created for pottery pieces and blankets for the interior of the home.
This is a wireframe image of the Casqui home. The model was created by Kent Walker in Softimage.

Aaron White is working on the interior artifacts for the home, he has created headpots, weapons and benches in Softimage.

Harlan Skinner is in charge of creating the fire scene for the home. The modeling of the fire and creating a realistic setting is a challenge in 3D animation.
**Destination Lab.** Destination Lab is a series of unique, interactive, project-based, week-long classes, held in Florida, that explore the concepts, technology, hardware, and software of geospatial technologies. This program is a result of a collaboration between the U.S. Space and Rocket Center, the Stanford Research Institute, International (SRI) the world's largest independent nonprofit R&D organization, and CAST. The classes were established to instruct students in how to integrate Geospatial technologies into a 21st century management tool. Training and application technical sessions consist of intense, project-based learning that combine technology instruction, video teleconferencing with researcher at NASA, major universities, and prestigious research organizations and field-based data gathering. Fred Limp and Brian Culpepper of CAST participated in the May 6-9, 2001 Destination Lab class in Orlando, Florida. Limp served as an instructor, and Culpepper was an instructor and provided technical assistance. This class, titled *Integrating Geospatial Technologies into 21st Century Management*, offered instructions in applied technology and its uses in city management, interactive experiences with GPS, GIS, remote sensing and public access to e-government information, and taught skills for implementation of systems into work environments.

Fred Limp served as an instructor during the May Destination Lab in Orlando, Florida.

**Environmental Dynamics Ph.D. Program.** This program’s prime focus is human-environmental interactions within recent Earth history. It stresses interdisciplinary regional analysis of geophysical, biological, climatic, and socio-cultural interactions and changes. The Program is an outgrowth of many years of successful research in human adaptations to past and present environments by faculty of the J. William Fulbright College of Arts and Sciences. Primarily, the program is staffed by faculty from the Departments of Anthropology, Geography, and Geology and associated research institutes and labs: CAST, the Arkansas Water Resources Research Center, the Tree-Ring Lab, the Bioarchaeology Lab, and the Archaeology Lab. The program stresses the application of appropriate methodologies such as GIS, GPS, remote sensing, computer modeling, and cartography to environmental problems. The research approach integrates the power, efficiency, and economy of advanced computer-based technologies into the study of human-environmental interactions within recent Earth history. CAST's Director Fred Limp serves as a faculty member of this program.
Internship Program in Applied Spatial Information Technologies. CAST, in cooperation with the University of Arkansas Department of Anthropology, now offers an internship program in Applied Spatial Information Technologies. The emphasis is on the practical skills needed to prepare the candidate for careers in nonacademic environments including employment in consulting and other private sector firms or federal, state, or local government employment. This internship allows the candidate to gain hands-on experience in one or more areas of computer systems administration, remote sensing and GIS applications and data, use of GPS, and/or database design and management.

Conferences and Workshops. Each year, CAST staff attend, give talks, and participate in major conferences and workshops about the latest in GIS technologies. These events help to continue the learning process of CAST's educators and researchers. A few of the major conferences and workshops that CAST staff participate in each year are discussed below.

- The international GeoSpatial World 2001, sponsored by Intergraph Corporation, was held this year in Atlanta in June. Fred Limp, Debbie Harmon, Malcolm Williamson, and Heath Wallis of CAST attended. Fred Limp also serves on Intergraph's GeoSpatial Executive Board. This yearly conference provides professional development and productivity training opportunities, a forum for interactive discussion of business and product direction, and a chance to network with other industry professionals. Intergraph Corporation continues to be a strong supporter and corporate sponsor of CAST.

- Each year, various CAST staff member attend the ESRI International User Conference and attend GIS technologies training sessions, participate in technical workshops, view exhibitions, and listen to lectures. This conference also provides current information on the latest in ESRI GIS software. The lectures, classes, etc. also provide participants the opportunity to discuss GIS related issues with others from around the county with like interests in current technologies.

- In August of 2000, Brian Culpepper represented CAST at the URISA Conference in Orlando, Florida. The Urban and Regional Information systems Association (URISA) is an organization for those involved in improving urban and regional environments through the use of information technologies. URISA seeks to provide its members with as many resources as possible to meet the demands of today's workplace. URISA offers information to those interested in planning, public works, information systems, assessment, natural resources, transportation, emergency services, or departments within state and local government. While there, Culpepper presented CAST's current research on the Arkansas SWAP project.
Each year, CAST staff are involved in numerous major research projects, training programs, and other cooperative efforts with a variety of governmental and business organizations. These projects include GIS applications, data development, technology transfer, software evaluation, remote sensing applications, and similar efforts. Cooperative research and teaching efforts are also in place with off-campus faculty at the University of Arkansas at Little Rock, Westark Community College, and the Arkansas Archeological Survey. Since 1991, CAST has worked to establish excellent working relationships with federal, state, county, local agencies and governments, as well as the public sector, to better serve the citizens of Arkansas through its many cooperative projects. Recent projects focused on areas such as source water protection, soils mapping, environmental impact of population expansion, and providing data to the public sector of Arkansas.

The total amount of grant monies awarded during FY 00-01 was $449,252.00. A list of grants awarded during FY 00-01 follows, and a list of projects that were active during FY 00-01 is also included. Many of the projects listed in the second section are multi-year projects and have already been listed as awarded during previous year(s) but remained active during this fiscal year. The total amount of CAST grants listed in this second section of multi-year projects active in FY 00-01 (but not awarded during the fiscal year) is $1,343,434.00. Awarded in FY 00-01 amount of $449,252.00 plus grants active (but not awarded) during FY 00-01 totals $1,792,686.00.

**Overview of Grants Awarded During FY 00-01.**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Award Amount</th>
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<tbody>
<tr>
<td>1) LULC - Environmental Characterization of Arkansas: Soil and Land Use/Land Cover Maps and Saline Water in Southern Arkansas</td>
<td>$ 9,676.00</td>
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<tr>
<td>07/01/00 - 06/30/01</td>
<td></td>
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<tr>
<td>Awarded 08/15/99 Arkansas Soil and Water Conservation Commission</td>
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</tr>
<tr>
<td>2) RGIS - National Consortium for Rural Geospatial Innovations Program</td>
<td>$111,969.50</td>
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<tr>
<td>04/15/99 - 06/30/00</td>
<td></td>
</tr>
<tr>
<td>Awarded 04/15/99 by USDA/CSREES (second year funding)</td>
<td></td>
</tr>
<tr>
<td>07/01/00 - 06/30/01</td>
<td></td>
</tr>
<tr>
<td>Awarded 11/30/00 by USDA/CSREES</td>
<td>$128,939.50</td>
</tr>
<tr>
<td>3) FGDC - Framework Demonstration Projects: Enhancing Economic Development in the Arkansas Delta Using Framework Data</td>
<td>$69,735.00</td>
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<tr>
<td>07/01/00 - 09/30/01</td>
<td></td>
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<tr>
<td>Awarded 07/01/00 U.S. Geological Survey</td>
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<tr>
<td>4) GIS-Based Natural Resource Analyses for the L'Anguille River and Big Creek WPA</td>
<td>$21,112.00</td>
</tr>
<tr>
<td>08/15/00-03/30/01</td>
<td></td>
</tr>
<tr>
<td>Awarded 11/01/00 by Arkansas Soil and Water Conservation Commission</td>
<td></td>
</tr>
</tbody>
</table>
6) Increasing GeoStor Capabilities Data  77,844.00
04/01/01 - 06/30/01
Awarded 04/16/01 by the Arkansas Department of Information Services

7) Clearinghouse Integration with WebMapping  20,000.00
06/01/01 - 05/30/02
Awarded 06/01/01 by U.S. Department of the Interior

8) EAST Cultural/Historical Animation Workshop  9,976.00
06/11/01 - 08/17/01
Awarded 06/01/01 by the EAST Initiative

Total of grants awarded during FY00/01:  $449,252.00

Details of Grants Awarded during FY 00-01.

• LULC - Environmental Characterization of Arkansas: Soil and Land Use/Land Cover Maps and Saline Water in Southern Arkansas  $9,676.00 (July 2000 - June 2001)
Optimal use of soil and water resources is one of society’s principal challenges. Numerous water and soil conservation problems: surface and ground water pollution, topsoil loss, increasing soil salinity, and ground water depletion are directly related to how land is used. Various land-use types: cropland, pasture, roads, residential, commercial, industrial, mining operations, etc. offer different challenges to those tasked with protecting our soil and water resources. Accurate land-use maps can help soil and water scientists to identify potential problem areas, predict where problems are likely to occur in the future, and to model appropriate solutions. In 1999 the Arkansas Soil and Water Conservation Commission (ASWCC) provided funding to CAST for the development of a statewide digital land-use/land-cover map focusing on the year 1999. The digital maps are derived from satellite imagery from the TM sensor aboard Landsat satellite platforms 5 and 7. Three maps will depict intra year changes in Arkansas land-use: Spring, Summer, and Fall. Combined with existing spatial data, the information produced from this project will serve as a basis for the formulation of soil and water policies and practices.

Tasks.
• Collection of ground-truth (GT) data for image classification and accuracy assessment: a Trimble® Pro XR GPS unit was used to collect ground truth (GT) samples for the following targets: Soybeans (Late and Early), Cotton, Rice, Sorghum, Corn, Bare Soil, Warm Season Pasture, and Cool Season Pasture. The GT data collection was done over a four week period from August 27 to September 3, 1999. Week 1 was spent collecting GT crop information in southern Delta counties. Week 2 was spent collecting GT crop information in northern Delta counties. Week 3 was spent collecting cool vs. warm season pasture GT information in north and central Arkansas. Week 4 will be spent collecting GT crop information in the Arkansas and Red River Valleys.

• Data Acquisition: Necessary Landsat data was purchased from Space Imaging, Inc. and the USGS-EDC. Ten scene footprints are needed to cover the entire state. Three scenes were
purchased for each footprint making a total of 30 scenes. The images were inspected for system error. Errors existed in three scenes, and those scenes were returned and exchanged for other scene dates.

- Image preprocessing: All Landsat images were geo-rectified to into a UTM projection and the NAD83 datum. Some scenes were filtered to remove minor system/calibration errors. All 10 scenes were “mosaiced” for each season to create statewide seasonal images.

- Image classification: (For the purpose of this project, we define image classification as the extraction of differentiated classes or themes from raw remotely-sensed digital satellite data). The Landsat data was classified using standard supervised and unsupervised image classification methods, as well as techniques developed specifically for this project.

- Accuracy assessment: Using ground-truth data collected from the first task (ground-truth points not used in preceding task) the accuracy of the crop and pasture categories in the final classified LULC maps are currently being assessed. Initial results show high positional map accuracy between all crop and pasture categories.

- Report writing and WWW page creation: A written report is currently being produced. This report provides details of the project methodology and examines, in detail, project results. Project data will be delivered to the Arkansas Soil and Water Conservation Commission in Little Rock during the first week of July, 2001. A project web page will be set up to disseminate the results of the project and will be maintained throughout the life of the project and thereafter as funding permits.

The goal of the Arkansas LULC project is to produce a high quality digital land-cover database for the state of Arkansas. Project data is derived from the ETM+ sensor aboard the satellite Landsat 7. The LULC project is part of an ongoing effort at CAST to maintain an up-to-date picture of Arkansas’ landscape.
Significant Innovations

- The method for collecting ground-truth points was enhanced by combining GIS and GPS in the field for real-time sampling and visualization.
- Crop phonologies were actively used to select appropriate satellite imagery useful for differentiating between pasture and crop types.
- Levelized category extraction methods were developed and employed to improve inter-class accuracy.
- GIS and image processing techniques were combined in new approaches to modeling spatial data from a variety of sources.

- **RGIS - National Consortium for Rural Geospatial Innovations Program**
  - $111,969.50 (April 1999 - June 2000) (second year funding)
  - $128,939.50 (July 2000 - June 2001)

RGIS-Mid-South, located at CAST, is one of eight regional centers located throughout the United States whose mission is to transfer GIS technology to county and local governments. In 1991, when RGIS-Mid-South (formally NCRI-SW) became part of CAST, it brought together the considerable expertise of a network of researchers with a long-standing history of GIS development that has been beneficial to both. The RGIS mission includes technology transfer, demonstrations to introduce GIS to county and local officials, needs assessments, assisting in pilot projects, research to develop new analytical and technological delivery systems, and development of accessible digital databases; all aimed toward aiding local and county governments in their service to the community.

- **FGDC - Framework Demonstration Projects: Enhancing Economic Development in the Arkansas Delta Using Framework Data**
  - $69,735.00 (July 2000 - September 2001)

This project, funded by FGDC, uses a working public-private partnership of state, local and private entities to develop an online, site location system integrating geospatial technology, framework data, and Internet access to address a priority problem facing rural America; economic development.

CAST’s collaborators include The Arkansas Department of Information Systems, Office of Information Technology, The Arkansas Department of Information Systems, State Land Information Board, The Arkansas Science and Technology Authority (ASTA), Entergy Corporation, Environmental and Spatial Technology Program (EAST), and First Electric Cooperative Corporation.

There are four specific objectives for this project:

- Provide communities in 27 counties of the Arkansas Delta, including Randolph, Clay, Lawrence, Greene, Independence, Jackson, Craighead, Mississippi, Poinsett, White, Woodruff, Cross, Crittenden, St. Francis, Pulaski, Lonoke, Prairie, Monroe, Lee, Jefferson, Arkansas, Phillips, Lincoln, Desha, Drew, Chicot, and Ashley, with a regional, spatially referenced framework-based information infrastructure scalable to the local level.

- Develop an interactive web-based decision support system for business site location that augments existing economic development efforts, enhances global competitive standing, and promotes the marketability of rural communities via heightened Internet presence. Derivatives of this project include delivery of raw data to desktop GIS clients, technology transfer to under-served rural communities, and contribution of local enhancements to framework data sets from the community level.
• Execute a focused technology transfer effort to economic development professionals and the communities in the area to insure the continuity of the system and the fulfillment of local needs. A key part of this technology transfer effort is the use of the existing and growing network of Environmental and Spatial Technology (EAST) Partnership Programs already active in the Delta.

• Extend the USGS Framework model to include baseline information measuring local features and phenomena. This NSDI-like scaling of the Framework concept will increase the project impact at the local level. Framework data is a central element in this project but its value is accentuated by integration with other, locally available geospatial data. The use of framework data in a project of immediate and significant impact will provide an effective demonstration of its importance and merit.

The user view of the proposed system is that of an easy-to-use geospatial decision support structure. The back end of the system is an enterprise-class geographic database of critical framework data supplemented by application specific data for place-based analysis and decision support to promote economic development, simplify business decision making, attract business to the Delta, and facilitate capacity building for community development.

Counties of the Delta region of Arkansas.
• GIS-Based Natural Resource Analyses for the L’Anguille River and Big Creek WPA
  $21,112.00 (August 2000 - March 2001)

CAST has continued its collaborative research efforts to identify, quantify, and analyze wetland resources in the Arkansas Delta. This study area of this particular project is the L’Anguille River and Big Creek wetland planning areas. Much of the project encompasses the gathering and translation of data to be compatible with the geographic information systems (GIS) of the Soil and Water Conservation Commission (ASWCC). Analyses of same data focuses on the methodology co-developed by CAST and the Multi-Agency Wetland Planning Team (MAWPT), as already applied to five other wetland planning areas in the Arkansas delta. Compatibility with previous analyses is of primary consideration, in order to maintain the value of previous research.

The project consists of four principle steps:

• Gathering and conversion of ecosystem component data.

• Creation of base component overlays and hardcopy maps.

• Application of GIS analysis.

• Technical support of MAWPT personnel.

The first step focuses on assembling data both for wetland delineation and for cartographic production. Most definitions of wetlands contain three components: (1) water, (2) unique soils different from upland areas, and (3) vegetation adapted to wet environments (“hydrophytic” vegetation). This project utilizes water data from the U.S. Geological Survey (USGS) and from a satellite imagery-based project of the Natural Resources Conservation Service (NRCS). Soils data is also obtained from NRCS in the form of their digital county soils database, SSURGO. Hydrophytic vegetation is extracted from the Arkansas GAP Analysis data. Additional data, such as roads, political boundaries, etc., are extracted from USGS and Bureau of the Census sources.

Once data has been gathered and converted to a uniform database, a series of GIS overlays and maps are produced. These include a hydric soils map (indicative of wetlands), a wetlands inventory map, and a public ownership map. These provide researchers of the MAWPT with tools that can be used both for immediate planning purposes, and also for evaluating the latter GIS analysis stage of the project.

The core of the project is the GIS analysis of the assembled data. CAST conducts analyses that identify priority wetland protection and restoration sites based on the characteristics, distribution and functions of existing wetlands in Arkansas. This process involves the identification of wetlands for protection, restoration or acquisition, and prioritization of areas that would benefit the most with limited state funds. The end products are both hardcopy paper maps, useful for overall planning or presentation, and the underlying GIS coverages, which allow more precise identification of locations, as well as the option of changing analysis criteria and re-calculating.

The last step of this project has been the most critical. CAST’s long-term relationship with the agencies of the MAWPT has fostered strong collaboration between technical specialists. This insures the future value of state dollars spent on research at CAST.
• Increasing GeoStor Capabilities Data
  $77,844.00 (April 2001 - June 2001)
GeoStor, the outgrowth of the SWAG project, went online during FY00-01. GeoStor is an online data delivery system that allows the user seamless access to digital map data of any area in Arkansas with no subscription fee. The name GeoStor refers to a comprehensive, web-based geodata delivery system. At the core of this system is a massive Oracle database, located at CAST facilities, containing all publicly available geodata for the State of Arkansas. This includes roads, streams, aerial photography satellite imagery, and elevation data. In GeoStor you can search by many different easy to use criteria, such as (a) address, (b) place (e.g. city-limits, county, park boundaries), (c) point in UTM, lat/lon or SPSC coordinates, (d) box drawn on the screen, (e) township/range/section, and/or (f) theme keyword (e.g. elevation, soils). Access to GeoStor is available via CAST's webpage at www.cast.uark.edu. (Also see Public Service section of this report for more information on GeoStor.)

• Clearinghouse Integration with WebMapping
  $20,000.00 (June 2001 - May 2002)
In response to the rapid growth of the Internet and its expanding role in the dissemination of geospatial data and services, the National Spatial Data Infrastructure has extended its early emphasis on the production and management of spatial data to include a focus on the development of more effective means of web-based spatial data distribution and related web technology. The extension of Clearinghouse to include scalable, interoperable, and extensible web mapping services is another step forward in the evolution of Internet technologies that support the spatial data infrastructure.

The goal of this project is to extend the capabilities of NSDI Clearinghouse to include the web mapping services demonstrated in the Web Mapping Testbed 1 and documented in the OpenGIS Web Mapping Specification 1.0, providing prospective data clients the opportunity to visually explore the spatial data behind the Arkansas GeoLibrary node of Clearinghouse and merge that data with data from Arkansas cities and counties at multiple locations.

This implementation, the GeoStor Map Portal, represents a strategic partnership of the Arkansas State Land Information Board, the Center for Advanced Spatial Technologies at the University of Arkansas, the City of Fort Smith, Sebastian County and the Western Arkansas Planning and Development District (WAPDD), Fort Smith, Arkansas, that will further the goals of the Arkansas Spatial Data Infrastructure and the NSDI. The Portal will link the contents of the Arkansas GeoLibrary Clearinghouse node to local and remote OGC-compliant map servers via a viewer client to expose the spatial data documented in the clearinghouse to the growing network of web map servers. The data to be utilized include (1) small scale regional data stored in the GeoStor database at the University of Arkansas and (2) the large-scale 'local' data from Fort Smith and Sebastian County stored as part of the Western Arkansas Planning and Development District Enterprise Project.

The project includes modification of existing metadata records to support links to data servers and map servers, updates to the Arkansas GeoLibrary with GeoStor metadata, addition of WAPDD metadata to the Arkansas GeoLibrary clearinghouse, and design and installation of map servers and viewer clients at both CAST and WAPDD. This implementation, in fulfilling the technical objectives of the State Land Information Board, will take both data stores several steps toward greater interoperability by bringing the Planning District into Arkansas Spatial Data Infrastructure and NSDI and by making both facilities OGC web mapping standards compliant.
• EAST Cultural/Historical Animation Workshop  
  $9,976.00 (June 2001 - August 2001)  
This EAST program is a collaboration between the business and education community to provide opportunities to at-risk high school students. Some of the opportunities that are provided are training camps that teach technically advanced subjects which students may not otherwise encounter in the regular high school curriculum. One of the training camps that is available is the Animation camp, which teaches students the basics of 3D animation with leading edge software, such as Softimage. They learn to model and animate objects, scenes and human characters. CAST provides technological support to EAST and takes the opportunity to enlist the EAST students in various projects to further provide them with more experience. One of the projects that CAST has begun is an animation demonstration for the Department of Parks.

  During the summer of 2001, EAST students, Aaron White, Kent Walker, and Harlan Skinner, were enlisted and assigned a project to model and animate the Parkin Archeological Park of the Indian town of Casqui. They are lead by CAST’s Web/Graphic Designer, Snow Ballard, to produce a realistic animation of Indian life in 1400 A.D. (Also see Public Service section of this report for more details and graphics for this project).

Projects Active During FY 00-01.

• The Seamless Warehouse of Arkansas Geodata (SWAG).  
  $610,985.00 (December 1998 – November 2000).  
CAST initiated a collaborative research and technology transfer project with a focus on delivering stable framework and corporate geodata into a diverse user community using existing Internet tools. This effort is based on CAST’s existing statewide, comprehensive spatial database and emerging commercial software products. Under this initiative, CAST is working with a network of partners to build a comprehensive, open standards-compliant warehouse that supports vector and raster data, attribute information, and descriptive metadata. The SWAG project demonstrates the use of an enterprise approach to managing and providing digital geodata. SWAG provides a bridge that spans distributed data, applications, and user domains, thereby empowering all levels of government with geospatial data and infrastructure. Additionally, it represents a working instance of the National Spatial Data Infrastructure that can be replicated across governmental components. In 1999, due in large part to the efforts of CAST’s Technical Director Jim Farley, CAST’s SWAG project received the Computerworld Smithsonian Award. The SWAG project will become part of the Permanent Research Collection on Information Technology at the Smithsonian's National Museum of American History. In 1999, SWAG was renamed GeoStor. (For more information and graphics, see Public Service section and earlier references to SWAG and GeoStor in this section of this report.)

• Arkansas Source Water Protection Plan.  
  $10,845.00 (July 1999 – February 2001).  
  $22,022.00 (July 1999 – September 2000).  
In conjunction with the USGS office in Little Rock and the Arkansas Department of Health, CAST is participating in a Source Water Protection Project, under a national mandate by the Environmental Protection Agency. CAST will provide 1,565+ maps of all of Arkansas’ public water intakes and the potential sources of contamination adjacent to each source. Various GIS data and map products will be developed during this multi-year project. The goal of this model is to define and rank the relative risk of contamination of each of the Arkansas public water sources.
Arkansas Land-Use/Land-Cover Saline Water Project.  
$279,203.00 (August 1999 – June 2001).

In the Summer of 1999, CAST began work on the 1999 Arkansas Land-Use/Land-Cover (LULC) project. Funded by the Arkansas Soil and Water Conservation Commission, the overall goal of the 1999 Arkansas LULC project is to map seasonal land-use and land-cover for the entire state of Arkansas for the year 1999. The maps will be derived from Landsat TM data and depict how the landscape of the state changes from season to season: Spring, Summer, Fall, and Winter. The multi-temporal approach to LULC mapping, utilized by this research, will extend the ability to map certain temporal information about agricultural cropping patterns, pasture land type, forest land types, and seasonal flooding patterns. The resulting data set will also be useful for measuring landscape conversion that has taken place in the past and monitoring future landscape changes. Project work for the past fiscal year involved the acquisition of ground-truth data, the selection and purchase of remote sensing data, image preprocessing, and image classification/information extraction. Results of this research will be published via CAST’s website.

As part of the 1999 Arkansas Land-Use/Land-Cover project, three seasons of satellite imagery will be used to map seasonal land-use changes. The resulting 1999 maps will be compared to previous land-use/land-cover maps in order to monitor the ever-changing landscape of Arkansas. The three images below are from the Landsat 5 Thematic Mapper satellite and depict seasonal changes, from Spring to Fall, in Arkansas County.
• **Web Base Soils Map.**
  **$20,000.00 (September 1999 – September 2000).**
  This project is composed of three phases to design a web-based atlas of soils available to any Internet users for browsing. The data made available will be exactly the same as those contained in the Soil Survey books that were historically published by NRCS. This first version will allow the user to select a quarter-quad from an index sheet. The returned quarter-quad is a grayscale orthophoto and labeled soil type boundaries. Descriptions for the latter are accessible by clicking in a specific area. A prototype serving a subset of the Soil Survey maps for Woodruff County is currently accessible from CAST’s website. NRCS headquarters is interested in using our method to publish Soil Surveys for all counties in the U.S.

• **Mapping Arkansas’ Information Networks (MAIN).**
  **$57,951.00 (March, 2000 – September 2000).**
  Project MAIN is a cooperative effort between CAST, the schools of the EAST initiative, and the Arkansas Department of Information Services (DIS). The goal of this project is to optimize networking of the public sector in the state. Identification of existing fiber-optic runs is fairly straightforward, involving acquisition of data from the network vendors. The difficult task has been accurately identifying the location of all potential public network consumers (PNCs), including local police and fire departments, libraries, county, state, and local government offices. There are currently 4000 of these entities in the state numbers around 53 EAST locations spread across Arkansas. Tim Stephenson, Director of the EAST Program, was contacted and agreed that this was an important project for the state and the local communities, and that it would be a great example of the potential of EAST. Governor Huckabee announced his support for the project by issuing an official proclamation of support. CAST became involved as a provider of technological support, dividing up data for the schools, supporting the students in their data validation efforts, and then collecting and merging the completed data.

• **GIS-Based Natural Resources Analyses for the St. Francis River.**
  **$23,845.00 (March 2000 – June 2001).**
  CAST is working with the Arkansas Soil and Water Conservation Commission (ASWCC) to identify, quantify, and analyze wetland resources within the St. Francis River wetland planning region. Much of the project encompasses the gathering and translation of data to be compatible with the geographic information systems (GIS) used by the ASWCC. Analyses of the same data will focus on the methodology co-developed by CAST and the Multi-Agency Wetland Planning Team (MAWPT), as already applied to four other wetland planning regions in the Arkansas delta. Compatibility with previous analyses will be of primary consideration, in order to maintain the value of existing research. Cooperating researchers at CAST and ASWCC will also examine methods to enhance and improve this existing methodology.

• **Web-GIS to Evaluate Environmental Impact of Population Expansion.**
  **$22,957.00 (September 1999 – September 2000).**
  In cooperation with the RGIS Wisconsin Program, the Center is involved in a research project focusing on the integration of a suite of EPA environmental data sets and other data sources dealing with demographic growth. The goal of the project is to develop easily accessible systems, using the World Wide Web, that will allow citizens to consider the interaction of projected population growth in an area and its possible impact or interaction on environmental processes.
• **Geo-Spatial Support and Training for the EAST Initiative.**

The EAST Project is an outgrowth of a highly successful model that was developed by Tim Stephenson of Greenbrier High School. From the beginning, the EAST project has stressed learning in combination with community service. Students use high tech tools to solve real problems in their own hometowns. High school students in the EAST program have developed emergency response systems for town fire departments, created new economical and efficient bus routes, and designed new parking lots for their schools. Each summer, teachers from Arkansas and surrounding states' high schools attend two-week professional development workshops that includes GIS/GPS components. This program is being rapidly expanded to include as many communities as possible (56 schools during the 1999-2000 school year; at least 92 during the 2000-2001 school year). Due to this phenomenal growth, new EAST training facilities have been established in Harrison and Little Rock, Arkansas. CAST staff members Malcolm Williamson and Heath Wallis provide technical support and training, including on-site visits and web-delivered training materials, for this highly successful program. This year, CAST staff participated in the first EAST Partnership Conference. This conference, held in Little Rock in late March, brought together students, educators, local and state leaders, and private industry executives. Additionally, CAST is hosting a two-week Introduction to Technology camp for first-year EAST students and teachers from five Arkansas delta schools. (Also see Education section of this report for detailed EAST information and graphics).
• **Census 2000 (Technical Support of Arkansas' 2000 Redistricting).**  
  $19,948.00 (April 2000 – March 2001).
CAST has recently entered into a cooperative agreement with the Arkansas Secretary of State, and one of the first amendments to this agreement comes in the form of GIS technical support for the 2001 Statewide Redistricting effort. The primary goal of this agreement is for CAST to assist the members of the Arkansas Legislative Redistricting Project regarding technical issues related to the hardware, software tools, and data required for completion of the Year 2001 Redistricting effort. This effort will include the assessment of the software and hardware capabilities required to effectively complete the redistricting of Arkansas' House and Senate districts once the U.S. Census Bureau has released the Year 2000 population data. After the Secretary of State's Office has purchased software and hardware, CAST will ensure the product(s) are functional and will load the Census data that will be required to complete the redistricting project. CAST will not participate in the actual redistricting project.

• **Harnessing Geo-Media Book.**  
  $20,000.00 (May 2000 - December 2000)
*Harnessing GeoMedia*, a general introduction to GIS and the GeoMedia 4.0 software, is in progress and scheduled for publication in Fall 2000. This volume is a follow up to the 1998 publication of *INSIDE GeoMedia* published by OnWord Press. The 1,000-page book covers the functionality of the GeoMedia and GeoMedia Professional toolkits and the spatial data management concepts behind that functionality. It is aimed at beginning through intermediate users, describing GeoMedia’s use in the context of typical spatial data management tasks and sample workflows. The workflows are *how to* examples based on sample data sets. They are designed to help readers develop GeoMedia skills by providing practical hands-on exercises which illustrate the procedures for accomplishing both typical GIS tasks and those unique to GeoMedia. The book's contents include GeoWorkspaces; Warehouses; Legends; Data Types, Manipulation, and Structure; Thematics and Images; Select Sets; Performing Queries with GeoMedia; Mapping and Output; Using Access; Working Onscreen; Advanced Data Development and Management, Projections and Datum Transformations, Introduction to Data Server Terminology; Creating and Configuring a Coordinate System File; GeoMedia and MGE: Setting Up a CAD Server; GeoMedia ArcInfo and ArcView Servers; Oracle and GeoMedia; and Importing Data into Access Databases.

• **CAST Cooperation with the Archeology and Ethnography Program of the National Park Service (NADB).**  
  $70,000.00 (May 1998 – December 2001).
Since its inception, CAST has assisted NPS with its mandate to provide archaeological information to its local offices and other federal agencies to meet the cultural resources management requirements set by various Acts of Congress. In order to achieve this, NPS now has three sets of data currently available to the public via the web. NADB-Reports is a database of more than 250,000 archeological reports. NADB-NAGPRA provides the full text of the Native American Graves Protection and Repatriation Act, up-to-date information on regulations and guidance, and summaries of inventory and repatriation activities. NABD-NACD (Native American Consultation Database), the latest addition, is the result of a partnership between the National Park Service and the U.S. Air Force. It provides an easy way to identify contacts for each of the 771 federally recognized Indian tribes, Alaska Native groups, and Native Hawaiian organizations. Contacts can be searched by name, tribe, reservation, state, country, and military installation. This information is crucial to organizations who must comply with the Native American Graves Protection and Repatriation Act. In November of 1997, NPS and CAST made substantial improvement to the web interface to both NADB-Reports and NADB-NAGPRA and
doubled the amount of citations made available via NADB-Reports. A web interface to the NABD-NACD database is accessible by the public.

- **FGDC Clearinghouse.**
  - $9,000.00 (October 1999 – September 2000).

CAST was awarded these grants from the Federal Geographic Data Committee (FGDC) to create an on-line clearinghouse of digital geographic data. This project is directed towards establishing a network accessible inventory of digital geodata from Arkansas and maintaining this archive in a standards-compliant format consistent with that established by the FGDC. With support from these grants, a permanent node in the Clearinghouse network was established to provide an index of sorts to the geographic data that has been collected at the Center. Since its creation, this catalog has been expanded through additional entries.

**NASA Scientific Data Purchase Grant (Fayetteville High Resolution Mapping Project).**

On October 9 and 10, Positive Systems, Inc. of Whitefish, Montana collected high-resolution aerial photographs of the Fayetteville area. The digital images were collected under the terms of a NASA Scientific Data Purchase (SDP) initiative grant awarded to the Center for Advanced Spatial Technologies (CAST) at the University of Arkansas. The SDP initiative is sponsored by NASA’s Earth Science Enterprise - Commercial Remote Sensing Program. The grant covers Positive Systems’ costs of acquiring and processing the digital image data. The images will aid ongoing CAST research into the use of airborne and spaceborne digital images for mapping and monitoring land-use and land-cover characteristics in mixed urban-rural environments.

The Scientific Data Purchase initiative is managed by NASA’s Commercial Remote Sensing Program Office at the John C. Stennis Space Center in Mississippi. The program’s mission is to enhance U.S. economic competitiveness through development of remote sensing technologies. The spaceborne, airborne, and in-situ commercial remote sensing data being made available through the SDP program were identified as data sets that are "needed" and have "high value to science". NASA, together with Positive Systems and other commercial partners, is working to expand the resources available to the Earth science research community in its quest for knowledge about the Earth’s changing environment.

Positive Systems, Inc. (www.possys.com) designs, manufactures, and markets the Airborne Data Acquisition and Registration (ADAR™) family of Digital Aerial Photography Systems and Services. Since 1991, ADAR Digital Aerial Photography has provided cost effective solutions for natural resource management, environmental monitoring, land use planning, and regulatory compliance activities. ADAR 5500 data is especially useful for urban applications. The cities of Springfield, MO and Salinas, CA, for example, used ADAR 5500 multispectral digital aerial photography to create pervious vs. impervious ground cover maps. The resulting maps were used to derive a wastewater utility tax based on storm water run-off, supporting compliance with the federally mandated National Pollutant Discharge Elimination System (NPDES) guidelines set by the EPA. Research by HJW & Associates of Oakland, CA, has shown that this type of pervious/impervious classification methodology is 90% accurate, or better, for all surfaces visible from the air. It is hoped that Fayetteville residents will soon benefit from this NASA Scientific Data Purchase grant. Fayetteville mayor Dan Coody and the Fayetteville GIS coordinator John Goddard have expressed interest in working with CAST to use the data to enhance a variety of current city projects.

Bruce Gorham, CAST research scientist, was awarded the NASA Scientific Data Purchase grant to conduct a comprehensive comparison of ADAR 5500 images with Landsat 7 Thematic Mapper...
satellite data. The comparison will focus on spectral, spatial, and radiometric characteristics of each sensor system. The research will be beneficial in determining optimal imaging system characteristics for land-use/land-cover mapping and change detection in mixed urban-rural environments.

United State Geological Survey (USGS) Memorandum of Understanding. In order to establish a framework for the exchange of scientific and technical knowledge, with respect to the sciences with an emphasis on geospatial applications, USGS and CAST have agreed to cooperate to pursue scientific and technical areas of the sciences and spatial applications. Other University of Arkansas related programs participating in these objectives are Anthropology, Geosciences, Environmental Dynamics, Landscape Architecture, Crop, Soil and Environmental Sciences, Biological Sciences, Computer Science, Computer Engineering, and Middle East Studies. The

ADAR 5500 multi-spectral imagery from Positive Systems, Inc. is a valuable data source for high resolution mapping and modeling. The image on the right is a real color composite comprised of ADAR 5500 bands 3, 2, and 1. The image on the left is a permeability map derived from the data.
framework of this memorandum includes such areas of collaborative activities as exchanges of
technical information, cooperative research, and other academic and outreach activities. It may
also include geospatial applications, open standards for geoprocessing, dissemination of complex
data over the web, and decision support related to disaster management.

**Grant to Develop a North American Database and Website for Archaeological Geophysics.**
This grant was awarded to Dr. Kenneth Kvamme to collect basic data on archaeological
geophysics projects conducted throughout North America and to develop a computer database
and website around these data. A bibliography of about 800 citations has been amassed, and the
website contains a projects database, an image library, educational materials, a bibliography
database, an instrumentation database, a practitioners and consultants database, links to other
geophysical websites, and an upcoming events page. The grant supported two Department of
Anthropology graduate students, Richard Allan and Ryan Peterson, who put most of the
databases and website together. The website is maintained at CAST. It may be viewed at:
http://www.cast.uark.edu/nadag.

**The Nature Conservancy: Setting Conservation Priorities for Resident Birds at Risk in
Latin America Project.** Latin America holds nearly half of all of the world's bird species, so
the continent is crucial for bird conservation. However, resources for such conservation are
scarce. The Nature Conservancy's Wings of the Americas program has therefore asked CAST to locate *Conservation Priorities for Birds at Risk in Latin America*. PIs Dr. Fred Limp (CAST) and
Dr. Kim Smith (Biological Science) with Research Associate Dr. Thomas Brooks (CAST) and
Graduate Research Assistant Alex Jahn (CAST) have worked on this question since May of 1998,
when the project began with the presentation (in Little Rock) of $100,000 to CAST from Canon
via The Nature Conservancy. To date, digital maps have been made of the ranges of the 1,300
rarest Latin American birds, using data provided by many collaborators in Latin America,
Europe, and the USA. These maps were overlaid in the sophisticated program WORLDMAP,
specifically produced by the British Natural History Museum to address questions of conservation
priority. The next phase of the project included producing maps using environmental data (e.g.,
from satellite imagery), and of adding information to WORLDMAP (e.g., protected area
boundaries) to make the priority setting process as useful as possible. Results of this project are
available by CDs, reports, and via the net at CAST's website: www.cast.uark.edu.
CAST staff members are regularly involved in a variety of activities that directly and indirectly benefit Arkansans, from its work with Arkansas' high school students who participate in the EAST Initiative to making geographic information data easily available to the general public through the CAST website and the GeoStor database. CAST staff respond to hundreds of requests for assistance or demonstrations each year from sources ranging from University of Arkansas students to rural 4H clubs. CAST's public service mission includes talks, demonstrations, workshops, meetings, presentations, and responding to requests for information. Some of CAST's major public service efforts for FY 00-01 are described below.

In April, CAST demos were given to 190 fifth and sixth graders from Westville, Oklahoma.
During the fall of 2000, CAST staff members presented a GIS talk and demonstration to almost 100 University of Arkansas Alumni.

**CAST’s Website.** Established in 1994, CAST’s website (www.cast.uark.edu) was designed to provide access to maps and spatial data, to contain information on the Center’s research projects, and serve as an informational resource in the areas of GIS, remote sensing, photogrammetry, spatial technologies, historic preservation, and archaeology. This award-winning site was developed and designed by Snow Ballard. It is constantly enhanced and reorganized to better reflect the variety of the Center’s activities and is updated regularly to provide easier access to frequently requested data. CAST’s goal to introduce and provide GIS technologies to the widest audience possible continues to drive the development of this website.

The Center’s website continues to expand in the quality and quantity of data it contains and the ease of access to that data. While most website accesses come from the U.S., the site is utilized by students, the public, and researchers from around the world. 10.77% of total hits are from international visitors. During the last six months, the number of hits has risen from an average of 13,600 hits per day to an average of 14,613 hits per day. Website visitors are from diverse backgrounds with 67.2% from the commercial, education, and government sectors.

Almost 3,600 other websites link to CAST webpages. CAST’s website has recently been added to TenLinks.com as a top ten link. TenLinks.com is a top directory for engineers, designers, GIS professionals, architects and other technical professionals. Along with being listed on TenLinks.com, CAST has also been added to CAD-Portal.com, an internet resource for engineering professionals.
Yahoo*, AltaVista and Google are the three top search engines in the U.S. ranking websites. All three are very competitive and can make or break a site. The ultimate goal of any website is to be ranked within the top 30 search results. CAST has achieved this. (*Yahoo is a directory that ranks websites with human evaluation, and is one of the hardest search engines to rank with.)

Using the key words spatial technologies:
• Yahoo ranks CAST #1.
• AltaVista ranks CAST #2.
• Google ranks CAST #1.

With key words spatial technology:
• Yahoo ranks CAST #4.
• Google ranks CAST #2.

With key word spatial:
• Yahoo ranks CAST #1.
• AltaVista ranks CAST #19.
• Google ranks CAST #11.

The heart of CAST’s home page shows many choices of access to information.
Graph of the different regions that access CAST’s website. This graphic is from the Web Trends web program that checks the webpages for statistics of usage.

Bar chart representing most requested website pages (see following list for details).
List of the top requested pages by visitors to the CAST website.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Title</th>
<th>Views</th>
<th>% of Total Views</th>
<th>Visitor Sessions</th>
<th>Avg. Time Viewed</th>
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</thead>
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<tr>
<td>1</td>
<td>STARTING THE HUNT: Guide to Mostly On-line and Mostly Free U.S. GeoSpatial</td>
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<tr>
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<td>STARTING THE HUNT: Guide to Mostly On-line and Mostly Free U.S. GeoSpatial and A</td>
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<tr>
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<td>1,988</td>
<td>00:00:51</td>
</tr>
<tr>
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<td>JAPAN GIS MAPPING SCIENCES RESOURCE GUIDE: Table of Contents</td>
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<tr>
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</tr>
<tr>
<td>9</td>
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<td>1,357</td>
<td>00:00:47</td>
</tr>
</tbody>
</table>

Sample map created with data from the Economic Development resource section of CAST’s website.
Samples of the ALMAS interactive mapping site.
The Seamless Warehouse of Arkansas Geodata (SWAG). CAST initiated a collaborative research and technology transfer project with a focus on delivering stable framework and corporate geodata into a diverse user community using existing Internet tools. This effort is based on CAST’s existing statewide, comprehensive spatial database and emerging commercial software products. Under this initiative, CAST worked with a network of partners to build a comprehensive, open standards-compliant warehouse that supports vector and raster data, attribute information, and descriptive metadata. The SWAG project demonstrates the use of an enterprise approach to managing and providing digital geodata. SWAG provides a bridge that spans distributed data, applications, and user domains, thereby empowering all levels of government with geospatial data and infrastructure. Additionally, it represents a working instance of the National Spatial Data Infrastructure that can be replicated across governmental components. In 1999, due in large part to the efforts of CAST’s Technical Director Jim Farley, CAST’s SWAG project received the Computerworld Smithsonian Award. The SWAG project will become part of the Permanent Research Collection on Information Technology at the Smithsonian’s National Museum of American History. Work on the SWAG project was completed and went online during FY00-01. The online system was named GeoStor. (See below for details on GeoStor. Also see Research section of this report for grants information.)

GeoStor. GeoStor, the outgrowth of the SWAG project, went online during FY00-01. GeoStor is an online data delivery system that allows the user seamless access to digital map data of any area in Arkansas with no subscription fee. The name GeoStor refers to a comprehensive, web-based geodata delivery system. GeoStor provides web access to a huge repository of geospatial data and allows easy search and retrieval of more than 500 different data sets representing more than 1.5 terabytes of data. At the core of this system is a massive Oracle database, located at CAST facilities, containing all publicly available geodata for the State of Arkansas. This includes roads, streams, aerial photography satellite imagery, and elevation data. In GeoStor you can search by many different easy to use criteria, such as (a) address, (b) place (e.g. city-limits, county, park boundaries), (c) point in UTM, lat/lon or SPSC coordinates, (d) box drawn on the screen, (3) township/range/section, and/or (f) theme keyword (e.g. elevation, soils). Access to GeoStor is available via CAST's webpage at http://www.cast.uark.edu.

Although GeoStor has not been online with access to the public for very long, it has already proven to be extremely popular. For the period December 11, 2000 through June 21, 2001, there have been a total of 6,598 downloads, an average of over 240 downloads per week. This number includes 6,040 vector downloads and 227 raster downloads. The top 10 layers downloaded are county road, state highway, all roads, landcover, city streets, sections, flood data, townships, blocks, and city limits. The data formats used were ESRI_Shape, GIF_Image, AutoCAD_DWG_DXD, ESRI_ArcInfo_Export, ESRI_Coverage, MapInfo_TAB, MicroStation_Design, and MapInfo MIF/MID.

GeoStor partners include
- Arkansas Department of Information Systems.
- Arkansas State Highway and Transportation Dept.
- Arkansas State Land Information Board.
- Federal Geographic Data Committee.
- Intergraph Corporation.
- MapInfo Corporation.
- Nortel Networks.
- Oracle Corporation.
- Open GIS Consortium.
- PCI Geomatics.
- Safe Software, Inc.
- Sun Microsystems.
GeoSurf is a Java-based product that allows the user to query and download geodata from GeoStor. The user can query the database with geographic and metadata constraints to find data layers of interest. These layers can then be downloaded to the user's machine. GeoSurf allows the user to specify geographic clip boundaries, projection, and data format (e.g. Arcview Shape, MapInfo, etc.) and packages the data layer as specified. GeoSurf's implementation uses a Java Applet, a collection of Java Servlets, several third-party products, and some perl scripts for glue. The Java Servlets are running in a Java 2 Enterprise Edition Servlet environment. MapXtreme 3.0 (MapInfo Corporation) is used to provide a visual interface for geographic queries. Data is converted and re-projected using the Feature Manipulation Engine (FME), from Safe Software, which was also used to load much of the data. GeoGateway software (PCI GeoMatics) is used to re-project raster data and was used to load much of the raster data.

Online Mapping is another web-based access point for GeoStor. This project uses ESRI's ArcSDE and ArcIMS 3.0 products as the basis for a soils mapping and analysis system. GeoMedia (Intergraph), ER Mapper (ER-Mapper) and ArcInfo 8 (ESRI) were used to create seamless data sets and manipulate the data before loading. At present, this project is limited to soils data, but its capabilities will be expanded in the future. (Also see Research section of this report for grant information on this project.)

**Benefits of GeoStor:**

- Obtain just the part of data that you want, they are not restricted to pre-defined map units (i.e. data is dynamically "clipped" by the selected polygon).
- Select data by many easy-to-use criteria: (a) Township/Range/Section, (b) address and buffersize, (c) point in UTM, lat/lon or SPSC coordinates and buffer size, (d) box drawn on screen (e) place (e.g. city-limits, county, park boundaries and/or (f) theme keyword.
- When an area is selected all available themes are listed for that area.
- Convert the data to up to 50 + different GIS formats.
- Convert the data to a wide range of datums and projections.
- Obtain a much wider range of data.
- Access seamless statewide DOQQ aerial photography and TM imagery that is contrast balanced.
- Access imagery (including DRG, DOQQ, TM) that has not lost any detail through compression (if desired).
- Access all data via the FGDC NSDI clearinghouse system, and get data that is OGC specification compliant.

GeoStor allows the user to access geocoded street address, points, or boxes.

To access map layers in GeoStor the online mapper is used.
Global Positioning System Base Station. CAST, through its cooperative agreement with Trimble Navigation Ltd., has maintained a community base station on an almost continuous basis since late 1992. This base station offers public access to end users within 300 miles, which includes large portions of Arkansas, Oklahoma, Kansas, and Missouri. Access to base station data files is available via CAST’s website, anonymous ftp, and bulletin board. This community base network offers those who use GPS technologies an inexpensive, accurate, and easy to use tool.

Digital Data Archive. One of the most essential components of a GIS is digital data. CAST staff continues to upgrade the digital data archive. Initial efforts focused on acquiring digital data sets for Arkansas, but CAST also maintains an extensive library of global, continental, and regional data sets. Additional data are being acquired constantly, and staff members work closely with major federal, state, and local data providers. CAST also provides information on commercially available spatial data, though such data are not directly available through CAST. The available data are maintained on two server systems and are accessible via the net. CAST also maintains the Arkansas Digital Spatial Data Catalog containing a listing of the digital spatial data available at CAST for the State of Arkansas. Presently, there are over 150 listings of spatial data created by federal, state, local, and private agencies available for distribution, and listings will be added as additional spatial data are acquired. This catalog is available via the Internet.

Arkansas GAP Analysis Project. The GAP Analysis project is a nationwide effort using GIS and remote sensing to develop wildlife habitat distribution maps and models. Maps are compared to public land ownership maps to detect gaps in management of environmentally sensitive areas. The GAP approach involves compiling a digital biodiversity database in a GIS. The principle layers are land-cover, animal species distribution, and land stewardship. A variety of GIS and remote sensing data sources including satellite imagery, soils maps, elevation maps, and many other data sets that provide much needed ground-truthing information have been utilized in the development of statewide land-cover and wildlife distribution maps. This project not only identified Arkansas’ biodiversity, but lead to the development of totally new digital data relevant to Arkansas and the region including a complete and uniform vegetation classification system and species-based wildlife habitat distribution models. Arkansas GAP project information is maintained on CAST’s website at www.cast.uark.edu/gap/. In early 2000, the USGS released a CD version of the GAP report and data to be distributed to interested parties in the state and region. The Center continues to offer GAP Analysis via the CAST website.

Arkansas Interactive Mapper. The Arkansas Interactive Mapper is a real-time application that allows anyone with access to the web an opportunity to make a map of any area in Arkansas. Unlike a digital catalog, mapper accesses a GIS engine, and within a few minutes, generates a map from specifications defined by the user, such as information to be displayed (i.e. vegetation, soils data, streams, railroads, schools, airports), the area to map (i.e. county, USGS quad), and the desired size and format (i.e. GIF, Adobe or Postscript) for the output map. This project is sponsored by NASA as a demonstration effort to increase the usability and access to imaging-platform-based data, particularly by state and local agencies and by the general public. This mapper is available through CAST’s home page at www.cast.uark.edu. The mapper is very popular as a demonstration of on-line mapping but is also a very practical tool for students, hunters, and others throughout Arkansas who use it to make maps before doing research projects or going out into the field. There are some 1,000 different maps made each month by the system.
CAST Visibility through Publications. During FY 00-01, CAST continued to increase the quality and volume of its public service and outreach activities. Much of this outreach information is available on CAST’s home page at www.cast.uark.edu. CAST’s library continues to expand to offer access to GIS technical information, periodicals, software manuals, and other source materials. This year, all review software packages were cataloged and made available for students to access. Newspaper, magazine, and newsletter articles (see appendices A and D) written by CAST staff or written about CAST appeared this year in print in various media.

Arkansas Land Information Board. During the 1997 legislative session, a bill was introduced to abolish the Arkansas Department of Computer Services, and to organize the Arkansas Department of Information Systems. A part of this legislation concerned the development of statewide GIS initiatives, one of which was the organization of the Arkansas Land Information Board. Two relevant changes regarded the addition of three Land Information Board members to represent institutions of higher learning and the option for the Department of Information Systems to utilize existing state resources for housing a statewide spatial data archive. CAST’s Director Fred Limp continues to serve as a member of the State Land Information Board. Various CAST staff members also play an important role in this program.

Vision 2010: Preparing Arkansas Communities for the Twenty-First Century. Building the Capacity of Communities and Institutions in the Information Age. During FY 97-98, the Center hosted the Vision2010 Technology Seminar here on the University of Arkansas, Fayetteville campus. Approximately 50 participants represent seven Arkansas counties who are participate in the Vision2010 program. The many events covering technology topics that benefit small and large communities can be used to compete in the global economy and provide information from technology experts on telecommunications, GIS, banking, and education. CAST staff continue to support and participate in this program.

The Rural America 2000 Program. Rural America 2000, a major program initiated in FY 94-95, continues to thrive. This program provides access to state-of-the-art systems and technical expertise for rural governmental units. The use of the lab is provided for a limited time at no cost to rural government groups to provide them with essential hands-on expertise in the use of such systems before they make critical decisions about purchase.

OpenGIS Specification (OGIS). According to many publications and industry pundits, the most prominent force in the geoprocessing marketplace today is the OpenGIS Consortium and the specification for interoperable geoprocessing that is being developed under their auspices. The membership of the consortium and the workhorse technical committee reads like a who’s who of information technology, GIS, and remote sensing. CAST has been instrumental in the consortium since before its inception. CAST staff (Farley and Limp) are counted among the founders of this organization that evolved from collaborative research work involving CAST, the U.S. Army Construction Engineering Research Laboratories, and the President of OGIS, David Schell. Limp serves on the OGC Board of Directors, a position he has held since its founding.

Demonstrations, tours, talks, and assistance to the public. CAST staff regularly participate in, sponsor, and lead demonstrations, tours, talks, workshops, etc. in GIS technologies, archaeology, forestry, biological sciences, architecture, and many others. CAST staff receive requests for information via email, phone, and through CAST’s website. Each of
these requests is handled on a one-on-one basic. A few of the individuals and/or groups served this year are listed below. (See appendix B for extended listings by staff member.)

- Arkansas Wildlife Society.
- UAF Chancellor's Merit Scholars.
- Acxion Corporation
- King Fahd University, Jeddah, Saudi Arabia.
- Baxter County Judge's Office staff.
- Korean Cultural Resource Manager's staff.
- American Planning Association.
- Benton County Assessor's Office staff.
- Middle School, Westville, Oklahoma.
- Professor Brett Bryan, University of Adelaide, Australia.
- Dr. Colleen Batey, University of Glasgow, Scotland.
- City of Fayetteville.
- Northwest Arkansas Times.
- Western Arkansas Planning and Development District.
- National Resource Technologies, Inc.
- University of Arkansas at Monticello, School of Forest Resources.
- Oklahoma State University, Forest Hydrology Department.
- Green Bay Packaging, Inc.
- Poisen Springs State Forest.
- Arkansas Science and Math School.
- Institute of Higher Learning.
- Shiloh Museum.
- Entergy Corporation.
- Agri ImaGIS, Inc.
- Arkansas Natural Heritage Commission.
- Missouri Resource Assessment Partnership.
- Golden Tower Reunion Society.
- Springdale Gifted and Talented students.
- University of Arkansas Alumni Association.
- Berkeley Geo-Research Group.
- Ozark Regional Land Trust.
Appendix A: Publications.

**Books and Chapters in Books.**

Harmon, Deborah and W. Fredrick Limp  

Limp, W. Fredrick  

**Peer Reviewed Articles.**

Culpepper, B., J. Wilson, W. Limp  
2000 Culpepper, B. J. Wilson and W. Limp  

**Articles, Publications, and Proceedings.**

Culpepper, R. Brian  


Gorham, Bruce  

Limp, W. Fredrick  
2000 Put the "Fizz" into "Data Viz." *GeoWorld*. September.


Nigro, J.D., W.F. Limp, K.K. Kvatme, D.J. de Ruiter, L.R. Berger

Williamson, Malcolm

Magazine Software Reviews.

Harmon, Deborah

Limp, W. Fredrick
Wilson, John M.

**Formal Presentations.**

**Gorham, Bruce**


2000  Presentation to State Representative Jan Judy on the Arkansas 2000 Land-use/land-cover project. December 11.

2001  Assisted with the presentation to Mayor Dan Coody (city of Fayetteville). Presentation provided an overview of CAST projects, functions, and capabilities. Mr. Gorham demonstrated CAST image processing/remote sensing capabilities and provided an overview of CAST’s current remote sensing projects. March 16.


**Harmon, Deborah**
2000  *Introduction to GeoMedia 4.0*.  Vector Analytics.  September.


**Limp, W. Fredrick**


2000 A sense of where you are: geoinformatics in the university. Invited lecture, University of Mississippi, Oxford, September.


2000 Practical applications of remote sensing to state local and tribal governments. NASA Northeast Regional Workshop, Skaneateles, NY, October.

Williamson, Malcolm


Appendix B: Public Service.

Talks, Demonstrations, Conference Attendance, Meetings, General Presentations, Workshops, and Assistance to the Public.

**Ballard, Snow**


Assisting animation students for summer project - June, 2001.

**Culpepper, R. Brian**
Attended a one-day *Delta Economic Development Conference* in Vicksburg, Mississippi. Approximately 120 attendees from surrounding delta states attended the conference and our FGDC project was announced to the group. Fifteen attendees registered for inclusion to our DELTA-L listserv discussion group (http://listserv.uark.edu/archives/delta_econ-l.html).

Attended two *Meetings with the Arkansas Secretary of State* regarding the 2001 Statewide Redistricting Project where I was responsible for CAST’s role in the technical support of the project and preparing software for a “public-use” area within our computer laboratories in Ozark Hall.

Attended three *Public Meetings with the Arkansas Department of Health* regarding the Source Water Protection Project where I was responsible for CAST’s role in the project and presenting our project results.

Attended the *ESRI Conference* in San Diego, CA and gathered much information pertaining to software design and direction from the paper and poster sessions. Also attended two pre-conference seminars: *Hydro 2000* and *ESRI Redistricting Solutions*.

Attended the *URISA Conference* in Orlando, FL and presented our research methods and findings regarding the Arkansas Source Water Protection Project in Arkansas.
Attended the National Conference of State Legislators (NCSL) Conference in Savannah, GA. Accompanied the members of the Arkansas Redistricting team to presentations and meetings of software developers and consultants in order to prepare for the upcoming redistricting efforts.

Presented a GIS discussion to VISION 2010 leaders at the University of Arkansas Center for Continued Education for Mark Peterson. July 2000.

Helped Andrew Swanson and two other Biology Graduate students with printing their posters for a conference. July 2000.

Met with the interim director of the NWP Planning Commission to assist them with GIS implementation and future hiring. They hired a recent graduate from the U of A Geosciences department. July 2000.


Assisted Bruce Gorham with information and data for a video project for the University of Arkansas Relations department. July 2000.

Attended an ESRI Technical meeting by Alan Jackson regarding ArcIMS. August 2000.


Attended the URISA Conference in Orlando, Fl and presented our research to date on the SWAP project. August 2000.


Met with NWA Planning Commission’s new hire to discuss data conversion strategies. They decided to take advantage of the Rural America 2000 lab at RGIS Mid-South Offices for their hardware needs during their data conversion effort. August 2000.

Hosted Clayton Sedberry of the NWA planning commission. Gave him a tour of CAST and set up his account information for their data conversion project. September 2000.

Provided Puneet Savarent of the Arkansas Department of Pollution Control and Ecology with some data for southern Arkansas. September 2000.


Assisted Jennifer Luks of the CDC (U of A) with a data request for an 800 acre site near Fayetteville. September 2000.

Managed to extend the MAIN project budget through the end of year 2000.

Attended Autobound training for the State of Arkansas officials at UALR for three days. October 2000.

Spent ½ day with Learon Dalby of the SLIC office for an extensive review of the SWAG project. His comments and suggestions were provided to the SWAG team. October 2000.

Developed some data files for distribution via the SWAG project. Delivered them to Doug Meredith for inclusion in the distribution files of downloaded data. October 2000.

Kelly Sparks and I gave a 2 hour presentation to the Arkansas Wildlife Society meeting at the Continuing Education Bldg. In Fayetteville. October 2000.

Traveled to Fort Smith to meet with the Western Arkansas Regional Planning and Development District members to discussion their GIS plans for the future. October 2000.

Stephan Pollard and I gave a GIS presentation to a group of Business College students during their class. October 2000.

Met with Dan Rainey of the Agricultural College regarding his future research efforts and possible collaborations with CAST. October 2000.

Delivered DOQQ cd’s to Pam Smith of the NRCS office in Little Rock. October 2000.

Meet with other members of the 2001 Arkansas GIS Users Conference Planning Committee at DeGray Lake State Park in Arkadelphia, AR. October 2000.

Assisted Steven Burian, PhD in Civil Engineering with a proposal to be submitted to NASA. CAST will receive 3 years of approximately 40k funding if he is successful. November 2000.

Presented the “Hogs in Space” presentation to approximately 32 high school seniors from Springdale High. November 2000.

Gave Jim DeTuerk of Penn State University a tour of CAST. November 2000.


Gave a presentation to the Chancellor's Merit Scholar students regarding CAST and GIS. November 2000.

Consulted with Nigel Shaw of the National Park Service regarding a GIS job posting in New York. Posted the job in the mailroom and distributed it among the Geosciences department. November 2000.


Visited with the Secretary of State’s office regarding Redistricting preparedness
Assisted Lyle Godfrey with data development and access at his office in Little Rock. November 2000.


Attended the CRM 2000 Meeting in Santa Fe and presented the ERI GIS prototype I developed for the National Park Service. The ERI team members from all over the United States attended the meeting. December 2000.

Composed a draft of a Source Water Protection Bulletin for the RGIS series of information bulletins and submitted it to Fred for review and comment. December 2000.

Final MAIN data was delivered to Learon Dalby of the SLIC office in Little Rock. December 2000.

Acxiom Corporation contacted me to discuss a review of Geocoding software and data providers. A meeting will be confirmed for later in the spring of 2001. December 2000.


Assisted graduate student, Robin Miller, with her GIS research project. February 2001.


Co-presented a GeoStor presentation to the WAPDD in Fort Smith, Arkansas. Approximately 60 professionals from the region attended the one-hour luncheon and demonstration of our GeoStor product. February 2001.

Presented a one-hour (APA accredited course) to a group of Arkansas Planners at the annual American Planning Association meeting in Hot Springs, Arkansas. The design, development and future of GeoStor was the topic. February 2001.


Consulted with a new hire at the Arkansas Department of Health with geospatial methods employed during the source water protection project. February 2001.


Met with Mike Bivin of the Arkansas Game and Fish Commission for 4 hrs and demonstrated the use of GeoStor for his future research studies on area lakes. March 2001.


Processed the 2000 Redistricting data files from the U.S. Census Bureau for the Arkansas Board of Reapportionment project. They were having difficulty processing the statewide data for their reapportionment project. March 2001.


Presented CAST research and University recruitment presentation to 88 7th and 8th graders from Oklahoma for the U of A Admissions office. April 2001.

Assisted Dr. Fred Limp with 3 class meetings for a “special problem’s” course. The course had 4 students enrolled. April 2001.

Traveled to Celebration, Florida for the 4 day Destination Lab course that CAST has co-developed with the U.S. Space and Rocket Center. May 2001.


Assisted the Arkansas Board of Apportionment with technical assistance in support of their redistricting project. May 2001.
Installed the Autobound software on 3 of our “public use” computers for other legislators and school board members to use in Northwest Arkansas. Consulted with various administrators on campus regarding these issues while Dr. Limp was traveling. May 2001.

Traveled to St. Louis, Missouri to attend an ESRI ArcGIS trainer certification course. June 2001.


**Farley, Ben**
Traveled to New York to attend a *Technology in Secondary Education* Conference for EAST.

Presented CADIS demonstration at University Day to a small group of students.

Attended Second Annual EAST Conference in Little Rock representing the FASST and CADIS programs.

**Gorham, Bruce**
Provided remote sensing/image processing assistance to biology graduate student Dawn Browning July-October 2000.

Provided remote sensing/image processing assistance to ENDY graduate student Dori Gould. October-November 2000.

Provided remote sensing/image processing assistance to geography graduate student Brandon Bottomley. July-November 2000.

Provided Raster GIS expertise to graduate student Anna Jankovic. September 2000.


Provided remote sensing/image processing assistance to geography graduate student Tyrone Rogers. January – June 2000.


Demonstration of CAST remote sensing capabilities for Professor David Cameron of the Siwaliks Project. August 9, 2000.

Demonstration of current CAST remote sensing projects and capabilities for Professor Brett Bryan of the University of Adelaide, Australia. Sept. 19, 2000.

Demonstration of CAST remote sensing/image processing capabilities to Assistant Professor (UA Agricultural Engineering) Indrajeet Chauby. October 2000.

Demonstration of Arkansas 2000 Land-use/land-cover project for Judith Habicht-Mauche of (Stigler lecturer from the University of California, Santa Cruz). October 4, 2000.

Demonstration of Arkansas 2000 Land-use/land-cover project for Colleen Batey (Stigler lecturer from the University of Glasgow, Scotland). November 1, 2000.


Provided training and assistance with PCI software and image processing techniques to Assistant Professor Yousef Aldakheel (Department of soil and water at King Faisal University, Saudi Arabia). July 2000.


Filled data request and provided image processing expertise to Professor Terry Hanson.


Assisted Anne Stovola of U.S. Environmental Protection Agency with identifying sources of remote sensing data for various EPA projects. August 2000.

Provided several aerial images of Razorback stadium (aerial photos and satellite images) to Rebecca Wood of University Relations. September 2000.

Provided hardcopy image maps of satellite remote sensing data to science teacher Bill Dark of Rogers High School. September 2000.

Provided technical assistance with various image processing procedures to Brett Bryan of University of Adelaide, Australia. Siwaliks Project. September 2000.


Provided Assistant Professor Steven Burian (UA Civil Engineering) with ADAR image data and assisted him with the processing of that dataset. January 2001.

Provided Associate Professor Norman Dennis (UA Civil Engineering) with Landsat 7 data and assisted him with the processing of that dataset. February 2001.


Assisted William French with downloading various datasets from GeoStor, as well as the GAP and MAVA-LULC project web pages. April 2001.

Worked extensively with Dr. Christopher Carr of Arizona State University on a project designed to digitally reconstruct Hopewellian artifacts using advanced image processing techniques. Functions included arranging for Dr. Carr’s sabbatical visit to UA campus, interviewing and selecting two student assistants for Dr. Carr, providing assistance to Dr. Carr with image processing and computer problems. January – May 2001.


Member of the AAAS Great Plains Agriculture working group. July 2000 – Present.

Acted as proposal peer reviewer for NOAA Cooperative Institute for Coastal and Estuarine Technology. March 2000 – Present.


Harmon, Deborah
Worked with Dr. Joe Schriver and the social work staff concerning incorporation of GIS method and theory, and spatial data into a new post-graduate social work curriculum.

Planned Metadata Training for Western Arkansas Planning and Development District funded under NSDI 2001 CAP grant.

Responded to more than 60 queries and data requests sent to CAST through the www gateway.

Provided demonstration for Dr. Judith Habicht-Mauche, Stigler Lecturer, University of California, Santa Cruz. October 2000.

Provided demonstration for Dr. Colleen Batey, Stigler Lecturer, University of Glasgow. November 2000.


Wallace, Joseph Heath
Provided initial training for Hawaiian EAST students as part of the EAST Project's expansion into that state.

Aided with the development of a population growth model of Northwest Arkansas with the CADIS summer interns.
Provided 8 weeks of geospatial training to EAST students and also provided another two months of on site visits to EAST labs across the state of Arkansas.

Gave CAST tours to 150 5th and 6th graders from Westville, OK.

Attended the 2nd annual EAST conference.

Visited and provided support to the following EAST Initiative schools:

1) Gravette Schools.
2) Izard County Consolidated Schools.
3) Viola Schools.
4) Flippin Schools.
5) Calico Rock Schools.
6) Norfork Schools.
7) Yellville Schools.
8) NACC Schools.
9) Huntsville Schools.
11) UALR
12) Pulaski Heights Middle School.
13) Mablevale Middle School.
15) OTC Schools.
17) Pottsville Schools.
18) Ola Schools.
19) Altus Schools.
20) Swifton Schools.
21) Brookland Schools.

Williamson, Malcolm
Organized and managed projects for 20 Arkansan high school students during the EAST Advanced Projects Camp in Lahaina, Hawaii. July 2000

Assisted 25 high school students and 5 teachers during the EAST Delta Workshop, held at the University of Arkansas, Fayetteville. July 2000

Managed projects for 10 high school student interns during the summer 2000 CADIS project. July – August 2000.


Responded to a GPS base station support request from Matthew J Butler, UAM School of Forest Resources. July 12, 2000.

Responded to a GPS base station support request from Brian Valleskey, Forest Hydrology, Oklahoma State University. July 12, 2000.

Responded to a GPS base station support request from Shauna Ginger, Oklahoma State University. July 17, 2000.

Provided GRASS software support to Alynne Bayard, Tree-Ring Laboratory, Department of Geosciences, University of Arkansas. July 18, 2000.

Responded to a GPS base station support request from Margaret Medford, Green Bay Packaging Inc. July 19, 2000.


Provided GPS purchase consultation to Dr. Indrajeet Chaubey, Assistant Professor, Bio-Environmental Eng., Dept. of Biological and Agricultural Eng. July 20, 2000.

Presented information on geospatial software and project development during EAST facilitator training in Harrison, Arkansas. July 26, 2000.


Assisted the EAST facilitator from Concord High School with list server information. August 11, 2000.
Assisted the EAST facilitator from North Arkansas College with list server information. August 18, 2000.

Assisted a student at Arkansas Science and Math School with information about the EAST list server and Project MAIN. August 21, 2000.

Assisted the EAST facilitator from Morrilton High School with list server subscription issues. August 22, 2000.


Assisted the EAST facilitator from Smackover High School with list server information. August 23, 2000.


Assisted the EAST facilitator from North Arkansas College with information about satellite imagery. August 29, 2000.

Assisted a student at Dermott High School with information about the EAST list server. August 30, 2000.

Assisted the EAST facilitator from Rogers High School with list server information. August 30, 2000.

Assisted a student at Gravette High School with information about the EAST list server. September 5, 2000.


Assisted the EAST facilitator from Ouachita Technical College with information about the EAST list server. September 7, 2000.

Assisted the EAST facilitator from Mena High School with information about the EAST list server. September 7, 2000.


Provided software support to the EAST facilitator at Morrilton High School. September 8, 2000.


Provided assistance regarding geospatial data to a student from Alabama School of Fine Arts. September 11, 2000.

Assisted a student at Lincoln High School with information about the EAST list server. September 12, 2000.

Provided software support to the EAST facilitator at Morrilton High School. September 12, 2000.


Provided GPS assistance to an EAST student. September 13, 2000.


Provided software support to a student in the EAST lab at Morrilton High School. September 14, 2000.


Provided list server support to the EAST facilitator at Russellville High School. September 20, 2000.


Provided software support to Richard Christofferson, University of Utah. September 25, 2000.

Provided software support to the EAST facilitator at Morrilton High School. September 26, 2000.
Provided software support to Denis Leray, CRI Lab, France. September 26, 2000.

Provided software support to an EAST student from Pottsville High School. September 27, 2000.

Provided list server support to the EAST facilitator at Yellville-Summit High School. September 28, 2000.


Arranged for out-dated software at CAST to be distributed to EAST labs. September 28, 2000.

Responded to a GPS base station support call from John P. Messick, Dean, School of Arts and Sciences, Missouri Southern State College. October 4, 2000.

Provided GPS support to the EAST facilitator from Yellville-Summit High School. October 9, 2000.

Provided information about data to an EAST student from Lincoln High School. October 10, 2000.

Provided information about data to the EAST facilitator from Kea’auh High School, HI. October 11, 2000.

Assisted students at Greenland High School with a local GIS/GPS project. October 11, 2000.

Met with personnel from the Arkansas Multi-Agency Wetland Planning Team to discuss the direction of GIS-based wetlands analyses in Arkansas. October 13, 2000.

Provided software support to an EAST student from Hampton High School. October 17, 2000.

Provided software support to a student at University of Arkansas at Monticello. October 18, 2000.

Provided software support to an EAST student from Hampton High School. October 18, 2000.

Provided all USGS Digital Orthophoto Quarter-Quadrangles (DOQQs) to the Benton County 911 Office. October 19, 2000.


Provided software support to Rob Dzur, INRA, La Paz, Bolivia. October 20, 2000.


Provided software support to the EAST facilitator at West Helena High School. October 31, 2000.
Provided day-long support visits to the EAST lab at each of the following schools in Arkansas (November 2000 – April 2001):

1) Huntsville High School  
2) DeQueen High School  
3) Centerpoint High School  
4) Lewisville High School  
5) Magnolia Jr. High School  
6) Fountain Lake High School  
7) Smackover High School  
8) Norphlet High School  
9) J. A. Fair High School, Little Rock  
10) Parkview High School, Little Rock  
11) N. Little Rock High School-West  
12) Rison High School  
13) Dermott High School  
14) Dumas High School  
15) Marvell High School  
16) Augusta High School


Provided software support to the EAST facilitator at Russellville High School. November 9, 2000.

Provided list server support to the EAST facilitator at Kea’au High School. November 9, 2000.


Provided a letter of support regarding a visit to the Spatial Analysis Laboratory at the University of Arkansas at Monticello for the facilitator of the EAST lab at Dermott High School. November 14, 2000.

Presented to state legislators and others at the GIS Day information session at the Capitol. November 15, 2000.


Organized EAST students to present the CADIS projects to the Superintendents’ Meeting at the Northwest Arkansas Education Cooperative. November 21, 2000.


Provided list server support to the EAST facilitator from Lakeside High School (Hot Springs). November 29, 2000.

Provided six weeks of geospatial training to a total of 110 EAST students from more than 50 junior high, middle, and high schools. December 2000 – March 2001.

Provided software support to an EAST student from Hampton High School. December 1, 2000.

Provided GPS support to an EAST student from Altus-Denning High School. December 1, 2000.

Provided GPS support to the EAST facilitator from Morrilton High School. December 1, 2000.


Provided GPS support to an EAST student from Lahainaluna High School. December 3, 2000.

Provided list server support to the EAST facilitator from Altus-Denning High School. December 6, 2000.


Provided software support to an EAST student from Lahainaluna High School. December 11, 2000.

Provided systems support to the EAST facilitator from Dermott High School. December 12, 2000.

Provided GPS support to an EAST student from Green County Technical High School. December 12, 2000.

Provided list server support to the EAST facilitator from Russellville High School. December 12, 2000.

Put an EAST student from Leadhill High School in touch with our Chemistry department to help him locate project information. December 28, 2000.

Provided software support to EAST students from Pulaski Heights Middle School. January 3, 2001.


Provided contact information to an EAST student from Morrilton High School about the Spatial Information Systems program at UAM. January 17, 2001.


Provided GPS support to an EAST student from North Pulaski High School. February 1, 2001.

Provided software support to an EAST student from Fountain Lake High School. February 1, 2001.

Provided software support to an EAST student from Little Rock Central High School. February 5, 2001.


Provided software support to an EAST student from Lahainaluna High School. February 7, 2001.
Provided software support to an EAST student from Fountain Lake High School. February 9, 2001.

Provided software support to an EAST student from Lakeside High School (Hot Springs). February 12, 2001.


Provided software support to an EAST student from Lakeside High School (Hot Springs). February 13, 2001.

Provided software support to an EAST student from Omaha High School. February 14, 2001.

Provided software support to an EAST student from Lahainaluna High School. February 15, 2001.

Provided software support to an EAST student from Dermott High School. February 16, 2001.

Provided software support to an EAST student from Lahainaluna High School. February 16, 2001.

Presented two workshops for students, and manned an information/presentation booth at the National EAST Conference in Little Rock. February 19-21, 2001.


Provided a tour of CAST for representatives of EAST programs in the county of Maui, HI. February 23, 2001.

Provided GPS support to an EAST student from Robinson High School February 26, 2001.

Provided consultation about a possible summer training program at Lakeside High School, Hot Springs. March 5, 2001.

Provided software support to EAST students from Lakeside High School (Hot Springs). March 7, 2001.

Provided software support to an EAST student from Lahainaluna High School. March 12, 2001.


Provided software support to EAST students from Lakeside High School (Hot Springs). March 14, 2001.


Provided systems support to the EAST facilitator from Morrilton High School. April 5, 2001.

Provided data support to an EAST student from Cabot High School. April 6, 2001.

Provided software support to the EAST facilitator at Yellville-Summit High School. April 6, 2001.

Provided data support to an EAST student from Fountain Lake High School. April 6, 2001.

Provided software support to an EAST student from Brookland High School. April 9, 2001.


Provided input on the proposed technology charter school at Greenland during a planning meeting. April 10, 2001.

Provided software support to EAST students from Little Rock Central High School. April 11, 2001.

Provided software support to an EAST student from Norphlet High School. April 11, 2001.

Provided data support to an EAST student from Cabot High School. April 11, 2001.

Provided software support to an EAST student from Lincoln High School. April 13, 2001.

Provided software support to the EAST facilitator at Dumas High School. April 16, 2001.
Provided GPS consultation to Andrew James, Arkansas Cooperative Fish and Wildlife Research Unit. April 16, 2001.


Provided consultation on project ethics to an EAST student from Hampton High School. April 18, 2001.


Provided software and data support to an EAST student from Norphlet High School. May 1, 2001.


Provided software support to EAST students from Lahainaluna High School May 9, 2001.


Provided software support to the EAST facilitator at DeQueen High School. May 17, 2001.

Met with Fayetteville city officials and Bank of Fayetteville personnel to organize funding for 2001 CADIS project. May 21, 2001.


Provided software support to Francois Delclaux, UMR HydroSciences Montpellier, France. May 25, 2001.

Wilson, John M.
Assisted Brandon Bottomley (GeoSciences) with ArcView and GeoMedia. July 5, 2000.


Assisted Barnali Dixon (Soil Physics) with ArcView and GRASS. July 7, 2000.


Assisted Rob Doster (BIOL) with large format plotting. August 1, 2000.

Attended a demonstration and technical session for ESRI’s ArcSDE in Fayetteville. August 1-3, 2000.

Assisted Dr. Elaine Padovani (USGS) with data management planning. August 8, 2000.

Data support for Mark Miller (Agri ImaGIS, Inc.). August 8, 2000.

Assisted Dr. Tom Foti (Arkansas Natural Heritage Commission) with ArcView. August 8-11, 2000.


Assisted Dr. Tom Foti (Arkansas Natural Heritage Commission) with ArcView and data support. August 21-25, 2000.


Demo/Tour for Anthropology students. September 6, 2000.

Assisted Alynne Bayard (Tree Ring Lab) with ArcView. September 8, 2000.
Data support for Angela Davis (USGS Wetlands Office). September 13, 2000.
Demo/Tour for Dr. Mark Flinn (ANTH Candidate). October 24, 2000.
Assisted Andrew James (BIOL) with ArcView and data support. February 12, 2001.


Assisted Dr. Karen Hanna (Utah State University) with ArcView. February 26, 2001.


Data support for Andrew Schmidt (University of Missouri, Columbia). March 12, 2001.


Assisted Randy Frye (Soil Physics) with ArcView. April 9, 2001.


Assisted Marty McKimmey (Soil Physics) with ArcView. May 9, 2001.


## Appendix C: Staff Listing

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Title</th>
<th>Email</th>
</tr>
</thead>
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<tr>
<td>5</td>
<td>Sarah Bull</td>
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<td>15</td>
<td>Chad Going</td>
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<td>16</td>
<td>Dorianne Gould</td>
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<tr>
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<tr>
<td>23</td>
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<td>37</td>
<td>Harlen Skinner</td>
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<tr>
<td>38</td>
<td>Kelly Sparks</td>
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<td>39</td>
<td>Kristy Stewart</td>
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</tbody>
</table>

Note: During the summer of 2001, CADIS students working at CAST included John Cromwell, Will Gibson, Ryan Bruner, Justin Frazier, and Josh Johns.
Appendix D: Selected Articles.