From the Director

“2006 was a hallmark year for the GeoResources Institute in many respects. From Hurricane Katrina assistance to record funding for research activities, it has been a year of contributions and successes.

GRI also had a number of changes in its management structure. Chuck Hill has assumed duties as Deputy Director, and is the official MSU liaison to Stemisc Space Center. Roger King relinquished his position as Associate Director for Research to take on responsibility as Associate Dean for Research and Graduate Studies in the Bagley College of Engineering. Lori Bruce has now stepped in as GRI Associate Director for Research. We have also revised Robert Moorhead’s management responsibilities, and renamed his position as Associate Director for High Performance Computing. In addition, a number of new faculty are now affiliated with GRI.

The Institute has opened up several new avenues of funding focused on such areas as coastal ecosystem management, homeland security, satellite technology, state and local government GIS, and earth observations. Through the expertise of affiliated faculty across the university, GRI has established a national and international reputation for innovative, solutions-oriented research and outreach.

The coming year promises to bring even greater success on these and other fronts. We are focusing our efforts even more in strong relationships with the departments and colleges at MSU, and in collaborating with the very best partners around the world so that we can advance research knowledge, improve educational programs, and enhance economic development in our state and region.”

David R. Shaw
William L. Giles Distinguished Professor
Director

GeoResources Institute

Our Mission is to understand Earth’s natural and managed systems and provide comprehensive solutions for socioeconomic and environmental requirements, leading to an improved quality of life.

Our Vision is to be a world leader in advancing the state-of-the-art in spatial technologies and resource management.

Focus areas for recent spatial technology development by the GeoResources Institute include: agriculture, forestry, invasive species management, water resources, transportation, oceanographic and atmospheric modeling, data mining and management, and homeland security. These represent areas in which MSU has developed nationally recognized research strengths, with strong relationships and inherent respect from state, regional and national business entities.

Using the infrastructure and expertise of one of the largest computing centers in the United States, the GRI provides capabilities in remote sensing, computational technologies, visualization techniques, natural resource management, and the transition of these into operational agency research, planning, and decision-support programs.
Invasive species present enormous problems for terrestrial and aquatic ecosystems in the United States, degrading biodiversity and impairing the ecosystem services they provide to our society. Invasive species are the second leading cause of species extinction, a significant factor in the degradation of natural areas, and reduce the quality of wildlife habitat. Invasive species cause direct economic loss to society, through infestations of agricultural crops, loss of timber, reduction in fish, damage and disease to livestock, and increase in risk from flood or fire.

For instance, MSU’s GeoResources Institute has entered into an agreement with the Mississippi Bureau of Plant Industry to survey for giant salvinia in our state. Giant salvinia populations are currently being monitored within Mississippi and the MidSouth. Research is being conducted on giant salvinia’s environmental and ecological requirements, and techniques for remote sensing and management are being explored.

Giant salvinia is an aquatic fern native to southern Brazil. This invasive species is free-floating and can form dense mats of up to 3 feet thick and will take over and fill in bodies of water thereby choking out native aquatic plants and animals. Similarly, giant salvinia mats clog irrigation canals, interfere with rice production, and impede access to waterways for humans and livestock.

Giant salvinia is considered one of the world’s worst weeds. The ecological consequences of giant salvinia introduction have prompted the United States Department of Agriculture and the Mississippi Department of Agriculture and Commerce to list this species on both the federal and state Noxious Species Lists.
August 29, 2005 - a date we will never forget. Immediately after landfall of Hurricane Katrina, a storm that has been called the most devastating storm of the last 100 years, GRI faculty researchers and students suddenly became aware of the urgent ‘life or death’ situations facing the coastal residents. They realized there was an immediate need for geo-coding locations — taking street addresses and converting them into map coordinates — providing emergency rescue personnel with longitude/latitude points to use GPS units to guide them to stranded victims of the storm. Their aerial imagery and mapping skills would provide valuable assistance to rescue and recovery agencies for days, weeks and months to come.

Nearly 300 rescues were performed by U.S. Coast Guard rescue missions from the information provided by MSU volunteers and Extension specialists from the Departments of GeoSciences, Forest Resources, and Plant and Soil sciences, who worked 12-hour shifts around the clock. These volunteers made personal sacrifices of their time and talent, traveling to emergency operations stations far away from their own safe and secure homes. Using their geographical skills, they created maps to show locations of aid and relief stations around the state. For weeks, the group worked endlessly to provide infrastructure officials with locations of power outages, downed cell towers and power lines, and detailed road maps for the military to set up check points in order to secure the area.

Katrina was one of the strongest storms to impact the gulf coast of the United States during the last 100 years. The MSU team produced 186 maps the first day of operation immediately after the August 29 storm came ashore. Thousands of maps were produced daily in the following weeks after the storm. Countless lives were saved. And to this day, the GRI-led team is ready to provide expertise and assistance should another emergency situation occur.
NEW START-UP COMPANY

Spatial Information Systems, Inc.

Researchers at the GeoResources Institute have developed a portfolio of software products that will be marketed to government agencies, private companies and individual clients. This has led to the start-up of a new company called Spatial Information Solutions, Inc., or SIS for short.

The new company, based at Mississippi State University, is filling some critical gaps in remote sensing and spatial information technology—increasingly used by policymakers and resource managers as a major tool of economic development. Provisional patents have been filed on eight SIS software products developed by GRI researchers in collaboration with several other MSU scientists. SIS has exclusive rights to the technology and the University will share in the royalties.

The new software developed by SIS will be compatible with traditional Geographic Information System tools, but provide more accurate mapping data for such critical applications as 911 emergency response and disaster planning. End users will be able to mine information from large quantities of imagery taken over time. This much-needed information could provide better abilities to understand such things as urban and land cover change, model predictions of crop growth and productivity estimates, monitor the status of critical natural resources such as forests, and track losses or change trends in natural habitats such as wetlands or coastal ecosystems.

Mississippi State University supports a number of start-up companies via incubator facilities at the Thad Cochran Research, Technology and Economic Development Park, which is located just north of the main campus. SIS will create jobs that will enrich the local economy and provide a new high-tech presence in geospatial technologies within our region.
The GeoResources Institute at MSU and the Mississippi Department of Transportation (MDOT) have partnered together in an effort to complete a Highway 49 Transportation Corridor Economic Development Study. This project began as part of a larger study concerned with the application of remote sensing and spatial information technologies in promoting economic development through transportation corridor planning.

Researchers have become concerned with the integration of economic development alternatives into MDOT’s transportation corridor planning process. It was determined that enhancements made to MDOT’s planning process should focus on the inclusion of innovative planning techniques that offer viable alternatives to traditional corridor by-pass development and design.

The GRI is collaborating with researchers from MSU’s Department of Landscape Architecture to complete an assessment of the potential for integrating Smart Growth development alternatives into transportation planning projects along the Highway 49 transportation corridor in southern Mississippi. The assessment identifies the types of data needed to develop Smart Growth-based alternatives to standard economic development along the highway by-passes of rural Mississippi communities, and offers a proposal for a GIS-based method of collecting and analyzing these data.

Ultimately, an effective decision-making tool shall emerge from this research that will aid transportation planners and officials (specifically MDOT and the U.S. Department of Transportation) in making “smart” and efficient development decisions that will not only boost local economies, but enhance quality of life and maintain environmental integrity.
Researchers at the GeoResources Institute are collaborating with those from other MSU departments, such as Agriculture and Biological Engineering and Extension specialists from the Thad Cochran National Warmwater Aquaculture Center, for the development of an expert system for management of environmental parameters in a catfish pond. The primary objective is to develop an expert system for management of environmental parameters that adversely affect catfish production using remote sensing devices, robotics, and wireless networks.

Channel catfish production in ponds is the largest component of freshwater aquaculture in the United States with an estimated annual farm gate value of close to one billion dollars. Although successful, poor environmental quality and infectious disease are limiting production. Farm revenues losses associated with these problems are estimated to range between 60-100 million dollars annually. The Personal In-Pond Information System (PIPIs) could be used as an early warning system to alert catfish producers to potential problems.

Researchers are using wireless sensors, geographic information systems (GIS) and communication technologies to monitor and analyze environmental and physical conditions of catfish ponds. Collectively, these technologies are used to develop an “expert system” that will be capable of identifying and alerting growers to the occurrence of adverse situations that can indicate oncoming disease or environmental threats.

MSU is collaborating with Delta Western, Inc. near Indianola, MS, to serve as the prototype that will lead to a statewide operational system of automated data collection, data visualization and the integration and optimization of electronics in order to create in-pond information systems for catfish producers.
MSU’s GeoResources Institute has entered into an agreement with NOAA to explore the possibility of creating a Northern Gulf of Mexico Cooperative Institute to address critical research areas which collectively represent enormous economic and ecological regional, national and global impacts.

The Northern Gulf region contains some of our nation’s most environmentally sensitive ecosystems. It is one of the most important marine fisheries regions in the United States, and has often been impacted more severely by terrestrial influences and factors than any other region. As experienced with Hurricane Katrina, the Northern Gulf region experiences more hurricane landfalls and sustains more economic damage than any other region in the U.S.

MSU is strategically positioned to undertake a lead role for such an institute, in collaboration with other technically qualified institutions in the region. A long-term, sustained collaboration with NOAA will benefit all parties — and more importantly, benefit to our local, regional, and national constituencies.

The GRI shares a common focus with NOAA in the research, development and practical application of spatial and modeling technologies to help manage the natural and developed resources of the coastal zones, and in supporting the interdependent inland regions of our nation. A joint institute in this region will be a vehicle to more effectively link local, state, regional and national agencies and organizations concerned with Northern Gulf issues and management.
The university’s GeoResources Institute is marshaling its geospatial technology expertise to help build a computerized, one-stop data resource. It could have global research impacts on such diverse issues as climate change, bioterrorism, transportation, and population trends. A recently approved $9.6 million federal grant will help NASA develop a stronger and more accessible Earth science research infrastructure for use by a wide variety of U.S. governmental agencies.

The GRI’s high-performance computing, remote sensing, rapid prototyping, geographic information systems, and 3-D visualization capabilities will come together in a very complementary way to aid in the creation of a data system that will be globally accessible.

The goal of the rapid prototyping capability, or RPC, is to speed the evaluation of potential uses of NASA research products and technologies, and improve future operational systems by reducing the time to access, configure and assess their effectiveness.

Also providing support for the National Aeronautics and Space Administration project are the University of Mississippi’s Geoinformatics Center and a team from the Stennis Space Center comprised of the Institute for Technology Development and Science Systems and Applications, Inc.
AWARDS & RECOGNITION

Corbin, J. H. 2006. NASA award for service on the Stennis Space Center Port-Katrina Housing Committee. Bay St. Louis, MS.

King, R. L. 2006. J. Donald Trotter Electrical and Computer Engineering Leadership Award. MSU.


Moorhead, R. J. 2006. Career Achievement Award. Bagley College of Engineering. MSU.


Robles, W. 2006. 2nd Place - Other - for subjects that don’t conveniently fit into another category. SouthEast Exotic Pest Plant Council’s 2006 Photo Contest.

Robles, W. 2006. 2nd Place - Specimen - close up of an invasive plant. SouthEast Exotic Pest Plant Council’s 2006 Photo Contest.


Wersal, R. M. 2006. Scholarship Awarded by the Midwest Aquatic Plant Management Society. MSU.


PATENTS & LICENSES

Anantharaj, V. G., Y. Li, P. J. Fitzpatrick. 2006. Incorporation of MODIS Land Cover Data into COAMPS (TM). MSU.

Anantharaj, V. G., P. J. Fitzpatrick. 2006. MODIS-Atmosphere Data Handler. MSU.

Fitzpatrick, P. J., Y. Li, N. Tran. 2005. COAMPS data ftp script. MSU.

Fitzpatrick, P. J., Y. Li, N. Tran. 2005. Grib to flat file converter. MSU.

Fitzpatrick, P. J., Y. Li, N. Tran. 2005. NCEP download software. MSU.


Tran, N., P. J. Fitzpatrick. 2005. Hurricane hugging program. MSU.

Tran, N., P. J. Fitzpatrick. 2005. MMScycle. MSU.

GRI PROPOSALS

Federal: $68,265,040
Non-federal: $582,765
Total: $68,847,805

GRI ACTIVE PROJECTS

Federal: $16,303,676
Non-federal: $5,500
Total: $16,309,176

119 Students involved in GRI Research
Book and Book Chapters


Peer-Reviewed Journals


Peer-Reviewed Conference Papers


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