Digital Texas 2008

Biennial Report on Geographic Information Systems Technology

Galveston Bay

Gulf of Me

Avenue J
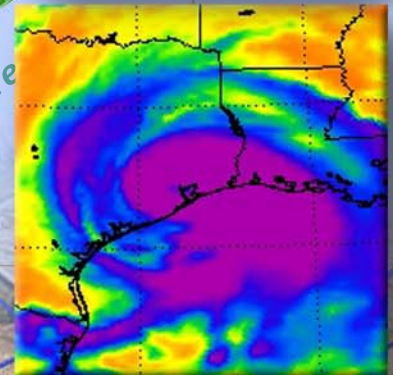
Texas Geographic Information Council
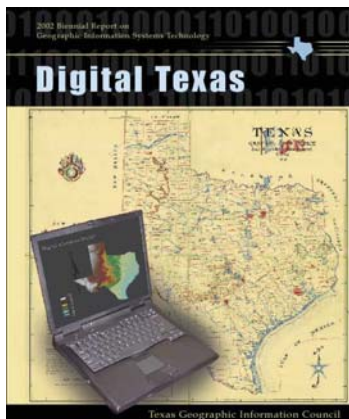
About the Texas Geographic Information Council

In 1997, the 75th Legislature established the Texas Geographic Information Council (TGIC) as the primary coordinating body for geographic information systems (GIS) in Texas state government. The coordination role is designed to achieve cost-effective use of GIS data and technologies and to support the incorporation of GIS into state agency business functions. TGIC includes 43 members from state, local, and federal agencies and universities. The executive director of the Texas Department of Information Resources (DIR) and the executive administrator of the Texas Water Development Board (TWDB) serve as the executive sponsors of the Council.
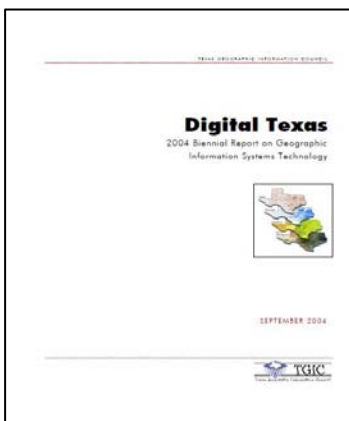
About this Report

The Texas Water Code (Section 16.201) requires TGIC to publish a biennial report on the use of GIS technology by state government. This report, *Digital Texas 2008,* is the fourth biennial report submitted by the Council. *Digital Texas 2008* presents planned initiatives for improvements for geospatial data programs within the state and a description of 2007–2008 GIS initiatives and accomplishments. Partial funding support and strategic planning assistance for this document was provided by the Federal Geographic Data Committee through the 50-States Project, which aims to encourage state government planning for the development of the national spatial data infrastructure.
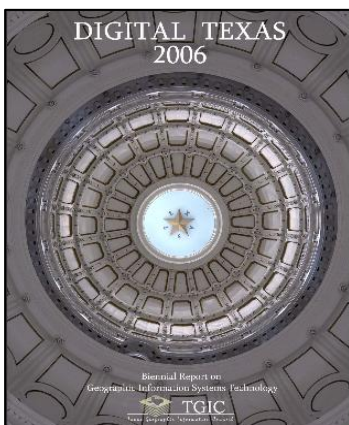
About the Cover

The cover illustrates the variety of geospatial technologies now used in hurricane preparedness and response. The underlying image of Galveston Island is a Light Detection and Ranging (LiDAR) image of digital elevation data with parcel boundaries overlaid the image. The aerial image is a high-resolution oblique view of the aftermath of Hurricane Ike's near total destruction of homes along Crystal Beach on the Bolivar Peninsula with parcel boundaries. Additional inset images from top to bottom show a rain precipitation map, oblique aerial imagery before Hurricane Ike, Galveston Island flood model, weather radar map, and a map of food distribution centers in the Houston-Galveston area.

Contents

Letter from the TGIC Chair and Vice-Chair

November 1, 2008

Geographic information systems (GIS) technology and geospatial data are critical to the missions of nearly every governmental entity in Texas. While GIS technology plays a highly visible role in emergency response to and recovery from natural disasters like the recent Hurricane Ike, it is also used on a daily basis by all levels of government to analyze complex problems and work toward solutions. Any interaction between the two things that make Texas what it is—its land and its people—is amenable to spatial analysis.

Geospatial technology serves an essential function in many state government enterprises—including conserving precious natural resources; supporting agriculture; managing fisheries, wildlife, and the parks system; promoting tourism; responding to natural disasters and other emergencies; regulating oil and gas production; building and maintaining highways; and redistricting. Geospatial socioeconomic data provides local government and the private sector the tools they need for urban planning and economic development. Geospatial applications and data have a key role in supporting original research in the earth sciences and serve as a visual medium for communicating analyses and findings to scientific and academic communities and the public.

Texas is continually building its geospatial capabilities, as demonstrated by the initiatives and accomplishments presented in this document. Going forward, the planned initiatives will serve as a guide for TGIC to work toward achieving realistic goals over the next biennium.

The structure of TGIC has served the organization well since its inception in 1997. Changes to the structure are being considered to better position TGIC to realize goals and leverage future opportunities. TGIC will continue striving for greater collaboration among all Texas geospatial stakeholders to increase the value and benefits provided by GIS, which will ultimately improve the quality of life for the citizens of Texas.

Bruce Barr
TGIC Chair
Texas Association of Counties

Claire DeVaughan
TGIC Vice-Chair
United States Geological Survey

The Texas Geographic Information Council was created to provide cost-effective and useful exchange and retrieval of geospatial information both within and among the various agencies and branches of government, and from agencies and branches of state government to the people of Texas and their elected representatives.

State and Regional Associations

County Information Resources Agency
Texas Association of Counties
Texas Association of Regional Councils

State Universities and Research Centers

Houston Advanced Research Center
Stephen F. Austin University (SFAU) Columbia Center
Texas A&M University - Academy for Advanced
    Telecommunications and Learning Technologies
Texas A&M University Cooperative Extension
Texas A&M University Department of Forest Science
Texas A&M University Spatial Reference Center
Texas State University
Texas Tech University (TTU)
University of Texas Bureau of Economic Geology (UTBEG)
University of Texas Center for Space Research (UTCSR)

Federal Agencies

United States Geological Survey

State Agencies

Department of Information Resources (DIR)
Governor's Office of Economic Development and Tourism
Office of the Attorney General
Office of the Governor of Texas
Public Utility Commission of Texas (PUCT)
Railroad Commission of Texas (RRC)
Texas Animal Health Commission (TAHC)
Texas Army National Guard
Texas Board of Professional Land Surveying
Texas Commission on Environmental Quality (TCEQ)
Texas Commission on State Emergency Communications
Texas Department of Agriculture
Texas Department of Criminal Justice
Texas Department of Family and Protective Services
Texas Department of State Health Services
Texas Department of Insurance
Texas Department of Assistive and Rehabilitative Services
Texas Department of Transportation (TxDOT)
Texas Education Agency (TEA)
Texas Facilities Commission
Texas Forest Service
Texas General Land Office (GLO)
Texas Health and Human Services Commission
Texas Historical Commission
Texas Legislative Council (TLC)
Texas Natural Resources Information System (TNRIS)
Texas Parks and Wildlife Department (TPWD)
Texas State Soil and Water Conservation Board
Texas Water Development Board (TWDB)

The Texas Natural Resources Information System is the principal state archive and clearinghouse for geospatial and natural resources data. TNRIS, a division of the Texas Water Development Board, maintains an extensive library of digital and printed map data and delivers information about data available from external sources. The clearinghouse archives hardcopy and digital maps, remote sensing imagery, groundwater, and surface water data, metadata and GIS data for Texas and the Texas/Mexico border region. TNRIS is a leader in the use of Internet map services to help people discover, view, and download data for their area of interest.

TNRIS manages the StratMap Program and Borderlands Information Center and provides training opportunities. TNRIS also provides management support to the TGIC Technical Advisory Committee and several workgroups.

TNRIS Website: www.tnris.state.tx.us

The Department of Information Resources is the state's lead information technology office and is directed by the State Chief Technology Officer. DIR works to ensure that all forms of information technology are deployed within state government in an effective and cost-efficient manner.

DIR recognizes that GIS is a key technology for the State of Texas and works to encourage its effective and efficient deployment through state coordination activities. These efforts are to ensure against duplication of organizational effort and maximize cooperative opportunities for GIS development. DIR also provides management support to Texas Geographic Information Council and several workgroups.

DIR guides and supports the appropriate use of GIS by
1. Providing state GIS coordination for inter-agency and intergovernmental efforts,
2. Setting state GIS policies and technical standards,
3. Integrating GIS planning into the State Strategic Plan for Information Resources Management, and
4. Providing TGIC management, agency coordination, report publishing, and website management.

DIR Website: www.dir.state.tx.us

For the time period 2009–2010, the Texas Geographic Information Council (TGIC) has identified ten planned initiatives that could further development of the Texas Spatial Data Infrastructure (TSDI). TGIC is required by Section 16.021 of the Texas Water Code to make recommendations on additional initiatives to improve the state's geographic information systems programs. The planned initiatives (listed below and described in more detail starting on page 3) are recommended by TGIC membership based upon priority needs coupled with the staff resources that are realistically expected to be available within this time frame. TGIC will further consider these planned initiatives over the coming months. A final decision on modification or adoption of the individual initiatives will be made at the next TGIC quarterly meeting planned for January 2009.

Planned TGIC Initiatives

1. Collect and distribute a *best-available* public-domain county-parcel dataset of counties along the Texas coast prior to the beginning of the 2009 hurricane season.

2. Convert the *Digital Texas Base Map Plan* into web pages that can be maintained by data custodians and Council workgroups.

3. Optimize the structure of Council meetings and improve communication capabilities through the use of Internet technologies to better coordinate state geospatial activities with all stakeholders.

4. Investigate models for sustainable funding to support the development and maintenance of statewide geospatial base-map datasets and services through the StratMap and BEG STATEMAP and other related programs to maximize funding matches for the state.

5. Develop a comprehensive online catalog of geospatial datasets including metadata records and information on the maintenance, custodianship, distribution, restrictions, and limitations of each dataset.

6. Develop an enterprise geospatial web services strategy for Texas government based on a shared services model including recommended Internet-mapping standards and specifications.

7. Conduct an inventory and develop a registry of state government geospatial web services.

8. Review and update the Texas state government geospatial standards and technical specifications.

9. Establish recommended guidelines for the publishing and dissemination of GIS data in a variety of formats that will facilitate the development of web mapping projects and applications.

10. Foster the development of GIS metadata documentation and the use of map disclaimers through training sessions and information dissemination in the GIS community.

TGIC is also required by Section 16.021 of the Texas Water Code to describe the progress being made in implementing GIS goals and initiatives by TGIC members. The Initiatives and Accomplishments 2007–2008 section (starting on page 11) provides real-world examples of how Texas is using GIS technology to better manage state resources and achieve organizational missions. Five geospatial application areas are highlighted: (1) Shared Services, (2) Citizen Service Delivery, (3) Economic and Infrastructure Development, (4) Emergency Response and Preparedness, and (5) Environmental Conservation.

Virtually every aspect of modern life is linked to geography. For this reason, the majority of digital data that exists also has an associated location attribute or geospatial data of either an address or coordinate pair location such as latitude/longitude. Geospatial technology enables the management of geospatial data to locate, analyze, plan, and deliver public services more efficiently. It encompasses several related technologies: geographic information systems map technology, global positioning system (GPS) location technology, and remote sensing imaging technology.

Geospatial technology is now widely utilized and has matured to the point that almost any organization with a business requirement for GIS can find a system to meet its needs and budget. In Texas state government, an estimated 50+ state agencies and universities are using geospatial technology for operational purposes. This does not include another 40+ state universities and community colleges using geospatial technology for their educational curriculum.
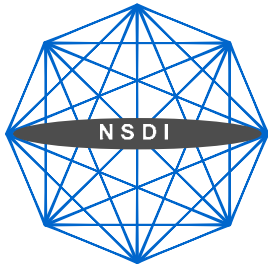
An ongoing challenge is provisioning for the development of infrastructure that can support all geospatial users on a national and statewide basis. Presidential Executive Order 12906 established the National Spatial Data Infrastructure (NSDI) in 1994. Its primary goals are to promote geospatial data sharing, reduce duplication of efforts among agencies, improve geospatial data quality, and make geospatial data created in the public domain easily accessible to everyone. The Federal Geographic Data Committee (FGDC) and the United States Geological Survey (USGS) are the two federal entities primarily responsible for promoting the development of the NSDI. Implementation of the NSDI is being carried out through technology projects, policies, best practices documents, standards, and, most importantly, a network of stakeholder partnerships (see Initiative 3).

Texas has been a long-time supporter of the NSDI and was the first to sign-on as a state partner through a memorandum of understanding with the FGDC in 1995. Well before 1995, the State of Texas had begun to build a state spatial data infrastructure—the Texas Spatial Data Infrastructure (TSDI)—that is complimentary to the NSDI. The Texas Spatial Data Infrastructure (see page 4) consists of eight components: Geo Data, Coordination, Partnership Programs, Clearinghouse Network, Web Services, Standards, Metadata, and Training and Education. Together, these eight components provide the foundation for a shared services environment for geospatial technology in Texas that supports both the public and private sectors.

For the time period 2009–2010, TGIC has identified ten planned initiatives that could further development of the Texas Spatial Data Infrastructure. These planned initiatives (see page 11) are recommended by TGIC membership based upon priority needs coupled with staff resources that are realistically expected to be available within this time frame. TGIC will further consider these planned initiatives over the coming months. A final decision on modification or adoption of the individual initiatives will be made at the next TGIC quarterly meeting planned for January 2009.
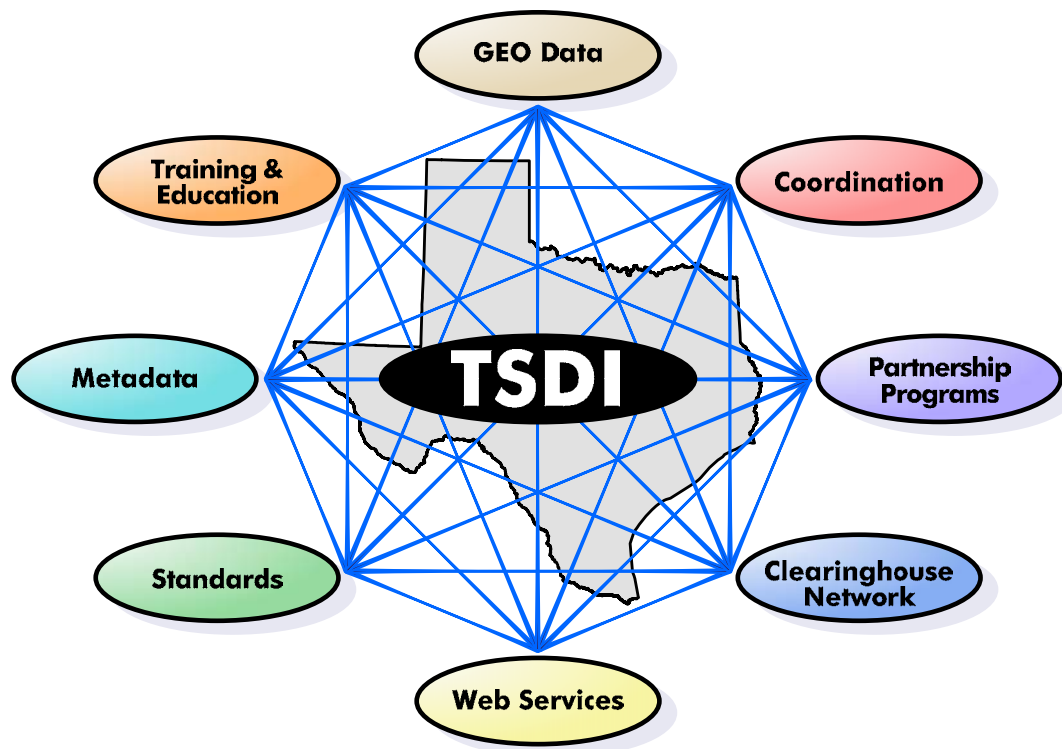
Geo Data is a formalized program of producing digital geospatial data that is developed to an adopted standard for scale, accuracy, and attribute content for use in GIS applications.

Coordination encompasses the programs, institutions, and governance structures that are responsible for guiding geospatial programs and projects to ensure the end results provide maximum benefit for stakeholders.

Partnership Programs provide an institutional or contractual means for financial and or staff resources to be pooled for joint geospatial project development.

Clearinghouse Network is a network of clearinghouses and web service search tools that collect, catalog, transform, publish, and archive geospatial data from available public domain sources and make that data easily available in the public domain through web portal applications.

Web Services (geospatial) are modular Internet-based applications that perform specific functions that one organization can publish as a shared web service and many other organizations can use.

Standards, Guidelines, and Best Practices are written specifications that provide the basis for data, applications, and services to be developed in a consistent and interoperable manner.

Metadata are digital records that document both the technical and program details as to how and why geospatial data was produced so that others can easily determine whether that data is suitable for their project purposes.

Training and Education Programs provide a means for staff to keep current with geospatial technology advancements, standards, and best practices.

Initiative 1

Collect and distribute a "best-available" public-domain county-parcel dataset of counties along the Texas coast prior to the beginning of the 2009 Hurricane season.

Property parcel data in a GIS format has proved to be extremely useful for emergency response efforts. GIS parcel data facilitates insurance and damage assessment analysis, search and rescue missions, flood modeling, and identification of properties for evacuation planning. Prior to the landfall of Hurricane Ike, parcel data requested by several organizations was not readily available from the state or in the public domain. A private-sector dataset was licensed, but the dataset was only 25 percent complete for the state.


Compared with neighboring gulf coast states, Texas lags in the collection of property parcel data for emergency response purposes. Collecting and normalizing parcel data for a state the size of Texas is a very large undertaking that would likely require several years to complete. Focusing the project on Texas' coastal counties would be achieved more easily and produce an immediate benefit to emergency response and disaster recovery efforts.

Bolivar Peninsula Beach Property Parcels (aerial image prior to Hurricane Ike)

Initiative 2

Convert the Digital Texas Base Map Plan *into web pages that can be maintained by data custodians and Council workgroups.*

TGIC's *Digital Texas Base Map Plan 2007* documents the current status and planned development of statewide digital geographic base map data for Texas. The first edition of the *Digital Texas Base Map Plan,* published in February 2002, listed 21 base map layers. The third and most recent edition, published in January 2007, lists 24 layers.
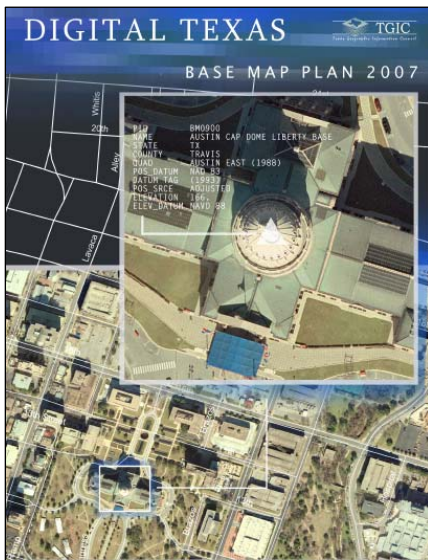
The *Digital Texas Base Map Plan* includes:
- Base map description,
- Base map uses,
- Relationship to other base map layers,
- Status,
- Source of data,
- Standards,
- Next steps,
- Data steward(s),
- Data developer(s),
- Data distributor(s),
- Primary data users,
- Stakeholders, and
- Comments.

To date, the *Digital Texas Base Map Plan* has been published in hard copy and made available online in PDF format. Administrative issues presented by producing the document, such as the amount of staff time required, publishing support provided by the executive sponsor agencies, and printing costs, have resulted in the plan not being as up-to-date as needed. The better approach, beginning with the fourth edition, would be to publish the *Digital Texas Base Map Plan* as a set of linked web pages that can be directly maintained by the data custodians and TGIC workgroups. This will allow the plan to be kept more current and allow for additional content to be included than would otherwise be possible in a printed document.

Coordination

Initiative 3

Optimize the structure of Council meetings and improve communication capabilities through the use of Internet technologies to better coordinate state geospatial activities with all stakeholders.

Texas' great size and diversity of interests make coordinating geospatial activities statewide a challenging task. To make the Texas Spatial Data Infrastructure successful, TGIC must be able to communicate, coordinate, and cooperate with the community of geospatial stakeholders in Texas. TGIC has identified the need to increase participation and improve communication and outreach activities with its members and stakeholders through the use of Internet technology and by restructuring of meetings to reduce the need for travel.

TSDI members and stakeholders include:
- State agencies,
- Local governments,
- Federal agencies,
- Academic institutions,
- Regional organizations,
- Professional organizations,

- Nonprofit and community organizations, and
- Private enterprise.

Strategies to improve communication, coordination, and participation include:
- Encourage all state agencies and universities with active GIS programs to join or renew their TGIC membership and actively participate in Council coordination activities.
- Expand the use of Internet meeting technology to webcast all TGIC meetings as a means to reach member organizations outside of Austin and other interested stakeholders. The first Internet webcast of a TGIC meeting was successfully accomplished on October 2, 2008.
- Publish and update an online membership directory including a list of available subject-matter experts within Council organizations.
- Publish a quarterly TGIC e-newsletter.
- Redesign the TGIC website.
- Reduce the number of meetings and increase their effectiveness by leveraging meetings with other complimentary stakeholder events such as the annual meeting held by the Texas Association of Counties and the Texas Association of Regional Councils.
- Eliminate recurring general purpose technical workgroup meetings where possible and move toward special purpose meetings with specific mission and objectives and a limited lifespan.

Partnership Programs

Initiative 4

Investigate models for sustainable funding to support the development and maintenance of statewide geospatial base-map datasets and services through the StratMap and BEG STATEMAP and other related programs to maximize funding matches for the state.

Geospatial base maps are statewide digital datasets of specific geographic features or themes such as transportation, elevation, or political boundaries. Base maps are the fundamental building blocks for all geographic information systems and are a vital range of important applications such as homeland security, 9-1-1 addressing and emergency response, economic development, and health and human services. To meet the widest range of needs, base maps should provide statewide coverage, be developed according to the adopted cartographic standard, and be interoperable with other base maps.

The StratMap program, managed by the Texas Water Development Board/TNRIS, and the STATEMAP Program, managed by UT-BEG, are two examples of base map programs that have increased the value of Texas' geospatial base map holdings. However, these programs are highly-dependent upon outside partnership funding from federal and local government partners. The prospects of an economic recession and federal budget deficits are expected to reduce available partnership funding during the next few years. It is increasingly clear that states will need to take the lead on provisioning for the development of statewide base maps to ensure they are produced to the required accuracy and currency that will meet critical business needs.

Many states have responded to this challenge by exploring sustainable funding options to support statewide base map development and maintenance programs. During the coming biennium, Texas should consider this approach

by examining the best practices of other states and promulgating a set of recommendations that will sustain the state's ongoing need for geospatial technology and services.

Clearinghouse Network

Initiative 5

Develop a comprehensive online catalog of geospatial datasets including metadata records and information on the maintenance, custodianship, distribution, restrictions, and limitations of each dataset.

Information on Texas' geospatial data holdings is incomplete. TGIC maintains the *Digital Texas Base Map Plan* (see Initiative 2) that provides some of this information for statewide base maps available through the state GIS clearinghouse (TNRIS), other agency distributors, and regional organizations. However, many other specialized agency-maintained datasets are not distributed through the clearinghouse, but are shared on an ad-hoc basis through an informal network of GIS professionals.

A comprehensive catalog or inventory of all geospatial dataset holdings within state government will better facilitate information exchange and application development and prevent duplication of effort by helping agencies find data that has already been developed, rather than unknowingly duplicating existing datasets. The data inventory could be accomplished through DIR's Information Resource Deployment Report (IRDR). The IRDR is intended to provide a biennial review of the operational aspects of each agency's information resources supporting of agency's mission, goals, and objectives. The IRDR could also be used to collect information on agency geospatial data holdings rather than implementing a separate inventory effort. The next IRDR is scheduled for completion at the end of 2009.

Web Services

Initiative 6

Develop an enterprise geospatial web services strategy for Texas government based on a shared-services model including recommended Internet-mapping standards and specifications.

Texas state agencies and local and regional governments have been exploring ways statewide data sharing could be fostered through the development of enterprise GIS web services built on service-oriented information technology architecture. This fast-growing trend toward web-enabled mapping allows for so-called *mashups*. A mashup combines data from two different sources, for example, the locations of emergency relief centers could be rapidly deployed by combining the geospatial coordinates of the centers with popular user-oriented base maps displaying roadways, aerial, and satellite imagery, such as Google Maps, MapQuest, or Virtual Earth.

The basic premise of enterprise GIS web services is the organization of a centralized utility service that integrates geographic data and provides web services to multiple agencies throughout the entire state. Moreover, the reuse of software code and the elimination of redundant databases can result in significant cost savings for Texas. The availability of enterprise GIS web services would also reduce the tendency for data and technology to be *siloed*

within state agencies, as well as lowering deployment costs and extending beneficial data and technologies to all state agencies.

The primary cost of establishing enterprise GIS web services is the initial investment in data center infrastructure and the preparation of large datasets. Once deployed, the incremental cost of adding new agency connections to an enterprise GIS web service can be less than the cost would be than if each agency developed their own instance of the same service. Providing enterprise GIS web services would also give small organizations the technological base and support to build web-map applications, without the prohibitive cost of provisioning their own web mapping service.

Initiative 7

Conduct an inventory and develop a registry of state government geospatial web services.

During the last biennium, geospatial web services were deployed by several state agencies including GDEM, DIR, GLO, RRC, TCEQ, TNRIS/TWDB, TPWD, TxDOT, TTU, SFAU, and UTCSR. A good first step toward establishing an enterprise strategy for geospatial web services would be an inventory of current and planned web services. Using the inventory, a registry of web services and programming code that follows the Universal Description, Discovery, & Integration (UDDI) protocol can be created that would facilitate agencies to build web services based on shared web services developed and maintained by other agencies. Moreover, a registry would reduce redundant application and data development by helping users discover available geospatial web services.

For example, in the aftermath of Hurricane Ike, many federal, state, and local government organizations had collected data from the impact area in the form of aerial imagery, advanced elevation data, and other geospatial information that could be distributed as a web service. Implementing post-hurricane data as an enterprise shared web service would allow other organizations to build useful applications to reduce disaster-recovery time, such as damage assessment, debris removal, and service restoration, while reducing wasteful duplication of effort.

Standards

Initiative 8

Review and update the Texas state-government geospatial standards and technical specifications.

Geospatial standards and specifications ensure that return on investment in data is maximized by providing guidance to data developers to ensure the data they create is interoperable with other geospatial systems and will fill the broadest range of needs. TGIC developed and recommended the current Texas geospatial standards, which DIR incorporated into the Texas Administrative Code (1 TAC 10 § 201.6) in 2001. TGIC should review this TAC section for any needed updates and consider new data-development standards. There is also a need to develop web-mapping technical specifications as agencies are beginning to implement this technology without any state-enterprise guidance (see Initiative 6).

There are many geospatial standards and specifications initiatives at the national level that are either completed or underway by the FGDC, Open Geospatial Consortium, and several other governmental entities and professional organizations. Therefore, most of the effort for this initiative would be for TGIC to review national standards and

specifications and determine which are appropriate for Texas to either adopt or adapt, and then reach consensus with membership and stakeholders on a business case for their adoption. If circumstances suggest the need to create a new standard, this would occur only after determining that an existing standard would not meet requirements.

Initiative 9

Establish recommended guidelines for the publishing and dissemination of GIS data in a variety of formats that will facilitate the development of web mapping projects and applications.

Web-mapping technology options have expanded in recent years from just a few vendors to a number of vendors and open source options. While many state agencies and universities have begun to utilize web mapping technologies, generally the data that is being formatted for web services purposes is not being distributed in that format, but instead is usually distributed in one selected vendor format. Guidelines for publishing and dissemination of state GIS data in a variety of formats will facilitate the development of web mapping projects and applications within state government. It will also assist in extending the technology to citizens and the private sector who are increasingly utilizing commercial online map technologies with other data to publish their own individualized web maps.
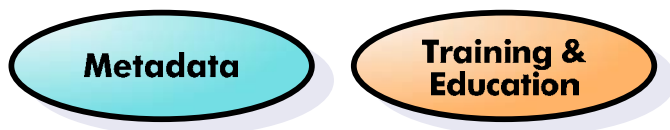
Initiative 10

Foster the development of GIS metadata documentation and the use of map disclaimers through training sessions and information dissemination in the GIS community.

Geospatial Metadata is a digital record that documents both the technical and program details as to how, why and when geospatial data was produced so that others can easily determine whether that data is suitable for their project purposes. Metadata is also a key component to geospatial data discovery as it allows data to be electronically cataloged and searched with Internet search tools.

Texas adopted in 2001 the geospatial metadata standard that is aligned to the FGDC standard. Also in 2001, Texas adopted a map disclaimer rule that requires geospatial metadata records and maps to carry disclaimers advising users as to the limitations and appropriate uses of the data. Efforts should be extended this biennium on outreach efforts to the agencies regarding the geospatial metadata content standard and map disclaimer standard coupled with an updated training and education opportunities.

A primary purpose of the Texas Geographic Information Council is to ensure that the state's investment in geospatial technologies is coordinated and cost efficient. Even more important is to ensure that investments in geospatial technology are being effectively used to meet the state's challenges. Geospatial technology contributes toward creating a successful future for Texas by providing the means to locate and analyze changes in population, economic activities, natural resources, and critical infrastructure and to make meaningful plans and decisions to adapt to those changes.

Texas government has utilized geospatial-related technologies for over 30 years. On a daily basis, state agencies work with many types of geographic and location-related data—boundaries, districts, regions, property parcels, addresses, facilities, infrastructure, and demographics. GIS technology provides these agencies with the ability to manage vast amounts of geospatial data and to analyze and interpret it to make informed decisions.

TGIC is required to describe the progress being made in implementing GIS goals and initiatives by TGIC members. This section provides real world examples of how Texas is using GIS technology to better manage state resources and achieve organizational missions.

Five geospatial application areas have been highlighted:
- Shared Services,
- Citizen Service Delivery,
- Economic and Infrastructure Development,
- Emergency Response and Preparedness, and
- Environmental Conservation.

Together these applications and initiatives illustrate the wide range of uses and benefits that GIS technology offers. Considering these examples against the wider future potential of overall government functions in Texas, it is evident that the state is just starting to harvest the full benefit of GIS technology.

Shared Services Initiatives

Shared Services Initiatives are geospatial services and applications required by more than one enterprise partner, and managed by one entity to improve service and efficiency.

Council on Competitive Government

- **Provisioning of State Geographic Information Services**
  In August 2008, the Council determined that GIS imagery and dataset acquisition may be better provided by selecting a service provider through competition, and directed staff to develop a request for offer that would establish a contracted state service. The Master Contract will be for the acquisition of GIS-related imagery and high priority geospatial datasets for the state to facilitate savings, sharing, and collaborative arrangements among state, federal, local, and private entities. For more information visit http://www.ccg.state.tx.us/.

Department of Information Resources

- **Cooperative Purchasing Program**

  DIR negotiated a cooperative purchasing agreement with the Environmental Systems Research Institute, Inc. (ESRI) for its suite of geospatial software and services. In addition, DIR maintains state cooperative purchase agreements with several other major GIS software vendors: Microsoft, Google, Intergraph, and AutoCad.

- **TGIC Administration**

  In partnership with TWDB, DIR provided administrative support to TGIC and the TGIC Steering Committee. The Council held eight quarterly meetings during the biennium and covered topics and issues including GIS standards, project and program status, and geospatial data development planning.

- **Texas Online 2.0**

  DIR added a section to Texas Online 2.0 (Texas state government web portal) request for bid responses including proposals for the provisioning basic GIS web mapping functionality with an option to include proposals for enhanced web services based upon specific customer requirements. By using shared enterprise-GIS services, TexasOnline 2.0 will provide a flexible GIS web development service that will reduce costs and save time its users by equitably distributing the overall cost of development.

- **GIS Data Recovery**

  DIR has begun exploring enterprise services for data back-up and recovery of GIS data stored in the state data center. The aim is to provide remote back-up and data recovery services based upon customer service level agreement requirements particularly for critical applications related to continuity of government and emergency response and homeland security applications.

- **GIS Technical Assistance and Referral Services**

  DIR staff provided GIS technical assistance to more than 10 state agencies and provided additional assistance with GIS procurement strategy to state agencies and universities. DIR also fields questions on a regular basis from state staff, citizens, and vendors regarding the status of various GIS projects and programs within Texas government.

Texas Agrilife Extension – Texas A&M University

- **eXtension – Geospatial Technology Community of Practice**

  eXtension is an Internet-based, collaborative learning environment delivering the best, most researched knowledge from the smartest land-grant university minds across America. eXtension connects knowledge consumers with knowledge providers—experts who know their subject matter inside and out. Topic areas are organized into *communities of practice*—groups of individual experts who actively participate by contributing their knowledge and expertise in a particular subject area.

  A geospatial technology community of practice was launched in February 2008 to provide information on using geospatial technologies, how geospatial technologies are making a difference in peoples' lives, how they are being used to improve the long term sustainability of critical natural resources, secure long-term agricultural production, improve community economies and services, and help educate the next

generation. Resources include informational articles, Ask the Expert, FAQs, online learning modules, and, as of September 2008, over 200 articles and resources on geospatial technology. Information is a collaborative effort and is peer reviewed by geospatial experts across the country. For more information visit http://www.extension.org

- **Geospatial Technologies in the Classroom**
  More than 60 educators took part in training on GPS, GIS, Google Earth, and state data resources. The training session focused on teaching the basics of geospatial technology and integrating geospatial science into the classroom.

  Following training, the educators produced exercises for grades K–12 to provide as a teaching resource. Each participating teacher received classroom GPS units, digital cameras, and supporting materials to integrate geospatial technologies into their 2008–2009 curricula.

Texas Department of Criminal Justice

- **Offender GIS/Data Conversion Training**
  The Texas Department of Criminal Justice Manufacturing and Logistics Division continues to expand its offender-training program. The training offenders receive includes surveying and cartographic principles, ESRI ArcGIS, Bentley Microstation, Intergraph GeoMedia Professional, and TopCon GPS systems. This TDCJ program offers GIS and data conversion services to tax supported entities. For more information contact Robert Laake, Manager, (936) 348-3751 x266, or visit http://www.tci.tdcj.state.tx.us.

Texas Water Development Board/TNRIS

- **Statewide Orthoimagery Acquisition**
  Aerial imagery supports many diverse needs, including 9-1-1 call management, air quality, facilities planning, and vegetation classification. For the second time in four years, Texas is partnering with the USDA Farm Services Agency to coordinate a multi-agency partnership to provide statewide aerial imagery coverage for Texas. The current project is distinguished by a greater level of detail and additional spectral content. The project is being conducted in two phases to capture the forests in East Texas during the winter, leaf-off period. A partnership project with the Texas Forest Service is acquiring one-meter, color-infrared imagery of state and national forest lands in east Texas.

- **LiDAR Acquisition**
  TNRIS initiated a partnership with the Federal Emergency Management Agency (FEMA) to acquire LiDAR data for 12 counties along the Texas Gulf Coast for use in flood studies and flood-map modernization. Another complementary project initiated with the USGS to acquire two additional counties along the coast will result in a complete high resolution coastal-coverage data set. The TWDB initiated a partnership with CAPCOG and the LCRA to acquire counties in central Texas and along the Colorado River to be used for local flood-plain mapping and hydrologic modeling of the Lower Colorado River.

- **USGS National Map Graphics Project**

  TNRIS/TWDB received a $100,000 grant to develop an automated process for updating the aging 1:24K scale USGS topographic quadrangle map series. This project successfully demonstrates the value of the statewide GIS data holdings for Texas, as well as the abilities and complexities of automating USGS map production.

- **TNRIS Portal Enhancements**

  An updated website was launched in January 2007 to improve user experience and data access. Improvements included interactive maps and improved navigation to access and download data.

- **Land Cover Mapping**

  A five-year partnership with Texas Parks and Wildlife was established in 2008 to update the 1984 Vegetation Types of Texas map.

- **Texas Hydrologic Information System**

  Texas is participating in a national effort to make water information universally accessible and useful by providing access to data sources, tools and models that enable the visualization, synthesis, and evaluation of the behavior of hydrologic systems. The project has three parts: a national cyber-information system for sharing hydrologic data; research into hydrologic information science; and support for the hydrologic information community. In addition to this national effort, a number of participating agencies from the State of Texas (UT Center for Research in Water Resources, TCEQ, TWDB, TPWD, and TNRIS) have come together to create the Texas HIS Program, which supplements the national data visualization and development efforts. For more information, please visit http://his.cuahsi.org/project.html.

- **National Flood Insurance Program (NFIP)**

  Texas established a state-level capability to guide development of the detailed data used to produce the flood analysis and mapping data to support the FEMA NFIP. This program supports FEMA's Community Assistance Program and will improve the quality, accuracy, and timeliness of flood maps.

- **Texas Height Modernization Program**

  The Texas Height Modernization Program is building the elevation reference system that is vital to producing accurate, reliable maps — crucial for maps that define areas of flooding, coastal surge impacts, and other engineering projects that depend on accurate elevation data. The Height Modernization program goes beyond GPS, which relies on calculated elevation references, by tying location elevation to true sea level. This program contributed to both the coastal LiDAR program and the statewide aerial imagery program. Support for the Texas Height Modernization Program and spatial reference center is a fundamental requirement to ensure the accuracy of all of Texas' geographic data resources.

Citizen Service Delivery Initiatives

Citizen Service Delivery Initiatives are programs and services that make geospatial technology more easily available and responsive to the needs of citizens and the private sector.

Department of Information Resources

- Texas Online 2.0
  TexasOnline is the state's primary web portal for delivering citizen-centric web services. DIR added a section to Texas Online 2.0 (Texas state government web portal) for bid responses including proposals for the provisioning basic GIS web mapping functionality with an option to include proposals for enhanced web services based upon specific customer requirements. By using shared enterprise-GIS services, TexasOnline 2.0 will provide a flexible GIS web development service that will reduce costs and save time its users by equitably distributing the overall cost of development.

Public Utility Commission of Texas

- Outage Reporting Application
  The Public Utility Commission of Texas is developing an outage database that allows electric and telecommunications utilities to update outage data by county. The geospatial component of outage data allows for the percentage of customers without power in a given location be calculated and displayed graphically. Information reported in the database is linked to the PUCT website (www.puc.state.tx.us). The public can view electric outage by county, company, or zip code and track the progress of power restoration in their area.
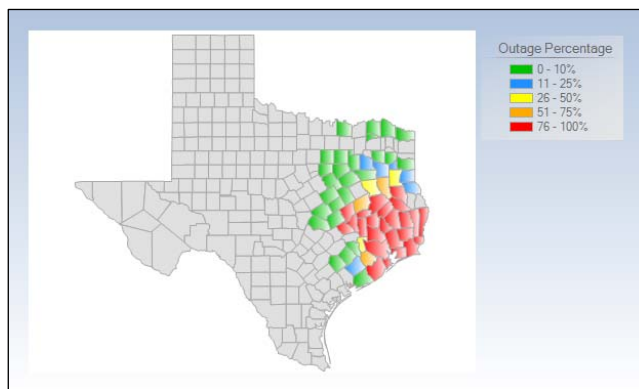
  The database was relied upon during the 2008 hurricane season. Pictured is a map of the power outages following Hurricane Ike. On September 13, 2008, electric utilities reported that 2.35 million customers were without power. By enabling utility crews to see and address the areas of most critical need first, 8 days later, the number of customers still without power had dropped to 892,000.

Texas Animal Health Commission

- Emergency and Ongoing Livestock and Domestic Animal Health Issues
  TAHC is an active member of each of the 24 Disaster District Committees in Texas. Field GIS capability enables TAHC personnel be the "eyes and ears" for disaster-planning and recovery efforts by providing information to emergency management teams on animal issues related to the emergency and assistance the TAHC is providing to those preparing for and responding to the emergencies. This capability incorporates GPS receivers connected to laptops and wireless cards to transmit data and maps via e-mail.

  TAHC also works with the Texas State Animal Resource Team to address domestic animal issues resulting from natural disasters. The Emergency Evacuation Holding Facilities Database provides sheltering numbers, availability, and location for facilities providing various levels of emergency shelter for dogs, cats, and exotic animals. Other current collaborative GIS projects include Hurricanes Dolly and Ike, and continuing efforts to control cattle ticks in the Lower Rio Grande area.

Texas Legislative Council

- **School District Review Program**

  The Texas Legislative Council, in cooperation with the Texas Education Agency, participated in the U.S. Census Bureau's School District Review Program to update the state's school district boundaries. This project directly affects the state's Title I funding allocation for each district.

- **Historical Congressional District Mapping Project**

  The Texas Legislative Council completed a project to map Texas congressional districts from 1845 to the present day—available at http://www.tlc.state.tx.us/redist/congress_historical.htm. Historical state senate and state representative district maps are being developed. Additionally, the Texas Legislative Council's mapping staff delivered on more than 425 cartographic or data requests during the 2007–08 biennium.

- **Ongoing Voting Data Maintenance**

  The Texas Legislative Council continues to update and maintain voting precinct geography, associated election returns, and voter registration data.

Texas Education Agency

- **School District and GED Test Center Locators**

  TEA provides and maintains the School District Locator web application that provides district and school contact, enrollment, and accountability information. The GED Test Center Locator web application provides GED test center contact information along with testing schedules, times, and fees. TEA also maintains GIS layers containing point features representing school and GED test center locations. For more information visit: http://deleon.tea.state.tx.us/sdl/Forms/.

- **School District Boundaries**

  School district boundaries define the geographic limits of the legal entities known as school districts established under Chapter 11 of the Texas Education Code. School districts are required under Section 13.010 of the Texas Education Code to submit to the Texas Education Agency (TEA) information about their boundaries and any changes made to those boundaries.

  Texas Legislative Council GIS staff, upon notification by TEA of which districts have had boundary changes and consolidations, routinely collect the boundary data from the county appraisal districts and annually prepare a district boundary data set for publication.

Economic and Infrastructure Development Initiatives

Economic and Infrastructure Development Initiatives are geospatial programs and applications that manage and spatially analyze data for tangible physical and economic assets.

Columbia Geospatial Center

- Economic Risk Analysis and Mapping Training
- GIS support for Nacogdoches, Panola, San Augustine, Victoria, and other East Texas Counties

- Research work in Carbon Sequestration, Bio Fuels, and fuel availability for forest biomass-fired power plants in East Texas
- Geospatial support for the Nacogdoches County Economic Development Corporation
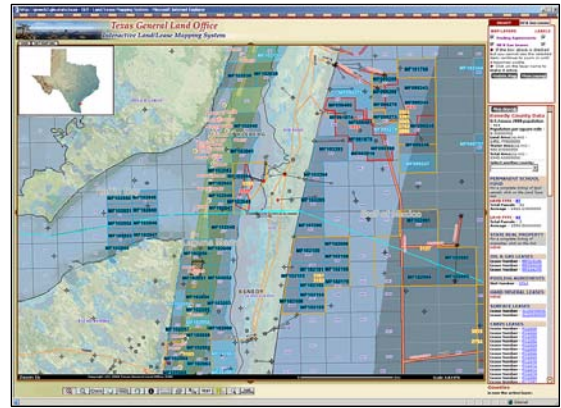
General Land Office, GIS Division

- **State Land Management**
GIS maps and databases have become fundamental for managing more than fifteen million acres of state land and waters, including coastal bays and the near-shore Gulf of Mexico. GIS supports all aspects of the leasing of state-owned tracts scattered across Texas for oil, gas, and mineral production and other uses—including advertising of land for lease, appraisal, permitting, and inspection—which generates more than $337 million annually for public education. GIS was required for the success of the 2008 Well Inventory Project and helped the GLO Energy Division cope with expanded drilling activity on Permanent School Fund Lands.

- **The GISWeb**
GISWeb is an Internet-based mapping and analysis tool that allows users to display any area of Texas and look at many types of information. The Interactive Land/Lease Mapping System within the GISWeb gives prospective lessees the ability to view maps and information pertaining to state lands, including tracts available for nomination in oil/gas lease sales, which generate an average of $60 million dollars a year. The system is also used within the agency for tracking revenue generated by oil and gas leases, which have generated more than $1.4 billion dollars for Texas public schools and other programs in the last five years. The system continues to be enhanced and has become the number one software application utilized at the GLO. For more information visit http://gisweb1.glo.state.tx.us/website/gisweb.cfm.

Railroad Commission of Texas

- **Mobile Computing Initiative**
The Railroad Commission successfully deployed GIS technology on over 100 ruggedized notebook computers, enabling field personnel to better perform the agency's regulatory and safety responsibilities and provide quick and accurate information about wells and pipeline locations during emergencies. Each notebook is equipped with a GPS receiver and is loaded with all the GIS map data required, including pipeline, well location, LP gas, and Original Texas Land Survey datasets. Since all the GIS data is loaded on the notebooks, field personnel can quickly view a location on a map and the relevant GIS layers without needing to access any network. Enabling access to GIS by field personnel has significantly enhanced staff ability to perform agency tasks.

Texas Agrilife Extension – Texas A&M University

- **Military Installations in Texas: an Atlas of Regional Context**
Military Installations in Texas: an Atlas of Regional Context describes and analyzes the status and trends in land use, land ownership, land values, and ecological condition of public and private lands adjacent to military installations in Texas. The ownership, use, economic, value, and ecological condition of these lands both influence and are influenced by the management of military land. The atlas provides regional context information for each installation including:

- General information on the installation and region,
- Land use and land cover,
- Land ownership-size and population trends,
- Topography of the installation and surrounding area,
- Soil characteristics, and
- Hydrologic information.

Texas Department of Transportation

- **Right of Way Maps Application**

  The Right-of-Way Maps application provides users—both inside and outside TxDOT—with electronic access to files of available maps describing the right-of-way area along TxDOT highways. The maps are available on the Internet in PDF and TIFF versions, which can be viewed and/or downloaded. This project is an internal, cooperative effort between TxDOT districts and the Technology Services Division; it is a work in progress as many of TxDOT's districts continue to scan their vast archives of paper maps. This application will save each district at least one full-time employee that would otherwise be needed to fulfill customer map requests.

Texas Forest Service

- **Statewide Assessment of Forest Resources**

  The 2008 Farm Bill requires each state that receives funding through the USDA Forest Service State and Private Forestry Program to develop a statewide assessment of forest resources. The statewide assessment should be partly based on geospatial analyses. Texas Forest Service recently completed a draft of this statewide assessment. Separate geospatial analyses were conducted on each of six issues deemed important to the forest resources of the state. Basic weighted overlay analysis of multiple thematic input layers was used to identify important forest lands across the state and areas where priority should be given when delivering federally-assisted state forestry programs. This assessment will serve to inform the development of a forest resource strategy that is also required by the Farm Bill. Contact Brad Barber, (979) 458-6630 or bbarber@tfs.tamu.edu.

Emergency Response and Preparedness Initiatives

Emergency Response and Preparedness Initiatives are geospatial programs and applications that provide strategic and tactical capabilities to law enforcement and emergency management and response programs.

Columbia Geospatial Center

The Columbia Regional Geospatial Service Center System is a federal funded cooperative program involving Stephen F. Austin State University, The University of Texas at El Paso, Texas Tech University and Lamar University. The system, established by a 2006 federal appropriation, provides regional geospatial support for emergency preparedness and response, economic development, and natural resource management. Projects undertaken for Emergency Preparedness and Emergency Response include:

- TCEQ funded project to map small public drinking water supplies and gather information relevant to restoration of service in an emergency;
- Mapping of the Texas Electric Power Grid in cooperation with GDEM and TMF;
- 9-1-1 road-centerline rectification and modernization for DETCOG;

- Eight training modules to support first responders;
- Wide-area damage assessment training for Texas Military Forces and for City and County Law Enforcement;
- Response for hurricanes Edouard, Gustav, and Ike;
- Fuel Availability web application; and
- Remotely updateable road closure web application.

Commission on Statewide Emergency Communications

- GIS Data for 9-1-1 Mapping

  The Commission on State Emergency Communications (CSEC) initiated the Texas GIS 9-1-1 Collaborative Portal in response to a federal Department of Homeland Security initiative to collect public safety answering point (PSAP) boundaries in a GIS format. CSEC engaged DIR to build the mapping portal and provide other GIS technical and coordination assistance. CSEC solicited stakeholder input and participation from every 9-1-1 entity and the Texas 9-1-1 GIS Users Group, in particular for the planning and implementation of the portal.

  On an ongoing basis, CSEC works with the telecommunications industry and local 9-1-1 administrators to administer the statewide 9-1-1 Program. CSEC contracts with the 24 regional planning commissions to provision 9-1-1 service. The program covers 225 counties with 347 PSAPs. The program includes funding support to the entities within its program to develop geospatial data (including street centerline files) required for the mapping of 9-1-1 calls. With the exception of 5 PSAPs, all PSAPs have completed development of the GIS data necessary to be wireless phase 2 ready. A PSAP's wireless phase 2 readiness is defined by its ability to map the geodetic location information of a wireless 9-1-1 caller's location.

General Land Office, GIS Division

- Oil Spill and Hurricane Response

  In September 2008, the GLO responded to a request to deploy the agency's GIS Strike Team in support the Texas Task Force 1 Urban Search and Rescue (TTF1) during Hurricane Ike. The GLO team supported the Unified Command System operated by TTF1, producing over 500 planning maps for search and rescue missions by organizing search area segments and sectors for response activities.

  In the aftermath of Ike, GIS continued to play a major role in coordinating efforts to mitigate oil spills. The GIS team produced maps of sunken or damaged vessels in the shipping lanes to guide removal efforts. GIS team members deployed to the field with GPS equipment mapped debris and assisted with beach-home damage assessments, which enabled GLO management to prioritize debris removal. For more information visit www.glo.state.tx.us.

Texas Forest Service

- East Texas Fuels Classification Project

  The East Texas Fuels Classification Project is developing geospatial datasets that can be used to predict forest-fire behavior in 65 east-Texas counties. The datasets being developed include vegetation type, surface fuels, canopy cover, canopy base height and ceiling height, and canopy bulk density. This program helps wildland fire managers determine surface and canopy fire potential. Contact Curt Stripling at (979) 458-7332 or cstripling@tfs.tamu.edu.
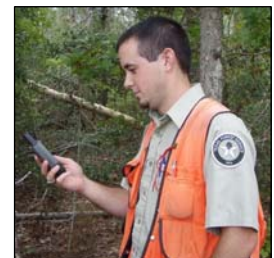
- **Emergency Response to Hurricane Ike**

  In the immediate aftermath of Hurricane Ike, Texas Forest Service conducted a rapid Timber Damage Assessment by aerial survey of the impacted area. The aerial survey helped define the damage-zone boundaries and led to the creation of the Timber Damage Assessment map. Texas Forest Service Forest Inventory and Analysis field crews used this map to collect the "ground truth" of the damage—the actual timber damage—for each of the 275 plots identified in the map, resulting in a timely estimate of actual timber damage.

  The Texas Forest Service also provided GIS specialists to provide situational awareness for the command staff of the Governor's Department of Emergency Management and FEMA. The specialists compiled data from a range of disparate sources to produce daily-updated map products showing Points of Distribution (PODs), shelter and resource locations and logistical

  networks were provided daily. The specialists produced a proximity analysis map showing the relative locations of PODs and open retail grocers—this map was shown to the President of the United States and used to determine the timing and sequence of POD closures. For information, contact Jin Zhu at (979) 458-6630 or jzhu@tfs.tamu.edu, or Curt Stripling at (979) 458-7332 or cstripling@tfs.tamu.edu.
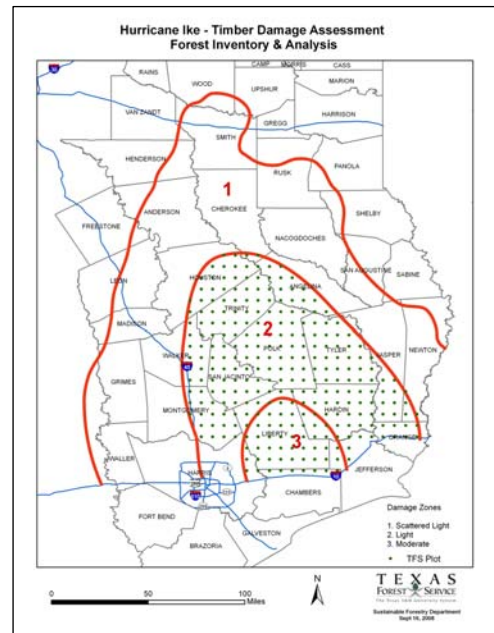
Texas Water Development Board / TNRIS

- **Emergency Management**

  TNRIS responded to amendments to Texas Water Code 16.021 by initiating several projects to strengthen the capacity of the state to respond and manage emergency events.

- **Geospatial Emergency Management Support System**

  FEMA awarded a grant to TNRIS through the Governor's Division of Emergency Management to develop the Geospatial Emergency Management Support System. This web-based system was jointly envisioned as a dedicated repository for comprehensive information related to hurricanes impacting Texas. In addition, several projects were undertaken in support of the GDEM to develop applications for risk-zone management accessible to authorized personnel from any Internet web browser.

Environmental Conservation Initiatives

Environmental Conservation Initiatives are geospatial programs and applications that manage and spatially analyze data on environmental assets and resources.

Columbia Geospatial Center

Natural Resource Management:
- Remote sensing forest inventory of northeast Texas
- Update remote sensing forest inventory for central east Texas

- Research on remote sensing methodologies for monitoring soil carbon concentration and change over time in young pine plantations in east Texas
- GIS-based assessment of current and future fuel availability for forest biomass fueled electric power plant feasibility study
- GPS Mapping training for sportsmen and private land owners

Texas Agrilife Extension – Texas A&M University

- Trinity River Information Management System
  The Trinity River Basin is one of Texas' largest watersheds — providing water and livelihood for many communities as it makes its way to the coast. The basin has been highly impacted and was identified as a critical watershed by the Governor's Trinity River Basin Environmental Restoration Initiative.

  Developed in response to this initiative, the system provides landowners, stakeholder organizations, and citizens with mapping and analysis capability, through any Internet browser, similar to a desktop GIS. The system delivers access to baseline data, recent high-resolution digital aerial imagery, natural resource datasets, and analysis tools that have been identified as critical to resource management and planning decisions pertaining to water quality, hydrology, floodplain management, wetland restoration, land conservation, bottomland hardwood establishment, and wildlife habitat management in the Trinity River Basin. Project collaboration and funding are provided through the Trinity River Authority, the Texas Clean Rivers Program, and TCEQ. For more information, contact Amy E. Hays, Geospatial Extension Specialist at (254) 865-2061 or ahays@tamu.edu (http://trims.tamu.edu).
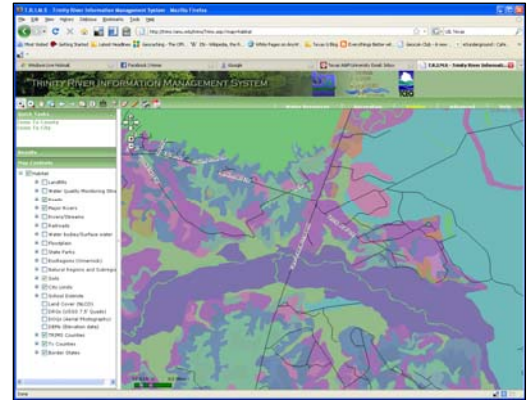
Texas Department of Transportation

- Outfall Tracking System
  TxDOT monitors outfalls (drainage ways) within right of ways along state maintained roads as required by federal agencies. The Outfall Tracking System project allows users to query, map, analyze, edit, and report on outfalls via the Internet. The Outfall Tracking System is managed by the Environmental Affairs Division and supported by the Technology Services Division.

Texas Forest Service

- CTexGIS Oak Wilt Information System
  The Texas Forest Service developed a GIS for managing oak wilt suppression and other landowner-assistance programs in central Texas. The system was designed to allow multiple users to "check out" and update shared data without the necessity of being connected to the Internet. Many field offices have limited Internet bandwidth, so the ability to edit shared data while disconnected from the Internet avoids the overhead of maintaining an active connection between field offices in central Texas and the Texas Forest Service headquarters. Contact Jin Zhu at (979) 458-6630 or jzhu@tfs.tamu.edu.

Texas Parks and Wildlife

- **Ecological Systems Map Project**

  The Ecological Systems Map project will provide accurate vegetation-community information developed in a systematic and efficient way to support the missions of TPWD and the Texas Water Development Board. The project will map plant-community locations, extent, and distribution according to the Ecological Systems Classification System—the foundation on which the all of the natural systems of Texas are built. The project will update the current vegetation mapping standard, the TPWD 1984 Vegetation Types of Texas, and provide better quality information about distribution and quantity of vegetation communities and the associated wildlife habitats in Texas. For information, contact Kim Ludeke at (512) 389-8071 or Kim.Ludeke@tpwd.state.tx.us.
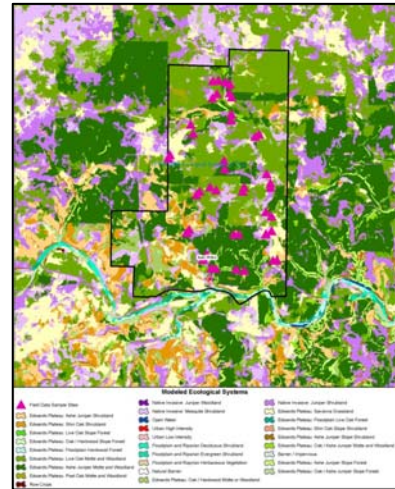
- **Resource Information System**

  The Resource Information System is a suite of custom GIS applications and services developed by the TPWD GIS Lab under the State Wildlife Grants program. The Resource Information System applications are targeted at PX-1 Species of Concern in the Texas Wildlife Action Plan, the widely-used Endangered Species by County application. Ongoing projects and services include RISmap, the Field Data Collection Upload Service, the Cowbird Trapping and Monitoring Application, and the Historical Orthophoto Project.

  The Resource Information System project produced web-based applications to display dynamic maps utilizing interactive data-entry tables and for query by TPWD staff and contributing citizen scientists. Online application projects for 2008–2009 include, Texas Tarpon Observation Network, Artificial Reefs Interactive Mapping, Lesser Prairie-Chicken, Native Plant Communities of Texas, the Texas Horned Lizard Watch, and the Kills and Spills Team Application. Resource Information System projects are developed and completed on an as-need basis in response to client requests for desired data layers, new tools, or ortho-rectify historic aerial photography of specific areas of interest, as well as Wildlife Management Areas and State Parks.
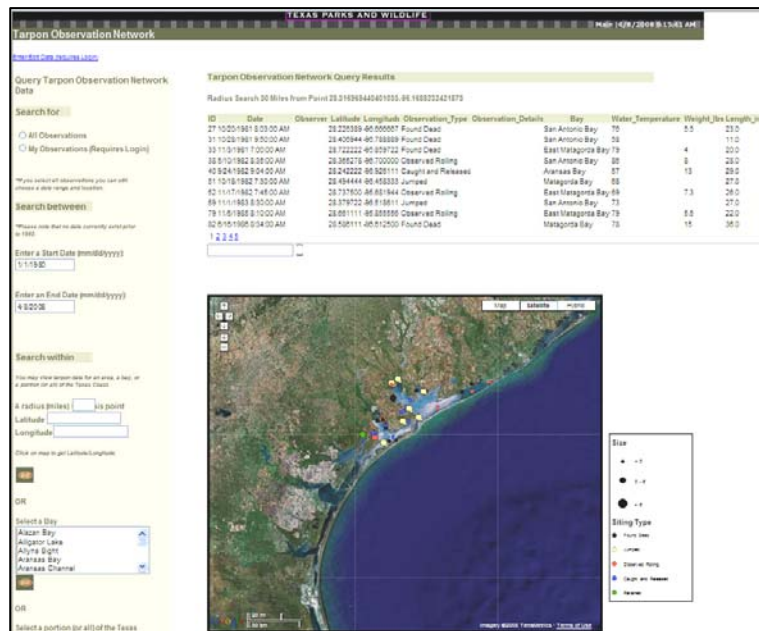
Texas Water Development Board/TNRIS

- **Drought Information System**
  A grant award from GDEM supported the development of a pilot project for an early-warning system that integrates national drought conditions data with local lake and river conditions to provide a drought-notification service.

- **Digital Climatic Atlas of Texas**
  The TWDB Research and Planning Fund awarded a $60,000 grant to the Texas Agricultural Experiment Station of the Texas A&M University System for the development of a digital climatic atlas of Texas. The completed project provides historical monthly, annual, and decadal climate summaries in a geodatabase format for state-wide precipitation, maximum and minimum temperature, and lake evaporation parameters from 1890 to 2000.

Base map data – set of information that provides a baseline orientation for another layer of primary focus, e.g., roads, streams, and other data typically found on USGS topographic and/or planimetric maps.

Dataset – collection of similar and related information recorded in a common format.

Enterprise GIS – a GIS that integrates geographic data across multiple departments and serves the entire organization.

Geographic Information System (GIS) – a computer system for the input, editing, storage, maintenance, management, retrieval, analysis, synthesis, and output of geographic, or location-based, information. In the most restrictive usage, GIS refers only to hardware and software. In common usage, it includes hardware, software, and data. In this document, the common usage of hardware, software, and data is the intended meaning.

Geospatial data – information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth.

Geospatial Metadata – data about the content, quality, and other characteristics of geospatial data.

Global Positioning System (GPS) – a satellite-based navigation system developed by the U.S. Department of Defense. GPS receivers can determine one's position on the earth's surface.

Imagery – a two-dimensional digital representation of the earth's surface. Examples are a digital aerial photograph, a satellite scene, or an airborne radar scan.

Latitude – angular distance measured in degrees, minutes, and seconds, of a point north or south of the equator on the earth's surface.

LiDAR – Light Detection and Ranging laser-based measurement technology used to generate extremely precise surface elevation data.

Longitude – angular distance measured in degrees, minutes, and seconds, of a point east or west of the Greenwich Meridian on the earth's surface.

Metadata – see *Geospatial metadata*.

NSDI – National Spatial Data Infrastructure. The technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve use of geospatial data.

Orthoimagery – an aerial photograph or satellite image from which displacements caused by terrain relief and sensor tilt have been removed. The result combines the image characteristics of a photograph with the geometric qualities of a map.

Standards – exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results.

Terabyte – a measure of computer storage capacity. Technically, a terabyte is 2 to the 40th power of bytes, but a common approximation is a thousand billion bytes (that is, a thousand gigabytes).

Texas Base Map – A common, consistent set of 22 digital base map themes defined by TGIC.

Texas Spatial Data Infrastructure (TSDI) – the technology, policies, programs, standards, and human resources necessary to improve and enhance the implementation of geospatial technology. Specifically, the TSDI is defined as having eight components: geo data, coordination, partnership programs, clearinghouse network, web services, standards, metadata, and training and education.

Web Services (geospatial) – modular Internet-based applications that perform specific functions that one organization can publish as a shared web service and many other organizations can use.

Acknowledgments

TGIC Steering Committee

Rob Aanstoos	Claire DeVaughan	Jim Scott
Bruce Barr	Sean Moran	Robert White
Carolyn Brittin	Michael Ouimet	Darryl Zercher

Content Contributors

Rob Aanstoos	Bowden Hight	Susan Seet
David Arnold	Scott Lary	Stephanie Shelton
LaNell Aston	A. Kim Ludeke, Ph.D.	Curt Stripling
Brad Barber	Kelli Merriweather	Robert White
Bruce Barr	Andrea Mikulcic	Andy Wilson
P.R. Blackwell	Michael Ouimet	Jules Vieau
Claire DeVaughan	Jim Patterson	Ann Yelderman
Duane German	Katie Rich	Darryl Zercher
Sterling Harris	Jim Scott	Jin Zhu
Amy Hays		

Production and Design

Lisa Nowotny, DIR – Publications Lead
Jules Vieau, DIR – Graphics

Project Management

Michael Ouimet, DIR – Project Lead
Jules Vieau, DIR – Senior Editor
Andy Wilson, DIR – Research

Special Acknowledgment

The Texas Department of Information Resources and the Texas Geographic Information Council would like to extend a special acknowledgement and appreciation to the Federal Geographic Data Committee (FGDC) for partial funding support for *Digital Texas 2008* through the FGDC Cooperative Agreement Program, 50-States Project.