The Texas Geographic Information Landscape

Geographic Information Officer Report

December 1, 2021

Texas Water Development Board

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EXECUTIVE SUMMARY

In 2011, the 82nd Texas Legislature amended Texas Water Code (Sec. 16.021(c),(d)) to create a state geographic information officer position within the Texas Water Development Board (TWDB) and charged it with improving state government operations through coordinated acquisition, use, and dissemination of authoritative statewide digital geographic datasets. This document fulfills the requirement to report to the governor, lieutenant governor, and speaker of the house on the status of these coordination efforts and recommendations that could lead to further operational improvements and funding needs.

Geographic information systems support a wide range of government mapping activities including transportation and water resource planning, flood mitigation, state lands management, industrial permitting, public safety, and emergency management. Reliable geographic datasets continue to drive and support state agencies that demand accurate location information to support their missions.

State statute designates the head of Texas Natural Resources Information System (TNRIS), a division of the TWDB, as the geographic information officer (GIO) of Texas. The GIO coordinates closely with the chief data officer at the Texas Department of Information Resources (DIR) to ensure that the state's GIS technology plans and policies align with the state's overall information technology plans and policies. In addition, leveraging the DIR's information technology contracting and data center services programs has enabled the geographic information officer to make significant progress on its objectives.

Texas has a long tradition of interagency and community collaboration through the governance-based Geographic Information System (GIS) Solution Group and the quarterly GIS Community meetings. These resources provide communication avenues for all GIS technologies and geographic data to all levels of government and the public. Input from these groups helps establish statewide data priorities and formulate strategies and workflows that improve the effectiveness and efficiencies of important decisions affecting all Texans.

Several major accomplishments of the GIO and partnering agencies are summarized below.

Texas Imagery Service
Many of the state's most important applications depend on aerial imagery as their foundation. The Texas Imagery Service is an on-demand mapping service that is licensed and hosted through a commercial vendor. It offers 6-inch, high-resolution imagery for the entire state of Texas. This program leverages cost sharing between all governmental entities in Texas and utilizes strong public and private partnerships to find low-cost solutions that financially benefit the state. Since the pilot project began, more than 35 public entities in Texas contribute to the Texas Imagery Service, making it the largest and only continuous cost-share of any geographic dataset to date.

Statewide Elevation Data (Lidar)
In December 2020, Texas achieved full statewide coverage of Lidar data, essentially providing the state with the most accurate and detailed information about the earth's surface. This information is now used in scientific studies to help understand the impacts of flooding and how to minimize future risks through more accurate planning.

TNRIS maintains a full catalog of Lidar data and works with state partners to define areas in the state in need of updates. Lidar data is made available to the public through the TNRIS Data Hub at no cost.

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National Address Database
The National Address Database (NAD) is a national priority created under the joint stewardship of the United States Census Bureau and the United States Department of Transportation to support Next Generation 9-1-1, more accurate broadband mapping, geo-enabled elections, better and more consistent geocoding, and many other uses. TNRIS collects and contributes a statewide file of street address points to the NAD on an annual basis. Participation in the NAD brings value to Texas as a national leader and provides Texas GIS users with access to the national database for any projects that extend beyond the Texas border.

Land Parcel Database
Land parcel data are critical datasets that have multiple uses in state government and are complementary to the address point data. Land parcels are boundaries that have associated information such as property owner, land use, value, and location attributes. Approximately 90 percent of data contributed from county appraisal districts, or their service providers, have been acquired and translated into a common schema for state and public use.

Statewide Collaboration
TNRIS, along with the DIR, established the GIS Solution Group to help address the needs and complexities of GIS in the state. The GIS Solution Group provides a platform for sharing information and making unified decisions that will better serve geographic information departments at state agencies. The GIS Solution Group meets bi-monthly.

NSGIC Geospatial Maturity Assessment for Texas
The National States Geographic Information Council (NSGIC) conducts a national assessment of core GIS data layers as part of its bi-annual Geospatial Maturity Assessment (GMA) of the states. The Texas grade for the 2021 GMA is a "B+," putting it very close to the top of this national ranking.

Statewide Efficiency
TNRIS has implemented multiple programs that contribute to statewide efficiency:

StratMap Vendor Contract
TNRIS administers the Texas Strategic Mapping (StratMap) Contract, which is designed to strengthen Texas' capabilities to procure quality geographic products, services, and software. The contracts are available to customers including state, regional, and local government offices, river authorities, water authorities, and public education entities. StratMap contracts are awarded to companies that can provide quality geographic data products, services, and software.

Geographic Data Hub
TNRIS has developed a Geographic Data Hub to improve access to statewide geographic data and information for Texas. This web-based geographic hub organizes data and information in a simple and easy-to-use way allowing state agencies and the public to gain access to information needed to support the citizens of Texas.

Community Engagement and Outreach
TNRIS hosts one of the largest annual GIS forums in the country dedicated to promoting technologies and sharing ideas. These events are a critical way to connect with the community and support collaboration and knowledge-sharing that keeps innovation moving forward and working for Texas. Additionally, TNRIS hosts quarterly GIS community meetings to update stakeholders and share information with the GIS community.

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Informational Website and Social Media
The TNRIS website and Data Hub are accessed on average by more than 12,000 monthly visitors. The website is designed to provide the public with the most up-to-date information about data products and services around the state, as well as keep the community informed about other GIS events. In addition, TNRIS staff utilizes Twitter (@tnris) as another form of communication. Tweets include current events, data releases, education opportunities, and other GIS information that will benefit and inspire others.

To better support the state's ever-growing reliability for quality geographic data and technology, TNRIS and its state partners are embarking on several major statewide initiatives.

Emergency Response Support
Emergency response support represents one of the most important uses of geographic data in Texas. Current and accurate geographic data can help save lives and property. To support emergency activities across Texas, state agencies are collaborating to develop tools and improve processes.

Flood Decision Support Toolbox
As a collaborative effort to develop a real-time inundation mapping system, the Texas Water Development Board joined forces with the United States Geological Survey (USGS) to significantly enhance communities' flood warnings and response operations.

Texas Water Data Initiative
The Texas Water Data Initiative is the development of an open and transparent water data system that will provide access to all water-related information in a manner that is relevant to the needs of decision makers in Texas.

Institute for a Disaster Resilient Texas
Institute for a Disaster Resilient Texas aims to deliver critical research on disaster risk reduction, support state agencies with data analytics and decision-making tools, and generate evidence-based solutions that help Texas communities become more resilient over the long term.

New Geodetic Datum in 2022
To improve the National Spatial Reference System for improved spatial measurement accuracy, the National Geodetic Survey will replace the North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAVD 88) with a new geometric reference frame and geopotential datum in 2022.

State Agency Data Coordination
In 2021, the 87th Texas Legislature passed Senate Bill 475 (SB 475) that further established and strengthened data management programs across state agencies and reinforced the need for continued collaboration and data sharing. As a result of this bill, the efforts of the DIR and TNRIS will continue to be aligned in the overall management of data. SB 475 also offers opportunities for groups such as the Texas Division of Emergency Management (TDEM) and the Texas A&M Institute for a Disaster Resilient Texas (through the Texas Disaster Information System) to partner in the sharing of GIS data and other data sources and to address critical natural disaster response and recovery efforts.

Artificial Intelligence and Machine Learning
TNRIS is exploring artificial intelligence and machine learning as emerging technologies. Implementing these new technologies can maximize the usefulness of geographic

data and provide the means to develop proactive systems to support future emergency management activities. Proof-of-value concepts are currently being explored and planned to understand how these technologies can benefit real world situations such as predictive modeling for flood planning and management.

Workforce Training
TNRIS is developing and promoting professional and well-organized internships for students to actively work on state-related projects. This program will utilize the abundant student labor from multiple universities in the Central Texas area and train them on advanced processes critical to support state needs. Ultimately, the students will gain the experience and skills needed to obtain permanent state employment.

Some key issues have been identified along with recommended actions that will improve the support, efficiency, and productivity of several state agencies.

Next-Generation 9-1-1
A gap analysis should be performed to understand the status of 9-1-1 GIS data among the 75 jurisdictions in Texas. This is the first step to ensuring that all public safety answering points (PSAPs) in Texas have the high-quality GIS data needed for Next-Generation 9-1-1 and those who are lagging receive support and guidance. The gap analysis might well conclude that Texas is near completion of its GIS datasets. It is also possible that Texas should consider establishing an oversight committee for Next Generation 9-1-1.

Authoritative Data Catalog
The development of an authoritative geographic data catalog is critical to verify and validate data authenticity, promote data integrity, and ensure the use of a common standard dataset. To facilitate and actively manage this effort, a committee composed of the GIS power users in state government is recommended. The purpose of this committee would be to search for and identify geospatial datasets created and maintained by a state agency for the purposes of filling a state mandate or making an agency business decision.

Broadband Mapping
The currently available broadband mapping produced by the Federal Communications Commission is not granular enough and masks many underserved locations, especially in sparsely settled rural areas. Continued legislative support is recommended for all broadband mapping efforts at the local level, including support for a granular location map of underserved homes. The GIO is aware that the expansion of broadband services was a key focus of the 87th Texas Legislature and will continue to monitor the implementation of key legislation, such as House Bill 5, that pertains to broadband mapping.

Enterprise Geocoding Service
The development of statewide geocoding services will make available to all state agencies a way to quickly convert street addresses into geographic coordinates (latitude and longitude). This service will also perform reverse geocoding operations that will convert geographic coordinates into a human-readable address. This will enable database records tied to street addresses to be mapped and used in GIS applications.

Strong collaboration and support between state agencies for both the acquisition and sharing of geographic information will continue to be the focus of the state GIO and the GIS community as Texas works to provide the highest quality geographic information to all Texas agencies and the public.

"A map does not just chart, it unlocks and formulates meaning; it forms bridges between here and there, between disparate ideas that we did not know were previously connected."

-- Reif Larsen

Purpose

This report is to give state leadership an overview of the use of geographic information to make informed decisions for the citizens of Texas. In 2011, the 82nd Texas Legislature amended Texas Water Code (Sec. 16.021(c),(d)) to

1. create the position of state geographic information officer within the Texas Water Development Board (TWDB);
2. assign certain responsibilities to the geographic information officer related to the coordinated statewide acquisition, use, and dissemination of geographic datasets; and
3. periodically report to state leadership about the status of these coordination efforts and offer recommendations that could lead to further improvements in state government operations using geographic data.

This document is submitted to state leadership in fulfillment of item three above. The Texas Water Code amendments further specify that the report include recommendations regarding

- statewide geographic data acquisition needs and priorities;
- policy initiatives to address the acquisition, use, storage, and sharing of geographic data across the state;
- funding needs to acquire data, implement technologies, or pursue statewide policy initiatives related to geographic data; and
- opportunities for new initiatives to improve the efficiency, effectiveness, or accessibility of state government operations using geographic data.

The GIO developed this report with valuable input from state agencies that extensively use geographic datasets and geographic information system (GIS) technology in support of their regular business functions. In addition, the GIO worked closely with staff of the Texas Department of Information Resources (DIR) to ensure that its recommendations reflect and support the state's plan for improved use of information technology contained in the State Strategic Plan for Information Resources Management. Finally, this report was approved by the Texas Water Development Board at its November 19, 2021, meeting.

Quarterly GIS Community meeting participants discuss future data needs in Texas
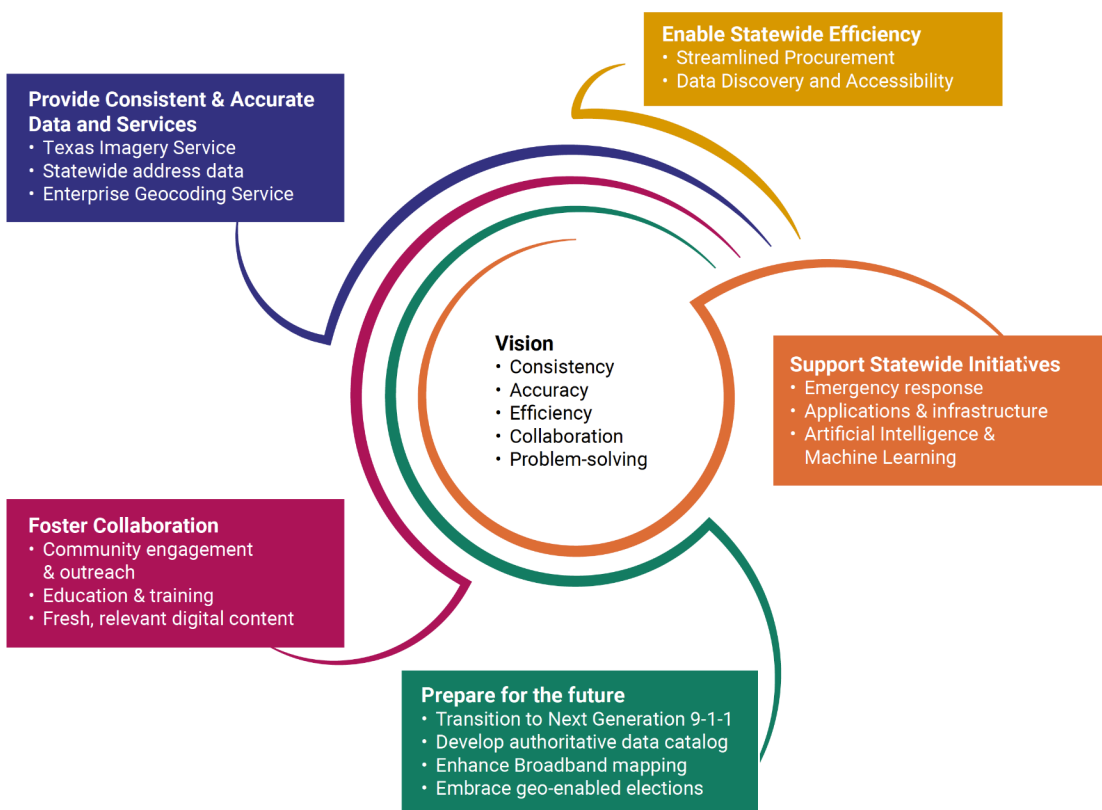
Vision

The vision of the GIO is improved accuracy and delivery of geographic data and map services to state agencies and the citizens of Texas. Consolidated acquisition and management of digital geographic information and GIS infrastructure will help achieve this vision and enable state agencies to modernize services while minimizing costs.

The GIO facilitates interagency collaboration through intergovernmental coordination with local, regional, and federal government entities. Through the GIO, state agencies can speak with one voice to state leadership on needs and recommendations related to the improved, cost-effective use of geographic information technology in Texas.

Having a single organization creating, aggregating, and provisioning digital geographic information to meet the needs of the broad community of GIS users across Texas is less costly and more efficient than having each organization produce or acquire digital geographic information on its own. Consistent availability and quality of digital geographic information also ensures that all Texas government entities that need to use digital geographic data can do so, thereby maximizing the return on the state's investment in the data as well as ensuring equity between "have" and "have-not" communities.

Strong collaboration and support between state agencies for both the acquisition and sharing of geographic information will continue to be the vision of the GIS community as Texas works to provide the highest quality geographic information to all Texas agencies and the public.

Vision & Goals

Provide Consistent & Accurate Data and Services
• Texas Imagery Service
• Statewide address data
• Enterprise Geocoding Service

Enable Statewide Efficiency
• Streamlined Procurement
• Data Discovery and Accessibility

Vision
• Consistency
• Accuracy
• Efficiency
• Collaboration
• Problem-solving

Support Statewide Initiatives
• Emergency response
• Applications & infrastructure
• Artificial Intelligence & Machine Learning

Foster Collaboration
• Community engagement & outreach
• Education & training
• Fresh, relevant digital content

Prepare for the future
• Transition to Next Generation 9-1-1
• Develop authoritative data catalog
• Enhance Broadband mapping
• Embrace geo-enabled elections

Background

Through an amendment to Texas Water Code Sec. 11.070 in 1957, the 55th Texas Legislature introduced the need for the state of Texas to create a data bank to centralize geographic data collected by state agencies. These data would then be shared among all agencies to plan for the future needs of Texas citizens.

Sixty-five years after that concept was introduced, the need to collect, develop, and share geographic data is greater than ever. All levels of government in Texas rely heavily on updated maps, aerial imagery, and terrain elevation data used for urban planning, land development, conservation, flood risk assessment, and managing emergency events across the state.

Modern technology has greatly improved the way geographic data is developed, maintained, stored, analyzed, and shared. Costs and redundancy of data ownership have also been minimized, allowing all levels of government to incorporate geographic data into their everyday business processes.

The proliferation of new technologies and new sources of data presents both challenges and opportunities. There are a range of important benefits from the rich datasets now available and the advanced technologies that can mine even greater value out of the data. However, the growth in technology and data also vastly increases the need for overall coordination to prevent wasteful redundancies and ensure that these investments can reap the widest range of benefits to the widest range of stakeholders. This level of enterprise coordination of geographic data and supporting resources is the primary purpose for a state geographic information officer.

State statute designates the head of Texas Natural Resources Information System (TNRIS), a division of the TWDB, as the GIO of Texas. TNRIS is a well-recognized state organization, synonymous with geographic information and coordination. Official state rules governing GIS use at state agencies (Texas Administrative Code Title 31, Rule 353.103) are designed to encourage geographic data sharing and coordination between state agencies.

During review of the TWDB in its 2010–2011 review cycle, the Sunset Commission recognized the need for stronger, enterprise-level coordination of the state's geographic data acquisition and management efforts. In 2011, the 82nd Texas Legislature amended Texas Water Code (Sec. 16.021(c),(d)), directing the TWDB to designate a state geographic information officer with responsibilities to

- coordinate the acquisition and use of high-priority imagery and datasets;
- establish, support, and disseminate authoritative statewide geographic datasets;
- support geographic data needs of emergency management responders during emergencies;
- monitor trends in geographic information technology; and
- support public access to state geographic data and resources.

Accomplishments

Over the past five years, successful initiatives and projects have been pursued jointly by the geographic information officer and multiple state agencies. These efforts have yielded a collection of noteworthy accomplishments in several categories:

Texas Imagery Service

Statewide Elevation Data (Lidar)

National Address Database

Land Parcel Database

Statewide Collaboration

Geospatial Maturity Assessment

Statewide Efficiency

Texas Imagery Service

Many of the state's most important applications of GIS technology depend on aerial imagery as their foundation; however, the cost of acquiring high-resolution imagery is often a prohibitive factor. Since 2014, the state has been pursuing a low-cost alternative for high-resolution statewide imagery. The Texas Imagery Service initially licensed Google imagery for state, regional, and local government use. This program, originally funded by the Texas Water Development Board, Texas Department of Transportation, Commission on State Emergency Communications, Texas Commission on Environmental Quality, and Texas Department of Information Resources, established precedence with public and private partnerships in Texas to find low-cost solutions to benefit the state.

"Just wanted to note what a USEFUL and VITAL service TNRIS is able to bring to public agencies in Texas ....100's of folks at the LCRA use this service on weekly basis as it's imbedded in our Internal web mapping programs and utilized on couple of our external facing web mapping programs as well."

– Doug Gannon, GIS Lead
Lower Colorado River Authority

The Texas Imagery Service is an on-demand mapping service that is licensed and hosted through a commercial vendor. It offers 6-inch, high-resolution imagery for the entire state of Texas. Though the imagery service is licensed for government use only, a lower resolution version of the imagery is available in the public domain.

The cost sharing success of the Texas Imagery Service allowed for continued growth and refinement of the program. On September 1, 2020, Hexagon Geospatial began supporting the Texas Imagery Service as the sole image provider following Google's decision to discontinue its support for the program. Since the pilot project began, more than 35 public entities in Texas contribute to the Texas Imagery Service, making it the largest and only continuous cost-share of any geographic dataset to date.
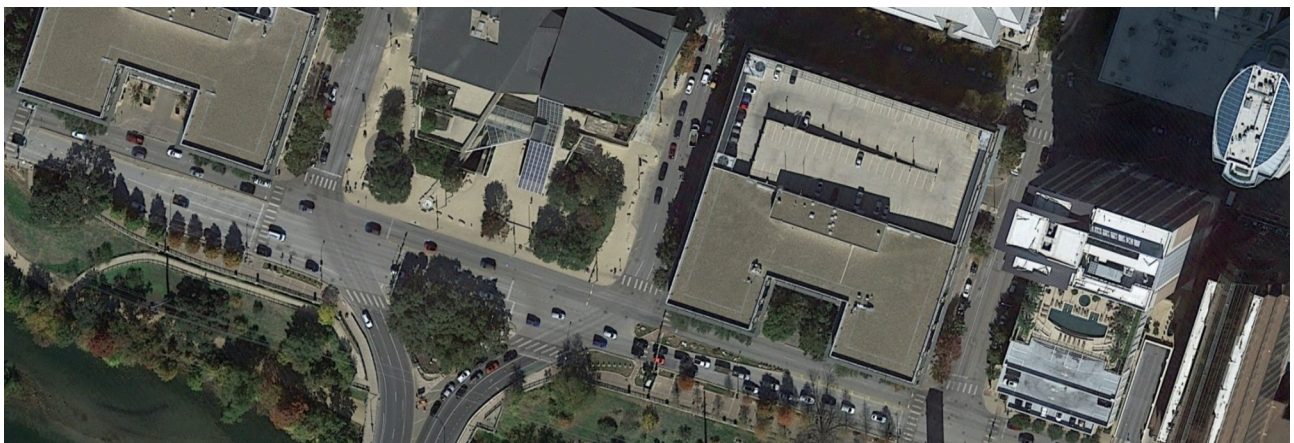
Texas Imagery Service: 6-inch imagery of downtown Austin, TX

Statewide Elevation Data (Lidar)

Elevation data is one of the most important and useful datasets for Texas. It is used by governmental agencies for surveying, forestry management, environmental sciences, flood planning, and emergency management operations. One emerging technology for the acquisition of elevation data is Light Detection and Ranging (Lidar), an advanced surveying method that utilizes light in the form of a rapidly pulsed laser that measures distances from a target on the earth's surface to a sensor located on an aircraft. Lidar is used to make a digital 3-D representation of buildings, vegetation, infrastructure, and other features.

In 2006, TNRIS began using Lidar technology as a more accurate method for elevation data of Texas. Lidar yielded high detail and high accuracy results in test areas, prompting additional collections of Lidar data in critical, flood prone areas.

> Using Lidar data as the elevation data source has greatly improved the reliability and accuracy of flood modeling across the state.

Lidar technology has evolved considerably and is now the most crucial dataset for flood planning and mitigation. Using Lidar data as the elevation data source has greatly improved the reliability and accuracy of flood modeling across the state.

Subsequently, the National Geospatial Program of the United States Geological Survey (USGS) created the 3D Elevation Program in response to the growing need for high-quality topographic data of the nation's natural and developed features. TNRIS utilized the program to expedite the acquisition of Lidar statewide.

In December 2020, Texas achieved full statewide coverage of Lidar data, essentially providing the state with the most accurate and detailed information about the earth's surface. This information is now used in scientific studies to help understand the impacts of flooding and how to minimize future risks through more accurate planning.

TNRIS maintains a full catalog of Lidar data and works with state partners to define areas in the state in need of updates. Lidar data is made available to the public at no cost through the TNRIS Data Hub.
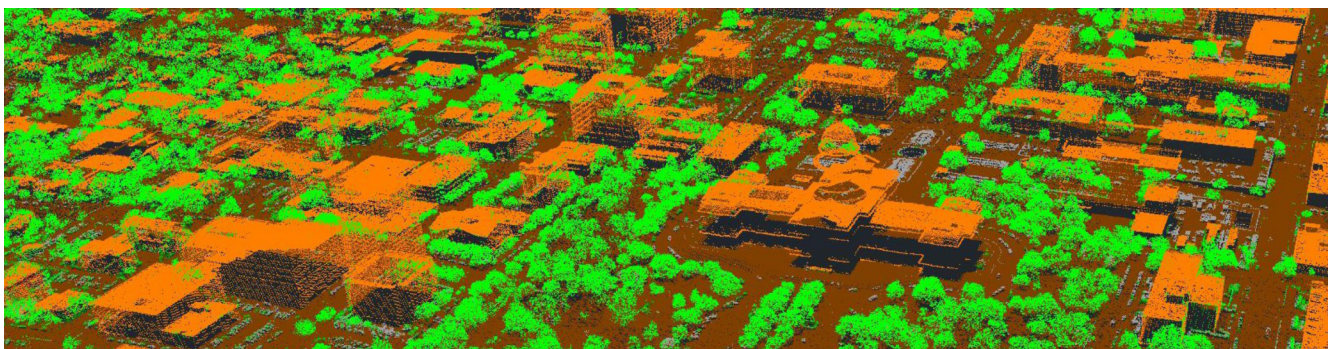
Lidar data of the Texas State Capitol area

National Address Database

TNRIS has collected and contributed a statewide file of street address points to the National Address Database (NAD). The NAD is a national priority and is getting renewed attention from the Federal Geographic Data Committee to support Next Generation 9-1-1, more accurate broadband mapping, geo-enabled elections, better and more consistent geocoding, and many other uses. The NAD is being created under the joint stewardship of the United States Census Bureau and the United States Department of Transportation.

TNRIS continues to collect, aggregate, and harmonize the land parcel data and street addresses available from counties into respective statewide files. These are both very important framework data layers needed for multiple purposes; having them assembled and readily accessible as statewide files is exactly the type of value-added service that TNRIS brings to the Texas GIS user community. Institutionalizing the process and providing regular updates are key to long-term success.

> … participation in the NAD will bring value to Texas as a national leader to other states as well as provide Texas GIS users with access to the national database for any projects extending beyond the Texas border.

The street address layer, which consists of address points mapped at their latitude and longitude coordinates, along with basic attribute data containing the components of the address fields according to the national standards, is promoted by the Federal Geographic Data Committee.

TNRIS' participation in the NAD will bring value to Texas as a national leader to other states as well as provide Texas GIS users with access to the national database for any projects extending beyond the Texas border. The National Address Database stewards also conduct quality assurance checks of the state-contributed data against data from United States Census Bureau and the United States Postal Service (using data that cannot otherwise be disclosed) with results shared back to the states as mechanisms to improve the state data.
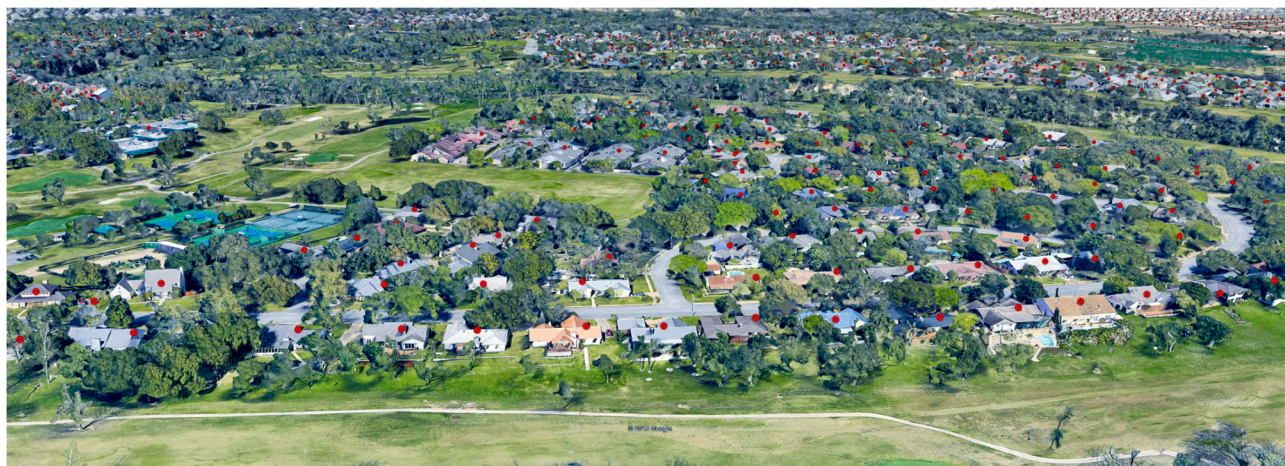
The goal for NAD is to represent every home and commercial structure with an address point location

Land Parcel Database

Land parcel data are critical datasets that have multiple uses in state government and are complementary to the address point data. Land parcels are boundaries that have associated information such as property owner, land use, value, and location attributes. This property information is recorded and maintained at the county level through the local appraisal districts. It is used by public entities to make informed decisions on community planning, development, and emergency preparation and response.

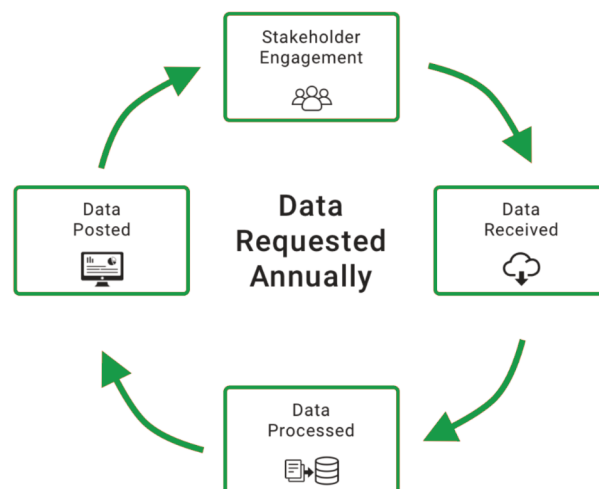Example of parcel data overlay on aerial imagery

Each appraisal district collects the parcel information important or unique to that county. Information between counties can be dramatically different in content and format.

To develop a statewide parcel layer, TNRIS formed a land parcel committee to review and understand the parcel information and determine the most important information and format required by the state. In collaboration with stakeholders from across the state, TNRIS created a statewide standardized GIS land parcel schema.

Collection of land parcel data began in 2018 and was made possible through shared funding with the Texas General Land Office. Approximately 90 percent of data contributed from county appraisal districts, or their service providers, has been acquired and translated into this common schema. TNRIS collects, standardizes, and annually publishes these data, which are now available on the TNRIS Data Hub at no cost.

Process Workflow

TNRIS works with the authoritative data sources and their authorized aggregator to deliver annual updates for both address points and parcel data.

Stakeholder Engagement

Data Received

Data Processed

Data Posted

Data Requested Annually

Statewide Collaboration

TNRIS, along with the DIR, established the Geographic Information Systems Solution Group to help address the complexities of geographic information systems in the state. The GIS Solution Group, which meets bi-monthly, provides a platform for sharing information and making unified decisions that will better serve geographic information departments at state agencies.

The primary responsibilities of the GIS Solution Group are to

- set enterprise GIS strategic goals, including the acquisition of strategic datasets for the enterprise;
- promote GIS data sharing across the enterprise;
- monitor and provide enterprise direction concerning GIS service delivery and performance and promote continuous service;
- identify and communicate customer business drivers and common demands related to GIS technology;
- recommend priorities for the development of new or enhanced GIS services and provide guidance to service providers concerning customer needs and priorities;
- review and approve critical GIS technology-related decisions;
- recommend GIS solutions to the Information Technology Leadership Committee;
- approve and prioritize enterprise GIS technology needs and projects;
- verify that service providers have been vetted and have a state vendor identification, and review the need for direct award versus a statewide bid or request for proposal;
- review and provide input to improvement plans resulting from the annual customer satisfaction survey related to GIS services;
- coordinate with other solution groups as needed to complete committee responsibilities;
- identify training and coaching opportunities to support Texas Department of Information Resources customers; and
- identify lessons learned and promote continuous improvement in delivery.
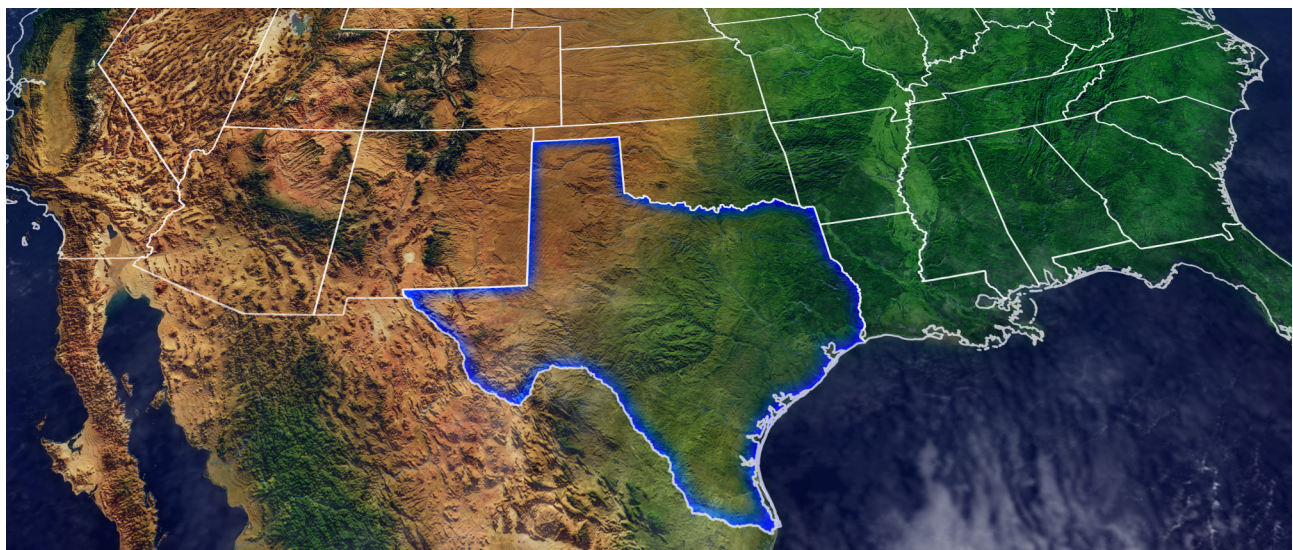
The National States Geographic Information Council (NSGIC) conducts a national assessment of core GIS data layers as part of its bi-annual Geospatial Maturity Assessment (GMA) of the states. The results are compiled into several reports, including state "report cards" indicating the maturity, using A–F grades, of several data layers and a separate grade on statewide coordination functions. The average of grades for each state are summarized in an overall state grade.

The Texas grade for the 2021 GMA improved to a "B+." Where the 2019 GMA graded on eight layers, the 2021 GMA added one additional layer by splitting orthoimagery into two categories — leaf-on and leaf-off. On coordination and the nine data layers, Texas received grades between A and B.

GEOSPATIAL MATURITY ASSESSMENT 2021

Texas Report Card — **Overall Grade: B+**

COORDINATION	GRADE: A

STATE–LED THEMES	GRADE
Address	A –
Cadastre	A
Elevation	A
Ortho imagery (Leaf–Off)	B –
Transportation	B

FEDERAL–LED THEMES	GRADE
Geodetic Control	B
Government Units	B –
Hydrography	B –
Ortho imagery (Leaf–On)	A

METRICS:

A –Superior
B –Above average

C –Average
D –Below average

F –Failure
N/A –Not Applicable

The National States Geographic Information Council Geospatial Maturity Assessment provides NSGIC members and other partners with a summary of geospatial initiatives, capabilities, and issues within and across state governments. The NSGIC GMA now produce report cards for each state on central data themes and coordination topics. The assessment is performed every two years.

www.nsgic.org | info@nsgic.org | @nsgic

NSGIC

Statewide Efficiency

Streamlined Procurement

StratMap Vendor Contract

The Texas Department of Information Resources maintains multiple cooperative contracts designed to strengthen Texas' capabilities to procure quality geographic data, services, and software. The contracts are for use by customers that include Texas state, regional, and local government offices, river authorities, water authorities, and public education entities.

The process for procuring GIS products, services, and software is administered by TNRIS through Texas Strategic Mapping (StratMap) contracts.

StratMap contracts are awarded to companies that are technically evaluated by a team of GIS professionals and determined to provide quality geographic data products, services, and GIS software. The availability of these contracts streamlines the procurement process and provides beneficial competition among some of the best companies in the industry.

StratMap contracts are truly a representation of successful public and private partnerships across Texas.

Since 2017 → Over **64 million dollars** have flowed through the StratMap contract for GIS services, software and IT-based land surveying purchases.

Data Discovery and Accessibility

Geographic Data Hub

To improve access to statewide geographic data and information for Texas, TNRIS established a web-based geographic Data Hub. The Data Hub organizes geographic data and information in a simple and easy to use way. Users of the Data Hub gain access to online map services, metadata, geospatial data downloads, and other applications that are utilized by local, regional, and state governments, private companies; and the public to support the needs of the citizens of Texas.

Land Parcels 2021 Basemap Download

Address Points 2021 Basemap Download WMS Service
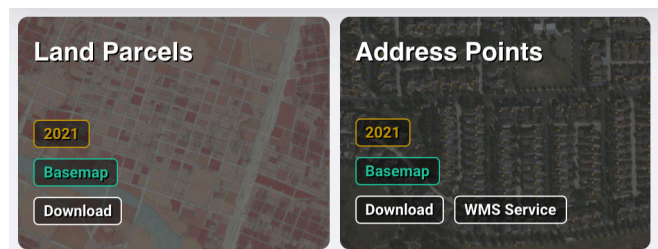
Average monthly users for the TNRIS Data Hub is approximately 15,500 users per month

The Data Hub will also be a key technology to facilitate access to standardized data and link multiple data initiatives across the state.

Agency GIS Coordination Efforts

Annual Texas GIS Forum

In existence since 1987, the annual Texas GIS Forum has garnered success for over 30 years, attracting more than 400 professionals each year from around Texas, the United States, and other nations. This event features workshops taught by top instructors and presentations from professional peers and experts in the GIS industry. The GIS Forum has hosted keynote speakers such as astronaut Story Musgrave, *America Unearthed* TV show host Scott Wolter, and famed oceanographer Robert Ballard. The Forum is a self-sustaining event funded solely by attendance fees and industry sponsorship.

Keynote presentation at the Texas GIS Forum

The importance of this event is not only to keep up with the latest technologies in the industry, but also to gain insight into the mapping needs for our great state. Each Friday following the GIS Forum, TNRIS hosts an open discussion meeting known as State of the State to discuss state needs related to GIS. This important event allows the GIO to determine the highest geographic data needs and priorities that will benefit the state for years to come.

Presentation at a TNRIS hosted GIS technology event

Statewide Efficiency

Quarterly GIS Community Meetings

State agencies tend to have their own approaches when it comes to geographic data needs. In the past, decisions concerning data standards, acquisition, and processing were often made at the state agency level even though other agencies might have similar or overlapping geographic data needs. This often resulted in duplication of effort, inefficiency, high costs, and uninformed decisions across government entities. To address this situation, the GIO has focused substantially on improved interagency and intergovernmental communications.

To better facilitate communication around the state, the GIO implemented quarterly GIS Community meetings to bring agency representatives together to gain valuable information about the GIS activities around the state. These meetings provide statewide project and technology updates, as well as a platform for agencies to inform the community about their individual projects or needs. These meetings foster a collaborative environment that improves efficiency around the state.

Agencies report on current activities during "Roll Call" at the quarterly GIS Community meetings

TNRIS Website and Social Media

The TNRIS website and Data Hub are accessed on average by more than 15,000 monthly visitors. The website is designed to provide the public with the most up-to-date information about data products and services around the state, as well as keep the community informed about other GIS events.

TNRIS utilizes Twitter (@tnris) as another form of communication. Tweets include current events, data releases, education opportunities, and other GIS information that will benefit or inspire others in the community. All tweets are displayed on the front page of the TNRIS website.

Follow @TNRIS

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@TNRIS

Happy #GISDay!! We hope you can attend any number of events happening around the state and the country. Find a GIS Day event near you! gisday.com/en-us/overview
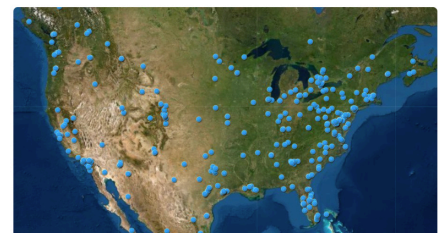
Nov 17, 2021

Statewide Initiatives

The state GIO's most important task is to coordinate the availability and use of geospatial data and resources across the widest possible range of stakeholders at all levels of government in Texas. Doing so ensures the highest value from the state's investments in geospatial technology and provides the greatest range of benefits to all Texans. To better support the states ever-growing reliability for quality geographic data and technology, the GIO and state partners are embarking on several major statewide initiatives.

Emergency Response And Support

Advanced Planning And Modeling

State Agency Data Coordination

Technology Advances

Workforce Training

Emergency Response and Support

Emergency response and support represent some of the most important uses of geographic data in Texas. Current and accurate geographic data save lives and property. In the last decade, areas in central and east Texas have experienced some of the worst flooding events in Texas history.

Using highly detailed geographic information, the Texas Division of Emergency Management (TDEM) and other state and local agencies have been able to mitigate emergency situations by accurately modeling and mapping areas to help predict and understand flooding in high-risk areas. This information is available to all emergency responders to help with planning and evacuation procedures.

Top leaders from federal, state, and local agencies collaborate on flood efforts in Texas

Support for emergency management operations is a key mandate for the GIO. The importance of high accuracy and complete geographic data is reflected in the current Texas Homeland Security Strategic Plan.

The following emergency support initiatives demonstrate active intergovernmental cooperation to develop applications and processes to support all Texans to minimize the impact of disasters in Texas.

Flood Decision Support Toolbox (FDST)

As a collaborative effort to develop a real-time inundation mapping system, the TWDB has joined forces with the USGS to significantly enhance a community's flood warning and response operations.

FDST highlights the impact of flooding on building structures in Texas

Benefits

- The FDST is built on the existing modern framework and the successful accomplishments of the Interagency Flood Risk Management team comprised of the Federal Emergency Management Agency, United States Army Corps of Engineers, USGS, and the National Weather Service.
- A publicly available map viewer provides the best available information ranging from engineering scale models to base level engineering scale models to National Oceanic and Atmospheric Administration (NOAA) river forecasts.
- The system supports the citizens of Texas by promoting continued flood-related collaboration at the highest levels of government.

Emergency Response and Support

Texas Water Data Initiative

The Texas Water Data Initiative is the development of an open and transparent water data system that will provide access to water information in a way that is relevant to the needs of decision makers in Texas.

Initiatives
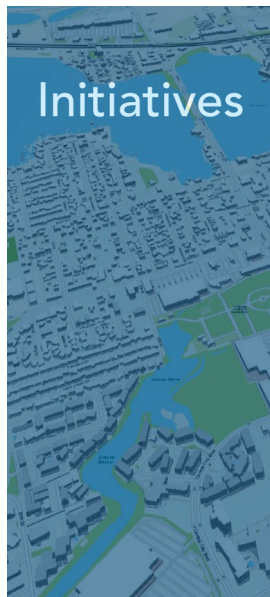
- Leading a sustained effort to accelerate the development of open data and information systems to support sustainable water resources management in Texas and around the country;
- Providing the infrastructure, community, and standards to make data accessible, and data will lead to information that can be used for better decision making;
- Enabling capabilities for innovators to develop new solutions that are not currently available;
- Creating findable, accessible, interoperable, reusable water data and developing the infrastructure platform to access data that enable stakeholders to use water data that address equity issues; and
- Developing standardized formats designed to reduce time and resources required to harvest data while enabling more time for analysis and informed decision making.

Institute for a Disaster Resilient Texas

The Institute for a Disaster Resilient Texas was formally established on May 14, 2020, by the Texas A&M University System Board of Regents following the passage of House Bill 2345 by the 86th Texas Legislature. The Institute's mission is to facilitate the integration of analytical tools and state-level decisions related to disaster resiliency. Through collaborative efforts, the Institute aims to deliver critical research on disaster risk reduction, support state agencies with data analytics and decision-making tools, and generate evidence-based solutions that help Texas communities become more resilient over the long term.

Benefits

- Create a venue to collaborate and learn about hazards with an initial focus on coastal and inland flood issues.
- Work with existing data collection entities in the state to create a repository for hazard-related data.
- Deliver critical research on disaster risk reduction through collaborative initiatives.
- Support state agencies with data analytics and decision-making tools.
- Promote evidence-based solutions, training and outreach, and innovation.

Texas Disaster Information System

A major initiative of the Institute for Disaster Resilient Texas is the Texas Disaster Information System (TDIS), an interactive, analytical, and visual web-based spatial data system designed to support more resilient decision making at the state level. The primary objective of TDIS is to collect, create, and provide analytical tools, information, and data that support disaster resilience efforts for the state of Texas.
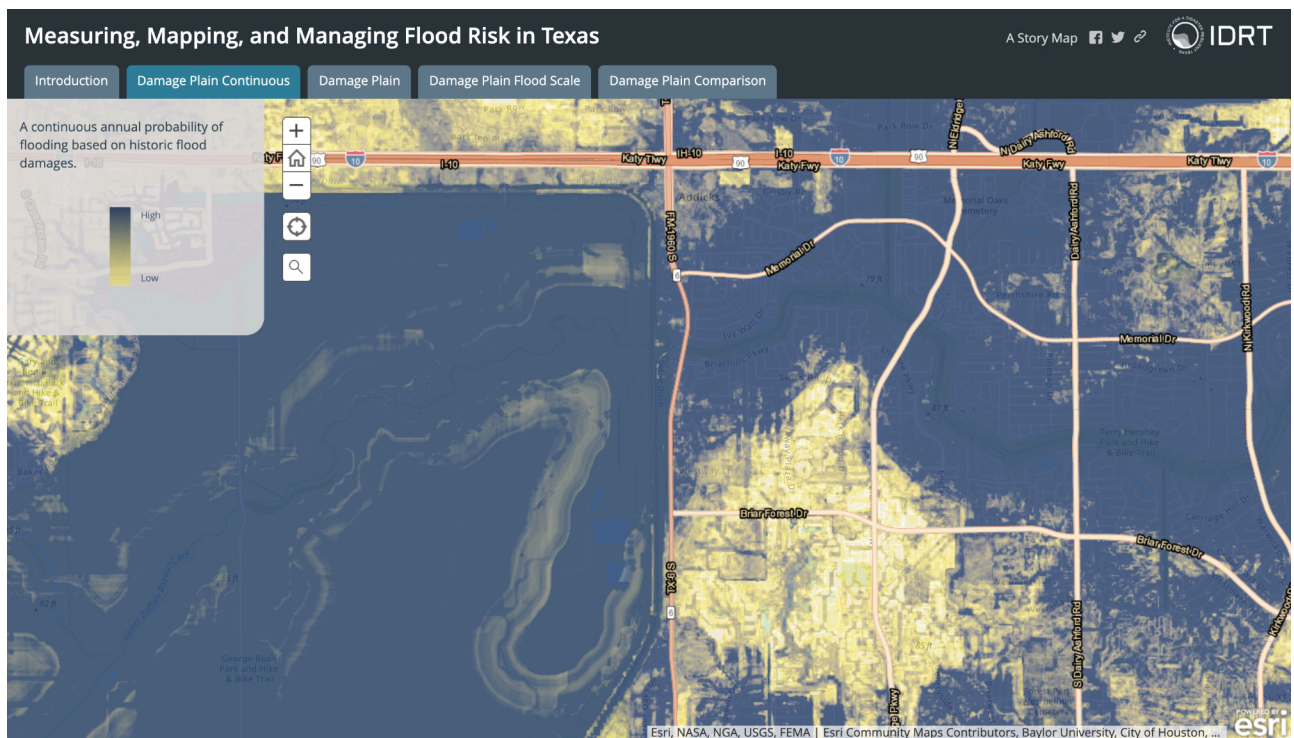
This flood risk application is one of the many being offered under the TDIS suite of tools

Benefits

- Consolidation of data and information spread across a wide array of agencies and systems into a single disaster preparedness resource.
- Development and use of data to better prepare Texans to mitigate against disasters across the state.
- Reliable and timely insights for a diverse group of stakeholders to make decisions during different stages of disasters.

Advanced Planning and Modeling

The National Geodetic Survey (NGS), the United States federal agency that maintains the country's National Spatial Reference System (NSRS), is part of NOAA. The NSRS is a coordinate system that is the foundation for all national geospatial products and is used for mapping and charting in a wide variety of science and engineering applications.

In 2008, the NGS announced in its 10-year plan the replacement of the country's two national datums: North American Datum of 1983 (NAD 83), the geometric datum used mainly for horizontal positions, and the North American Vertical Datum of 1988 (NAVD 88), the vertical datum used for determining orthometric heights (elevations).

To improve the NSRS, the NGS will replace NAD 83 and the NAVD 88 with a new geometric reference frame and geopotential datum in 2022.

Benefits

- Because the new reference frames and geopotential datum will be based on highly accurate measurements, the consistency will make spatial analysis and aligning spatial data much easier and more reliable, which is a clear benefit for the GIS professional.
- Accurate elevations from satellite data will be available in mere seconds.
- Adoption of this new standard is required for organizations that do business with federal agencies.
- The new reference frames will rely primarily on Global Navigation Satellite Systems, such as the Global Positioning System (GPS), as well as on a gravimetric geoid model resulting from Gravity for the Redefinition of the American Vertical Datum Project.
- These new reference frames will be easier to access and maintain than NAD 83 and NAVD 88, which rely on physical survey marks that deteriorate over time.

State Agency Data Coordination

In 2015, the 84th Texas Legislature passed House Bill 1912 (HB 1912) creating the statewide data coordinator position in the Department of Information Resources. This position was the foundation for developing the Texas Data Management Program, which created a formalized approach to governing, managing, sharing, and leveraging the state's strategic asset: data!

Shortly thereafter, the DIR and TNRIS teamed up to create the GIS Solution Group. This cost-saving, efficient solution for the state helped forge a strong relationship between the DIR and TNRIS to address GIS data needs. As a result, Lidar, address points, and land parcel data have been identified as priority datasets for the state. These data are now available to the GIS data community members.

Data, whether tabular (rows and columns) or geographic (maps and imagery), are critical for leadership to make the best decisions on behalf of Texas constituents. The Texas Data Management Program and the GIS programs are aligned and supportive of each other's efforts to provide the best data-related solutions and approaches to meet the state of Texas' needs today and in the future.

In 2021, the 87th Texas Legislature passed Senate Bill 475 (SB 475), a comprehensive security, data, procurement, and technology bill that further established and strengthened the overall data management programs across state agencies. It also reinforced the need for continued collaboration and data sharing. As a result of this bill, the efforts of the DIR and TNRIS will continue to be aligned in the overall management of data. It also offers opportunities for groups such as the Texas Division of Emergency Management and the Texas A&M Institute for a Disaster Resilient Texas through the Texas Disaster Information System to partner in the sharing of GIS data and other data sources to address critical natural disaster response and recovery efforts.

Benefits

- The implementation of SB 475 will further strengthen communication between state agencies and institutions of higher education while lessening the burden of individual data gathering as authoritative data custodians are discovered.
- SB 475 also provides a stronger collaboration between data, security, records management, and privacy as a shared strategic asset responsibility for state of Texas data.
- SB 475, with the designation of data management officers, allows agencies and institutions of higher education the ability to establish a solid framework for data management program development, formal data governance policy and procedures, and increased data sharing amongst the enterprise.

The TNRIS is exploring artificial intelligence (AI) and machine learning (ML) as emerging technologies. Implementing these new technologies can maximize the usefulness of geographic data and provide the means to develop proactive systems to support emergency management activities. Proof-of-value concepts are currently being explored and planned to understand how these technologies can benefit real world situations such as predictive modeling for flood planning and management.

Through the DIR and the GIS Solution Group, TNRIS has initiated a contract with Google to utilize tools that provide capabilities to develop AI and ML tools to support emergency activities in Texas. These new technologies will utilize data in a more efficient and proactive way to help first responders and managers understand the impacts and magnitudes of major events before they occur.

Texas is looking to work with partners on concepts related to machine learning and artificial intelligence to continue to drive innovation and realize efficiencies.

Benefits

- AI can monitor disasters in the making. AI models can be trained to look for data anomalies and report trends that are common with specific disasters before they occur.
- AI can help sound the alarm when a disaster strikes. It can tie into existing technological systems, expanding their reach and offering faster responses and reduced costs.
- AI can support disaster relief efforts on the front lines and beyond. It can map, analyze, and model disaster zones to provide updated travel advisories, help mobilize and find citizens, and ensure that disaster response teams know what resources need to be deployed.
- AI can be used to record data during events. Information is critical to understanding the anatomy of a disaster. By using AI systems to "trigger" when specific data patterns are matched, data can be recorded and cataloged for future reference and analysis. This data can then be used to train other AI systems to help with future disaster predictions that will aid in planning.

TNRIS has benefited widely from an internship program that has evolved over the past 30 years. TNRIS partners with local higher education institutes to give students an opportunity for hands-on, real-life work experience in exchange for college credit hours. These interns primarily assist TNRIS with daily work tasks related to geographic data: filling orders, quality assurance checks, and answering customer inquiries.

As other state agencies begin to understand the importance of using GIS to make decisions, their budgets often do not support modernization that would ultimately present data on a map. The Texas GIO is dedicated to bringing GIS technology to state agencies through an internship program that would train a workforce and ultimately offer employment. To achieve this goal, the GIO is committed to building a program that will provide geographic data at the level of quality TNRIS is known to provide.

State agencies working with higher education to establish an intern-based workforce

Benefits

- A trained workforce in the specialty field of GIS.
- Advanced geographic data services provided to state and local governments at minimal cost.

Needs and Recommendations

Over the past 5 years, the GIO has worked closely with state agencies that rely on GIS tools and data as a part of their daily workflows. Through normal communication and a series of interviews and meetings, the GIO has identified the following needs and recommendations to further improve efficiencies and support productivity at all levels of government.

Next Generation 9-1-1

Authoritative Data Catalog

Broadband Mapping

Enterprise Geocoding Services

9-1-1 systems were first introduced in the 1960s, well before the advent of mobile phones. Legacy 9-1-1 systems rely on wired phone lines at a specific address and do not support mobile caller location. Next Generation 9-1-1 (NG9-1-1) is a major overhaul of 9-1-1 to be internet-enabled and to use GIS at the core of the system design. A GIS-based system allows 9-1-1 calls to be routed to the nearest 9-1-1 call center rather than a static address associated with the caller's phone number. The transition to NG9-1-1 cannot occur without the required GIS data.

Public safety answering point (PSAP) facility

States are under immense pressure to ensure that all the public safety answering points (PSAPs) (or 9-1-1 call centers) are provisioned with the required GIS data. The required GIS data include address points, road centerlines, and emergency service boundaries. Additional recommended GIS data layers, including landmarks, waterways, 3D buildings, municipal boundaries, railroads, and more, provide a fuller understanding of the caller's location. In Texas, there are 75 disparate 9-1-1 jurisdictions, each with a variety of budgets and capabilities. Coordination and support are key amongst these jurisdictions to move forward with data development and ultimately, web-based connectivity. The goal is a nationwide 9-1-1 interoperable system that will allow PSAPs to transfer calls to the nearest call center.

Coordination occurs informally amongst three umbrella organizations: Commission on State Emergency Communications, the Texas 9-1-1 Alliance, and the Texas GIS/9-1-1 User Group. Texas does not have a formal oversight committee charged with monitoring the multiple steps required to fully meet the requirements of NG9-1-1.

Recommendation

It is recommended that a gap analysis be performed to understand the current status of 9-1-1 GIS data among the 75 jurisdictions. This is the first step to ensure that all PSAPs in Texas have the high-quality GIS data needed for Next-Generation 9-1-1 and those who are lagging behind receive support and guidance. The gap analysis might well conclude that Texas is near completion of their GIS datasets. It is also recommended that Texas consider establishing a formal oversight committee for Next Generation 9-1-1.

Authoritative Data Catalog

The Texas Geographic Information Officer (GIO) is tasked by Texas Water Code §16.021 (c)(2) to "establish, support, and disseminate authoritative statewide geographic datasets." Authoritative data discovery will depend on the implementation of legislation recently passed by the 87th Texas Legislature, which took effect on September 1, 2021. SB 475 requires each state agency with more than 150 full-time employees to designate or hire a data officer responsible for data management and governance. Working with the data officer at each state agency will help the GIO determine authoritative data and work to add elements to the data that would give each record a place on a map, a process known as geo-enabled data.

"An Authoritative Data Source (ADS) is a single officially designated source authorized to provide a type or many types of information that is trusted, timely, and secure on which lines of business rely. Information that is trusted means that the information provider exercises management responsibility for appropriate practices, procedures, and processes to produce information that is within acceptable thresholds for quality, integrity, and security."

- United States Geological Survey

Recommendation

The GIO recommends developing an authoritative geographic data catalog to verify and validate data authenticity, promote data integrity, and ensure the use of a common standard dataset. To facilitate and actively manage this effort, a committee composed of the GIS power users in state government is recommended. The purpose of this committee would be to search for and identify geospatial datasets created and maintained by a state agency for the purposes of filling a state mandate or for making an agency business decision.

Broadband Mapping

The COVID-19 pandemic made clear the importance of broadband connections to all citizens as they strived to work in a home office environment. Those without home broadband service could not work remotely, attend remote classrooms, access medical care resources, or shop online to avoid exposure to the virus. The need and the will to finally close the "digital divide" appears to be at hand. However, precise mapping that shows exactly which homes have access to broadband and those that do not has never been created for the United States or Texas. The currently available broadband mapping produced by the Federal Communications Commission is not granular enough and masks many underserved locations, especially in sparsely settled rural areas. The Broadband DATA Act (S. 1822) requires the Federal Communications Commission to collect data from governmental entities responsible for mapping. The current method to determine broadband service uses Census block data. If one house receives service, the entire block is deemed serviced.


New broadband mapping at the granularity of individual street addresses is needed to fully define the problem and inform the proposal of potential solutions. Using address points to determine population served will bring a better understanding of where broadband services are needed. In addition, other GIS data layers will be essential to this effort, including aerial imagery, address points, parcel boundaries, roads, topography, water features, boundaries, and much more. These additional map layers can help identify gaps in the coverage details that broadband provider companies are not willing to disclose. Fortunately, TNRIS has these essential data layers to apply toward broadband mapping.

Recommendation

The GIO recommends continued legislative support for all broadband mapping efforts at the local level, including support for a granular location map of underserved homes. We are aware that the expansion of broadband services was a key focus of the 87th Texas Legislature, and we will continue to monitor the implementation of key legislation, such as House Bill 5, that pertains to broadband mapping.

Geocoding is the process of converting street addresses into geographic coordinates (latitude and longitude), which enable database records tied to street addresses to be mapped and used in GIS applications. Reverse geocoding is the process of converting geographic coordinates into a human-readable address. Because street addresses are the most common geographic references found in government datasets, geocoding is the essential step to enable that data to be explored and queried with GIS.

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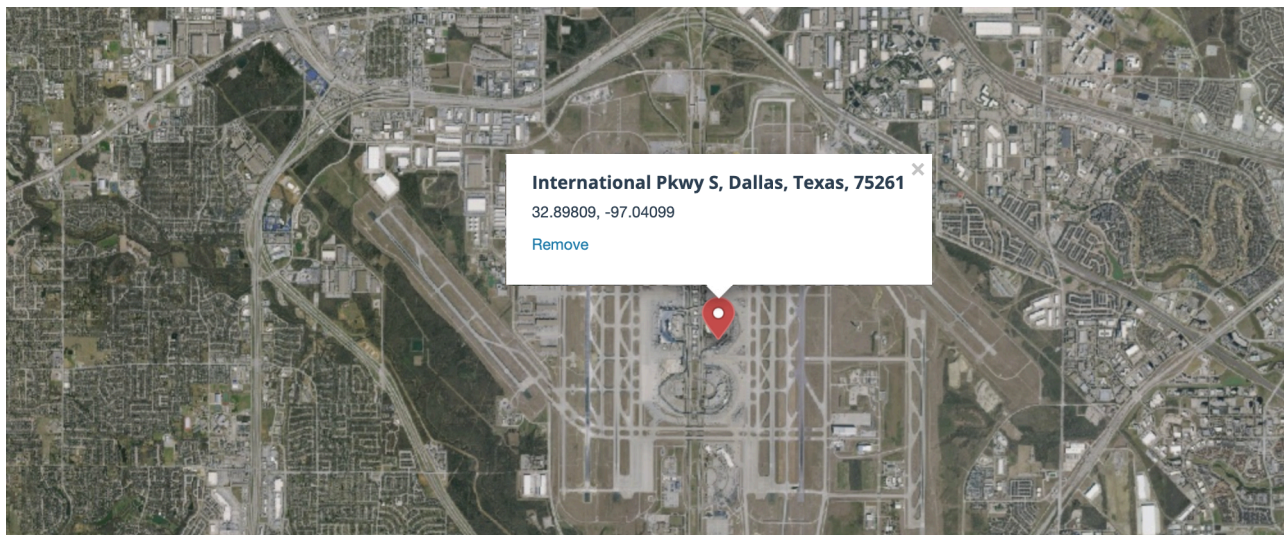
GIS application using a geocoding service to map the address of geographic coordinates

There are a variety of tools and software that perform geocoding, but each is configured differently, uses different algorithms to understand the components of a street address, and uses different reference data to determine address locations. Consequently, the exact same street address fed into different geocoding solutions will yield different latitude/longitude coordinates.

Benefits of an enterprise geocoding service include the following:

- A geocoding service provides a consistent and reliable process for users to submit street addresses and receive coordinates, based on quality mapping layers maintained by the state.
- A service enables users to have access to geocoding without the need for their own specialized geocoding software.
- A single, widely available geocoding service will prevent inconsistent coordinates for the same street addresses, thereby stymieing efforts for sharing data and analyses.

Recommendation

The GIO recommends developing and maintaining a license-free, statewide geocoding service to be made available to all state agencies for emergency and everyday use.

Closing Statement

Geographic information has become one of the most critical datasets in Texas. It has proven to be the common thread that binds all levels of government together. Through outreach programs such as the GIS Solution Group, quarterly GIS Community meetings, and the Texas GIS Forum, Texas is more united in the way we acquire, use, and freely distribute information between agencies and the public.

Texas is highly ranked for national achievement according to the National States Geographic Information Council, and we continue to improve our standing by contributing to national programs such as the National Address Database. We also lead by example as we demonstrate to other states the importance of strong, statewide collaboration between agencies. This has been the critical key to our success.

Texas has had its share of emergency situations over the past five years, and undoubtedly there will be many more. At the heart of a successful response is geographic information. These data not only help first responders understand the magnitude of a situation, but they can ultimately help save lives in the process.

There is still work to do. Through communication with state partners, the GIS community continues to find ways to work together and find opportunities where we can improve efficiency. There is a strong sense of pride in our GIS community, where Texas comes first. There will be new challenges ahead and we will be ready for whatever comes our way.

Example of coordination between federal, state, and local agencies during hurricane Harvey in 2017

APPENDICES

Appendix A

Acronyms Used in this Report

AI – Artificial Intelligence
DIR – Department of Information Resources
FDST – Flood Decision Support Toolbox
GIO – Geographic Information Officer
GIS – Geographic Information System
GMA – Geospatial Maturity Assessment
Lidar – Light Detection and Ranging
NAD – National Address Database
NAD 83 – North American Datum of 1983
NAVD 88 – North American Vertical Datum of 1988
NG9-1-1 – Next Generation 9-1-1
NGS – National Geodetic Survey
NOAA - National Oceanic and Atmospheric Administration
NSRS – National Spatial Reference System
NSGIC – National States Geographic Information Council
PSAP – Public Safety Answering Point
StratMap – Strategic Mapping
TCEQ – Texas Commission on Environmental Quality
TDIS – Texas Disaster Information System
TDEM – Texas Division of Emergency Management
TNRIS – Texas Natural Resources Information System
TWDB – Texas Water Development Board
USGS – United States Geological Survey

Appendix B

Texas State Water Code

Sec. 16.021. TEXAS NATURAL RESOURCES INFORMATION SYSTEM.
(a) The executive administrator shall establish the Texas Natural Resources Information System (TNRIS) to serve Texas agencies and citizens as a centralized clearinghouse and referral center for:

    (1) natural resource data;
    (2) census data;
    (3) data related to emergency management; and
    (4) other socioeconomic data.

(b) The executive administrator may, on behalf of TNRIS, enter into partnerships with private entities to provide additional funding for improved access to TNRIS information. The board shall adopt administrative rules to describe the process of establishing partnerships, define the types of partnerships that may be formed, establish the fee collection process, and define the nondiscriminatory methods used to determine which private entities may enter into partnerships. Any process developed by the board must comply with all applicable laws regarding ethics, purchasing, and contracts.

(c) The executive administrator shall designate the director of the Texas Natural Resources Information System to serve as the state geographic information officer. The state geographic information officer shall:

    (1) coordinate the acquisition and use of high-priority imagery and data sets;
    (2) establish, support, and disseminate authoritative statewide geographic data sets;
    (3) support geographic data needs of emergency management responders during emergencies;
    (4) monitor trends in geographic information technology; and
    (5) support public access to state geographic data and resources.

(d) Not later than December 1, 2016, and before the end of each successive five-year period after that date, the board shall submit to the governor, lieutenant governor, and speaker of the house of representatives a report that contains recommendations regarding:

    (1) statewide geographic data acquisition needs and priorities, including updates on progress in maintaining the statewide digital base maps described by Subsection (e)(6);
    (2) policy initiatives to address the acquisition, use, storage, and sharing of geographic data across the state;
    (3) funding needs to acquire data, implement technologies, or pursue statewide policy initiatives related to geographic data; and
    (4) opportunities for new initiatives to improve the efficiency, effectiveness, or accessibility of state government operations through the use of geographic data.

(d-1) The board shall consult with stakeholders in preparing the report required by Subsection (d).

(e) The executive administrator shall:

    (1) further develop the Texas Natural Resources Information System by promoting and providing for effective acquisition, archiving, documentation, indexing, and dissemination of natural resource and related digital and nondigital data and information;
    (2) obtain information in response to disagreements regarding names and name spellings for natural and cultural features in the state and provide this information to the Board on Geographic Names of the United States Department of the Interior;
    (3) make recommendations to the Board on Geographic Names of the United States Department of the Interior for naming any natural or cultural feature subject to the limitations provided by Subsection (f);
    (4) make recommendations to the Department of Information Resources to adopt and promote standards that facilitate sharing of digital natural resource data and related socioeconomic data among federal, state, and local governments and other interested parties;
    (5) acquire and disseminate natural resource and related socioeconomic data describing the Texas-Mexico border region; and
    (6) coordinate, conduct, and facilitate the development, maintenance, and use of mutually compatible statewide digital base maps depicting natural resources and man-made features.

(f) A recommendation may not be made under Subsection (e)(3) for:

    (1) a feature previously named under statutory authority or recognized by an agency of the federal government, the state, or a political subdivision of the state;
    (2) a feature located on private property for which consent of the property owner cannot be obtained; or
    (3) naming a natural or cultural feature for a living person.

(g) The board may establish one or more advisory committees to assist the board or the executive administrator in implementing this section, including by providing information in connection with the preparation of the report required by Subsection (d). In appointing members to an advisory committee, the board shall consider including representatives of:

    (1) state agencies that are major users of geographic data;
    (2) federal agencies;
    (3) local governments; and
    (4) the Department of Information Resources.

Appendix C

Major Agency Business Functions Using GIS Technology

Many state agencies use digital geographic data and GIS technology as an essential tool in the cost-effective performance of their essential business functions. Some of the major agencies with business functions that rely heavily on GIS technologies are listed below.

Texas General Land Office

- State lands management
- Coastal permitting
- Energy resources
- Oil spill prevention and response
- Disaster mitigation and recovery
- Community development and revitalization
- Veteran's benefits issues

Texas Water Development Board

- Statewide water planning
- Financial assistance for water projects
- Surface water mapping and modeling
- Aquifer mapping and groundwater modeling
- Water use and population estimates
- Soil moisture and reservoir evaporation
- Innovative water resource mapping
- Flood science and planning
- Rainfall and drought early warning system
- Water well mapping and monitoring

Texas Parks and Wildlife Department

- State lands planning and management
- Environmental impact studies
- Habitat management
- Exotic invasive species management

Texas Historical Commission

- Preservation of historic and cultural resources
- Clearinghouse for historical data

Texas Commission on Environmental Quality

- Air permitting
- Air quality modeling and data analysis
- Water rights
- Groundwater
- Public drinking water
- Water quality planning

Texas Department of Public Safety

- Emergency management and response
- Border security
- Texas homeland security
- Highway safety
- Communications
- Intelligence and investigative support

Texas Railroad Commission

- Oil and natural gas industry regulation
- Pipeline transporters
- Hazardous liquid pipelines
- Natural gas utilities
- Coal and uranium surface mining operations

Texas Department of Transportation

- Transportation planning
- Highway design and construction
- Roadway inventory maintenance
- Highway project mapping
- Traffic congestion management and mitigation
- Crash records and safety improvement
- Bridge deficiency and maintenance programs
- Pavement condition programs
- Railroad line and railroad crossing inventory
- Freight movement and freight planning

Commission on State Emergency Communications

- 9-1-1 caller location mapping
- NG9-1-1 call routing
- NG9-1-1 location validation

Public Utility Commission of Texas

- Electric utility service area mapping
- Electric utility outage mapping
- Electric utility infrastructure monitoring

Texas Animal Health Commission

- Animal disease tracking
- Investigation of animal disease outbreaks

Texas Department and Health and Human Services

- Mortality tracking
- Health data analysis
- Health data query tool
- Licensed facility mapping

Texas Department of Insurance

- Fraud investigation
- Licensing and compliance of firework facilities
- Disaster response mitigation and mapping
- Ammonium nitrate facility inspection
- Fire safety and analysis program outreach

Texas Legislative Council

- Tracking House and Senate district boundaries

Appendix D

Major Contributors and Acknowledgments

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- Texas Commission on Environmental Quality - Raj Nadkarni, Jennifer Kirby
- Commission on State Emergency Communications - Kelli Merriweather, Heather Barnes, James Johnson
- Texas Parks and Wildlife Department - Jeremy Nobles
- Texas General Land Office - Scot Friedman
- Texas Railroad Commission - Lorenzo Garza, Matt Brown, James Harcourt
- Texas Historical Commission - Michelle Valek

DIR
- Ed Kelly, Chief Data Officer