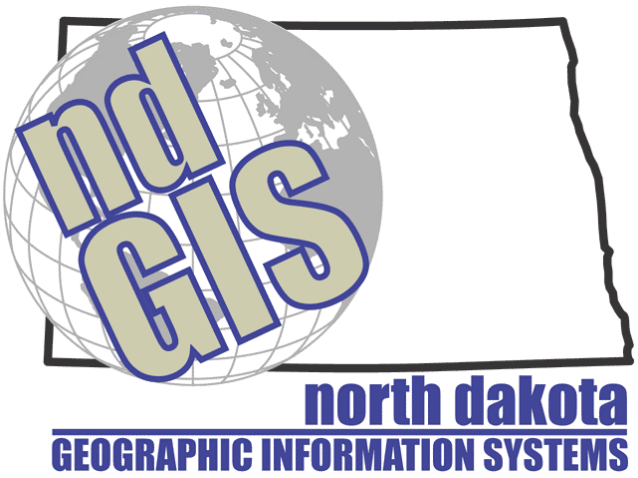
State of North Dakota

GIS Initiative Strategic Plan - 2006



Prepared By: Bob Nutsch
GIS Coordinator
Information Technology Department

Date of Publication: March 2006

Contents

Overview

The Strategic Plan addresses the on-going and planned growth of the GIS Hub and other components of the GIS Initiative as envisioned by the North Dakota GIS Technical Committee (GISTC). The GISTC is composed of seven state agencies: Department of Transportation, Department of Health, State Water Commission, Geological Survey, Parks and Recreation Department, Game and Fish Department, and the Information Technology Department.

Today, as part of the on-going GIS Initiative, the GIS Hub continues to have heavy use from state and other levels of government and from the public and private firms. State agencies primarily connect to the GIS Hub databases while other levels of government, the public, and private firms primarily view and download data. These usage patterns drive the need to create additional applications and develop/upgrade data sets.

In mid-January 2000, North Dakota's Chief Information Officer (CIO) was contacted by a representative from the GISTC asking that ITD study the need for a centralized GIS hosting service for North Dakota state agencies and their partners. The GIS Hub would provide a means of sharing the GIS information being stored locally at each agency. The CIO agreed that GIS is an important technology for state government and that ITD should take a lead role in GIS.

ITD retained a consulting firm to study how GIS was used in state government. The report's findings were presented to the GISTC, the Director of Office and Management and Budget, the Governor's Chief of Staff, and the Legislative IT Committee. At the request of the GISTC, the CIO agreed to request funding from the Legislature to fund the GIS Initiative. In April 2001 the Legislature provided funding to construct the GIS Hub, a database and web infrastructure hosted by ITD for hosting and sharing state agency GIS data and applications.

Mission Statement

The State of North Dakota's GIS Hub will provide the essential infrastructure to share core geographic datasets through an accessible data warehouse among stakeholders with browsing ability to the general public. The Hub will leverage the State's existing data, infrastructure and expertise to implement the core elements of this enterprise solution.

Vision Statement

It is the vision of the GISTC that the GIS Initiative will continue to grow in value to state agencies and other levels of government which in turn increases the level of service and cost effectiveness to the citizens of the North Dakota. The core of the GIS Initiative is

the GIS Hub which will continue to develop through increased and improved functionality and by expanded and improved data sets.

Business Case

Cost Savings

- Consolidation/coordination of vendor support and training
- Labor savings associated with creating, compiling, and transforming project data
- Application standardization and code re-use
- Coordination of application development activities

Cost Avoidance

- Reduce project start-up costs
- Ability to leverage skills, training, and learning curves across multiple departments
- Elimination of application development and data redundancies
- Application development/platform re-use opportunities

Enhancement of State's Image Opportunities

- Economic development applications and data
- Enhanced ability to provide maps and data to the public
- Compliance with federal regulations, requirements, and best practices

Strategic Goals

The following goals have been identified by the GISTC to implement its vision and achieve its mission; they are listed in order of importance.

Goal 1 – Continued enhancement and development of GIS data. Improve existing data sets, and after identifying desired data sets, develop plans to acquire that data. NSDI (National Spatial Data Infrastructure) framework data is a priority and will serve as a guide.

Goal 2 – Improved statewide GIS coordination. Streamline the flow of data, ideas, and priorities within the state at all levels of government, the academic sector, the private sector, and the public. The seven characteristics of effective statewide coordination councils as defined by the Fifty States Initiative will serve as a guide. The Fifty States Initiative defines the criteria, characteristics, and activities that identify effective state coordination councils who are working with other levels of government to build the National Spatial Data Infrastructure (NSDI). A copy of the Fifty States Initiative can be found at http://www.nsgic.org/committees/documents/fifty_states_initiative.pdf .

Goal 3 – Outreach GIS. Promote the exchange of data, ideas, activities, standards, and technologies at tribal, county, city, federal, and higher education levels. The seven activities which can be used to measure the implementation of the NSDI by statewide coordination councils, as defined by the Fifty States Initiative will serve as a guide.

Goal 4 – Promote GIS training. Continue and expand GIS education opportunities. While the focus of this effort is state agencies, these opportunities are open to other entities.

Goal 5 – Improved GIS Standards. Designed to assist in sharing of data and to serve as a guide for new projects, and in accordance with goals of the NSDI, these standards would be developed in partnership with local government.

Goal 6 – Improved GIS data distribution. Provide enhanced means of distributing vector and raster data through the GIS Hub.

Goal 7 – Implement greater levels of open source GIS. Open source GIS represents a rapidly growing sector of geospatial technologies. The state needs to continue to monitor open source tools and to regularly review its applicability to state and local government.

Goal 8 – Promote view of geographic information as critical information asset. Geographic information not only is costly to develop and maintain, but is critical in emergency preparation and mitigation, and as such should be protected in case of power failure, fire, flood, etc.

Goal 9 – Improved reliability and access of GIS Hub systems. Enhance the GIS Hub systems to provider greater reliability and enhanced accessibility to state agency users.

2003-2005 Biennium Accomplishments Highlights

- U.S. Geological Survey grant for sharing GIS Hub data with The National Map
- Free GIS software for all K-12+ schools
- Annual GIS Day conferences
- Increased GIS Hub usage
- New and updated data
- New agency-driven GIS applications

Business Plan Summary: 2005-2007 Biennium

The following is a summary of the business plan objectives which support the strategic goals. Please note that the categories of Operational Objectives, Enhancement Objectives, Projects, and Not Scheduled or Budgeted are not shown if there are no items within them.

Goal 1 – Continued enhancement and development of GIS data

Operational Objectives

- Define maintenance schedule of existing data

Enhancement Objectives

- Review data framework categories then identify existing and missing data
- Prioritize framework data sets to be improved and developed
- Adopt FGDC currency and accuracy guidelines for framework data
- As required, provide support for the NSGIC Imagery for the Nation program
- Acquire 2004 and 2005 NAIP county MrSID data
- Post Cass County and Bismarck-Mandan high-resolution aerial photography

Projects

- Data development: road centerlines, aquifers, 10m or better DEMs, hydrologic unit delineation, enhanced PLSS, acquire 2005 NAIP

Not Scheduled or Budgeted

- Drop the _line and _poly suffixes in the Hub database where possible
- Develop a grant program to facilitate local government data development
- Data development: NHD development, FEMA flood map data, acquire 2006 NAIP

Goal 2 – Improved statewide GIS coordination

Enhancement Objectives

- Define and implement a GIS Professional Services Vendor Contract Pool
- Define a statewide GIS coordination model

Goal 3 – Outreach GIS

Operational Objectives

- Continue to assist in the GIS in K-12 program
- Promote and grow the GIS Users Conference
- Continue the existing partnerships and pursue new opportunities with the federal government, which include The National Map, the NSDI, and the Geospatial One-Stop

Enhancement Objectives

- Develop Memorandums of Understanding with local and federal government entities

Not Scheduled or Budgeted

- Develop a GIS web site forum for the exchange of ideas and information

Goal 4 – Promote GIS training

Operational Objectives

- Continuation of coordinated GIS training to keep abreast of changes in GIS technology

Projects

- Conference grant program to facilitate training of GISTC member agencies
- Develop customized training classes

Not Scheduled or Budgeted

- Develop coordinated GIS training registration application

Goal 5 – Improved GIS Standards

Enhancement Objectives

- Develop address and road centerline data standards, with a focus on attributes and spatial accuracy. Monitor and maintain data content standards with respect to national standards.

Not Scheduled or Budgeted

- Develop more user-friendly metadata standards

Goal 6 – Improved GIS data distribution

Operational Objectives

- Agency application development as required

Enhancement Objectives

- Merge ND Geological Survey clearinghouse with the Hub

Not Scheduled or Budgeted

- Develop a raster data extraction application, similar to what is available for the vector data.
- Study using a defined projection to improve storage accuracy and usability
- Facilitate metadata publishing by local government
- Make available all USGS black and white DOQQs available on the FTP site

Goal 7 – Implement greater levels of open source GIS

Operational Objectives

- Complete implementation of OGC (Open Geospatial Consortium) WMS (Web Map Service)

Enhancement Objectives

- Continue to monitor the development of open source server and desktop tools

Not Scheduled or Budgeted

- Develop an open source pilot project designed to measure the strengths/weaknesses of the products and the applicably of the products to enterprise GIS at the state level and for use within local government.

Goal 8 – Promote view of geographic information as critical information asset

Enhancement Objectives

- Define critical applications and data sets. These may be on more secure hosting systems

Not Scheduled or Budgeted

- Define service level objectives - a current level of service along with what can be expected. Include data storage types, database, and web services
- Investigate back-up services such as off-site storage or data replication, then identify needs of redundancy and mirroring of data at alternate sites

Goal 9 – Improved reliability and access of GIS Hub systems

Operational Objectives

- Enhance the Hub Explorer and the Metadata Explorer with new functionality as needed

Enhancement Objectives

- Develop a GIS Hub data model

Projects

- Development of Internet Mapping Framework (IMF) as possible replacement to Hub Explorer template.

Not Scheduled or Budgeted

- Development of a web-based editing environment
- Develop greater/easier access to Hub by remote agency field offices, e.g., better connections from GNF, P&R, and Health Dept. field offices.
- Enhance data loading tools for state agency use

Business Plan Summary: 2007-2009 Biennium

The following is a summary of the business plan objectives which support the strategic goals. Please note that the categories of Operational Objectives, Enhancement

Objectives, Projects, and Not Scheduled or Budgeted are not shown if there are no items within them.

Goal 1 – Continued enhancement and development of GIS data

Operational Objectives
- Update maintenance schedule of existing data
- As required, provide support for the NSGIC Imagery for the Nation program

Enhancement Objectives
- Review framework data sets to be improved and developed
- Data development: geodetic, FEMA flood map data

Projects
- Data development: road centerlines, 10m or better DEMs, cadastral
- Increased storage capacity

Not Scheduled or Budgeted
- Data development: NHD development

Goal 2 – Improved statewide GIS coordination

Enhancement Objectives
- Review status and implementation of statewide GIS coordination model
- Provide a web-based statewide tool that allows a user to quickly note data that has been or will be developed and to easily allow the data to be uploaded for use on the GIS Hub

Goal 3 – Outreach GIS

Operational Objectives
- Assist in the GIS in K-12 program
- Promote and grow the GIS User Conference
- Continue the existing partnerships and pursue new opportunities with the federal government, which include The National Map, the NSDI, and the Geospatial One-Stop
- Develop MOUs with local and federal government entities
- Review the status and benefit of existing MOUs

Goal 4 – Promote GIS training

Operational Objectives
- Continuation of coordinated GIS training

Enhancement Objectives

- Consideration of developing training in other parts of the state

Goal 5 – Improved GIS Standards

Enhancement Objectives

- Review of addressing and road centerline standards and their application

Goal 6 – Improved GIS data distribution

Operational Objectives

- Agency application development as required

Enhancement Objectives

- Facilitate metadata publishing by local government
- Study using a defined projection to improve storage accuracy and usability

Goal 7 – Implement greater levels of open source GIS

Enhancement Objectives

- Develop total cost comparisons between open source and commercial GIS applications
- Implement WFS, Z3950, and other OGC-standards
- Continue to monitor the development of open source server and desktop tools

Goal 8 – Promote view of geographic information as critical information asset

Enhancement Objectives

- Develop service level objectives - a current level of service along with what can be expected. Include data storage types, database, and web services
- Develop and implement plan for disaster recovery of critical data sets, this could include replication of data to the second data center and/or putting data on more robust disk.

Goal 9 – Improved reliability and access of GIS Hub systems

Operational Objectives

- Enhance the Hub Explorer and the Metadata Explorer with new functionality as needed
- Review and update the GIS Hub data model as required

Projects

- Allocate a full-time employee at the Information Technology Department to assist in Hub development

Not Scheduled or Budgeted

- Conversion from ArcIMS to ArcGIS Server as needed

Business Challenges

- Defining data standards that work for both state and local government.
- Continuation of funding.
- Cost of data storage. Future, additional data acquisition may be hampered by the cost of storage.
- Resources for data and application development.
- Application development for state agencies pulls resources away from overall development. However, this is offset by the cost savings generated from re-use of existing infrastructure.
- Transitioning to Open Source GIS tools may have difficulty fitting into ITD enterprise strategies. The use of Open Source GIS tools may be required by state agencies and will be driven by state agencies.

Organizational Strengths

- Executive GIS Technical Committee composed of seven agencies defines data development priorities and overall GIS Hub development
- In-house GIS knowledge at state agencies
- Existing hardware, software, and development staff infrastructure at the Information Technology Department
- Executive order 2001-06 provides a mandate
- General funding from the Legislature
- In May 2004 the National States Geographic Information Council (NSGIC, see www.nsgic.org for more information) released a set of criteria for effective statewide GIS coordination (http://www.nsgic.org/states/statemodel_git.pdf). This criteria is now part of the Fifty States Initiative. When that survey was being conducted, North Dakota responded as follows.

Criteria	Met In North Dakota?
A full-time, paid coordinator position is designated and has the authority to implement the state's business and strategic plans.	Yes
A clearly defined authority exists for statewide coordination of geospatial information technologies and data production.	Yes
The statewide coordination office has a formal relationship with the state's Chief Information Officer (or similar office).	Yes
A champion (politician or executive decision	Yes

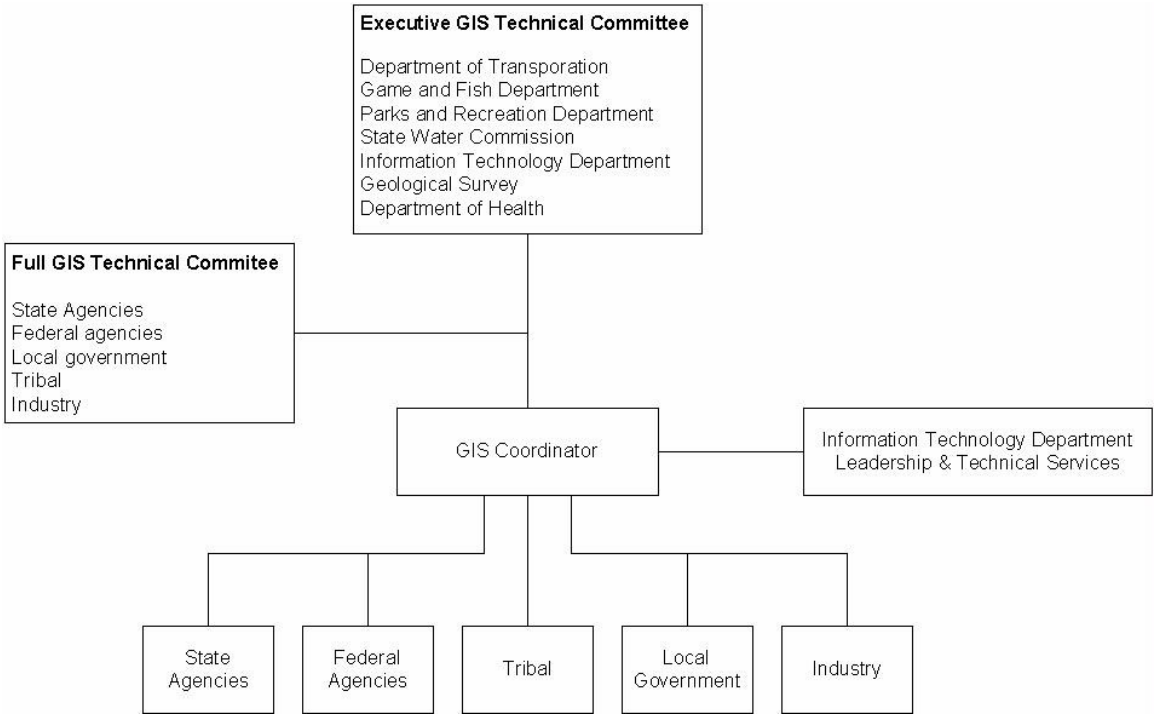
maker) is aware and involved in the process of coordination.	
Responsibilities for developing the National Spatial Data Infrastructure and a State Clearinghouse are assigned.	No
The ability exists to work and coordinate with local governments, academia, and the private sector.	No
Sustainable funding sources exist to meet projected needs.	No
Coordinators have the authority to enter into contracts and become capable of receiving and expending funds.	Yes
The Federal government works through the statewide coordinating authority.	Yes

Budget

GIS Budget 2005-2007	2003-05 Actual	2005-07 Requested	2005-07 Appropriated	2007-09 Estimated*
Total Ongoing Operational Costs	$345,343	$515,084	$515,084	$706,100
Total Implementation & One-time Costs	$333,000	$488,259	$171,850	$238,900
Total Legislative Appropriation:	$678,343	$1,003,343	$687,206	$945,000

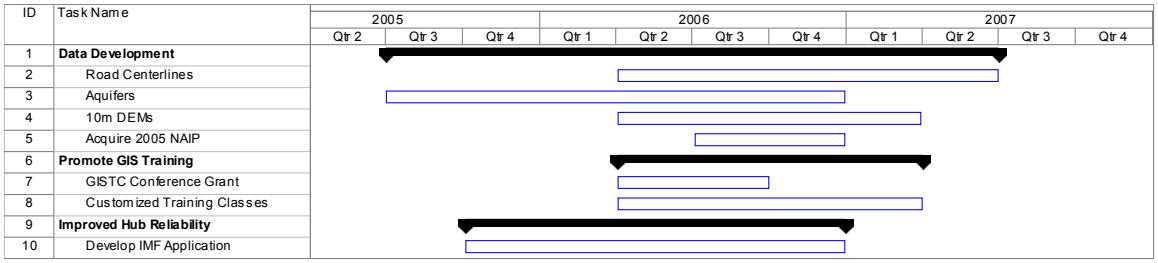
*There will be rate increase for hosting, storage, and developer rates for 2007-2009 but these rates are not yet established.

Organizational Chart



Business Plan Details: 2005-2007 Biennium

Schedule of Projects



Goal 1 – Continued enhancement and development of GIS data

Operational Objectives

- Define maintenance schedule of existing data –
    - For each data set on the GIS Hub, a planned and attainable schedule needs to be defined.

Enhancement Objectives

- Review data framework categories then identify existing and missing data –

    - Existing GIS Hub data layers need to be matched against the base FGDC framework layers. Additional North Dakota-specific framework layers should be defined where there are no FGDC layers for a particular dataset.
- Prioritize framework data sets to be improved and developed –
    - Within the identified framework layers identify those that are in greatest need of updating and for those framework layers that we have no corresponding GIS Hub data, create a plan and budget for development of those layers. Utilize FGDC recommendations for data currency.
- Adopt FGDC currency and accuracy guidelines for framework data –
    - Document and publish on the GIS web site existing FDGC framework currency and accuracy requirements.
- As required, provide support for the NSGIC Imagery for the Nation program –
    - For North Dakota this would consist of annual 1-meter natural color imagery. The GISTC will have to specify the imagery requirements which include: resolution, accuracy, and frequency. By approximately May 2006 the Imagery for the Nation program will have final documentation.
- Acquire 2004 and 2005 NAIP county MrSID data –
    - This data will be obtained as it becomes available. The data will be placed onto the FTP site.
- Post Cass County and Bismarck-Mandan high-resolution aerial photography –
    - This data will be loaded into the GIS Hub ArcSDE and onto the FTP site.
- As required, provide support to the Bureau of Land Management for the development and distribution of Geographic Coordinate DataBase (GCDB) data and applications.

Projects

- Data development:
    - Road centerlines: Pilot project utilizing all available data sources using conflation processes to develop a statewide centerline data set.

    - Aquifers: Update surficial aquifer data with the most recent data sources. This is the continuation of a program begun during the 2003-05 Biennium to update the surficial aquifer data.

    - 10-meter or better Digital Elevation Models (DEMs): Update existing Level 1 30-meter DEMs throughout the state with 10-meter or better data.

    - Acquire 2005 NAIP: Purchase the 2005 NAIP color aerial photography from the Aerial Photography Field Office (APFO) of the Farm Service Agency of the U.S. Department of Agriculture. The data will be offered for purchase during Summer 2006.

    - Hydrologic unit delineation – this project is managed and funded by the Department of Health. This data is needed for watershed delineation.

- Enhanced PLSS – this includes fixing a number of known issues with the current data. At this time the work is expected to be done internally at the Game and Fish Department and the State Water Commission

Not Scheduled or Budgeted

- Drop the _line and _poly suffixes in the Hub database where possible –
  - This suffix convention is no longer necessary as few if any people connect to the GIS Hub using ArcView 3.x. The suffixes will be maintained for data sets that require it, such as water feature layers that are either polygon (_poly) or linear (_line) in nature.
- Develop a grant program to facilitate local government data development –
  - Discussed by the GISTC as a possible means for assisting data development.
- Data development:
  - NHD development – completion of the National Hydrography Dataset for North Dakota
  - FEMA flood map data – this data should be placed onto the GIS Hub.
  - Acquire 2006 NAIP – as this becomes available, the GISTC may wish to purchase this data, though at this time we do not know if this will be 1m or 2m.

Goal 2 – Improved statewide GIS coordination

Enhancement Objectives

- Define and implement a GIS Professional Services Vendor Contract Pool –
  - Modeled after the Information Technology Department IT Vendor Pool, this will allow agencies to be able to quickly obtain GIS services from a pre-qualified pool of vendor specializing in data development, project management, programming, consulting, and several other categories.
- Define a statewide GIS coordination model –
  - Investigate how the current GISTC and Full GISTC coordination model can be enhanced to include more regular communication and participation from a larger base of state, local, and tribal government, including the academic and public sector. The seven characteristics of the Fifty States Initiative will serve as a guide (condensed):
    - Provide a mechanism for broad representation and inclusion in decision-making of user communities, including Federal, state, county, municipal and tribal governments; private sector GIS users and vendors; academic sector; non-profit organizations; utilities; and the general public.
    - A Strategic Plan that incorporates a vision statement, with appropriate goals and objectives related to implementing the NSDI.
    - A business and marketing plan that details the development of a geospatial technology infrastructure (including data) to mirror the definition of the NSDI.

- Formal authorization establishing the council along with appropriate by-laws.
- A relationship and linkage with the nine coordination criteria to feed consensus based decision-making into official statewide initiatives.
- Funding and support to enable the operation.
- A commitment to implement appropriate OGC, FGDC, ANSI, and ISO standards.

Goal 3 – Outreach GIS

Operational Objectives

- Continue to assist in the GIS in K-12 program –
  - This will largely be accomplished by promoting the program wherever possible and assisting the user base with utilization of the GIS Hub. The program is being led by the North Dakota Department of Career and Technical Education. ESRI software and training is being made available to all public and private schools in North Dakota.
- Promote and grow the GIS Users Conference –
  - Continue to advance the quality and content of the GIS Users Conference. Although the conference is currently held annually, the GISTC may consider in the future holding the conference every other year to ensure quality and content.
- Continue the existing partnerships and pursue new opportunities with the federal government, which include The National Map, the NSDI, and the Geospatial One-Stop –
  - The GISTC will continue to grow the GIS Hub and wherever possible work in parallel with federal agencies to assist in accomplishing their goals, which in turn help the state. The seven activities defined by the Fifty States Initiative will serve as a guide:
    - Local, state, tribal, and federal agencies have data sharing agreements in place unless they routinely provide data in the public domain.
    - A published list of local, state, tribal, and federal data stewards and integrators for each of the framework layers is available.
    - Local, state and tribal framework data are being posted to the statewide clearinghouse or otherwise being made available through OGC interfaces.
    - Local, state and tribal data producers create metadata for data holdings and post it to the Geospatial OneStop (GOS) Portal.
    - A functioning clearinghouse or appropriate inventory tool is available to all interested sectors in a state.
    - Local, state and tribal agencies participate in the National Map.
    - Local, state and tribal agencies adopt and incorporate OGC, FGDC, ANSI, and ISO standards as appropriate.

Enhancement Objectives

- Develop MOUs with local and federal government entities –
    - These Memorandums of Understanding help to clarify and solidify relationships with multiple agencies with the goal of assisting in data and application development.

Not Scheduled or Budgeted

- Develop a GIS web site forum for the exchange of ideas and information –
    - Create a web-based forum in which GIS users can log in and supply information and find answers to common and not so common questions.

Goal 4 – Promote GIS training

Operational Objectives

- Continuation of coordinated GIS training –
    - The GISTC has been successful in developing classes led by ESRI instructors or ESRI-qualified instructors. By organizing these classes in Bismarck, significant time and cost is avoided. The GISTC plans to continue this as long as there is a demand. The students from state agencies are the primary audience for these classes, but students from other levels of government and from the academic and public sector are welcome.

Projects

- Conference grant program to facilitate training of GISTC member agencies: Designed to assist sending someone from a GISTC member agency to the ESRI Users Conference who otherwise could not attend due to lack of funds.

- Develop customized training classes: Designed to provide state agencies with a common need a level of specialized training not otherwise found in a standard ESRI class.

Not Scheduled or Budgeted

- Develop coordinated GIS training registration application –
    - Removes the need for the GIS Coordinator to maintain and develop a list of applicants to a planned coordinated GIS training class.

Goal 5 – Improved GIS Standards

Enhancement Objectives

- Develop address and road centerline data standards, with a focus on attributes and spatial accuracy –
    - Addressing standards will be for North Dakota but will follow the recommendations provided in the Street Address Data Standard which is currently under review. See http://www.fgdc.gov/standards/status/sub2_4.html and

http://www.census.gov/geo/www/standards/scdd/StanSubMenu.html#addstand for more information. Road centerline attributes will utilize the Street Address Data Standard but will also contain attributes required by the NDDOT and other entities which are to be defined. Spatial accuracy for road centerlines and other data collection efforts will use the National Standard for Spatial Data Accuracy as a recommended best practice. See http://www.fgdc.gov/standards/status/sub1_3.html for more information. Note that the USGS has submitted a proposal to revise these standards.

Not Scheduled or Budgeted

- Develop more user friendly and understandable metadata standards –
    - The current standards are a subset of the FGDC standards. The North Dakota standards are noted at http://www.nd.gov/gis/mapsdata/metadata/standards/index.html. It is the desire of the GISTC to elaborate and clarify what is required.

Goal 6 – Improved GIS data distribution

Operational Objectives

- Agency application development as required –
    - As agencies require, utilize existing tools and develop enhanced tools to allow display and download of data.

Enhancement Objectives

- Merge ND Geological Survey clearinghouse with the Hub –
    - Complete the merging of data present on the NDGS clearinghouse (which is no longer maintained) with the GIS Hub FTP site. The NDGS will then change the link on their web page to point to the single site.

Not Scheduled or Budgeted

- Develop a raster data extraction application, similar to what is available for the vector data –
    - This would be done using FME/Spatial Direct. It is likely that an additional server, FME license, and ArcView license will be required to handle the load.
- Study using a defined projection to improve storage accuracy and usability –
    - The GIS Hub stores all vector data in the Geographic Coordinate System using NAD83. This works well in most cases but for day-to-day use it is not convenient as the ESRI tools do not allow proper calculation of area. It has been suggested at past GISTC meetings that a customized projection would have benefits which include greater accuracy when storing in ArcSDE and being more user-friendly. Other states have created a statewide customized projection. In North Dakota the GISTC would have to document the projection and get buy-in and usage from state agencies and other interested users.
- Facilitate metadata publishing by local government –

    - Cities, counties, and other interested parties currently can email metadata files to the GIS Coordinator who in turn will publish the metadata on the GIS Hub Metadata Explorer. It would be preferable to allow these entities or personnel to have a tool by which they can publish their metadata to the GIS Hub. Their metadata would be searchable on the GIS Hub, but those metadata records would point to the local data source.
- Make available all USGS B&W DOQQs available on the FTP site –
    - Individual Digital Orthophoto Quarter Quadrangles used to create seamless layers on the GIS Hub will be loaded onto the FTP site to allow downloading of the individual DOQQs.

Goal 7 – Implement greater levels of open source GIS

Operational Objectives

- Complete implementation of OGC (Open Geospatial Consortium) WMS (Web Map Service) –
    - To be used with the National Map as the first priority. As a side benefit, other parties can access the WMS service.

Enhancement Objectives

- Continue to monitor the development of open source server and desktop tools –
    - The area of open source GIS is evolving rapidly at both the server and desktop levels. The GISTC will continue to monitor the open source tools with the goal of understanding their application to the GIS Hub and to agency use. The utilization of open source GIS tools will have to be done in accordance with North Dakota's Enterprise Architecture.

Not Scheduled or Budgeted

- Develop an open source pilot project designed to measure the strengths/weaknesses of the products and the applicably of the products to enterprise GIS at the state level and for use within local government. –
    - The on-going State Water Commission work may accomplish this objective which is effectively using a number of open source tools for internal applications.

Goal 8 – Promote view of geographic information as critical information asset

Enhancement Objectives

- Define critical applications and data sets (resources such as the Homeland Security Infrastructure Protection (HSIP) Program may be of assistance). These will be on more expensive hosting systems –
    - Critical applications and critical data sets need to be determined. A budget will have to be developed to allow those applications and data sets that are deemed critical to be placed on redundant and more costly systems.

Not Scheduled or Budgeted

- Define service level objectives – A current level of service along with what can be expected. Include data storage types, database, and web services –
    - This will be a joint project between the GISTC and ITD. Documentation will be developed to illustrate the level of support and uptime for each component of the GIS Hub.
- Investigate back-up services such as off-site storage, data replication, etc., then identify needs of redundancy or mirroring of data at alternate sites –
    - Currently existing options that provide levels of disaster recovery while at the same time providing a level of backup need to be identified. Based on this information, the GISTC can plan how these systems can be utilized for critical applications and data that should have been previously defined.

Goal 9 – Improved reliability and access of GIS Hub systems

Operational Objectives

- Enhance the Hub Explorer and the Metadata Explorer with new functionality as needed –
    - As required by state agencies and from suggestions made by other users, make these two primary tools easier to use with increased functionality. This includes improving ArcIMS security.

Enhancement Objectives

- Develop a GIS Hub data model –
    - The data model will be based on the current data sets. It will provide documentation useful to application developers and it will provide another level of Quality Assurance when loading data.

Projects

- Development of Internet Mapping Framework (IMF) as possible replacement to Hub Explorer template: IMF from Latitude Geographics provides a server-side template used for ArcIMS application development. Benefits of using IMF include improved application speed, functionality that would otherwise have to be developed for the Hub Explorer, utilization of WMS data, and server side processing.

Not Scheduled or Budgeted

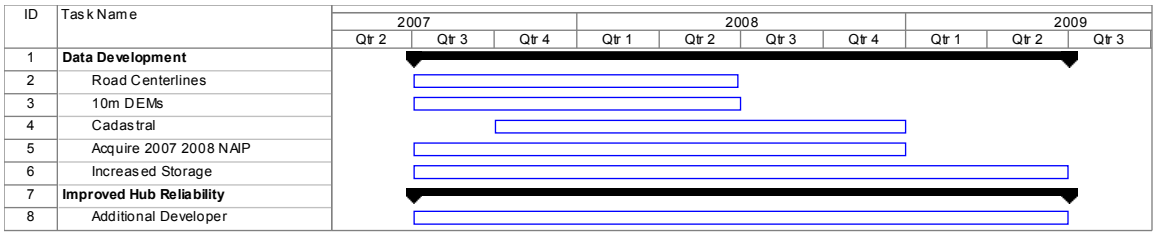
- Development of a web-based editing environment. –
    - A number of agencies have indicated a possible interest in allowing a user to edit data within a browser. This can be done in a variety of ways, with the most common the likely use of the ArcSDE API.
- Develop greater/easier access to Hub by remote agency field offices, e.g., better connections from GNF, P&R, and Health Department field offices. –
    - Some agencies have noted degraded speeds when accessing the GIS Hub. Networking bottlenecks would have to be investigated but multiple servers

inside and outside of the firewall may provide additional benefits yet to be determined.

- Enhance data loading tools for state agency use –
    - Approved data stewards would be able to load approved data sets onto the GIS Hub production area using a web-based data loading wizard that includes field checking against a data model. It is likely this would utilize Spatial Direct and FME which is already in use for data extraction.

Business Plan Details: 2007-2009 Biennium

Schedule of Projects



Goal 1 – Continued enhancement and development of GIS data

Operational Objectives

- Update maintenance schedule of existing data –
    - For each data set on the GIS Hub, a planned and attainable schedule needs to be maintained and defined where needed.
- As required, provide support for the NSGIC Imagery for the Nation program –
    - In North Dakota this will consist of annual 1-meter natural color imagery. The GISTC will have to specify the imagery requirements which include; among other items, resolution, accuracy, and frequency.

Enhancement Objectives

- Review framework data sets to be improved and developed –
    - Within the identified framework layers identify those that are in greatest need of updating. For those framework layers that we have no corresponding GIS Hub data, create a plan and budget for development of those layers. Utilize FGDC recommendations for data currency.
- Data development:
    - Geodetic – define the data steward, this data is being maintained at the State Water Commission and the Department of Transportation
    - FEMA flood map data – this data should be placed onto the GIS Hub

Projects

- Data development:

- Road Centerlines: Continuation and possible completion of the project started during the 2005-2007 Biennium which utilizes all available data sources using conflation processes to develop a statewide centerline data set.

- 10-meter or better Digital Elevation Models (DEMs): Continuing from the DEM updates begun during the 2005-2007 Biennium, update existing Level 1 30-meter DEMs throughout the state with 10-meter or better data.

- Cadastral: Develop a state-wise cadastral data set using all available data sets. This may be a pilot project.

- Acquire 2007 and 2008 NAIP: Purchase the 2007 and 2008 NAIP color aerial photography from the Aerial Photography Field Office (APFO) of the Farm Service Agency of the U.S. Department of Agriculture. This assumes the data is 1-meter and that the data is not available from the Imagery of the Nation Program. Even if the Imagery program is viable at this time, this budgeted item could be used by the state to buy-up to other needed products such as color-infrared.

- Increased Storage Capacity: As new data becomes available, the GIS Hub will require more disk storage. Data can be stored on disk systems at ITD ranging in cost from $1/gigabyte/month to $20/gigabyte/month. This range in rates reflects federal pricing mandates along with ITD support levels.

  A note on ITD storage rates: From ITD administration, "Federal pricing mandates are based on Federal Circular A-87 - Cost Principles for State, Local and Indian Tribal Governments which restrict ITD from accumulating more than two times our monthly expenditures in reserve. In other words ITD cannot generate a profit greater than two times the amount ITD spends each month on average for ITD services. The logic behind this is governments were charging programs receiving federal funds more than their costs and transferring the excess money to their general fund."

Not Scheduled or Budgeted

- Data Development:
  - NHD development – the 24k hydrology work is complete, now complete the National Hydrography Dataset for North Dakota

Goal 2 – Improved statewide GIS coordination

Enhancement Objectives

- Review status and implementation of statewide GIS coordination model –
  - Review in the context of the Fifty States Initiative, determine where we can improve.

- Provide a web-based statewide tool that allows a user to quickly note data that has been or will be developed and to easily allow the data to be uploaded for use on the GIS Hub –
    - Users can click on a number of choices that describe their planned or existing data. They have the option of uploading their data for use on the GIS Hub, including the ability to match the layers/fields in the new data to the layers/fields from their previous upload. Any changes to this inventory system would be collected and distributed to subscribers of an email list, letting them know something has changed. This tool may be modeled after the NSGIC Ramona tool and the USGS Geospatial One-Stop tool.

Goal 3 – Outreach GIS

Operational Objectives

- Assist in the GIS in K-12 program –
    - This will largely be accomplished by promoting the program wherever possible and assisting the user base with utilization of the GIS Hub. The program is being led by the North Dakota Department of Career and Technical Education. ESRI software and training is being made available to all public and private schools in North Dakota.
- Promote and grow the GIS User Conference –
    - Continue to advance the quality and content of the GIS Users Conference. Although the conference is currently held annually, the GISTC may consider in the future holding the conference every other year to ensure quality and content.
- Continue the existing partnerships and pursue new opportunities with the federal government, which include The National Map, the NSDI, and the Geospatial One-Stop –
    - The GISTC will continue to grow the GIS Hub and wherever possible, working in parallel with federal agencies to assist in accomplishing their goals, which in turn help the state.
- Develop MOUs with local and federal government entities –
    - These Memorandums of Understanding help to clarify and solidify relationships with multiple agencies with the goal of assisting in data and application development.
- Review the status and benefit of existing MOUs –
    - Update where needed.

Goal 4 – Promote GIS training

Operational Objectives

- Continuation of coordinated GIS training –
    - The GISTC has been successful in developing classes led by ESRI instructors or ESRI-qualified instructors. By organizing these classes in

Bismarck, significant time and cost is avoided. The GISTC plans to continue this as long as there is a demand. The students from state agencies are the primary audience for these classes, but students from other levels of government and from the academic and public sector are welcome.

Enhancement Objectives

- Consideration of developing training in other parts of the state –
    - Determine the benefits associated with expanding or modifying the existing coordinated GIS training to hold classes in other parts of the state.

Goal 5 – Improved GIS Standards

Enhancement Objectives

- Review of addressing and road centerline standards and their application –
    - Review the implementation of these standards.
- Develop cadastral standards –
    - These standards will use as a guide the FGDC Cadastral Data Content Standard published at http://www.fgdc.gov/standards/status/sub3_5.html .

Goal 6 – Improved GIS data distribution

Operational Objectives

- Agency application development as required –
    - As agencies require, utilize existing tools and develop enhanced tools to allow display and download of data.

Enhancement Objectives

- Facilitate metadata publishing by local government –
    - Cities, counties, and other interested parties currently can email metadata files to the GIS Coordinator who in turn will publish the metadata on the GIS Hub Metadata Explorer. It would be preferable to allow these folks to have a tool by which they can publish their metadata to the GIS Hub. Their metadata would be searchable on the GIS Hub, but those metadata records would point to the local data source.
- Study using a defined projection to improve storage accuracy and usability –
    - The GIS Hub stores all vector data in the Geographic Coordinate System using NAD83. This works well in most cases but for day-to-day use it is not convenient as the ESRI tools do not allow proper calculation of area. It has been suggested at past GISTC meetings that a customized projection would have benefits which include greater accuracy when storing in ArcSDE and being more user-friendly. Other states have already created a statewide customized projection. In North Dakota the GISTC would have to document the projection and get buy-in and usage from state agencies and other interested users.

Goal 7 – Implement greater levels of open source GIS

Enhancement Objectives

- Develop total cost comparisons between open source and commercial GIS applications –
    - Tabulate both server and desktop products listing all costs including training, initial purchase, maintenance fees, development, and transition from commercial to open source.
- Implement WFS, Z3950, and other OGC-standards –
    - The primary driver for this will be need and application. The Z3950 standard is needed as part of the NSDI.
- Continue to monitor the development of open source server and desktop tools –
    - The area of open source GIS is evolving rapidly at both the server and desktop levels. The GISTC will continue to monitor the open source tools with the goal of understanding their application to the GIS Hub and to agency use. The utilization of open source GIS tools will have to be done in accordance with North Dakota's Enterprise Architecture.

Goal 8 – Promote view of geographic information as critical information asset

Enhancement Objectives

- Develop service level objectives – A current level of service along with what can be expected. Include data storage types, database, and web services –
    - This will be a joint project between the GISTC and ITD. Documentation will be developed to illustrate the level of support and uptime for each component of the GIS Hub.
- Develop and implement plan for disaster recovery of critical data sets, this could include replication of data to the second data center and/or putting data on more robust disk. –
    - This assumes that data and application have been defined as being critical and in need of being part of a disaster recovery. This work should be done in conjunction with ITD though directly working with other states having the same objective needs to be considered.

Goal 9 – Improved reliability and access of GIS Hub systems

Operational Objectives

- Enhance the Hub Explorer and the Metadata Explorer with new functionality as needed –
    - As required by state agencies and from suggestions made by other users, make these two primary tools easier to use with increased functionality.
- Review and update the GIS Hub data model as required –
    - The data model will be based on the current and planned data sets. It will provide documentation useful to application developers and it will provide another level of Quality Assurance when loading data.

Projects

- Allocate a full-time employee at the Information Technology Department to assist in Hub development.

Not Scheduled or Budgeted

- Conversion from ArcIMS to ArcGIS Server as needed –
    - ESRI may be ending ArcIMS development in the future, creating the need to switch to using ArcGIS Server. Identify conversion requirements, costs, training.

Future State - Technology

A look into the future state of GIS in North Dakota (at the state level) in an attempt to view the general direction of technology may be helpful in planning. No time constraints are considered. The trend that is displayed in the following table demonstrates that open source tools may become more prevalent and that at minimum need to be constantly monitored for applicability, functionality, and cost effectiveness.

Item	Current	Future Possibilites
Server: Database	Oracle & SQL Server	1) Oracle & SQL Server 2) PostgreSQL[1]
Server: Spatial Engine	ArcSDE on Oracle & ArcSDE on SQL Server	ArcSDE on Oracle; ArcSDE on SQL Server, ArcSDE on PostgreSQL[2]; PostGIS on PostgreSQL[3]
Server: Web Infrastructure	IBM HTTP, WebSphere, IIS	IBM HTTP, WebSphere, IIS, Apace, Tomcat, Geronimo
Server: Web GIS	1) ArcIMS & MapServer 2) Metadata Explorer	1) MapServer 2) GeoNetwork for metadata
Server: Hardware	Database: Sun Web: Windows	Database: Intel/AMD with Linux[4] Web: Windows & Linux
Desktop GIS	1) ArcGIS 2) web applications	1) ArcGIS, possibly including ArcGIS Server, and web applications 2) OS tools such as JUMP, uDIG, QGIS, Thuban, GRASS
Desktop Operating System	Windows, Macintosh	Windows, Macintosh, Linux
Web Data Services	1) ArcIMS 2) OGC-WMS	OGC-WMS & WFS
ArcGIS Desktop GIS	Each agency has its	Enterprise licensing as an option to an

Licensing	own license	agency to supplement existing agency license – to obtain less expensive licenses for the agencies. But there is the issue of ensuring each agency has no change in ESRI support.

[1]Assumes this is a viable tool and can fit into ITD's strategy
[2]As above and depends on the level of support provided by ESRI
[3]Much testing would have to be done to ensure this is a viable solution. Futuristic!
[4]Assumes Oracle runs on this platform

The GISTC recognizes that by nature GIS is a distributed system. Data may come from federal, state, tribal, and local sources. The GIS Hub and applications on it will continue to utilize and expand the usage of various data sources through direct database connections and OGC-compliant web data services as much as possible.

List of Acronyms

ANSI – American National Standards Institute: administers and coordinates the U.S. standardization and conformity assessment system

ArcIMS – ESRI Internet Map Server: software that delivers maps and information through the Web

ArcSDE – ESRI Spatial Database Engine: software used to access spatial data stored in a relational database management system

DEM – Digital Elevation Model: digital representation of elevation consisting of a regular array of elevations of ground positions

DOQQ – Digital Orthophoto Quarter Quadrangle: digital image of an aerial photograph covered a quarter of a USGS mapping quadrangle. Each quarter quadrangle covers 3.75 minutes of latitude and 3.75 minutes of longitude.

ESRI – Environmental Systems Research Institute: software company based in Redlands, California which produces commercial GIS software.

FGDC – Federal Geographic Data Committee: responsible for coordinating the development, use, sharing, and dissemination of geospatial data across the nation

GIS – Geographic Information System: computer-based system used to manage and integrate spatial data, maps are a common by-product

GISTC – North Dakota GIS Technical Committee: consists of seven state agencies acting as a clearinghouse of state GIS activities and responsible for disseminating spatial data

GNF – North Dakota Game and Fish Department

ISO – International Standards Organization: international organization who develops technical standards

IT – Information Technology: dealing with the use of computers and telecommunications

ITD – North Dakota Information Technology Department

MrSID – Multi-Resolution Seamless Image Database: image compression file format

NAD83 – North American Datum 1983: earth-centered elevation datum used as a basis for surveying and mapping

NAIP – National Agriculture Imagery Program: the program is administered through the Aerial Photography Field Office of the US Department of Agriculture (USDA) Farm Service Agency. NAIP imagery is intended to support USDA agriculture management programs.

NDDH – North Dakota Department of Health

NHD – National Hydrography Dataset: digital spatial data that contains information about surface water features such as lakes, ponds, streams, rivers, wells, and springs.

NSDI – National Spatial Data Infrastructure: technologies and policies used to promote sharing of geospatial data throughout government, administered by the FGDC

NSGIC – National States Geographic Information Council: national organization of states with a goal of efficient and effective government through effective use of geospatial information technologies

OGC – Open Geospatial Consortium: non-profit organization which leads the development of standards for geospatial and location-based services.

PLSS – Public Land Survey System: method for subdividing and describing land in the US. Regulated by the US Department of the Interior's Bureau of Land Management

P&R – North Dakota Parks and Recreation Department

SWC – North Dakota State Water Commission

USGS – U.S. Geological Survey

WFS – Web Feature Service: vector data (lines, points, polygons) delivered via the Web in an open standard format

WMS – Web Map Service: image data (aerial photography, scanned image, etc.) delivered via the Web in an open standard format