# STRATEGIC PLAN FOR DEVELOPMENT AND DEPLOYMENT OF IDAHO'S SPATIAL DATA INFRASTRUCTURE

**Version 1.0**

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# 1. STRATEGIC PLANNING METHODOLOGY AND BACKGROUND

## 1.1 Project Background and Purpose

In February 2008, the State of Idaho was awarded a Category 3 Federal Geographic Data Committee (FGDC) Cooperative Assistance Grant (CAP) for "Strategic and Business Plan Development in Support of the NSDI Future Directions Fifty States Initiative." This grant is intended to assist states in the development and implementation of strategic and business plans to facilitate the coordination of programs, policies, technologies, and resources. Planning work under this grant program began in March 2008. The project is being managed by the Idaho Geospatial Office (IGO) which is part of the State's Office of the Chief Information Officer (CIO).

This work is being carried out within a national context and adopts the principles defined as part of the National Spatial Data Infrastructure (NSDI). It follows guidelines and a planning approach espoused by the "50 States Initiative" (www.nsgic.org/hottopics/fifty_states.cfm), organized as a partnership between the Federal Geographic Data Committee (FGDC) and the National States Geographic Information Council (NSGIC). Each state realizes its spatial data infrastructure (SDI), which fits within the National Spatial Data Infrastructure (NSDI) and feeds the National Map.

**Spatial Data Infrastructure (SDI) Definition (from OMB Circular A-16):**

The technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data.

The main goal of the SDI is to improve statewide coordination and access to geographic data and services to support the business needs of Idaho stakeholders by building on existing GIS capabilities and spatial data development in Idaho. The main objectives of this project are to prepare a strategic plan and a business plan to guide full development and deployment of the Idaho SDI. From its outset, this SDI planning effort has maintained a *statewide* perspective with a focus on the needs and coordination of all Idaho stakeholders.

SDI development will be based on optimal use of GIS technology which is the foundation for a large range of applications that support users' business needs. Appendix A provides a brief tutorial on GIS concepts for those readers without great familiarity with the technology and its uses.

## 1.2 Project Participants and Planning Approach

The planning project is being managed by Idaho's Geospatial Office (IGO) and the state's Geospatial Information Officer (GIO) is the project manager. An Executive Steering Committee (ESC) with representatives from state and local government has been assembled to support project management and Idaho's Geospatial Committee (IGC) is acting as an oversight body. The members of the ESC include:

- Gail M. Ewart, Idaho GIO, Idaho Geospatial Office (ESC Chair)
- Anne Kawalec, Ada County
- Jacob Mundt, Ada County
- Nick Nydegger, Idaho Military Division
- Tony Morse, Idaho Department of Water Resources
- Scott Van Hoff, U.S. Geological Survey, Idaho Liaison

The firm of Croswell-Schulte IT Consultants has been engaged to assist in the project. The scope includes participation and input from a broad geospatial community in all types of organizations throughout the state.

This project follows accepted strategic and business planning methodologies and the planning templates and support materials developed by the FGDC and NSGIC as part of the "50 States Initiative" (see www.fgdc.gov/policyandplanning/50states). The approach includes the key activities of information gathering, research, plan preparation and review, executive summary, and plan presentation. The project scope includes the following main phases:

- Phase 1: Project Orientation and Planning Meeting, General Project Set-up and Management
- Phase 2: Regional Stakeholder Meetings, Information Gathering and Compilation
- Phase 3: Strategic Plan Preparation and Presentation
- Phase 4: Business Plan Preparation and Presentation
- Phase 5: Executive Summary Preparation

A critical part of the planning process has included contact with and information gathering from a wide spectrum of Idaho's geospatial user community, including all levels of government, the private sector, tribal governments, non-profit organizations, and the academic community. Communication with these groups has been conducted using a variety of approaches including:

- Ongoing contact through the state's Geotech listserv managed by the Idaho Geospatial Office
- Six regional stakeholder meetings—facilitated sessions that included over 110 people representing the full range of stakeholder organizations
- Meetings with senior officials (state and local government agencies) to gather ideas about long-term direction, business needs, and financing SDI development
- A custom survey gathering information on GIS status, applications, limitations, benefits, and ideas for future development
- Ongoing exchange of information via telephone and email communications
- Participation and outreach at meetings of key professional associations and industry groups including Idaho Association of Assessors, Idaho Society of Professional Land Surveyors, and the Idaho Geospatial Forum

Information about Regional Stakeholder Meetings and the survey form is included in Appendix B.

## 1.3 Strategic Plan Overview

Strategic planning is essential for success of the SDI. Strategic planning is an established part of the "50 States Initiative" and, over the past 20 years, has become a proven technique for major GIS and information technology development efforts.

> "*Strategic Planning is a process by which we can envision the future and develop the necessary procedures and operations to influence and achieve that future.*"
>
> - Clark Crouch (noted strategic planning educator, author, and consultant)

This *Strategic Plan* establishes a long-term path for SDI development and operation in Idaho. It serves as the "compass" which guides overall SDI development activities and creates the strategic platform for organizing specific implementation work. The vision, mission, and goals create a firm foundation for specific SDI implementation activities.

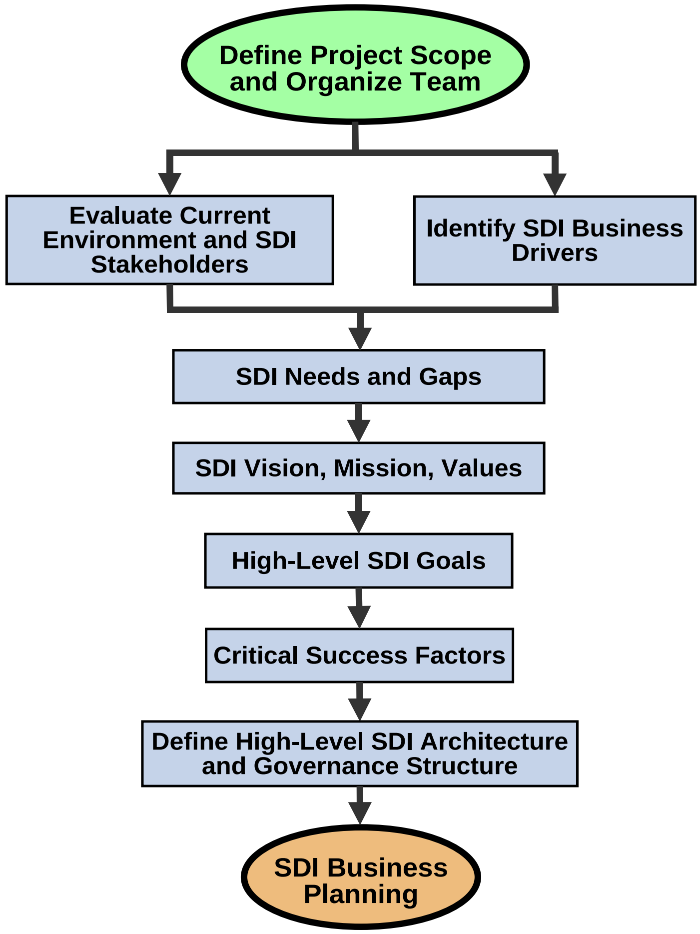
The *Strategic Plan* and the *Business Plan* complement each other. The *Strategic Plan* defines the long-term target and direction for implementing a SDI, while the *Business Plan* provides more detail on approach and resources for accomplishing strategic goals and a business case for proceeding. Together, the *Strategic Plan* and *Business Plan* provide a basis for action and for generating support and wide participation in achieving the vision.

This *Strategic Plan* includes the major sections summarized below:

- Section 1, Strategic Planning Methodology and Background, presents information about the planning project and describes the content and context for the Strategic Plan
- Section 2, GIS Coordination History and Current Status, gives background about the history and status of SDI coordination and use in Idaho to establish a baseline for future SDI development
- Section 3, Strategic Foundation, presents the core contents of the strategic plan including a vision, mission, and high-level goals which together establish a future target and path for SDI development and deployment
- Section 4, SDI Architecture, explains the SDI's technological and organizational components. This architecture paints a high-level picture of the system configuration, data, governance, and management elements that work together in a successful SDI
- Section 5, Implementation Strategy, addresses implementation initiatives associated with high-level goals stated in Section 3. The *Business Plan* will provide more details about these implementation initiatives
- Appendices contain more detailed information elaborating on topics presented in the body of the plan.

Figure 1 is a picture of the strategic planning process which began with an evaluation of the current environment and the business drivers for the SDI. Needs are examined along with an identification of current gaps and limitations. This was followed by the development of a vision and mission for the future SDI and the values and guiding principles upon which SDI development and operation are based. High-level goals which address the various technical, organizational, and financial areas for SDI development are then prepared. The strategic plan culminates in the definition of implementation initiatives which explain specific areas of work to accomplish the stated goals. The *Strategic Plan* encompasses goals and implementation activities for completion in a five-year period, beginning in January 2009.

**Figure 1:**
**Overview of Strategic Planning Components**

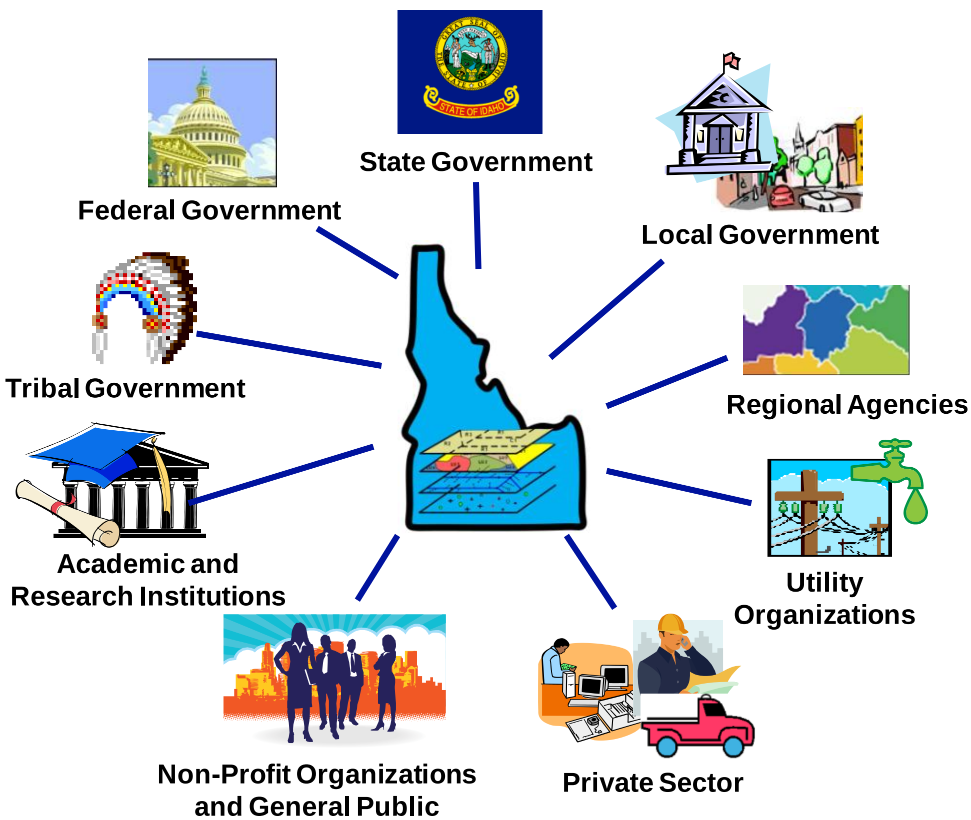


## 2. OVERVIEW OF THE HISTORY AND CURRENT STATUS OF GIS IN IDAHO

### 2.1 Overview of the Statewide GIS User Community

GIS technology has been used in Idaho for the past 30 years. Use began in state government with the creation, in 1978, of the Idaho Image Analysis Facility in Idaho Department of Water Resources (IDWR). The IDWR became an active user of GIS and remote sensing technology, and in the late 1980s and early 1990s, other state agencies including the Department of Lands, Department of Environmental Quality, Department of Fish and Game, and the State Tax Commission, gradually adopted GIS technology. Since the early 1990s, GIS technology has become an important tool used by a wide range of state agencies. Also during this period, GIS technology became popular with local governments, utilities, and many other public- and private-sector organizations. As illustrated in Figure 2, the current Idaho geospatial community encompasses a wide range of stakeholder groups reflecting the importance of geographic information. More information about the history and current status of GIS technology implementation and use in Idaho is provided in Appendix C.

**Figure 2:**
**The Idaho Geospatial User Community**



## 2.2 History and Current Status of SDI Coordination in Idaho

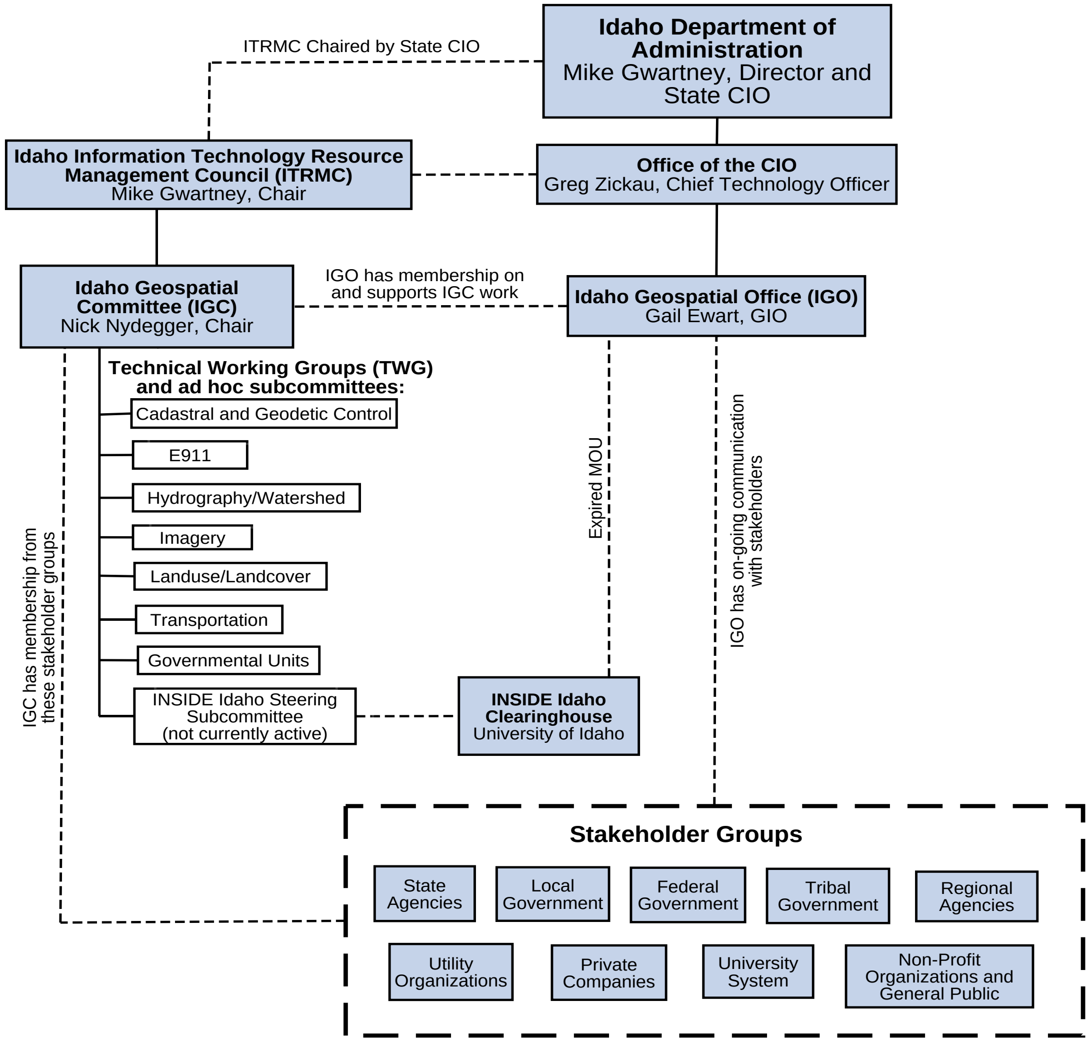
Formal actions to coordinate GIS efforts in Idaho go back to initial discussions and planning in 1978 which culminated in a 1980 Executive Order from the Governor's Office that established the Idaho Image Analysis Facility (IIAF) in the Idaho Department of Water Resources (IDWR) and designated IDWR as the lead state agency for remote sensing and geographic information systems. State GIS coordination was advanced in the 1980s with the empowerment of the Idaho Mapping Advisory Council (IMAC) later renamed the Idaho Geographic Information Advisory Committee (IGIAC) in a 1988 Executive Order (88-16). Following the 1988 EO, a series of formal actions took place to strengthen GIS coordinated activities and to broaden GIS collaboration statewide. Some key organizational milestones include:

- 1992 Executive Order (92-24) reauthorized IGIAC and renamed the Image Analysis Facility to the Idaho Geographic Information Center (IGIC).
- IGIAC and IGIC were reauthorized by an additional Executive Order in 1996 with a redefined membership and designation as a multi-organizational coordinating body under, the newly formed Information Technology Resource Management Council (ITRMC).
- Executive Order in 2001 (EO 2001-07) establishing the Idaho Geospatial Committee (IGC) and a state GIS Coordinator position.
- Preparation of the thematic I-Plans and an overall 2003 I-Plan for state GIS coordination.
- 2006 Executive Order (EO 2006-05) was approved to continue the geospatial coordination structure established in 2001.

Currently, ongoing management and coordination of statewide SDI resides in the Idaho Geospatial Office (IGO) led by the Geospatial Information Officer (GIO). The GIO and her small staff support and coordinate efforts with the IGC and with GIS personnel in state agencies. In addition, the IGO keeps in communication with GIS professionals in non-state government organizations around the state.

More details about the history and status of statewide GIS coordination in Idaho are included in Appendix C.

**Figure 3**
**Current Organizational Structure for the Idaho SDI**




Working in parallel with this formal coordination structure are informal groups and collaborations that have been created to support local and regional GIS programs and projects. For the most part, these are launched by users to support sharing of information, project costs, and education/training activities. Of particular note are:

- Regional Idaho user groups: Ada County Special Interests Group (SIG), Canyon County Spatial Data Consortium (SDC), Southwest Idaho GIS Users Group (SWIG), Kootenai County GIS consortium, Southeast Idaho Regional user Group, ESRI Technical Working Interest Group (TWIG), North Central Idaho Networking Cooperative, ESRI Panhandle User Group
- URISA Northern Rockies Chapter (www.intermountaingis.org/)
- Northwest ESRI User Group
- Avista-led effort for orthoimagery development—collaboration with local governments in northern Idaho
- Idaho Power program for parcel database development support with county governments

## 2.3 Overview of System Infrastructure and GIS Technology Use in Idaho

### 2.3.1 Computer System Infrastructure and Standards in Idaho

GIS technology is dependent on a sound computing infrastructure that includes computer hardware, networks, and standards that support system administration and integration. At the state government level, information technology infrastructure is managed by the Department of Administration's Office of the CIO with input and direction provided by the Information Technology Resources Management Technology (ITRMC). The ITRMC includes representation for state and local government and the private sector and approves standards, guidelines, and policies that are the basis for information technology procurements and development (see www2.state.id.us/itrmc/plan&policies.htm).

In addition to the general enterprise IT standards referred to above, the ITRMC has approved a number of specific GIS standards (based on IGC recommendations), listed below.

- ITRMC Standard: S4210 Projection
  http://www2.state.id.us/itrmc/plan&policies/Standards/S4210_Projection.pdf
- ITRMC Standard: S4220 Geospatial Metadata
  http://www2.state.id.us/itrmc/plan&policies/Standards/S4220_GeospatialMetadata.pdf
- ITRMC Guideline: G420 – Roles of GIS Participants
  http://www2.state.id.us/itrmc/plan&policies/guidelines/G420%20-%20Roles%20of%20GIS%20Participants.pdf
- ITRMC Policy: P1070 – Geographic Information Systems (GIS)
  http://www2.state.id.us/itrmc/plan&policies/Policies/P1070_GeographicInformationSystems.pdf
- ITRMC Guideline: G320 - Geographic Metadata
  http://www2.state.id.us/itrmc/plan&policies/guidelines/G320_Metadata.pdf

More information summarizing enterprise IT standards in the state is included in Appendix C.

### 2.3.2 GIS Software

GIS applications are based on commercial or public domain software packages that provide off-the-shelf capabilities and tools for custom applications for geographic data management. GIS implementations normally make use of one or more of the following types of software which are blended together to provide a range of GIS functionality:

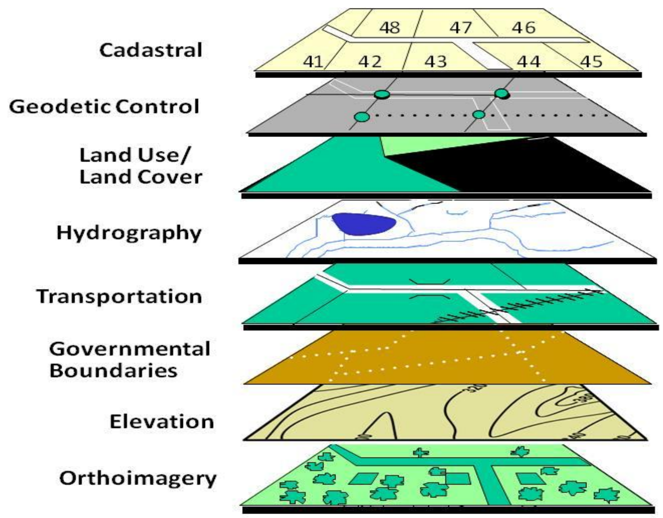
- Core GIS Software
- Image Management/Remote Sensing Software
- Database Management Software
- Web-based GIS Software
- Special Application Software Packages or
- Field-based GIS

While there is no required software standard at the state government level, the predominant software packages in use by state agencies are provided by Environmental Systems Research Institute (ESRI). ERDAS software is used by some agencies for image access and remote sensing applications, and AutoCAD is used for some selected mapping applications. ESRI GIS software is also widely used by local governments, federal agencies, utility companies, and other users in Idaho. These organizations make considerable use of ArcGIS desktop, ArcSDE, and ArcIMS for Web-based applications. Some organizations have recently implemented ArcGIS Server, and others are interested in adopting this relatively new software offering from ESRI. Some local government agencies use GIS and digital mapping software from other vendors, including Intergraph, AutoDESK, and others.

Additional information about GIS software use in Idaho is provided in Appendix C.

## 2.4 Geographic Data Development Status and Use

SDI success is dependent on high-quality, statewide geospatial data which is well-maintained and adheres to acceptable content and format standards to support effective use and sharing. SDI development has a central focus on Framework data themes—spatial data that is commonly needed by a wide spectrum of GIS users with a goal toward developing and maintaining coverage statewide. Currently accepted Idaho Framework themes include:




The Idaho Geospatial Office (IGO) has proposed several additional themes for acceptance as Framework data including: Bioscience, Geoscience (soils, surficial geology), Climate, Public Safety, Utilities (pipelines, broadband communications), and Hazards.

Statewide coordination of Framework Data is managed through Technical Working Groups (TWGs) established under the IGC. There are currently six active TWGs (Cadastral and Geodetic Control, E911, Hydrography/Watershed, Landuse/Landcover, Imagery, Transportation) and one additional TWG, Governmental Units, is being organized. Also, the current E911 TWG is being reorganized as the Public Safety/Preparedness TWG. See www2.state.id.us/itrmc/committees/igc/twgs.htm and http://gis.idaho.gov for more information about the status of TWG activities.

There has been significant progress in Framework database development in Idaho, but much work remains to reach the ultimate objective of statewide coverage and sound ongoing stewardship. Table 1 provides summary information about the status of Framework database development and challenges that remain.

**Table 1: Status of Framework Data Theme Development**

| Framework Data Theme* | Development Status |
|---|---|
| Geodetic Control | Height modernization can proceed with ITD as the lead agency. |
| Orthoimagery | There is statewide coverage available from the 2004 NAIP project (1-meter resolution natural color orthoimagery) and plans/partnership program is in place for 2009 statewide NAIP reacquisition (1-meter resolution, color). Also, selected local governments and utility companies have acquired recent higher-resolution (1-foot and 6-inch) leaf-off orthoimagery. |
| Transportation | INSIDE Idaho and the Coeur d'Alene Tribe, with funding from USGS, are leading the effort to assemble statewide road transportation network (including highways and local streets). A common data model is in place, and 22 counties and the Coeur D'Alene Tribe have contributed data and other counties plan to contribute data. |
| Hydrography/ Watersheds | With statewide completion of the high-resolution National Hydrography Dataset (NHD) complete, the main focus is on data improvements (stream names, flow direction) and long-term data stewardship. Watershed boundaries are complete, but stewardship is needed to incorporate high resolution elevation data and hydrography updates. |
| Governmental Units | Working group currently being established. Little work completed for consistent, statewide governmental unit coverage. The State Tax Commission (STC) is working on general government boundaries, taxing districts and tax code areas. The state Legislative Services Office (LSO) is working on voting precinct boundaries. |
| Cadastral Reference and Parcels | There is a nascent effort for statewide assembly of improved coordinate data for public land survey corners. Little is being done by federal agencies for GCDB improvement on federal land. Some counties have undertaken their own surveys. An application has been developed for import of enhanced survey control and adjustment of GIS data. A large number of Idaho's 44 counties have some level of digital parcels and tax district boundary data, but the format, specifications, and accuracy level is inconsistent. Current survey of County Assessor's should provide information for development of standards and statewide database development. |
| Land Use/ Land Cover | No recent, highly accurate land cover or land use GIS data is available statewide although some local governments have gathered land use data. The federal government (USGS and EPA) has general land cover data available for the state (National Land Cover Dataset-NLCD) compiled through classification of Landsat Thematic Mapper data (imagery from the 1990s). In addition, the IDWR has compiled some land cover data sets for southern Idaho. There is also selected land cover data available from and state's GAP analysis (2001) and soon, from the NW ReGAP effort. |
| Elevation | National Elevation Dataset (NED) data (10-meter cell format) is available for the entire state. This provides general topographic data. No statewide effort toward compilation of more detailed digital elevation data is contemplated at this time, but LIDAR data has been collected for some areas of the state. |

*Several additional themes have been proposed for Idaho Framework status: Bioscience, Climate/Meteorological, Public Safety/Critical Facilities, Natural Hazards, and Geoscience (soils, geology).

## 2.5 GIS as Part of Overall Information Technology Strategy

Information technology development and operation at the state government level is guided by the Information Technology Resources Management Council (ITRMC) established by the Idaho Legislature in 1996. ITRMC's mission is to review and evaluate current IT and communications systems and to prepare plans and provide direction for future IT enhancement and development for organizations statewide. In 1997, the ITRMC approved the state's Information Technology Strategic Plan (now being refreshed) which defines a vision and high-level goals for IT development (see Appendix C).

These enterprise information technology recommendations are fully consistent with the overall direction and goals of the SDI and specific implementation initiatives, defined in the SDI *Business Plan*, will respond to these recommendations. The SDI initiative described in this document includes goals and actions that are consistent with the state's IT Strategic Plan and responds to issues addressed in the legislative report, as illustrated in the following themes guiding SDI development:

- Enterprise information services with a focus on business needs and cross-departmental sharing of resources
- Integration of disparate systems and data sources supporting easier information access and greater efficiency in system operation
- Collaboration and partnerships among all levels of government, academic institutions, and the private sector
- Improved services to citizens, businesses, and visitors to the state
- Improvements in the state's computing infrastructure to enhance statewide access to information, system security
- Sound management, policies, and standards that ensure robust, efficient SDI

## 2.6 Strengths, Weaknesses, Opportunities, Challenges Impacting SDI

Through stakeholder meetings, project team brainstorm sessions, and ongoing input from project participants, we identify Strengths, Weaknesses, Opportunities, and Challenges (SWOC) in Table 2. This SWOC evaluation provides a starting point for the development of SDI goals and an implementation strategy.

**Table 2:**
**Strengths, Weaknesses, Opportunities, and Challenges Impacting SDI Development**

| Positive Factors | Negative Factors |
|---|---|
| Strengths:<br>• Existing statewide GIS organizational structure addresses many important coordination issues<br>• Effective, long-term use of GIS technology in many state agencies<br>• Large, knowledgeable community of GIS users throughout the state<br>• Active GIS user groups in some regions<br>• Current state GIS clearinghouse (INSIDE Idaho) provides many of the SDI services needed for the future<br>• Undergrad and graduate GIS courses and degree programs at the universities (also GIS Certificates are available) | Weaknesses:<br>• State government IT planning and management is highly decentralized without sufficient level of central coordination and authority<br>• Organizational structure does not provide adequate level of authority for GIS standards and policy approval and adoption<br>• Lack of a comprehensive set of Framework geospatial data standards limits database consistency and statewide development<br>• Organizational and political barriers present obstacles to collaboration and consensus<br>• State legislated cap on annual budget increase for local governments inhibits fund allocation for GIS initiatives |
| Opportunities:<br>• GIS is an accepted "core information technology" and is effective in enabling information and organizational integration<br>• New technology tools and procedures lower costs for GIS database compilation<br>• SDI success in other states presents models for adaptation in Idaho<br>• INSIDE Idaho could be basis for enhanced geospatial portal<br>• Extensive GIS educational offerings in the state higher education system support future training and professional development<br>• Professional and industry associations are potential "allies" in garnering support and creating heightened awareness for the SDI<br>• Increased demands by the public for information from government agencies create potential role for GIS | Challenges:<br>• Rapidly changing and evolving technology—hard to adapt and manage<br>• Geographic disparity in resources limits GIS development and operation in low-resourced jurisdictions<br>• Insufficient availability of qualified staff and frequent staff turnover and low wages for competent technical and management personnel<br>• Maintaining involvement and coordination among stakeholder organizations statewide<br>• Establishing awareness and keeping the interest and support from senior officials<br>• Ongoing funding<br>• Sprawling geography<br>• Keeping regional efforts aligned |

## 2.7 Current Limitations and Obstacles to be Addressed in SDI Planning and Development

An evaluation of the status of SDI development, current GIS use, and the needs of stakeholders statewide has revealed a number of important limitations and obstacles that inhibit SDI development and which prevent users from achieving the full range of potential benefits from GIS technology and statewide geographic information sharing. These obstacles and limitations create a starting point for planning—to ensure that strategic goals and implementation initiatives focus on the critical areas that will contribute to SDI success. Obstacles and limitations impact a number of critical areas including: a) organizational and management structure and practices, b) data development or management, c) system configuration, software, or application development and operation, d) education, outreach, and internal/external communications, e) funding, budgeting, and financial management, and f), Legal or policy development.

Some of the more critical limitations and obstacles cited by stakeholders have to do with the lack of a clearly articulated business case and cost justification and how this inhibits high-level support and allocation of funds for SDI initiatives. The lack of a consistent statewide GIS database is identified by many as a major problem that inhibits deployment of IS and sharing of data at a regional and statewide level. The geographic distribution of users and statewide disparity among jurisdictions in availability of resources for GIS development is a major factor that impacts SDI development. Other organizational, technical, and operational limitations have been identified which will be addressed through this plan. Appendix D contains a detailed explanation of important obstacles and limitations identified through information gathered from stakeholders

## 3. STRATEGIC FOUNDATION

As previously defined, the SDI is "the data, technology, policies, and people necessary to promote geospatial data sharing and appropriate use throughout all levels of government, the private and non-profit sectors, and academia." The National States Geographic Information Council (NSGIC) describes the purpose of the SDI, "to provide accurate and reliable data for decisions regarding the security, health and welfare, and prosperity of our citizens." This section establishes a strategic foundation for creating and sustaining the SDI. It includes a vision, mission, and high-level goals that set the overall direction for Idaho's SDI development over the next five years. In keeping with ITRMC's enterprise concept, strategic foundation is defined in relationship to long-term business needs for geospatial data and technology tools.

### 3.1 Business Drivers for an Improved SDI

A business driver is a major need, program, service area, or challenge faced by organizations that may be impacted or supported by GIS technology and data. Business drivers may reflect strategic or operational goals of the organization, user or customer service needs, legal or regulatory requirements, external conditions (economic, social, political) or other business factors. Identifying business drivers that may be impacted or supported by GIS can establish a very strong, strategic foundation for the GIS program. Business drivers for Idaho's SDI have been identified through input from stakeholders statewide. These business drivers are explained in more detail in Appendix E.

Some business drivers for GIS are high-level in nature, reflecting overall goals or advantages for the organization as a whole and impacting multiple departments and user groups. The main overarching business drivers impacting Idaho's SDI are listed below.

- Basis for inter- and intra-organization coordination and partnerships
- Management and access to historical geographic information
- Response to public demand for information
- Reduction in redundancy, labor time, and cost
- Enhanced revenue
- Energy costs and efficiency
- Enhancement of environmental quality, sustainability, and livability
- Improved geographic data quality and currency
- Support for private business

Other business drivers are more specific to an individual department or organization, business area, or program. These program-specific business drivers for the Idaho SDI include those below. Appendix D provides more information about these drivers and their priority.

- Emergency planning/ management and public safety
- Economic Development and Tourism Promotion
- Real Property Appraisal
- Infrastructure facility management
- Agricultural productivity and invasive species management
- Comprehensive planning
- Facility planning and design
- Floodplain mapping/flood event management
- Support for improved regulatory decisions
- Educational program enhancement
- Support to County Commissions

- Grant application support
- Public health management

### 3.2 Vision and Mission Statement

The vision and mission statements establish a foundation for the strategic plan. The vision statement paints a picture of the future. The mission statement articulates what will be done to reach that vision. These brief statements serve as the basis for SDI goals and a work program for SDI development and implementation. Idaho's SDI vision and mission statements presented below have been prepared with input from the project Executive Steering Committee (ESC) and stakeholders around the state.

**Vision:**
*Idaho's Spatial Data Infrastructure (SDI) is fully developed, maintained, and managed and supports the missions of Idaho organizations through easy access to high-quality geographic information and related services.*

**Mission:**
*With leadership by state government and active participation from stakeholders statewide, we will develop, deploy and efficiently operate the SDI with a focus on meeting the geographic information needs of users and delivering real, substantial benefits to a comprehensive spectrum of organizations and individuals in Idaho.*

### 3.3 High-Level Goals

A critical element of the strategic foundation is a set of high-level goals (sometimes referred to as "strategies") which identify key areas for action to accomplish the stated mission. These goals address important development or operational areas that are critical for long-term SDI development and operation.

The Idaho SDI Goals are:

1. Develop a strong business justification to cultivate high-level support and sustained financing for the SDI.
2. Implement an improved SDI management and coordination structure with appropriate legislation, policies, and management practices that support full SDI development and its ongoing operation and which promotes statewide participation and collaboration.
3. Define standards for and complete development of Framework data, and establish tools and procedures for perpetual data maintenance and appropriate access.
4. Leverage emerging technologies to enhance access and use of SDI data and services.
5. Connect and integrate state and local/regional activities by establishing region-based resources that provide practical help, enable professional networking, disseminate best practices, and act as a consistent, multi-directional channel of communication.
6. Increase awareness of and support for the SDI and its benefits.
7. Encourage, provide guidance, and help establish financial support for development and maintenance of non-Framework geographic data that enhance organizations' use of and benefits from GIS technology.

8. Expand the awareness of the GIS technology and integration of geographic information in organizations, disciplines, and applications in which GIS use is not common but where substantial benefits may be achieved.
9. Maintain current knowledge about GIS and information technology trends and industry offerings to take advantage of new products, tools, and practices.

### 3.4 Values and Guiding Principles

Values and guiding principles establish an underlying basis and set of bounds for SDI development work and operations, and they help set a context for how work is carried out and how workers interact among themselves and the users and constituents they serve.

GIS Community Values and Guiding Principles:

- Attention to quality and responsiveness to users of SDI data and services
- Inclusive and open communication
- Attention to quality in the creation, maintenance, and archiving of SDI data and services with continuous quality improvement
- Optimize efficiency in all aspects of development and implementation
- Incorporate or develop best practices
- Actively seek collaborative approaches
- Data is appropriately accessible

### 3.5 Critical Success Factors

Critical success factors (CSF) are technical, organizational, or financial variables and requirements that have a major influence on SDI development and operation. These CSFs will be taken into account in plan execution to maximize the probability that goals will be accomplished in the stated timeframe. Using NSGIC's CSFs as a starting point, factors important for Idaho are:

- Agreement and support of stakeholder groups.
- A full-time, paid coordinator position with the authority to oversee and direct SDI development and operation and with adequate staffing.
- Clearly defined authority for statewide coordination of geospatial information technologies and data production.
- The statewide coordination office has a formal relationship with the state's Chief Information Officer, the Governor's Cabinet, or similar office.
- One or more "champions" (senior elected official or executive) is aware of and involved in the SDI.
- Sustainable funding sources to meet projected SDI needs.
- Leaders have the authority to enter into contracts and become capable of receiving and expending funds.
- The Federal Government works through the statewide coordinating authority.

- Clearly defined work plans, performance criteria, practices for monitoring performance are in place.
- Financial, organizational, and contractual mechanisms allow for effective collaboration, joint projects, business relationships with all public sector and private sector stakeholders.
- Policies, procedures, and workflows support effective data stewardship
- Appropriate and reliable data discovery and access is sustained.

# 4. SDI REQUIREMENTS AND ARCHITECTURE

This section defines the requirements for the SDI and describes a high-level architecture that addresses its technical and organizational elements.

## 4.1 Enterprise GIS and SDI Architecture Concept

The strategic goals and initiatives presented in this plan support the development and deployment of an SDI which adheres to the "enterprise model" concept as described in the ITRMC's IT Strategic Plan, guidelines, and Policy P1070 (www2.state.id.us/itrmc/plan&policies/Policies/p1070.htm). The following enterprise GIS tenets will guide SDI development and operation:

- Multi-organizational, statewide scope
- Focus on organization's business needs and strategic goals
- Long-term vision and focus
- Coordination among and service to user groups in multiple departments and business units
- Geospatial data and infrastructure as an investment with ongoing value and benefits
- Integration of GIS with overall information technology architectures with user organizations
- Policies and management structure that encourage and support coordination and collaboration
- Shared data, applications, and support

The SDI architecture presented in this section, gives a general picture of the SDI's technical components, applicable standards, and the organizational context for SDI implementation and operation. The SDI architecture encompasses the system configuration, data, and organizational elements essential for SDI operations.

## 4.2 Technology Trends Impacting SDI Development and Use

Strategic planning implies a long-term view with an ability to channel SDI development in a way that anticipates and takes advantage of changes in technology and the GIS industry. The pace of technology change and the dynamic nature of IT and GIS make it challenging to predict specific developments. One can examine trends and prepare a multi-year plan that takes likely changes into account and creates an environment for effective technology monitoring and response to new techniques, practices, and products. Five main technological trends are impacting information technology and GIS. These trends are explained in more detail in Appendix F.

**Trend 1: Pervasive, High-performance Computing**: Continued dramatic increases in the performance of computers, decreases in their size, and greater options in their physical format and adaptability to different user environments. This drives the wide availability of computers of different types and forms (traditional and nontraditional) any place and any time.

**Trend 2: Digital Connectivity:** Increasing capabilities and infrastructure to transmit digital information over large areas at increasingly higher speeds in wired and wireless modes, including advances in Web-based environments for discovery and access to geographic information.

**Trend 3: Geographic Data Capture and Compilation**: New and more efficient methods of spatial information capture and processing and an increasing array of sources for geographic information provide GIS users with a larger number of options in building GIS databases.

**Trend 4: Geographic Data Processing, Management and Visualization**: More sophisticated and powerful tools and systems to manage geographic data and to convey meaning through maps, charts, pictures, models, and other visualization forms, with an increase in the tools for management of 3D and time-series spatial data.

**Trend 5: Standards and Open Systems**: Technical standards (formal or de facto) impacting operating systems, network technology, application software, and data format that promote interoperability, consistency, and common interfaces. As these standards drive the industry, they become the basis for products and practices that support and enable interoperability and make it easier for people and applications to access and use information from multiple sources.

## 4.3 Summary of Data and Technology Requirements

The evaluation of GIS status, business drivers, and limitations presented above provides context for a summary of key technical requirements for SDI development presented in this section.

### 4.3.1 Geospatial Data Requirements

Realizing the SDI goals is dependent on actions that fulfill the following geographic data needs of the statewide stakeholder community:

- Useful, practical **geographic data content, format, and quality standards for Framework data themes** that provide a consistent basis for ongoing database development, quality improvements, statewide consistency, and support for flexible data access and sharing
- **Completed, statewide, standards-based, Framework data** theme coverage with clear procedures, tools, and responsibilities for stewardship (regular maintenance, quality assurance, tracking of updates, and provision of access to a broad user community)
- An **environment that supports the development and maintenance of non-Framework data themes** with an acceptable level of standards that drives consistency and integration with other data themes
- **Clear, useful metadata standards with effective tools** and procedures for capturing, maintaining, and accessing metadata regardless of software environment
- **A directory of statewide geographic data sources**, their characteristics and status to make it easy for users to find needed data, determine its usefulness, and access it for use.
- **Capture and access to a wide range of non-map geographically referenced data sources** (text documents, forms, site photos, drawings, external Web sources), integrated with GIS, to support numerous geographic information management applications

The evaluation of statewide SDI stakeholder needs included an assessment of the importance of a range of geographic data themes, Framework and non-Framework, through a survey. Table 3 shows the results of this survey, which primarily included responses from a range of local, state, and federal governments.

**Table 3:**
**Summary of Stakeholder Responses on Geographic Data Priority**

| Geographic Data Theme | Framework (Y/N)* | Priority Score** |
|---|---|---|
| Administrative Districts | Y | 6.3 |
| Cadastral Reference/GCDB | Y | 6.4 |
| Elevation—Contours | Y | 5.6 |
| Elevation—Digital Elevation Models | Y | 5.6 |
| Geodetic Control | Y | 6.5 |
| Governmental Boundaries | Y | 6.8 |
| Hydrologic Unit Boundaries | Y | 4.3 |
| Land Cover | Y | 4.8 |
| Land Use/Zoning | Y | 6.1 |
| Ortho or Satellite imagery (low resolution) | Y | 5.5 |
| Orthoimagery (High resolution) | Y | 7.7 |
| Parcels (land ownership) | Y | 7.2 |
| Surface Hydrography | Y | 6.5 |
| Transportation (roads) | Y | 7.4 |
| Bioscience-Aquatic | Proposed | 3.3 |
| Bioscience-Terrestrial | Proposed | 3.6 |
| Climate/Meteorological | Proposed | 5.9 |
| Geology | Proposed | 4.8 |
| Natural Hazards | Proposed | 5.3 |
| Public Safety Critical Facilities | Proposed | 3.0 |
| Soils | Proposed | 4.5 |
| Utility-Pipelines | Proposed | 4.0 |
| Wetlands | Proposed | 5.1 |
| Buildings/Structures | N | 4.3 |
| Cultural/Historic Sites and Features | N | 4.7 |
| Demographic Enumeration Districts/Data | N | 3.7 |
| Recreation Facilities | N | 4.5 |
| Street Addresses | N | 6.1 |
| Subsurface Hydrology | N | 4.4 |
| Telecommunications*** | N | 4.1 |
| Transportation (aviation) | N | 4.7 |
| Utility-Drainage, Flood Control | N | 5.0 |
| Utility-Electric | N | 4.1 |
| Utility-Gas | N | 3.7 |
| Utility-Sanitary Sewer | N | 4.7 |
| Utility-Water Distribution | N | 4.7 |
| Utility-Water Supply, Transmission | N | 4.7 |

*Y" indicates that this theme is now accepted as part of Idaho's data Framework, "N" designates a non-Framework theme, and "Proposed" means that the data theme has been proposed by the IGO to become part of the Idaho Framework.

**Average of all scores from responses. Range of scores from 1 to 8 with "8" indicating critical importance and "1" meaning little or no importance.

*** A broadband infrastructure dataset is proposed as Framework.

In the course of discussions with stakeholders, some other geographic data themes were identified as important to specific user organizations:

- Airspace restrictions
- Green infrastructure
- Traffic analysis zones
- Navigable waterways
- Easements
- Hunt units
- Vegetation

### 4.3.2 Software and Application Requirements

GIS software and custom applications must support the following major functional needs of users:

- Storage and **management of different forms of spatial data** in a way that permits transparent access and integration (vector map data, image layers, CAD data, etc.) regardless of format or coordinate system
- A software and database architecture that **supports the creation and management of properties and rules of GIS data features** (e.g., spatial and connectivity constraints, attribute domains, boundary relationships, etc.)
- Tools and easy-to-use **applications for capture of GIS data,** including field data collection and processing, capture of data from aerial images, GIS data conversion from hard copy sources
- Flexible **integration of non-map sources of data** with GIS data and applications
- **Web-based GIS interfaces** and tools with the ability to combine locally managed data with any external Web-based service
- Full **integration of GIS software with database management software** allowing handling of spatial data and non-spatial data (alpha-numeric, vector, image, XML) with all needed functionality for database administration (e.g., security, back-up, performance monitoring)
- A full set of **functions for spatial analysis** which can be adapted for a wide range of analysis applications (e.g., overlay modeling, network analysis, service area/district analysis, a range of spatial statistical analysis tools).
- Flexible tools for customizing map display and map production, including the ability to adjust content, scale, size, colors, annotation, margin/title format, etc.)
- Easy-to-use tools for customizing the user interface and more complex application development
- Ability to embed GIS functionality and data in "non-GIS" applications through access to GIS objects

### 4.3.3 System Configuration and Integration Requirements

The following basic requirements address physical system configuration issues and integration between GIS and external databases and applications:

- Access of GIS from a **range of computer platform and device types** (in the office and the field) including desktop computers, laptop/notebook computers, handheld devices, and PDAs

- System architecture that allows both **local data storage and processing (desktop environment) and a server-centric configuration** supporting both central and distributed management of data and services
- Web-based environment that permits flexible **access to and integration of data and applications** (regardless) of location, via the Internet
- Robust **data, system, and network security** with appropriate controls to eliminate unauthorized access or accidental loss or corruption of data
- High-speed wired network access from fixed locations and an increasing access to wide area wireless connections

## 4.4 Organizational and Governance Structure Issues and Requirements

Use of the term, "governance" has become frequent in GIS and IT management circles. The Gartner Group (www.gartner.com) describes governance relative to information technology programs as "assignment of decision rights and the accountability framework to encourage desirable behavior in the use of IT." Expanding on this definition, governance to implement and sustain the SDI encompasses all aspects of organizational authority and coordination and includes the following main parts:

- Enabling Action: A documented, officially recognized, legal or administrative action that enables, establishes, and sanctions the SDI. The action may be legislation, an executive order (Governor), or some other measure.
- GIS Governance Authority: The formally designated roles and bodies that are granted governance responsibility for the SDI. The nature and extent of this authority may vary, but it is an important piece of the overall structure of the SDI.
- SDI Management: This includes the organizational entity and people with assigned responsibility for overall management of the SDI. Currently, this includes coordination responsibilities of the IGO and its ongoing role in operational support to stakeholder organizations
- Coordination Bodies: Includes any groups (with multi-agency or multi-organizational participation) established as part of an overall SDI organizational structure to support and facilitate SDI coordination, management, communication, and operations. Currently, the IGC and its Technical Working Groups (TWGs) are the main examples of coordination bodies.
- Policies and Rules of Operation: Written rules, policies, bylaws, formal agreements, etc., which provide the structure for clear, consistent operations, communications, allocation of resources, and performance of SDI work and statewide coordination. There may be multiple sources of these rules and policies, including the ITRMC/IGC.

Idaho's future SDI and governance structure must meet the following organizational and management challenges:

- Strengthen the statewide focus of SDI to encourage collaboration among all stakeholder groups
- Clear oversight roles with adequate authority to approve SDI standards and policies and make resource decisions that support SDI goals
- Maintain understanding and support from senior elected and executive officials
- Routine coordination and liaison with GIS users throughout the state and establish formal partnerships for project activities and expanded use and access to geographic information and services

- Maintain coordination of SDI activities of state agencies as a distinct, critical SDI user community
- Understand the importance of regional groups for mutual GIS program support, and find practical ways to establish regional services
- Secure and sustain adequate funding from multiple sources in support of SDI development and operation
- Prepare, approve, and implement formal standards and policies for SDI development and operation
- Align the work of stakeholder organizations, contractors, and data suppliers to accelerate Framework database development
- Expand access to GIS technology and geographic data—particularly by current organizations that are not traditional GIS users but which have an important need for geographically referenced data
- Address requirements for communication and education at all levels to promote wide use of GIS and technical support to users.

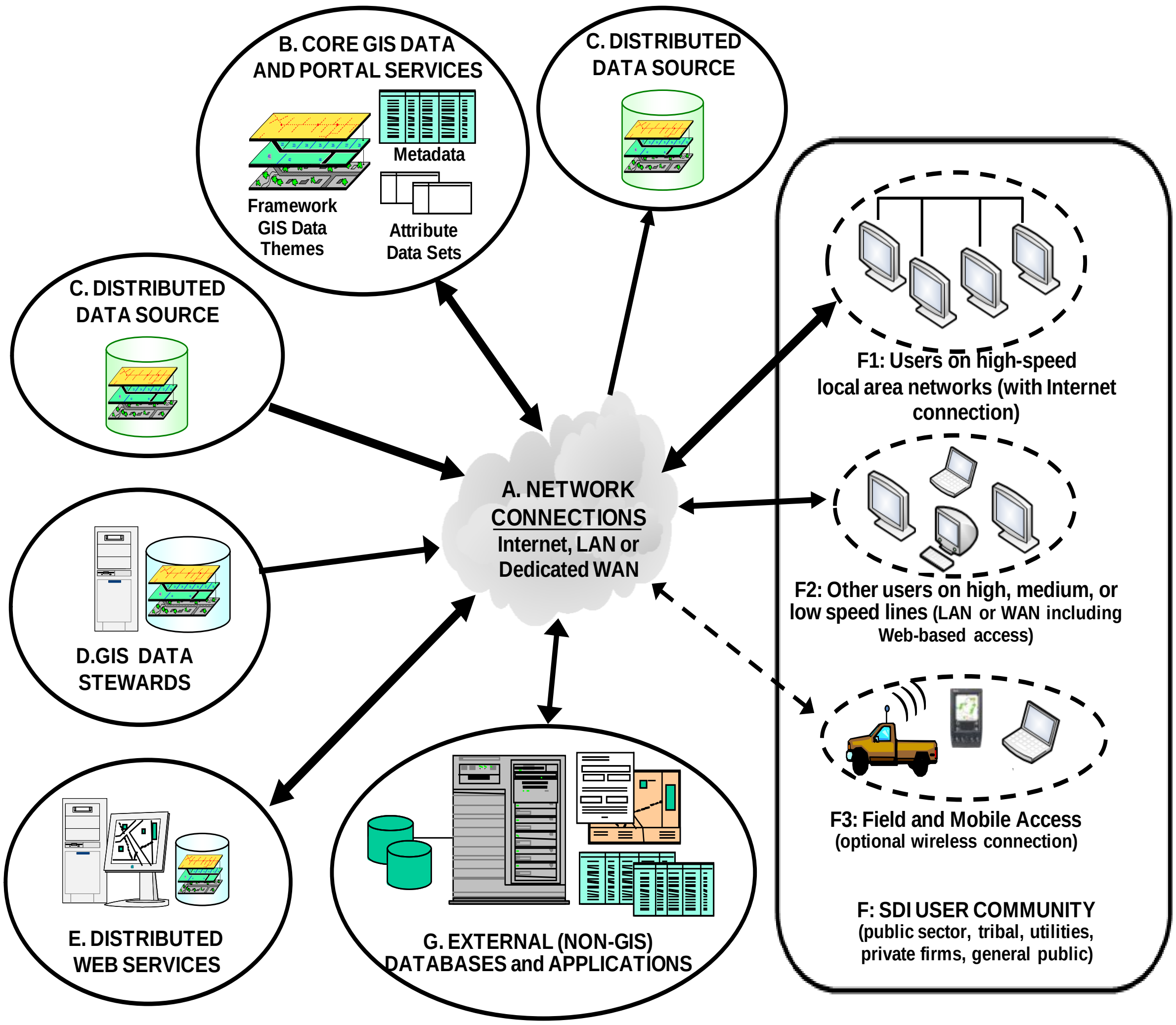
## 4.5 Recommended Idaho SDI Architecture

### 4.5.1 SDI Technical Architecture

The overall system architecture for support of Idaho's SDI consists of the components illustrated in Figure 4. This figure represents a conceptual technical configuration for full deployment by the end of the five-year timeframe of this plan. It shows, at a high level, the main system, database, and network connections that would be needed to support SDI users. This figure gives a general depiction the main parts of the SDI architecture which is not intended to be used as a physical configuration design. Its purpose is to provide a general concept to guide long-term SDI development.

Note: The SDI architecture in Figure 4 below shows a number of key components that convey a range of roles and services. In practice, the architecture will follow a system model with a mix of distributed and centralized services for data management and GIS application services for users throughout the state. This can generally be described as a virtual environment, using increasingly robust communication links and web services to allow user access without the need for a highly centralized system configuration. The technical details and designated roles for specific sites will be defined as part of SDI development.

**Figure 4:**
**Idaho SDI Conceptual Technical Architecture**




The main parts of the SDI technical architecture are described in Table 4.

**Table 4:**
**Conceptual SDI Technical Architecture—Main Services and Roles**

| | |
|---|---|
| **A: Network Connections** | This "virtual component" conveys the idea that the SDI will make use of all available network links available to users. This includes access by existing dedicated local and wide area communications (e.g., state government and local government networks) and all other services allowing Internet communications for users inside and outside the state. |
| **B. Core GIS Data and Portal Services** | SDI data and services will be organized and made accessible at multiple sites that have a designated role for providing data and services. They will include storage of selected data for direct access, metadata and links that support search and evaluation of data, some core Web-based applications, links to distributed data sources, and other information useful to the statewide SDI community. The sites serve as repositories for all or most Framework data and will coordinate closely with data stewards for accepting and consolidating updates. Sound policies and procedures for data and service administration and maintenance will be put in place. |
| **C. Distributed Data Sources** | These will be sites at different locations around the state with the computer hardware, software, and system administration resources to support GIS data management and access. These sites include selected GIS clearinghouses that are already in place or may be created in the future to support management and access of data for specific geographic areas (e.g., county jurisdiction) or a particular subject area or discipline. Some of these sites may serve a back-up role for the Core GIS Data and Services (B) to establish some fault tolerance for continuity of SDI services. These sites may also play a Data Steward (D) role. |
| **D. GIS Data Steward Sites** | Designated stewards, those organizations that have a lead responsibility for collecting, creating, and updating data, will perform the majority of Framework and non-Framework data update and maintenance. This includes multiple federal and state agencies, local governments, utility companies, and other participants. For some themes, data may be uploaded to the Core GIS Data and Services Sites (B) for hosting, but the stewards will manage other data sets with access provided at their sites. These sites may also play roles as Distributed Data Sources (C) and or Distributed Web-based GIS Services (E). |
| **E. Distributed Web-based GIS Services** | Distributed Web sites providing a range of GIS services. These may include Web-based applications provided by government agencies (state or local), the private sector (e.g., Google Earth), or other sites providing geographic query, viewing, analysis, and other applications. In some cases these sites may be the same as, or integrated with, Distributed Data Source sites (C), but they may include any site providing Web-based applications (not necessarily a formal part of Idaho's SDI) that can be used to augment other sources of GIS applications. |
| **F. SDI User Community** | The broad user community includes any public sector or non-public sector organization or member of the public that uses any SDI data or service. |
| **F1. Users on High-speed Network** | This group of users includes office-based personnel who connect to a local server and to the Internet through a high-speed local area network. |
| **F2. Other LAN or WAN Users** | Includes all participating, public sector organizations (federal, tribal, regional agencies, special districts, local governments, and public universities, private companies, general public). These users will access SDI data and services using available wired communication services, including dial-up in some cases. |
| **F3. Wireless Access** | As the technology matures, expanded support will be developed for field and mobile data access through wireless data communications from vehicle-based computers or portable/hand-held devices. Field and mobile access may include "disconnected" GIS use or wireless communications as wireless data services are made available to specific geographic areas. |
| **G. External Databases and Applications** | Access will be provided to and from non-GIS databases and applications that require geographically referenced data or specific services to geographically enable those external systems. The nature of the access may range from data download to more interactive data and application integration. |

### 4.5.2 SDI Coordination Concept

The SDI program will be built around a concept of coordination of key organizational components and "shared services" by specific entities throughout the state. This coordination concept acknowledges that state government, due to its statewide responsibilities, will play an SDI leadership role but that formal roles and relationships are developed and maintained to stimulate regional collaboration and participation of all stakeholder groups and organizations in the public, private, and nonprofit sectors. This concept encompasses the following major SDI components:

- **Idaho Geospatial Council** and **Executive Committee** as the main governing and coordination body (see Section 4.5.3)
- **Shared Services roles,** centered in different areas of the state, each of which assumes leadership for one of three main SDI operational and support functions:
    - SDI management with the Idaho Geospatial Office (IGO) and other SDI organizational entities primarily occurring in the capital city
    - Geospatial Data Library services at the University of Idaho Library (INSIDE Idaho)
    - GIS Research and Training activities at the GIS Training and Research Center (GIS TreC) on the Idaho State University campus.
- **Regional GIS Resource Centers** which encourage local and regional participation and provide help and support to users around the state. These centers would be located at existing facilities with GIS resources and staff (e.g., state universities) and could include actual site locations with Web-based services to provide technical support, training, and professional networking. These Regional Resource Centers may also play one or more of the service roles described above as part of the SDI technical architecture, but this is not a requirement.
- **GIS Community** that encompasses all user organizations and stakeholder groups.

### 4.5.3 SDI Governance Structure and Management

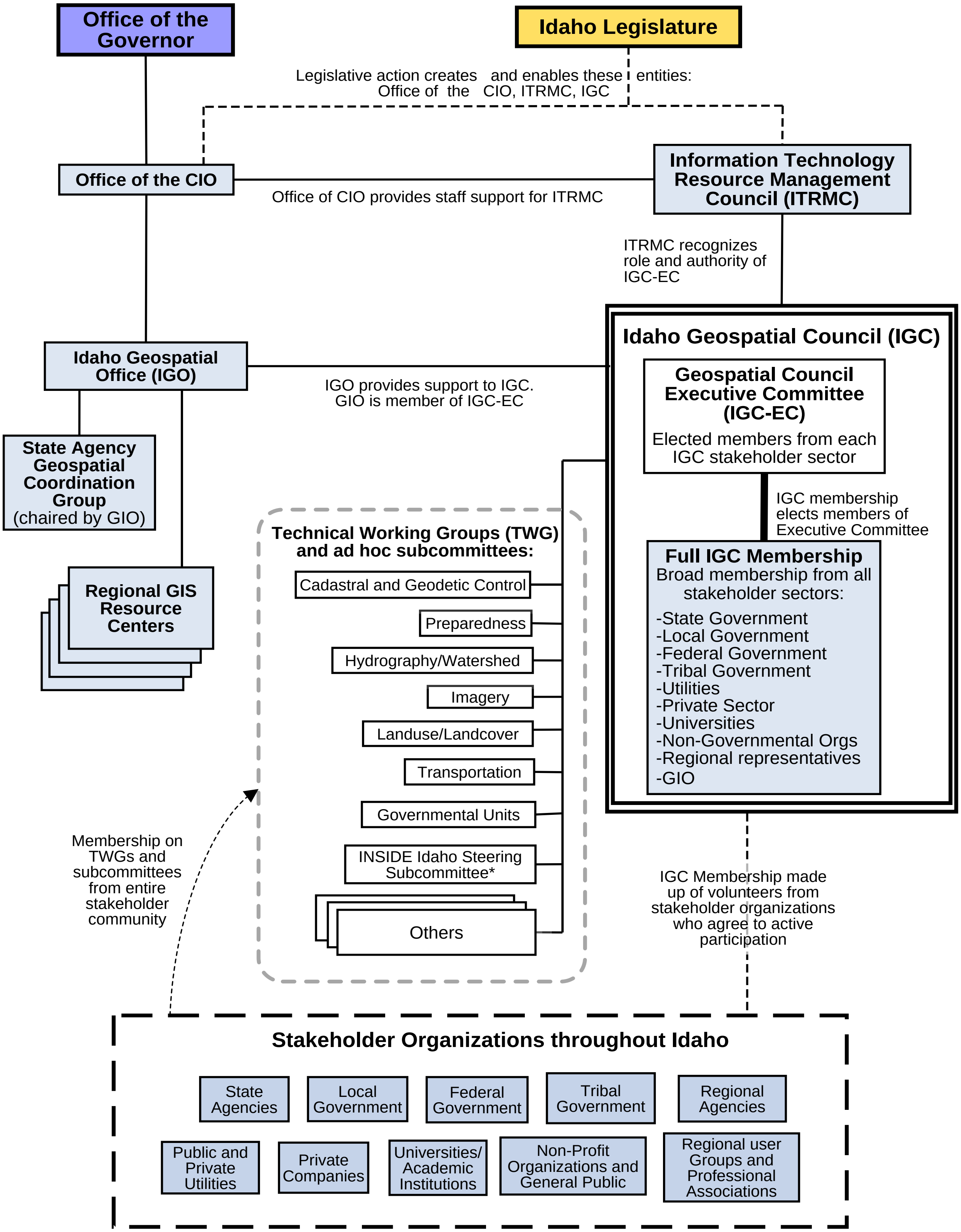
The proposed SDI governance structure addresses all the critical organizational and management concerns important for statewide coordination and operation including: a) enabling legal/policy action, b) GIS oversight authority, c) SDI management, d) coordination bodies, and e) formal policies and rules for SDI operation. Idaho's future SDI governance structure must meet the following organizational and management challenges:

- Clear oversight roles with adequate authority to approve SDI standards and policies and make resource decisions that support SDI goals
- Maintaining understanding and support from senior elected and executive officials
- Routine coordination and liaison with GIS users throughout the state and establishing formal partnerships for project activities and expanded use and access to geographic information and services
- Maintaining coordination of SDI activities of state agencies as a distinct, critical SDI user community
- Understanding the importance of regional groups for mutual GIS program support, and finding practical ways to establish a regional presence as part of the statewide SDI program
- Securing and sustaining adequate funding, from multiple sources in support of SDI development and operation

- Preparing, approving, and overseeing formal standards and policies for SDI development and operation
- Coordinating the work of stakeholder organizations, contractors, and data suppliers to accelerate Framework database development
- Expanding access to GIS technology and geographic data—particularly by current organizations that are not traditional GIS users but which have an important need for geographically referenced data
- Addressing requirements for communication and education at all levels to promote wide use of GIS and technical support to users.

The SDI governance structure is designed to integrate smoothly with state government IT governance and management while strengthening coordination and collaboration with all stakeholder groups and users statewide. This governance structure adapts organizational elements currently in place and includes some new and revised elements that better respond to SDI coordination and support needs. Figure 5 depicts this proposed structure and Table 5 explains the main components.

**Figure 5:**
**Proposed Future Governance Structure for Idaho's SDI**




*INSIDE Idaho services enhanced to play Core GIS Data and Services site with stable funding, expanded capabilities, and primary coordination role for "virtual geospatial portal" support.

**Table 5:**
**Explanation of the Main Organizational Components of the SDI Governance Structure**

| | |
|---|---|
| **Information Technology Resource Management Council (ITRMC)** | The ITRMC maintains its current status as an IT coordination, policy, and standards body with its legislative mandate. Staff support from the newly re-established Office of the CIO continues. Acting on recommendations by the Office of Policy Evaluation and the IT Alignment Committee, the ITRMC's authority and oversight activities are enhanced. |
| **Office of the CIO** | The Office of the CIO is moved, through legislative action, to the Governor's Office. In this organizational shift, it continues its role as staff to the ITRMC and increases its role and activity in IT planning and oversight, IT coordination for state agencies, development, oversight, and operation of enterprise shared systems. It continues to be the parent body for the Idaho Geospatial Office. |
| **Idaho Geospatial Office (IGO)** | The IGO maintains its role as the main management body for GIS and the SDI program. Its authority is expanded through the organizational move to the Governor's Office. Staff is expanded somewhat to respond to increased requirements for SDI coordination and operational support and administration. The IGO is led by a Geospatial Information Officer (GIO). |
| **Idaho Geospatial Council (IGC)** | The IGC is a new body that will be an expansion of the current Idaho Geospatial Committee. This is a large group made up of volunteers acting as representatives of different stakeholder sectors (constituent groups). This organizational approach has been successful in several states to meet the need to broaden SDI involvement. The main purpose of this body is to represent the needs and ideas of the broad statewide SDI community and to serve in an advisory role to the IGO, ITRMC, the Office of the CIO, and other decision makers. Ideally, the IGC is formally recognized by the legislature. Bylaws are created which establish operating rules and requirements for members. The GIO is a member, but the Chair position rotates based on voting by members and any member of the IGC may be elected to the Chair role. Membership size is not limited. |
| **Idaho Geospatial Council Executive Committee (IGC-EC)** | The Executive Committee of the Geospatial Council is formally created and recognized by the ITRMC. It formally governs the IGC and takes formal actions on SDI-related policies, standards, resolutions, and recommendations from senior management. Members of the EC are voted on by the full membership of the IGC and the leader of this body is the Chair of the IGC. There are approximately 12 members that include representatives from all stakeholder sectors, the IGO, shared services locations, and regional centers. |
| **Technical Working Groups (TWG) and Subcommittees** | Technical Working Groups and Subcommittees are established as required by the IGC-EC. They operate in a manner similar to the current organizational structure. TWGs have a specific mission, leadership, membership and timeframe and are formally dissolved after their mission is completed. Subcommittees are more long-term and fulfill roles that have an ongoing need without necessarily a fixed work plan or timeframe. |
| **State Agency Geospatial Coordination Group** | A separate group organized administratively by the Office of the CIO and led by the IGO. Its purpose is to address SDI and GIS technology issues of direct interest and importance to state agencies and to facilitate communication, coordination, sharing of resources, development and adoption of standards, joint project work, in support of SDI goals and overall efficiency of GIS operations and resource usage. It includes membership from all state agency geospatial technology and data users and is chaired by the GIO. |
| **Regional GIS Resource Centers** | These Centers act as points of coalescence for GIS user organizations in different areas of the state and help to connect local activities with the statewide SDI program. They will be supported by existing institutions or groups (e.g., universities, existing regional GIS user groups). Depending on regional needs, they may provide services and support functions, such as: a) answering technical questions for users, b) providing some general "consulting" support and advisory services for organizations in the process of GIS development, c) training sessions, d) site for meetings and special SDI events, and e) aggregate and serve regional Framework data. These centers can be established and put in operation over a period of time as they are needed and as resources permit. The coordination and support now provided by regional GIS user groups will be a foundation for Resource Center development. |

#### 4.5.4 Operational Policies and Practices

Formally defined policies and “best practices” will guide all aspects of SDI development, operations, and coordination among stakeholders. These should be consistent with, and expand on where necessary, existing information technology and organizational management policies and practices of stakeholder organizations. For the SDI, a clear, accessible set of policies will promote statewide coordination and sharing of data and resources. Currently, the necessary policies and supporting standards and practices do not exist in a comprehensive way. SDI development will include initiatives that will gather and enhance existing policies and practices and develop new ones in the following areas:

- Enterprise system architecture and administration
- Compliance with technical standards
- GIS data quality and maintenance
- Access to GIS and use of GIS data
- GIS product/service procurements
- GIS integration with external systems
- Legal and administrative rules and procedures impacting access and distribution of GIS data and products
- Technical support to GIS users
- GIS staffing and professional development
- GIS project set-up and management

# 5. IMPLEMENTATION STRATEGY

## 5.1 Implementation Strategy Overview

This section introduces a five-year work program to accomplish the strategic SDI goals presented in Section 3. This work program includes a series of implementation initiatives, each supporting one of more the SDI goals. These implementation initiatives describe specific activities that fall under the following categories:

- Organizational and management structure and practices
- Data development or management
- System configuration, software, or application development and operation
- Education, outreach, and internal/external communications
- Funding, budgeting, cost-benefit evaluation, and financial management
- Legal or policy development and management

The Idaho SDI *Business Plan* describes the implementation initiatives, their timing, and resource requirements.

## 5.2 Phases and General Timing

This section describes phases for SDI development, deployment and accomplishment of the SDI goals over a five-year period. This gives a general context of overall timing. More detailed timing for specific SDI implementation initiatives is presented in the SDI *Business Plan*. Four phases will carry Idaho's SDI from its current status to an operational level that substantially accomplishes the SDI vision. Table 6 presents a summary of overall timing for SDI development. More specific timing associated with implementation initiatives is included in the *Business Plan*.

**Table 6:**
**General Phases for SDI Development and Deployment**

| Phase | Projected Timing | Description | Key Milestones |
|---|---|---|---|
| **Phase 1: Organizational Development and Technical Design** | Jan. 2009 to Dec. 2010 | Concentration on getting formal approvals and putting in place the proposed governance structure, augmentation of staff. Includes garnering sustained high-level support and sustained funding through additional budget allocations and partnerships. Technical design work includes definition of standards for Framework themes, database design, and assigning responsibilities and establishing procedures for development and ongoing maintenance. Also includes identification, design, and initiation of development for several critical GIS applications. Continue and expand outreach and communication with stakeholders and define structure for regional centers. Existing work in database and application development, Web-based services, and application development continue at their current or accelerated pace. | • Get formal approvals<br>• Establish additional funding sources<br>• Put in place SDI governance structure<br>• Augment support staff<br>• Finalize data standards and development procedures<br>• Design and begin development of critical GIS applications<br>• Define Regional Center structure and data stewards<br>• Complete refinements to statewide NHD data |
| **Phase 2: High-Priority SDI Development and Deployment** | Jan. 2010 to June 2011 | Continue to build partnerships, expand SDI participation, and secure funding sources. Make substantial progress or complete statewide development of critical Framework development including orthoimagery, cadastral/parcels, governmental units, and transportation. Complete development of critical GIS applications and initiate development of others. Put in place the Core Data and Services sites with enhanced "virtual SDI clearinghouse" approaches building on existing capabilities of INSIDE Idaho. Enhance outreach, education, and training programs for SDI stakeholders. | • Secure additional funding sources and partnerships for SDI development<br>• Complete development and deployment of critical GIS applications<br>• Complete statewide development of selected Framework themes (orthoimagery, road centerlines) and transition to perpetual maintenance (stewardship) mode<br>• Make substantial progress on statewide development other Framework themes (e.g., geodetic control, cadastral reference, parcels , governmental units)<br>• Establish/activate at least two Regional Centers<br>• Establish Core Data and Services operations |
| **Phase 3: Continued SDI Development and Deployment** | July 2011 to Dec. 2012 | Continue work on SDI partnership and outreach activities. Continue Framework development and make significant progress toward full statewide coverage for all Framework themes. Support efforts for development and integration of non-Framework data. Continue to enhance outreach and education programs. | • Maintain funding sources and partnerships for SDI development<br>• Complete statewide development of selected Framework themes (cadastral reference, parcels) and transition to stewardship mode<br>• Make substantial progress on development of other Framework data (geodetic control, parcels, governmental units, elevation)<br>• Establish/formalize at least two additional Regional Centers<br>• Enhance Core Data and Services operations |
| **Phase 4: Full SDI Development and Deployment** | Jan. 2013 to Dec.2013 | All major SDI goals and implementation initiatives will be accomplished during this Phase. Sustained funding and high-level support will be achieved and there will be extensive participation from stakeholder groups throughout the state. Statewide Framework coverage will be in an ongoing maintenance mode, and GIS data access and related services will be enhanced. | • Maintain funding sources and partnerships for SDI development<br>• Complete statewide coverage on most Framework data themes<br>• Establish/activate additional Regional Centers |

## 5.3 Plan Approval and Period

This *Strategic Plan* is approved by the ITRMC which supports its goals and the overall approach for development of Idaho's Spatial Data Infrastructure. The *Strategic Plan* defines a long-term SDI vision and a foundation for action covering a five-year period, after which it must be reviewed and, if necessary, updated. If deemed appropriate by the IGC, Annual review may occur if deemed appropriate by the IGC to make minor adjustments to the plan.

## 5.4 Resources and Funding SDI Development and Operation

Realizing the SDI goals will require the support of public and private organizations in Idaho and the efforts of geospatial professionals statewide. SDI development will also require significant monetary expenditures. Cost projections will be provided in the *Business Plan.* Where will these funds come from? Part of SDI implementation work, as described in the *Business Plan*, will be to explore and secure funding opportunities, which may include the following sources and strategies:

- Better leveraging of funds currently expended by federal, state, and local agencies to support SDI goals: Tens of millions of dollars are already expended annually in Idaho for geospatial data and system development. Insufficient standards and lack of collaboration means that some of this development work does not result in sharable or accessible information. The coordination structure and consensus standards established through the SDI will ensure that current investments are used to their full benefit
- State government budget allocations: SDI development will require state general fund and special allocations for specific development areas for which direct value, costs savings, and other benefits can be projected
- Federal budget allocations: The SDI effort will put the state in an improved position to receive federal agency funds for programs that support geographic data and application development. There are considerable opportunities for funding through federal agencies that oversee programs in environmental management, homeland security, transportation, defense installations, and others
- Grants from outside sources: The SDI will improve competitiveness in competing for grants from outside organizations (federal sources and private organizations) that support geospatial development
- Improved public-private collaboration: Cost savings in geographic database development have already been exhibited in Idaho through formal collaborations between government jurisdictions and private companies (e.g. utilities). Many future opportunities with the potential for lowering overall costs and bringing in private funds for mutually beneficial development work.
- Special funds with fee-based support: A large number of local governments and state governments around the US have successfully established sustained sources for geospatial development by setting up funds supported by transaction fees. The fees are associated with certain programs that use geospatial information (e.g., Recorder fees on land-based transactions, construction permit fees, etc.).

It is also strongly recommended that a financial strategy, referred to as "benefits funding", be explored as a way of allocating resources to support SDI development (see NASCIO 2008 report: Innovative Funding for State IT). This approach would allocate funds from tangible benefits that are achieved through the increased use of GIS technology. This would require the tracking of benefits (cost savings, avoided costs, or revenue increases) from the use of geographic data and GIS applications and the establishment of an accounting mechanism to transfer funds to a special SDI account. With the expected benefits from SDI, this approach is a realistic financing mechanism for short-term or long-term SDI funding and has been successfully used in other states for information technology initiatives. There are other innovative financing and funding approaches, used in other states for IT and GIS initiatives, that could prove effective in Idaho. Such approaches as bond financing, user fees, and allocation of portions of capital project and special project funds, and other financing mechanisms should be evaluated for possible use in SDI development.

# APPENDICES

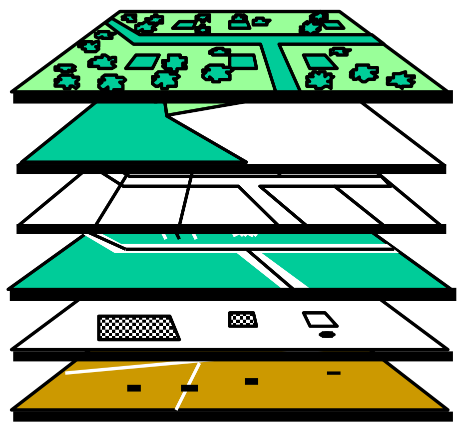
## STRATEGIC PLAN FOR DEVELOPMENT AND DEPLOYMENT OF IDAHO'S SPATIAL DATA INFRASTRUCTURE

## APPENDIX A: BRIEF TUTORIAL ON GIS TECHNOLOGY

A geographic information system (GIS) is a proven technology that has been used widely by governmental and other organizations for more than 30 years to support the mapping and management of information tied to its physical location. GIS provides capabilities to efficiently collect, manage, map, and analyze almost any type of information that is tied to a location (county, regional district, tax lot, highway segment, watershed, building, address, etc.). GIS technology is a "toolbox" of capabilities that can be applied by skilled staff to a range of programmatic needs and business requirements.

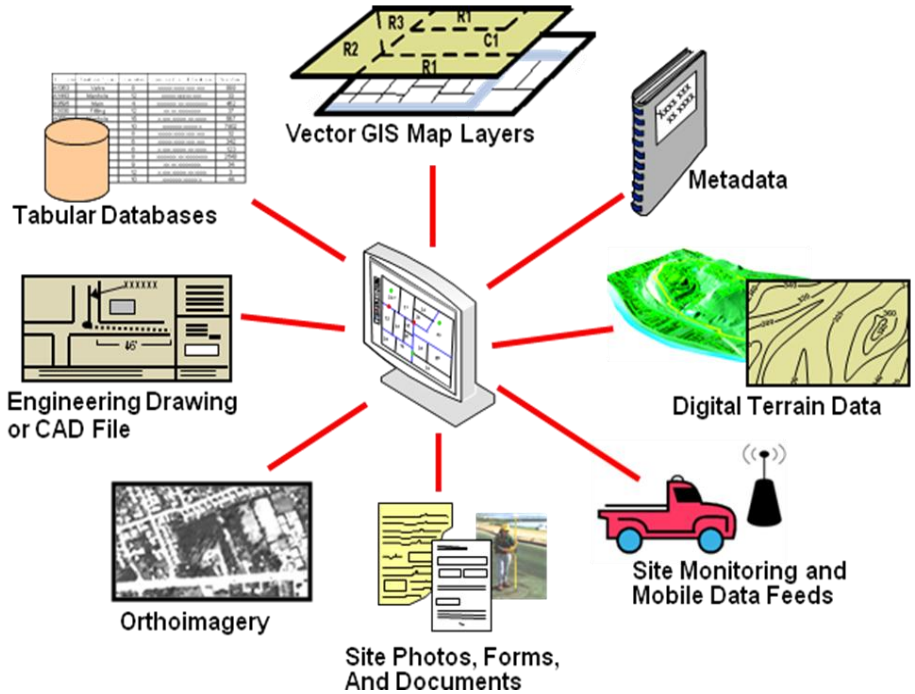
As shown in Figure A1, information in a GIS can be conceived as a series of "map layers" which can be accessed, queried, and analyzed to answer questions and generate products needed by users.

**Figure A1:**
**The Essential GIS Concept—Digital Map Layers**



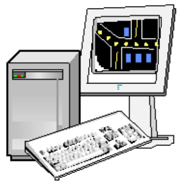
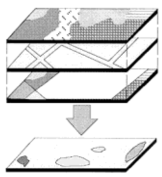
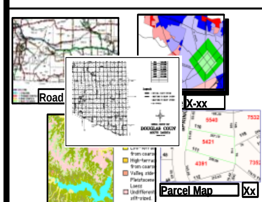
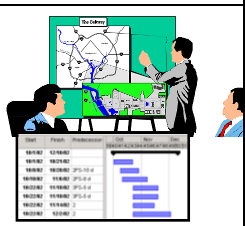
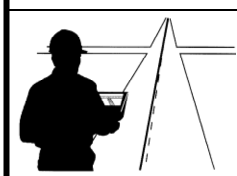
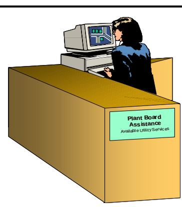
The majority of information that is collected and used by government agencies, utility companies, and other public and private organizations is geographically referenced. In some cases, this information is still stored and managed using hardcopy maps, paper forms, or computer files that are in proprietary formats or on inaccessible storage devices. An integrated GIS makes maps and geographic information easily accessible, while at the same time creating an efficient environment for keeping the data current and complete. Today, GIS technology goes far beyond the management of map layers and digital map production. It can manage and integrate many types and forms of information (databases, documents, digital images) that are tied to a location (e.g., a coordinate, address, site or facility reference, etc.) as shown in Figure A2.

**Figure A2:**
**GIS Ability to Manage and Integrate Many Types of Geographic Data Sources**




GIS applications provide users with a wide array of capabilities for capturing new information, integrating multiple databases, generating effective maps, performing interactive queries, spatial analysis, and producing many types of reports. GIS is a crosscutting technology that increases efficiency in the collection, management and display of information for a diverse range of organizations and program areas important to Idaho. The true, expanded value of information stored using GIS comes from the way in which it is applied to real-world problems as shown in Table A1.

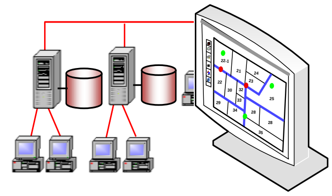
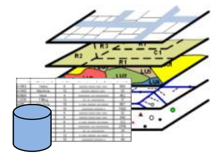
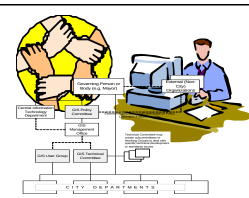
**Table A1:**
**Examples of GIS Applications**

| Applications of GIS Technology | | ***Examples:*** |
|---|---|---|
|  | **Data Query and Map Display** | • Highway condition and maintenance status<br>• Water quality problems at permitted withdrawal sites<br>• Demographic information (age, income, etc., by county or other geographic unit)<br>• Employment or educational statistics by geographic area<br>• Portraying public expenditures by geographic area |
|  | **Spatial Analysis for Patterns and Trends** | • Efficient and accurate local property appraisal<br>• Natural hazard risk and mitigation analysis<br>• Evaluation of local or statewide sites for business or industrial development<br>• Public health service needs analysis<br>• Transportation modeling and planning<br>• Crime pattern analysis and response planning<br>• Site suitability analysis for economic development |
|  | **Custom Map Presentation** | • Wall maps or hand-outs for public hearings<br>• Maps for inclusion in reports and plans<br>• Infrastructure status and master plans<br>• Crime incident mapping<br>• Natural resources and land cover maps<br>• Emergency operations plans |
|  | **Program Tracking and Reporting** | • Location and tracking the status of public land and assets<br>• Support for more efficient inspections and facility maintenance<br>• Public safety incident tracking<br>• Quick generation of regulatory reports (environmental, public utility regulation)<br>• Permit tracking |
|  | **Field Operations Support** | • Field inventory for facility or environmental information<br>• Support for highway and utility maintenance personnel<br>• Environmental inspections<br>• Support for health service workers<br>• Property survey and tax lot appraisal<br>• Maps and information to support emergency response |
|  | **Public Inquiry and Information Access** | • Information access in support of tourism<br>• Public counter access for questions on permit status<br>• Geographic queries for business and economic development<br>• Support for E-gov transactions |

An expanded use of GIS technology and data will save time, supports applications not feasible with hardcopy information sources, and provides a very effective means to integrate and share data across program areas and levels of government; thereby reducing duplication and encouraging coordination.

A successful GIS program includes support and effective management of three main components as shown in Figure A3: the technology infrastructure, geographic data, and the organizational environment. This *Strategic Plan* defines a path to strengthen and improve each of these components.

**Figure A3: Main Components of a GIS Program**

| | |
|---|---|
| **Technology infrastructure,** including hardware, software, and networks |  |
| **Geographic data** consisting of digital map layers and associated geographic data in all formats |  |
| **Organizational Environment and User Community** encompassing the people, organizational structures, management roles and responsibilities, policies, and coordination among all elements of the user community |  |

## APPENDIX B: INFORMATION FROM REGIONAL STAKEHOLDER MEETINGS AND STAKEHOLDER INFORMATION COLLECTION

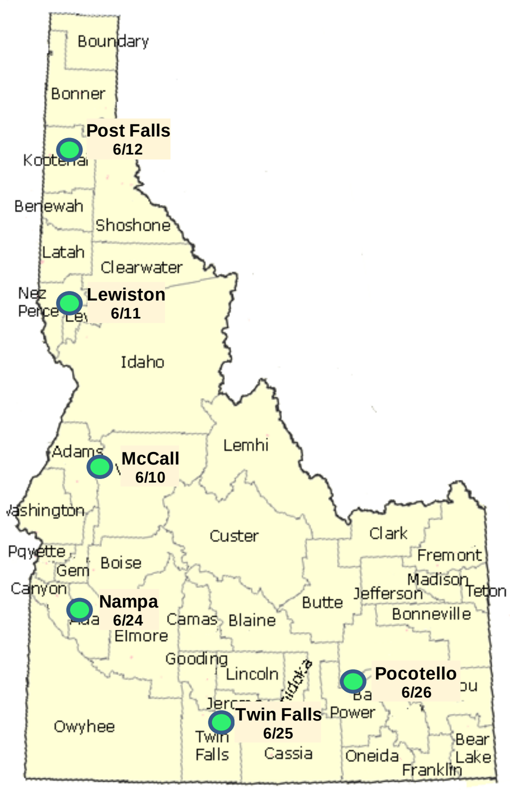
Information was gathered from a wide range of stakeholder organizations. This Appendix contains background information on two key stakeholder information gathering methodologies used in this project: regional stakeholder meetings and a form-based survey.

### Regional Stakeholder Meetings

The IGO organized a series of six regional stakeholder meetings in June of 2008 (see Figure B1) at locations throughout the state. The purpose of these meetings was to:

- Build stakeholder understanding of and support for SDI goals
- Learn about status of stakeholder GIS use and business needs
- Get input and ideas for achieving the SDI

**Figure B1:**
**Regional SDI Stakeholder Meeting Locations**




June 10 - McCall

June 11 - Lewiston

June 12 – Post Falls

June 24 - Treasure Valley (Nampa)

June 25 - Twin Falls

June 26 - Pocatello

These were full-day, interactive sessions each of which followed the following agenda.

## Stakeholder Meeting Agenda

1. Welcome and Introduction [8:15 to 8:45]

Introduction of moderators and participants • Discuss overall project objectives and NSDI context • Review current statewide GIS coordination and management structure • Review meeting objectives, format, timing • Review of handout materials

2. Business Drivers and Business Needs for GIS [8:45 to 9:30]

Examine organizational missions and key drivers • identify key GIS business processes • examine current inter-organizational partnerships • prioritize business needs for geospatial data and technology

3. High-level Characterization of GIS Status and Obstacles [9:30 to 10:45 *includes break]

Characterize status of GIS technology and data use • Explore industry/technology trends impacting GIS adoption • Examine key limitations and obstacles in GIS access and use

4. Geospatial Data Activities and Needs [10:45 to 11:45]

Overview of geospatial data types and framework • Explore more details about current geospatial data sources and use • Discussion of current GIS data standards and development efforts • Identify and prioritize geospatial data needs

5. Ideas for Improvements to Statewide GIS Access and Coordination [12:45 to 1:45]

Brainstorming on key topic areas: a) governance structure, b) strategies to complete and maintain GIS databases, c) funding, financing, partnerships, d) better GIS access and support in underserved areas, e) approaches for regional and statewide communication and collaboration

6. Brainstorm Session on Mission, Vision, and Goals for Implementing Idaho's Spatial Information Infrastructure [1:45 to 2:45 can incorporate informal break]

Interactive session (using a "strawman" mission and goal statement) and get ideas for mission and goals for the strategic plan.

7. Summarize Results of Meeting and Identify Follow-up [2:45 to 3:15]

A contracted consultant was used to support meeting preparation and facilitation. The GIO and members the Executive Steering Committee participated in meeting organization and facilitation. Over 110 people from all stakeholder organizations attended the sessions and actively participated. Information was captured during the meetings and summary reports were prepared. Detailed information on meeting planning and summary reports may be accessed at http://gis.idaho.gov/gio/stratplan.htm.

## Stakeholder Survey

To augment information gathered through other means, a survey was conducted to gather summary information on GIS status, applications, limitations, benefits, and ideas for future development. The survey used Excel-based forms distributed to attendees of the Stakeholder meetings and other stakeholders around the state who did not attend the regional meetings. The following five forms were included:

- Form 1: Contact Information, Organization Type, GIS Program Status,
- Form 2: Geospatial Business Drivers
- Form 3: Geospatial Data Priorities
- Form 4: Limitations and Obstacles with Geospatial Data and Technology
- Form 5: GIS Implementation and Operational Experience

Responses were received from 36 organizations (including 16 from local governments, 8 state government agencies, and 6 from federal government agencies), which provided a representative sample of public sector SDI stakeholders. Responses were compiled into a master spreadsheet. These forms are shown on the following pages.

**STRATEGIC AND BUSINESS PLANNING-IDAHO SPATIAL DATA INFRASTRUCTURE**

**Survey Form 1: Contact Information, Organization Type, GIS Program Status**

Organization/Dept./Div.: ____________________

Contact: ____________________ Title: ____________________

Phone #: ____________________ Email: ____________________

**1. Organization Type**: Place an "X" in the box which most closely matches your organization's type.

| Federal Agency | State Agency | Local Government | Regional Agency or Special District | Tribal Government or Organization | Public/Private Utility | Non-Profit Organization | Vendor or Consultant | Other Private Company | Other: ____ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**2. Current GIS Program Status**: Place an "X" in one or more boxes that characterize the status of the GIS program and use in your organization. Below and to the right, please indicate which GIS software packages you are using or plan to use in the near future

| No Major Use of GIS | New GIS in Planning or Development | Current Department-based GIS Program in Operation | Current Multi-Dept or Enterprise GIS Program in Operation | Major Expansion/Enhancement of GIS Program | Use GIS Services or Products from Another Organization | Other: ____ |
|---|---|---|---|---|---|---|
| | | | | | | |

**GIS Software being used or planned:**

**3. Additional Comments**: Enter additional comments about current GIS status, and GIS program direction:

**STRATEGIC AND BUSINESS PLANNING-IDAHO SPATIAL DATA INFRASTRUCTURE**

**Survey Form 2: Geospatial Business Drivers**

**Directions**: Place an "X" in the most appropriate priority column for business drivers for geospatial technology and data for your organization. A "business driver" is major program area, organizational need, or challenge that GIS technology and data can help support or address. The priority score gives a relative indication of the importance of this business driver in your organization. In the "other" boxes below, enter additional business drivers not listed. Provide brief comments to help elaborate on the business drivers and their significance for your organization.

| | 1 (Little or no importance) | 2 | 3 | 4 | 5 | 6 | 7 | 8 (Critical importance) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| Reduction in labor or operational costs | | | | | | | | | |
| Improvement in geospatial data quality and consistency | | | | | | | | | |
| Explore new channels and sources for revenue generation | | | | | | | | | |
| Enhance/Increase inter-organizational partnerships and collaboration | | | | | | | | | |
| Improved response to citizens or customers | | | | | | | | | |
| Economic/business development and improvement | | | | | | | | | |
| Infrastructure improvement and maintenance (transportation, utility, etc) | | | | | | | | | |
| Environmental Protection/Natural Resource Enhancement | | | | | | | | | |
| Improved land use planning and decision making | | | | | | | | | |
| Emergency preparedness and response (protection of life and property) | | | | | | | | | |
| Enhancement of health and quality of life for Idaho Citizens | | | | | | | | | |
| Support quality and availability of education and training opportunities | | | | | | | | | |
| Other: Regional Knowledge Base Support | | | | | | | | | |
| Other: xxxx | | | | | | | | | |

**Additional Comments**: Enter additional comments about current GIS status, and GIS program direction:

**STRATEGIC AND BUSINESS PLANNING-IDAHO SPATIAL DATA INFRASTRUCTURE**
**Survey Form 3: Geospatial Data Priorities**

**Directions:** Place an "X" in the most appropriate priority column to indicate the relative importance of the geospatial data categories. As appropriate, add other geospatial data categories below. Provide additional comments in the last column or at the bottom of the form describing issues of scale and accuracy, your needs for this data, and concerns about compilation or update.

| Geospatial Data Categories: | 1 (Little or no importance) | 2 | 3 | 4 | 5 | 6 | 7 | 8 (Critical importance) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| Administrative Districts | | | | | | | | | |
| Bioscience-Aquatic Habitats and Features | | | | | | | | | |
| Bioscience-Terrestrial Habitats/Features | | | | | | | | | |
| Buildings/Structures | | | | | | | | | |
| Cadastral Reference (24K PLSS) | | | | | | | | | |
| Climate/Meteorological | | | | | | | | | |
| Critical Facilities | | | | | | | | | |
| Cultural/Historic Sites and Features | | | | | | | | | |
| Demographic Enumeration Districts/Data | | | | | | | | | |
| Elevation—Contours | | | | | | | | | |
| Elevation—Digital Elevation Models | | | | | | | | | |
| Geodetic Control | | | | | | | | | |
| Geology | | | | | | | | | |
| Governmental Boundaries | | | | | | | | | |
| Hydrologic Unit (watershed) Boundaries | | | | | | | | | |
| Land Cover | | | | | | | | | |
| Land Use/Zoning | | | | | | | | | |
| Natural Hazards | | | | | | | | | |
| Orthoimagery (High resolution) | | | | | | | | | |
| Ortho or Satellite Imagery (lower resolution) | | | | | | | | | |
| Parcels or Legal Lots | | | | | | | | | |
| Recreation Sites and Facilities | | | | | | | | | |
| Soils | | | | | | | | | |
| Street Addresses | | | | | | | | | |
| Surface Hydrography (water bodies/streams) | | | | | | | | | |
| Subsurface Hydrology | | | | | | | | | |
| Telecommunications Facilities | | | | | | | | | |
| Transportation (Street/ Highway Network) | | | | | | | | | |
| Transportation (aviation facilities) | | | | | | | | | |
| Utility-Electric Transmission/Distribution | | | | | | | | | |
| Utility-Gas Transmission/Distribution | | | | | | | | | |
| Utility-Pipelines | | | | | | | | | |
| Utility-Sanitary Sewer | | | | | | | | | |
| Utility-Drainage, Flood Control | | | | | | | | | |
| Utility-Water Distribution | | | | | | | | | |
| Utility-Water Supply, Transmission | | | | | | | | | |
| Wetlands | | | | | | | | | |
| Other: xxxx | | | | | | | | | |
| Other: xxxx | | | | | | | | | |

**Additional Comments:** Enter additional comments about geospatial data needs and priorities:

**STRATEGIC AND BUSINESS PLANNING-IDAHO SPATIAL DATA INFRASTRUCTURE**
**Survey Form 4: Limitations and Obstacles with Geospatial Data and Technology**

**Directions:** Place an "X" in the most appropriate priority column to indicate the relative importance or impact of various limitations and obstacles with geospatial data and GIS technology in your organization. Enter comments to elaborate on your response.

| | 1 (Little or no importance) | 2 | 3 | 4 | 5 | 6 | 7 | 8 (Critical importance) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| Insufficient senior management awareness or support | | | | | | | | | |
| Inter-departmental communication and coordination obstacles | | | | | | | | | |
| No or insufficient operational management for GIS program | | | | | | | | | |
| Lack of or insufficient external partnerships | | | | | | | | | |
| Funding limitations | | | | | | | | | |
| Poor program focus, direction, or plan | | | | | | | | | |
| Staffing limitations (number of staff or skills) | | | | | | | | | |
| Needed geospatial data does not exist or is not readily accessible | | | | | | | | | |
| Problems with data quality, currentness, updating | | | | | | | | | |
| GIS applications are not "user-friendly" enough | | | | | | | | | |
| System problems: SW, HW, and networks | | | | | | | | | |
| Difficult integration of data from different sources | | | | | | | | | |
| Lack of or insufficient use of data or system standards | | | | | | | | | |
| Insufficient opportunities for training and education | | | | | | | | | |
| Other: State Geographic Diversity | | | | | | | | | |
| Other: | | | | | | | | | |

**Additional Comments:** Enter additional comments obstacles, limitations and ideas on how to make improvements

**STRATEGIC AND BUSINESS PLANNING-IDAHO SPATIAL DATA INFRASTRUCTURE**

**Survey Form 5: GIS Implementation and Operational Experience**

**GIS Applications**: Briefly describe useful GIS applications which your organization has deployed or which are under development. Explain who uses the applications and why they are valuable.

| |
|---|
| |

**GIS Benefits**: Describe benefits that your organization has received from the use of GIS technology and data. Benefits may be very tangible in nature (savings of costs or staff time, avoided costs, quicker response, revenue generation) or they may be intangible (better service to "customers", improved information quality, better decision-making, use in emergency situation or special project).

| |
|---|
| |

**Lessons Learned:** Explain some key lessons your organization has learned about GIS program implementation and operations. Cite useful advice about best practices or important pitfalls or obstacles to avoid (and how they may be avoided).

| |
|---|
| |

# APPENDIX C: HISTORY OF GIS USE AND COORDINATION IN IDAHO

## History of GIS Use in Idaho

GIS technology has been used in Idaho for the past 30 years, getting its start in 1978 with the creation of the Idaho Image Analysis Facility in Idaho Department of Water Resources (IDWR). The IDWR became an active user of GIS and remote sensing technology and, in the late 1980s and early 1990s, other state agencies including the Department of Lands, Department of Environmental Quality, Department of Fish and Game, and the State Tax Commission gradually adopted GIS technology. Increased interest in state government led to a series of actions in the 1980s and 1990s to formalize multi-departmental GIS coordination as described below. GIS applications implemented by state agencies in the 1980s and early 1990s focused on land resources inventory and monitoring in support of water resources management, water quality monitoring, fish and wildlife resource management, land cover mapping and inventory, state lands ownership tracking, property tax district mapping, wildlife resources management, support for environmental regulatory programs, and ongoing improvement of base mapping data. In the last 15 years, GIS technology has become an essential tool for at least 9 state agencies and use of GIS technology is growing to support a wide range of business areas including transportation planning and engineering, public safety, emergency planning and coordination, timber management, geologic mapping, infrastructure asset management, economic development, permit management, and support for response to public requests for information.

In the late 1980s and 1990s, GIS technology use by local government agencies and utility organizations increased rapidly. Several local governments and other organizations became early users of the technology including the City of Idaho Falls, Bonneville County, Ada County, Worley Highway District, and the Panhandle Health District. At the local government level, GIS was focused on parcel mapping, real property appraisal, and land development planning. Applications in infrastructure asset planning and management and public safety gradually became important focal points for GIS implementation in local government and utility organizations. Since the mid-1990s, a significant number of county and city governments in Idaho have instituted GIS programs—in some cases positioning them as enterprise programs effectively serving multiple departments and playing a major role as part of the overall information technology architecture. GIS technology has also been important to public and private utilities in Idaho. Early utility users in Idaho include Idaho Power, Kootenai Electric Coop, and Washington Water & Power (now Avista) which have focused GIS applications on map update, facility query, and asset management. In the last 15 years all or most utilities have implemented automated mapping and GIS technology to support planning and design, asset/work management, troubleshooting, and long-range service planning.

## Current GIS Status and the Idaho Geospatial User Community

GIS technology is now used throughout the state by a wide range of large and small public and private sector organizations in Idaho. The information collected through this planning project points to a strong interest in expanded use of GIS and development of an improved SDI program to coordinate the development of spatial data and sharing of resources.

State government continues to be a major user of GIS technology, and its use continues to expand. Currently, a number of state agencies are actively using GIS to support their missions and to provide access to geographic information that they maintain. The primary state agency users of GIS technology include:

| | |
|---|---|
| Department of Water Resources (IDWR) | Idaho Bureau of Homeland Security (BHS) |
| Department of Lands (IDL) | Department of Environmental Quality (IDEQ) |
| State Tax Commission (STC) | Department of Fish and Game (DFG) |
| Idaho Geological Survey (IGS) | Idaho Transportation Department (ITD) |
| Idaho Military Division | Department of Agriculture |

In addition to these principal state agency users of GIS, other state government agencies use products generated from GIS implementations and some, including the Department of Parks and Recreation and the Department of Health and Welfare, are planning to implement GIS applications to support their business needs. Some important GIS uses are summarized below:

- IDWR uses GIS technology for water rights accounting, watershed mapping, flood plain management, and other program areas. Applications include a Web-based interactive map query and display providing access to base map, image, and water resource data. Special GIS applications have been developed to support water rights adjudication and water resource modeling. Information about the IDWR's GIS program and access to on-line mapping and data sources is available at www.idwr.idaho.gov/gisdata.
- IDL uses a variety of interactive GIS-based queries, display, and custom generation tools to support its basic mission to manage trust lands in the state. This involves the active mapping and land records management for trust land. The IDL uses GIS technology to support an active role in geographic information access and dissemination (for internal staff and the public). GIS data access is available on-line from the Web Site (http://gis1.idl.idaho.gov/)
- STC makes use of digital mapping to support its mission to oversee and administer the State's tax laws as it relates to real property. This includes coordination with counties in the mapping of parcels and tax district boundaries and the review and approval of this mapping work in support of annual tax roll preparation and appeals that may follow. The STC provides on-site access to digital map information from its Web Site (http://tax.idaho.gov/propertytax/pt_GISmaps.htm).
- The Idaho Military Division uses GIS technology to manage maps and geographic data for multiple National Guard facilities and training sites throughout the state. GIS applications support query and map display, facility/work management, planning site development, etc. The Division also provides data to support training exercises and emergency management.
- The ITD http://itd.idaho.gov/planning/GIS/ uses GIS to support automated mapping, transportation planning, and support for highway engineering projects
- The DEQ uses GIS data and maps to support many aspects of its mission to oversee and enforce state and federal environmental regulations impacting Idaho's land, water, and air. GIS applications now focus on support for surface water quality monitoring and EPA Clean Water Act reporting. Web based services for interactive map viewing and GIS data downloads is available at www.deq.state.id.us.
- The IGS uses a combination of CAD and GIS technology for the automation of geologic maps and custom map generation. Geologic map automation is an ongoing effort, and data may be accessed through the IGS Web site (www.idahogeology.org/data)

Coordination and statewide access to geographic information was greatly improved following a 2001 Executive Order which called for a state geospatial clearinghouse. INSIDE Idaho was established at the University of Idaho in 2002 and formally recognized by the State's Geospatial Committee (IGC). INSIDE Idaho is a Web-based resource that serves as a portal providing flexible access to geospatial information.

It is maintained by the University of Idaho Library and may be used by any organization or individual with Web access. It includes search tools and download capabilities, as well as interactive viewing. In addition to storing a large amount of geospatial data, it includes links to other useful sources of information maintained by other organizations and provides other useful information for the geospatial user community (GIS standards documentation, useful links to other Web sites, tutorials). INSIDE Idaho may be accessed at http://insideidaho.org.

Over the past ten years, GIS technology has become an important tool for local governments in Idaho. The majority of the State's 44 counties have employed some level of GIS or digital mapping technology to support real property parcel mapping and appraisal, but the level of technology deployment and use varies considerably across the state. Counties with large populations and rate of growth are making the most extensive use of GIS while smaller counties face severe resource and staffing challenges in GIS implementation and operation. At the municipal level, many large- and medium-sized cities in Idaho have made great progress with GIS development and deployment. Some examples of current operational GIS programs at the local government level include:

- City of Boise: The City's GIS program began in the late 1980s with management placed in the Public Works Department. The program assumed a more formal enterprise focus with a 2006 re-organization, placing GIS management in the IT Department. The City continues to develop a well-integrated GIS database with Web-services for flexible access to information about City resources and services. GIS is used extensively by users in Public Works, Parks, Planning and Development Services, and the Police Department. The City is completing a GIS planning project to define GIS needs and operations for the future.

- Ada County: The County has had a GIS program since the late 1980s with an initial focus on parcel mapping and real property management but gradually expanding to encompass a wide range of applications for multiple County departments. GIS applications are currently being used extensively to support land records management, recreation planning and operations, pest management, land use planning, and crime analysis. The County has a range of custom mapping applications and on-line, Web-based GIS applications for public access. The County coordinates with the City of Boise and other organizations to support GIS coordination in the Ada County region. See www.adaweb.net/departments/assessor.

- Bonneville County: The County's GIS Program has been active since the mid 1990s and serves multiple Departments. The GIS database includes a full parcel/real property database with a publicly accessible Web-based viewer application. The GIS is also used to support E911 and a range of public safety planning and response activities.

- Kootenai County: The Kootenai County GIS and Mapping Department (www.co.kootenai.id.us/departments/mapping/) supports the work of multiple county agencies and has assembled an extensive set of geographic data sources and custom map products which are available for access via the Web. The GIS program has a major focus on real property mapping and appraisal and plat review.

- Bonner County: With a successful GIS implementation for over ten years, the County formalized an enterprise GIS program by creating a separate GIS Department in 2004 providing coordination and service to all departments. A comprehensive GIS database is currently maintained, and it is used extensively to support planning and zoning decisions, parcel mapping and appraisal, addressing, and transportation infrastructure management. Custom maps and GIS data are available for download via the Web. (www.co.bonner.id.us/gis/)

- City of Jerome: The City's GIS program is managed from the Information Services Department and serves all City agencies. There is a comprehensive GIS database with base map and other datasets. The GIS is used extensively to support such program areas as zoning, building permitting, public safety planning and dispatch, land use planning decisions, transportation and utility infrastructure management, and economic development.

Local governments constitute a critical part of Idaho's SDI effort, and geospatial data and technology has been shown, in Idaho and elsewhere around the USA, to deliver substantial benefits to a wide range of programs and business needs of cities and counties. The statewide geographic disparity in available resources for GIS development and operation at the local government represents a major challenge for SDI development, and it is important to find ways to support statewide database development and access by all users, including those organizations with limited funds and staffing for GIS deployment and operation.

Over 60 percent of the land in Idaho is owned and managed by the federal government. Land management missions of several federal agencies, most notably the U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Bureau of Reclamation (BOR), use GIS technology extensively for tracking ownership, leases, and a range of natural resources and infrastructure management activities. GIS applications include standard and custom mapping, timber and grazing lease management, fire threat management and response, law enforcement and rescue operations, timber and vegetation health, recreation planning and operations, and others. Many other federal agencies have offices in or operate programs in Idaho, including the U.S. Geological Survey (USGS), Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), Census Bureau, U.S. Army Corps of Engineers (COE), U.S. Department of Transportation (USDOT), Environmental Protection Agency (EPA), Office of Surface Mining (OSM), Mine Safety and Health Administration (MSHA), and Department of Homeland Security (DHS). These and other federal agencies make extensive use of geographic information, often coordinate activities with state and local governments in Idaho, and invest considerable sums in GIS development and use.

Tribal governments also use GIS. The Coeur d'Alene Tribe has had an active GIS program since 1992 (gis.cdatribe-nsn.gov). The Tribe uses GIS technology to collect, store, and analyze information about the lands it has traditionally used. Information is collected about environmental, social, and cultural geographic features. In recent years the Tribe's GIS program has expanded to doing work for other organizations in the Northwest. In 2007, the Tribe received ESRI's Special Achievement in GIS award.

Idaho is fortunate to have active GIS programs at its three state universities. Idaho State University, Boise State University, and the University of Idaho each have mature GIS offerings that include degree programs, technical training, research, outreach, and support for GIS user organizations. GIS at the state universities is summarized as follows:

- At Boise State University (BSU) remote sensing and GIS are housed within the Department of Geosciences. The Department serves as the spatial information hub for the university through teaching and research collaboration. Teaching areas include remote sensing and GIS coursework in support of both an undergraduate minor and graduate certificate in Geographic Information Analysis. These programs also benefit from coursework offered by Idaho State University-Boise and internship collaborations with State (Water Resources, Environmental Quality) and federal (BLM, USFS, BoR) agencies housed in and around Boise. Through research, associated with the Geospatial Research Facility and graduate studies programs, BSU has established relationships with federal and state natural resource management and administrative agencies. Faculty in the department also maintain remote sensing-based research, funded in part through the NASA-funded EPSCoR and Idaho Space Grant Consortium, both housed at the University of Idaho.
- Idaho State University (ISU) performs teaching, research, and outreach in GIS and remote sensing science through its Depts. of Geosciences, Biological Sciences, Anthropology, and the campus-wide GIS Training and Research Center (GIS TReC). ISU's geospatial programs are located in Pocatello, Idaho Falls, and Boise, covering much of southern Idaho. ISU's Dept of

Geosciences MS in Geographic Information Science and PhD in Engineering and Applied Science train students in geospatial analysis, with GIS and remote sensing being a primary focus. ISU also offers a MA in Historical Resource Management and a BS in Geomatics. ISU's GIS TReC is a regional resource for geospatial users, both on and off-campus. The TReC offers numerous workshops each year, including field and laboratory based experiences while serving as a GIS data repository. ISU's GIS TreC also provides regional GIS and remote sensing data to the public through a clearinghouse (http://giscenter.isu.edu). The ISU remote sensing group has expanded to the Boise region through the Boise Center Aerospace Laboratory (BCAL). In addition, the ISU Geospatial Lab in Idaho Falls develops open-source GIS platforms for federal agencies such as the EPA and provides student training and outreach. ISU works extensively with federal agencies such as DOI (BLM) and USDA (FS, NRCS, ARS) and state and local groups through grants and contracts. ISU's geospatial research and outreach has blossomed in the past ten years, with annual funding of approximately $10M. Along with UI, ISU is an active member of UCGIS.

- The University of Idaho established their first GIS lab in 1985 and has maintained a remote sensing research program since the end of World War II. Over the years, teaching, research, and outreach involving geospatial technologies have spread throughout the University and now include the Colleges of Letters Arts & Social Sciences, Agricultural and Life Sciences, Art and Architecture, Natural Resources, and Science. These Colleges have produced graduates at all levels with GIS and remote sensing expertise. The Department of Geography has a GIS certificate program to serve students and professionals who want a basic understanding of techniques and application potential of GIS. Furthermore, the Geography Department offers the BS GIS degree, and the MS degree with emphasis in GIS. A diversity of leaning opportunities, research projects, and publications spanning local to global scales have resulted from GIS and remote sensing activities taking place in the Departments of Geography, Landscape Architecture, Forest Resources, Rangeland Ecology and Management, Biological and Agricultural Engineering, Fish and Wildlife, and Anthropology. UI Facilities and programs such as GAP and Waters of the West (WoW) use GIS for capturing, managing, analyzing, and displaying geospatial data. The Idaho Geological Survey (IGS), a special state public service and research agency housed at the UI, collects and disseminates geologic and mineral data for Idaho. UI faculty and staff are actively involved in local, regional, state, national, and international activities that enhance geospatial knowledge discovery. The UI was a founding member of the University Consortium for Geographic Information Science (UCGIS), has maintained Idaho representation in the NASA supported Upper Midwest Aerospace Consortium, and is also home to the NASA Idaho Space Grant Consortium. INSIDE Idaho, the state's portal for geospatial data, is housed in UI's library and is a national, state, and regional resource for the geospatial community as referenced in other locations in this document.

## History and Status of GIS Coordination in Idaho

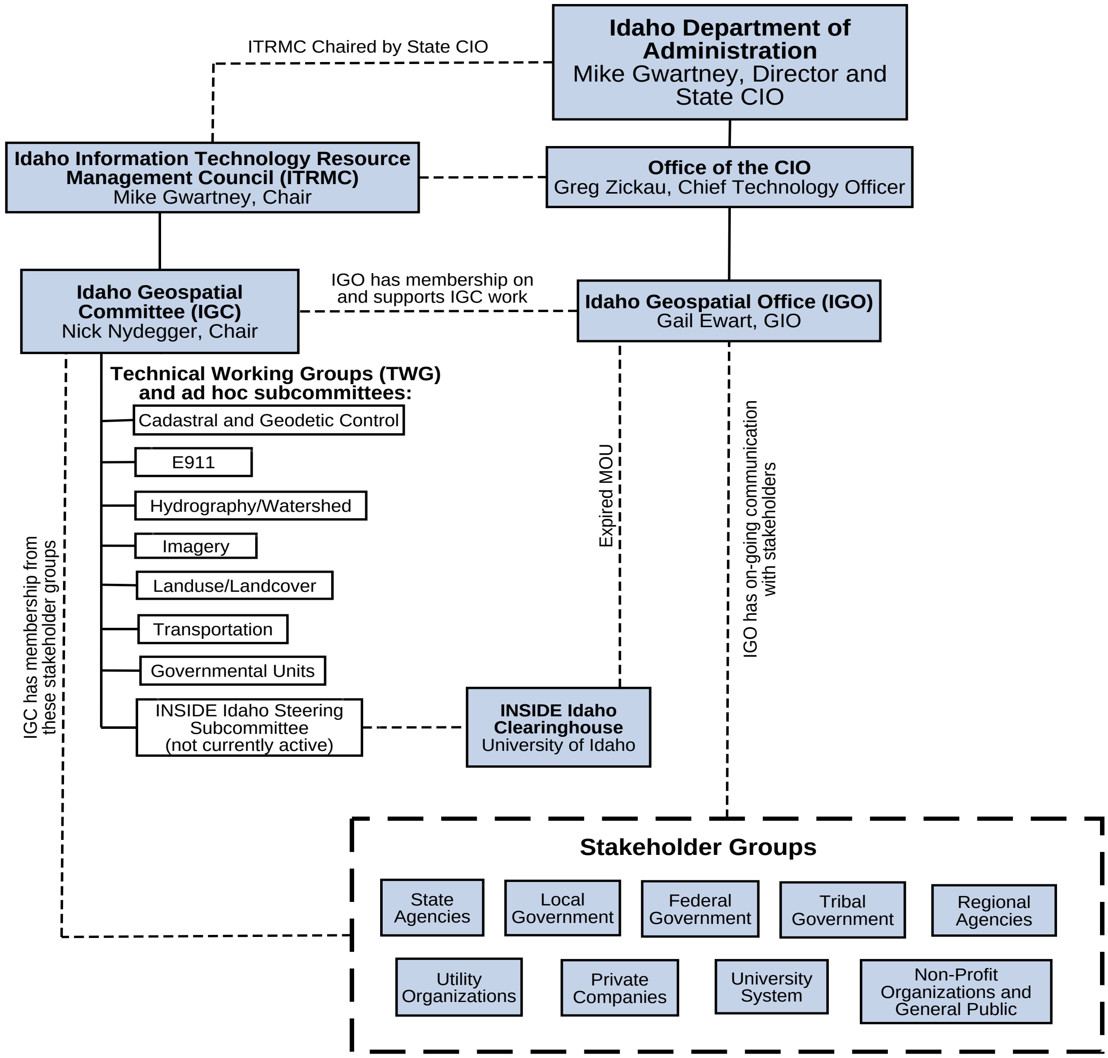
Formal actions to coordinate GIS efforts in Idaho go back to initial discussions and planning in 1978 which culminated in a 1980 Executive Order from the Governor's Office that established the Idaho Image Analysis Facility (IIAF) in the Idaho Department of Water Resources (IDWR) and designated IDWR as the lead state agency for remote sensing and geographic information systems. State GIS coordination was advanced in the 1980s with the empowerment of the Idaho Mapping Advisory Council (IMAC), through Executive Order, to assume coordination of geographic information and technology among state agencies. IMAC had been initially created in the 1970s to coordinate mapping operations with the USGS. IMAC was subsequently renamed Idaho Geographic Information Advisory Committee (IGIAC) in a 1988 Executive Order (88-16). The Legislature acted to designate IDWR's lead role in maintaining natural resources information in the state through the Ground Water Protection Act of 1989 (Idaho Code 39-120). Following adoption of this law, a 1992 Executive Order (92-24) reauthorized IGIAC and renamed the

Image Analysis Facility to the Idaho Geographic Information Center (IGIC). IGIAC and IGIC were reauthorized by an additional Executive Order in 1996. The 1996 Executive Order authorized and defined the membership and responsibilities of IGIAC and defined its role as a multi-organizational coordinating body, and it established IGIAC as a committee of the newly formed Information Technology Resource Management Council (ITRMC).

Interest in advancing and expanding statewide coordination of geospatial information and GIS technology use led to a new Executive Order in 2001 (EO 2001-07). This Executive Order established the Idaho Geospatial Committee (IGC) and made it a standing committee to ITRMC. The Executive Order directed the IGC to promote interaction and cooperation among geospatial data users across the state and at all levels of government and nongovernmental organizations. A state GIS Coordinator position was established at that time, and several Technical Working Groups (TWGs) were formed under IGC to pursue the development of GIS data standards for Framework themes. Subsequently each TWG developed an I-Plan for its theme, and they were gathered together under an umbrella document. The thematic I-Plans are attached as appendices to the 2003 I-Plan.

A 2006 Executive Order (EO 2006-05) was approved to continue the geospatial coordination structure established in 2001. This executive order expires on January 25, 2010. The current structure is shown in Figure C1. Ongoing management and coordination resides in the Idaho Geospatial Office (IGO) led by the Geospatial Information Officer (GIO). The GIO and her small staff support and coordinate efforts with the IGC and with GIS personnel in state agencies. In addition, the IGO keeps in communication with GIS professionals in non-state government organizations around the state. The IGC's mission is to "provide a forum for the GIS community to facilitate the use, development, sharing and management of geospatial data; and to communicate the value of geospatial information to citizens and decision-makers." Its bylaws call for a maximum of 16 members, including representation from state government, tribal government, local government, the private sector, and the state university system. In addition, IGC includes a federal GIS liaison from the U.S. Geological Survey.

**Figure C1:**
**Current Organizational Structure for the Idaho SDI**




Working in parallel with this formal coordination structure are informal groups and collaborations that have been created to support local and regional GIS programs and projects. For the most part, these are launched by users to support sharing of information, project costs, and education/training activities. Of particular note are:

- Regional Idaho user groups: Ada County Special Interests Group (SIG), Canyon County Spatial Data Consortium (SDC), Southwest Idaho GIS Users Group (SWIG), Kootenai County GIS consortium, Southeast Idaho Regional user Group, ESRI Technical Working Interest Group (TWIG), North Central Idaho Networking Cooperative, ESRI Panhandle User Group
- URISA Northern Rockies Chapter (www.intermountaingis.org/)
- Northwest ESRI User Group
- Avista-led effort for orthoimagery development—collaboration with local governments in northern Idaho
- Idaho Power program for parcel database development support with county governments

## Computer System Infrastructure and Standards in Idaho

GIS technology is dependent on a sound computing infrastructure that includes computer hardware, networks, and standards that support system administration and integration. At the state government level, information technology infrastructure is managed by the Department of Administration's Office of the CIO with input and direction provided by the Information Technology Resources Management Technology (ITRMC). The ITRMC includes representation for state and local government and the private sector and approves standards, guidelines, and policies that are the basis for information technology procurements and development (see www2.state.id.us/itrmc/plan&policies.htm). While these policies are only mandatory for state agencies, they are often applicable for non-state agencies and are aimed at promoting efficient, enterprise approaches for information technology development and operation. These standards and policies cover a number of system infrastructure areas that directly impact GIS technology, including operating systems, networks, and security tools. ITRMC-approved IT standards that have the most significant impact on GIS development include:

- Desktop Computer Operating System: Microsoft Windows 2000 and Windows XP (S2100)
- Server Operating System: Microsoft Windows 2003 as the primary OS and UNIX as a secondary server OS environment (S2510)
- Web Services: standards call for compliance with World Wide Web Consortium (W3C) Standards and the use of Microsoft Internet Information Server (IIS) software for Web services and hosting. (S3100)
- Web Browser: Microsoft Explorer (version 6 or Version 7) (S3110)

In addition to the standards cited above, the ITRMC has approved other network standards addressing local and wide area network communications which cite acceptance of the TCP/IP protocol and Internet services standards, Ethernet (IEEE 802.3) for local area communications, and IEEE standards for Wireless LANs (802.11). While not specifically defined as standard for database management, Microsoft SQL Server is the primary proprietary DBMS software in use, and open-source software packages MySQL and PostgreSQL are used for a number of applications. In coordination with the Idaho Geospatial Committee (IGC), the ITRMC has also approved a number of specific GIS standards including:

- ITRMC Standard: S4210 Projection
  http://www2.state.id.us/itrmc/plan&policies/Standards/S4210_Projection.pdf
- ITRMC Standard: S4220 Geospatial Metadata
  http://www2.state.id.us/itrmc/plan&policies/Standards/S4220_GeospatialMetadata.pdf
- ITRMC Guideline: G420 – Roles of GIS Participants
  http://www2.state.id.us/itrmc/plan&policies/guidelines/G420%20-%20Roles%20of%20GIS%20Participants.pdf
- ITRMC Policy: P1070 – Geographic Information Systems (GIS)
  http://www2.state.id.us/itrmc/plan&policies/Policies/P1070_GeographicInformationSystems.pdf
- ITRMC Guideline: G320 - Geographic Metadata
  http://www2.state.id.us/itrmc/plan&policies/guidelines/G320_Metadata.pdf

Current computer system and network operation and administration for state agencies may be characterized as a mix of centralized and decentralized services and support. The Idaho Department of Administration (DoA) has responsibility for overall information technology development and support with a primary focus on several enterprise systems used throughout state government, including:

- Server and network domain administration and support (individual server development and administration is often the responsibility of specific departments)
- Web server hosting and Web site development
- Primary firewall and network security administration
- Email services (with current effort for email system consolidation)

In many cases, computer system development and operational support is decentralized and is the responsibility of specific state agencies. This is the case with most of the state agency GIS implementations which typically use Windows-based Intel servers to support GIS data, applications, and Web services.

System and network infrastructure supporting GIS implementations at the local level vary by jurisdiction and organization, but Windows-based operating system environments predominate. Among local governments and utility organizations, there is a wide range of organizational models and practices governing computer system acquisition, standards, and system administration.

Current wide-area digital communications in Idaho vary in type and speed in different regions of the state. Wired communications include dedicated, high-speed point-to-point connections, such as T-1, T-3, and DSL services for business and residences. Wide area digital communications including broadband services are provided by a number of private companies (telephone, cable, and other communication providers) with service areas in different parts of the state. Verizon, Qwest, and Cox Communications are major providers but over ten other companies offer digital services for other areas of the state. See the Idaho Public Utilities Commission map at www.puc.idaho.gov/telecom/CITIES.pdf for service territories of private telecommunication companies. For state government agencies, a number of separate wide area networks are in place that serve central offices in Boise and locations throughout the state. These include IDANET (Idaho's state network), Cmphoni, 700 MHz digital microwave system for public safety, IRON (Idaho Regional Optical Network) serving education primarily, and a proposed Idaho Education Network.

## GIS Software

GIS applications are based on commercial or public domain software packages that provide off-the-shelf capabilities and tools for custom applications for geographic data management. GIS implementations normally make use of one or more of the following types of software which are blended together to provide a range of GIS functionality:

- Core GIS Software includes a rich set of capabilities for capturing and managing geographic information and range of functions for query, display, analysis, and the generation of a variety of products (maps, reports, exported data, etc.).
- Image Management/Remote Sensing Software includes capabilities for managing and accessing images—aerial or satellite and for providing various tools for image enhancement, analysis, and manipulation. Core GIS software includes basic capabilities for accessing images (e.g., orthoimagery), but these separate packages offer an extended set of functions, and in most cases, they are designed to integrate well with core GIS software.
- Database Management Software provides a structured environment for storing attribute, image, or spatial data types normally in a table format. Database Management Systems (DBMS) are usually tightly integrated with GIS software for management of attribute, map, and image data. DBMS software also provides for data security and administration and supports query and reporting functions of the GIS software.

- Web-based GIS Software includes a range of GIS data management, query, display, and analysis capabilities designed for Web-based management and access. Until recently, Web-based GIS software was clearly separate from "core GIS software", but technology trends are resulting in software products that deliver full GIS core functionality in a Web-based environment.
- Special Application Software Packages or Extensions are software packages developed to integrate fully with and augment the capabilities of the core GIS, database management, or Web-based GIS software packages to provide functionality for a specific type of application or user group (e.g., transportation modeling and analysis).
- Field-based GIS Software includes a limited set of functionality designed for operation on a handheld computer for use outside the office—in the field or a vehicle.
- While there is no required software standard at the state government level, the predominant software packages in use by state agencies are provided by Environmental Systems Research Institute (ESRI). Various versions of ESRI's ArcGIS software are prevalent, as is ArcIMS for Web-based applications. ESRI's ArcSDE software for enterprise geodatabase management is in frequent use, and there is interest in moving toward adoption of ESRI's ArcGIS Server software. ERDAS software is used by some agencies for image access and remote sensing applications, and AutoCAD is used for some selected mapping applications. This mix of software common for state government agencies also characterizes the software configuration of INSIDE Idaho, the state's official geospatial clearinghouse.
- ESRI GIS software is also widely used by local governments, federal agencies, utility companies, and other users in Idaho. These organizations make considerable use of ArcGIS desktop, ArcSDE, and ArcIMS for Web-based applications. Some organizations have recently implemented ArcGIS Server, and others are interested in adopting this relatively new software offering from ESRI. Some local government agencies use GIS and digital mapping software from other vendors, including Intergraph, AutoDESK, and others.

### GIS Clearinghouses and Portal Services

INSIDE Idaho is the primary digital clearinghouse and is recognized by the ITRMC and by executive order as having the lead role in statewide geospatial data access and distribution. INSIDE Idaho is maintained and operated by the University of Idaho Library at the Moscow campus. Computer hardware supporting this clearinghouse service consists of multiple dedicated rack-mounted servers running the Windows 2003 operating system with IIS Web server software. More information about the system architecture can be found at http://insideidaho.org/technology.htm and http://insideidaho.org/images/infrastructure.gif. The service uses ESRI GIS software and SQL Server database software.

As noted above, a number of state agencies also operate Web-based GIS portals that support interactive map query and viewing and data downloads for information specific to their programs (IDWR, IDEQ, IDL, IGS, and STC). These Web sites use dedicated Windows-based servers and state Web hosting. GIS data is maintained using ESRI ArcGIS software, and Web-based applications make use of ESRI ArcIMS software in most cases.

A number of federal agencies, tribal governments, and local governments with active GIS programs are supporting publicly accessible Web sites for access to geographic data and, in some cases, interactive GIS query and display applications. Some examples of these Web sites that provide geographic information and metadata for Idaho include:

- Coeur D'Alene Tribe GIS Clearinghouse: http://gis.cdatribe-nsn.gov/data.aspx
- US Forest Service: GIS Websites for specific National Forests: www.fs.fed.us/r4/gis/forest.html. For Region 1 see: www.fs.fed.us/r1/maps/index.shtml
- Kootenai County GIS and Mapping Department: www.co.kootenai.id.us/departments/mapping/
- City of Boise GIS: www.cityofboise.org/Departments/IT/GISAndMapping
- Ada County: www.adaweb.net/departments/assessor
- Bonner County: www.co.bonner.id.us/gis/
- City of Idaho Falls: http://gis.ci.idaho-falls.id.us/website/Zoning/viewer.htm
- U.S. Geological Survey Geospatial One Stop: http://gos2.geodata.gov/wps/portal/gos
- Teton County: http://www.co.teton.id.us:81/PublicMap/terms.htm
- Blaine County: http://maps.co.blaine.id.us/
- University of Idaho: http://maps.insideidaho.org/WebMapping/UIMoscowCampusImagery and http://maps.insideidaho.org/WebMapping/UIMoscowCampusData/
- Idaho State University: http://giscenter-ims.isu.edu/website/maps/viewer.htm

## GIS as Part of Overall Information Technology Strategy

Information technology development and operation at the state government level is guided by the Information Technology Resources Management Council (ITRMC) established by the Idaho Legislature in 1996. ITRMC's mission is to review and evaluate current IT and communications systems and to prepare plans and provide direction for future enhancement and development. It includes representation from state government, local government, the university system, and the IT industry. The Office of the CIO in the state's Department of Administration provides staff support to the ITRMC and is responsible for information technology implementation and operational support. The ITRMC has established a number of committees and working groups to address specific IT system or application areas (see www2.state.id.us/itrmc/committees.htm). As mentioned above, among these is the Idaho Geospatial Committee (IGC). In 1997, the ITRMC approved the state's Information Technology Strategic Plan which lists the following vision and high-level goals for IT development (which are in the process of revision):

**Idaho Strategic IT Vision:** Capture 21st Century technologies to deliver services to Idaho's citizens.

**Strategic IT Goals** (from ITRMC IT Strategic Plan, www2.state.id.us/itrmc/plan&policies/itplan.htm:

- Simplify delivery of government services and information.

- Protect the privacy and confidentiality of citizen information.
- Manage information technology from an enterprise (statewide) perspective.
- Promote collaborative relationships between federal and state agencies, public and higher education, and local governments
- Use 'state-of-the-art' procurement practices for acquisition of information technologies.

The plan itself emphasizes operational efficiency, security and reliability and the need to align information technologies more effectively to meet the needs of its users. There is a strong focus on improving information technology access to meet a growing demand and to support the integration of systems and organizations throughout the state. The ITRMC is currently working on a revision to the IT Strategic Plan.

In 2008, the Legislative Office of Performance Evaluations issued a report, "Governance of Information Technology and Public Safety Communications" which included observations about IT and communications systems and problems in technical and organizational areas. This report underscores the important challenges, reflected in the 2007 IT Strategic Plan, to develop and put in place more effective, strategic practices. To address these concerns, the State of Idaho Information Technology Alignment Task Force was formed April 2008 by ITRMC. This Task Force issued its recommendations in August 2008, summarized as follows:

- Transition to a dedicated Chief Information Officer (CIO) reporting directly to the governor
- Form a subcommittee of ITRMC to approve/disapprove shared-service IT projects prior to appropriations
- Clearly establish statewide shared IT services under the authority and responsibility of the CIO
- Review IT personnel distribution and assign small agency personnel to a central service organization reporting to the CIO
- Establish a Project Reporting Office within the central service organization to track government IT projects, assist with large-scale project reviews, and implement central service projects
- Develop and adopt an IT decision-making model, implemented through the CIO, to clearly establish the IT project approval/disapproval process

These enterprise information technology recommendations are fully consistent with the overall direction and goals of the SDI and specific implementation initiatives, defined in the SDI *Business Plan*, will respond to these recommendations.

The SDI initiative described in this document includes goals and actions that are consistent with the state's IT Strategic Plan and responds to issues addressed in the legislative report, as illustrated in the following themes guiding SDI development:

- Enterprise information services with a focus on business needs and cross-departmental sharing of resources
- Integration of disparate systems and data sources supporting easier information access and greater efficiency in system operation
- Collaboration and partnerships among all levels of government, academic institutions, and the private sector
- Improved services to citizens, businesses, and visitors to the state
- Improvements in the state's computing infrastructure to enhance statewide access to information, system security
- Sound management, policies, and standards that ensure robust, efficient SDI

## APPENDIX D: ELABORATION ON SDI LIMITATIONS AND OBSTACLES

An evaluation of the status of SDI development, current GIS use, and the needs of stakeholders statewide has revealed a number of important limitations and obstacles that inhibit SDI development and which prevent users from achieving the full range of potential benefits from GIS technology and statewide geographic information sharing. These obstacles and limitations create a starting point for planning—to ensure that strategic goals and implementation initiatives focus on the critical areas that will contribute to SDI success. Table D1 presents the main SDI obstacles and limitations and organizes these by severity—a relative indication of the impact and the frequency with which this limitation or obstacle is encountered by users. This table also identifies the type of obstacle or limitation reflecting the fact they relate to a range of technical, organizational, and other factors.

**Table D1:**
**Summary of Main Limitations and Obstacles to SDI Development**

| Obstacle/ Limitation | Type (1) | Severity (2) | Explanation |
|---|---|---|---|
| Benefits or business case for GIS not clear | F | VH | There is a lack of identification and understanding of the full scope and cost of GIS development and its potential benefits—addressing a wide range of business needs. There is difficulty in conveying a convincing business case argument for GIS—particularly making hard ROI case |
| Insufficient senior management awareness or support | O, E | VH | In most cases, senior officials (executives, elected officials) do not understand GIS technology—its scope and potential value. Often there is not sufficient information that explains the applications of GIS and shows its place to support the organizational mission. |
| Inter- and Intra-organizational coordination | O | VH | Existence of organizational and political barriers that prevent resource sharing and collaboration. Includes barriers between GIS and traditional IT programs in government and lack of administrative vehicles and policies that encourage cross-departmental sharing of resources and collaboration. Includes institutional barriers between GIS and "mainstream IT" that exist in some organizations. In some cases, there are problems in forging agreements and joint project work with outside organizations. |
| Lack of consistent, statewide GIS database | D | VH | Full statewide coverage of framework data does not exist and major development work remains to complete coverage. Lack of standards contributes to inconsistency in format and quality of existing data. |
| Funding/Budgeting Limitations | F | VH | Difficulty in getting funds allocated for GIS database development and technology (SW, HW, network) upgrades and ongoing staff support. Resistance for new budget allocations from government legislative bodies creates difficulty in securing sustained funding. |
| Geographic disparity in available resources across state | F | VH | There is major variability in resources for technology initiatives by local governments. Many low-resourced counties and cities have limited funds and staff constraining GIS development and operation. The; state legislation limiting local government budget increases to 3% per year impacts ability to allocate funds for major development work. |
| GIS data quality and management limitations | D | H | There are problems in accuracy and currency of specific GIS data layers including parcels, floodplain maps, GCDB and survey control, jurisdictional boundaries developed and maintained by different jurisdictions. Insufficient standards and accepted specifications add to the problems. In many cases, single jurisdictions are maintaining multiple, redundant geographic data sets. There are established best practices to guide GIS database administration (QA, security, backup, disaster recovery); redundant/duplicate database maintenance wastes time and money. |

(1) Type: Organizational and management structure and practices (O), Data development or management (D), System configuration, software, or application development and operation (S), Education, outreach, and internal/external communications (E), funding, budgeting, cost-benefit evaluation, and financial management, (F), Legal or policy development and management (L)

(2) Severity: Relative reflection of overall importance, frequency, and level of impact on SDI implementation and GIS technology. Very High (VH) means that the limitation or obstacle is critical and should be addressed as a priority in the SDI strategic and business plans. The High (H); Moderate (MOD); and LOW (L) severity scores indicate still important but somewhat progressively lower levels of importance in plan preparation.

**Table D1:**
**Summary of Main Limitations and Obstacles to SDI Development (con't)**

| Obstacle/ Limitation | Type (1) | Severity (2) | Explanation |
|---|---|---|---|
| Metadata not adequate or easily available | D | H | Metadata does not exist or is not easily accessible in many cases, and this limits geographic data searches and access. There are insufficient tools for easy capture, query and access to metadata. |
| Incomplete Geospatial data standards | D | H | Insufficient or unclear set of standards for Framework data themes; insufficient communication about or support in applying standards; no consistent statewide land base |
| Training/Staffing/ Skill limitations | E | H | Includes difficulty in finding qualified staff with technical skills and limitations in providing ongoing technical training. Rapid turnover of skilled staff is a problem, and “fuzzy creep" in assignment of roles to GIS staff can sometimes negatively impact job performance. |
| Statutory limitations regarding public information management and access | L | H | There is some ambiguity and lack of consistency in applying public records law (Idaho Code §§ 9-337 through 9-350) as it relates to distribution of geographic information. This includes wide variability in procedures and policies for responding to public requests for information and policies in regards to fee setting by government agencies. Also there is confusion and inconsistency in response to personal information confidentiality restrictions (e.g., protection of property ownership data). |
| State IT and GIS management and authority | O | H | Currently, the state Geospatial Office (IGO) is administratively located in the state CIO Office which has no official mandate or authority outside of that granted administratively by the Department of Administration. This limits its authority and potentially its long-term viability. |
| State GIS governance and coordination structure | O | H | IGC could be more effective through change of membership and more consistent representation and improved participation by a full range of statewide stakeholders. IGC service terms are inconsistent, and no specific decision-making authority exists. Standards approved by IGC only binding for state agencies. The current structure can be improved to address both the needs of state agencies and the broader GIS user community throughout Idaho. |
| State level IT management and oversight decentralized and too weak | O | H | Current IT governance structure and policies at the state level inhibit coordination and sharing of IT resources and the consolidation and interoperability among systems. See report, “Governance of Information Technology and Public Safety Communications” (www.legislature.idaho.gov/ope/publications/reports/r0801.htm). This could limit the adoption of policies and practices for SDI coordination and integration. |

(1) Type: Organizational and management structure and practices (O), Data development or management (D), System configuration, software, or application development and operation (S), Education, outreach, and internal/external communications (E), funding, budgeting, cost-benefit evaluation, and financial management, (F), Legal or policy development and management (L)

(2) Severity: Relative reflection of overall importance, frequency, and level of impact on SDI implementation and GIS technology. Very High (VH) means that the limitation or obstacle is critical and should be addressed as a priority in the SDI strategic and business plans. The High (H); Moderate (MOD); and LOW (L) severity scores indicate still important but somewhat progressively lower levels of importance in plan preparation.

**Table D1:**
**Summary of Main Limitations and Obstacles to SDI Development (con't)**

| Obstacle/ Limitation | Type (1) | Severity (2) | Explanation |
|---|---|---|---|
| State Geospatial Clearinghouse Support | S | H | INSIDE Idaho needs improved interface and search tools and possibly enhanced set of services for GIS data use (not just data download); no stable, sustained funding base and insufficient staff for operations and enhancement. Because of budgeting and accounting rules, state agency general fund allocations cannot directly support higher education institutions. This limits avenues for INSIDE Idaho financial support. |
| Current Geospatial Clearinghouses follow "archive-download" model | S | MOD | INSIDE Idaho and other organizations that support Web-based data clearinghouses that concentrate primarily on a centralized "data warehouse" model in which data from various sources is collected and stored in a central location and distributed out to users who access the clearinghouses. The centralized approach is a viable solution in many cases and will continue to be used, but it is limited because it requires higher overhead in data management and potential shortcomings in keeping data current and synchronized with the source. Technological changes and the growing number of geographic data sources support a move to more of a "virtual portal" model. This model would follow a federated approach in which data would be accessed via the Web directly from the source and downloaded or interactively viewed via a Web-based interface. NOTE: Current geospatial clearinghouses such as INSIDE Idaho are not purely centralized in structure and do offer metadata access and links to distributed sources. They have made moves to a more distributed, virtual model and are in a position to advance such architecture in the future. |
| Parcel mapping format and standards | D | MOD | Lack of statewide consistency among counties in parcel mapping standards and digital mapping format and need for stronger direction and support from the state. There are problems in ongoing update and confusion on when to post updates (date of actual change like a parcel split vs. "snapshot" for annual tax roll). |
| Storage and access to historical information | D | MOD | Lack of tools, data model, and procedures for effective storage and query of historical geographic information—historic information that is important for ongoing use in planning, research, and legal proceedings. |
| Acceptance/familiarity of technology by GIS staff and users | E | MOD | Lack of full acceptance of GIS technology and resistance from employees is sometimes a problem. Lack of skills prevents full, effective adoption. The general public user community often does not understand enough about the technology or data to use it effectively. |
| E911 funding allocation inconsistencies | F | MOD | E911 fee administration and could be better coordinated to support GIS data development t (e.g., address data, jurisdictional boundary, and centerline compilation). This contributes to data inconsistency among different jurisdictions. |
| Inconsistent use of sound GIS planning and management models and practices | O | MOD | There is no single source for a set of policies, guidelines, or organizational best practices to support GIS program development, management, and operation. While the ITRMC provides policies and guidelines for IT, most do not directly address GIS program needs. |

(1) Type: Organizational and management structure and practices (O), Data development or management (D), System configuration, software, or application development and operation (S), Education, outreach, and internal/external communications (E), funding, budgeting, cost-benefit evaluation, and financial management, (F), Legal or policy development and management (L)

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**Table D1:**
**Summary of Main Limitations and Obstacles to SDI Development (con't)**

| Obstacle/ Limitation | Type (1) | Severity (2) | Explanation |
|---|---|---|---|
| Statewide communication network | S | MOD | Multiple, inconsistent wide area communication networks and services makes access and interoperability difficult; all areas of the state do not have high-speed digital access. A wide array of wide area network service offerings by private companies (telephone companies and others) makes it confusing to secure broadband services for residences and businesses. |
| Rapid technology changes/technology migration problems | S | MOD | Rapid changes in software and hardware create problems in technology upgrades and keeping track of new approaches and practices that might be adopted. |
| Lack of accurate data for public safety response | D | MOD | In many cases, local, state, and federal law enforcement and fire protection organizations do not have ready access to geographic information for effective dispatch and response. This includes unclear jurisdictional boundary information (emergency service zones) which creates confusion in determining primary source of response and access to critical facility information to support response. |
| Accuracy problems with coordinate data and governmental boundaries | D | MOD | There are major accuracy problems with coordinates assigned to government land corners (PLSS) grid and in the placement of some county boundaries. This is a significant problem because other map data is based on this information and dependent on a reasonable accuracy level. Effort is underway through the Cadastral Reference TWG to work toward improvement of accuracy. |
| Limitations on state general fund allocation to universities | F | MOD | State government budgeting and accounting rules limit direct allocations from the General Fund to university programs. This creates obstacles in direct funding support from state agency budgets to university GIS programs that are a vital part of the SDI. |
| Data search and access limitations | D | L | Even with great advances in software tools and user interface flexibility, there are insufficient applications for easy, intuitive search and discovery of geographic information—not just map based information but documents, forms, images that contain geographically related content. |
| Overselling of GIS | E | L | GIS personnel--often younger, inexperienced staff sometimes overstate benefits and understate costs and time for GIS development to senior management. This creates unrealistic expectations and missed project goals |
| Time commitment and staff availability | O | L | Not enough staff and time to address all GIS program needs--particularly building better cross-agency coordination |

(1) Type: Organizational and management structure and practices (O), Data development or management (D), System configuration, software, or application development and operation (S), Education, outreach, and internal/external communications (E), funding, budgeting, cost-benefit evaluation, and financial management, (F), Legal or policy development and management (L)

(2) Severity: Relative reflection of overall importance, frequency, and level of impact on SDI implementation and GIS technology. Very High (VH) means that the limitation or obstacle is critical and should be addressed as a priority in the SDI strategic and business plans. The High (H); Moderate (MOD); and LOW (L) severity scores indicate still important but somewhat progressively lower levels of importance in plan preparation.

**Table D1:**
**Summary of Main Limitations and Obstacles to SDI Development (con't)**

| Obstacle/ Limitation | Type (1) | Severity (2) | Explanation |
|---|---|---|---|
| Limitations in field/ mobile access to GIS | S | L | Availability of appropriate field computer devices and limitations in wireless access |
| Census enumeration unit boundary problems | D | L | There is considerable miscorrespondence in positional accuracy of Census Bureau enumeration areas which are based on local geographic features (street centerlines, jurisdictional boundaries, physical features) and the correspondence with digital map boundaries maintained by local governments. Only a few Idaho government jurisdictions participated in the Census Bureau LUCA program to resolve boundary problems. The miscorrespondence in boundary placement will make it more difficult to integrate Census data with local GIS data. |

(1) Type: Organizational and management structure and practices (O), Data development or management (D), System configuration, software, or application development and operation (S), Education, outreach, and internal/external communications (E), funding, budgeting, cost-benefit evaluation, and financial management, (F), Legal or policy development and management (L)

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## APPENDIX E: ELABORATION ON SDI BUSINESS DRIVERS

A business driver is a major need, program, service area, or challenge faced by organizations that may be impacted or supported by GIS technology and data. Business drivers may reflect strategic or operational goals of the organization, user or customer service needs, legal or regulatory requirements, external conditions (economic, social, political) or other business factors. Identifying business drivers that may be impacted or supported by GIS can establish a very strong, strategic foundation for the GIS program. Some business drivers for GIS are high-level in nature, reflecting overall goals or advantages for the organization as whole and impacting multiple departments and user groups. Other business drivers are more specific to an individual department, business area, or program. Business drivers for the SDI have been identified through input from the statewide geospatial user community, and they are summarized in Tables E1 and E2. The priority is a relative ranking of the importance of this business driver—reflecting the number of organizations and volume of users for which the driver has a major impact on their missions and work.

**Table E1:**
**Overarching GIS Business Drivers Impacting Multiple Organizations and Disciplines**

| Business Driver | Priority (1) | Opportunities for Idaho's SDI |
|---|---|---|
| **Basis for inter- and intra-organization coordination and partnerships** | VH | GIS is a technology that naturally encourages sharing of information and resources because multiple departments and organizations share similar needs for geographic information. GIS can be used as a basis for effective partnerships, cost sharing, and project collaboration. |
| **Response to public demand for information** | VH | The demand and expectations for information from government agencies by businesses, organizations, and the general public is increasing. Much of the required information is geographically based, and GIS technology and data can support efficient response to information requests. GIS gives tools to government employees to give quicker response (permit information, property appraisal questions, jurisdiction and services) by employees and direct access by the public via Web-services. |
| **Reduction in redundancy, labor time, and cost** | VH | GIS tools and sound data management can be the basis for a reduction in the duplication and redundancy in data maintenance, thereby reducing costs and labor time in data maintenance. GIS reduces overall labor time for information access, data analysis, research, and information distribution. |
| **Enhanced Revenue** | H | With its ability to organize, integrate, map, and analyze geographic data, GIS helps to ensure effective and complete revenue generation from existing sources--tax payments, utility bills, fines/fees by finding missed revenues or cases where assessments are lower than called for by law or regulation. |
| **Energy costs and efficiency** | H | The rising cost of energy is impacting all operational areas in the public and private sectors. GIS technology plays a role in supporting analysis, decisions, and policies for two key areas: a) energy efficiency and savings, b) exploring opportunities for alternate energy sources. Both of these challenges have a strong geographic component (e.g. using GIS to examine vehicle mileage and determine more efficient vehicle use, GIS applications to support exploration for wind and solar energy sources |
| **Enhancement of environmental quality, sustainability, and livability** | H | Protection and enhancement of environmental quality of the state involves planning and regulatory programs and initiatives of the public and private sectors that are geographic in nature. Environmental quality is a factor in well-being and health of Idaho citizens but it also directly impacts economic development and tourism factors. |
| **Management and access to historical geographic information** | MOD | Historical information, often with a geographical reference, is needed regularly to support legal analysis, engineering design, land use decisions, growth projections, and policy analysis. GIS technology provides effective ways to capture, organize, and provide access to this historical data. |
| **Improved geographic data quality and currency** | MOD | GIS supports quicker and more accurate update of maps and geographic databases. GIS tools ensure data quality, adherence to standards, and reduction in redundantly maintained data. |
| **Support for private business** | MOD | Coordination between public sector and private company users of GIS data (title companies, land development companies, VARs) |

(1) Priority: Very High (VH), High (H), Moderate (MOD)

**Table E2:**
**Program or Discipline-Specific Business Drivers**

| Business Driver | Priority (1) | Opportunities for Idaho's SDI |
|---|---|---|
| **Emergency planning/ management and public safety** | VH | GIS provides direct support for public safety and emergency management organizations (local and state law enforcement, emergency operations, fire protection, rescue, emergency medical). GIS data supports emergency and public safety planning, and GIS data and tools support emergency event management and response. The range of applications is large and includes: preparation of emergency evacuation routes, local agency police/fire dispatch, better definition of jurisdictional responsibilities for response, mapping of wildland/urban interface, coordination of search and rescue operations, threat/vulnerability assessment, crime analysis and investigation. |
| **Real Property Appraisal** | VH | Support for more complete, accurate and equitable property appraisal. GIS allows more effect analysis of neighborhood variables impacting valuation and can result in increase of tax revenue through more complete, accurate appraisals. |
| **Economic Development and Tourism Promotion** | VH | GIS can provide information in map form, accessible through convenient search interface for government staff and external parties looking for development sites, improving opportunities for site location. GIS in itself is an incentive for many types of companies. GIS can support access to information on touring opportunities which can stimulate tourism. |
| **Infrastructure Facility management** | H | Support for facility inventory, tracking of condition and maintenance actions (transportation and utilities), and capital projects planning. The result is considerable cost savings and better service to citizens. This is of particular importance given assessments of infrastructure condition and funds that will need to be spent over the next decade to maintain a reasonable level of efficiency and safety. See "report card" from the ASCE (www.asce.org). |
| **Agricultural Productivity and Invasive Species Management** | H | GIS supports efficient monitoring of agricultural productivity and planning for seasonal cultivation and agricultural improvement practices. GIS technology is also effective in helping to control invasive plant and insect species which has a huge impact on agricultural and forestry health and productivity as well as impacts on recreational lands. |
| **Floodplain/Flood event management** | H | Access to accurate floodplain mapping; use of GIS for open space planning and floodplain management to guide more effective development decisions and support emergency planning and vulnerability assessment. |
| **Land Development Planning** | H | Support for evaluation of land development scenarios by providing access to and analysis of a wide range of geographic information on land use, infrastructure, demography, infrastructure, etc. GIS saves time and cost in the planning process and supports an end result which better reflects local and regional conditions and balances issue of economic health, business growth, environmental impact, and quality of life. |
| **Facility planning and design** | MOD | Use of GIS data and tools to support road and utility design, greatly reducing need and cost for collection and formatting of new information (base map, parcels, etc.). Coordination between government agencies and private engineering contractors in design projects. |

(1) Priority: Very High (VH), High (H), Moderate (MOD)

**Table E2:**
**Program or Discipline-Specific Business Drivers (con't.)**

| Business Driver | Priority (1) | Opportunities for Idaho's SDI |
|---|---|---|
| **Support for improved regulatory decisions** | MOD | GIS data and analysis tools can help answer questions driven by a variety of regulations impacting local and regional issues (e.g., zoning and local LU decisions, permitting requirements, Forest Practices Act decisions about private forest management, ID Water Resources water use restrictions, water rights decisions, many others). GIS can better equip government agencies to administer requirements of new regulatory requirements while reducing needs for great increases in staff and resources. |
| **Educational Program Enhancement** | MOD | GIS technology and the data resources and services provided through a statewide SDI support a range of educational needs at the elementary, high school, college level. The SDI will support the teaching of geographic concepts and enhance existing school programs in science, social studies, mathematics, and computer instruction. At the university level, SDI will support already active programs and research activity that result in the training of students in applying geospatial technology to a wide range of disciplines. |
| **Support to County Commissions** | MOD | GIS as tool to support Commission meeting issues and policy decisions |
| **Grant application support** | MOD | Access and presentation of geographic information in grant applications (e.g., Homeland Security) providing effective ways to prepare grant applications with greater chance of grant approval. |
| **Public Health Management** | MOD | Support for health services planning and allocation of resources for public health programs at the state and local level. Mapping and geographic analysis tools can provide means for better program planning and more efficient allocation of resources where the need is higher. GIS provides an effective tool for evaluation of health problems and patterns, and indicators and can be used as a decision support tool. |
| **Land Development Planning** | MOD | Support for evaluation of land development scenarios by providing access to and analysis of a wide range of geographic information on land use, infrastructure, demography, infrastructure, etc. GIS saves time and cost in the planning process and supports an end result which better reflects local and regional conditions and balances issue of economic health, business growth, environmental impact, and quality of life. |
| **Facility planning and design** | MOD | Use of GIS data and tools to support road and utility design, greatly reducing need and cost for collection and formatting of new information (base map, parcels, etc.). Coordination between government agencies and private engineering contractors in design projects. |
| **Support for improved regulatory decisions** | MOD | GIS data and analysis tools can help answer questions driven by a variety of regulations impacting local and regional issues (e.g., zoning and local LU decisions, permitting requirements, Forest Practices Act decisions about private forest management, ID Water Resources water use restrictions, water rights decisions, many others). GIS can better equip government agencies to administer requirements of new regulatory requirements while reducing needs for great increases in staff and resources. |

(1) Priority: Very High (VH), High (H), Moderate (MOD)

**Table E2:**
**Program or Discipline-Specific Business Drivers (con't.)**

| Business Driver | Priority (1) | Opportunities for Idaho's SDI |
|---|---|---|
| **Educational Program Enhancement** | MOD | GIS technology and the data resources and services provided through a statewide SDI support a range of educational needs at the elementary, high school, college level. The SDI will support the teaching of geographic concepts and enhance existing school programs in science, social studies, mathematics, and computer instruction. At the university level, SDI will support already active programs and research activity that result in the training of students in applying geospatial technology to a wide range of disciplines. |
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(1) Priority: Very High (VH), High (H), Moderate (MOD)

## APPENDIX F: INFORMATION TECHNOLOGY TRENDS IMPACTING GIS

Strategic planning implies a long-term view with an ability to channel SDI development in a way that anticipates and takes advantage of changes in technology and the GIS industry. The pace of technology change and the dynamic nature of the IT and GIS industry make it challenging to predict specific developments. One can examine trends and prepare a multi-year plan that takes likely changes into account and creates an environment for effective technology monitoring and response to new techniques, practices, and products become available. Five main technological trends are impacting information technology and GIS.

- Trend 1: Pervasive, High-performance Computing: Continued dramatic increases in the performance of computers, decreases in their size, and greater options in their physical format and adaptability to different user environments. This drives the wide availability of computers of different types and different forms (traditional and nontraditional) any place and any time.
- Trend 2: Digital Connectivity: Increasing capabilities and infrastructure to transmit digital information over large areas at increasingly higher speeds in wired and wireless modes, including advances in Web-based environments for discovery and access to geographic information.
- Trend 3: Geographic Data Capture and Compilation: New and more efficient methods of spatial information capture and processing and an increasing array of sources for geographic information provide GIS users with a larger number of options in building GIS databases.
- Trend 4: Geographic Data Processing, Management and Visualization: More sophisticated and powerful tools and systems to manage geographic data and to convey meaning through maps, charts, pictures, models, and other visualization forms, with an increase in the tools for management of 3D and times series spatial data.
- Trend 5: Standards and Open Systems: Technical standards (formal or *de facto*) impacting operating systems, network technology, application software, and data format that promote interoperability, consistency, and common interfaces. As these standards drive the industry, they become the basis for products and practices that support and enable interoperability and make it easier for people and applications to access and use information from multiple sources.

Dramatic changes in computer technology have helped fuel the growth of GIS and other information technologies. GIS software functionality available today would not have been possible 20 years ago because computers and display devices could not deliver the performance necessary to support sophisticated processing and output. Since then, the computer industry has delivered continual improvements in processing capability which has supported dramatic improvements in software and applications.

Prospects for the future point to continued advances in computer hardware as long as user demand for performance remains high. Raw computer performance will be driven by computer processor advances, including continued miniaturization and new semi-conductor materials, multi-core chips, multi-processing architectures, optical circuitry, and advances in operating systems. Advances in processing performance makes possible computer models suited to the ever increasing demand for GIS software. In recent years, there has been a strong trend toward “server-centric” computing which impacts GIS as well as all information technology application areas. This trend is creating a computing model in which most processing and data is housed on network accessible servers—reducing the reliance on local desktop storage and processing. Making use of high-speed networks and Web-based architectures, the server-centric model can improve the flexibility and reduce the complexity of system administration. Professionals who have been in the field for several decades will note the similarity between this emerging model and traditional centralized minicomputer and mainframe configurations of the 1970s and 1980s. The current server-centric network configuration approach combines the centralized administrative advantages of traditional mainframe/minicomputer configurations with the advantages of high-speed networks and Web-based interfaces.

For many years, GIS users have been interested in "breaking their tether" to the office and bringing the technology into the field. Hardware limitations made this difficult or nearly impossible until the mid-1990s. This trend toward field computing has been exhibited in a number of ways important to GIS professionals:

- Advanced GPS receivers and data collection units revolutionizing field surveying and data capture
- Portable laptop and tablet computers capable of running high-performance GIS software
- Ruggedized portable computers able to withstand rough treatment and harsh environments
- Hand-held computers, including PDAs and smart cell phones, with increased memory and processing power capable of running special versions of GIS software
- Remote data collection and monitoring devices delivering geographic information through wired or wireless connection without direct human presence
- On-board computers and navigation systems for surface vehicles and airplanes
- Wearable computers for specialized needs in GIS data collection and access

Wired and wireless network limitations have been a major hindrance to network computing for much of the history of GIS, but advances in the last ten years and prospects for the future promise to deliver high-speed, secure access to data and computing resources from any location. Improvements in the speed of wired networks and an increased set of offerings for local and wide area wireless communications have driven an impressive advance in GIS access. Combined with Internet capabilities, these network advances are supporting flexible GIS access from nearly any location.

GIS software functionality and flexibility continues to improve, and we can expect the industry to deliver a continued set of advances in the future. As is the case with information technology applications in general, GIS software is following a Web-based model providing users flexible, Internet access in which GIS resources can be easily integrated with other Web-based resources. One of the most powerful trends of GIS software has been advances in tools and functions to integrate GIS and map-based data and functions with what have traditionally been "non-GIS" applications. The ability to use GIS in an integrated manner with a wide array of "external" data and applications such as document and content management systems, asset management, analytical modeling tools, financial management systems, and many others create tremendous opportunities for GIS users and an expanded potential for deriving benefits from the technology. The capabilities of GIS software are advancing in many other areas as well, including improved CAD functionality, better map-based visualization including 3-D, management of time-series spatial data, more effective data search and data mining, and improved map display.

A growing trend in information technology application access is referred to as "software as a service" (SaaS). SaaS moves application software and much of the data to a central server provided by a hosting service, and users access this via the Web without a need to have software or all data sources stored locally. As exhibited by such services as Google Earth, Microsoft Virtual Earth, and a growing number of targeted Web services, the SaaS trend is providing an alternative GIS access model for a growing community of users. Computing and network advances are making GIS more widely available to users—not just in the office but in the field and in many mobile applications. Trends toward "embedded GIS" is driving the incorporation of spatial analysis tools into non-GIS software environments providing nearly transparent access to spatial analysis and mapping functions to an expanded set of users. Through the use of software "objects," GIS functionality can be directly integrated with other software packages to provide geographic query, map visualization, or spatial analysis for such applications as hydrological modeling, permit and asset tracking, or business marketing projections.

Geographic data has been the foundation of any successful GIS program, and capturing data in digital form has always been expensive and time-consuming. From the 1970s into the early 1990s, most GIS data conversion was accomplished through manual board digitizing of paper maps or keypunching of data collected in the field. While the board digitizing method is still used today, it has taken a backseat to more effective data capture approaches such as a) map scanning and computer-assisted heads-up digitizing, b) field data capture with direct input to a GIS database, and c) advanced techniques and software for aerial image capture and map compilation. Developments in geographic data capture and processing provide for quicker and less expensive GIS databases development. Advances in high-resolution satellite systems, airborne sensors, remote data collection systems, and LIDAR are making spatial data more readily available. More effective software and methodologies for spatial data processing—digital photogrammetry, digital terrain data compilation, automatic image interpretation, and intelligent map scanning and processing, promise to deliver more, higher-resolution data to users and support more effective update. One other important trend has been an increase in the number of government and private suppliers of spatial data—resulting in an expanded array of options for users to purchase GIS data or access it through subscription services. These offerings from a maturing GIS data product industry cover a large range of imagery and digital map products, as well as non-map data (e.g., real property information, economic statistics, demographic data, and infrastructure data) that can support GIS applications.

GIS and spatial database management software is becoming more complex and more accessible. GIS software vendors are adding to their suite of capabilities and improving their software offerings to support enterprise systems—helping to position GIS as a main part of an overall information technology architecture and broad integration of systems, databases and applications. Great interest and activity in GIS-related standards and open systems, by standards organizations such as the International Organization for Standardization (ISO) and the American National Standards Institute (ANSI); industry consortia like the Open Geospatial Consortium (OGC); and governmental bodies such as the Federal Geographic Data Committee (FGDC) in the USA and similar bodies in other countries. GIS and database software vendors are actively involved in standards development and in development of products that support integration and open systems.

All of these trends and changes present a management challenge: to put in place a structure, standards, and procedures to make the most effective use of new technology offerings and opportunities to deliver real business benefits to users and the organization.