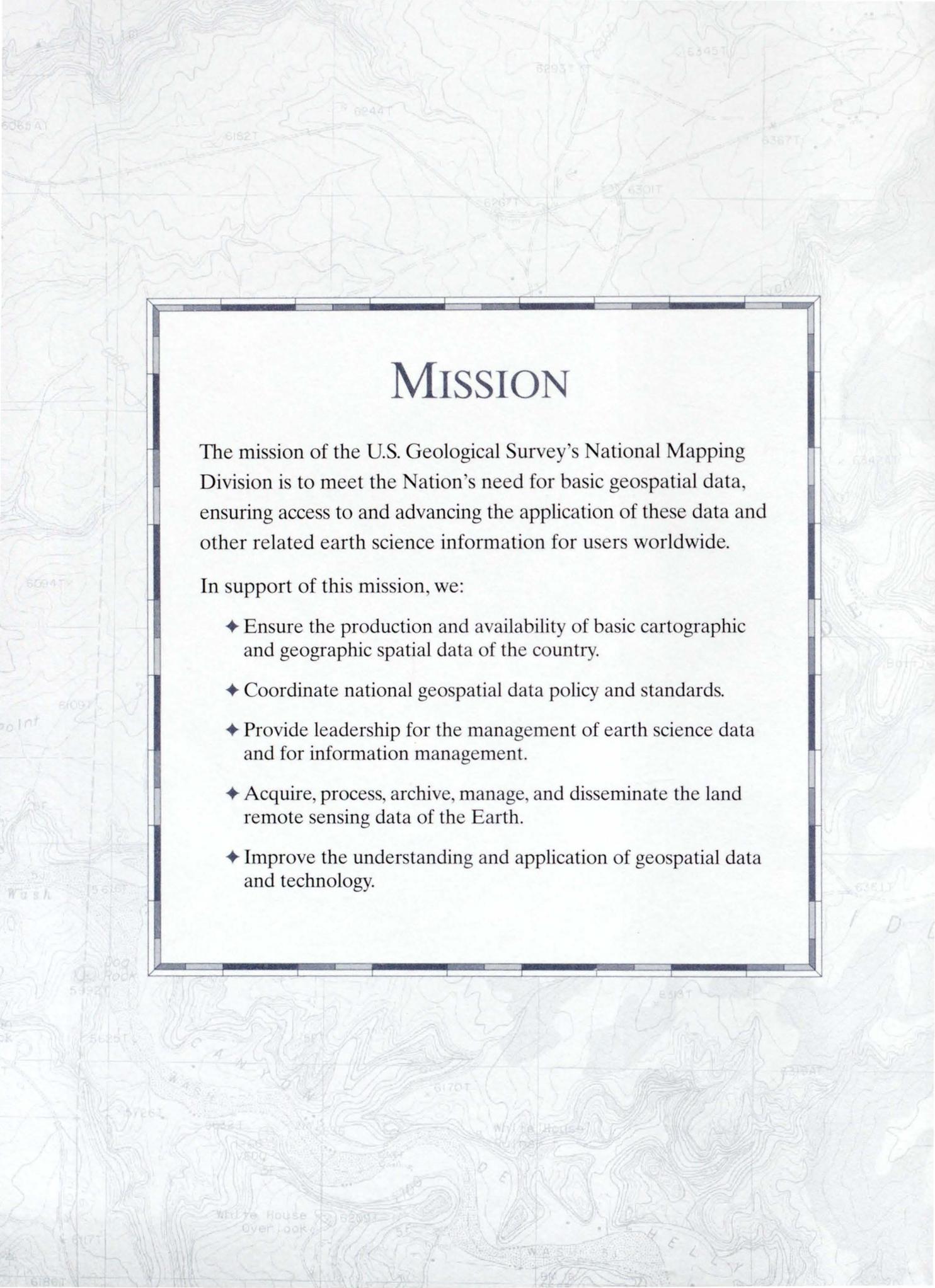


National Mapping Division Strategic Plan

U.S. GEOLOGICAL SURVEY 1997

A topographic map of a region in the United States, likely near Washington D.C., serves as the background. The map features contour lines, a grid, and various elevation points. A central white rectangular box with a black border contains the text. The word "MISSION" is prominently displayed at the top of the box in a large, serif font. Below it, a paragraph describes the mission of the U.S. Geological Survey's National Mapping Division. This is followed by a sub-heading "In support of this mission, we:" and a bulleted list of five key objectives, each marked with a diamond symbol. The map background includes labels such as "White House Overlook", "W.A. SHELLY", and various elevation points like "6293T", "6170T", and "6361T".

MISSION

The mission of the U.S. Geological Survey's National Mapping Division is to meet the Nation's need for basic geospatial data, ensuring access to and advancing the application of these data and other related earth science information for users worldwide.

In support of this mission, we:

- ◆ Ensure the production and availability of basic cartographic and geographic spatial data of the country.
- ◆ Coordinate national geospatial data policy and standards.
- ◆ Provide leadership for the management of earth science data and for information management.
- ◆ Acquire, process, archive, manage, and disseminate the land remote sensing data of the Earth.
- ◆ Improve the understanding and application of geospatial data and technology.

STRATEGIC PLAN
for the
National
Mapping Division
of the
U.S. GEOLOGICAL SURVEY

U.S. Department of the Interior
U.S. Geological Survey
National Mapping Division

February 1997

STRATEGIC PLAN

MISSION NATIONAL

NATIONAL MAPPING DIVISION

U.S. GEOLOGICAL SURVEY

Additional copies of the *NMD Strategic Plan* are available from:

Strategic Planning & Program Development
National Mapping Division
U.S. Geological Survey
Mail Stop 512
12201 Sunrise Valley Drive
Reston, Virginia 20192

The NMD Strategic Plan is also available electronically on the Internet
at <http://www-nmd.usgs.gov/misc/strategic.html>.

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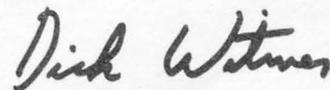
Preface

Over the past 30 years the work of the National Mapping Division (NMD) has evolved from producing hand-engraved topographic maps to providing largely computer-based information, in the process meeting a growing number of requirements and supporting a wide array of constituents by using rapidly advancing technology. Our mandate now extends from providing updated and revised graphic topographic maps to ensuring that the Nation has access to the best available geospatial information in formats and on media best suited to the customer's needs. *The Strategic Plan for the U.S. Geological Survey, 1996 to 2005* provides a statement of direction for the entire USGS, reflects the vision of the USGS in the year 2005, and sets a positive direction for programmatic change. In this companion NMD Strategic Plan, we have developed a document that is focused on our specific mission within the USGS. *The NMD Strategic Plan* is designed to be flexible and dynamic. Long-range planning will help establish a secure path to a future as a more productive organization that is responsive to the needs of constituents and able to successfully complete its mission of meeting the Nation's needs for basic geospatial data.

The strategic issues facing the NMD today continue to be strongly influenced by the rapid advances in mapping technology, increasing needs for geospatial information, and continuing pressures to reduce Federal spending. These competing factors compel the Division to maintain a highly qualified workforce and seek many kinds of partnerships with a variety of customers. Much of what the Division does depends on creativity in cooperation and coordination, seeking and finding matching dollars from other government agencies and the private sector in many different kinds of partnerships and consortia of customers.

In this Plan, the major programs of the Division are realigned into three mission areas: (1) "Mapping Data Collection and Integration," (2) "Earth Science Information Management and Delivery," and (3) "Geographic Research and Applications." This realignment reflects our transition from being solely a data producer to being also an information coordinator, collecting and integrating geospatial data from many sources, public and private, for multiple uses.

The Plan is a road map that we can use as the Division moves into the future. Please join me in using this Plan to our mutual benefit as we head down this new strategic path.



Dick Witmer
Acting Chief, National Mapping Division

Our Planning Process

The Plan maps the Division's future into the next century and beyond. Senior Staff, listed below, are the decision makers for the NMD and will be responsible for managing its future policies and programs.

Wendy Budd, *Acting Associate Division Chief, Programs and Finances*

Kathy Clement, *Sr. Program Advisor, Data Production and Integration*

Pat Dunham, *Acting Chief, Mapping Applications Center*

Max Ethridge, *Chief, Mid-Continent Mapping Center*

Jack Fischer, *Acting Associate Division Chief, Operations*

Jim Jancaitis, *Sr. Program Advisor, Research and Development*

Don Lauer, *Chief, EROS Data Center*

Alan Mikuni, *Chief, Western Mapping Center*

Randy Olsen, *Chief, Rocky Mountain Mapping Center*

Hedy Rossmeissl, *Sr. Program Advisor, Data and Information Delivery*

Gene Thorley, *Sr. Program Advisor, External Affairs*

Dick Witmer, *Acting Chief*

We established the Strategic Planning Team, consisting of 12 members representing each Mapping Center, each of the five major business areas of the Division, and the Office of the Chief. Beginning its work in January 1996, the team completed a draft report that was forwarded to the Senior Staff in August 1996 for appraisal, revision, and ensuing implementation. In preparing the draft report, the team followed a process that included interaction with Senior Staff, conversations with representatives from other USGS Divisions, and presentations by guest speakers and panels representing private industry, other Federal agencies, State agencies, and the Federal Geographic Data Committee (FGDC). The team reviewed a number of scientific and technical reports. They met with many NMD stakeholders and customers to learn more about perceptions about the Division and its future. The team also designed and conducted the "NMD Employee Opinion Survey" to better understand employee perceptions about the Division and to identify human resource issues needing management attention. Strategic planning is now a principal focus of business at selected decision points throughout our annual planning cycle.

Acknowledgments

Special thanks are due to the members of the Division's Strategic Planning Team. Team members were Tom Ciciarelli, Mark DeMulder, Beth Duff, Charles Egen, Dave Greene, Marilyn Myers, Glenn Osick, Bob Prescott, Wayne Rohde, Ted Saunders—Chairperson, Dave Seyler, and Dick Zorker. Members of the Strategic Planning and Program Development staff provided support and contributions to the work of the team.

The Strategic Planning Team received generous and thoughtful advice from numerous experts elsewhere in the USGS, other Federal and State agencies, and the mapping community. The following people were of valuable assistance in our planning efforts:

USGS Division Chiefs: Bob Hirsch (Water Resources Division), Pat Leahy (Geologic Division)

Other Federal agencies: Andre Coisman (U.S. Forest Service), George Komar (National Aeronautics and Space Administration), Bob Marx (Bureau of the Census), David Meier (Bureau of Land Management), Jim Reichman (National Biological Service), Peter Smith (Natural Resources Conservation Service)

State representatives: Dennis Goreham (Utah), Don Hoskins (Pennsylvania), Roddy Seekins (Texas)

Private sector: Cliff Greve (Science Applications International Corp.), Ed Downing (Pacific Meridian), Brian Logan (Photo Sciences), John Palatiello (MAPPS)

Federal Geographic Data Committee: Nancy Tosta

Intelligence community: Craig Chellis (National Reconnaissance Office), Karen Irby (Mapping Applications Center, USGS)

Technology: Michael Dobson (Rand McNally), Kris B. Tufto (Cray Research)

Executive Summary

The National Mapping Division (NMD) has developed this comprehensive strategic plan to chart its course over the next decade. To meet the challenges of the future, the NMD is changing its program emphasis, methods of responding to customer needs, and business practices. The NMD Strategic Plan identifies the new direction for the Division through a series of goals and actions for managers to use in formulating plans, establishing program emphasis, and determining resource needs and allocations into the next century.

The Plan refines the NMD mission on the basis of several key issues that are expected to face the Division in the next decade. The first of these is the continuing advances in technology and telecommunications. Related to this is the growth in the use of geographic information systems (GIS) and the demand for data to use in GIS's. Also, a trend exists toward decreasing costs of both the data and the systems, leading to even more demand for and use of data and technology by more users. Another is a changing customer base and increasing demand for NMD products and services. Finally, the financial resources available to the NMD are anticipated to remain relatively static.

The Plan assumes that a much greater reliance on partnerships with other government agencies and the private sector for production activities will be permanent. It calls for significantly greater emphasis on the inherently governmental information management responsibilities, and on geographic research to support the Division's mission. Multipartner consortia and shared funding agreements will constitute the basis for meeting most mapping needs in the future, with the NMD appropriations focused on map revision in areas of importance to the Federal Government. Mapping Centers will be encouraged to increase partnership agreements to meet mission requirements. The Division will continue to constrain employment, targeting new hiring to specific skills needed to support the revised mission in areas such as quality assurance, data standards development and maintenance, contract management, and information management. Retraining opportunities for current employees will be a high priority.

The Bureau Strategic Plan was reviewed carefully to assure that the NMD Strategic Plan would be consistent with it. The Division planning team built on the conclusions of the Bureau Plan regarding the political, economic, societal, and global forces that will affect our programs in the future. The NMD Strategic Plan also embraces all of the core competencies and business activities.



The National Mapping Division Yesterday and Today

Through the National Mapping Program (NMP), the National Mapping Division (NMD) provides geographic, cartographic, and remotely sensed information, maps, and technical assistance, and it conducts related research in response to national needs.

The NMP evolved out of the mission of the U.S. Geological Survey (USGS), "...the classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain," as stated in the Organic Act of March 3, 1879. In the early days of the USGS, its scientists found that they needed good topographic base maps for their geologic and hydrologic investigations. A Topographic Branch was established, and the topographic maps soon became widely used for a broad range of government and industry applications. To the general public today, these products are more closely linked to the identity of the Survey than any other USGS activity.

A Brief History

Throughout our Nation's history of exploration, expansion, and development, inexpensive government-produced maps have provided a worthy example of a fitting use of public funds. The maps and map-related products of the NMP have been characterized in this way, as a "public good," for two primary reasons. First, the benefits of maps, like national parks and forests, can be enjoyed and used by many people without significantly diminishing the value received by all. Second, it is in the best interest of the Nation to make mapping data widely available at low cost because it maximizes the benefits and opportunities for all citizens and businesses. Although availability of mapping data could be restricted to only those wealthy enough to cover its full cost, most nations around the world have recognized the need for and benefits of government-based mapping programs as they affect the growth of commerce, a sound national defense, and the quality of life of individual citizens. Mapping data also directly support and, in fact, are required for many functions that are now widely accepted as inherently governmental; that is, a proper and necessary use of public funds. These functions include emergency response, law enforcement, public land and national resource management, and environmental monitoring.

The recent history of the NMD shows many changes to the organization, its programs, its methods, and its customers. What the NMD looks like and what it does to carry out its mission have evolved and will continue to do so.

In 1980, the present-day NMD was formed from the former Topographic Division, components of the Publications Division, and the Geography Program of the USGS. In 1983, the Earth Resources Observation Systems (EROS) program was added to the NMD and the EROS Data Center became the fifth field center. The outward appearance of the NMD has stayed similar since then, but many internal changes have taken place.

Around 1983, the NMD began converting its map information into digital form. Originally, the focus was on automating the map production process, but it soon became apparent that the greatest benefit was in using digital cartographic data to solve real world problems. In 1984, the NMD established a geographic information systems (GIS) program. The next year, the NMD set up a GIS research laboratory in Reston to support the USGS mission and to transfer technology to other Federal and State users.

GIS use is now pervasive throughout government and industry and continues to grow. GIS technology is a major factor in expanding the use of NMD data far beyond applications in the traditional land management agencies. GIS technology also enables government organizations at all levels, the private sector, and academia to produce basic map data for their specific needs. The NMD is now developing strategies for building mutually beneficial, responsive relationships with these organizations to accomplish the goals of the NMP.

Since 1982, when it began a cooperative modernization program with the Defense Mapping Agency, the NMD has completed a major modernization program to shift production from analog-based to digital-based technology. In 1990, the NMD completed national coverage at the standard 1:24,000 scale with graphic topographic maps. Since then the emphasis has shifted to a major effort in digital conversion and map revision. Keeping the maps up to date will be a major ongoing effort into the foreseeable future. At the same time as the requirements for digital map information have grown, the demand by many customers for map information in paper form has continued.

In 1982, NMD efforts to provide digital cartography coordination led to the establishment of the Interior Digital Cartography Coordinating Committee. In 1983, an Office of Management and Budget (OMB) directive established the Federal Interagency Coordinating Committee

on Digital Cartography, chaired by the USGS, to address coordination on the larger Federal scale. In 1990, the OMB revised Circular A-16, which expanded the scope of digital data coordination and established the Federal Geographic Data Committee (FGDC), currently chaired by the Secretary of the Interior.

In 1994, the President issued Executive Order 12906 to implement a National Spatial Data Infrastructure (NSDI). The NMD began developing the technical means to implement NSDI framework data collection and integration. In 1995, the NMD began reorienting its data programs to support the NSDI framework concept in collaboration with other Federal, State, local, and private partners. Also in 1995, the NMD implemented a USGS clearinghouse node for the NSDI.

During the past several years, there has been a growing national debate on the role of government at all levels. It is believed that there will be continued pressure to downsize government. The fiscal year (FY) 1996 House Appropriations Report directs the NMD to increase the use of the private sector to accomplish its mission. The report requires the NMD to increase data production contracting levels to 50 percent in FY 1997 and 60 percent by FY 1999. The NMD has made significant progress toward meeting these goals.

In summary, to fulfill its mission and remain a viable organization, the NMD has been and must continue to be flexible and responsive to changing needs.

Recently, the NMD has developed and proposed a new structure within which to describe its funding areas, activities, and resource allocation. It involves a single overall activity (the NMP) with three mission areas (Mapping Data Collection and Integration, Earth Science Information Management and Delivery, and Geographic Research and Applications), briefly described as follows:

- ◆ The programs in the Mapping Data Collection and Integration mission area ensure the availability of basic geospatial data needed for decision making through (1) fostering and coordinating partnerships with other data producers, (2) promulgating and promoting national standards, (3) developing a vigorous data integration, revision, and certification activity, (4) conducting an appropriate level of in-house production, and (5) establishing contracting and other types of interaction with the private sector.
- ◆ The programs in the Earth Science Information Management and Delivery mission area provide access to, disseminate, and archive USGS and other agency information and data products, develop plans for new and enhanced geospatial products, and support outreach activities to increase public awareness of USGS information and services.

◆The programs in the Geographic Research and Applications mission area ensure the utility and value of geospatial data. Research and development activities integrate a wide variety of information to meet user needs, solve problems, develop tools for analysis and production, and manage and communicate geospatial data. Societal and technological changes, such as concern over the global environment, a global economy, international technical data exchange, proliferation of satellite remote sensing, and global research programs, put the NMD into the international arena.

Resources

As of January 1997, the NMD is composed of approximately 1,350 full-time, part-time, and temporary government staff. Cartographers and cartographic technicians make up the largest workforce segment, about 60 percent. NMD employees are distributed among a headquarters office in Reston, Va., and five operational field centers (in Menlo Park, Calif.; Denver, Colo.; Rolla, Mo.; Sioux Falls, S. Dak.; and Reston, Va. (colocated with headquarters)). In addition, the NMD uses about 385 contract employees to help in carrying out its activities.

The Division's appropriated budget for FY 1997 is about \$132 million. Reimbursements from partnerships and product sales are expected to augment those funds by an additional \$52 million.



The Future Environment and the NMD's Vision of Its Future

Assumptions

In the future, computer technology and telecommunications will advance exponentially. The ability to transmit large data sets between geographically dispersed sites will be the norm. GIS and image processing software will evolve from specialized applications for the professional community to full integration with many other applications and will become commonplace in the home and workplace. Government use of GIS as an aid in decision making will continue to grow. Geospatial data will be used increasingly in visualization and animation applications. Image and elevation data are key components of these applications. The proliferation of Earth-observing satellites (both public and private) will yield an infusion of diverse imagery into society. These conditions will lead to a burgeoning geospatial data marketplace that capitalizes on the demands for data created by the widespread use of data-dependent applications. The unique and costly aspects of geospatial data production, which had previously required the Federal Government to be directly involved in data production, will be largely overcome by the ever-decreasing cost of computing, the increasing use of global positioning system (GPS) technology, and the diffusion of GIS technology into society.

With the continuing improvement in computer technology, costs for producing, processing, and using digital geospatial data will decrease; the use of geospatial data will expand, and new applications for digital geospatial data will be identified. GIS technology also will enable government organizations at all levels and the private sector to produce basic map data for their specific applications. The NMD will develop strategies and partnerships that will extend the utility of these data to the participants in and customers of the NMP.

The continuing revolution in technology will change the mix of NMD's customers, their areas of interest, and their expectations for service. The customer base for geospatial data will grow as applications drive the demand for these data. Customer expectations concerning ease of use, variety, and availability of customized products will increase as faster and more efficient computers become commonplace in homes and businesses. Customers will want data and information that they can readily integrate and manipulate to suit each of their unique

The National Spatial Data Infrastructure

Information about where an object or feature is or where an event takes place often is an important factor in decision making in both the public and private sectors. Geospatial data, which identify the geographic location and characteristics of natural or constructed features and boundaries referenced to the Earth, provide a unique context for integrating otherwise disparate observations and for evaluating competing options. Factors of location, distance, pathways, and other spatial relations often must be considered when making decisions about economic ventures, resources management, environmental and health concerns, and responses to emergencies.

Public and private sector organizations have realized the usefulness of spatial data in their activities. The Nation spends billions of dollars annually on the collection, management, and dissemination of spatial data. Advances in computer techniques to collect and process spatial data, together with decreasing costs for acquiring these technologies, help organizations using spatial data to do so more efficiently and effectively; such advances also entice other organizations to use spatial data for the first time. Technologies such as the Internet and the World Wide Web enable organizations to make their information more widely available and to locate data produced by others.

The NSDI facilitates data sharing by organizing and providing a structure of relationships between producers and users of spatial data. By participating in

the NSDI, Federal, State, regional, and local government agencies, companies, and nonprofit organizations can cooperate to develop consistent, reliable means to share spatial data. Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure," formalized Federal participation in initial efforts to implement the NSDI. Instructions in this order are that Federal agencies will work with non-Federal organizations to develop the NSDI, will document their spatial data and make this documentation available to the public, and will make plans to provide public access to their spatial data. This executive order also instructs agencies to lead in the development of standards. The USGS has responsibilities for standards related to base cartographic and geologic information and shares responsibilities for developing standards for water information.

By participating and encouraging others to participate in the NSDI, the USGS can realize several opportunities for carrying out its mission. Making the USGS data available through the NSDI increases the opportunities for these data to be used in decisions made at the local, regional, national, and global scales, and it helps to increase the relevance of USGS activities. Through the NSDI, the USGS can locate data produced by others that can supplement the USGS data-collection efforts, and the USGS can identify organizations that are candidates for collaborative data collection and use.

applications. The commercial availability of geospatial data and information will grow with the increased demand in the marketplace, and many customer demands for off-the-shelf geospatial products will be met by the private sector. The Federal mapping sector will focus on effective data base and inventory infrastructure to support delivery of products and services to customers through partnerships with the private sector. The relationship between the private sector and the Federal mapping community will become more supportive and mutually beneficial. We believe that customer needs will be better met through this new partnership than they could be by either the Federal or the private sector alone.

Program Emphasis

By the year 2005, the success of the NMD and its viability as an organization will depend on how it has adapted to the needs of an information society. Society will value not only the existence of data and information, but also easy access to diverse data and information sets for a broad range of customers.

For the NMD, a key element of success in the information age will be the ability to meet the need for current, accurate data. As the Federal Geographic Data Committee (FGDC) draft report, *1996 Strategic Plan for the National Spatial Data Infrastructure*, aptly states in its discussion of the impediments to the promise of GIS technology for sharing information about location and solving community problems, “the technological barriers are falling. Computers are becoming less expensive and more widespread. Individuals and organizations are using the Internet to discuss common problems. *Data remain a stubborn barrier*” (emphasis added). The mission area of Mapping Data Collection and Integration will play a key role in breaking down this barrier by focusing on the development of framework data and multi-purpose maps, data revision and maintenance, integration, standards development, and individually tailored support to solve societal problems. In part, as a result of technology advances that increase the production capabilities of others, the NMD will view itself as a partner with other data producers, including the private sector. The National Spatial Data Infrastructure (NSDI) concepts and components will be implemented through NMD support and leadership in framework, standards, data management, and networking.

Increasing emphasis will be given to providing information about and access to digital geospatial data through the USGS node of the National Geospatial Data Clearinghouse. In the future, a USGS-wide integrated information strategy will efficiently manage all USGS geoscience and bioscience data and information. Access to geospatial data, products, and services through comprehensive online indexing,

National Satellite Land Remote Sensing Data Archive

The USGS has traditionally been a user and a manager of satellite land remote sensing data. Nearly 25 years of information extraction from satellite remote sensing data have demonstrated the broad utility of these data. Information derived from Landsat data, for example, has permitted scientists and program managers to study more effectively problems related to our water, energy, and mineral resources, to understand the effects of natural disasters, to protect the quality of the environment, and to contribute to the Nation's economic and physical development. Central to the application of these data is the reliable collection, maintenance, and distribution of a record of the Earth's surface; a record, moreover, that is comprehensive, historical, permanent, and impartial.

Over the past three decades, our Nation has invested more than \$3 billion for the collection and distribution of Landsat Earth observation data. In 1992, the Congress assigned to the Department of the Interior (DOI) long-term responsibility for managing, preserving, and providing access to these and other land remote sensing data (Public Law 102-555). Through Presidential Decision Directive/NSTC-3 in 1994 and the National Space Policy in 1996, the President reaffirmed DOI's role by directing it to "maintain a national archive of land remote sensing

data and other surface data, making such data available to U.S. Government and other users." In turn, the DOI delegated to the USGS the responsibility for the National Satellite Land Remote Sensing Data Archive (NSLRSDA).

During the next decade, the USGS will be responsible for managing, maintaining, and providing access to an extensive and continually increasing archive of satellite remote sensing data. The archive's content will grow from the 130 terabytes of digital satellite data today to more than 1,300 terabytes by 2003. User demand for these data is expected to grow significantly. The need to expand, modernize, and maintain NSLRSDA systems for archiving, preserving, accessing, and distributing data and information is essential. Society also has the expectation that in an information age, data and products should be delivered quickly and efficiently. Participation in the NSDI, Mission-to-Planet-Earth, civilian applications of classified data, and other interdisciplinary earth science investigations highlight the critical need for systems to store and manage diverse data sets. Appropriate financial and human resources, as well as partnerships with external organizations that can provide information management expertise, will enable the Survey to fulfill this responsibility.

ordering, and distribution mechanisms, and comprehensive customer and technical support operations will be realities. The NMD will have an appropriate management and physical infrastructure to deal adequately with very large stores of image data. Remotely sensed data will be recognized as a fundamental source of earth science information; thus, more attention must be paid to developing and managing image data bases.

The information society will value the interpretation and application of geographic data and information, emphasizing tools for applying data in many ways to society's problems and needs. The NMD's Geographic Research and Applications activities will assist the government and society in solving problems through the application and analysis of geospatial data. Research, development, and application tasks will occur through collaboration with a wide variety of Federal, State, local, academic, and private industry partners. A significant portion of the geographic research and applications resources will apply geospatial analysis to multidisciplinary studies with other USGS Divisions and other Federal and State agencies. The NMD also will increase the number of resources devoted to technical assistance and product support. Geographic Research and Applications will be strengthened and emphasized as appropriate to accomplish this enhanced mission. The outcome of these efforts will strengthen the NMD as the center of excellence within the USGS for geographic and cartographic sciences.

Resources

There continue to be reductions in funding in the Federal sector caused by societal and business pressures. Scrutiny of public expenditures is expected to continue. Programs are now routinely examined for consistency with the desire to balance the budget and concern about the "business sense" of expenditures; that is, what is an inherently governmental function that should be paid for with tax dollars? In this environment, Federal organizations must demonstrate the relevance of those programs to remain viable.

In spite of these general trends in the Federal sector, both the direct appropriated and reimbursable funds for Mapping Data Collection and Integration have consistently and significantly grown during the last decade. This growth is due to a number of interrelated factors. There has been a dramatic increase in the successful use of GIS technology to solve societal problems across both the public and private sectors. The breadth of these applications has created growth in both the appreciation of and demand for geospatial data. The data production contracting, standards, leveraging, and data sharing strategies

implemented in the NMD have placed our organization at the forefront of finding cost-effective solutions to the burgeoning demand for geospatial data. Targeted data production programs based on data sharing, like the Department of the Interior (DOI) high-priority lands initiative, have successfully demonstrated significant return on investment benefits using the NMD strategies. Growth in financial and programmatic support for NMD programs from the Administration, Congress, and data users and producers has been strong and continuous because such support saves taxpayer dollars and maximizes the benefit for all partners. This trend is expected to continue, and the NMD will continue to use and enhance the strategies that have brought us success in this mission area.

The Earth Science Information Management and Delivery and the Geographic Research and Applications mission areas will explore and, where possible, develop parallel strategies. In addition, to increase reimbursable funding, the NMD will require more frequent customer contact and distributed authority for entering into agreements. In the future, the NMD will become more flexible, able to devise field-site strategies within national guidelines for responding to customer requirements. Authority will be delegated to field centers to initiate and develop agreements and partnerships with cooperators, and retention of reimbursable funding by the originating field center will provide incentives to be proactive.

The NMD's permanent government workforce will probably continue to decline in numbers, emphasizing the need for more term and temporary appointments to deal with fluctuating workloads and changing program emphasis. Employees and (or) contractors with skills in computer science, geography, and GIS's will be hired more frequently to support the changing program emphasis. Contracts and contract staffs will be required options for meeting staffing needs. The NMD will have representatives in most States or regions, and field operations will be a major influence on the direction and priorities of programs under the guidelines and principles established by headquarters.

Organization

The NMD will require a flexible and dynamic organization to accomplish programs propelled by technological advances and changing customer requirements. (See Figure 1, page 12.) For example, the NMD will most likely be a more decentralized organization with more distributed program and operational responsibility. In the near term from 1997 to 2000, more geographic dispersion of NMD employees will occur with increased interaction among other USGS entities. By 2003, organizational structures will be adaptable to better meet mission needs.

Distributed field activities will result in opportunities to meet customer needs more adequately through regional consortia with State and local government entities. An effective communications network, both within the organization and externally with other cooperators and users, will be of paramount importance.

<i>USGS/NMP Change Over Time</i>	<i>Then</i>	<i>Now</i>	<i>Future</i>
FUNDING	Appropriated funds for Federal map requirements	Bilateral Federal/State co-ops— cost share	Multilateral consortia— innovative partnerships
PRODUCER	Federal primary producer	Federal/State—work share	Select framework categories—Federal integrator, data producer of last resort
PRODUCTION	Largely in-house with contractor support	Standards development: in-house and contract	Largely contractor with appropriate in-house capacity; Quality Assurance/Quality Control
FEDERAL SKILL MIX	Manual cartography	Digital cartography	Coordinator, integrator, contracting technical rep, QA/QC, standards, GIS
PRODUCT	Quad-based paper maps	Quad-based paper maps and digital map information	User-defined content and media
PRODUCT DELIVERY	Two warehouses, USGS ESIC's	One warehouse, Internet, USGS ESIC's	Business partners/ wholesale, Internet, maps-on-demand
INFORMATION ACCESS	USGS ESIC's	USGS and State ESIC's, Internet	Internet, kiosks, ESIC network
COST RECOVERY	Nominal	Full	Emerging issues

Figure 1.
A New Direction for the National Mapping Program

The role of the USGS National Mapping Program is changing from being a primary producer of map data to becoming a coordinator for collecting and integrating Federal, State, local, and private sector data to ensure the availability of basic geospatial data for the Nation.



Goals and Strategic Actions for the Future

Strategic Direction

As the NMD strives to ensure that geospatial data are available, accessible, and applicable, the methods it uses to accomplish its mission and functions will change. The scope and impact of data collection and integration will expand as the NMD successfully leverages its available resources through partnerships with many participants and access to NSDI clearinghouse nodes. As much as possible, the NMD will capitalize on the growing investment in the production of basic geospatial data at all levels of government, academia, and the private sector. The NMD will expand its presence in States and regions to improve its understanding of user needs, nurture the development of consortia and partnerships, promote the principles of the NSDI, and increase its outreach activities. The development and application of national standards will be increasingly important to ensure data quality and integration in this distributed production environment. Based on user needs, framework data will be augmented to produce multipurpose maps and derivative data that meet relevant societal needs.

During the next decade, the NMD will emerge as the USGS earth science information leader, managing, maintaining, and providing easy access to extensive and continually increasing volumes of data and information. Remotely sensed data archives will continue to grow, as will demand for these and other geospatial data useful for a multitude of societal applications. The need for strengthened systems for archiving, accessing, and distributing information will be a primary force driving the NMD's programs. Partnerships with external organizations that can provide expertise in information management will begin enabling the NMD to fulfill this responsibility.

The NMD will strengthen its role as the source of USGS expertise in geographic science and applications and will participate in the research and analysis of complex earth science problems that require the cooperation of multidisciplinary teams. As the use of geospatial data in solving societal problems grows, the NMD will expand product and technical applications support for NMD information, data products, and services. The NMD will expand the research and applications programs through partnerships with Federal, State, and local agencies and the private sector.

The NMD will maintain a cadre of highly qualified technical personnel with cartographic expertise among its Federal employee workforce, both for in-house production needs and for managing and overseeing the data production work undertaken by the private sector. This will require professional knowledge in cartography and computer science, as well as expertise in contract management. The NMD's data production funding will be used within the NMD to support production and production-related activities, such as quality assurance, standards development, and contract management. As more of the traditional data production activities are accomplished by private sector contractors, there will be a reduction in the numbers of NMD employees involved directly in map and data production. However, new opportunities for NMD employees will be created in computer science, contract management, quality assurance, data and information management, data interpretation, technical support, product support, research and scientific applications, standards development, and other areas. The NMD will support training and educational opportunities for current employees to enable them to prepare for this changing emphasis. As the NMD identifies the specific skills and backgrounds needed for the future, development plans will be implemented to enable employees to take advantage of these opportunities, and resources will be made available to support these plans.

Corporate Business Practices

Corporate business practices are the key characteristics, attitudes, and ways of doing business that the NMD must develop and maintain to accomplish its missions. These corporate business practices support all three mission areas and will direct the manner in which they are accomplished. The NMD cannot accomplish its mission alone but must cooperate with others, including the private sector, other Federal agencies, other levels of government, and academia. Knowing and delivering what customers want and using such information in decision making are critical elements in implementing the NMD's mission. To accomplish its mission, the NMD needs to obtain the support of important stakeholders, such as Congress, the DOI, and the public; an effective outreach program is therefore important.

Goal 1

The NMD has an effective workforce to accomplish its mission.

Strategic Actions:

- ◆1. Develop a staffing plan to determine the size and composition of the workforce necessary for the effective functioning of the NMD in the future.
- ◆2. Commit to a long-term and continuous program to maintain and enhance the skills of the workforce through training, career development and rotational assignments, outsourcing, in-house contracting, partnerships, and mixed types of appointments; this program should address the needs of both the Federal employees and the NMD.
- ◆3. Create a workforce that capitalizes on the strengths of cultural diversity.
- ◆4. Use innovative management techniques, such as flexible work schedules and telecommuting, to improve the flexibility and quality of work.
- ◆5. Establish a rewards system that acknowledges not only excellence and productivity but also cooperation and recognition of employees' roles in a public service agency.

Goal 2

The NMD makes increasing use of partnerships with other Federal agencies, State and local governments, and academia to accomplish its mission.

Strategic Actions:

- ◆1. Build a stronger requirements coordination staff.
- ◆2. Develop a proactive and flexible approach to establishing partnership arrangements by using a system of empowerment and rewards that will encourage field centers to enter into partnerships.
- ◆3. To encourage and maintain long-term partnerships, inform and involve partners in changes that affect them.
- ◆4. Ensure that our commitments to partners and cooperators are met.
- ◆5. Emphasize and increase the use of multipartner agreements to eliminate duplication of effort, reduce cost to each partner, and share expertise.

Goal 3

The NMD provides products and services that improve customer satisfaction by meeting changing customer requirements and expectations.

Strategic Actions:

- ◆1. Identify current and future NMD customers.
- ◆2. Develop improved mechanisms for collecting, analyzing, and using customer feedback to support technical, programmatic, and strategic decision making in the NMD.
- ◆3. Provide customer assessment reports of NMP responsiveness and product quality to NMD managers for use in strategic and operational planning and product life cycle activities.

Goal 4

The NMD makes appropriate use of the private sector to accomplish its mission and develops supportive relationships throughout the private sector.

Strategic Actions:

- ◆1. Increase communication with the private sector and explore new areas for cooperation. Organize workshops with the private sector to identify areas where mutually beneficial cooperation and partnering can be introduced or expanded.
- ◆2. Develop an implementation plan for partnering with the private sector for the functions that are identified as appropriate.
- ◆3. Devise ways to provide incentives to the private sector to invest in products, data, distribution systems, printing, research, and other program areas.

Goal 5

The NMD is widely recognized by many audiences as a respected source of geospatial information.

Strategic Actions:

- ◆1. Develop an NMD outreach program to complement the six areas of the USGS outreach program: (a) internal communications, (b) intergovernmental relations (executive, State, local), (c) legislative relations (congressional), (d) life-long learning, (e) nongovernment and industry relations, and (f) news media.

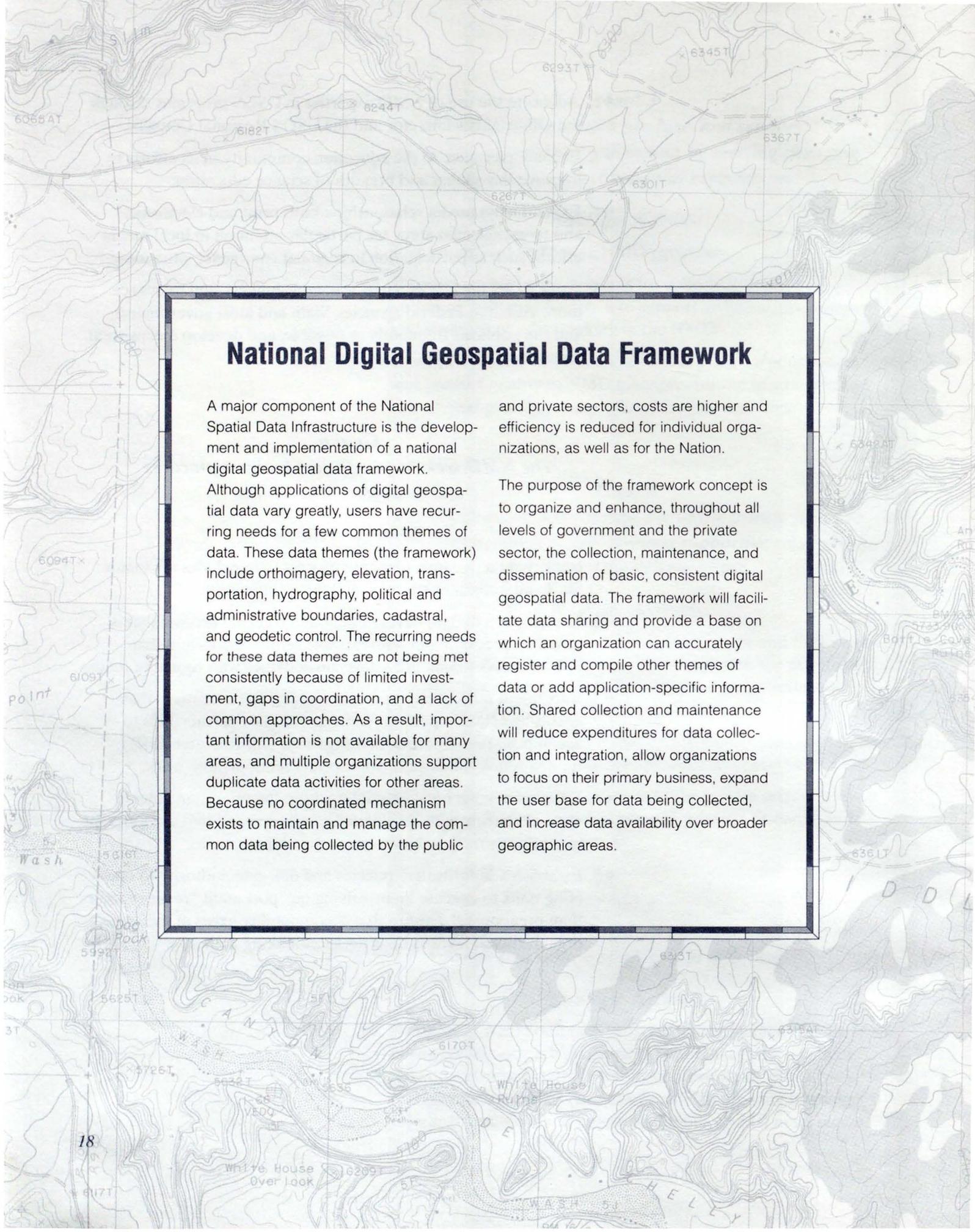
- ◆2. Advocate the use of NMD expertise in USGS programs through the Office of the Director and the USGS Regional Councils.
- ◆3. Expand assistance to the education community in its efforts to improve the quality and breadth of science education.
- ◆4. Expand news media relationships, both print and electronic, and target selected areas for particular attention in local media efforts, such as participation in regional emergency situations.
- ◆5. Work to get the USGS name, accomplishments, and relevance more visible to Federal agencies, State and local governments, and the public as frequently as possible, and develop a consistent corporate identity and identifier.

Goal 6

*The NMD seeks more efficient business practices
and empowers field centers.*

Strategic Actions:

- ◆1. Implement a dynamic planning process that includes all Senior Staff and integrates strategic and tactical planning.
- ◆2. Implement a budget development and tracking process that is based on program and reimbursable requirements and that includes ways to link programs and activities with source of funds.
- ◆3. Implement management practices and create incentives that encourage NMD operating units to establish partnerships to accomplish both Surveys, Investigations and Research (SIR) funded requirements and appropriate reimbursable work.
- ◆4. Develop management strategies within the operating units to cope effectively with the fluctuations in demand that are inherent in business practices based on partnerships.
- ◆5. Establish administrative policies and delegate authority to operating units to execute them, relying on "post audit" review rather than preapproval. Ensure that accountability exists at the same organizational level as does decision-making authority.



National Digital Geospatial Data Framework

A major component of the National Spatial Data Infrastructure is the development and implementation of a national digital geospatial data framework.

Although applications of digital geospatial data vary greatly, users have recurring needs for a few common themes of data. These data themes (the framework) include orthoimagery, elevation, transportation, hydrography, political and administrative boundaries, cadastral, and geodetic control. The recurring needs for these data themes are not being met consistently because of limited investment, gaps in coordination, and a lack of common approaches. As a result, important information is not available for many areas, and multiple organizations support duplicate data activities for other areas. Because no coordinated mechanism exists to maintain and manage the common data being collected by the public

and private sectors, costs are higher and efficiency is reduced for individual organizations, as well as for the Nation.

The purpose of the framework concept is to organize and enhance, throughout all levels of government and the private sector, the collection, maintenance, and dissemination of basic, consistent digital geospatial data. The framework will facilitate data sharing and provide a base on which an organization can accurately register and compile other themes of data or add application-specific information. Shared collection and maintenance will reduce expenditures for data collection and integration, allow organizations to focus on their primary business, expand the user base for data being collected, and increase data availability over broader geographic areas.

Mapping Data Collection and Integration

The purpose of the mission area known as Mapping Data Collection and Integration is to ensure that the Nation's needs for basic geospatial data and products are met. The methods used to accomplish this will continue to evolve, largely on the basis of advances in and widespread use of geographic information technologies and computer technology in general, coupled with an increasing awareness of the role of geographic information in solving societal problems. Geospatial data production is occurring at all levels of government and in many activities within the private sector. The Nation as a whole is investing significant resources in this production, far more than those available to Federal mapping activities alone. The challenge for the NMP is to capitalize on this large investment and through active coordination, integration, and refinement ensure that the Nation's needs for basic geospatial data and for multipurpose maps are met. This will be accomplished through fostering and coordinating partnerships with other producers, promoting national standards, integrating and certifying data, continuing some in-house production, and maintaining an appropriate relationship with the private sector.

Goal 7

The NMD participates fully in the development of the National Spatial Data Infrastructure and provides national leadership for appropriate framework categories.

Strategic Actions:

- ◆1. Provide national leadership in developing the orthoimagery and onshore elevation framework categories.
- ◆2. Participate fully in developing the transportation, hydrography, cadastral, and boundary framework categories.
- ◆3. Develop long-term partnerships with other Federal agencies, State and regional GIS councils, and other appropriate coordinating entities for shared data collection and maintenance strategies.
- ◆4. Increase the presence of NMD employees in appropriate State locations, such as the State offices of the Water Resources Division, USGS regional offices, or the offices of other State cooperating organizations to cultivate partnership arrangements with the private sector and State and local governments.

Goal 8

The Nation's needs for geospatial data standards are being met through NMD leadership.

Strategic Actions:

- ◆1. Provide leadership and technical expertise to assist in developing FGDC standards.
- ◆2. Change the NMD's focus on standards from primarily internal product specifications to national and international standards by increasing the NMD's presence in national (for example, American National Standards Institute, National Institute of Standards and Technology, and FGDC) and international (for example, Organization for Standardization) standards activities. Integrate internal standards with these national and international activities. Broaden these activities to include image processing standards as a vital aspect of the NMD's mission.
- ◆3. Promote standards activities, both within and outside the bureau, as a significant aspect of the NMD's mission.
- ◆4. Enhance standards coordination activities among Federal, State, local, and other geospatial data producers, in part by developing a network among field offices to gather input to standards development activities.

Goal 9

Availability of basic geospatial data and products is accomplished by coordinating activities with other producers, contracting with the private sector, and maintaining appropriate in-house production.

Strategic Actions:

- ◆1. To facilitate the integration of data from other sources, identify in the Research Plan the requirement for the tools needed to perform data assessment, cartographic generalization, feature conflict detection and resolution, and feature attribute and position conflation.
- ◆2. Establish more effective methods for assessing and integrating data from other sources as a primary means for meeting requirements.
- ◆3. Ensure high-quality, timely responses to the requirements of interdisciplinary earth science investigations by developing, managing, and promoting NMD contracts for producing digital and graphic products.

- ◆4. Implement soft-copy production capability for new and archived film in response to customer demand and internal NMD requirements.

Goal 10

The data and maps made available through the National Mapping Program are current and accurate, and reflect the reputation for quality that the NMD has developed.

Strategic Actions:

- ◆1. Maintain a level of currentness of maps and digital data that meets the needs of customers by integrating disparate sources, using advanced technology, and devising innovative process improvements.
- ◆2. Develop effective means to verify, certify, and publish the accuracy and quality of data produced by others in order to satisfy requirements of the NMP.

Earth Science Information Manage- ment and Delivery

The purpose of the mission area known as Earth Science Information Management and Delivery is to preserve and provide access to geospatial data through archiving, physical data base maintenance, clearinghouse activities, and data and information delivery. This mission activity will receive growing emphasis in response to society's demands for access to the burgeoning stores of data generated by USGS and Federal, State, and other agencies' programs, and because of the emerging importance and utility of imagery data. In an information age, society also expects data and products to be delivered quickly and efficiently. The NSDI, Mission-to-Planet-Earth, civilian applications of classified data, and other interdisciplinary earth science investigations highlight the critical need for systems to store and manage diverse data sets.

Goal 11

The NMD is a national leader, providing access to and delivery of geoscience and bioscience data and information products, printed and digital information, and customer services.

Strategic Actions:

- ◆1. Implement strategies and technical plans to effect easy, timely, and consistent access to USGS information and products for the USGS's wide range of users.
- ◆2. Identify and use appropriate public and private outlets for USGS products and services.
- ◆3. Become a leader in national and international standards activities related to information management and technology.
- ◆4. Develop requirements analyses, demonstration projects, and expert staffs to establish the NMD as an exemplary source of geospatial data through the NSDI.
- ◆5. Encourage and participate in the development and implementation of cost-effective data and product delivery systems to provide hard-copy products that meet customer requirements.
- ◆6. Develop and maintain inventory management information that enables timely and cost-effective delivery of products to customers.
- ◆7. Identify in the Research Plan requirements for archiving and product delivery systems and data search and access capabilities, including customer-specified geographic retrievals, data base linkages for one-stop shopping, and development and maintenance of data bases in the USGS node of the NSDI clearinghouse.

Goal 12

The NMD is a center of excellence for archiving, preserving, and processing land remote sensing and other geospatial data.

Strategic Actions:

- ◆1. Build advocacy within the DOI for its legislated mandate to manage and operate the National Satellite Land Remote Sensing Data Archive.
- ◆2. Develop and implement plans to enhance the NMD's current archive capacity and delivery systems for remote sensing data.
- ◆3. Pursue a data archive and management role for emerging, advanced land remote sensing technologies; for example, hyper-spectral and radar sensors.

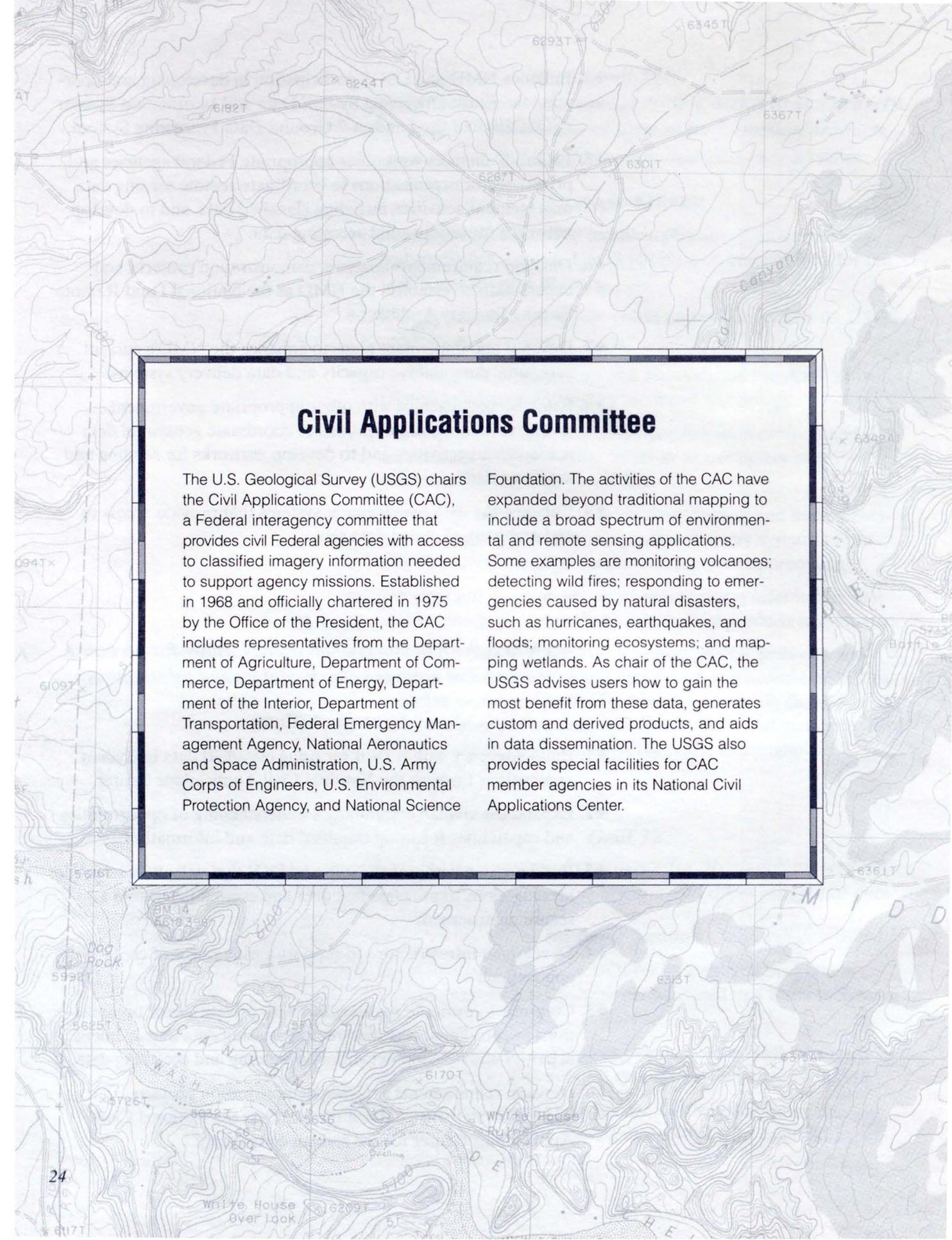
- ◆4. Enhance NMD and USGS participation in developing and operating the Earth Observing System Data and Information System (EOSDIS) and the Landsat-7 Ground Data Processing System.
- ◆5. Establish alliances with other appropriate Federal agencies and private sector organizations to coordinate remote sensing data management activities, including classified data, and to develop networks for sending and accessing data.
- ◆6. Develop requirements analyses, demonstration projects, and expert staffs to establish the NMD as the National Land Remote Sensing Imagery Archive.
- ◆7. Develop and implement plans to enhance the NMD's current geospatial data archive capacity and data delivery systems.
- ◆8. Establish partnerships with other appropriate government and private sector organizations to coordinate geospatial data management activities and to develop networks for sending and accessing data.
- ◆9. Enhance the data management systems that provide access to and archiving of global data sets.

Goal 13

The NMD is the national civilian agency leader for accessing, managing, and applying classified data and information.

Strategic Actions:

- ◆1. Build advocacy within DOI for using classified data in civilian applications through the National Civil Applications Center.
- ◆2. Expand the civilian community's understanding of opportunities and capabilities for using classified data and information.
- ◆3. Build a vision within the USGS and DOI that will allow scientific investigations to use classified data and capabilities within a secure environment.
- ◆4. Develop an infrastructure to support a wide range of civil applications.
- ◆5. Continue to promote partnerships with private sector organizations to coordinate classified remote sensing data management activities and develop networks for sending and accessing data.
- ◆6. Develop requirements analyses, demonstration projects, and expert staffs to establish the NMD as the National Civil Applications Center for the civilian community.



Civil Applications Committee

The U.S. Geological Survey (USGS) chairs the Civil Applications Committee (CAC), a Federal interagency committee that provides civil Federal agencies with access to classified imagery information needed to support agency missions. Established in 1968 and officially chartered in 1975 by the Office of the President, the CAC includes representatives from the Department of Agriculture, Department of Commerce, Department of Energy, Department of the Interior, Department of Transportation, Federal Emergency Management Agency, National Aeronautics and Space Administration, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and National Science

Foundation. The activities of the CAC have expanded beyond traditional mapping to include a broad spectrum of environmental and remote sensing applications. Some examples are monitoring volcanoes; detecting wild fires; responding to emergencies caused by natural disasters, such as hurricanes, earthquakes, and floods; monitoring ecosystems; and mapping wetlands. As chair of the CAC, the USGS advises users how to gain the most benefit from these data, generates custom and derived products, and aids in data dissemination. The USGS also provides special facilities for CAC member agencies in its National Civil Applications Center.

Goal 14

A bureau-wide integrated information management strategy exists for all bureau geoscience and bioscience data and information.

Strategic Actions:

- ◆1. Participate in the development of a bureau-wide geoscience and bioscience information management policy.
- ◆2. Participate on a USGS team to define a conceptual and technical plan for an integrated bureau-wide information management strategy and infrastructure.
- ◆3. Develop the NMD infrastructure, including funding mechanisms, short- and long-term plans, staff, processes, standards, and products, necessary to support the NMD's role in an integrated bureau-wide data and information management strategy that includes data base development, data integration, archiving, and data and information delivery.

Geographic Research and Applications

The purpose of the mission area known as Geographic Research and Applications is to provide research and development that enhance and improve the products and processes of the NMP and their application to societal problems and the management of the Nation's land, water, and biological resources. Geographic research includes the activities that assess, procure, enhance, develop, and apply the latest geographic, cartographic, and information science to the production and interdisciplinary analysis of geospatial and ancillary data. These activities involve a wide variety of partners within the Federal, State, local, academic, and private sectors. This mission area will receive growing emphasis because of the trend in society to demand more timely, flexible, and customized services and products. By increasing the level of effort within the NMD dedicated to geospatial data analysis, research, and applications, the NMD will improve the understanding and applicability of geospatial data and technology. The outcome of these efforts will strengthen the NMD as the center of excellence within the USGS and the DOI for the geographic and cartographic sciences.

Goal 15

The NMD is a partner with numerous other groups, both inside and outside the Federal Government, in applications that develop and apply new approaches to integrating geospatial data into a wide range of geoscience and bioscience models and applications.

Strategic Actions:

- ◆1. Expand the emphasis within the NMD toward developing new science initiatives that involve the other Divisions and demonstrate applications of geoscience and bioscience information aimed at solving societal problems.
- ◆2. Start an intensive retraining effort in state-of-the-art data analysis and applications techniques, and commit to an expanded level of effort toward those activities.
- ◆3. Establish an educational program at field locations to inform USGS and other civilian scientists of the capabilities of new and evolving civilian remote sensing systems and to enhance civilian applications of classified data.
- ◆4. Aggressively publicize successful applications partnerships.

Goal 16

The NMD is recognized for the relevance and scientific excellence of its geographic, cartographic, and information management research programs.

Strategic Actions:

- ◆1. Develop a strong information management research program matched to the needs of earth science information management.
- ◆2. Develop a geographic research program focused on integration, interpretation, and application of geospatial data for solving societal problems.
- ◆3. Enhance and expand the cartographic research program, strengthening the contributions to the mapping data collection and integration and earth science information management and delivery mission areas.
- ◆4. Increase research and development cooperation and partnerships at the Federal, State, academic, and private sector levels.

- ◆5. Strengthen academic ties to encourage the exchange of ideas and expertise between academia and the NMD and to increase awareness of academic research and its relevance to the NMD.
- ◆6. Develop a program that transfers new methods and technology to other scientific agencies, the private sector, and data producers.
- ◆7. Explore innovative methods for extracting information from both existing and new sources of remote sensing data; these methods should include techniques for data calibration, rectification, enhancement, mensuration, and classification.
- ◆8. Develop global-scale data sets describing the Earth's land cover in support of global environmental research and monitoring.

Goal 17

The NMD has a well-integrated, long-term strategy for technology development and management.

Strategic Actions:

- ◆1. Implement a systematic technology development plan to respond to the requirements of the various mission areas of the NMD.
- ◆2. Develop and implement a long-range strategy to acquire and maintain state-of-the-art hardware and software technology for geospatial data production, management, modeling, analysis, applications, and dissemination.
- ◆3. Implement a configuration management process that ensures effective management and control over important NMD technology.



Next Steps for the NMD

To be a major participant in a stronger, more responsive, and more relevant USGS, the NMD has several tasks. It must continuously position itself to be the Nation's leader in ensuring the collection, access, availability, and utility of required geospatial data and information. It must continually develop and enhance opportunities to work with the full range of potential partners, assess customer needs and act on them, seek innovative and effective technology mechanisms for carrying out its mission, and, above all, build on and keep a dedicated work force that has the skills needed to conduct business in an ever-changing environment.

The efforts of the NMD Strategic Planning Team and the NMD Senior Staff to develop and refine the NMD Strategic Plan represent a significant investment, but the hard part has just begun. Now the NMD has to use the Plan as part of a strategic planning and management process that will carry the NMD's programs forward. The goals and actions in the Plan set a strategic direction within the context of continuing resource uncertainties, programmatic and technological change, and potential opportunities. Now the NMD has to implement the long-term Plan by preparing mid-term and near-term business and programmatic guidance and developing performance measures that can be used to evaluate progress toward achieving goals. It is critical that we continually remind ourselves that strategic planning is an ongoing activity in which all of us participate. Thus, each NMD employee will have an important role in making the Plan a reality.

