Strategic Plan for the U.S. Geological Survey

1996 to 2005

The U.S. Geological Survey
A Tradition of Public Service
1879–1996

The U.S. Geological Survey (the USGS), established by Congress in the Organic Act on March 3, 1879, provides geologic, topographic, and hydrologic information to the Nation. This information comprises maps, data bases, and reports containing analyses and interpretations of water, energy and mineral resources, land surfaces, geologic structures, natural hazards, and the dynamic processes of the Earth.

While the Organic Act has been amended over time, the central mission of the USGS has largely stayed the same. What has changed are tools and talents, and an emphasis on the responsibility of the USGS to meet changing national needs. One such change will occur on or before October 1, 1996, when the National Biological Service (the NBS) is consolidated with the USGS. During the life of the USGS, the mission of the agency has been reaffirmed and restated to focus on how information about the Earth is used and to demonstrate the relevance of the USGS to the American people.

Key actions conducted by the USGS in fulfilling its mission are:

- Collect and analyze data on the quantity and quality of surface and ground water, on water use, and on the quality of precipitation. Assess the impact of human activities and natural phenomena on water resources.
- Assess energy and mineral resources, develop techniques for their discovery, and evaluate the impact of their extraction.
- Describe the onshore and offshore geologic framework of the Nation and develop an understanding of the formation and evolution of that framework.
- Evaluate hazards associated with earthquakes, volcanoes, floods, droughts, landslides, and toxic materials. Develop methods for the prediction and mitigation of such hazards.
- Produce and update geographic, cartographic, and remotely sensed information in both graphic and digital form.

The USGS employs nearly 9,000 employees located in 200 field offices. The USGS cooperates with and coordinates its efforts with nearly 1,200 agencies at Federal, State, county, and municipal levels, and with other nations and international organizations. The headquarters of the USGS is located in Reston, Virginia. Three regional centers are located in Denver, Colorado; Menlo Park, California; and Reston, Virginia. Field offices are located throughout the 50 states, the Commonwealth of Puerto Rico, and the Trust Territories of the Pacific.

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Office of the Director
Reston, Virginia 22092

MEMORANDUM

JUN 6 1996

To: All Employees

From: Gordon P. Eaton
Director

Subject: Strategic Plan, 1996-2005

I am pleased to announce that the new Strategic Plan for the U.S. Geological Survey has been launched and is attached to this memo, with a brief summary. The plan is neither "finished" nor truly "complete," because strategic planning is a continual process. This plan is a living document that will change over the next decade as conditions and circumstances around us change.

In the March 1996 Benchmark Note, I discussed the fundamental need for a USGS strategic plan to meet the challenges of our changing society, and I set forth what a strategic plan is and what it is not. As I explained, experience at Texas A&M, Iowa State University, and Lamont-Doherty Earth Observatory, Columbia University, over a period of almost a decade demonstrated the essential and enduring value of strategic planning. The USGS Transition Team had also recognized its importance in offering a recommendation back in 1993 that we institute such a process. Our colleagues at the National Biological Service (NBS), who will become part of the USGS on October 1, have also developed a strategic plan that will be integrated with the USGS plan over the coming months.

Fundamentally, a strategic plan is simply a road map drawn up to reveal most, if not all, of the different possible routes and options for moving from where we are today to where we need to be in 2005 in order to remain viable, strong, and relevant. Various optional routes are defined in the plan and in associated documents prepared by the team (e.g., reports on the workplan, threats and opportunities, strengths and weaknesses of the USGS, scenarios of the future, and so on). So, also, are the perceived conditions we might expect to encounter along the way. I want to reiterate a particular point: the strategic plan will not tell us how to achieve any of our goals; rather, it will indicate strategic actions that will benefit the USGS in spite of, and in anticipation of, the changing societal, economic, and political conditions that affect us specifically.

In the next few days, most managers and supervisors will be receiving a discussion packet related to the plan. The packet contains both a video introducing the plan and answers to some questions that you may have about the plan. The week of June 24-28 has been designated "StratPlan

Week." During that time, your managers and supervisors will plan to meet with all of you to discuss how your particular work activities may be affected by our new strategic plan.

The next step in achieving our goals is already underway. About 60 of the senior management staff from both USGS and NBS met for an intensive 3-day workshop at the end of May to establish priorities among the roughly 75 strategic actions laid out in the plan. In a few weeks, we expect to be announcing some of those initial actions in the form of a first-year implementation plan.

The USGS has survived and flourished during its 117-year history by facing the changes and challenges of the day and responding to them with vigor and enthusiasm. We stand on the shoulders of giants from our past, but we cannot dwell in the past. As our world changes, so we must change and look, not backward, but to the future. This strategic plan is a road map to our future, a building plan for the new USGS, but without your contributions it will remain only a stack of paper. Your efforts will make the difference as we strive to build a future worthy of our past. Join us, as we reach for the future--together. By working and planning together, we can keep the USGS the Nation's premier earth-science agency.

U.S. Department of the Interior
U.S. Geological Survey

Summary of the USGS Strategic Plan

Introduction

Strategic planning is a continuous process that forces an organization to look outward and inward. The challenge for the USGS is to stay focused on a horizon of some ten years out, while realizing that near-term shifts will demand our attention and mid-course corrections may be needed.

The strategic plan was designed and developed for the entire USGS, not for any particular organizational unit within it. The plan outlines strategic actions to be undertaken at all organizational levels to achieve excellence. The overall focus of the plan considers the USGS as it was configured prior to the mergers with Bureau of Mines and National Biological Service personnel.

The plan is divided into three parts. The first part describes the economic, political, and societal driving forces that are likely to influence the options and choices for future direction of the USGS. The second part discusses our core competencies—the key skills, characteristics, and assets that must be nurtured and strengthened for the USGS to excel. The third part describes our business activities—the scientific and technical efforts currently undertaken by the USGS and those we will carry out in the future. Special sections throughout the plan discuss related topics including mergers and acquisitions, support for research, advocacy, mandates for our functions, investments in people and technology, our involvement in the National Spatial Data Infrastructure, the international role of the USGS, and the balance among our funding sources.

Driving Forces

The eight driving forces outlined here significantly influence and create alternatives for the USGS. They will shape the future of the United States, the needs of the public, and the roles of Federal agencies. The driving forces are:

- Devolution (that is, downsizing, reinvention, etc.) of the Federal Government
- New technologies
- Demographic changes
- Public investment in science
- Society's concept of "public good"
- Tradeoffs between the economy and the environment
- Global interdependence
- Scarcity and management of natural resources

Core Competencies

Core competencies are the key skills, characteristics, and assets that the USGS must nurture and strengthen to excel in current and future business activities. They are the essential qualities that, when used to achieve our vision and mission and to conduct our business, differentiate our capabilities from those of other organizations. While the USGS embodies each of the core competencies to some degree today, achieving excellence in all of them must be the leadership's highest priority. The strategic plan outlines five core competencies.

Impartiality, credibility, and scientific excellence. The responsibility for providing credible, impartial scientific information to those charged with making public policy is central to the mission of the USGS. Our credibility depends on two essential factors—technical and scientific excellence and reputation for impartiality. Failure in either of these areas will have a crippling effect on our organization.

Relationships and partnerships. A wide range of organizations offer the potential for successful partnerships, including other Federal agencies, State and local government agencies, nonprofit organizations and administrative authorities, schools and universities, and the private and corporate sectors. The USGS must cherish and nurture its relationships and partnerships by giving timely and responsive results to customers and reaching out to partners with collegial respect.

Multidisciplinary workforce with national presence. The USGS must bring diverse talents to the earth science challenges of the future. The required disciplines will vary according to society's needs, but the USGS must retain its capability to apply scientific understanding and information technology to earth science problems anywhere in the Nation.

Long-term national data bases. The USGS must be the national leader in organizing and managing earth science data and information and making both available in useful forms. While we may collect some of the data, it is more important that we assume leadership in seeing that long-term measurements and descriptions of the Earth are accurate, properly documented, archived, and distributed to the public.

Long-term, broad-scale, multidisciplinary interpretive studies. The USGS must excel in understanding the scientific principles of Earth processes. We are in a unique position to apply a diverse, nationally distributed,

highly skilled workforce to long-term, broad-scale, multidisciplinary studies. Although we will continue to conduct scientific studies of short duration, limited scale, or narrow disciplinary focus, there will be increasing emphasis on earth science work that is much broader in scope.

Business Activities

The business activities are the present and future scientific and technical efforts of the USGS. Three fundamental tasks apply to all USGS business activities:

- Critically evaluating programs to ensure leadership and relevance to societal needs
- Developing Survey-wide priorities for implementation and funding
- Establishing a philosophy for capital investments and support services at all levels

The seven business activities described below are not intended to guide organizational or budgetary structures; rather, they convey the breadth, integration, and flexibility in the description of programs at which the USGS must excel over the next decade.

Water availability and quality. Investigations related to water availability and quality are the largest business activity of the USGS and are likely to remain so over the next decade. Water will continue to grow in importance as an issue because the Nation faces increasing and often conflicting demands on a finite water supply. The success of USGS water investigations depends on and will continue to depend on the combination of three efforts: data collection, interpretive studies, and research.

Hazards. An essential role of the Federal government is to minimize the loss of life and property that results from natural disasters such as earthquakes, volcanic eruptions, landslides, floods, and droughts. The concentration of population in urban and coastal areas increases the risk of catastrophic loss from natural hazards. Thus the study of hazards is an activity in which the USGS will grow in the coming decade.

Geographic and cartographic information. Knowledge of the location of and relations among natural and manmade features at and beneath the Earth's surface provides a framework for analyzing and understanding earth processes and for making wise decisions. The USGS has traditionally been a major supplier of this information not only to its internal operations but to other public- and private-sector organizations as well, who depend on this information as the basis for wise economic and physical development, management of resources, response to and mitigation of hazards, and many other uses. Coordination and collection of geographic and cartographic information will remain a fundamental Federal role and a viable program of the USGS.

Contaminated environments. Nuclear waste disposal, hazardous substances entering the Nation's water supply and food chain, and atmospheric transport and deposition of toxic materials are serious threats to human and environmental health. The USGS has a unique capability for the long-term, multidisciplinary study of contaminated environments. This activity will increasingly emphasize projects that integrate disciplines and/or allow work on larger geographic areas. This activity currently represents one of the larger business activities of the USGS and seems to have considerable growth potential.

Land and water use. Sound stewardship of the Nation's land and water resources requires up-to-date synoptic data on how land and water resources are being used as well as an understanding of how possible changes might impact the national economy, the environment, and the quality of life. We need to find new ways to translate earth science information into forms that will be used by public policymakers, the business community, and individuals. The USGS is uniquely qualified to undertake this activity. With a clear definition of a Federal role, this business activity is a growth area over the next decade.

Nonrenewable resources. Investigations of nonrenewable resources will undergo fundamental changes during the coming decade, and such investigations will likely decrease as a percentage of the total USGS effort. Successful national economic policy now depends on knowledge not only of locations and quantities of these resources throughout the world but also of their economic, social, and environmental costs, their quality, and their availability, especially as it may be influenced by shifting political situations and technological innovations.

Environmental effects on human health. This is a potential new business activity that would draw on the Survey's multidisciplinary expertise. An increasing proportion of the Federal budget is dedicated to health issues, and many chronic health issues may relate directly to earth processes and the environment. If we assume a significant role in understanding environmental contributions to diseases, managers will need to define an appropriate niche relative to traditional health and environmental agencies and form strong partnerships to collaborate on problem solving.

Next Steps

The efforts of the Strategic Planning Team and the Policy Council in developing this plan represent only the beginning. The Strategic Plan is intended to be a living document that will change over time. For example, at the next revision, the plan will change to include the new responsibilities of the USGS for biological resources research when the National Biological Service is consolidated with the USGS on October 1, 1996.

We must remember that planning is as important as the plan itself and that each employee has a role to play in making this plan a reality.

Strategic Plan for the U.S. Geological Survey

1996 to 2005

Vision

The U.S. Geological Survey is an earth science organization that is recognized worldwide as scientifically credible, objective, and demonstrably relevant to society's needs.

Mission

The U.S. Geological Survey provides the Nation with reliable, impartial information to describe and understand the Earth.

This information is used to:

- minimize loss of life and property from natural disasters;
- manage water, biological, energy, and mineral resources;
- enhance and protect the quality of life; and
- contribute to wise economic and physical development.

Strategic Plan for the U.S. Geological Survey

1996 to 2005

Prepared by the Policy Council
and the Strategic Planning Team
U.S. Geological Survey

U.S. Department of the Interior
U.S. Geological Survey
Office of the Director
107 National Center
Reston, VA 22092

May 1996

This plan was a collaborative effort by the senior management of the USGS and USGS employees, represented by the Strategic Planning Team.

The Policy Council of the U.S. Geological Survey
Gordon P. Eaton
William F. Gossman
Robert M. Hirsch
P. Patrick Leahy
Bonnie A. McGregor
Barbara J. Ryan
Linda D. Stanley
Richard E. Witmer

The Strategic Planning Team
Charles N. Alpers
Thomas J. Casadevall
T. John Conomos, *ex officio*
Michael A. Domaratz
William E. Fordyce
William F. Gossman
Timothy W. Hale
Gary W. Hill, *ex officio*
David G. Howell, **Tri-Chairperson**
Steven E. Ingebritsen
Herman A. Karl
Donald T. Lauer, *ex officio*
Katherine F. Lins, **Tri-Chairperson**
Gail E. Mallard, **Tri-Chairperson**
Alan M. Mikuni
Marilyn A. Myers
Douglas R. Posson
John C. Reed, Jr.
Linda D. Stanley, *ex officio*
Frederic H. Wilson

Copies of the *Strategic Plan for the U.S. Geological Survey* are available at the following USGS libraries:

USGS Library
12201 Sunrise Valley Drive
Reston, Virginia 22092-0001

USGS Library
345 Middlefield Road
Menlo Park, California 94025-3591

USGS Library
Denver Federal Center
Denver, Colorado 80225-0046

The *Strategic Plan* also is available electronically on the Internet at http://online.wr.usgs.gov/stratplan.

Table of Contents

Preface

In a time
of drastic change,
it is the learners
who inherit the future.

—Eric Hoffer

During the past two decades profound changes have swept across the scientific, social, and political landscape in which the U.S. Geological Survey (the USGS) functions and to which it is inextricably linked. Core values that were institutionally forged and universally embraced in the past have been vigorously challenged and even vigorously assaulted. Political, economic, and societal forces that coalesced in 1995 threatened the very existence of the U.S. Geological Survey—an organization that we long believed to be vital and important to the well-being of the American people and to the advancement of the earth sciences. The near abolishment of the USGS was averted largely by our customers. It was their understanding of the value of our work and their demand that we continue to provide our products and services that ensured our near-term survival.

One lesson we learned from the threat was that the viability and prosperity of the USGS depend on our ability to demonstrate the relevance of our work to society at large. We also learned that we must ensure better communication with our customers, including the Congress, and with the world around us. Moreover, we must actively prepare for the future. These lessons—hard earned and hard learned—have led us to develop a strategic plan.

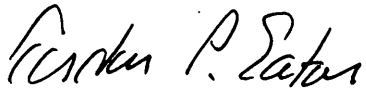
The challenge for the USGS is to stay focused on a horizon of some ten years out, while realizing that there will be near-term shifts that will demand our scrutiny and perhaps mid-course corrections. These shifts and corrections will be driven by such forces as the increasing devolution of Federal government functions to the States and other entities, changes in national demographics, the expanding influence of advances in scientific methods and technologies, and the continuing—and underlying—tension between the development of the Nation's natural resources and environmental conservation. Beyond these already compelling factors are the public's perception of its investment in science as a means of solving societal problems and society's concept of the "public good" of science.

Our contributions to public policy issues focus on four major themes: the environment, resources, geologic and hydrologic hazards, and integrated data and information management. The Nation's highest priority earth science problems must be approached increasingly from an interdisciplinary perspective that capitalizes on the array of USGS scientific and technical strengths. The consolidation of the National Biological Service with the USGS is a unique opportunity in the scientific community to integrate the physical and biological sciences, to provide the American people with an even richer scientific program about the Earth. Our strengths include a multidisciplinary workforce capable of working anywhere in the Nation, the maintenance of long-term national data bases, and the capability to conduct

long-term, broad-scale, multidisciplinary interpretive studies. Our strength also depends on a reputation for objectivity and scientific excellence, as well as a strong heritage of collegial relationships and partnerships with the customers we serve. It is upon these strengths that we will build our future.

Strategic planning is a continuous process that forces an organization to look outward and inward. It is a process that provides a way to be constantly aware of the choices we have available to us to ensure the health and relevance of the USGS. It requires a constant dialogue with stakeholders in the USGS—customers, public officials, scientists, professional societies, and employees—to be sure we select the best course at any point in time.

This strategic plan is a road map drawn to reveal the many routes and options we have to advance with continuous self-renewal, growth, and integrity into the 21st century. This plan will be a living document that will change over time. It is a start toward meeting the challenges posed by "a time of drastic change." We believe that we must balance our internal aspirations with external conditions, address those sometimes opposing or conflicting forces, and move forward into the future.



Gordon P. Eaton
Director, U.S. Geological Survey

Acknowledgments

Members of the Policy Council and the Strategic Planning Team met periodically during a 14-month period to develop the *USGS Strategic Plan*. The USGS wishes to acknowledge the special contributions of Carolyn C. Didonato and Charles F. Merk, facilitators; Gail Hardin, recorder and logistics coordinator; Carolyn Donlin, editor; and James Butcher and Linda Rose, two outside consultants who provided valuable guidance on the strategic planning process. Also, the USGS wishes to thank three original members of the Strategic Planning Team who were unable to remain with the project—Nancy B. Faries, David J. Lystrom, and Mary Lou Zoback.

The USGS would like to thank the numerous individuals within and outside the organization who shared with the Policy Council and the Strategic Planning Team their views on society, science, and the future.

The USGS in the Year 2005 Highlights

What will characterize the U.S. Geological Survey in 2005? The USGS will be focused on a well-defined group of business activities. The level of effort applied to current activities will be different. For example, the USGS will conduct more studies on hazards, water, and contaminated environments and fewer studies on nonrenewable resources. The following are the salient changes in emphasis:

Increasing Emphasis	Decreasing Emphasis
■ long-term interdisciplinary studies	■ single-discipline studies
■ mitigation studies	■ remediation studies
■ quality and accessibility of resources	■ distribution and quantity of resources
■ international mineral/energy studies	■ domestic mineral and energy studies
■ nontraditional disciplines	■ traditional earth science disciplines
■ regional and national studies	■ local studies
■ geospatial data integration	■ sole production of geospatial data
■ applied research and development	■ basic research studies
■ technology transfer	■ compartmentalized technology
■ engaging in controversial issues	■ avoidance of controversial issues
■ issue-driven studies	■ investigator-driven studies
■ studies involving population centers	■ wilderness areas studies
■ multiple-risk assessments	■ single-risk assessments
■ digital products	■ paper products
■ real-time event responses	■ post-event responses

The USGS of 2005 will reach across organizational boundaries to take greater advantage of the most useful skills, data, and technology and apply them to a more integrated, multidisciplinary approach to scientific problem solving. The USGS will seek more cost-effective methods of building and supporting services such as administration, personnel development, publications, and telecommunications. The USGS will take an organization-wide approach to acquiring and maintaining advanced technological capabilities. The agency's workforce will continue to be distributed nationally, but local offices will be able to engage a greater range of disciplinary skills in their program development. Additionally, the USGS will draw on skills outside of the traditional earth sciences to respond to society's changing needs.

The USGS of 2005 will rely much more on partnerships as a routine means of doing business. The USGS will develop more extensive partnerships with other Federal agencies, academia, State and local governments, nongovernmental organizations, and private industry.

These partnerships will supplement USGS skills and resources needed to accomplish its work. Together, the USGS and its partners will leverage the combined resources in many business activities: collect and distribute data of the highest possible quality; populate USGS national data bases with increasingly large quantities of reliable and timely data; reach out to communities, the media, schools, and new users of USGS information; and produce a broad range of earth science information products.

The USGS of 2005 will benefit from increased national name recognition. The positive image of the USGS will result from a combination of the high quality and timeliness of USGS products and the relevance of these products to problems with which the public is concerned. Extensive and continuing outreach will help the public understand how earth science affects the economy and the quality of life; will promote valuable, relevant USGS products; and will expand opportunities for the USGS to contribute scientific understanding and data to important public issues.

Introduction

The *Strategic Plan for the U.S. Geological Survey* was designed and developed to provide a statement of direction for the U.S. Geological Survey (the USGS) as an organization. The plan does not focus on any particular organizational unit within the USGS. The plan reflects the Vision of the USGS in 2005 and the refined statement of the Mission of the USGS, found on the second page of this document. An important aspect of the plan is that it highlights the shifts in organizational emphasis that are expected to occur between now and 2005.

The *Strategic Plan for the U.S. Geological Survey* was developed between November 1994 and February 1996 by the Strategic Planning Team, whose membership represented all of the major organizational and geographic units of the USGS. This team worked closely with the USGS Policy Council and program managers throughout the USGS. The strategic planning process included evaluating the current organization and its activities, considering which future external events might unfold and how such events would affect the USGS, and developing the strategic actions presented herein.[1]

In performing its work, the Strategic Planning Team prepared five documents in addition to the *Strategic Plan,* to provide information to support the conclusions and strategic actions contained in the plan. These are *Workplan, Strengths and Weaknesses of the U.S. Geological Survey, Profiles of USGS Programs, Managing Opportunities and Threats Affecting the U.S. Geological Survey,* and *Scenarios for the Future of the U.S. Geological Survey. Workplan* describes the process used in developing the *Strategic Plan. Strengths and Weaknesses of the U.S. Geological Survey* analyzes strengths and weaknesses and, together with *Profiles of USGS Programs*, describes the USGS as of June 1995. *Managing Opportunities and Threats Affecting the U.S. Geological Survey* and *Scenarios for the Future of the U.S. Geological Survey* are important tools in describing driving forces and possible future states for the USGS. *Scenarios* contains neither predictions of the future nor strategies, but concepts of possible future worlds derived partly from the driving forces influencing today's society. The team developed strategic actions that anticipated or responded to the implications of these scenarios.

[1] In late 1995, Congress mandated the consolidation of the National Biological Service (NBS) with the USGS. The merger will take place on or before October 1, 1996. The timing of the congressional directive precluded the integration of the *NBS Strategic Science Plan* with the *Strategic Plan for the USGS.* Although the two plans are being issued separately, the NBS plan will guide the initial scientific efforts of what will become the Biological Resources Division of the USGS. Subsequent refinements of the USGS plan will reflect the new responsibilities of the USGS for biological resources research and the integration of biological science into the USGS.

The USGS views the *Strategic Plan for the U.S. Geological Survey* as an umbrella under which all organizational units of the USGS will create their own strategic plans. More important, all organizational units will participate in the implementation of the strategic actions outlined in this plan. Development of a first-year implementation strategy by USGS managers is the next step in the planning process.

Organization of the Text

The text of the plan is divided into three major parts. Part 1 discusses the driving forces that are likely to influence the options and choices for the future direction of the USGS. Part 2 discusses the "core competencies" of the USGS—those attributes that give the USGS its competitive edge. The USGS must excel in all of these competencies in order to succeed by the year 2005. Part 3 describes the "business activities" of the USGS—those scientific and technical efforts currently undertaken by the USGS and those the organization will carry out in the future. These business activities are not defined along traditional program lines. Rather, they represent the key topical areas where one or more USGS organizational units may have interests, as well as the capabilities and skills necessary to pursue the activity.

The final section summarizes next steps in the strategic planning process. A glossary of selected terms and concepts contained in the plan is included at the end of the text.

part 1

Driving Forces: Political, Economic, Societal, and Global

Powerful forces in the world are driving a dynamic, uncertain environment in which society as a whole is evolving. These forces —which both significantly influence and create alternatives for the USGS—will shape the future of the United States, the needs of the public, and the roles of Federal agencies. Of particular importance to the USGS are the following forces:

Devolution of Federal government functions: What will be the appropriate role for a Federal earth science agency if many formerly Federal functions are assumed by State or local governments or by the private sector?

New technologies: How will new scientific and information technologies be exploited to help solve problems that concern and affect the public?

Demographic changes: How will a growing population's demand for resources be met? To what extent can the economic impact of natural disasters be mitigated when such disasters affect large population centers?

Public investment in science: What does society expect from investments in research and technology?

Society's concept of "public good": How can earth science that is publicly funded demonstrate its value to society?

Economic versus environmental interests: How might society benefit from impartial and credible earth science information when dynamic tensions between environment and economy arise?

Global interdependence: How can an understanding of global earth science issues contribute to U.S. foreign policy, national and economic security, and environmental quality?

Scarcity and management of natural resources: What can earth science contribute to the development of sound national public policy for natural resources?

These driving forces affect the quality of life of all citizens of the United States. Opportunities to help improve the quality of life through relevant work and research depend on how these forces evolve and how the USGS responds to them.

Mergers and Acquisitions

Mergers and acquisitions are a way of life or death in private industry. Companies are driven by the global economy to be leaner and more efficient. The Federal government may be poised for consolidation too, with dynamics both similar to and different from those of industry.

Public sentiment in this country seems to favor balancing the Federal budget, and both the President and Congress seem intent on achieving this goal. To some degree, the private industry model is being viewed as relevant to government organizations. Some functions no longer viewed as appropriate for the Federal government are targeted to be devolved to States, private industry, or individuals. Remaining functions might be reformed along business lines to take advantage of the government version of economies of scale.

Science and technology agencies, as government enterprises, might be downsized and consolidated. While private industry has long sought to produce products and services that customers are willing to pay for, government is only beginning to critically evaluate what society wants and is willing to pay for. Reinvention of government (that is, a customer orientation with an eye toward cost efficiency) is a first step toward operating parts of government like a business. It remains to be seen whether such reinvention activities will be sufficient to ensure long-term survival of agencies, when outmoded missions, insufficient leadership, or an unwillingness to change continues to exist.

In private industry, it is typically, but not always, the larger enterprise that acquires the smaller. Smaller businesses that are lean and focused can perpetuate themselves in larger groupings by infusing their culture and efficient business practices into larger but less efficient organizations. In government, as in private industry, Congress ("the Board of Directors") may base decisions about which organizations and functions to merge on public policy considerations, as well as economic considerations.

Devolution of Federal Government Functions

The role of the Federal government is changing and will continue to change. State and local governments, nongovernmental organizations, and private enterprises are beginning to be asked to provide more services, while the Federal government is being asked to provide fewer. The Federal government, including the USGS, needs to find ways to enhance its ability to work through and with other organizations.

The devolution of traditional Federal governmental functions implies significant changes for agencies such as the USGS. The trend toward downsizing, grounded in concerns about balancing the Federal budget, could result in smaller appropriations for the USGS. Responses to this changing environment include seeking novel partnerships with other U.S. and international agencies to take advantage of USGS scientific expertise for the benefit of society. The Federal government could reorganize into fewer, but larger, agencies that focus on broader areas of concern. A consolidated multiscience agency would create opportunities for new synergism among the sciences. The organization and scope of activities of such an earth science agency are unclear but certain to be different, in contrast to today.

New Technologies

Scientific concepts, analytical techniques, resource extraction technologies, Earth-observing satellites, biotechnology, and information sciences are evolving rapidly. Demand for information in the global economy is satisfied by increasingly cost-efficient and responsive new technologies that allow information to flow freely and quickly across political, economic, and intellectual borders. New technology first offers improved means of doing traditional tasks, but it soon enables people to create products that were never before possible. For example, satellites first helped improve weather forecasts. Today, data transmissions from low Earth-orbit satellites and cellular networks enable "nowcasting"—the immediate communication of events to emergency management agencies, farmers, pilots, and the public at large. The Internet, the World Wide Web (WWW), and cellular technologies have begun to revolutionize the way that consumers acquire information and the methods by which entrepreneurs disseminate information. Unit costs for both technology and information are decreasing.

Information technology also raises customer expectations. Consumers expect technology to be both fast and cheap, and they expect information to be reliable, accessible, and ubiquitous. Furthermore, consumers expect products to include information that is immediately accessible, inexpensive, and easy to use. Providers of information who do not live up to these expectations will find that competitors with better skills and a better customer orientation will fill the gap quickly. The use of scientific data will increase dramatically because real-time, high-capacity data systems are becoming more commonplace. This

phenomenon will drive a new generation of scientific applications and methods to integrate and interpret large quantities of data. In the earth sciences, new technologies and real-time information will be used to nowcast earthquakes, volcanic eruptions, and floods, and to mitigate the impact of such natural disasters on society.

Demographic Changes

More people are moving to some urban areas, coastal zones, and the Sunbelt States. As population and economic infrastructure become more concentrated, any natural disaster that strikes a population center will have a magnified, perhaps national or global, impact on human life and the economy. The international ramifications of seemingly local natural disasters can be large. Natural disasters can be expensive, especially when a population center is affected. In the United States alone, the annual economic cost of damage caused by natural disasters is estimated to exceed $50 billion. Although the number of natural disasters is not statistically larger than in the past, the impact of natural disasters on society and the economy continues to increase. Information about natural disasters cannot by itself reduce the intensity of the events, but earth science information can help reduce the deleterious impact of natural disasters on population centers through better scientific understanding, better public education, improved zoning laws, and improved building-design and materials science.

Changes in demographics also affect the competition for and use of resources. For example, as population density increases, there will be new stresses on water resources; different patterns of energy, mineral, and land and water use; and possibly unexpected demands on the infrastructure that supports human health and the quality of life. A scientific understanding of the quality and quantity of natural resources will be key to successful planning for demographic changes.

Public Investment in Science

Since World War II, science has been recognized by society as a powerful tool to improve economic and material well-being. For example, as a result of the Nation's investment in science, the United States economy is increasingly based on knowledge-intensive technology. Science, however, has not solved some persistent problems; for instance, science has not been able to find a cure for cancer nor has it provided a long-term solution to the disposal of nuclear wastes. Even when science has not solved a problem, scientific information can be used to direct public policy making toward solutions grounded in an objective understanding of natural processes.

A balance exists between short- and long-term expectations from science. Science has responded quickly to certain needs, such as faster telecommunications for the Internet or better techniques for modeling the flow of ground water. Other important needs of society might require a broader integration of scientific disciplines, or a deeper understanding of basic principles, in order to provide necessary insight into the underlying processes. Such longer-term investments, perhaps yielding new techniques for detecting signals of impending earthquakes or detecting subtle but significant changes in the environment, can result in enormous long-term returns on investment. However, unless society becomes convinced that solutions will result from long-term investments, federally-funded science will be driven to respond to the short-term service needs of society at the expense of long-term improvements and solutions.

Society's Concept of "Public Good"

What should the public pay for? And what products and services should they expect in return? Different segments of society have different priorities at different times. Public expectations for government services will reflect generational and regional tradeoffs. Devolution of functions of the Federal government implies that the perception of what constitutes a public good is changing. While certain functions may continue to be seen as governmental because they benefit the public at large and cannot be done by individuals, private industry is increasingly viewed as a viable alternative source for some products and services provided by government. National public science agencies, such as the USGS, will not escape the effects of these changing expectations.

In the past, a significant role of government was to improve the common welfare. Today, individuals in one part of the country may not be willing to pay for services that address problems elsewhere. There has been a shift toward individual responsibility, and away from the expectation that government will defray risks. States and individuals might be expected to cover their own risks, from natural disasters to medical emergencies. Some resources will continue to be shared at the Federal level, but nationwide there are discussions at every level of government about who should have access, and at what cost. National programs could take on a different character, perhaps focused more on coordinating efforts across the United States than on providing services and products directly.

Research

During the period from 1945 to 1990, government-funded military and civilian research enjoyed bipartisan support and unprecedented growth. Around 1990 that growth flattened out; recently, government support of research has actually begun to shrink. The 1995 budget agreement endorsed by both houses of Congress called for a 30 percent reduction in funding over the next seven years. The effects of congressional budgetary constraints are already being felt in all disciplines of science. Discussions of funding problems are widespread in scientific journals. For example, in the September 15, 1995 issue of *Science*, Mary Woolley writes "Conveying to the public a sense of reality about the future of scientific research is the crux of the matter. Very few nonscientists are aware that science is at risk."

The reduction in Federal support is especially threatening to scientific research in the United States because this reduction follows a period in which many private companies have downsized or totally eliminated research functions. In the fast-moving global economy, most U.S. companies are making short-term investments, rather than long-term investments such as fundamental research and development. A number of independent analyses suggest that Federal support of research and development is crucial to the continued growth of the U.S. economy. Such analyses indicate that about one-half of U.S. economic growth results from such investments. Furthermore, the societal rate of return on research and development investments is considerably higher than the rate of return to industry, because benefits from a new technology a firm introduces multiply.

The debate about the role and importance of science and research is and should be never-ending. Each scientist needs to be able to convey the societal benefits of earth science to nonscientists. Government scientists should strive to convey to the public, as Mary Woolley also suggests, an "I work for you" attitude.

Economic versus Environmental Interests

A dynamic tension exists between the forces promoting development as the basis of economic growth and the forces promoting conservation of the environment. This tension is prevalent in the United States and also exists to varying degrees in other parts of the world. Conflicts manifested by such tension often evolve quickly from being local in scope to being national or global in scope—Chernobyl, the ozone hole, loss of rain forests, greenhouse gases and global change, toxic materials in the Great Lakes, nuclear-waste disposal. In the global economy, there is increased attention to cost competitiveness; environmental legislation, therefore, requires long-term planning to anticipate problems and limit political and economic fallout. Litigation often reaches the highest courts with both parties invoking principles of justice, health and safety, and economic well-being of the country. One role for science in finding solutions to these conflicts is to provide unbiased data and information that can be the foundation for common understanding and eventual agreement.

A larger, more concentrated population stresses the natural environment in new ways. A greater scientific understanding, together with cost-benefit analyses of the alternatives available to society, can lead to strategies that balance society's need for economic growth with its need to protect the environment. Decisionmakers will act with or without relevant earth science information; better decisions will come from well-informed policymakers who rely on credible, timely earth science information.

Global Interdependence

Natural earth processes and many human activities have effects that transcend political boundaries. For example, questions of human impact on climate change must be addressed in terms of global environmental and economic issues. Additionally, the United States may be potentially affected by earth-related natural processes that occur beyond its borders, such as earthquakes and eruptions of volcanic ash. A natural disaster in a large commercial center such as Tokyo or Hong Kong could have pronounced effects on the U.S. domestic economy.

The global economy has become increasingly interdependent in recent years. Reduced barriers to international trade, as manifested by trade agreements such as the North American Free Trade Agreement, have allowed market forces of supply and demand to regulate the flow of commodities. Furthermore, self-sufficiency in energy and mineral resources is no longer possible, necessitating a global resource mix.

Quality of Life

People increasingly make decisions based on quality-of-life considerations. Environmental and economic tradeoffs are manifestations of different views on the meaning of quality of life. Demographic trends have resulted in great concentrations of people in urban areas, especially in the growing cities of the Sun Belt and coastal regions. As a result of these trends, competing demands will stress the availability and quality of water and its transportation infrastructure. The occurrence of natural hazards will also have increasing impacts on population centers; these hazards could be mitigated through proper planning. Thousands of municipalities, counties, and regional authorities will be seeking information on the quality of natural resources and on the potential risk of natural hazards that affect their citizens. The public is largely unaware that earth science issues affect quality of life. As conflicts occur among competing groups attempting to improve or maintain their quality of life, the demand for reliable and credible information about the Earth and its natural resources will grow.

Scarcity and Management of Natural Resources

Scarce resources get attention. Historically, the scarcity of certain resources has caused wars and disrupted national economies. Today, most resources are available, for a price, somewhere in the global economy. Oil and gas are relatively abundant and accessible, even if geographically distant. Minerals are available in necessary quantities from a variety of sources. Global economics, rather than national self-sufficiency, drives decisions on when and where to buy most resources.

Land and water resources, however, are fundamentally different from energy and mineral resources, because a country cannot economically produce or import quantities of either. The various demands on land and water are interrelated and depend on the price, quality, and quantity of each. As demographic shifts result in larger concentrations and a changing distribution of population, the use of the finite land and water resources becomes an increasingly crucial debate. Earth science information about the characteristics of land and water can help define alternatives available for the wise management of these resources.

part 2

Core Competencies

Core competencies are the key skills, characteristics, and assets that the USGS must develop and maintain, in order to excel in current and future business activities. These competencies are the essential qualities that, when used to achieve the vision and mission of the USGS and to conduct the business of the USGS, differentiate the capabilities of the USGS from those of other organizations. The development of core competencies requires an investment in time, skill, and resources. Competencies evolve over time and are enhanced with use. An organization cannot easily speed up the process of creating core competencies, and they can deteriorate over time. Core competencies are so fundamental to the success of the USGS that strengthening them must be viewed as a strategic goal. While the USGS embodies each of the core competencies to some degree today, achieving excellence in all of them must be the USGS leadership's highest priority, as the USGS strives to succeed in its business activities.

Five core competencies comprise this portion of the USGS strategic plan:

- Impartiality, Credibility, and Scientific Excellence
- Relationships and Partnerships
- Multidisciplinary Workforce with National Presence
- Long-Term National Data Bases
- Long-Term, Broad-Scale, Multidisciplinary Interpretive Studies

Goals have been established for each of these competencies and specific strategic actions are seen as necessary to achieve these goals.

The following text addresses the core competencies. For each, a goal statement is provided, followed by strategic actions necessary for achievement of the goal. Within each strategic action, operational actions in support of the strategic action are listed.

Core Competency 1:

Impartiality, Credibility, and Scientific Excellence

Goal

Safeguard the reputation of the USGS for impartiality, credibility, and scientific excellence.

The responsibility for providing credible, impartial scientific information to those charged with making public policy is central to the mission of the USGS. As the Nation's earth scientist, the USGS has a responsibility to provide impartial data and the most informed interpretations that advanced earth science has to offer. The reputation of the USGS is the result of the collective and individual actions of its employees. USGS scientists define scientific problems with regard to a public policy issue, interpret the data in light of that issue, and translate the information into a form that can be used by decisionmakers on all sides of an issue to set policy. Opportunities exist to be an authoritative source of information in dispute resolution. The credibility of the USGS in this role depends on two essential factors—technical and scientific excellence and a reputation for impartiality. Failure in either of these areas will have a crippling effect on the organization. In particular, the reputation of the USGS for impartiality rests on being unbiased in every aspect of the USGS's mission—from collecting data and doing research to interpreting such data and communicating the results. The following actions are designed to maintain or enhance the technical and scientific excellence of the USGS, as well as its reputation for impartiality.

Strategic Actions

A Strengthen the technical and scientific excellence of the USGS.

A-1 Develop a USGS-wide plan that focuses on desired scientific and technical accomplishments, upon which societally relevant program initiatives can be based.

A-2 Build a work environment that promotes success of both the USGS and its workforce.

- Ensure that external review of programs is used whenever possible to ensure scientific excellence and societal relevance.
- Ensure access to state-of-the-art instrumentation, libraries, data and information catalogs, physical facilities, laboratories, computers, and telecommunication facilities at all USGS locations.

- Explore and develop partnerships with other Federal and State agencies, nongovernmental organizations, academia, and private industry, to acquire and operate large instrument systems.
- Streamline preparation, review, and release of USGS products, while ensuring that these products continue to provide impartial information and meet the highest standards of scientific integrity.

A-3 Ensure that the USGS workforce will have the skills and expertise to meet the challenges of the Nation's earth science issues by the year 2005.

- Develop strategic staffing plans based on present and anticipated future skill needs.
- Provide continual educational opportunities for employees to meet new earth science challenges and opportunities.
- Renew the USGS's commitment to sharing technical and scientific expertise with colleagues through workshops, seminars, lectures, and in-house training.
- Increase the influx of new ideas and advanced research techniques by greater use of term appointments for students, contractors, and post-doctoral employees, and intergovernmental exchanges.

A-4 Recognize that both research and development are necessary and fundamental for a viable scientific organization.

- Focus internal research and development efforts to support the mission of the USGS.
- Ensure that the USGS is able to maintain sustained long-term, broad-scale research efforts.
- Establish a research rewards system that acknowledges not only excellence and productivity but relevance and cooperation.
- Encourage employee partnerships. Recognize and reward individuals who provide colleague review of technical products, conduct formal and informal training, act as mentors for other employees, and accept leadership roles to facilitate cooperation.

Advocacy

How aggressive can the USGS be in defining problems and providing solutions to societal issues before being perceived as crossing the line to advocating policy? At what point does a proactive stance on scientific grounds and issues risk being misinterpreted as support for a particular decision or group, or as an attempt to set policy?

To remain credible in the course of sometimes controversial investigations, the USGS and its employees must be impartial and unbiased. The Organic Act of 1879, which established the USGS, implicitly recognized the necessity of an unbiased stance, by prohibiting USGS employees from having any personal financial interests in areas surveyed and from undertaking surveys for private parties. Subsequently, several directors of the USGS have issued clear guidelines concerning the ethics and appropriate behavior of individuals with regard to their official duties. The guidelines that define the role of the USGS as a whole, in regard to advocacy, are less clear. If one considers the reputation of the institution as the collective result of actions of individual employees, then it is only necessary to define the role of the individual adequately, as a means of defining the role of the organization.

As the USGS becomes more involved in controversial societal issues, there is the possibility that a strong proactive position on, or in defense of, a scientific interpretation by an individual employee can lead to the perception of support for a specific policy or bias toward or against a particular organization. The perception of advocacy may be mitigated in part by reiterating that the USGS neither makes policy decisions nor advocates policies. On the other hand, the USGS has a responsibility to focus national attention and provide information on public policy issues for which earth science information is of critical importance. The USGS must do this without taking sides, except to insist that the appropriate scientific data are used in the resolution of the issue. While maintaining the USGS tradition of accepting scientific discussion and dissent, the USGS must continue to ensure scientific integrity through rigorous peer review.

B Maintain, protect, and uphold the USGS reputation for providing impartial scientific information.

B-1 Seek earth science issues of public importance and provide data that are relevant.

B-2 Recognize the tension between the rights of individuals and their responsibilities, as Federal employees, to protect the integrity of the USGS.

- Review and, if necessary, revise policies regarding conflict of interest, accountability, and ethics for individuals and for the organization as a whole.
- Establish an ethics training program targeted to USGS scientists and managers that emphasizes the essential role of nonadvocacy for the USGS.

B-3 Recognize that as the USGS becomes more involved in politically sensitive issues, there will be more controversy surrounding its participation and findings.

- Develop a protocol to assist employees in handling controversy.
- Provide training for employees who interact with the media and for those who testify as expert or factual witnesses.

B-4 Continually evaluate data, information protocols, and processes, to ensure that data quality is maintained.

Core Competency 2:

Relationships and Partnerships

Goal

Nurture relationships with USGS partners and be responsive to customers.

The USGS must cherish and nurture its relationships and partnerships by giving timely and responsive results to customers, and by reaching out to partners, with collegial respect. Public and private entities must form alliances to leverage resources, in order to help understand and solve societal problems that commonly have regional and sometimes global impacts. As budgetary pressures increase, the USGS will gather larger quantities of earth science data and information through and from partners.

The wide range of organizations that offer the potential for successful partnerships includes other Federal agencies, State and local government agencies, nonprofit organizations and administrative authorities, schools and universities, and the private sector. Working with the media offers unique opportunities for partnerships in presenting earth science information to the public. Individuals also can share their interests and skills with the USGS through the volunteer program.

The USGS of the future must improve and expand its relationships with customers through mutual education. The USGS has a responsibility to work with USGS customers to improve the practical value of earth science information, with particular attention to Congress as USGS's major customer and source of funding. The USGS must also educate itself with respect to USGS customers and their needs and level of satisfaction with USGS products. If USGS relationships and partnerships are healthy, USGS business activities will be healthy.

Strategic Actions

C2 A Improve USGS relationships with partners in both the public and private sectors.

C2 A-1 Deliver information to USGS customers promptly.

C2 A-2 Develop a common framework for relations with USGS partners that uses consistent funding mechanisms, guidelines, constraints, and objectives.

C2 A-3 Develop networks and expand partnerships.

- Seek innovative applications and greater use of earth science information with partners.

- Facilitate business relationships and exchange of earth science information with umbrella organizations, academia, and professional societies with large customer bases.
- Develop joint programs with the U.S. Department of the Interior land management agencies as well as other Federal, State, and local agencies.

A-4 Expand and strengthen USGS participation in Federal science policy-setting forums within the Department of the Interior, the Office of Management and Budget, the Office of Science and Technology Policy, and elsewhere.

A-5 Transfer technologies by teaching and training USGS partners and the public.

B Improve USGS relations with Congress.

B-1 Strengthen the role of the congressional liaison function. Use the USGS Congressional Liaison Office to establish lines of communication with the Congress, Congressional Research Service, Congressional Budget Office, and Government Accounting Office.

B-2 Arrange rotational staff assignments and technical briefings to assist Congress in addressing legislative issues involving earth science considerations.

B-3 Use the USGS State Representatives network to highlight the importance of earth science information in addressing issues in Congressional districts at the State level.

C Implement the Outreach Strategic Plan developed by the USGS Outreach Benchmark Committee.

C-1 Identify USGS customers and their needs and level of satisfaction with USGS products, using market analysis techniques.

C-2 Create opportunities to transfer and market USGS-developed technologies.

Mandates

Laws, regulations, executive orders, and policies prescribe what a Federal organization is required to do. These mandates are products of the political process, and they are usually directed at an organization because of the organization's core competencies and/or business activities. By their very nature, mandates define Federal functions. The most powerful and enduring are congressional mandates.

A review of USGS legislative authorizations shows that USGS mandates range from broad to extremely specific. As amended, the Organic Act of 1879, in broad terms, directs the USGS to classify public lands and examine the geologic structure, mineral resources, and products within and outside the National domain. The Land Remote Sensing Policy Act of 1992, a more narrowly focused mandate, assigns responsibility for the National Satellite Land Remote Sensing Data Archive to the Department of the Interior, through the USGS EROS Data Center, and also authorizes the DOI and others to carry out research and development programs in applications of these data.

An example of an extremely specific mandate is the National Geologic Mapping Act of 1992, which establishes within the USGS the National Cooperative Geologic Mapping Program, prescribes the composition and objectives of the program, and defines the program framework. Other focused mandates are OMB Circular A-16 (revised), which specifies Federal responsibilities for coordinating the Nation's surveying and mapping activities, and OMB Memorandum 92-01, which addresses coordination of water data.

Mandates can be beneficial or detrimental to an organization. They can contribute to organizational continuity and strength, provide a framework for the organization's mission, clarify its purpose, and establish either a well-defined niche or broad operational domain. Mandates can provide an underpinning that contributes to program stability; Congress, however, is free to change or eliminate them. On the other hand, outdated mandates can constrain an organization's activities and restrict its flexibility to change, by directing program resources into work that is no longer important or relevant. Similarly, mandates might help preserve a program of narrow political interest and limited value, while forcing programs of greater value to shrink.

C-3 Partner and network with other agencies, academia, and grassroots organizations to disseminate USGS information to citizens, public interest groups, and the media.

C-4 Inform and educate the media about the availability, extent, and types of USGS information, and package newsworthy USGS information in forms that facilitate ease of use by the media.

C-5 Train appropriate USGS employees to interact effectively with the media.

C-6 Create and showcase projects that incorporate USGS data and information, to demonstrate the relevance of the earth sciences.

C-7 Inform customers and potential customers about use of USGS data and information, with emphasis on multidisciplinary applications.

C-8 Ensure that outreach, communication, and partnering strategies emphasize a single corporate identity for the USGS.

D Define a USGS-wide role and policies for educational outreach that have specific and focused objectives.

D-1 Improve the quality and availability of earth science teaching materials through partnerships with teachers, the National Science Foundation, professional earth science societies, and publishers of educational materials.

D-2 Use innovative education approaches and methods that engage emeritus and volunteer staff, tap experts from the private sector, highlight high-profile "flagship" projects, and exploit the interactive capabilities offered by computer technology (such as the CD-ROM medium and the World Wide Web).

D-3 Develop and disseminate materials to be used by earth science professionals (USGS employees and others) when they are called on to participate in hands-on earth science educational activities.

Core Competency 3:

Multidisciplinary Workforce with National Presence

Goal

Bring diverse talent to earth science challenges of the future.

The USGS must bring diverse talents to the earth science challenges of the future. The required disciplines will vary according to society's needs, but the USGS must retain its capability to apply scientific understanding and information technology to earth science problems anywhere in the Nation. The USGS of today is a world leader in many fields related to geology, geography and cartography, biology, and hydrology. A presence in every state is a unique asset that enables the USGS to bring its national base of multidisciplinary talent to bear on important natural resource issues. It will be necessary for managers and project leaders across the country to know who has which skills and to be able to tap those skills when needed. The USGS must be increasingly flexible in USGS hiring and contractual practices, to take advantage of the full range of earth science, technology, and skills needed by USGS customers.

Employment in both the public and private sectors is evolving from the philosophy of "a job for life" toward the philosophy of "work for the life of the job." It is likely that the future USGS workforce will be a mix of permanent employees integrated with nonpermanent personnel on short-term work assignments, including student, post-doctoral, and contract employees. Some workforce skills will also be supplied through partnering with other organizations whose workforces possess skills outside the scope of the traditional USGS skills in the earth sciences. The USGS will use the scientist emeritus staff to help maintain continuity in major scientific studies and key long-term data bases, as well as to mentor newer employees. In addition, volunteers from the public will continue to gain work experience in the earth sciences and contribute to USGS programs through short-term, specific work assignments. To remain viable and successful, the USGS must be able to readily adjust the skills mix, size, and geographic distribution of the USGS workforce.

Strategic Actions

A Develop the potential and flexibility of USGS human resources.

A-1 Establish a USGS staffing plan to increase flexibility and aid workforce realignment when necessary.

- Anticipate future business activity needs and identify ways to access disciplines that are nontraditional to the USGS, such as human health, economics, and marketing.

- Develop mechanisms for increased use of contractor and nonpermanent government employees within the workforce in a manner that is mutually beneficial to both the employees and the USGS.
- Rotate job assignments with opportunities for job enrichment within the USGS and in the Federal, State, local, and private-sector communities.
- Increase use of flexible work schedules and telecommuting.
- Devise training plans that facilitate changes in the skills mix.

A-2 Develop excellence in the workforce.

- Investigate private sector models and work with other Federal agencies to develop new means of maintaining a high-performance workforce.
- Share human resources across organizational and geographic boundaries to improve employee understanding of USGS program diversity and to broaden employee experience and expertise.
- Establish a rewards system that acknowledges not only excellence and productivity but also cooperation and relevance of work to the mission of the USGS.
- Encourage employee partnerships. Recognize and reward individuals who provide colleague review of technical products, conduct formal and informal training, act as mentors to other employees, and accept leadership roles that facilitate cooperation.
- Require management training for all managers. Establish minimum thresholds for performance and reward excellence in management.
- Ensure that all employees understand their role as part of a public service agency.

Investments

Investing in core competencies cannot be optional. Important areas of investment for the USGS include programs, people, and technology.

A commitment to program investments dictates that the USGS develop programs beyond the time frame of the immediate activity. Examples include reasonable amounts of fundamental scientific research, development and maintenance of long-term field sites that meet the needs of several programs, conducting international work, and developing partnerships with organizations other than those with which the USGS traditionally has developed ties.

Investments in people should begin with a staffing plan for the USGS that addresses the diversity and distribution of expertise, the amount and type of new hiring, increased training and education opportunities, and the desirability of short-term assignments to other organizational units, government agencies, universities, or foreign posts.

The need for better-coordinated technology investment is highlighted by past practices that promulgated intra-organizational isolation and lack of communication. The USGS has a significant investment in small computing systems and applications, yet until recently has lacked an effective organization-wide electronic mail and data exchange system. The USGS needs to communicate and make full use of the newly developed working capital fund to pay for laboratory equipment that costs hundreds of thousands of dollars for a single item.

At present, the USGS does not approach investment problems and opportunities from an organization-wide perspective, and the USGS thereby misses opportunities to optimize USGS investments. A protocol is needed that takes into consideration the common needs and resources of larger segments of the USGS and other agencies. Improvements in investment policies will be realized only when management at all levels commits to a long-term investment strategy.

B Create a workforce that capitalizes on the strengths of cultural diversity.

B-1 Develop strategies to target staffing opportunities, training resources, and outreach programs that will strengthen cultural diversity in the USGS.

B-2 Provide programs that promote multicultural understanding and train managers to manage a diverse workforce.

C4

Core Competency 4:

Long-Term National Data Bases

Goal

Provide national leadership in maintaining earth science data and making them readily available.

The USGS must be the national leader in organizing and managing earth science data and information and making both available in useful forms. Although the USGS will continue to collect some of the data, it is more important that the USGS assume leadership in seeing that long-term measurements and descriptions of the Earth are properly documented, archived, and distributed to the public. The USGS must guide the quality of long-term, national data bases to ensure that their contents are reliable and accurate. The USGS must establish itself in this role by transforming USGS data and information into usable products that customers want and need. Neither academia nor private industry is likely to compete for the role as the Nation's earth science data manager, but they, along with other nongovernmental organizations and agencies at all levels of government, will contribute to these valuable data bases, as well as be primary users of the data contained within such data bases. The development of the National Spatial Data Infrastructure (NSDI) is one opportunity to provide leadership and work with other organizations to ensure that nationally consistent, long-term data are available to meet current and future challenges in the earth sciences.

The USGS must ensure that its data are well managed. Good management includes finding new uses for data and ensuring that the data can be integrated and interpreted to support new understandings of earth processes. Encoding these data into digital forms and making these digital data readily accessible via the Internet and the World Wide Web are key to ensuring that USGS data continue to contribute to the Nation's well-being. The USGS also has an important collaborative role in filtering and providing quality control for earth science data produced by other organizations.

Strategic Actions

C4 A Develop policies, programs, mandates, and a culture that recognize the USGS as the Nation's authoritative provider of earth science data and information.

C4 A-1 Acquire, store, maintain, upgrade, and distribute long-term regional, national, and global earth science data sets, including Earth-observing satellite images, digital cartographic data, and other types of geospatial data.

A-2 Develop and encourage use of nationally and internationally recognized standards for data and information management to ensure their use within the broader earth science community.

A-3 Improve the production, application, and management of digital earth science information products.

A-4 Lead in developing innovative uses of geospatial data and information in a broad range of earth science applications, from interpretive studies to educational materials to cartographic products.

A-5 Develop, implement, and operate advanced systems in data storage, information access, data processing, product generation, and product delivery.

A-6 Improve the availability of USGS data and information in digital form.

- Invest in data base management techniques and practices that focus on the processing and management of large data sets.
- Ensure access to and use of USGS data and information to all interested users.
- Expand the role of the USGS in establishing a clearinghouse for digital earth science data, and thereby increase accessibility to USGS and other earth science data.
- Facilitate the production and distribution of data and information with consistent and compatible USGS-wide facilities and procedures.
- Assemble and maintain a comprehensive digital library of earth science documents, maps, and data to be used for reproduction, distribution, printing on demand, or revision.

The National Spatial Data Infrastructure

Information about where an object or feature is or where an event takes place is an important factor in decision making in both the public and private sectors. Geospatial data, which identify the geographic locations 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 must often 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 needed data that are produced by others.

The National Spatial Data Infrastructure (NSDI) organizes and provides a structure of relationships between producers and users of spatial data that facilitates data sharing. Through 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. Some 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 accrues 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 on local, regional, national, and global scales, and it helps to increase the relevancy 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.

B Make data and information available to partners and the public as quickly as possible at the lowest possible cost, without compromising the reputation of the USGS for impartiality and credibility.

B-1 Establish USGS-wide standards for exploiting the full capabilities of the Internet, the World Wide Web, and other associated technologies.

B-2 Ensure the ability of the USGS to respond immediately to national disasters, national security concerns, and other urgent public needs with earth science data and information in the appropriate form.

B-3 Develop methods for real-time uses of data and information, by building on satellite and cellular technologies, to support the evolving techniques of nowcasting.

Core Competency 5:

Long-Term, Broad-Scale, Multidisciplinary Interpretive Studies

Goal

Excel in understanding the scientific principles of earth processes.

The USGS must excel in understanding the scientific principles of earth processes. The USGS is in a unique position to apply a nationally distributed, multidisciplinary workforce to long-term, broad-scale, multidisciplinary studies. The USGS must be unsurpassed in technical ability to assimilate and interpret scientific data and information from all appropriate sources to support scientific conclusions relevant to society's needs. While the USGS as an organization will continue to conduct some scientific studies of short duration, limited scale, or narrow disciplinary scope, there will be increasing emphasis on earth science work that is much broader in scope and perhaps beyond the capabilities of other organizations.

Strategic Actions

C5A Facilitate program integration and inter-divisional cooperation to undertake new avenues of investigation.

C5A-1 Pursue investigations that use USGS multidisciplinary strengths to study phenomena at multiple scales from laboratory to global and to integrate these findings to gain a comprehensive understanding of national earth science issues.

C5A-2 Develop a process of long-term program development whereby the USGS seeks input, develops plans, articulates those plans, and implements bold initiatives that may take several years to move from concept to reality.

C5A-3 Adopt a USGS-wide approach that encompasses innovation in assigning funds, personnel, technology, and support services, to take advantage of strategic opportunities, launch new initiatives, and accomplish short-term program priorities.

C5A-4 Promote geographic distribution of the workforce that will allow the USGS to conduct programs, respond to customer needs, and facilitate inter-divisional cooperation and cooperative activities.

part 3

Business Activities

The present and future scientific and technical efforts of the USGS are characterized as business activities. These activities were derived from the strategic planning process. The various programs and activities from the three science divisions were combined into 22 program groups, and these programs cluster into seven business activities. (See table 1.) Additional information about the programs may be found in the supporting documents to this plan. The business activities were not developed as a guide for organizational or budgetary structures, but to convey the breadth, integration, and flexibility in the description of programs in which the USGS must excel over the next decade.

The USGS must be able to mobilize its full strengths to address high-priority concerns within and across the array of business activities. The organization also must develop innovative paradigms for prompt USGS-wide response to emerging issues. Ensuring relevance to society's needs depends on the ability to develop and communicate program priorities that are recognized, understood, and supported across organizational boundaries. The USGS must avoid intra-organizational barriers that can lead to redundancies in staffing and large capital equipment expenditures.

The text below first describes program planning strategic actions, which apply to all business activities, regardless of type. Next, the following seven individual business activities are discussed:

- Water Availability and Quality
- Hazards
- Geographic and Cartographic Information
- Contaminated Environments
- Land and Water Use
- Nonrenewable Resources
- Environmental Effects on Human Health

USGS Programs FY1995	USGS Business Activities						
	Water Availability and Quality	Hazards	Geographic and Cartographic Information	Contaminated Environments	Land and Water Use	Nonrenewable Resources	Environmental Effects on Human Health
Astrogeology		■	■				
Cartographic and Geographic R&D		■	■		■		■
DOD Environmental Contamination				■			
DOE Yucca Mountain				■			
Ecosystems	■		■		■		
Energy Resource Surveys				■		■	
Federal-State Cooperative	■	■	■	■	■		
Geographic Data Coordination			■		■		
Geologic Framework and Processes		■	■	■	■	■	■
Geologic Hazards Surveys		■	■				
Global Change	■	■			■		
Ground-Water Systems	■	■			■		
Information Dissemination Services	■	■	■	■	■	■	■
International Geology		■		■		■	
Management of Remotely Sensed Data			■		■		
Map-Data Collection and Integration	■		■		■		
Marine and Coastal Surveys		■	■	■	■	■	■
Mineral Resource Surveys				■		■	
Mission to Planet Earth			■		■		
National Water Quality Assessment	■		■	■	■		■
Surface-Water Systems	■	■			■		
Toxic Substances Hydrology				■			■

Table 1

Integration of Current (FY 1995) USGS Programs with Business Activities

Shading denotes a significant relation between program and business activity. Order from left to right indicates relative size of business activities through 2005, with those on left being largest.

Program Planning

Goal

Mobilize the full strengths of the USGS to succeed in all business activities.

Strategic Actions

A Critically evaluate USGS programs and formal mandates to ensure scientific leadership and relevance to societal needs.

A-1 Review formal mandates yearly to determine how they can be modified to accommodate current programs or, conversely, how programs can be changed to accommodate mandates.

A-2 Implement an ongoing process to define and rank USGS program priorities that incorporates meaningful customer and employee input. Such a process will help the USGS determine how to change the mix of what the USGS does and when to start and end programs.

B Develop USGS-wide program implementation and funding priorities that are integrated across program lines at all organizational levels.

B-1 Communicate program priorities so they are clearly understood by all employees and managers.

B-2 Evaluate performance of managers on the basis of their support and implementation of overall USGS priorities.

B-3 Create common or complementary business practices designed to facilitate intra- and inter-organizational cooperation.

B-4 Communicate clearly the organizational values upon which operational goals, implementation strategies, and business practices are based.

B-5 Build organizational strategic plans that fully integrate with this strategic plan.

B-6 Improve the organization's ability to address relevant earth science issues through co-location of technical staff.

C Establish a USGS philosophy with respect to capital investments and support services that recognizes that investment strategies are a responsibility of management at all organizational levels.

C-1 Establish a planning process and coordinating mechanisms that help to avoid redundant investments and achieve economies of scale.

C-2 Optimize investments in technology and infrastructure through the use of standards and an effective coordination process.

C-3 Improve the balance, cost effectiveness, and seamlessness of support services.

C-4 Define and apply a common set of management performance measures to all organizational business processes.

BA1

Business Activity 1:

Water Availability and Quality

Water quantity is a Federal issue because water flows across jurisdictional boundaries, because of Federal water rights, and because the Federal government is the builder and manager of many water resource projects. Water quality is a Federal issue because the government invests in water quality improvements as well as the setting of standards and goals for water quality. Because the physical health of citizens is directly affected by water quality, there is a strong national need to share information that can be used to manage the national water infrastructure wisely. Investigations related to water availability and quality represent the largest business activity of the USGS and are likely to remain so over the next decade. Water will continue to grow in importance as an issue because the Nation faces increasing and often conflicting demands on a finite water supply—conjunctive use of water for industry, agriculture, municipal use, recreation, and fish and wildlife.

Success of USGS water investigations depends on and will continue to depend on the combination of three efforts: data collection, interpretive studies, and research. USGS water data have been crucial to designing the Nation's water resource infrastructure. USGS interpretive studies have helped water managers solve water quality and supply issues. USGS research has led to a broader understanding of hydrologic processes and also has developed methods and models that are widely used in water management. On the basis of these three efforts, the USGS is well positioned to assist in balancing competing water demands, and to assess the long-term effects of environmental regulations and other factors affecting water resources. There is a danger that this business activity could become unbalanced and, therefore, less successful, if too much emphasis is placed on any one of these three efforts at the expense of the others.

As population increases and relocates, the overall level of water monitoring will increase in areas of high urban and agricultural water use, but it may decrease in other areas. Despite local increases in demand, shrinking fiscal resources will make it difficult for the USGS to maintain water data-collection networks at current levels, unless advancing technology substantially decreases the costs of routine monitoring and data collection. An overriding concern with respect to water information is that timely data are becoming critical, because water data are increasingly used for real-time resource management.

Traditionally, the USGS has relied on its own human resources for the collection of water data. In the future, however, the USGS may not be the sole collector of these data and should be prepared to assist others in this endeavor. USGS water data bases could be greatly expanded if the USGS assimilates data from other sources. As a result, USGS ability to maintain long-term national data bases could be enhanced and strengthened. Increased partnering is also motivated by universities and the private sector becoming more involved in water studies, while USGS hydrologic research activities are increasingly difficult to fund.

Strategic Actions

BAI A Encourage other organizations to collect data to USGS standards, with the purpose of substantially supplementing USGS-maintained data bases.

BAI A-1 Further develop a clearinghouse function to ensure the accessibility of uniformly collected water data.

BAI A-2 Design and build data bases that will readily accept quality-assured water data from external sources, and make the data accessible through the Internet and the World Wide Web.

BAI A-3 Develop mechanisms to promote USGS data collection methods as the national and international standard.

BAI A-4 Improve the technical capabilities of the public and private sectors.

- Encourage use of technological developments that reduce the unit cost of water data collection.
- Develop technologies and field methods that can be widely applied to water issues.
- Transfer technologies by teaching and training partners and the public.
- Create opportunities to transfer and market USGS-developed technologies.

BAI A-5 Develop models that extrapolate meaningful information from the smaller data sets that result from a reduction in the number of collection sites.

B To reduce potential for conflict with the private sector, focus data collection and interpretive studies in areas where the Federal role is clearly defined.

B-1 Pursue investigations that use USGS strengths to study phenomena at multiple scales—from laboratory to global—and integrate these findings to gain a comprehensive understanding of national water issues.

B-2 Continue identifying and studying long-term, interdisciplinary problems related to water availability and quality.

B-3 Contribute to the resolution of inter-jurisdictional disputes.

B-4 Generate reports and information that pertain to national issues.

C Support a sustained, well-integrated, long-term water research effort.

C-1 Anticipate and be proactive on emerging national water-related issues.

C-2 Develop and transfer new methods and technologies throughout the USGS, other government agencies, and the private sector.

C-3 Incorporate geologic expertise into investigations of water quality and availability.

BA2

Business Activity 2:

Hazards

The study of hazards is an area in which the USGS will grow in the coming decade. An essential role of the Federal government is to minimize loss of life and property that result from natural disasters such as earthquakes, volcanic eruptions, landslides, floods, and droughts. The concentration of population in urban and coastal areas increases the risk of catastrophic loss from natural hazards. In addition, the advent of the global economy increases the risk that foreign disasters will disturb the domestic economy and affect foreign policy.

Hazards-planning and disaster-response organizations require timely notification of hazardous events and information to mitigate loss from natural disasters. Improvements in monitoring networks coupled with scientifically credible interpretive studies and research into earth processes will provide the information needed by decisionmakers during crises. Advances in technologies such as real-time data analyses and cellular and satellite communications offer the opportunity to provide these services more efficiently and effectively.

Strategic Actions

BA2 A Lead the planning and development of domestic monitoring and real-time warning networks, in cooperation with State and local governments, the private sector, and universities.

BA2 A-1 Organize interpretive studies to plan a responsive monitoring network.

BA2 A-2 Target products, services, and demonstration projects to public- and private-sector organizations responsible for minimizing losses.

BA2 A-3 Develop new technologies to monitor and respond to hazards. These technologies should include new methods to communicate warnings and real-time interpretations of events and provide data bases and data streams to all interested users.

BA2 A-4 Emphasize outreach activities that educate the public about the importance of monitoring and interpretive studies as a means of evaluating natural processes that lead to rapid-onset events such as earthquakes, volcanic eruptions, landslides, and floods.

B Develop new techniques of quantitative, probabilistic risk assessment for a variety of natural hazards to meet the growing needs of decisionmakers.

B-1 Develop models of events to predict and minimize losses caused by natural hazards.

B-2 Develop digital multihazard GIS maps of the major urban areas of the United States that can continually be updated as new information becomes available.

B-3 Expand partnerships with other governmental agencies and the insurance industry to conduct interpretive studies that support the development of public policy regarding risk management. Such studies would concentrate on identifying the areas of risk and quantifying the hazards associated with each area.

B-4 Improve understanding of earth processes to enhance the design of monitoring networks, improve the interpretations and explanations of potential hazards, and better forecast risks and damage.

C Target services and hazards research in geographic areas where the largest losses of life and property and disruptions of economic activity are likely.

C-1 Leverage Federal funds with those of State and local agencies, academia, and the private sector through partnerships and cooperative agreements.

C-2 Improve linkages with the existing network of policy, planning, and response organizations that are essential to improved effectiveness of USGS hazards studies.

C-3 Monitor the Nation's expenditures in response to natural disasters and identify the benefits derived from the work of the USGS; use this information to refocus program efforts.

C-4 Pursue international work on hazards and target opportunities that would have the largest impact on the domestic economy and foreign policy or would contribute significantly to understanding domestic hazards.

BA3

Business Activity 3:

Geographic and Cartographic Information

Coordination and collection of geographic and cartographic information will remain a fundamental Federal role and a viable program of the USGS. Knowledge of the location of and relations among natural and manmade features at and beneath the Earth's surface provides a framework for analyzing and understanding earth processes, and for making wise decisions. Public- and private-sector organizations depend on this information as the basis for wise economic and physical development, management of resources, response to and mitigation of hazards, and many other uses. The USGS has traditionally been a major supplier of this information not only to its internal operations, but to other public- and private-sector organizations as well.

Technology is causing a transition from traditional data collection and integration processes to digital processes, and thereby improving quality and efficiency as USGS products are redefined. The proliferation of digital capabilities also increases the availability of geographic information from other public and private entities. This increasing volume of data drives the need for new technology and data applications and for increased coordination and outreach.

Advancing technical capabilities such as global positioning, remote-sensing satellites and GIS are revolutionizing the ability to determine precise geographic positions and to identify geospatial features. These capabilities are challenging assumptions about the means and types of data that should be collected. The Internet also offers coordination and outreach opportunities for the USGS to leverage resources and become a leader in a collaborative, devolved effort to create and maintain geographic and cartographic data.

Strategic Actions

BA3A Expand and redefine the USGS role from principal producer of primary geographic and cartographic data to collaborator with primary responsibility for coordination, setting of data standards, long-term storage and management of data, and development of interpretive methods, both nationally and internationally.

BA3A-1 Establish a collaborative approach to meeting needs for geographic data bases.

- Encourage and participate in regional groupings of other Federal, State, and local government organizations, the private sector, and others, to identify needs for data and develop cooperative strategies for meeting those needs.

- Encourage USGS participation in a distributed, electronic clearinghouse through which the user community can share information on data availability and needs.

BAS A-2 Encourage development of technical capabilities and standards that are needed for a collaborative approach to succeed.

- Ensure that techniques used for the distributed, electronic clearinghouse stay current with advances in electronic communications.
- Work closely with the private sector and with other organizations to ensure that these developments are widely available within the user community.
- Sponsor or encourage the development of needed standards.

BAS A-3 Establish standards for digital geologic maps, and develop and operate a viable national geologic map data base.

BAS B Accelerate change from traditional product lines (typically paper maps and reports, but including older digital product lines) to new digital geospatial product lines that respond to changing customer needs.

BAS B-1 Develop new techniques and products to meet customer demand for data, information, and applications predicated on use of the Internet, the World Wide Web, and other evolving technologies.

BAS B-2 Accelerate the evolution of USGS data collection and maintenance capabilities to address customers' changing expectations.

- Use data collection approaches that minimize the time needed to develop and deliver data.
- Balance the needs for production efficiencies with customers' perceptions of valuable products and services, when designing data development strategies.
- Respond to customer requirements for different data content, forms, and delivery schedules.

BA3C Develop new approaches to integrating geospatial data into a wide range of earth science models and applications.

BA3C-1 Implement partnerships with other Federal agencies, commercial operators, and foreign governments for accessing, archiving, and making available new types of remotely-sensed satellite data.

BA3C-2 Develop a geographic research and development program focused on interpretation and application of geospatial data.

BA3C-3 Develop advanced geospatial data handling and analysis techniques such as the inclusion of three-dimensional geologic information in complex, integrated earth science data bases.

BA3C-4 Develop data models that allow geographic data to be used in more efficient, effective ways.

BA4

Business Activity 4:

Contaminated Environments

Nuclear waste disposal, hazardous toxic substances entering the Nation's water supply and the food chain, and atmospheric transport and deposition of toxic materials are serious threats to the human and environmental health of the United States. Society must deal with the legacy of contaminated sites, accidents involving hazardous substances, and increasing quantities of toxic waste. Locally, toxic substances can pose a significant risk to public health and the environment.

Some hazardous and toxic substances are anthropogenic, whereas others are occurring naturally. Contaminated environments are not entirely a domestic concern; development along the United States-Mexico border threatens water supplies and public health on both sides of the border, Russian nuclear waste in the Arctic Ocean potentially threatens U.S. territory, and atmospheric movement of persistent organic chemicals is global in extent.

Several current USGS programs focus on contaminated environments both on land and in the oceans, with some of this work supported by outside funding. Most of the work funded by outside sources is narrowly focused on specific sites. However, the USGS has a unique capability for the long-term, multidisciplinary study of contaminated environments. This capability enables the USGS to take a broader view of contamination problems, build an understanding of how

contaminants move through the natural environment, identify potentially sensitive environments, and help to assess the effectiveness of various environmental regulations. The emphasis of this activity will increasingly be on projects that integrate disciplines and/or allow work on larger geographic areas. This activity currently represents one of the larger business activities of the USGS and seems to have considerable growth potential.

Strategic Actions

BA4 A Take a broader view of contamination problems by choosing new projects that integrate disciplines and allow for integrated approaches across multiple scales of investigation.

BA4 A-1 Focus USGS efforts on scientific activities that develop and test new techniques for remediation. Avoid projects involving routine remediation.

BA4 A-2 Develop techniques that can be used to predict the consequences and evaluate the effectiveness of remediation actions.

BA4 A-3 Improve USGS expertise in surficial geology and other disciplines that are germane to addressing contaminated environments.

BA4 A-4 Participate with other agencies in the evaluation of policies and technologies related to decisions about hazardous waste.

BA4 A-5 Strengthen USGS capability to advise the Nation on environmental impacts of contaminated environments such as abandoned mine sites and nuclear-waste repositories.

Living Resources

America's abundant living resources provide a significant foundation for the wealth of the Nation and the well-being of its citizens. Nonetheless, human pursuit of an improved quality of life has produced unintended threats to ecological systems and living resources. The health, prosperity, and overall quality of life enjoyed by current and future generations depend on careful stewardship of these ecological systems and living resources.

Problems resulting from habitat loss and fragmentation, land-use change, environmental contaminants, and the invasion of non-indigenous species, among other relatively rapid changes to the global geobiosphere, are arising with increasing frequency. It is clear that the information needed to address these problems so as to enhance and protect the quality of life depends on understanding interactions of biological processes with hydrologic, geochemical, and geologic processes. As recognition of the multidisciplinary nature of science problems has grown, so has recognition that earth science studies are incomplete without a biological component.

The congressionally mandated consolidation of the former National Biological Service (NBS) with the USGS offers a strategic opportunity to develop a more comprehensive understanding of the Earth's life-sustaining physical and biological systems, and to generate and disseminate knowledge and information needed by many Federal, State and private land and natural resource managers. The resulting merger means that the new USGS will be well positioned to be the lead agency in providing the high-quality, unbiased data needed to manage fish and wildlife resources, conserve native biodiversity, maintain the integrity of natural ecosystems, and determine the environmental effects of natural systems as well as human activities at local, regional, and national levels.

BA5

Business Activity 5:
Land and Water Use

Sound stewardship of the Nation's land and water resources requires up-to-date synoptic data on how land and water resources are being used, as well as an understanding of how possible changes in use might impact the national economy, the environment, and the quality of life for people. The USGS needs to find new ways to translate this information into forms that will be used by makers of public policy, the business community, and individuals. The USGS is uniquely qualified to undertake this activity, because of its mix of scientific and technical skills and its capabilities to design and manage large geospatial investigations and data bases, and because the organization is perceived as impartial and unbiased.

Earth science information required to make decisions about the availability and use of natural resources, including land, is inherently multidisciplinary. The USGS has extensive experience incorporating a multidisciplinary approach to decision making about resource availability. For example, to aid land resource planners and decision-makers in the Powder River Basin, USGS combined coal resource information with knowledge about the surrounding geology, hydrology, and land use to provide guidance about coal availability and cost of extraction. Other examples include USGS involvement in the debate over resource development in the Arctic National Wildlife Refuge (ANWR), in delineating the effects of the 1993 Mississippi River floods, and in ecosystem studies in the Florida Everglades and the San Francisco Bay Area.

This business activity is a growth area for the USGS over the next decade, but this growth will require careful definition of the appropriate Federal role and will be conducted largely through partnerships with other organizations. There is a recognized Federal role when large tracts of Federal lands or national policy are involved, as in the case of the Alaska pipeline, ANWR, the Florida Everglades, or reconstruction after the Mississippi River floods. A Federal role may also be appropriate in partnerships with multiple states for planning land and water use in areas such as the lower Missouri River corridor, the Ohio River corridor, or in developing suburban areas such as the Northeast corridor. Finally, a Federal role may be evident in developing areas that involve Federal or tribal lands, multiple Federal installations, or where specific chronic earth science problems exist, such as swelling soils and subsidence owing to ground-water withdrawal or melting permafrost.

International Role of the USGS

The USGS has traditionally been concerned with determining how earth processes affect the United States. But natural earth processes and many human activities have effects that transcend political boundaries. Earthquakes, volcanic eruptions, and water, mineral and energy resources are manifested differently in various geologic and hydrologic environments around the world. Knowledge and understanding of earth processes and their effects are vastly enhanced by comparative studies of similar processes or features worldwide. Studying climate change, assessing hazards, and characterizing rapidly changing landscapes are areas of ongoing responsibility for the USGS that relate directly to dynamic global processes. And maintaining earth science expertise within the USGS depends on a global perspective.

The USGS is often requested to supply timely earth science information in support of peace treaty negotiations, military actions, and foreign policy. Examples of these activities include developing water resource data bases in support of the Middle East peace process, seismic monitoring of nuclear testing, and monitoring changes in land and vegetative cover in Africa. Applying advanced data and information systems to address problems of food availability, populations at risk, and ecological disasters can affect U.S. foreign policies. USGS data and information have also contributed to protecting lives and property. For instance, when the USGS predicted the eruption of Mt. Pinatubo in the Philippines, the Department of Defense was spared a loss of approximately 300 million dollars because of the safe evacuation of personnel and removal of equipment from Clark Air Force Base. Other Federal agencies (such as the Department of State) and other organizations worldwide (such as the United Nations and foreign governments) look to the USGS for scientific and technical leadership.

The USGS can help U.S.-based industries either through partnerships or by providing essential data and information so that responsible decisions on development issues can be made by funding organizations such as the World Bank and private investors. The USGS will continue to maintain and develop an international role as a strategic part of its mission responsibilities, while recognizing that unanticipated national and international events will no doubt play a role in these determinations.

Strategic Actions

B45 A Integrate land and water information with other earth science data to support land management and policy decisions.

B45 A-1 Build a USGS-wide infrastructure that allows the design, creation, and maintenance of regional and national data bases.

B45 A-2 Form interdisciplinary teams to carry out demonstration studies in areas of rapid urban growth with critical land- and/or water-use problems, or regional studies such as ecosystems projects.

B45 A-3 Build standardized land-use and land-cover data sets suitable for a broad cross-section of users.

B45 A-4 Create customized products that can be tailored to meet each customer's unique information needs.

B46

Business Activity 6: Nonrenewable Resources

Investigations of nonrenewable resources will undergo fundamental changes during the coming decade, and such investigations will likely decrease as a percentage of the total USGS effort. Studies of metallic minerals and fossil fuels have been at the core of the USGS's activities for more than a century. Increasing dependence on international sources for many mineral and energy commodities signals a shift from exploration for domestic reserves to identifying and characterizing conventional and unconventional sources throughout the world. Successful national economic policy now depends on knowledge beyond that of locations and quantities of these resources. Knowledge also is necessary about economic, social, and environmental costs; quality; and availability of these resources, especially as potentially influenced by shifting political situations and technological innovations.

The focus of domestic studies will be on completing undiscovered resource assessments, both onshore and in the Exclusive Economic Zone (EEZ), and on identification and mitigation of potential problems caused by resource extraction on Federal lands. Important strategic opportunities also include such nontraditional areas as non-metallic minerals and aggregate, in-situ mining and its environmental impacts, and in mined land remediation and associated resource recovery. Finally, continued development and refinement of genetic models based on domestic and foreign occurrences will remain an essential part of the nonrenewable resource activity.

Strategic Actions

BAG A Support land management agencies and policymakers, with energy and resource assessments, and provide regulators and industry with an understanding of the environmental impacts of resource extraction.

BAG A-1 Increase studies done through partnerships with academia and the private sector.

BAG A-2 Develop information about availability and supply of aggregate and nonmetallic minerals to support the Nation's needs as population centers expand.

BAG A-3 Provide scientific information to support the development of innovative industrial technologies for extraction and use of resources.

BAG B Develop information about the global availability of undiscovered energy and mineral resources to support the needs of policymakers concerned with the economy and national security.

BAG B-1 Monitor and assess trends in worldwide energy and mineral resource development activities and their environmental effects.

BAG B-2 Characterize trends in global supply and demand of nonrenewable resources.

BAG B-3 Assess new and unconventional sources of nonrenewable resources.

BAG B-4 Facilitate the development of global data bases and methods of assessing resources worldwide.

BA7

Business Activity 7:

Environmental Effects on Human Health

This is a potential new business activity that would draw on the USGS's multidisciplinary expertise. Earth scientists have not traditionally played a substantial role in addressing human health issues. An increasing proportion of the Federal budget, however, is dedicated to health issues, and many chronic health issues may relate directly to earth processes and the environment. As the Nation's earth science agency, the USGS can play a significant role in understanding environmental contributions to diseases. If the USGS assumes such a role, managers will need to define an appropriate niche, relative to traditional health and environmental agencies, and form strong partnerships to collaborate on problem solving.

Work by the USGS has already contributed to understanding the effects of radon, asbestos, selenium, chromium, and uranium on human health. Ongoing research on bacterial and virus transport in ground water and bioaccumulation of metals such as arsenic, mercury, and lead also address public health issues. The USGS has considerable experience in conducting studies on the occurrence and distribution of natural and manmade organic chemicals that can affect human health. Human exposure to potentially toxic chemicals through plants and animals in the food chain is another area of concern in which the USGS can lend its expertise. Water quality remains an important concern in health and medicine, and the USGS already has a significant role in helping others determine the best methods for monitoring drinking-water quality.

In the field of disaster epidemiology, earth science information is important to understanding the movement of waterborne and airborne pathogens that proliferate following some floods, earthquakes, and disruptions of water supplies. USGS scientists also have in-depth knowledge about volcanic ash, and this knowledge is important to public health officials as they investigate the consequences of inhaling volcanic ash as well as volcanic gases and aerosols.

Strategic Actions

BA7 A Commit resources to pursue development of opportunities related to human health.

BA7 A-1 Review and document the occurrences and effects on human health from low levels of naturally occurring substances (for example, radon, arsenic, mercury and selenium) and manmade organic compounds. Focus on low-level chronic problems, not high-level toxic contamination.

Balance Between Appropriated and Reimbursable Funding

The present economic and political climate makes it unlikely that congressional funds appropriated to the USGS (appropriated funds) will dramatically increase in the near future. To remain viable and respond properly to the needs of society, it appears that the USGS will continue to seek funds from other agencies (reimbursable funds).

How aggressively should the USGS pursue these reimbursable funds, what constraints should be placed on accepting them, and what should be the proper balance of appropriated and reimbursable funds?

Reimbursable funds can allow the USGS to grow, to build partnerships, and to be more responsive to customers' needs. Such funds can help the USGS increase its organizational capabilities by providing opportunities and experiences for staff and by allowing the purchase of additional equipment and other resources. By their very nature, reimbursable funds help the USGS build partnerships and facilitate the use of standard methods.

However, accepting reimbursable funds can also lead to disruptions of strategic programming, create overcommitments of government staff, contractors, and other resources; increase stress on resources in other parts of the program; and perhaps drive the creation of an inappropriate staff mix. These factors could diminish the focus on the USGS core competencies.

The USGS must monitor both the balance between appropriated and reimbursable funds and the activities that the USGS agrees to complete. The obligation should generally be central to the USGS mission, be tied to existing USGS programs, be long term, and be of mutual benefit and interest. Results derived from reimbursable work should be nonproprietary. The agreements must be firmly established and be legally, technically, and administratively sound. The size and permanence of the workforce (both government and contract) engaged in such activities should be carefully considered.

BA7 A-2 Assess which existing USGS activities could be organized into a more coherent approach to human health issues.

BA7 A-3 Develop and promote partnerships with public health agencies, universities, and nongovernmental organizations, to investigate potential links between the USGS and the health field.

BA7 A-4 Support the U.S. Agency for International Development, in assessing and monitoring populations at risk.

BA7 A-5 Develop products targeted for use by the health community.

Next Steps

To be a stronger, more responsive, and more relevant organization in 2005, the USGS must do two things. First, the organization must strengthen the core competencies that have brought it successfully to this point in time. Second, the USGS must undertake some necessary changes in scientific and technical efforts to improve efficiency, strengthen partnerships, and respond to changing national needs. The USGS must mobilize the full strength of the organization to succeed in the seven business activities enumerated in this plan.

Although the steps taken by the Strategic Planning Team and the Policy Council represent a significant investment of time and effort, this plan only marks the beginning of strategic planning that will take the USGS into the next century. This plan will be used to guide the future direction of the USGS and management of its programs and resources. The goals and strategic actions presented set a positive direction within the context of current budget uncertainties and programmatic change. Managers within the organization are considering how, when, and where to implement the strategic actions. A necessary element in this process is formulating an implementation plan and performance measures—signposts that evaluate the effectiveness of implementation. In the final analysis, we must all remember that planning is as important as the plan itself and that each employee has a role to play in making this plan a reality.

Glossary

Core competencies
Key skills, characteristics, and assets that an organization must possess to excel in its activities.

Devolution
Process whereby functions performed by the Federal government are turned over to States, local governments, or the private sector.

Geographic and cartographic information
Information that has specific geographic coordinates and is displayed in map form.

Geospatial
Refers to the geographic location and characteristics of natural or constructed features and boundaries on the Earth.

Opportunities and threats analysis
An integral part of strategic planning that examines either external conditions that pose an opportunity for further work or conditions that threaten the continuation of existing work.

Partnership
Formal, collaborative working relations with other government, academic, or private industry entities.

Risk assessment
An analysis combining economic, scientific, and socially ethical considerations surrounding a proposed action.

Relationship
Informal agreement involving the exchange of ideas and information with colleagues outside the USGS.

Scenario
Alternative future environment in which decisions made by organizations today might play out. Any scenario is designed to highlight the risks and opportunities associated with specific strategic issues.

Scenario building
Process of developing several plausible views of the future.

Strengths and weaknesses analysis
An internal and external survey of the functional capabilities of an organization.

Workforce
Refers to everyone working for the USGS, including Federal employees, nonpermanent employees, contractors, postdoctoral employees, emeritus employees, and volunteers.

Selected Sources for Information and Publications

USGS Home Page http://www.usgs.gov

Technical information and interconnected educational pages explaining the science behind the many programs that encompass the USGS mission.

Earth Science Information Center 1-800-USA-MAPS

Map, book, digital data, and aerial photography products and information.

EARTHFAX 703-648-4888

Menu-driven, 24-hour fax-on-demand service that provides USGS news releases and current information on activities and projects and on a range of water, mapping, and geologic products.

U.S. Geological Survey

Earth Science in the Public Service