Moving Forward: A 2010-2015 Strategic Plan for USGS EROS

January 12, 2010

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

Moving Forward: A 2010-2015 Strategic Plan for USGS EROS
January 12, 2010

Table of Contents

Preface

Strategic planning is an organization's process of defining its strategy, or direction, and making decisions on allocating its resources to pursue this strategy, including its capital and people. Simply put, strategic planning determines where an organization is going over the coming years and how it is going to get there. And importantly, through strategic planning, we must align ourselves with the needs of the community we serve.

With all the changes, challenges, and opportunities that EROS is facing, it became evident that we needed to modernize our strategic plan. The first step was to revive the strategic planning process. We formulated a strategic planning team of individuals from throughout EROS that represented the breadth of EROS activity and a perspective that would recognize the overwhelming capability of our staff and the potential for the future.

From the beginning it was paramount that we engage as many people as possible in the planning process. We consulted key leaders in the USGS Geography Discipline at the Headquarters and Regional level and throughout the USGS. We sought input from key stakeholders from other Federal agencies, from academia, and from international cooperators. We also sought advice and ideas from the staff at EROS. In addition, we reviewed key USGS and Geography Discipline strategic plans and annual guidance documents.

The response from everyone was overwhelming. First, I would like to express thanks to everyone on the staff at EROS who provided thoughts and ideas on the present and future of EROS. A summary of the input from the EROS staff is summarized in Appendix A. It comes as no surprise that the ideas for innovation and creativity and the commitment to excellence came so effortlessly from our staff. Second, it is evident that our leaders in the Geography Discipline and throughout the USGS recognize EROS as a remote sensing center of excellence and a critical component in the future of the USGS. Finally, our stakeholders confirmed their respect for our commitment to excellence and the vital role we play in their success.

Strategic planning is a very important activity for organizations focused on the future and the commitment to mission. Throughout the EROS Strategic Plan you will see this commitment to the future and a roadmap of ways to achieve our goals.

The future of EROS is in the hands and minds of our leaders, managers, administrators, engineers, scientists, and technicians. The mission is the foundation and the plan is the roadmap.

Jeffery C. Eidenshink, PhD Acting Director, U.S. Geological Survey Earth Resources Observations and Science (EROS) Center, August 7, 2009.

Introduction

Driving the Future of EROS

The Earth Resources Observation and Science (EROS) Center is a U.S. Geological Survey (USGS) facility with a national and international mission. As part of the USGS Geography Discipline, EROS contributes to the Land Remote Sensing (LRS), Geographic Analysis and Monitoring (GAM), and National Geospatial Programs (NGP). EROS plays a key role in the Geography Discipline's goal to "advance geographic science by improving and expanding Earth observation in order to understand coupled human-environmental systems in the face of land change." (McMahan et al., 2005)

The EROS mission is shaped by science and implemented through the integration of science, engineering, and strong program and project management. Our mission is to:

> **Contribute to the understanding of a changing Earth through research to operations activities that include developing, implementing, and operating remote sensing based terrestrial monitoring capabilities needed to address science and applications objectives at all levels – within the USGS, across the Federal government, and around the world. The EROS multidisciplinary staff uses their unique expertise in remote sensing-based science and technologies to carry out basic and applied research, data acquisition, systems engineering, information access and management, and archive preservation to address the Nation's most critical needs.**

Of particular note is the role of EROS as the primary provider of Landsat data, the longest comprehensive global land record ever collected. As a result, EROS has a responsibility to contribute to both national initiatives, such as the U.S. Global Change Research Program, and international initiatives that focus on improving global land monitoring and assessment, such as the Committee on Earth Observing Satellites and the Group on Earth Observations.

The mission of EROS must continually evolve to meet the changing needs of the USGS, the Department of the Interior (DOI), and the Nation, as well as our international constituents. The recent USGS science strategy, – Facing Tomorrow's Challenges: USGS Science in the Decade 2007-2017 (USGS, 2007), identifies a series of science thrusts dealing with climate variability and change, ecosystems change, energy, hazards, water, and environment and wildlife in human health. Earth observation is essential for understanding these complex issues, and EROS must contribute the data, products, services, and science needed to understand the interconnected issues associated with these thrusts.

In addition to serving USGS science objectives, EROS also supports Federal and international operational activities including agricultural monitoring, environmental assessment, emergency response, hazards monitoring, and natural resources management.

Operational uses of remote sensing will grow in scope and rigor, and EROS must be prepared to meet the evolving requirements. As a USGS Geography national capability, EROS must be prepared to meet the needs of an expanding user base that is increasingly diverse, has local to global requirements, and has a huge appetite for "GIS-ready" geospatial data that can be applied to the most complex issues of our times.

In August 2007, the Future of Land Imaging Interagency Working Group, on behalf of the Office of Science and Technology Policy, called for a U.S. commitment to the continued collection of moderate resolution imagery (Landsat), the establishment of a core operational moderate resolution land imagery program, and the establishment of a National Land Imaging Program (NLIP) within the DOI (FLIWG, 2007). See Appendix B for a list of study recommendations. While the formal authorization of NLIP is pending, the need for the program recommended by the Future of Land Imaging Interagency Working Group is great – and its impact on the future of EROS could be profound.

Therefore, the mission of EROS, stated previously, must include a strong commitment to national land imaging. ***By embracing the national land imaging concept, EROS reaffirms its role as a premier USGS remote sensing center.*** Working with USGS Geography leadership and the network of USGS Geography Science Centers, EROS will address the following goals:

- **Understand the Nation's remote sensing requirements.**

- **Expand our multi-mission capabilities so that we can address those requirements.**

- **Develop a terrestrial monitoring system that provides the data, services, and assessments needed to understand and manage environmental change.**

- **Maintain a strong remote sensing-based science, applications, and development program that addresses the Nation's most pressing needs.**

These four goals are intertwined and coupled to the EROS mission of advancing the national land imaging concept. The following section elaborates on the key priorities associated with this mission and four goals.

EROS Mission Goals

The commitment to embrace the national land imaging concept essentially means that EROS must continue to improve and diversify its role as a national and international remote sensing center. The EROS mission will be framed by interrelated activities that are based on user requirements, energized by science, and supported by a strong and efficient multi-mission capability. Terrestrial monitoring capabilities shift the EROS mission paradigm proactively from being data intensive to providing information products and scientific assessments and knowledge needed for understanding environmental change and managing natural resources. While many of the functions associated with the national land imaging concept already exist, the four interrelated goals represent the long-term foundation that enables this transformation.

Understanding the Nation's Remote Sensing Requirements

An ongoing assessment of user requirements is necessary to effectively focus, plan, and improve EROS science priorities and operational capabilities associated with data access, processing, and distribution of remotely sensed land data. The key to understanding the Nation's remote sensing requirements is to continuously capture and analyze information in order to (1) better understand the current and emerging needs of the land imaging user community, including their associated data and product expectations, and (2) stay abreast of emerging science and technology drivers needed to effectively address the full spectrum of remote sensing requirements, from research to operations.

To accomplish this objective, EROS staff, in close collaboration with USGS Geography Headquarters staff, must assume custodianship of user requirements collection, documentation, and reporting. In order to be successful, requirements gathering must become the responsibility of all EROS staff, i.e., an institutionalized commitment to capture and evaluate requirements.

The building blocks for understanding the Nation's remote sensing requirements are to:

> **Define EROS requirements gathering responsibilities and processes** through dialog with USGS Geography.
>
> **Collect and analyze user remote sensing requirements** of the land imaging community and translate requirements into capabilities for operational land imaging systems.
>
> **Periodically assess the relevance of requirements** and to evaluate emerging requirements.

Effectiveness in addressing this objective is of paramount importance since EROS programs and functions must be founded on meeting user needs. Understanding the Nation's remote sensing requirements will solidify an integrated research to operations approach by focusing EROS research and development on the most urgent and important

problems, will drive EROS multi-mission priorities and capabilities, and will provide needed focus to the Center's terrestrial monitoring system.

Expanding Our Multi-Mission Capabilities

Tomorrow's problems require multi-source solutions, so we must grow beyond our current Landsat-centric approach to land remote sensing. Multi-mission capabilities must be developed, enhanced, and supported in response to the Nation's requirements for land observation data and in response to the USGS Geography goal of developing a terrestrial monitoring system. Multi-mission capabilities need to encompass flight operations, data acquisition, archive, processing, product generation information distribution, and user support functions. Multi-mission data will consist of measurements acquired by space and aerial platforms or *in-situ* observational networks. With a clear understanding and prioritization of requirements, we must then intelligently and cost-effectively develop and implement the necessary functional capabilities.

Landsat data alone, however, will not be sufficient to satisfy the evolving requirements of the land remote sensing user community, because their needs are for data acquired at variable spatial resolutions, spectral and radiometric characteristics, and temporal frequency. The fusion of data collected by high spatial resolution and wide-field optical sensors, radar, and lidar offers challenges and opportunities to improve the types and quality of land information products that we provide to our user community.

The building blocks for the multi-mission goal are to:

Continue the Landsat legacy. Sustainment and continuation of the Landsat missions lie at the core of multi-mission capabilities because these data provide the longest continuous and calibrated measurements of the Earth's terrestrial environments.

Pursue mission opportunities that offer measurements for generating higher level science products. We must understand the land science and application communities' requirements in order to determine the appropriate measurements, instruments, and observational platforms or networks to engage and use.

Implement a flexible and open architecture. We must continue to implement a flexible and open architecture of ground system(s) and information technology that can accommodate a wide range of potential platforms, requirements, customers, and user communities. The architecture must be open, modular, extensible, and scalable in response to evolving requirements.

We must understand and document the relationship of science and applications requirements, identify measurement opportunities that are applicable, and develop the necessary capabilities to deliver information products and support service functions to meet the needs of the user community.

Developing a Terrestrial Monitoring System

For several years, USGS Geography has discussed and advocated for the establishment of a terrestrial monitoring infrastructure that supports USGS, DOI, and other scientific and operational investigations. This concept, as first proposed in the current USGS Geography Discipline science strategy, called for the provision of data, products, services, and assessments of national to global landscape status and condition. (McMahon, et al., 2005) Especially important was the provision of synoptic land products based on remotely sensed data – especially Landsat data.

Until now, EROS has primarily provided high-quality basic remote sensing datasets rather than higher level derived science products. The implementation of a terrestrial monitoring system marks a major paradigm shift in which EROS will proactively deliver advanced operational monitoring products, services that support their use, and specific assessments of land trends needed by our Nation's decision makers.

The terrestrial monitoring system capabilities must be designed to be relevant at several spatial scales, applicable from local to global venues, include past, current, and future observations and perspectives, and emphasize quantifying trends in resource conditions. The building blocks for establishing this terrestrial monitoring system consist of the following:

Generate synoptic land products based on remotely sensed data –especially Landsat. The concept of Essential Climate Variables (ECV) has been adopted by national and international science organizations as the measurements needed to understand climate variability and global environment change. ECVs are based on sound scientific standards and are relevant for a wide range of environmental investigations. As a first step, EROS will develop terrestrial ECVs appropriate at Landsat resolution. Terrestrial ECVs will enable the evaluation of current land and water conditions and monitor long-term trends in resource status and conditions.

Implement analytical capabilities needed to carry out scientific assessments. Resource managers, scientists, and other decision makers need periodic assessments of specific processes and events. Some of those assessments are formal, and others are *ad hoc* based on current needs or emergencies. EROS must establish scientific assessment teams that can apply ECVs to current issues such as carbon tracking, land change trends, and vegetation stress, e.g., drought, evaluation.

Establish data archive, management, and delivery systems. This near-real time monitoring capability requires a fresh data access approach. The concept of an "applications-ready" archive should be pursued as a means to ensure that the terrestrial monitoring system represents the diverse analytical requirements of

users. There are many ways to be "applications-ready," including provision of Web-based tools and services for monitoring product uses. Regardless of the solution, EROS must modernize primary information access systems in order to support a proactive data-products-assessment capability.

Create an applications services capability. Many potential users of terrestrial monitoring products and assessments will not be conversant in the use of remote sensing and other geospatial datasets. To better serve our user base and to ensure the effective use of the capabilities of the terrestrial monitoring system, EROS must reinvent its approach to customer service and provide applications support services that enable effective use of all monitoring system datasets, products, and assessments. The applications services would benefit from the participation of geographers and geospatial analysts from USGS regional geography science centers.

The provision of science quality data, products, and assessments will have major benefits for EROS constituents – if implemented with the expected rigor, quality, and transparency. EROS staff involved in the development of this system will be called upon to provide unprecedented leadership. This goal requires EROS scientists and engineers, along with university and industry scientists, to work together to transparently establish the required capabilities.

Delivering the Highest Quality Remote Sensing-Based Science, Applications, and Developments That Address the Nation's Most Pressing Needs.

EROS scientists, engineers, and technical staff, individually and collectively, are responsible for achieving the mission and goals of this strategic plan. While all EROS staff take great pride in their past contributions and accomplishments, our future is confronted with the increasingly challenging scientific issues that must be addressed, the technological advancements to be leveraged, and the expanding scientific and technical role that EROS must play in enabling and leading scientific investigations. To meet these future challenges and achieve success requires that every member of EROS must achieve even higher standards by setting higher personal and project expectations, growing in stature, and taking on national and international leadership roles that advance the use of remote sensing for societal benefit.

Major scientific issues facing us today require extraordinary efforts on the part of both individuals and interdisciplinary teams, and these issues are numerous. This will challenge our ability to focus our science and organize our efforts so that we provide appropriately sized and skilled teams to the key issues. Without a clear strategy for setting scientific goals and priorities, our science and engineering capabilities could be fragmented to the point that their contributions are minimized. We must create opportunities, through strategic and calculated use of all resources (e.g., human, financial, facilities, etc.), to address scientific goals and the requirements of operational users.

Today's prominent scientific issues such as climate change, carbon tracking and management, and hazards such as fires and floods, will likely be important for years to come and EROS staff must make major contributions. However, unanticipated issues will emerge in the future that must also be addressed. Our challenge is to ensure that our core science capabilities are sufficiently strong and adaptable to address future priorities. Climate change and carbon tracking and management, for example, rely on strong remote sensing, land use and land cover change, and hazards science. The building blocks associated with strengthening our core scientific and technological capabilities include:

Establishing Priorities – Considering the science priorities of the Geography Discipline and the USGS Science Strategies, ***we must identify the areas of emphasis for EROS science***. The evaluation must be based on mission relevance and scientific impact. We must define our scientific niches and develop research plans that not only grow these but also contribute results to integrated science initiatives. Our scientific research and applications must be based on a critical analysis of needs, strengths, weaknesses, and strategic opportunities.

Setting high standards and expectations – Performance standards and expectations must be set for both projects and individuals with an eye toward EROS scientists and engineers gaining recognition as world leaders in their various fields. We must increase the recognition and enhance the stature of the individuals comprising the EROS scientific and technical staff. The measures of success must be based on productivity, leadership, and impact. Our goal is to be leaders within our respective fields and the communities we serve. It is particularly important for our scientists and engineers to play leadership roles in regional, national, and international circles, regardless of employer affiliation (Federal or contractor); therefore, we must recognize and commit to the highest performance standards.

Achieving the Mission

To successfully advance real-time remote sensing-based science and applications and the provision of products and services in support of the national land imaging concept, EROS must embrace business practices that lead to improved science, applications, assessments, and operations. This must involve all EROS staff, whether working in science, engineering, or technical or administrative support. While the mission is driven by science and implemented through engineering, administrative staff are critical to facilitating the various functions of EROS by providing efficient support and services.

While maintaining our critical core capabilities that were essential for our successes over the last four decades, e.g., science and applications, satellite data processing, data management and archiving, etc., we must update, change, and strengthen several aspects of EROS. A key to our future is (1) following a consistent Centerwide approach to conducting research and operations – the research to operations continuum, (2) having a competent workforce that is sufficient in size, talent, and experience – building our future

workforce, (3) enabling a workplace environment of innovation and success, and (4) reinventing customer services, communications, and outreach – all focused on taking EROS programs to the next level.

The Research to Operations Continuum

The past and future success of the EROS Center has been and will be founded on the breadth of its activities, a fundamental set of core capabilities, and the diverse expertise of the workforce focused on delivering timely data, information, and services to the Nation and the global community. It is important to understand the historical basis of our success in order to define a roadmap for the future and to adapt to future challenges and opportunities. The scope of work undertaken by the Center crosses a number of broad functional areas: science and technology research and development; flight operations, data collection, calibration and validation, archiving, and management; generation of data and information products; data and information access and distribution; information technology infrastructure capacity development and maintenance; customer support; and communications and outreach. Some projects map discretely to one of these functional areas, whereas other projects are made up of elements from several areas. Given year-to-year budget uncertainties, long-term planning remains a significant challenge – do we evolve the organization holistically or as a collection of individual parts?

Research, development, and operations serve as categorical descriptions of the types and phases of work performed by the Center, but they also represent the lifecycle phases that individual projects evolve. These phases occur at multiple timescales in response to programmatic direction and new initiatives undertaken through internal and external collaboration. Our information technology infrastructure must grow and advance commensurately. The levels of service associated with customer support must be adaptive to changing needs of the user community. Communications and outreach must help broaden our ability to have impact by advocating our achievements and capabilities. The organization cannot function effectively and efficiently if our portfolio of projects is managed as a collection of discrete activities. Instead, we must manage these as a suite of complementary and synergistic functions that are integrated to meet the broader programmatic requirements and satisfy user community needs.

Scientists and engineers, individually and collectively, are responsible for implementing the mission and objectives of this strategic plan. The scope of their work should be focused on five principles that constitute the continuum of Center activities. Those principles are science, applications development, capability and capacity development and optimization, information product quality assurance and improvement, and science and technology transfer and support. Each is described below:

1. **Science is an approach to an understanding.** As such, it will be applied to investigate and understand (1) societal issues; (2) their underlying processes, conditions, and implications; (3) the information needed to address them; and (4) the utility of remotely sensed data and associated systems to satisfy that need.

Understanding requirements is the essential first step toward the definition and development of science-based applications. Remote sensing-based science must guide the development and support for terrestrial monitoring products, services, and assessments.

2. **Applications development proceeds to test viable scientific hypotheses** by (1) identifying and prescribing or adapting applicable technologies; (2) designing methods; (3) processing and transforming data into useful information; (4) verifying, documenting, and presenting outcomes; and (5) deciding if a resultant application merits implementation.

3. **Capability and capacity development and optimization are required to refine and automate potential applications and take advantage of the existing systems, protocols, and configuration.** Implementation and testing of the system's enhanced capability and throughput for measuring, monitoring, modeling, and projecting conditions and processes that address the overarching issues to which they were developed should be the focus of this task.

4. **Information product quality assurance and improvement effort are critical to ensure the integrity and associated utility of information products and services.** Scientists and engineers must work collaboratively to perform data characterization and calibration, perform product validation, and advance information access and distribution.

5. **Effective science and technology transfer and support are essential in order to advance and extend the use of our capabilities, information products, and services.** Our customers' understanding of the relevance and importance of remote sensing systems to meet their needs is our investment in their continued support and trust. We must leverage opportunities to provide an operationally applied understanding of the science, engineering, and technologies that make our products and services a societally responsive reality.

Software and systems engineering are critical to the advancement and maintenance of the Center's information technology infrastructure. These disciplines perform complementary functions to those of the scientists in the continuum of Center activities. Engineering expertise and processes are required to translate requirements into prototype capabilities, perform technology investigations and trade studies, develop and test system components and integrate these into a functional and open architecture, assist with the transition of these new capabilities into the Center's enterprise architecture, and provide sustaining support.

The principles of project management must be consistent whether the work is research, development, or operational, but the approach to managing scope, schedule, cost, and risk might vary. For example, operational activities are risk averse, while development work involves identifying and managing risks, and research tends to be more risk tolerant. Managing work that cleanly falls into a discrete bin within this continuum from research

to operational activities is not overly complex. We have gained experience moving projects through the development phase into operations and maintenance phase. The more significant challenge, however, is to strengthen our ability to transition research activities through the development phase and into operations for broader integration into decision support systems. We recognize this as a critical implementation priority.

Building our Future Workforce

The evolution of the EROS mission, shaped by the changing demands of our broad constituency, requires a thoughtful and coordinated approach to workforce development. Achieving the results associated with the four goals outlined in this plan means that the EROS workforce must have strengths in remote sensing-based science and technology, data management, advanced information science and technology, systems engineering, project management, and leadership. Our increased Bureau focus on delivering integrated science and our goal of enhancing research to operational practices means that staff must also be adept at working in team settings. The different functional areas of EROS have unique workforce development challenges, and each area must therefore carefully tailor their recruitment, retention, incentives, and expectations according to their needs. However, regardless of the functional area, we must consider both short- and long-term needs when recruiting staff. Because EROS includes Federal and contract employees, building the strongest possible workforce means that all employers set the highest standards. Recognizing the unique advantages of both a Federal and contract workforce is crucial so that the different roles and responsibilities are considered in an EROS-centric holistic workforce development strategy. Building the future EROS workforce must be based on the following considerations:

Recruitment – Strong, aggressive recruiting practices must be the centerpiece of workforce development. Recruitment starts with widely distributed proactive advertising so that the applicant pool is large and competitive.

Diversification – The most creative and open workforce is diverse, and special efforts must be made to seek applicants from diverse and underrepresented backgrounds. A diverse workforce that is consistent with building a world-class staff places even greater emphasis on the recruitment process.

Setting Expectations – All staff must be challenged and held to the highest standards. Members of EROS should have an individual development plan that outlines a long-term approach to sustained professional development.

Developing Leaders – Leadership is needed at all levels, and every member of EROS should be given the opportunity to provide appropriate leadership. Leadership in both programmatic and technical areas is essential and it is important to have an appropriate balance of strategic and highly specialized technical/topical leaders.

External Expertise – In cases where unique expertise is needed, use of short-term consultancies, grants and contracts with external experts, and the Intergovernmental Personnel Act should be employed.

Incentives – A motivated workforce benefits from incentives. Whether the incentive is recognition, monetary, or advancement, we must ensure that our staff recognizes the incentives associated with exceptional performance.

Creating a Workplace Environment of Technical Innovation and Success

A robust terrestrial monitoring system will require EROS to adopt novel ways to manage, organize, visualize, analyze, and manipulate complex data and information streams. This may involve anything from incremental improvements to radical departures from existing capabilities. A distinction is often drawn between *invention*, which is a new idea made manifest, and *innovation*, which is the successful application of the new idea. Swimming in an ocean of new ideas and inventions, EROS scientists and engineers must be discerning in their search for and selection of new capabilities, rapidly evaluate their utility, tailor their development toward EROS' user base, and communicate the lessons learned to other groups within the organization who may benefit from the new capability.

Currently, EROS relies on project funding to perform these functions. While this generally works well for incremental improvements within a specific project, it's not optimal for creating a Centerwide environment or culture for innovation. The current arrangement forces projects to compete with each other for talent, rather than coordinating this talent to work toward common goals. A truly innovative environment should not only provide a framework for rapid prototyping and evaluation, which are necessary elements for technology infusion, but also enable the performance of these functions transparently across projects. This is not likely to occur without a Centerwide structure to solicit new ideas, provide start-up "capital" to develop prototypes or proofs-of-concept, coordinate their development across relevant projects, and communicate the results and lessons learned across the Center and the USGS.

How does EROS foster a change in practices that permits innovation? As noted by Peter Denning, successful innovation is not "a matter of psychology, charisma, inspiration, talent, or flash of genius; it is a matter of education." (Denning, 2004) Citing Peter Drucker's definitive work, *Innovation and Entrepreneurship*, he sees that innovation is a discipline, a dynamic interaction between the innovator, who searches for opportunities and transforms them into new practices, and the entrepreneur, who embeds the practice of innovation into an organization (Drucker, 1985). There is no shortage of innovators at EROS – the success of effective technology innovation and incubation relies on an entrepreneurial leadership to develop the Centerwide infrastructure required to promote innovation as practice and ensure that innovative research and development can be incorporated into EROS' operational capabilities.

Reinventing Customer Services, Communications, and Outreach

The Center's customer services functions must evolve to a user support services model as a consequence of our data services paradigm shift – moving from a provider of data to a provider of information services and solutions. The services must emphasize applications assistance and science support, permitting user support services to play a key role in helping the land imaging community to bridge the gap between science and decision making. User Support Services must provide direct end-user support in an increasingly complex land imaging environment while serving as a principle means for communicating the societal benefits of operational land imaging.

Several specific building blocks for User Support Services are to:

- Increase the breadth and depth of knowledge on the full spectrum of operational land imaging user requirements, i.e., research to operations. In doing so, User Support Services must leverage other USGS resources to provide the advanced applications support needed by our users.

- Play an increased role in providing documentation, training, and technical outreach services, tailored to customer requirements and, where appropriate, specific applications.

Integral to new User Support Services operations is a commensurate evolution of the Center's communications and outreach activities. We must communicate the value of our science, services, and products, and the pressing societal issues they address. We must create excitement and enthusiasm for our science among the lay public, the science community, our colleagues, partners, and cooperators.

A communications and outreach strategy must be multi-faceted and aggressive; but it must recognize that outreach responsibilities are to be shared Centerwide. If we are to be truly effective at communication and outreach, everyone at EROS must feel a sense of responsibility for outreach, and every project must understand that outreach is an integral part of their activities. An effective communication and outreach program must fully understand what needs to be communicated (driven by Department; Bureau; Discipline; Center; and Project objectives, mission, and priorities), who the targeted audiences are (understanding our audience is a must), when to communicate our stories (timing is everything), and finally, how to best get our stories told (innovation and professionalism is key).

Several specific building blocks for Communications and Outreach are to:

- Recognize that the content of what we communicate must come from the subject-matter experts, i.e., the EROS staff. The communication experts, i.e., the communication and outreach staff (both at USGS and EROS), must coordinate how we communicate. Together these respective experts form an impressive "outreach team."

- Provide leadership and coordination: leadership to develop the strategy and ensure that it is carried out in an effective and innovative way, and coordination to ensure that the Centerwide approach to external outreach and communication is focused, on-target, and consistent with USGS policies and priorities.

Both User Support Services operations and the Center's communications and outreach activities must be viewed as a legitimate and essential component of our mission.

The Next Steps – Implementing the Plan

An effective implementation plan and a process to create and maintain it are critical to realizing the benefits of a strategic planning effort. The most common reason that strategic planning ends up as wasted effort is that there is faulty implementation – no follow through. The following steps are intended to serve as the foundation for the development of an implementation plan and help ensure follow through and achieve a successful realization of the goals and objectives of this strategic plan. The steps are organized into three areas of emphasis: commitment and communication, phased implementation plan, and monitoring and maintaining progress.

Commitment and Communication

The EROS Center managers have the responsibility of translating the goals and objectives of the strategic plan into identifiable tasks and deliverables. The Branch Chiefs will involve their respective Team and Project managers in the process to help ensure buy-in and feasibility. Draft action and implementation plans will first be vetted with EROS Center Management and then with Geography Discipline programs and executive management. The goal is to draft and formulate actions plans that have buy-in from the highest level of executive management and extending out to the lowest level of task management.

Part of keeping the plan alive and relevant involves managers and leaders helping staff understand what the plan actually means in practical implementation. By an open exchange of ideas between employees and management about the meaning of the plan as applied to every day operational decisions, staff will clarify their own understanding of the plan and their role in achieving the goals, and realize that the management team is serious about implementation. Management should communicate the goals and objectives of the plan with staff, and they should regularly assess status and report on progress on the plan using an agreed-upon up-front way to report out. All levels of management and their staff should be part of the process of updating and fine tuning the plan. This not only enhances buy-in at all levels and the likelihood of implementation success but also demonstrates the importance of the plan to all staff and the commitment to making progress on the goals and objectives.

Phased Implementation Plan

We view this strategic plan as the high-level vision that outlines the direction and broad priorities for EROS in the coming years. The next step is to develop a detailed implementation plan. The implementation tasks and deliverables identified by the Branches and their Teams and Projects will be captured and organized into this implementation plan. The implementation plan is a separate, companion document to this strategic plan. The purpose of the implementation plan is to document the details of planned tasks and actions resulting from the mapping of strategic goals and objectives to

tasks and deliverables. It is a separate document that will articulate the need for project activities to shift focus toward our strategic directions. It must be allowed to mature and change as milestones are achieved and lessons are learned in the implementation without requiring modification of the strategic plan, which will be updated at more extended intervals.

The mapping of strategic goals and objectives to specific tasks and deliverables will include the development of intermediate milestones and deliverables. By indentifying intermediate milestones or deliverables, progress can be more effectively monitored and lessons learned can be employed to modify and enhance the plan and subsequent deliverables. Toward this end, the detailed plans will be organized into three phases of implementation. The first phase will include tasks and deliverables that can be accomplished within the first 12 months after their endorsement. Phase II will encompass tasks and deliverables in the 2- to 3-year timeframe, with Phase III at 4 to 5 years.

In addition to the Branch managers having the responsibility to follow through and ensure implementation of the identified tasks and deliverables, champions for each of the Center's key strategic goals and objectives will also be identified. The role of the champion is to be the "owner," or leader, of a goal or objective. Since the implementation efforts associated with the various strategic goals or objectives will span the Center, cross-coordination and leadership is needed. The champion serves as the advocate for achieving the strategic goal or objective and serves as the primary point-of-contact for status and update and for leading budget initiatives associated with the particular goal or objective.

Monitoring and Maintaining Progress

This strategic plan, the companion implementation plan, and corresponding performance metrics, will be used by managers throughout the Center to evaluate the degree to which the plans are being followed and the goals and objectives contained in them being achieved. Staff will be encouraged to evaluate whether any specific action of interest is consistent with the strategic goals and priorities in the plan. This is a very practical evaluative process designed to help keep things on track, and, once again, it tells staff that management is serious about the plan.

Monitoring progress on the tasks and deliverables will be a critical part of weekly and monthly staff meetings and management reviews. Periodically, but not less than once a year, Center management will revisit the strategic and companion implementation plans and consider changes to keep them relevant and current.

Finally, we recognize that strategic planning is different from long range planning in that it assumes a constantly changing rather than a static environment. As a result, the process is never complete, but always evolving through continued feedback, evaluation, and revision. It is also for this reason that we are seeking endorsement of the plan rather

than approval of the strategic plan as if it were a static set of blueprints for the future. Therefore, it is vitally important to conduct semi-annual/annual reviews and revisions of the plan. As the environment changes, strategies may be adjusted, eliminated, or added. When goals are achieved, new ones may be added. Obtaining ongoing feedback of our efforts from our staff, USGS Geography leadership, and our partners and customers will give further guidance in developing an even stronger twenty-first century vision and mission for EROS.

References

Denning, Peter, 2004.The Social Life of Innovation. Communications of the ACM, 47(4).

Drucker, Peter, 1993. Innovation and Entrepreneurship. Harper Business.

Future of Land Imaging Working Group, 2007. A Plan for a U.S. National Land Imaging Program, U.S. Office of Science and Technology Policy 110 p.

McMahon, G., Benjamin, S.P., Clarke, K., Findley, J.E., Fisher, R.N., Graf, W.L., Gunderson, L.C., Jones, J.W., Loveland, T.R., Roth, K.S., Usery, E.L., and Wood, N.J., 2005. Geography for a Changing World: A Science Strategy for the Geographic Research of the U.S. Geological Survey, 2005-2015. Circular 1281, Reston, VA U.S. Geological Survey 54 p.

U.S. Geological Survey. 2007. Facing Tomorrow's Challenges: U.S. Geological Survey Science in the Decade 2007-2017. USGS Circular 1309 69 p.

Appendix A – Organizational Improvement Recommendations

Our fact-finding process involved discussions with USGS Geography discipline leaders and program coordinators, and dozens of representatives from other parts of USGS as well as NOAA and NASA. Importantly, we also received input from over 50 EROS employees from most EROS employers, including the USGS, SGT, SAIC, ASRC, Aerospace, Information Dynamics, and ADNet. We consider the input from the EROS staff to be especially significant because of their long-term commitment to the goals of the USGS and EROS.

The EROS staff identified several specific areas needing attention. These areas provide opportunities for EROS, with an institutional commitment, to improve and build our capabilities for the future.

- **Striking a balance between management and leadership efforts – finding the optimal combination of focus on processes/procedures while also accomplishing the science vision**. An increased focus on processes and procedures has created hurdles to collaborative research and partnerships and fostering an environment supportive of new ideas and technology. A proper balance of following these processes and procedures while maintaining a productive work environment needs to be reached.

- **Evolving business models**. The balance between our sales/reimbursable activities and appropriated dollars has dramatically shifted. We need to have a full understanding of how this change in dynamics will affect the type of work we do and the ability to accomplish our vision. We must maintain flexibility in our business models in order to adapt to our cooperators and sponsors.

- **Strengthening leadership and ties with USGS Headquarters.** A permanent EROS Director, at the Senior Executive Service level, is an essential building block to a strong and stable relationship with the USGS Headquarters staff. Headquarters and EROS must work together to leverage our SIR funding and reimbursable work with cooperators to move forward on a collaborative future vision. Having a permanent SES Director will further our work and focus as we implement our vision.

- **Going beyond a Landsat-Centric paradigm**. The Landsat missions have played a key role in the success of EROS over the years and are a great source of pride for the Center. With over 37 years of acquisitions, Landsat represents the world's longest archive of continuously acquired moderate resolution land remote sensing data. While a focus on preserving and providing access to these data remains critical, it is also important to evolve to a multi-mission environment with a focus on land imaging in a broader scope.

- **Working across internal organizational boundaries and projects**. The remote sensing missions exist to answer our science questions. We need to ensure that

the missions stay focused on providing information and knowledge that our scientists and users need and that all staff focus on work relative to our mission while working seamlessly as a team.

Appendix B – Future of Land Imaging Recommendations and Provisions

There are important parallels between the mission of EROS and the recommendations of the Future of Land Imaging Interagency Working Group (FLIWG). Because of these parallels, **we embrace the concept** of a National Land Imaging Program defined in the FLIWG report (2007). The FLIWG report offered the following recommendations:

1. The U.S. must commit to continue the collection of moderate-resolution land imagery.

2. The United States should establish and maintain a core operational capability to collect moderate-resolution land imagery through the procurement and launch of a series of U.S.-owned satellites.

3. The United States should establish the National Land Imaging Program, hosted and managed by the Department of the Interior, to meet U.S. civil land imaging needs.

Regarding the establishment of the National Land Imaging Program, the FLIWG recommended enactment of the following provisions related to the goals, organization, and operation of the program:

- The NLIP would lead, coordinate, and plan for future U.S. civil operational moderate resolution land imaging, including managing the civil operational moderate-resolution land imagery needs of the Nation, to promote the widest beneficial use of land imagery for civil purposes in the United States and to ensure that land imagery data are available to all public and private users throughout the United States.

- The NLIP would be led by the U.S. Department of the Interior and would report to the Secretary or an Assistant Secretary of the Department, consistent with national responsibilities assigned to this program.

- The NLIP would recognize and accommodate the critical role that other U.S. Federal agencies play in serving U.S. moderate-resolution land imaging data needs. NLIP would convene a Federal Land Imaging Council composed of the National Aeronautics and Space Administration, the National Geospatial-Intelligence Agency, the Departments of Defense, Commerce, Agriculture, Homeland Security, State, and other agencies as appropriate to coordinate these needs. This Interagency Council would advise NLIP on its future land imaging needs and program objectives.

- In concert with other U.S. agencies and consistent with the economic, scientific, security, and foreign policy interests of the United States, the NLIP would acquire global, moderate-resolution land imagery data, manage all U.S. civil moderate-

resolution land imaging technologies, satellites, and systems needed to sustain future U.S. capabilities in this area, ensure archival preservation of U.S.-acquired moderate-resolution land imagery, and promote the application and use of civil land imagery on behalf of the United States.

- The NLIP would ensure that all U.S. needs for civil moderate-resolution land imaging data are met and enact policies to ensure ease of access to affordable civil operational land imaging data for all users.

- The NLIP would maintain ongoing assessments of user needs and advanced technologies in remote sensing, including communication with private, nonprofit, academic, commercial, and international users, U.S. State and local Government, and the satellite and land imaging data industries.

- The NLIP would conduct a program of field-based research, development, and training to promote and expand the range of uses of moderate resolution land imagery and related products to meet public needs.

- The NLIP would have the authority to negotiate international agreements, in coordination with the U.S. Department of State, when needed, to augment U.S. civil operational moderate resolution land imaging systems and capabilities.

- The NLIP would recognize and accommodate the critical role that commercial, State and local Government, academic, and other nonprofit users play in the conduct of national affairs and how these users perform their roles in American society. The Department of the Interior would convene a Federal Advisory Committee on Land Imaging under the rules of the Federal Advisory Committee Act (FACA) to provide input and advice to the NLIP.

- NLIP will ensure that, consistent with the 1992 Land Remote Sensing Policy Act (15 USC 5601), development of the remote sensing market and the provision of commercial value-added services based on remote sensing data should remain exclusively the function of the private sector.

The NLIP would coordinate future civil operational moderate-resolution land imaging programs and activities with other U.S. Federal agencies through the auspices of the U.S. Group on Earth Observations.