



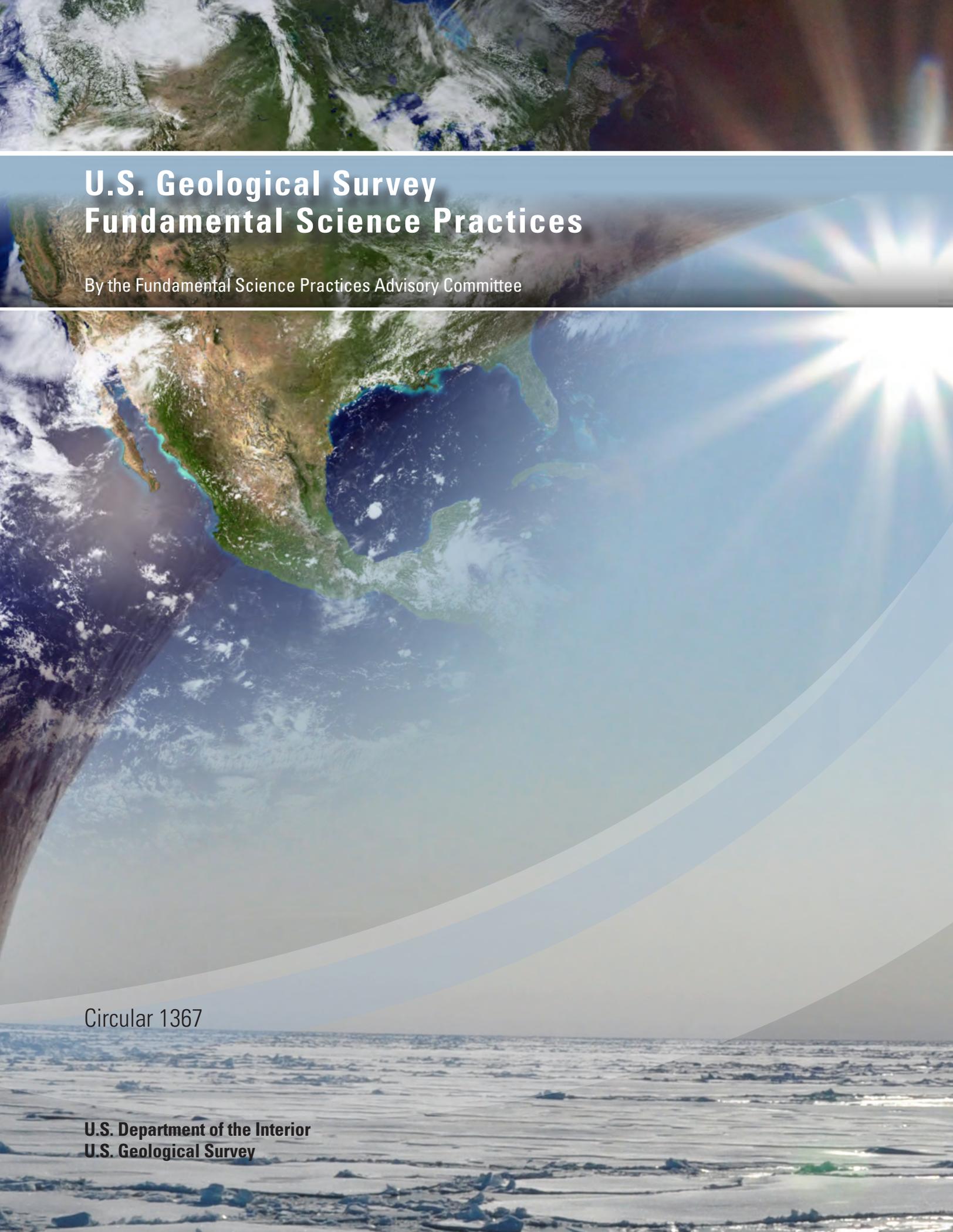
**U.S. Geological Survey
Fundamental Science Practices**



Circular 1367



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

A composite image featuring a satellite view of Earth from space on the left, showing the Americas and the Atlantic Ocean. On the right, a bright sun creates a lens flare effect against a blue sky. The bottom of the image shows a wide, flat landscape, possibly a beach or a large field, with some low-lying vegetation and a clear horizon.

U.S. Geological Survey Fundamental Science Practices

By the Fundamental Science Practices Advisory Committee

Circular 1367

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

A person in a green shirt is kneeling in a field, possibly collecting samples. In the background, there is a geothermal vent with a plume of white steam rising from the ground. The scene is outdoors with trees and a clear sky.

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2011

This and other USGS information products are available at <http://store.usgs.gov/>
U.S. Geological Survey
Box 25286, Denver Federal Center
Denver, CO 80225

To learn about the USGS and its information products visit <http://www.usgs.gov/>
1-888-ASK-USGS

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Contents

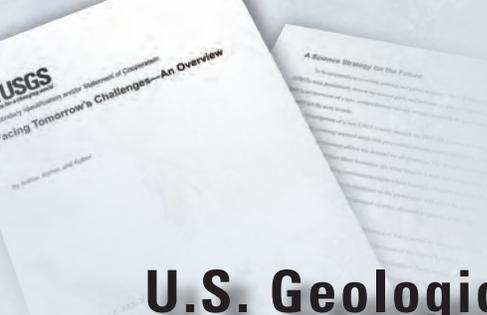
Background.....	1
Fundamental Science Practices	2
FSP Web Sites	2
Roles and Responsibilities	2
The Peer Review Process	6
USGS Peer Review Requirements	6
Federal Peer Review Requirements	7
The Bureau Approval Process.....	7
Scientific Integrity	7
Functions Supporting FSP	7
Science Publishing Network	7
Information Product Data System	8
For More Information	8



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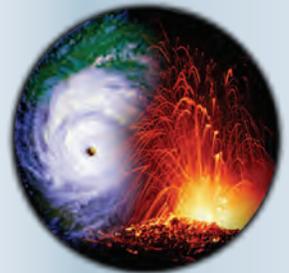
No matter what policies and guidelines are developed, the responsibility for science excellence remains where it has always been—in the hands and minds of the dedicated scientists of the USGS.

—Charles G. Groat, 13th Director, USGS

Background

The U.S. Geological Survey (USGS) was established during the final session of the 45th Congress by the Organic Act of March 3, 1879 (20 Stat. 394; 43 U.S.C. 31). The USGS was placed in the Department of the Interior and was charged with a unique combination of responsibilities: "...classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." The legislation stemmed from a report by the National Academy of Sciences, which in June 1878 had been asked by Congress to provide a plan for surveying the Territories of the United States that would secure the best possible results at the least possible cost. The necessity for communication of the best possible results led to the establishment of an ongoing tradition of internal and external publication of USGS information products and the longstanding USGS reputation for scientific excellence guided by the internal quality standards and processes applied when developing these products.

The USGS is an independent science agency that serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. With no regulatory or management mandate, the USGS is able to provide impartial science to address the needs of our changing world. A diversity of scientific expertise enables the USGS to carry out multiscale, multidisciplinary investigations that continue to add to the base of knowledge about the Earth. Through these efforts, the USGS provides citizens and decision makers at all levels of government with information needed to address critical societal issues. USGS Circular 1309, "Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007–2017" (<http://pubs.usgs.gov/circ/2007/1309/>) describes current Bureau science emphases, all of which are supported by USGS Fundamental Science Practices (FSP).



Fundamental Science Practices

The USGS has a long and proud tradition of objective, unbiased science in service to the Nation. A reputation for impartiality and excellence is one of our most important assets.

To help preserve this vital asset, in 2004 the Executive Leadership Team (ELT) of the USGS was charged by the Director to develop a set of fundamental science practices, philosophical premises, and operational principles as the foundation for all USGS research and monitoring activities.

In a concept document, “Fundamental Science Practices of the U.S. Geological Survey,” the ELT proposed “a set of fundamental principles to underlie USGS science practices.” The document noted that protecting the reputation of USGS science for quality and objectivity requires the following key elements:

- Clearly articulated, Bureau-wide fundamental science practices.
- A shared understanding at all levels of the organization that the health and future of the USGS depend on following these practices.
- The investment of budget, time, and people to ensure that the USGS reputation and high-quality standards are maintained.

FSP encompass all elements of research investigations, including data collection, experimentation, analysis, writing results, peer review, management review, and Bureau approval and publication of information products. The focus of FSP is on *how* science is carried out and *how* products are produced and disseminated. FSP is not designed to address the question of *what* work the USGS should do; that is addressed in USGS science planning handbooks and other documents.

Building from longstanding existing USGS policies and the ELT concept document, in May 2006, FSP policies (refer to <http://www.usgs.gov/fsp/policies.asp>) were developed with input from all parts of the organization and were subsequently incorporated into

the Bureau’s Survey Manual. In developing an implementation plan for FSP policy, the intent was to recognize and incorporate the best of USGS current practices to obtain the optimum overall program for our science. In January 2009, the USGS moved to full implementation of FSP. The FSP Advisory Committee (FSPAC) was formed to serve as the Bureau’s working and standing committee to ensure the objectivity and quality of the Bureau’s science information products and to provide support for the full implementation of FSP.

FSP Web Sites

The **FSP Intranet** site (<http://internal.usgs.gov/fsp/policies.html>) serves as a resource for USGS employees, particularly USGS scientists, supervisors, managers, reviewers, approving officials, and publishing professionals. The Intranet site helps USGS employees find the information and guidance they need to ensure that we are continually maintaining the objectivity and quality of USGS science and how information products are developed, reviewed, approved, and released.

The **FSP Internet** site (<http://www.usgs.gov/fsp/>) is the primary resource for our stakeholders, partners, and the public to obtain information about FSP. The site provides users with quick and easy navigation to FSP policy and procedural and guidance materials.

Roles and Responsibilities

FSP are the collective and shared responsibility of everyone in the USGS. Designated officials and offices have specific roles, authorities, and functions in establishing the policies that underpin these practices:

- The **Director of the USGS** has final authority and responsibility for FSP and for the excellence, integrity, and objectivity of USGS science and of its information products.
- **Associate Directors** set policy for how scientific investigations, research, and activities are carried out and how information products are reviewed and approved for release and dissemination. They provide oversight for the processes and policies that govern FSP. They collaborate with Area Executives to address issues or take corrective action with regard to these policies.
- **The Office of Science Quality and Integrity** executes FSP policies, including the appointment of officials who approve information products for release (refer to <http://www.usgs.gov/usgs-manual/200/205-18.html>). This Office collaborates with Associate Directors and Area Executives to address issues or take corrective action regarding the execution of these policies and maintains the policy documents and procedures that pertain to FSP.

USGS information products that are reviewed and approved in accordance with FSP policies follow a standard workflow (p. 4–5) that includes other specific roles and responsibilities as follows:

- **Science Center Managers** or their equivalents ensure that standards for scientific quality are met; that is, methodology is documented, and accepted metadata standards are used. They determine if a planned product qualifies as influential scientific information or highly influential scientific assessment (as defined in the Office of Management and Budget (OMB) directive available at http://www.usgs.gov/peer_review/) and therefore must adhere to the OMB requirements for peer review of influential products. They ensure that only properly peer reviewed products are forwarded to Bureau Approving Officials (for products that contain new interpretive information) and alert these officials about potential high-visibility products or policy-sensitive issues. They have delegated authority for Bureau Approval of information products that do not contain new interpretive information, all abstracts (except extended abstracts), and all poster and presentation materials disseminated to the public or left with the meeting sponsor. They also ensure that information products conform to USGS publishing requirements (refer to SM Part 1100, Publishing at <http://www.usgs.gov/usgs-manual/t500.html#pubs>) and that official records are archived at their centers or placed in
- the Information Product Data System (IPDS) document vault.
- **Bureau Approving Officials** are responsible for using consistent and uniform practices for information product review and approval across the Bureau. They ensure that appropriate peer review has been sought and applied, that authors have considered and adequately responded to peer review comments, and that the product is clear in its presentation with the intended audience in mind. They ensure that strict objectivity regarding the relation of science to public policy is upheld, thus preserving the reputation of the USGS as a source of high-quality and policy-relevant but policy-neutral science. They alert appropriate officials and offices of the progress of policy-sensitive or high-visibility information products that are likely to be of interest or potentially controversial to the Bureau, the Department of the Interior, and other Federal agencies; State, local, and Tribal governmental organizations; the scientific community; the public; and any specific industry or interest. They communicate effectively with one another and with Associate Directors and Area Executives to share knowledge and expertise relative to review, approval, and release practices. They grant Bureau Approval on behalf of the Director. They share the Bureau Approval responsibility, one acting on behalf of another as needed and in accordance with their educational background and science expertise.



U.S. Geological Survey Fundamental Science Practices (FSP) Information Product Workflow

Author

1. Author prepares first draft of information product, a metadata record is created in the USGS Information Product Data System (IPDS), and draft manuscript is forwarded to supervisor with recommendations for peer reviewers.

3. Author receives peer review comments, modifies manuscript, and prepares reconciliation documentation. Author forwards revised manuscript, peer reviews, and reconciliation documentation to supervisor.

Supervisor

2. Supervisor reviews manuscript to determine if it is ready for peer review, accepts author's suggested reviewers, or identifies other peer reviewers, monitors whether manuscript could be considered as *influential scientific information* or *highly influential scientific assessment* for the OMB Peer Review Agenda process.

4. Supervisor determines whether response to peer review is adequate, and whether editorial review is required and then forwards to Science Center (SC) Manager or equivalent.

Science Center Manager

5. SC Manager or equivalent reviews all documentation and, if appropriate, forwards package to Bureau Approving Official (BAO) for approval.

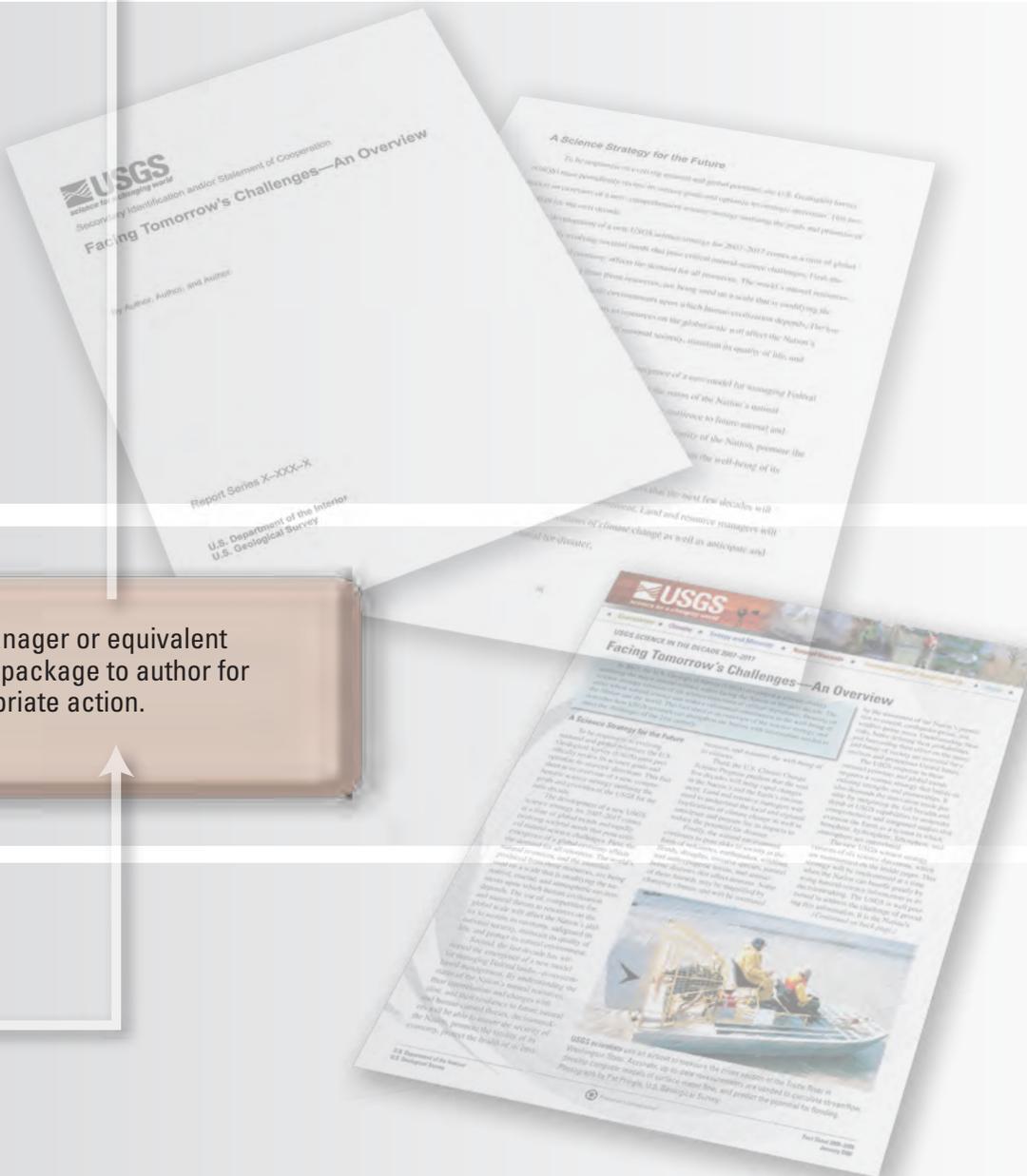
Bureau Approving Official

6. BAO ensures all required reviews are performed, validates peer review reconciliation, identifies any revisions needed, and returns (for additional review or revision) approved or unapproved package to SC Manager or equivalent.

8. Author responds to revisions recommended and (or) required by BAO.

9. Approved manuscript is submitted for internal release (USGS Series) or for external publication and citation, and related metadata are entered into IPDS by author or alternate.

7. SC Manager or equivalent sends package to author for appropriate action.



- The **Senior USGS Author** (or the first USGS author in instances of collaborative external publications) is responsible for ensuring that appropriate USGS review and approval of information products occur prior to public release. Authors suggest peer reviewers and inform their supervisors and Approving Officials if changes in drafts of products require or warrant further review and approval prior to publication.
- The **Senior USGS Author's Supervisor** collaborates with the Science Center Manager to determine if a planned information product qualifies as influential scientific information or highly influential scientific assessments. The supervisor accepts the author's suggested peer reviewers or identifies other qualified reviewers and facilitates transmission of the manuscript package to peer reviewers. The supervisor also ensures that peer reviews are adequate, that all review comments are addressed by the author (that is, addressed in a reconciliation document), and forwards the manuscript to the Science Center Manager or equivalent.
- The **FSP Advisory Committee (FSPAC)** reports to the Director's Office and coordinates closely with the Office of Science Quality and Integrity. The FSPAC was established in 2008 and is the Bureau's working and standing advisory committee charged with monitoring

full implementation of FSP. Members of the FSPAC include scientists, Science Center Managers, Bureau Approving Officials, and publishing managers. Membership is deliberately broad to provide optimum benefit from various perspectives across the Bureau and to ensure continuity of FSP. The FSPAC is the primary contact for questions and concerns regarding FSP and serves as a resource to USGS management by offering recommendations and advice to help ensure that the Bureau continues to produce high-quality, objective science information products. The FSPAC conducts periodic reviews to determine how FSP policy and practices are working to quantify benefits and assess the added value to the Bureau.

The Peer Review Process

USGS Peer Review Requirements

Peer review, as a cornerstone of scientific practice, validates and ensures the quality of published USGS science.

Also referred to as "refereeing," "technical peer review," or "scientific peer review," peer review is scrutiny of work or



ideas by one or more scientists (peers) who are sufficiently well qualified, who are without conflict of interest, and who are not associated with the work being performed. A peer is defined as one who is of equal standing with another; in science, the implication is that education and (or) experience qualify one to comment on the work of others in a particular field of expertise. Peer reviewers may be internal or external to the USGS.

Peer review is required for all information products, regardless of media (print, digital, audiovisual, or Web),

- whether published and disseminated by the USGS or by an outside entity,
- whether the work was funded in whole or in part by the USGS,
- and as long as USGS affiliation is identified with authorship (refer to <http://www.usgs.gov/usgs-manual/500/502-3.html>).

In keeping with practices in the broader scientific community, directives from Government authorities, and FSP, the following, in part, is USGS peer review policy:

- Peer reviews must include at least two qualified scientists who have no stake in the outcome of the review, who are not associated with the work being performed, and who are without conflict of interest.
- Only peer-reviewed information products may be forwarded to an Approving Official for Bureau Approval. Information products sent to an Approving Official must include reconciliation documentation indicating how review comments were addressed.

Federal Peer Review Requirements

The OMB directive, Final Information Quality Bulletin for Peer Review, dated December 16, 2004, requires that there be a “systematic process of peer review planning” and access to a list of information products for official dissemination that will be peer reviewed as either influential scientific information or highly influential scientific assessments (as defined in the OMB directive). The OMB requirements do not replace or duplicate the USGS peer review requirements. The USGS has the responsibility to maintain and conduct the appropriate peer review process for its products and to identify products as influential according to the OMB definitions.

A list of USGS information products peer reviewed as influential scientific information or highly influential scientific assessments can be found at http://www.usgs.gov/peer_review/.

The Bureau Approval Process

All information products must receive review and approval by line supervisors of the senior USGS author before subsequently receiving final Bureau Approval. Bureau Approval validates the scientific excellence of the information product and includes a policy review to ensure that all policy requirements relevant to FSP are met and to identify policy-sensitive issues including those that may have implications related to current policy or that may involve matters of national interest, security, or potential commercial gain. Bureau Approval also ensures that all appropriate reviews, such as peer review, have been conducted. Review of products for Bureau Approval addresses criteria such as integrity and objectivity, conflict of interest, impartiality and nonadvocacy, methodology and documentation, public benefit and access, natural hazards, and (or) public or wildlife health. Delegations of authority to officials who grant Bureau Approval are detailed in the Survey Manual (<http://www.usgs.gov/usgs-manual/200/205-18.html>).

Scientific Integrity

In January 2007, USGS released a policy on scientific integrity (refer to <http://www.usgs.gov/usgs-manual/500/500-25.html>) that describes our requirements “for ensuring scientific integrity in the conduct of scientific activities and procedures for reporting, investigating, and adjudicating allegations of scientific misconduct by USGS employees and volunteers.” The policy contains a “code of scientific conduct” that not only documents research standards but also assures customers, partners, and the general public that USGS abides by them in all aspects of scientific work performed. A USGS Scientific Misconduct/Integrity Review Panel has also been in place since 2007.

Functions Supporting FSP

Science Publishing Network

Building upon its reputation for publishing excellence, the USGS implemented a Bureau-wide publishing approach through the Science Publishing Network (SPN) that directly supports all employees of the USGS as well as the many partners, suppliers, and consumers of

USGS data and information products and services. Production support is coordinated at Publishing Service Centers located across the Nation, thus ensuring workload balancing and optimizing network efficiencies throughout the Bureau. SPN services include technical and scientific editing, graphics support, publication layout and design, Web and print release of all USGS series publications, and customized support for other USGS products including abstracts, posters, journal articles, books, presentation materials, Web pages, internal documents, and outreach materials. Additional information on USGS publishing is available at <http://www.usgs.gov/publishing/>.

Information Product Data System

The standard workflow steps for products that are reviewed and approved in accordance with FSP requirements (p. 4–5) have been incorporated into IPDS, the Bureau’s official tracking system for managing the development steps of USGS information products that require Bureau Approval. IPDS workflows track and document the review and approval process as it occurs. The resulting IPDS workflow history

provides documentation to show that proper procedures have been followed and that the necessary steps have been taken. IPDS also manages the documents that support the review and approval process. Peer review comments, author peer review reconciliation documents, and other archival records that are stored in IPDS provide documentation of compliance with FSP and, in accordance with USGS requirements (<http://www.usgs.gov/usgs-manual/schedule/432-1-s1/index1.html>) and the National Archives and Records Administration, satisfy requirements for storing these documents. IPDS is used to document and certify that Bureau Approval has been granted.

For More Information

The primary sources of FSP information for USGS employees are their immediate supervisors, Science Center Managers, Bureau Approving Officials, and the internal FSP Web site. Additionally, USGS employees, as well as all other parties, should contact the FSPAC (by email at gs_fspac@usgs.gov) for FSP-related questions and concerns or visit the public FSP Web site at <http://www.usgs.gov/fsp/>.

