

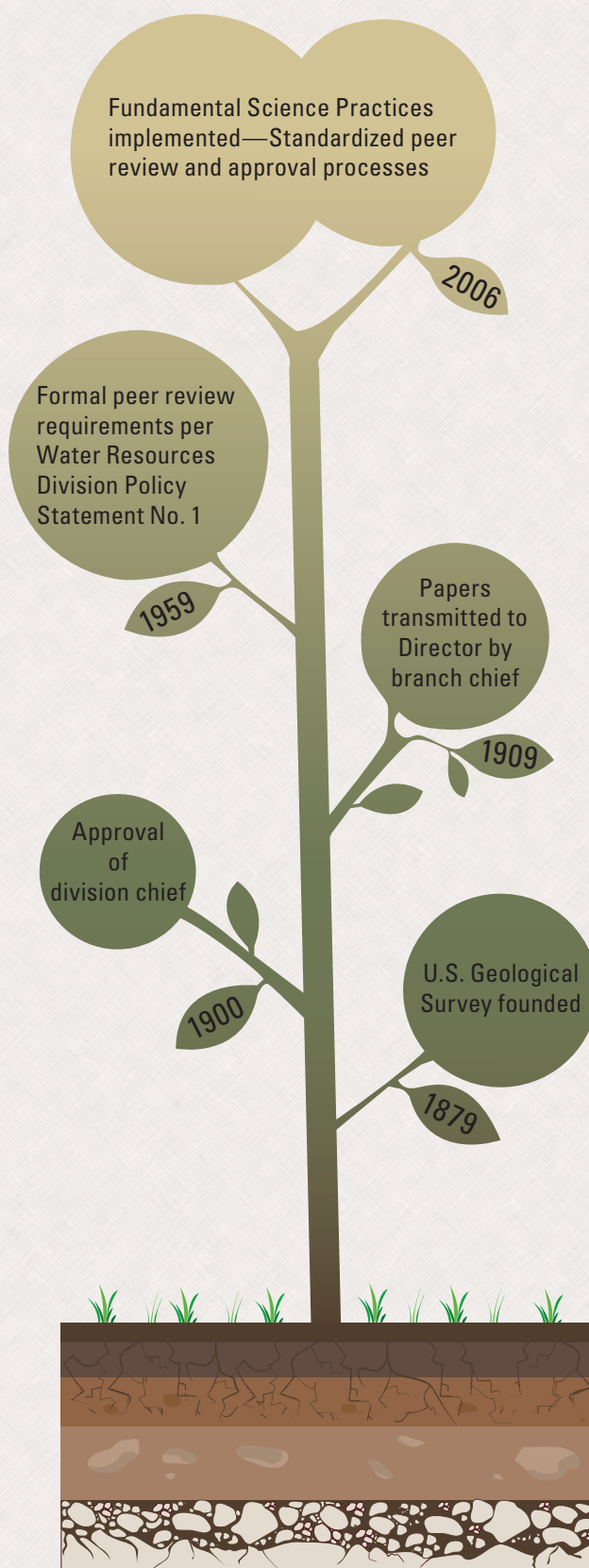
# History of U.S. Geological Survey Scientific Peer Review and Approval, 1879–2019

The U.S. Geological Survey (USGS), a bureau within the U.S. Department of the Interior, has valued and used a scientific peer review and approval process since its creation in 1879. Bureau approval, formerly called Director's approval, has been described in several USGS documents since 1900, and peer review has been codified in policy since 1959. Peer review of USGS manuscripts is intended to ensure the accuracy of data, the scientific validity of interpretations, and the consideration of alternative interpretations. This rigorous quality assurance process is considered deliberative because of the iterative exchange of ideas and opinions among the involved parties.

Peer review practices differed between USGS organizational units until implementation of [USGS Fundamental Science Practices](#) (FSP) in 2006, which formalized Bureau-wide science practices, including peer review and approval, for all Bureau scientific information products released to the public or other Federal agencies. FSP policies also address review and approval requirements pertaining to the release of USGS-funded data and software and endorse quality-control standards for USGS laboratories. Bureau approval signifies the scientific excellence of information products, validates and ensures that all necessary reviews have been conducted, and confirms that information products meet USGS science quality standards and have the full backing of the Bureau. The extent, scope, and history of the peer review and approval process within the USGS are documented herein, so future USGS scientists and the public understand how consistent approaches in developing, reviewing, and publishing USGS scientific information have been and continue to be essential in maintaining the reputation of the Bureau for reliable and impartial Earth science research and data collection.

## Peer Review and Approval in the USGS before Fundamental Science Practices

Rigorous scientific review has been woven into the fabric of the USGS and its publications since its creation in 1879. Currently, peer review and Bureau approval of USGS science information products follow FSP—a set of consistent operational principles and requirements that govern not only how scientific studies are carried out, but also how the resulting science information products are developed, reviewed, approved, and disseminated. In other Federal agencies, the equivalent of the USGS Bureau approval is often referred to as the agency's clearance to publish. The first iterations of peer review primarily occurred in the form of focused technical discussions among the author's scientific peer group or at national scientific conferences, where the approach and conclusions presented in an individual scientist's manuscript were debated. In addition, Bureau approval, which was formerly called Director's approval, was a separate but integral part of the review process and was equally interwoven into the establishment of USGS scientific practices.





# Director's Approval

Scientific and administrative control was divided in the reorganized Geologic Branch July 1, 1900. Mary Rabbitt (1980, p. 302) writes, "Seven divisions were set up, covering specified subject areas... For each subject area, or division, the field of supervision of the specialist in charge, or division chief, was Survey-wide and his opinion was authoritative... Division chiefs would... review manuscripts, and no manuscript would be accepted for publication without a favorable recommendation from the division chief concerned." Beginning in 1909, the USGS prepared a series of manuals designed to aid USGS authors in the preparation of manuscript reports, collectively referred to as "Suggestions to Authors" (STA). The requirement to review manuscripts and obtain Director's approval was further articulated in the first edition of STA (p. 5) published in 1909:

"Every paper should be transmitted to the Director by the chief of the branch in which it originated, whose recommendation for publication will be regarded as an approval of the paper from a technical or scientific point of view. If the paper originating in one branch, say water resources, contains matter pertaining to the work of another branch, say geologic, the chief under whom the paper originated should, before transmitting it to the Director, refer it to the chief of the other branch for approval (after revision as necessary) of the portion germane to his work."

Although all approvals became Director's approval, the process differed somewhat across each of the four major technical disciplines composing the USGS—Geology, Water, Geography, and Biology. Whereas the administrative names of these technical disciplines have changed over the years, such as Branch, Division, Discipline, and Mission Area, the discipline name itself was sometimes retained. For example, the Water Resources Division was later called the Water Discipline and is currently referred to as the Water Mission Area, or simply Water. The original administrative names of the technical disciplines are used herein for historical context.



In the Geology Division, Director's approval for all publications other than abstracts was originally conferred by the Chief in the Office of Scientific Publications in the Reston, Va., headquarters.

Three regional publications groups were established in the Geology Division in the 1960s. These groups ensured publication quality and adherence to USGS publishing standards and played a key role in editing and formatting USGS geologic maps in accordance with mapping standards. Abstracts were reviewed and approved at the Regional Publications Groups level. In the early 1980s, all approvals were transferred to the Publications Chiefs in the three Regional Publications Groups for Geology.



Three geologists scramble downhill to document driftlogs stranded by a tsunami generated by the magnitude 8.6 Andreanof Island earthquake in 1957. U.S. Geological Survey photograph by Robert Witter.

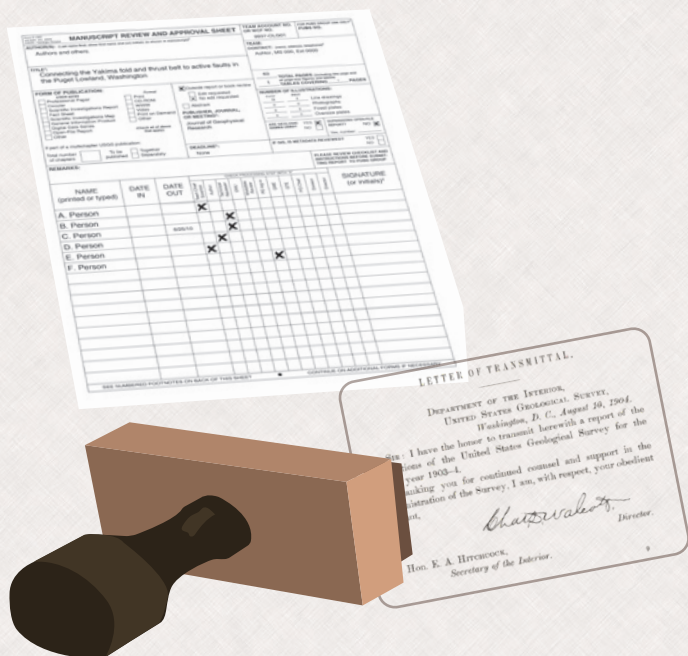


In the Water Resources Division, Director's approval was granted by the Chief Hydrologist in headquarters at Reston, Va.

A cadre of senior Water editors was established in headquarters who reviewed and recommended approval of scientific manuscripts. In 1967, the Water Resources Division created positions known as Regional Reports Specialists. These specialists were responsible for ensuring report quality and adherence to USGS publishing standards and recommending approval to headquarters. In 1993, Director's approval in the Water Resources Division was delegated to each Regional Hydrologist who then transferred approval responsibility to the Regional Reports Specialists.



U.S. Geological Survey (USGS) scientists explaining water monitoring in the Big Bend National Park region, Texas. USGS photograph by Daniel Pearson, September 2010.







In Geography, formerly the National Mapping Division, Director's approval was conferred in the Associate Director of Geography's Office, in Reston, Va., and later by a staff member working for the Geography Chief Scientist. Preliminary review and approval were conferred at the four Mapping Centers (Menlo Park, Calif.; Denver, Colo.; Rolla, Mo.; and Reston, Va.) and at the Earth Resources Observation and Science Data Center (Sioux Falls, S. Dak.). Final Bureau approval was not delegated to Regional Chief Scientists until FSP was put in place Bureau wide in 2006.



U.S. Geological Survey (USGS) topographic mapping crew at camp in the Cascade Mountains of Washington. USGS photograph by A.E. Murlin, January 1, 1903.



On October 1, 1993, the Secretary of the Department of the Interior, by Secretarial order, established the National Biological Survey as a new research agency within the Department. Subsequently, the National Biological Survey was incorporated into

the USGS in 1996 and renamed the Biological Resources Division (BRD). At that time, Director's approval was conferred at the science center level by the individual science center directors.

## Peer Review

The USGS defines peer review (also referred to as technical peer review, refereeing, or scientific peer review) as scrutiny of work or ideas by colleagues (peers) who are qualified. Regardless of the administrative changes that the Bureau may have undergone, the purpose of the technical peer review has not changed. This purpose, according to the fifth edition of STA, is to ensure the validity of the science being reported and the clarity of that presentation. More recent editions of the STA, second through the seventh editions, emphasized review by technical and scientific staff. The fifth edition of STA (p. 11) outlined the process for reconciling peer review comments, and, for the first time, differentiated preliminary (informal) review by colleagues from subsequent formal peer review:

“While the author is preparing the text and illustrations of the manuscript report, he will profit greatly from consultation with fellow workers on both general and specific problems. Also, the author may wish to have all or parts of the manuscript reviewed in a preliminary way by associates who are familiar with the subject matter. Such informal review often pays large dividends, and it requires comparatively little effort on the part of either author or reviewer.”

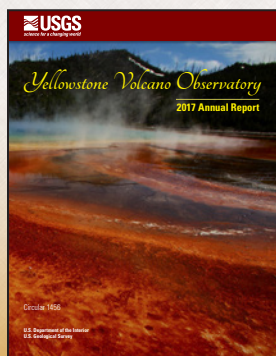


U.S. Geological Survey photograph of an arctic fox on the tundra of Alaska's North Slope. Photograph by Ryan Askren.

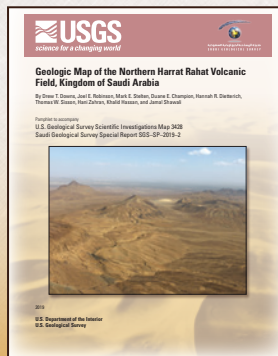
## Science Publishing Network

Examples of publications

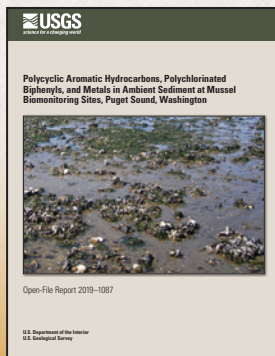
### Circular



### Scientific Investigations Map



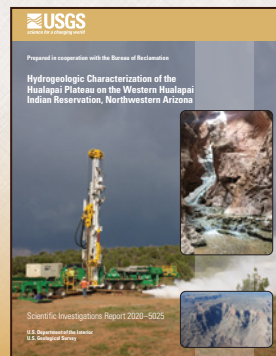
### Open-File Report



### Fact Sheet



### Scientific Investigations Report





Formal peer review was established first in the Water Resources Division by Chief Hydrologist Luna Leopold on June 4, 1959, by way of the “Water Resources Division Policy Statement No. 1.”

“When a manuscript is considered to be ready for review, the supervisor will arrange for review by one or more qualified professionals within the Survey (in some cases from outside the Survey). The author may assist his supervisor by suggesting appropriate reviewers. Comments by the reviewers must be considered in the preparation of a final draft to be presented to the author’s supervisor for subsequent transmittal through channels toward ultimate publication. The manuscript should be accompanied on its movement to all Administrative levels by a brief summary of the comments of each reviewer and of the changes that were made in response to the reviewer’s suggestions. This summary should be matter of fact and dispassionate. If necessary, the supervisor will prepare the summary. If any significant suggestions made by the reviewers are not accepted, the author will present reasons why he found the suggestions unacceptable.”

When scientists sought publication in outside journals, their manuscripts were also subjected to the journal peer review process.

Until FSP was implemented in 2006, peer review requirements chiefly remained the same across the Bureau following issuance of Leopold’s policy statement with the exception of the BRD. The BRD, which came into the USGS in 1996, had no formal peer review requirements. Few records were kept documenting any science center-specific process used in the peer review of information products. BRD peer review requirements were at the discretion of the individual science center directors with the exception of journal articles where peer review was required by the journal. “Internal records indicate that formal peer review requirements for BRD were drafted in 1996, but there is no documentation that these requirements were ever finalized” (R. Shively, U.S. Geological Survey, written commun., 2020).

## Peer Review and Approval in the USGS after Fundamental Science Practices

The initial implementation of FSP on July 24, 2006, ended discipline-specific review and approval processes. FSP standardized the peer review and approval process across the Bureau and is described in USGS Survey Manual chapters [SM502.3](#) and [SM502.4](#). FSP policy requires a minimum of two peer reviews. Authors and supervisors are disallowed from peer reviewing one another’s works. At least one reviewer must be from outside the originating office. Qualified peer reviewers are defined to possess appropriate education and expertise, have no stake in the outcome of the review or publication of the work, and are not directly associated with the work being performed. Under FSP, the term “Director’s approval” was replaced with “Bureau approval” to more accurately express that approval is on behalf of the Bureau. Designated Bureau Approving Officials were put in place and delegated responsibility to (1) validate the scientific

excellence of information products, (2) ensure that all appropriate reviews and reconciliations have been conducted and that information products are consistent with all pertinent USGS and Departmental policies, and (3) confer final approval for release of information products. Since implementation of FSP in 2006, the peer review and Bureau approval process within the USGS has remained essentially the same.

## Conclusion

The U.S. Geological Survey (USGS) has valued and used some form of peer review and Bureau approval since its creation in 1879. Peer review practices varied within USGS organizational units until the implementation of Fundamental Science Practices in 2006. This implementation formalized Bureau-wide science practices, including peer review and approval, for Bureau scientific reports (information products) released to the public. The creation of consistent practices, both in how USGS science is conducted and how it is ultimately published, has led and continues to lead to enhanced trust in USGS products among its stakeholders and the public.

## Learn more about the history and current processes of USGS Fundamental Practices and publications at:

Fundamental Science Practices (FSP) Homepage:

<https://www.usgs.gov/about/organization/science-support/science-quality-and-integrity/fundamental-science-practices>

In-depth summary of FSP rationale, practices, and policies:

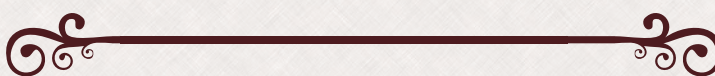
<https://pubs.usgs.gov/circ/1367/>

Mary Rabbitt, 1980: A history of geology in relation to the development of public-land, federal-science, and mapping policies and the development of mineral resources in the United States during the first 25 years of the U.S. Geological Survey. <https://pubs.usgs.gov/book/1980/rabbitt-vol2/report.pdf>

Suggestions to authors of the reports of the United States Geological Survey, 1909 (1st ed.): <https://pubs.er.usgs.gov/publication/70058734>

Suggestions to authors of the reports of the United States Geological Survey, 1958 (5th ed.): <https://pubs.er.usgs.gov/publication/70058737>

Suggestions to authors of the reports of the United States Geological Survey, 1991 (7th ed.): <https://doi.org/10.3133/7000088>



The authors gratefully acknowledge the contributions of Ronald E. Kirby, retired USGS Bureau Approving Official. His efforts in documenting the early history of Fundamental Science Practices made this work possible.

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