Measuring Scientific Excellence at the USGS

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The Issue:

How does a research organization, like the USGS, measure scientific excellence and how can that information be used to support future planning?

The scientific reputation of the U.S. Geological Survey (USGS) for excellence, integrity, and objectivity is one of our most important assets. Our gold-standard for science quality brings authority to data and findings, creates and protects long-term credibility, and ensures that the public trust is maintained.

The mission of the USGS is to serve "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." Our vision is to be "a world leader in the natural sciences through our scientific excellence and responsiveness to society's needs." Any measure of scientific excellence must keep the mission and vision in mind.

It is also important, when measuring scientific excellence, to keep the overall imperative of providing impartial, objective and relevant high-quality scientific research. These results, of course, address natural resource decision- and policy-maker issues in response to pressing societal needs. We are policy relevant but policy neutral.

In recent years the USGS has published over 10,000 scientific information products each year, including USGS series publications, journal articles, and other external publications. To evaluate the impact and relevance of our science, the USGS needs to be able to measure the excellence of our scientific research in support of our mission.

The Challenge: What ways should we use to measure scientific excellence in the digital age?

Background Material/Resources:

- "Centres of Research Excellence Performance Measurement Framework Guidelines", The [NZ] Tertiary Education Commission https://www.tec.govt.nz/assets/Forms-templates-and-guides/2c04687749/CoREs-Performance-Management-Framework-guidelines.pdf

- Visualizing USGS Research: Past, Present and Future (https://www.usgs.gov/atom/71016) using VOSViewer (http://www.vosviewer.com/)

- DOI Strategic Plan (https://www.doi.gov/sites/doi.gov/files/uploads/fy2018-2022-strategic-plan.pdf) lists key budget-linked performance indicators for the USGS (also listed in Appendix A)

- The National Science Foundation (NSF) uses expert judgment through NSF Committees of Visitors (https://www.nsf.gov/od/oia/activities/cov/covs.jsp) to evaluate programs.

- Mapping Scientific Excellence (http://www.excellencemapping.net/#/view/measure/top10/calculation/a_ohne_kovariable/field/all-areas/significant/false/org/)

- Federico Ferretti, Ângela Guimarães Pereira, Dániel Vértesy, Sjoerd Hardeman; Research excellence indicators: time to reimagine the 'making of'?, Science and Public Policy, Volume 45, Issue 5, 1 October 2018, Pages 731–741, https://doi.org/10.1093/scipol/scy007
- Nature. 2018. Science needs to redefine excellence. 554:403-404. doi: 10.1038/d41586-018-02183-y https://www.nature.com/articles/d41586-018-02183-y
- "How to Track the Impact of Research Data with Metrics" http://www.dcc.ac.uk/sites/default/files/documents/publications/reports/guides/How_To_Track_Data_Impact.pdf

Expectations:

- Identify the current organizational (not individual) measures of scientific excellence at the USGS?

- How can the scientific impact and relevance of USGS science be best evaluated, measured, and then communicated?

- How can this information help the USGS to determine future scientific research directions and priorities over the next 5 to 10 years?

Appendix A: Current USGS Performance Indicators in FY18-22 DOI Strategic Plan

Bureaus Key Performance Indicators in FY18-22 DOI Strategic Plan

USGS Percent completion of targeted land and water management research actions 100%

USGS Millions of people living in targeted watersheds covered by completed water quality models 306.7

USGS Percent completion of planned water quality sampling and studies for the Nation's groundwater, streams and rivers 100%

USGS Percent completion of the USGS National Water Census baseline 100%

USGS Percent completion of U.S. aquifer groundwater availability baseline studies 43%

USGS Percent completion of targeted species management research actions 100%

USGS Percent completion of targeted biological threats research actions 100%

USGS Percent completion of collaborative research projects on factors affecting fish and wildlife habitat 100%

USGS Percent of land-area coverage available to the public over the internet through the National Geologic Mapping Database 55.5%

USGS Percent of foundational topographic information services updated quarterly to support on-demand mapping 100%

USGS Percent completion of research efforts related to land resource management 100%

USGS Number of terabytes of remotely-sensed data managed 20,140

USGS Percent increase of scientific research enhanced with Advanced Research Computation 100%

USGS Percent completion of targeted non-fuel mineral resource assessments and research 100%

USGS Percent completion of targeted Critical Mineral Early Warning System (CMEWS) analyses and evaluations 100%

USGS Percent completion of targeted natural hazards assessments of very high and high-threat regions of the Nation (Index) 4%

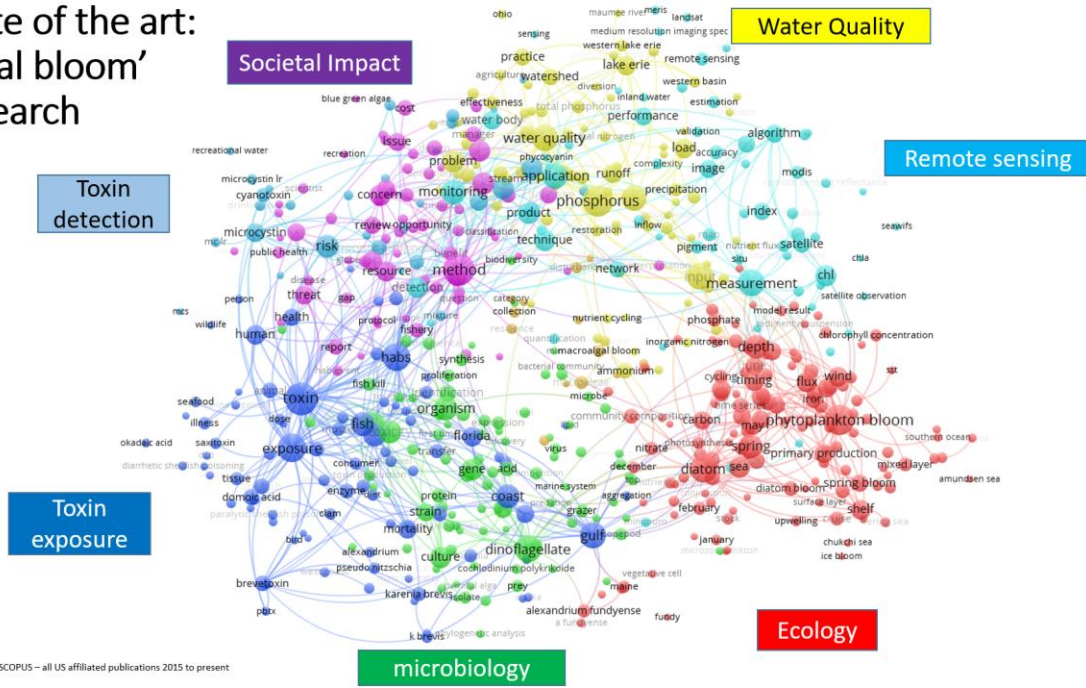USGS Percent completion of targeted landslide hazard research 8%

USGS Percent completion of coastal and marine hazards and subsidence research (Index) 87%

USGS Percent progress towards optimal monitoring capability for natural hazards situational awareness (Index) 52%

USGS Percent of the National Streamflow Network (NSN) streamgages that are fully operational 88%

Appendix B: Using Visualization Tools

From "Visualizing USGS Research: Past, Present and Future"
(https://www.usgs.gov/atom/71016) using VOSViewer (http://www.vosviewer.com/)