THE NATIONAL ACADEMIES

Division on

Earth & Life Studies

Where the nation turns for independent, expert advice

NATIONAL ACADEMY OF SCIENCES ◦ NATIONAL ACADEMY OF ENGINEERING

INSTITUTE OF MEDICINE ◦ NATIONAL RESEARCH COUNCIL

"...the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science..."

—1863 Charter of the National Academy of Sciences

In 1863, President Lincoln signed the charter creating the National Academy of Sciences to honor the nation's top scientists with membership and enlist them to serve as independent expert advisors to the nation.

serving the nation

For advice on issues of science, technology, and medicine, the nation's leaders turn to the National Academies. Established by the Congress under President Abraham Lincoln as an entity separate from government, the institution serves the nation whenever called upon.

The Division on Earth and Life Studies consists of twelve units that enlist the nation's top scientists, engineers, and public health experts to advise the nation on important issues at the intersection of public policy and the geosciences, life sciences, chemical sciences and technology, nuclear science and technology, and the environment. The division's studies and convening activities provide insight and guidance to federal and state leaders who manage the nation's agriculture, water and other natural resources, oceans, climate and energy activities, and laboratory animal and other research assets, as well as providing guidance to the scientific communities in all those realms.

The division produces about 30-40 expert reports each year and regularly convenes experts in meetings and workshops to explore cutting-edge topics. The division's activities have resulted in many measurable impacts.

Our committees produce independent, peer-reviewed consensus reports that help decision-makers understand the scientific issues at hand.

assessing scientific advances

The U.S. Environmental Protection Agency was looking for a vision and strategy for revolutionary change in the scientific approach to testing and evaluating toxic chemicals.

They asked the National Academies to review current practices in toxicity testing and create a far-reaching vision for the future of the science.

Toxicity Testing in the 21st Century (2007) concluded that developing, improving, and validating new laboratory tools based on recent scientific advances could significantly improve our ability to understand the hazards and risks posed by chemicals.

The report advocated sweeping changes in regulatory toxicity testing, changes geared towards creating more informed environmental regulations and dramatically reducing the need for animal testing.

In response to this report, the Environmental Protection Agency and two of the National Institutes of Health formally agreed to undertake the research and development needed to achieve that vision.

Recreational fishing in the United States is an important social and economic component of many marine fisheries, with an estimated 14 million anglers making almost 82 million fishing trips in 2004.

offering guidance to lawmakers

To ensure that fish populations are not overexploited, managers typically monitor recreational fishing through surveys. The National Academies undertook a study of those surveys to determine if they provided an accurate picture of the recreational fishing landscape.

Review of Recreational Fisheries Survey Methods (2006) concluded that the most efficient way to improve current surveys would be to establish a national registry of all saltwater anglers.

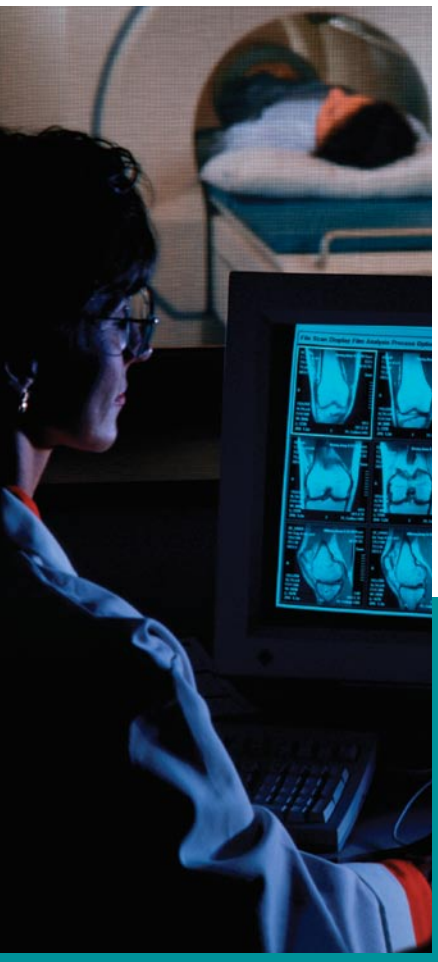
Later that year, Congress passed the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, which specifically cited the Academies report in calling for a national registry and a new survey methodology.

In 2005, Congress directed the Academies to produce a report dealing with the thorny problems posed by the use of highly enriched uranium in the production of medical isotopes.

helping to safeguard the public

Molybdenum-99, which is used in the majority of medical diagnostic imaging procedures in the United States, is typically produced using highly enriched uranium, or HEU. HEU is also used in nuclear explosive devices, so the U.S. government has sought to minimize its civilian applications.

Medical Isotope Production without Highly Enriched Uranium (2009) found that molybdenum-99 could be produced with low enriched uranium instead and that conversion from the production of high to low enriched uranium could be accomplished at a relatively low cost.



In November of 2009, the House of Representatives passed a bill to support domestic projects aimed at producing molybdenum-99 using low enriched uranium.

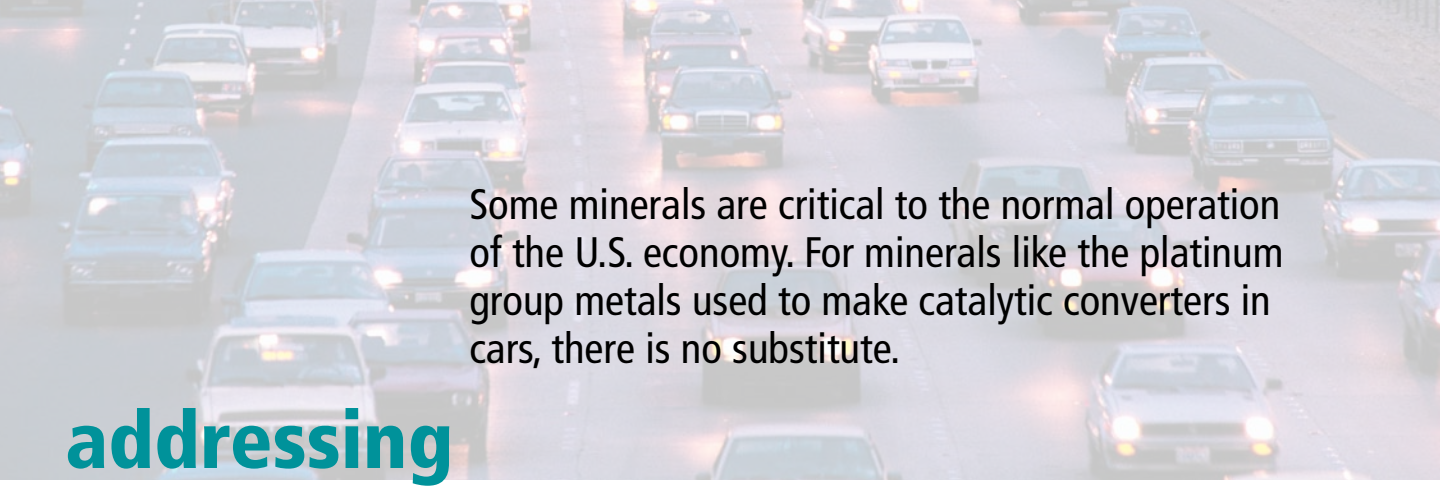
Washington state lawmakers had wrestled with management of water resources in the tightly controlled Columbia River Basin.

supporting efforts to protect the environment

Seeking objective outside advice, they turned to the National Academies to carry out a study that would answer a central question in the debate: if 1 million acre-feet of water were to be removed from the river, what impact would that action have on endangered species?

The National Research Council report ***Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival*** (2004) concluded that water removal could put salmon populations at risk and that water withdrawals would have to be made carefully to avoid affecting wildlife.

State policymakers passed legislation creating a new water storage program with provisions for the protection of salmon based on the report's findings.



Some minerals are critical to the normal operation of the U.S. economy. For minerals like the platinum group metals used to make catalytic converters in cars, there is no substitute.

addressing challenges to industry

If the supply of any given mineral were to become restricted, consumers and sectors of the U.S. economy could be significantly affected. Until 2006, however, no methodology existed to identify which minerals are most critical.

Minerals, Critical Minerals, and the U.S. Economy (2006) introduced a "criticality matrix," which is a simple generic tool for evaluating mineral criticality, flexible enough to adapt to any specific business or strategic needs.

General Electric has now adopted the matrix described in this report to help guide business decisions related to the purchase of minerals and manufacture of products.

The rapid conversion of open land to urban and suburban areas has profoundly altered how water flows during and following storms, channeling higher volumes of water and more pollutants into the nation's rivers, lakes, and estuaries.

advising regulatory bodies

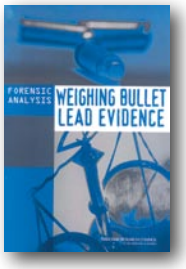
In light of the challenges posed by its enormous realm of oversight with regard to water discharge, the EPA asked the National Research Council to review its stormwater program.

In the resulting report, ***Urban Stormwater Management in the United States*** (2009), the NRC called for an entirely new permitting structure that would put authority and accountability for stormwater discharges at the municipal watershed level.

The EPA has acted on a number of recommendations from this report to improve its 20-year program for regulating stormwater.

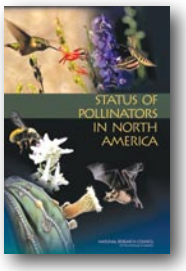
Evaluating scientific approaches

Starting in the 1960s, FBI testimony in thousands of criminal cases relied on comparing the elemental composition of bullets found at a crime scene to the elemental composition of bullets found in a suspect's possession. In 2007, the FBI announced it would review all criminal convictions in which this type of analysis had been used after the technique was critiqued in ***Forensic Analysis: Weighing Bullet Lead Evidence*** (2004).



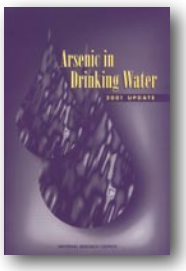
Finding solutions to the challenges of agriculture

Pollinators are insects, birds, bats, and other animals that carry pollen from the male to the female parts of flowers for plant reproduction and an essential part of natural and agricultural ecosystems. ***Status of Pollinators in North America*** (2006) identified species in decline, causes of decline, and potential consequences, resulting in more funding for USDA's pollinator research program.



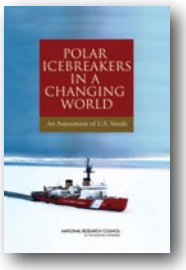
Responding to public health concerns

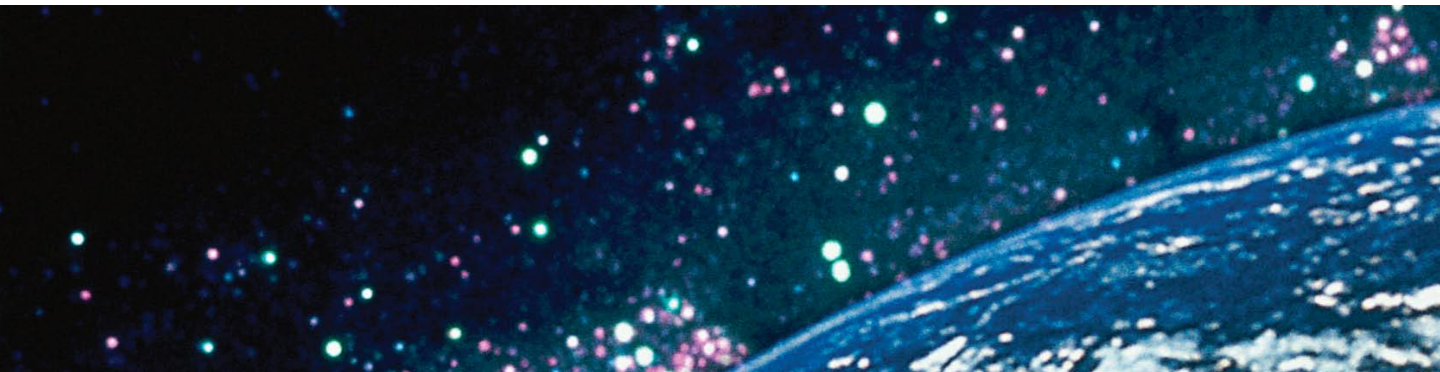
Safe drinking water is important to everyone. ***Arsenic in Drinking Water: 2001 Update*** provided the scientific basis for the Environmental Protection Agency's decision to reduce the maximum allowable level of arsenic in drinking water from 50 to 10 parts per billion, making the nation's drinking water safer.

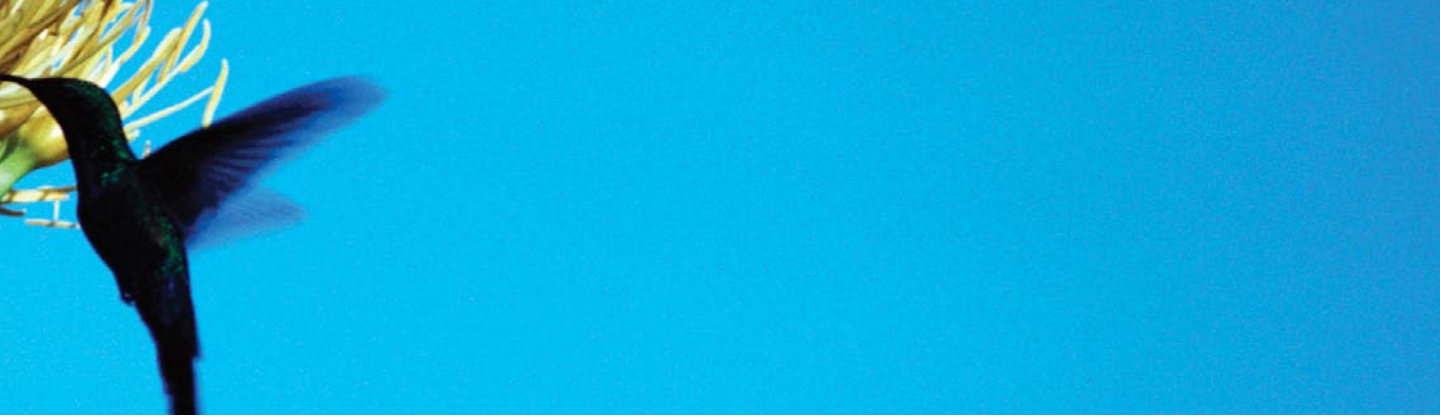


Informing government spending decisions

Polar icebreaking ships provide access to the polar regions above the Arctic circle and in the Antarctic, where the United States has enduring interests. ***Polar Icebreakers in a Changing World*** (2006) recommended the construction of two new icebreakers, which Congress then ordered the U.S. Coast Guard to acquire or construct.

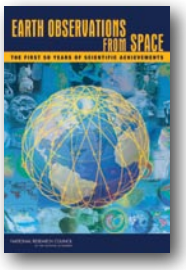






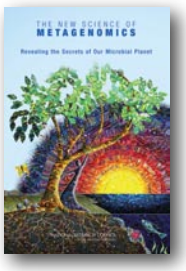
Contributing to science education

To accompany ***Earth Observations from Space: The First 50 Years of Scientific Achievements***, the Academies released a CD and brochure. The CD contained images and video clips from throughout the history of satellite and spaceflight. Thousands of copies of the CD have been requested by teachers in K-12 education.



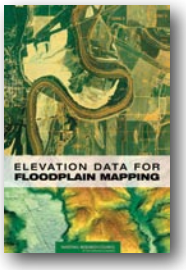
Defining new terrain for scientific study

The New Science of Metagenomics (2007) provided an overview of this emerging area of study, which provides a new way of viewing the microbial world. This report both coined the term for this exciting new field and assessed its current state and future opportunities.



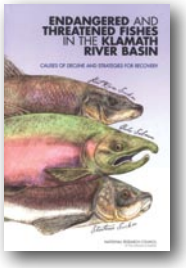
Providing guidance for federal agencies

Elevation Data for Floodplain Mapping (2007) highlighted methods and technologies that could be used to modernize the Federal Emergency Management Agency's floodplain maps. The U.S. Senate Appropriations Committee acknowledged the value of the report's recommendations and directed FEMA to implement the report's recommendations as it continues its Map Modernization Program.



Sustaining biological diversity

Endangered and Threatened Fishes of the Klamath River Basin: Causes of Decline and Strategies for Recovery (2003) identified priorities for federal agencies charged with protecting fish in Oregon's Upper Klamath Lake and Klamath River. It identified four dams on the river as the most significant dangers to the river's fish populations. Currently there is an agreement to remove all four of the dams to protect the fish.



Serving the nation with expert, independent advice in many different ways.

Reports

The National Academies produce about 200 authoritative reports a year, ranging from targeted studies to comprehensive assessments. The study process brings together scientists and other experts with diverse backgrounds and points of view. These volunteers are chosen by the Academies to address a specific set of questions. Committee members work together to review available scientific evidence, reach consensus, and issue a report with their findings and recommendations in an environment free of political, special-interest, and agency influence. A rigorous peer review and other checks and balances are a part of every study to ensure the integrity of the reports.

Reports are organized into three general categories:

Regulatory analyses are designed to help guide regulatory and policy decisions. For example, a U.S. House of Representatives committee requested and then implemented the recommendations of *Scientific and Humane Issues in the Use of Random Source Dogs and Cats* (2009).

Program reviews evaluate current or proposed government programs. For example, municipalities, counties, and states grappling with ensuring adequate amounts of water in times of high demand and low supply may benefit from *The Science of Instream Flows: A Review of the Texas Instream Flow Program* (2005).

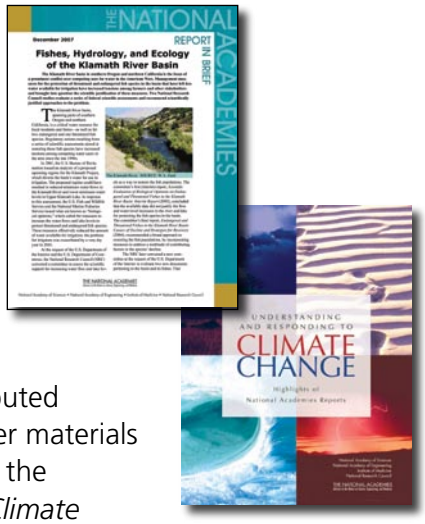
General assistance reports answer specific questions on diverse topics. For example, the Florida Department of Citrus has sought advice and assistance of the Academies in combating Greening Disease, a currently incurable insect-borne disease that kills citrus trees in within a few years of infection. The state is funding research based upon the Academies recommendations. In another example, advice on how to begin a program to transport spent nuclear fuel from current storage to permanent storage, as outlined in *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the U.S.* (2006), has been used to support a variety of actions taken by the U.S. Nuclear Regulatory Commission, the Association of American Railroads, and the U.S. Department of Energy.

Convening Activities

Convening activities bring together experts with wide ranges of perspectives to discuss timely issues. Often these involve policy-makers, members of industry, scientists, and sometimes the general public. The events include workshops, symposia, and roundtables that can have anywhere from 25 to 500 participants or more. Proceedings or workshop summaries are often produced to capture the information discussed for those who cannot attend in person. For example, the Disasters Roundtable convenes in Washington, DC several times a year to discuss important issues related to understanding and reducing the effects of natural, technological, and other disasters.

Communications

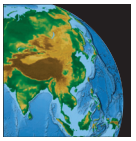
The Academies are not policy advocates and do not represent a stakeholder view point. However, to serve the mandate to advise the nation on matters of science and technology, there are a wide range of efforts to communicate the results of the Academies' work. For example, the Division on Earth and Life Studies has produced a "Report in Brief" series, that presents the messages of many reports in a 4-page format. In addition, the division has produced and distributed numerous educational booklets, web resources, and other materials that help broaden the reach of our reports. For example, the educational booklet *Understanding and Responding to Climate Change* synthesizes our body of work in climate change for a lay audience. Nearly all of these communications products are available online for free.



In addition, DELS publishes the ILAR Journal, a quarterly journal on current topics in the field of laboratory animal research.

Division Leadership



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Advisers to the Nation on Science, Engineering, and Medicine

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The Division on Earth & Life Studies Committee is a group of senior executives and policy leaders who oversee the management, operations, and strategic planning of the division. Its membership is approved by the Governing Board of the National Research Council.

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WORKING WITH THE ACADEMIES

The National Academies are equipped with administrative tools for working with federal, state, and other sponsors to find answers to key scientific questions. Blanket authorization has been granted for federal sole-source contacts. Research grants, cooperative agreements, and contract proposals can be rapidly prepared. Costs vary with the type and scope of the activity. The National Academies have implemented mechanisms to reduce costs and are continuing to review policies and procedures to identify other changes to make the process as efficient as possible.

HOW TO ACCESS OUR EXPERT REPORTS AND FINDINGS

Go to our division web site (http://dels.nas.edu) to browse our independent expert reports, to search for specific findings from the reports, and to sign up to receive email updates about our latest news, events, reports, and projects. The division's reports are also available from the National Academies Press (http://www.nap.edu).