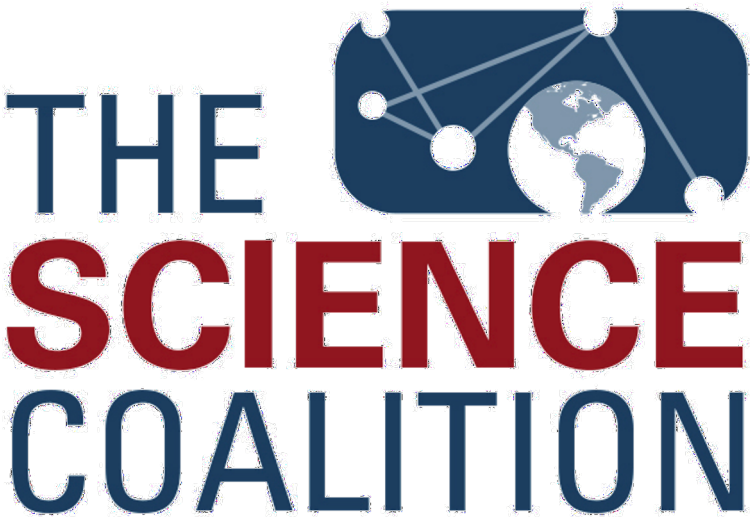

Why Fund Science?

The Science Coalition (TSC) is a nonprofit, nonpartisan organization of more than 50 of the nation's leading public and private research universities. Collectively, TSC members are dedicated to sustaining federal investment in fundamental scientific research as a means to stimulate the economy, spur innovation, and ensure that America continues to lead the world in innovation.

In a divisive political environment, investment in research is something everyone, regardless of party affiliation, can endorse. Our country's scientific enterprise has for decades been a powerhouse for innovation and economic prosperity. Importantly, it is not just research universities who understand this – voters agree. Recent TSC polling shows nearly all voters (94 percent) believe the United States should be the global leader in scientific research and technology, and the majority (82 percent) approve of the federal government providing public funds to achieve this.

TSC members appreciate – as do the American people – that federal research investment can uniquely help solve society's most pressing problems. Cutting-edge advances in health care, energy innovation/sustainability, agriculture, and national security are underpinned by the special relationship between America's research universities and federal research agencies. What's more, there are few investments more catalytic for new industries, more jobs, and expanded economic growth than the basic science that enables discovery and development.

In short, protecting stable, predictable investment in fundamental research is one of the most impactful ways to secure America's continued leadership. During the upcoming campaign TSC urges candidates from all parties and ideologies to remember that fundamental science is central to progress on the issues most important to voters.

For more information on The Science Coalition, please contact tsc@sciencecoalition.org.

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THE SCIENCE COALITION

A Majority of American Voters Support Federal Investment in Science

KEY TAKEAWAYS FROM TSC'S 2018 POLL

A majority of Democratic and Republican voters believe that investment in scientific research should be a priority for the U.S. federal government.

82% of voters approve of the federal government **investing taxpayer funds** in scientific research.

- 77% R
- 87% D
- 79% I

Since 2015, more women and Republican voters have increased their support for federal investment in scientific research.

- 36% more stay-at-home moms
- 34% more midwestern voters
- 32% more Republican base voters

60% of voters feel strongly that the federal government should **invest more** in scientific research.

- 45% R
- 75% D
- 56% I

72% of voters feel that scientific research **helps grow** the U.S. economy.

- 69% R
- 78% D
- 62% I

94% of voters believe it is important for the United States to be the **global leader** in science and technology.

- 95% R
- 96% D
- 89% I

Voters' views about the importance of the United States being the global leader in scientific research and technology are on the rise. Today, 61% of voters say it is "very important" compared to 48% in 2015.

The most important contributions science makes to the U.S. economy and society are:

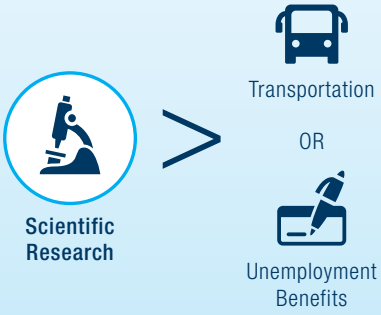
(when ranked by personal importance)

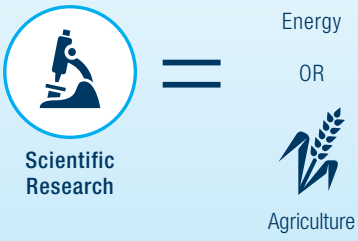
1. developing **new medicines** and curing diseases
2. developing **new energy technologies**
3. identifying the best ways to protect our **environment**
4. developing new **national security technologies**
5. creating new technologies for **business/job growth**
6. keeping America competitive in a **global economy**
7. exploring and better **understanding the world** in which we live
8. exploring **space**

WHEN RANKING

FEDERAL FUNDING PRIORITIES,

VOTERS THINK...





The Science Coalition (TSC) is a nonprofit, nonpartisan organization based in Washington, D.C., comprised of more than 50 of the nation's leading public and private research universities. Serving as a public affairs organization, we are dedicated to promoting the need for sustained federal investment in basic or fundamental scientific research. To learn more about public support for federal investment in scientific research, visit **www.sciencecoalition.org.**

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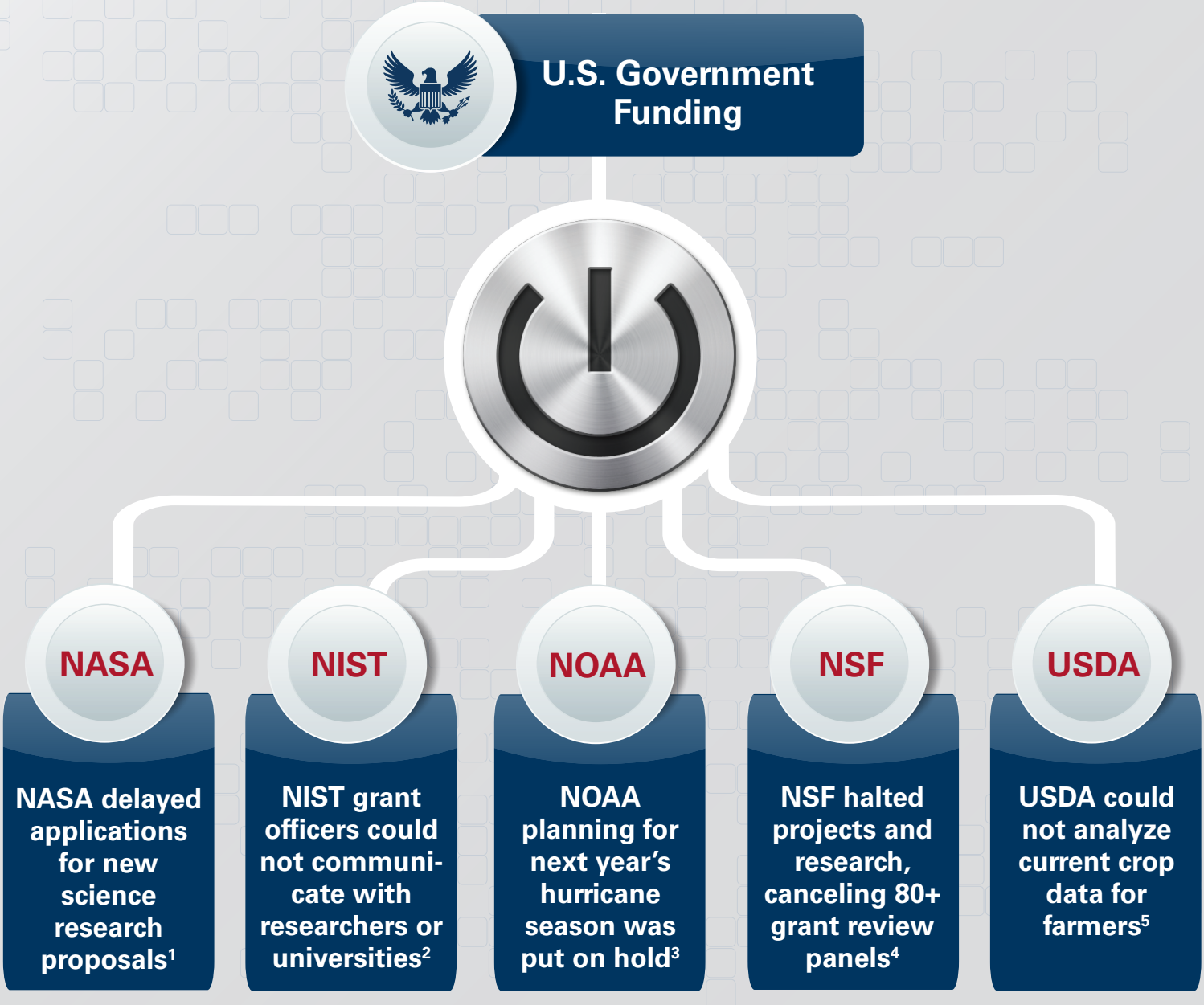
Funding Instability Hurts Scientific Research

At least $1.3 BILLION* in funding for fundamental science research and projects was on hold because of the government shutdown.

Even though the shutdown has ended for now, its lingering costs to research are still being felt. Federal research agencies will take time to get back up to speed, halting university projects for weeks or even months to come.



*Based off FY18 estimates for January

To learn more about the real cost to science, visit sciencecoalition.org

Universities Caught in the Middle

Bloomberg

Shutdown Damage Will Persist Long After U.S. Government Reopens

January 28, 2019 – "The government may be reopening, but the consequences of the longest federal shutdown in U.S. history are likely to linger for national parks, forests, the federal workforce and cutting-edge scientific research. Some may even be permanent…The shutdown forced a weeks-long closure of the National Science Foundation, a hub for research grants. The NSF canceled more than 80 review panels, in which specialized scientists grade applications and decide what research grants to fund, covering everything from molecular biology to cyber infrastructure. Because the upcoming calendar is jam-packed, rescheduling the sessions and clearing the mounting backlog could take months..."

Science

End of U.S. Shutdown Won't Mean Return to Business as Usual for Research Agencies

January 25, 2019 – "The agencies that conduct or fund research that have been mostly closed since 22 December 2018 include NASA, the National Science Foundation (NSF), the U.S. Department of Agriculture, the Food and Drug Administration, the National Oceanic and Atmospheric Administration, and the National Institute of Standards and Technology…Once their doors are open, however, there will be a staggering amount of work waiting to be done."

POLITICO

Shutdown Forces Universities to Scramble for Absent Research Dollars

January 25, 2019 – "Colleges across the country are fronting the money — in some cases, millions — to keep federally funded research projects running. And some may soon have to think about pulling the plug as the longest-ever shutdown drags on, shuttering many of the key agencies that fund university research, including the National Science Foundation, NASA and the U.S. Department of Agriculture. The damage could be long lasting, potentially including job cuts."

TwinCities BUSINESS

The University of Minnesota is Losing More Than $500K Every Day During Government Shutdown

January 21, 2019 – "The expenses derive from the nearly 1,300 awards that University of Minnesota researchers rely on for projects. These awards come from different agencies, including the National Science Foundation, NASA, the U.S. Department of Transportation, the Environmental Protection Agency, and more."

Daily Camera

Concern Over Shutdown Mounting at CU Boulder, Where Majority of Research Funding Comes from Federal Government

January 18, 2019 – "Last year CU received about $369 million, or 72 percent, of its research funding from the federal government, according to the university…Graduate students working in joint programs with federal labs are among those affected, as well as CU researchers who are funded through federal grants."

abc

Web Exclusive: Government Shutdown Disrupting University Research

January 17, 2019 – "The university receives 50-60% of its research funding from the federal government. Rulli [Associate Vice President for Research at Notre Dame] says that 30% of all research funding is impacted by the shutdown, specifically from agencies including the National Science Foundation, NASA, and the National Endowment for the Humanities."

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[1] https://www.theverge.com/2019/1/29/18202071/nasa-government-shutdown-recovery-backpay-contractors
[2] https://www.commerce.gov/sites/default/files/2018-12/DOC%20Lapse%20Plan%20-%20OMB%20Approved%20-%20Dec%2017%2C%202018.pdf
[3] https://www.miamiherald.com/news/local/environment/article224016445.html
[4] https://www.bloomberg.com/news/articles/2019-01-28/shutdown-damage-will-persist-long-after-u-s-government-reopens
[5] https://www.foodingredientsfirst.com/news/us-government-shutdown-fda-and-usda-feel-the-squeeze-as-key-services-come-under-threat.html

SEQUESTRATION'S POTENTIAL IMPACT TO FEDERAL SCIENCE RESEARCH AGENCIES

Fiscal year (FY) 2020 is right around the corner, and with it, potentially devastating post-sequestration cuts – mandated by the **Budget Control Act of 2011** – totaling **$225 billion** over the next two years.

POTENTIAL IMPACT TO FEDERAL SCIENCE RESEARCH AGENCIES IN FY20

Office of Science
$593 MILLION ↓

Basic Research Funding
$278 MILLION ↓

NIH
$3.5 BILLION ↓

NSF
$726 MILLION ↓

FOR A CUT OF $5.1 BILLION TO CORE FEDERAL RESEARCH AGENCIES

TIME FOR ACTION

Congress and the administration must act by October 1, 2019 to avoid across-the-board spending reductions to defense and non-defense discretionary spending. **The sooner they reach a deal, the better it is for research agencies and their employees, as well as America's research universities.**

Failure to reach an agreement could have serious implications for federal investment in scientific innovations and life-changing technologies. Decreased funding has a very real impact for regional economies supported by these resources.

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To learn more visit sciencecoalition.org

Budget impact is based off projections from the Center for Budget and Policy Priorities, March 2019

EVERYDAY TECHNOLOGIES FROM **FUNDAMENTAL RESEARCH**

Federal funding for fundamental research has led to humankind's most groundbreaking discoveries, from the Internet to DNA fingerprinting. Fundamental research touches our lives in a myriad of ways. Here are some ubiquitous technologies – thanks to decades of fundamental research – that make our everyday lives better.

LASER:

Building off work funded by the **Air Force Office of Scientific Research (AFOSR)**, researchers at **Columbia University** drew from Albert Einstein and Wolfgang Paul to create the "maser," laying the groundwork for the laser itself in 1960.[1] Since its inception, the laser has been the basis for a long list of modern technologies, from the DVD player[2] to life-saving medical treatments.[3]

GLOBAL POSITIONING SYSTEM (GPS):

After Sputnik's launch, researchers at the **Massachusetts Institute of Technology (MIT)** and **Johns Hopkins University** determined the satellite's exact location through the Doppler effect.[4] With this observation, and the creation of atomic clocks at the **National Institute of Standards and Technology (NIST)**,[5] the **Department of Defense (DOD)** and Johns Hopkins University developed Transit, the first global satellite navigation system and precursor to the modern GPS.[6]

BABY FORMULA:

While prepping for a Mars mission, research funded by the **National Aeronautics and Space Administration (NASA)** uncovered algae rich in omega-3 fatty acid, a nutrient in breast milk that helps brain function. That ingredient has since been added to more than 90% of infant formula brands on the market as an enriched supplement.[7]

LITHIUM-ION BATTERY:

Based on fundamental research in the 1950s in lithium chemistry,[8] and supported by advances in the **Department of Energy's (DOE) Office of Basic Energy Sciences (BES)**, lithium-ion batteries now power everyday machinery and act as a viable solution to grid-scale energy storage.[9]

MAGNETIC RESONANCE IMAGING (MRI):

Researchers at **Stanford University** and **Harvard University** laid the groundwork for the MRI in 1946 when they discovered the phenomenon of nuclear magnetic resonance. Through the 1990s, the **National Science Foundation (NSF)** and the **National Institutes of Health (NIH)** committed substantial funding to ensure the MRI could be developed into the widely used diagnostic tool it is today.[10]

TOUCH SCREEN:

Originally used for air traffic control, the first touch screen was invented in the 1960s with indium tin oxide – a compound crucial to electric conductivity.[11] Today's touch screen emerged years later from a **National Science Foundation (NSF)**-funded project at the **University of Delaware**, when researchers searched for a no-pressure keyboard.[12]

THE SCIENCE COALITION

Learn more about America's investment in fundamental research at our website:
www.sciencecoalition.org

RESOURCES

1. http://www.au.af.mil/au/awc/awcgate/ndu/spawned_by_basic_research.pdf
2. http://www.innovationtaskforce.org/NewSite/wp-content/uploads/2012/08/scientific_research_2012.pdf
3. http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/townes-charles.pdf
4. https://www.nap.edu/read/9479/chapter/4
5. https://www.nist.gov/pml/time-and-frequency-division/time-services/brief-history-atomic-clocks-nist
6. https://www.darpa.mil/about-us/timeline/transit-satellite
7. https://spinoff.nasa.gov/Spinoff2008/ch_8.html
8. https://physicstoday.scitation.org/doi/pdf/10.1063/PT.3.3296
9. https://science.energy.gov/~/media/bes/pdf/BESat40/BES_at_40.pdf
10. https://www.nsf.gov/about/history/nifty50/mri.jsp
11. https://arstechnica.com/gadgets/2013/04/from-touch-displays-to-the-surface-a-brief-history-of-touchscreen-technology/
12. http://www1.udel.edu/udaily/2014/may/nai-fellows-052714.html

The National Science Foundation:

STEERING THE FUTURE

of Fundamental Science

THE SCIENCE COALITION

WHAT DOES THE NSF DO?

The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 to promote the progress of science, advance the country's prosperity, welfare, and health, and secure the national defense. Put simply, the agency's focus is **advancing knowledge and unearthing discoveries for the benefit of society** – from astronomy to geology to zoology.

As the only federal agency that supports fundamental research in all fields of science and engineering, NSF invests in the research that underpins our economy, including **"high-risk, high pay-off"** ideas, novel collaborations, and numerous projects that may seem like science fiction today, but will shape our future in meaningful ways.

WHY DOES THE NSF MATTER?

NSF is a unique federal agency in the way it operates – from the bottom up. Officials work closely with the research community to identify cutting edge opportunities and monitor the areas of research most likely to result in progress.

Examples of discoveries as a result of NSF-funded research[1] include:

- Technology discovered in 1992 underlying today's wireless internet and cell phone networks;
- A tool that uses brain waves to predict reading problems like dyslexia in young children; and
- Multi-angle snowflake cameras to make winter driving safer and verify snowfall predictions.

WHAT SCIENCE DOES THE NSF FUND?

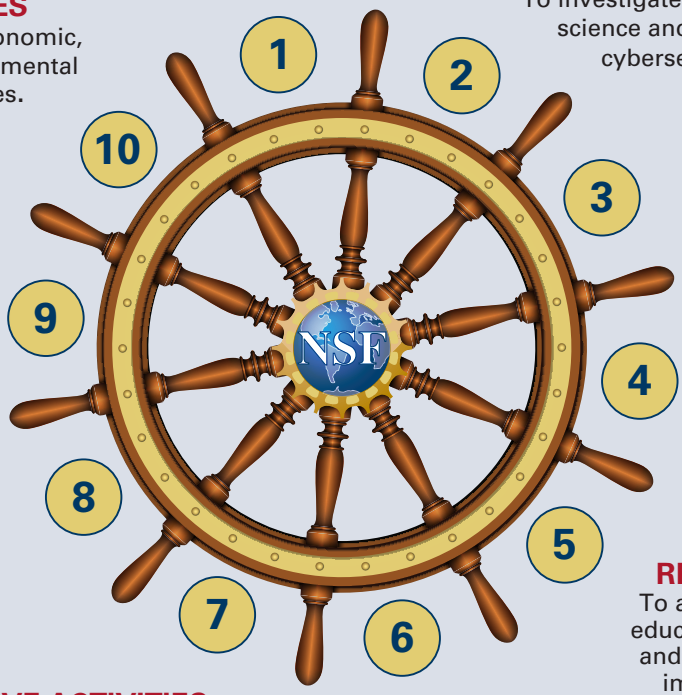
BIOLOGICAL SCIENCES
To enable discoveries for understanding life.

COMPUTER & INFORMATION SCIENCE & ENGINEERING
To investigate computer and information science and engineering, including cybersecurity and big data.

SOCIAL, BEHAVIORAL & ECONOMIC SCIENCES
To understand how social, economic, political, cultural, and environmental forces affect people's lives.

EDUCATION & HUMAN RESOURCES
To achieve excellence in U.S. science, technology, engineering, and math (STEM) education at all levels.

MATHEMATICAL & PHYSICAL SCIENCES
To harness the collective efforts of the math and physical sciences communities to address the most compelling scientific questions, educate the future workforce, and promote discoveries to meet the needs of the nation.



ENGINEERING
To enrich the understanding of natural systems, enhance electronics, and fortify the nation's infrastructure.

INTERNATIONAL SCIENCE & ENGINEERING
To promote innovation through access to international knowledge, infrastructure, and capabilities.

ENVIRONMENTAL RESEARCH & EDUCATION
To advance environmental research, education, and scientific assessment, and to determine the best means of implementing related activities.

INTEGRATIVE ACTIVITIES
To lead and coordinate strategic programs and opportunities across disciplinary boundaries.

GEOSCIENCES
To expand our knowledge about the processes that affect the global environment including the atmospheric, earth, ocean, and polar sciences.

[1] https://www.nsf.gov/about/congress/reports/Transforming_the_World.pdf

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From the surface of the sun to the depths of the ocean floor

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

WHAT NOAA DOES:

The National Oceanic and Atmospheric Administration (NOAA) was established in 1970 to understand and predict changes in climate, weather, oceans, and coasts, share that knowledge and information with others, and conserve and manage coastal and marine ecosystems and resources.

WHY NOAA MATTERS:

Our physical world is rapidly changing, and the research conducted at NOAA is vital to predict, protect, manage, and mitigate changes in the environment affecting our daily lives.

Through weather, climate, and storm forecasting, NOAA researchers provide reliable information to people, planners, and emergency personnel so they have the most up-to-date data when making crucial decisions.

Along with cutting-edge research and technology, NOAA's research supports marine commerce and coastal restoration, and its products and services affect more than one-third of the United States' GDP.

NOAA AND FUNDAMENTAL RESEARCH:

NOAA has strong partnerships with our nation's universities, providing grants to support research across a variety of physical sciences, including climate, weather, and marine ecosystems.

Some programs include:

CLIMATE PROGRAM OFFICE: Advances our understanding of the planet's climate system and fosters application for risk management and adaptation efforts.

Example: Researchers at Northeastern University studied the effects of climate change on fisheries to better inform decision-making and plan for future coastal sustainability.[1]

SEA GRANT: Supports research to create and maintain a healthy coastal environment and economy.

Example: The Ohio State University researchers are reducing and mitigating harmful algal blooms to protect Lake Erie.[2]

NATIONAL OCEAN SERVICE: Supports our coasts and oceans through science-based solutions to address economic, environmental, and societal pressures.

Example: The University of Washington houses the Northwest Association of Networked Ocean Observing Systems, which maintains a fleet of real-time sensors, monitors, radars, and buoys across the Northwest to track ocean conditions that benefit the commercial fishing industry, first responders, shellfish growers, native tribes, and more.[3]

1 https://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/COCA/Climate-Fisheries/Funded-Projects?udt_7674_param_orderby=Lead_x0020_PI&udt_7674_param_direction=descending
2 https://ohioseagrant.osu.edu/research/issues/habs
3 http://nvs.nanoos.org

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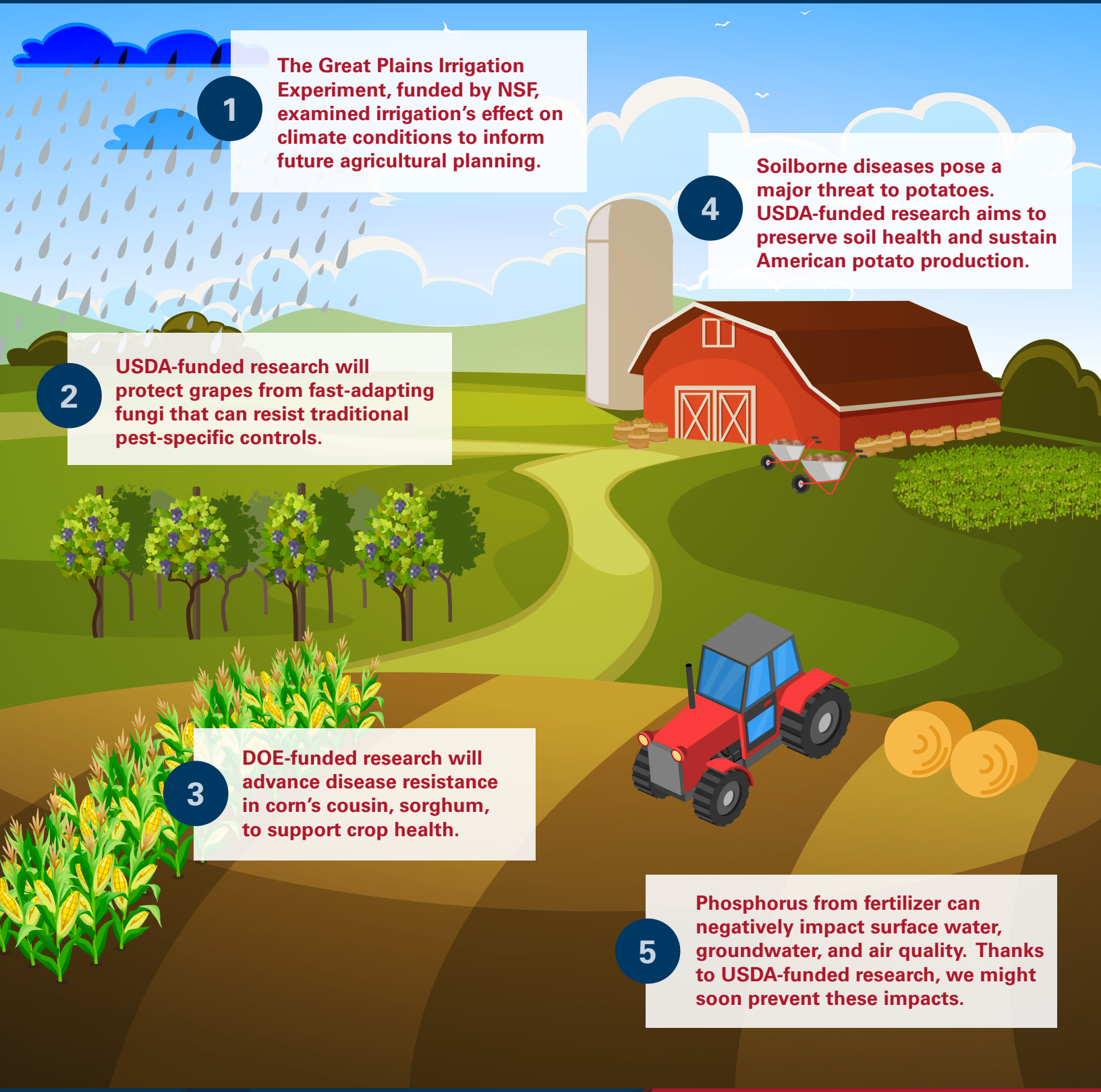
THE FUTURE OF FARMING

How Federally-Funded Fundamental Research Is Planting The Seeds For Innovation In Agriculture

November 2018



1. The Great Plains Irrigation Experiment, funded by NSF, examined irrigation's effect on climate conditions to inform future agricultural planning.

2. USDA-funded research will protect grapes from fast-adapting fungi that can resist traditional pest-specific controls.

3. DOE-funded research will advance disease resistance in corn's cousin, sorghum, to support crop health.

4. Soilborne diseases pose a major threat to potatoes. USDA-funded research aims to preserve soil health and sustain American potato production.

5. Phosphorus from fertilizer can negatively impact surface water, groundwater, and air quality. Thanks to USDA-funded research, we might soon prevent these impacts.

SCIENCE MATTERS

To learn more about how federally-funded fundamental research improves lives, visit **www.sciencecoalition.org**.

1 UNIVERSITY OF NEBRASKA

The Great Plains Irrigation Experiment at the University of Nebraska-Lincoln—funded by the National Science Foundation (NSF)—will help Americans better understand how irrigation affects climate conditions and will inform future agricultural planning and weather forecasting.

2 WASHINGTON STATE UNIVERSITY

With support from the U.S. Department of Agriculture's (USDA) National Institute of Food and Agriculture (NIFA) Specialty Crop Research Initiative, researchers at Washington State University will seek to improve how we detect and predict how harmful fungi develop resistance to traditional pest-specific controls. Based on the results, these findings could be applied to all specialty crops—from apples and cherries to hops and potatoes—and prevent damage from fungi.

3 UNIVERSITY OF ILLINOIS

Corn is an American staple, but research into its cousin—sorghum—might hold the key to more stable crops in the future. At the University of Illinois, researchers are investigating how genes in sorghum confer resistance to harmful fungi. This research, funded by the U.S. Department of Energy (DOE), could lead to greater stability and yields in both crops.

4 UNIVERSITY OF MINNESOTA

The USDA's NIFA Specialty Crop Research Initiative funded research to better understand the complex factors affecting soil health and potato soilborne diseases, a major threat to the crop. Led by investigators at the University of Minnesota, this research will enhance environmental quality and sustain the economic production of potato operations in the U.S.

5 AUBURN UNIVERSITY, UNIVERSITY OF WISCONSIN-MADISON, AND THE UNIVERSITY OF CALIFORNIA, RIVERSIDE

Researchers at Auburn University, the University of Wisconsin-Madison, and the University of California, Riverside are investigating how to prevent poultry and dairy waste—and the phosphorus they contain—from negatively impacting surface water, groundwater, and air quality, thanks to funding from the USDA's NIFA Agriculture and Food Research Initiative.

Follow The Science Coalition on social media: