Preface

As the women and men of the National Environmental Satellite, Data, and Information Service (NESDIS) work daily to accomplish our mission, we interact closely with U.S. industry and affect the economy in a variety of ways. It is a multifaceted and mutually beneficial relationship. Our roles with industry can be summarized as follows:

- **Customer:** NESDIS procures launches, spacecraft, instruments, ground systems, technical services, and commercial imagery. We depend on the expertise and robustness of U.S. industry to meet our needs for improved technology and cost-efficient solutions to accomplish the mission entrusted to us in service to the public.

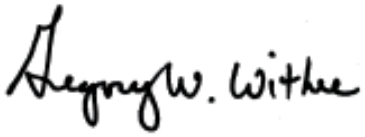
- **Employer:** The NESDIS workforce is an integration of civil service and on-site contract employees, with a commitment of achieving the most efficient workforce structure possible.

- **Data, Information, and Service Provider:** NESDIS provides timely access to global environmental data, information, and assessments used by almost every sector of society and benefiting all Americans. As a multiplier of effect, the private sector adds enhanced value to these products and services.

- **Partner:** Beyond the traditional procurement relationship, public and private sector entities work closely in innovative ways while addressing some of the Nation's most challenging environmental issues.

As an integral component of the Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA), NESDIS is committed to maintaining and strengthening its relationship with business, which in turn promotes job creation, economic growth, sustainable development, and improved living standards for all.

The following are highlights of the NESDIS partnership with industry. It serves as a tribute to dedicated members of both public and private sectors who work together to support the NESDIS mission every day, providing services that promote, protect, and enhance the Nation's economy, security, environment, and quality of life.



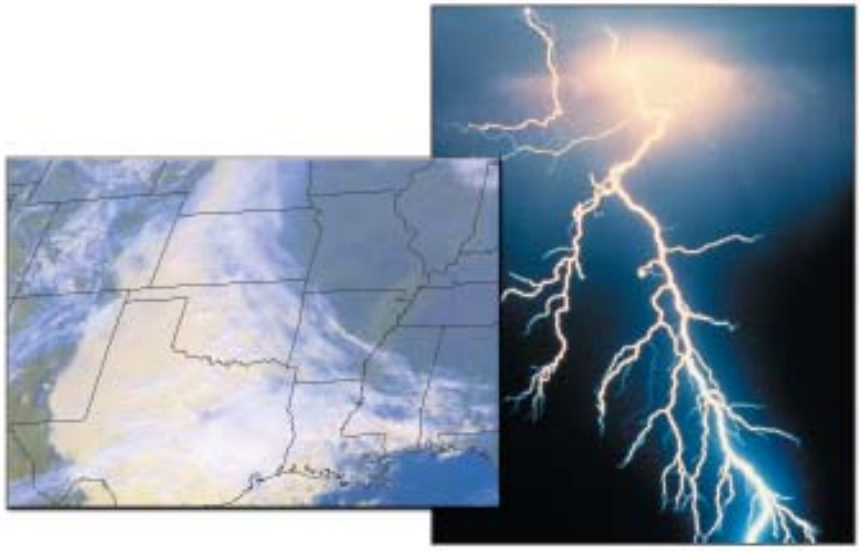
Gregory W. Withee
Assistant Administrator for Satellite
and Information Services

NESDIS wishes to thank industry and academic
partners for their contributions
to this document.

Quality Environmental Information Enhances Our National Economy

Virtually every sector of the Nation's economy relies upon rapid and reliable access to environmental data and information. The National Oceanic and Atmospheric Administration's (NOAA) environmental data form the basis for making decisions that have far-reaching economic consequences on local, regional, and global levels. These data, which cost billions of dollars to collect, are distributed to, and used by government, commerce, industry, science, engineering, and national defense.

NOAA's satellites and Data Centers—operated by NESDIS—focus upon the delivery of high-quality scientific information to U.S. industry to meet its needs. The dramatic explosion of affordable information technologies throughout the 1990s and the growing value-added industry have helped NESDIS reach all economic sectors.



Severe storm over the Midwest. GOES satellite data and imagery product from NESDIS.

NESDIS is committed to preserving the long-term data record of environmental conditions, to capturing current conditions and trends, and to providing these data and information to ensure that the business sector has the best available insight to secure the success of our Nation's economic future. Records that can be used in past, present, and future applications are key:

- **Past.** Records of our environment are crucial to understanding Earth's evolving nature and sustainable health.
- **Present.** Observations from space and from ground-based systems are essential in helping society understand our ever-changing environmental conditions, prepare forecasts, and evaluate seasonal trends.
- **Future.** Trends must be understood to ensure that our economy will continue to be prosperous.

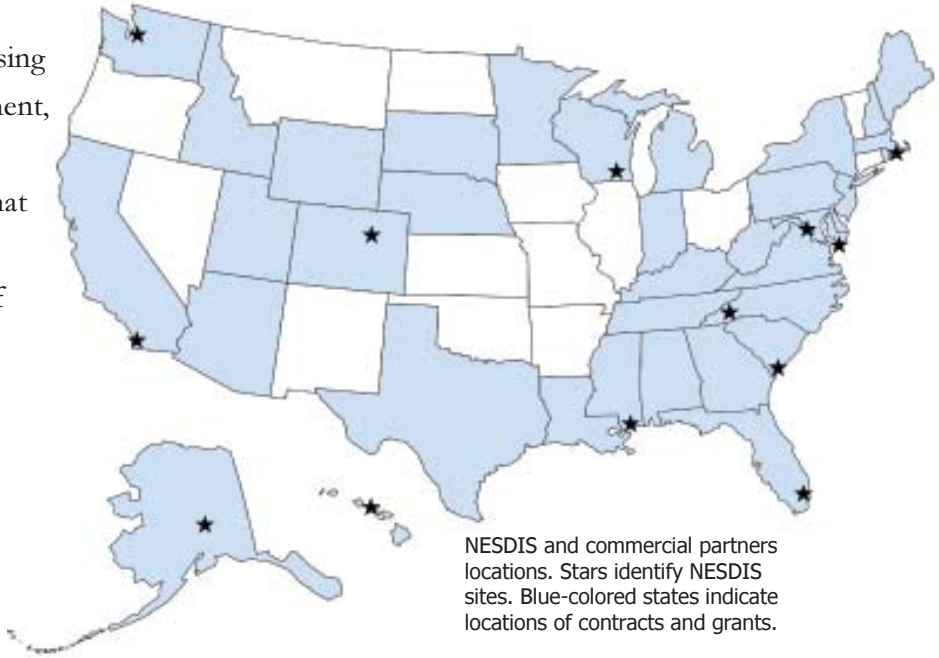
The dramatic explosion of affordable information technologies throughout the 1990s and the growing value-added industry have helped NESDIS reach all economic sectors.

NESDIS Needs: U.S. Industry Delivers

As a satellite service, NESDIS procures launches, spacecraft, instruments, ground systems, technical services, and commercial imagery. NESDIS Data Centers also receive support from numerous and geographically diverse commercial entities. NESDIS depends on the skills and expertise of U.S. industry. Its annual budget for space systems and related services exceeds $500 million. From 1990 through 2000, total estimated contract value for satellite programs and associated services reached $3.72 billion.

NESDIS provides jobs and opportunities for regional economic growth through employment and contracts. NESDIS comprises 830 Federal employees and 530 contractor support members. This dedicated team works diligently to ensure timely access to global environmental data.

NESDIS is eagerly harnessing the best research and development, production, operations, and innovative business solutions that U.S. industry offers to ensure continuity and improvement of our critical services.

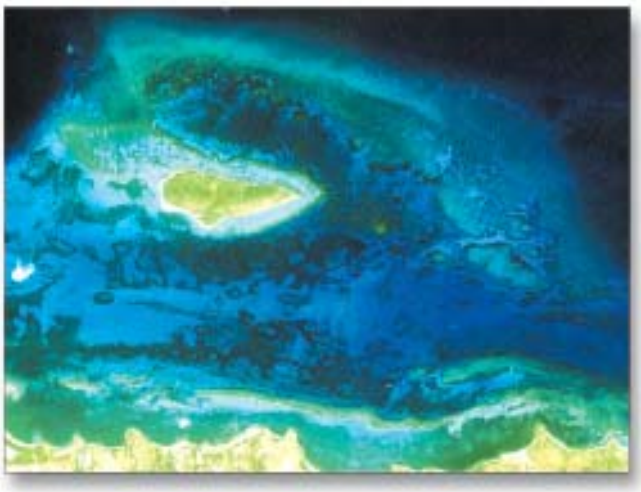


NESDIS and commercial partners locations. Stars identify NESDIS sites. Blue-colored states indicate locations of contracts and grants.

Commercial Remote Sensing: Licensing and Advocacy

NESDIS has regulatory authority to license private, remote-sensing space systems. On behalf of the Secretary of Commerce, NESDIS—through a responsive, predictable, licensing program—has issued 17 licenses covering more than 40 satellites. NOAA plays an integral role in the Federal government's policy to support and enhance U.S. competitiveness in this exciting new sector of the space and information community. These new commercial sources of geospatial information will contribute to wide-ranging civil, commercial, and military applications.

As a separate and independent function from licensing, NESDIS is providing NOAA with leadership in acquiring data as the commercial remote-sensing industry develops. Industry data have helped NOAA with the acquisition of ocean color information to assist in the effective management of fisheries, space-based synthetic aperture radar data for operational ice forecasting, and high-resolution imagery for coral reef monitoring.

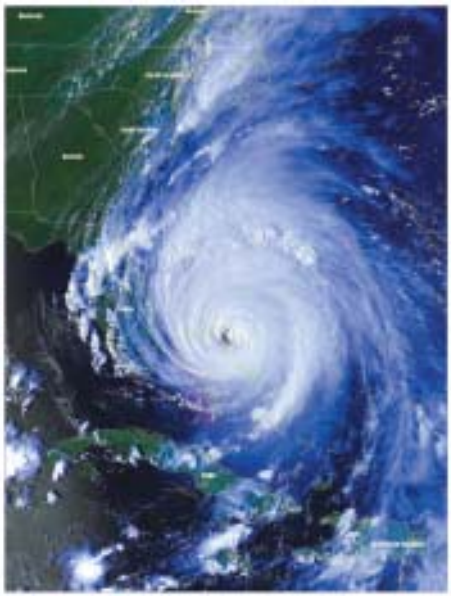


Coral reef ecosystem, Buck Island Reef National Monument, U.S. Virgin Islands. IKONOS satellite image.

Coping with Daily Weather Conditions

Every minute of every day, people can find out about weather conditions in their neighborhood or intended destination, based upon satellite data collected and processed by NESDIS. NESDIS manages the procurement and operation of the geostationary and polar-orbiting environmental observing satellites. These provide information that forecasters use to issue weather warnings and forecasts. NESDIS and NOAA's National Weather Service collaborate with commercial weather providers to produce timely weather and climate information for the public.

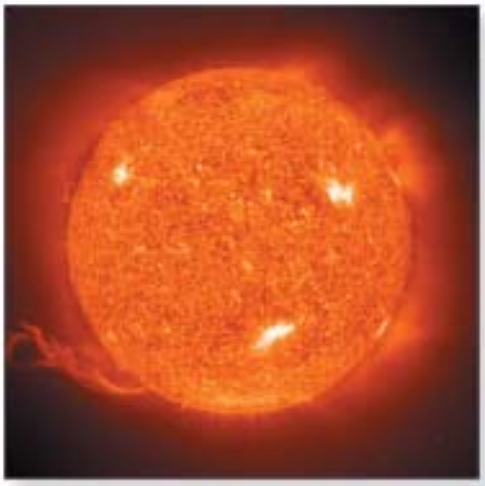
"Is my family in the path of the hurricane?" "What is its strength?" "Will we have time to get to a safe place?" In times of turmoil—from hurricanes to tornadoes to floods—millions of people view NESDIS satellite data on commercial TV, in the newspaper, or via the Web. Our citizens expect access to information that will allow them to keep out of harm's way. Individuals and community leaders clearly understand the public safety issues associated with minimizing loss of life and property from severe weather events. NESDIS data play a critical role in keeping people informed about the weather conditions impacting their lives.



Hurricane Floyd and its aftermath, September, 1999.

Energy

Weather and climate directly influence our national energy policy. Energy companies critically rely upon weather and climate data collected and provided by NESDIS. Hydroelectric plants seek NESDIS data to evaluate stream flow constraints. Utilities use climatological data provided by NESDIS to predict expected demands for energy and determine rate adjustments. Companies that pioneer alternative energy sources—solar, wind, geothermal, ocean waves—also rely upon NESDIS data as part of their research and development.



Space Weather

Space weather has a significant effect upon energy providers, communication, transportation, and space exploration. For example, the Sun periodically generates geomagnetic solar storms that have, on numerous occasions, caused massive power outages. Potential costs associated with power system disruptions due to geomagnetic storms has been estimated to be $3 to $6 billion. Susceptibility to power outages are greater now than before, since so many systems are running at peak output.

Utilities and communication companies rely on near real time NESDIS satellite data to warn about these severe space weather events. The aerospace industry uses NESDIS data to help design and operate satellites for global telecommunications and Earth observations. NESDIS research on satellite failures led many designers to recognize the value of historical space weather data in building sustainable hardware. Additionally, awareness of current space and Earth weather forecasts is essential for the efficient tasking of satellites.

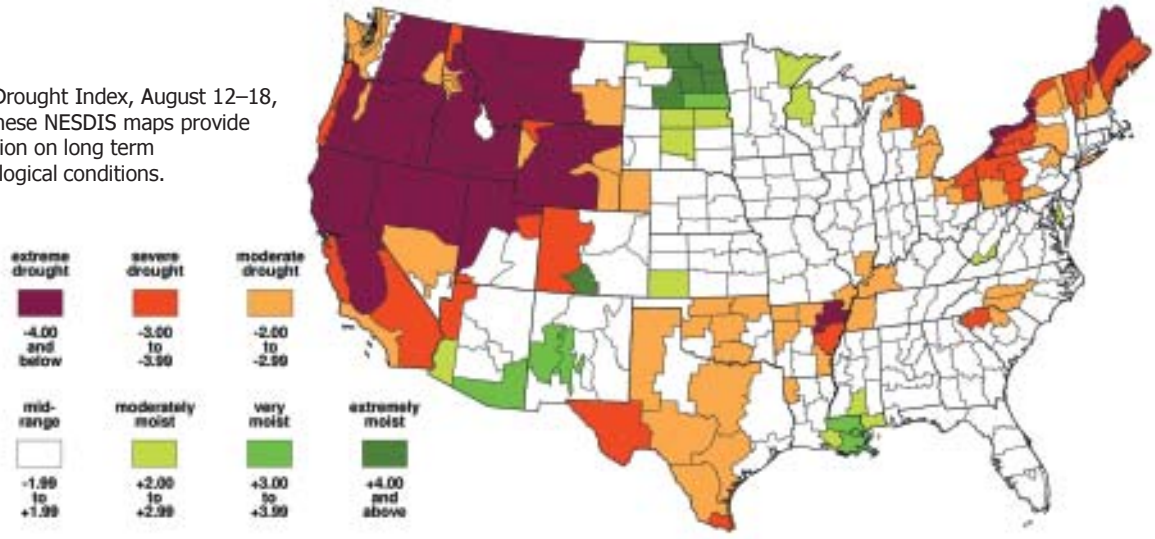
Timely access to NOAA's environmental data is of critical importance. NESDIS' award-winning Web systems allow immediate access to information ranging from historical data to satellite observations recorded only hours ago.

Planning for Climate Variations

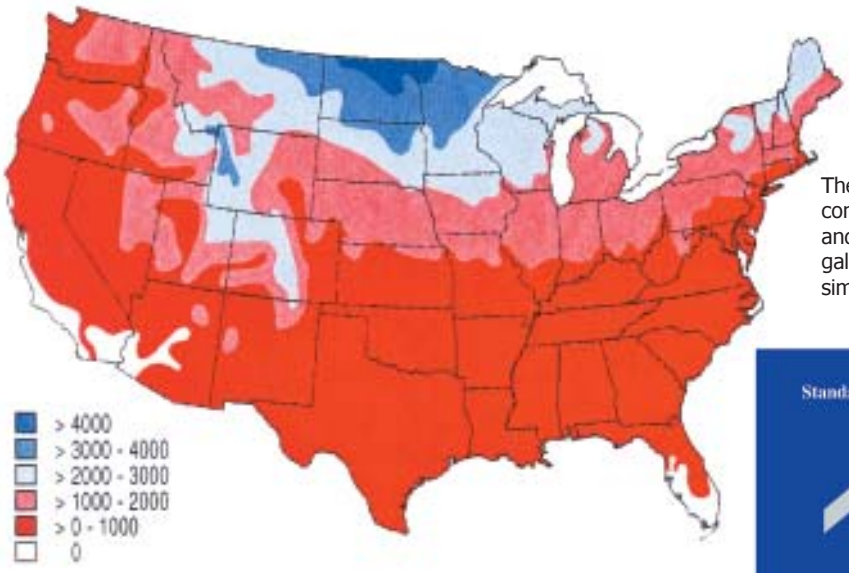
Agribusiness

Drought, excessive rainfall, and late spring frosts can have a detrimental effect on crops and, by extension, the national economy. In the United States, agriculture and forestry are collectively a $100 billion industry. NESDIS data are fundamental to the development of long-term climate and weather forecasts which can help farmers determine optimum agricultural practices. Agribusinesses use environmental data to study the effects of climate variations on crop yields, determine optimal geographic locations for certain crop types, and plan for application of herbicides and pesticides. Forestry managers use these data to plan logging roads, fight fires, and implement controlled burns. Applications of high quality environmental data greatly increase economic stability and growth for the agribusiness industry.

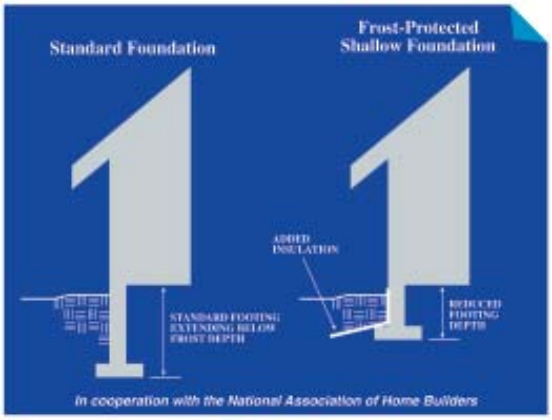
The economic benefits for U.S. agriculture of improved forecasts are approximately $100 million per year. CONTEMPORARY ECONOMIC POLICY, JULY 1995.



Palmer Drought Index, August 12–18, 2001. These NESDIS maps provide information on long term meteorological conditions.



The Air-Freezing Index (AFI) reduces construction costs by $330 million per year and saves an equivalent of 8.6 million gallons of heating fuel. The map shows a simplified AFI over a 100-year period.



New Freezing Index =
1. Building codes changed
2. $330 million saved in new construction costs
3. 586,000 megawatts of energy saved annually

Construction Industry/Real Estate Companies

The construction industry and real estate companies are major users of environmental data. Applications include determining construction deadline penalties due to weather, assisting in site selection for resort and retirement developments, and providing the climate guidance necessary for the design and construction of airports, housing, highways, dam projects, and power plants. Architects request air freezing index and soil freeze depth maps in order to build shallower frost-protected foundations. These shallower foundations have been documented to save $330 million annually in addition to energy savings provided by extra insulation around foundations.

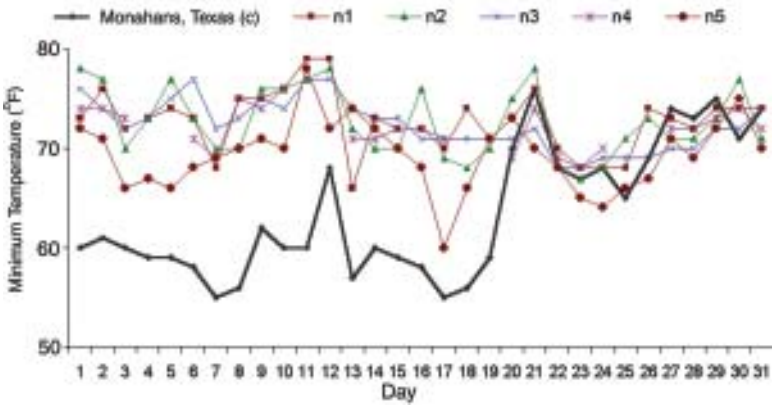
For years, NESDIS has worked with the American Society of Heating, Refrigeration and Air Conditioning Engineers to develop standards for heating and cooling systems in homes and buildings. Climate data are used to improve construction technology, resulting in better insulating materials, strategic

placement of windows, and more efficient heating and air conditioning systems. These improvements have reduced building energy consumption by nearly 50% since the 1970s. Dry-bulb, wet-bulb, and dew point temperatures are used in analyses to improve building ventilation systems and the air quality. Temperature, humidity, sun, and wind data are used to improve indoor comfort levels and reduce energy use. Inefficient heating systems are a significant fire safety risk. By utilizing climate data, engineers can properly plan and design for extreme cold events and install appropriately-sized, safe, and efficient heating systems.

Weather Derivatives

Weather derivatives are market options that help industries protect themselves financially against adverse climate conditions. In the United States, it is estimated that 15–20% of the economy is directly affected by weather. While farmers look forward to rain, neighboring marina owners may not; while ski resorts wish for huge snowfalls, urban city governments may be overwhelmed by snow removal problems.

Weather derivatives help enterprises protect themselves from the uncertainties of nature or seasonal climate anomalies by establishing a market in which weather risks can be managed.

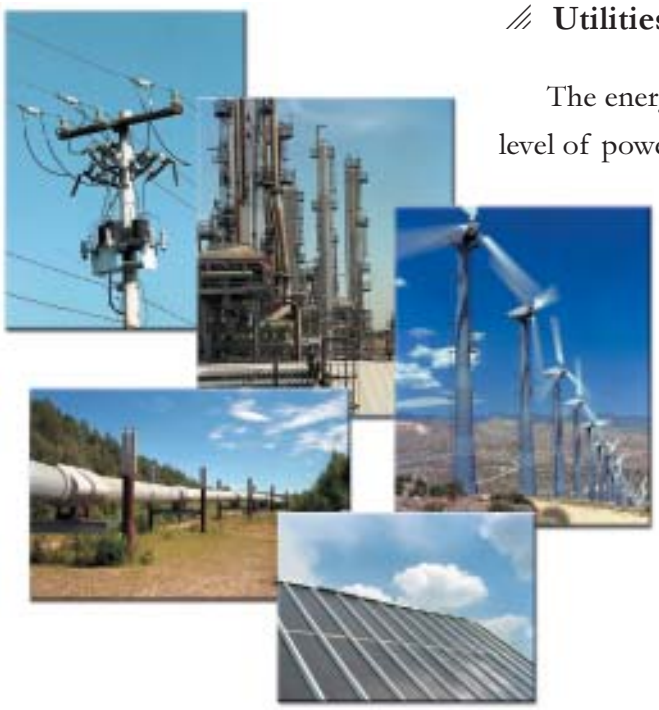


Temperature analyses from NESDIS data, like this one for a region in Texas, provide risk information for climate sensitive industries.

Fifteen to twenty percent of the U.S. Gross Domestic Product originates in **climate sensitive industries.** The economic impacts of events, such as the 1997–1998 El Niño, likely exceeeded $10 billion. RODNEY F. WEIHER, NOAA CHIEF ECONOMIST.

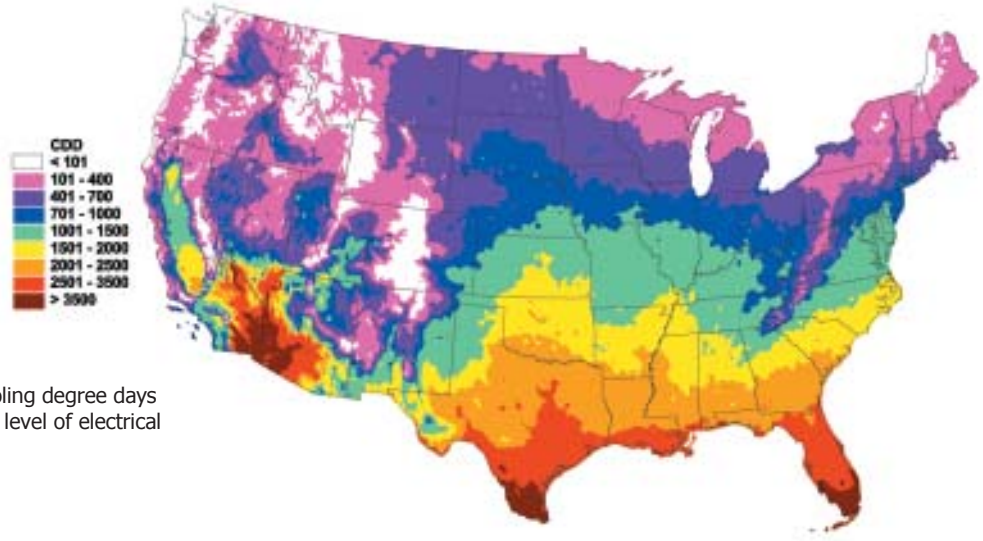
These markets provide a form of insurance in which industries—such as a utility company trying to manage peak demand—can protect themselves from adverse acts of nature. Underlying variables—temperature, precipitation and wind speed—are all parameters maintained by NESDIS and provided to the weather derivative industry.

NESDIS and the National Weather Service are collaborating with financial exchanges and energy companies to ensure they receive degree-day information critical to "weather derivative contracts." The weather derivative industry, which began in late 1996, currently accounts for over $1 billion in annual trades (with expected short-term growth to over $100 billion).



Utilities

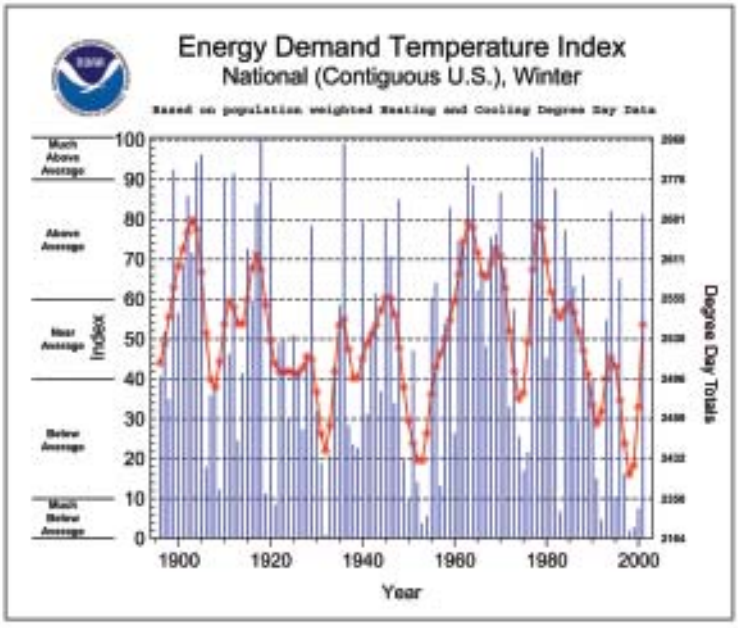
The energy industry uses environmental data to determine level of power usage, compute rate adjustments, research alternate energy sources, conduct air pollution studies, and plan offshore oil drilling platform construction. For example, electric power companies use heating and cooling degree-days to model the level of electrical demand. Gas utilities use 30-year climate normals or averages to determine rate adjustments and expected energy usage. NESDIS computes 30-year normals for thousands of observing sites throughout the country every ten years. Alternative energy companies use historical wind and solar data to



Annual mean total cooling degree days are used to model the level of electrical demand.

determine potential sites for wind generators and solar panels. Oil companies use marine climatic summaries and satellite imagery in the planning of offshore drilling platforms.

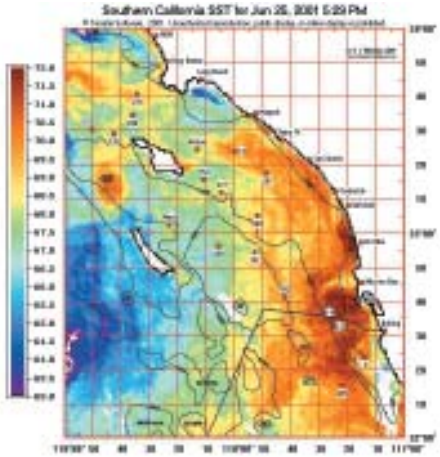
NESDIS is also developing environmental indices to allow for better interpretation of the complex array of weather and climate data for the energy sector. For example, a weather and climate power demand index is based on heating and cooling degree days for a month or season, put into the context of historical data. A drought index for hydroelectric power watersheds measures precipitation deficit and seasonal snowpack, both critical factors for energy production.



Ensuring Effective Multiple Uses of Our Coasts

Coastal Recreation and Tourism

U.S. coastal recreation and tourism have an annual economic value of about $24 billion. These activities include sport fishing, pleasure boating, charter cruises, eco-tourism, and the living accommodations, restaurants, marinas, and other infrastructures supporting the activities. NESDIS provides the U.S. value-added industry with historical and near-real time data crucial for safe navigation and structural safety. Buoy and coastal water temperature data provide climatological statistics for planning recreational activities.



Sea surface temperature chart for southern California, June, 2001. The chart was created from NOAA/NESDIS Satellite Active Archive data by an industry partner.

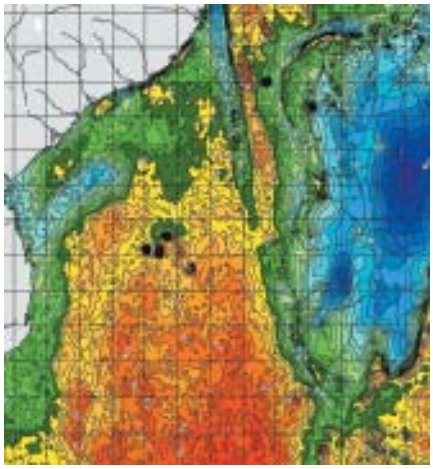
Coastal Development and Protection

As global environmental stresses increase—primarily in response to population growth—industry and government need to expand their interactions to ensure long-term sustainability of natural resources and to preserve the value of such assets. As a proactive pilot project, NESDIS's new National Coastal Data Development Center is working with key communities to produce a Coastal Risk Atlas. The Atlas will provide up-to-date coastal data through easily-accessible geographic information systems and Web techonology. The NESDIS product will help industry and local governments improve their vulnerability assessments and mitigate coastal hazards risks.

Supporting Maritime Industry and Exploration

The economic value of the coasts, Great Lakes, and oceans has been conservatively estimated to exceed 2.6% of the U.S. gross domestic product—greater than $109 billion, annually. Components of this estimate include: (1) primary income and products, (2) state and local coastal commerce data, (3) assessed value of maritime capital (e.g., fisheries, aquaculture, oil and gas, and minerals), and (4) assessed indirect values (e.g., coastal tourism and marine amenities).

While the surface area of the oceans is 71% of the planet, ocean volume represents almost 99% of space available for living organisms. Coastal environments (6.3% of the world's surface) host 43% of the world's ecosystems. NESDIS, in cooperation with other NOAA offices, is supporting a four-year study—led by an academic consortium with an industry advisory council—to more accurately understand our ocean's influence with respect to our economy (see The National Ocean Economics Project at http://wrigley.usc.edu/NOEP).



NESDIS creates custom maps for industry use. The maps have been used to identify deep water areas for possible future exploration, as well as to better delineate basins and known prospects.

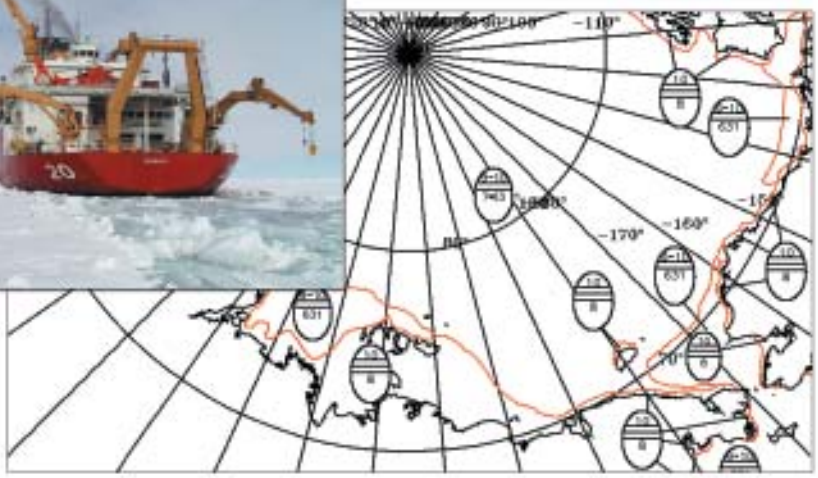
Marine Transportation System

NESDIS satellite and ocean platform data help the marine transportation system address many of its critical issues. The United States marine transportation system includes publicly and privately owned vessels, navigable waterways, ports and harbors, shipyards, repair facilities, and other infrastructure-supporting elements.

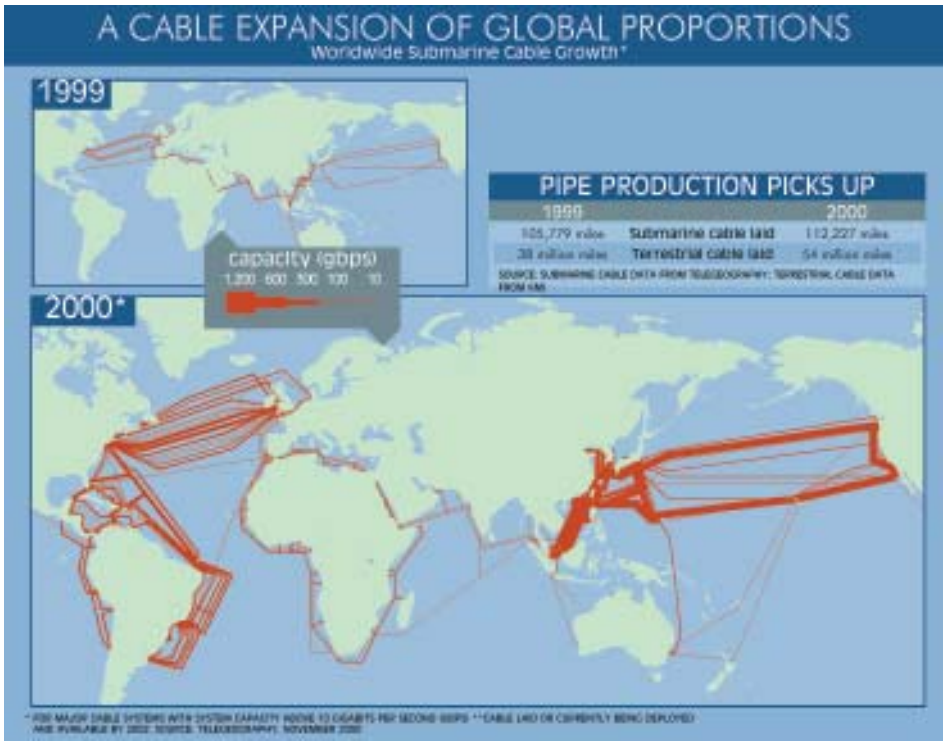
Waterborne cargo contributes more than $742 billion to the U.S. Gross Domestic Product, and creates employment for 13 million people. NESDIS satellite data analyses—such as ice forecasts and ocean currents studies—support global shipping. The National Ice Center—a partnership among NOAA, the U.S. Navy, and the Coast Guard—uses satellite data to produce analyses of sea ice conditions in the polar regions. These analyses are critical for the safety of vessels operating in ice-covered waters of the Arctic, Antarctic, and Great Lakes.

The Baltic and International Maritime Council receives NESDIS data. As a value-added service, the Council provides these data to its members in support of routing and safety of cargo transport. The Council is the largest private shipping association in the world, listing members in 121 countries. It consists of nearly 1,000 ship owners, and controls 61% of the world's merchant fleet. The U.S. receives about 95% of its commercial goods (more than 1 billion metric tons) via marine shipping.

U.S. icebreaker *Healy* uses NESDIS satellite data to help keep shipping lanes open.



30-day ice forecast from the National Ice Center.



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The Industry Standard: http://www.thestandard.com.

Marine Engineering

Marine engineers are building an extensive submarine infrastructure to overcome the natural barriers that oceans have always posed to communication and commerce. Powering the global Web, these networks are based upon high-capacity fiber-optic cables. In recent years, the communication industry has laid over 100,000 miles of submarine cables per year—two to three times the terrestrial network equivalents. Telecommunication capacity across oceans now exceeds one terabyte per second (with rates expected to double during each successive 9-month period). NESDIS provides valuable marine geological and geophysical data that enable marine engineering companies to optimize the location of their cables and pipelines.

Ocean-based communication infrastructure is rapidly growing. The global Internet population exceeds 600 million and generates more than $500 billion in e-commerce.

Aquaculture

Snapper hatchery. U.S. aquaculture sales total almost $1 billion per year.

U.S. aquaculture sales total almost $1 billion per year, a figure that includes both marine and freshwater products. The NOAA Library, hosted by NESDIS, has recently established the Aquaculture Information Center (http://www.lib.noaa.gov/docaqua/frontpage.htm). The Center brings together aquaculture information from DOC regulatory, policy, and research programs.

NESDIS, through its central NOAA library, provides aquatic science and fisheries information to the publishing industry (specifically Cambridge Scientific Abstracts). These electronic databases are used extensively by the academic and research communities. Important NESDIS data include sea floor topography of the oceans and Great Lakes, as well as chemical composition of these waters.

Marine and Coastal Research

NESDIS programs contribute to marine and coastal research. Maritime observations have helped to improve El Niño forecasts, improve hurricane landfall predictions, warn about harmful algal blooms, improve information for the fishing industry, and enhance safety at sea for all sectors of marine recreation and transportation. Shoreline protection and ecosystem health are critical to several sectors of the maritime economy. Addressing these varied issues requires innovative means for governments, industry, and academia to work together, to realize the application of marine knowledge in the future.

Reducing the Impact of Natural Disasters

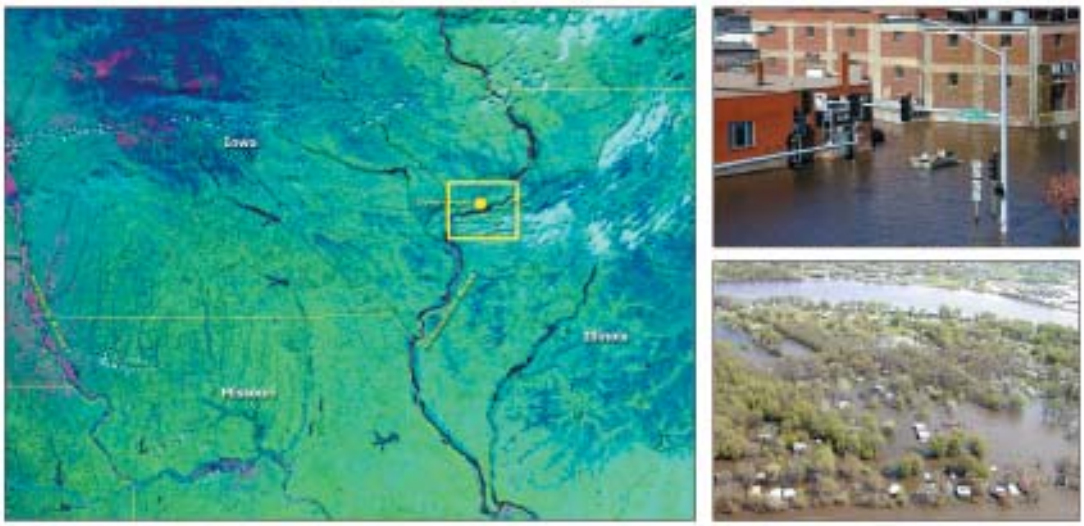
Natural disasters threaten lives, property, natural resources, public health, and the stability of local and regional economies. In recent years, U.S. weather-related events have caused more than $1 billion per week in damages.

Data from environmental satellites are used in detecting, assessing, and forecasting severe weather and other natural hazards. Seismological hazards, including earthquakes and tsunamis, affect both coastal and inland areas. NESDIS plays a major role in post-event data collection.

Detecting and Monitoring Hazardous Events

Wildfire management. Numerous satellite sensors effectively observe "hot spots" on a global scale. Wildfires are devastating to natural resources, destroying habitat, and adding to increased levels of carbon dioxide to the atmosphere. NESDIS satellite data have assisted in analyses of conditions and planning of strategies to combat wildfires, especially in remote regions.

Aviation. In collaboration with the Federal Aviation Administration, NESDIS develops volcanic ash advisory statements. Ash plumes represent an immediate and severe risk to flight safety, and pilots are warned to avoid routes with a high probability of danger.



During the Spring of 2001, the Mississippi River flooded surrounding areas. The NESDIS image on the left is from NOAA-16 satellite data (April 26). The yellow square is the region around Davenport, Iowa. The photos, taken the same day, show Davenport and nearby Campbell's Island, Illinois.

Responding to Natural Disasters

Search and Rescue Satellite-aided Tracking providers. Mariners and pilots rarely fly without their emergency locator beacons. NESDIS operators monitor these signals via satellites and other resources, pinpointing the location of a disaster and initiating a rescue. This humanitarian search and rescue system has saved almost 12,000 lives since its inception.

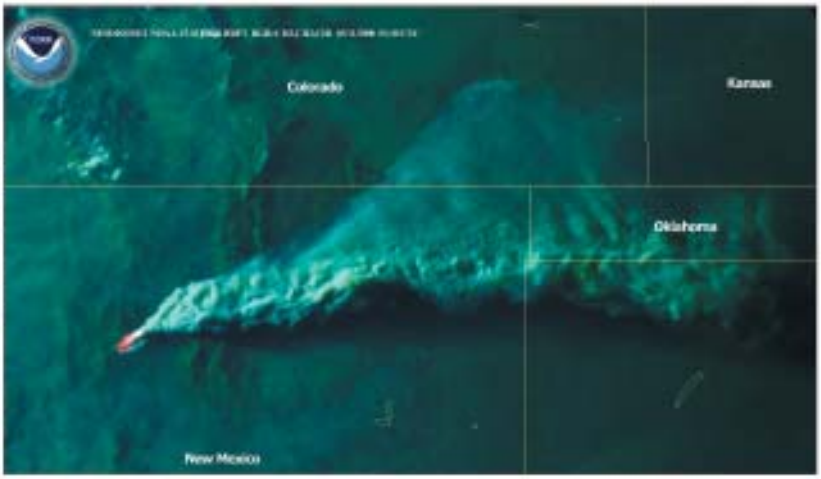
Emergency response providers. When disaster strikes, local systems are often disrupted, making the assessment of damage, and the monitoring of continued threats, difficult. NESDIS is partnering with other agencies to formulate a natural hazards information strategy that will be based upon national observation resources and interpretative expertise.

Significant Events Notification. A NESDIS team of scientists follow disaster-related events such as fires, floods, dust storms, snow storms, tropical storms, and volcanic activity. Using imagery from NOAA and other satellites, the team creates high resolution visuals with annotations and descriptive narratives.

These materials are posted within hours of the event, and are available for viewing at http://www.osei.noaa.gov. The images are widely used in printed and broadcast media.

Mitigating Economic Losses

Community planners. NESDIS environmental data have been used to document a global trend of population movement toward coastal areas. As this trend continues, planners are looking to NESDIS for historical environmental data to help mitigate the effects of hazards such as storms, tsunamis, earthquakes, and habitat loss. These data support the economic viability of communities—improving zoning codes, developing safer construction practices, and preserving delicate habitats. They also support local planning for disaster mitigation and environmental health.



During May 2000, the Cerro Grande fire burned nearly 50,000 acres in and around Los Alamos, New Mexico. NESDIS imagery from NOAA-15 POES satellite data shows the plume generated by the intense fire. U.S. Government agencies and industry worked together to reduce the impact and economic losses from this disaster.

NOAA's Eyes on the Environment

As the Federal Government's leading provider of environmental data, NESDIS supports the goals of e-government. Our award-winning, Web-based services benefit society by providing timely information to a broad segment of the U.S. economy. These services help:

- **Insurance companies** resolve claims more rapidly
- **Energy companies** manage utilities more effectively
- **Engineers** develop safer construction criteria
- **Community planners** address environmental impacts
- **Public safety providers** improve their level of services.

Industry interacts with NESDIS on numerous levels—developing state-of-the-art technology for NOAA's satellite programs, constructing observation networks, building vast warehouses of data, and transmitting and displaying information to millions of users. Industry uses NESDIS data to develop value-added products such as weather derivatives that help manage weather-related risks.

Day and night, NOAA scientists maintain their vigil, monitoring changes detected by satellites hovering above Earth and from land, ocean, and atmospheric-based observing systems. In partnership with industry and academia, NESDIS develops critical information streams which are shared worldwide to sustain life and empower healthy economies.

The public-private partnership that exists in the United States for the provision of weather services is unique in the (entire) world, and I think, beyond a doubt, it results in the citizens of the United States receiving the best weather information . . . on the planet.

Clearly, (while) the costs of establishing and operating a weather-satellite program are beyond the private sector, . . . the private sector is able to utilize the data, which are funded by the taxpayers. It's able to take data, tailor them, fine-tune them, and provide them to specific segments. . . . Those users then are responsible for paying for those services to the private enterprise, which is providing them. That enterprise, in turn, continues to fund the public programs through corporate taxes.

Although the costs of archiving these data and keeping them in an accessible form . . . would probably be beyond that of the private sector, the government does an excellent job in this area. Once again, the data are readily accessible to the private sector for tailoring and making specific use for its particular customers.

Ray Ban
Senior Vice-President
Meteorological Operations
The Weather Channel

The third generation of the Geostationary Operational Environmental Satellites will be launched in 2010. This new GOES will scan Earth nearly five times faster than the current GOES. The satellites will provide the user community with almost eight times the amount of data currently provided.

http://www.nesdis.noaa.gov

NESDIS Headquarters
1335 East West Highway
Silver Spring, MD 20910

Office of the Chief Information Officer
1335 East West Highway
Silver Spring, MD 20910
(301) 713-9220

NESDIS Public Affairs
Federal Building 4
Washington, DC 20233
(301) 457-5005

Office of Research and Applications
NOAA Science Center
Washington, DC 20233
(301) 763-8282

Office of Satellite Data
Processing and Distribution
Federal Building 4
Washington, DC 20233
(301) 457-5681

Office of Satellite Operations
Federal Building 4
Washington, DC 20233
(301) 457-5208

Office of Systems Development
Federal Building 4
Washington, DC 20233
(301) 457-5208

NOAA National Data Centers:

National Climatic Data Center
151 Patton Avenue
Asheville, NC 28801-5001
(704) 271-4800
orders@ncdc.noaa.gov

National Geophysical Data Center
325 Broadway
Boulder, CO 80305-3328
(303) 497-6826
info@ngdc.noaa.gov

National Oceanographic Data Center
1315 East-West Highway
Silver Spring, MD 20910-3282
(301) 713-3277
services@nodc.noaa.gov

Snow and Ice Data:

National Ice Center
Federal Building #4
Washington, DC 20395
(301) 457-5300
http://www.natice.noaa.gov
liaison@natice.noaa.gov

National Snow and Ice Data Center
University of Colorado
Campus Box 449
Boulder, CO 80309-0449
(303) 492-6199
http://www-nsidc.colorado.edu
nsidc@kryos.colorado.edu

NOAA Libraries:

NOAA Central Library
1315 East West Highway
Silver, Spring, MD 20910-3282
(301) 713-2600

NOAA Miami Regional Library
Atlantic Oceanographic and
Meteorological Laboratory
4301 Rickenbacker Causeway
Miami, FL 33149
(305) 361-4428

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Miami, FL 33165-2149
(305) 229-4406

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7600 Sand Point Way NE, Building 3
Seattle, WA 98115
(206) 526-6241

NESDIS sets the standard for world-class environmental satellite and data services. Through daily operations and research, NESDIS is the first stop for scientific information on the oceans, the atmosphere, the Sun, and the Earth.

Afterword

While this document provides a snapshot of some of our interactions with industry and the many ways we impact the economy, it is a starting point for further efforts to increase awareness of the benefits and opportunities derived from public and private sector interfaces. As a result of preparing this publication and other strategic planning efforts, NESDIS intends to conduct further activities to improve our understanding and articulation of the specific economic impacts and benefits of our products and services. This information will assist the organization in evaluating our programs and services, and measuring in more objective terms agency performance and return on investments.

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DOC, NOAA, and NESDIS - Working Together

DOC promotes job creation, economic growth, sustainable development and improved living standards by working in partnership with business, universities, communities, and workers to:

- Build for the future and promote U.S. competitiveness in the global marketplace by strengthening and safeguarding the Nation's economic infrastructure.
- Keep America competitive with cutting-edge science and technology and an unrivaled information base.
- Provide effective management and stewardship of the Nation's resources and assets to ensure sustainable economic opportunities.

DOC touches the daily lives of Americans in many ways—it makes possible the weather reports; it facilitates technology used in the workplace and home every day; it supports the development, gathering, and transmitting of information essential to competitive business; it makes possible the diversity of companies and goods found in our marketplaces; and it supports environmental and economic health for the communities in which we live.

NOAA is a major component of DOC. Its mission is two-fold:

- Environmental assessment and prediction—to observe and assess the state of our environment, while protecting public safety and the Nation's economic and environmental security through accurate forecasting.
- Environmental stewardship—to protect ocean, coastal, and living marine resources while assisting their economic development.

NESDIS operates the Nation's geostationary and polar-orbiting environmental satellites. It manages the largest collection of atmospheric, geophysical, and oceanographic data in the world. NESDIS also licenses private remote-sensing space systems. NESDIS's central role in providing and ensuring timely access to global environmental data and information from satellites and other sources is fundamental to NOAA's "assessment and prediction" and "environmental stewardship" goals. NESDIS services also support the Department of Commerce's mission to create jobs, economic growth, and sustainable development.