United States Government Accountability Office

GAO

Report to Congressional Requesters

September 2005

ENVIRONMENTAL INFORMATION

Status of Federal Data Programs That Support Ecological Indicators

GAO-05-376

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Status of Federal Data Programs That Support Ecological Indicators

GAO Accountability · Integrity · Reliability

Highlights

Highlights of GAO-05-376, a report to congressional requesters

Why GAO Did This Study

The federal government supports numerous data programs that assemble and analyze quantitative measures of the nation's environmental conditions and trends (known as indicators). A substantial number of these data programs are housed in several federal agencies, and provide various types of data used routinely by decision makers from the private sector and all levels of government. As federal agencies take actions to improve the coverage and usefulness of these programs, it is equally important that the quality and availability of existing data generated by these programs do not erode overtime. In this regard, periodic uninterrupted monitoring to determine conditions and trends is important to accurately describe the extent or seriousness of environmental problems, or conversely, improvements in environmental conditions.

GAO reviewed 20 data programs to determine whether federal agencies responsible for the programs anticipate that changes during fiscal years 2005 and 2006 related to funding, shifting priorities, or other factors will affect the ability of the programs to (1) continue to generate data comparable with data from past years, and (2) continue providing data used in a nationwide ecological indicator study by the H. John Heinz III Center for Science, Economics and the Environment, *The State of the Nation's Ecosystems*.

www.gao.gov/cgi-bin/getrpt?GAO-05-376.

To view the full product, including the scope and methodology, click on the link above. For more information, contact John B. Stephenson at (202) 512-3841 or stephensonj@gao.gov.

What GAO Found

The federal officials responsible for 14 of the 20 data programs that GAO reviewed are confident that the 14 programs will continue to provide all of the types of data that they provided in 2002 at a comparable or higher level of availability and quality. Agency officials do not expect 2 of the programs to provide such data and are uncertain about the ability of 4 programs to do so. However, several of these programs are likely to benefit from enhancements, including new satellite observations and improved sampling and methodological techniques.

However, in the near term, regarding the specific data used to support 58 ecological indicators that were identified as suitable for national reporting in the Heinz Center's 2002 *State of the Nation's Ecosystems* report, agency officials are confident that 15 of the 20 data programs that produced these data will provide all of the types of data at a comparable or higher level of availability and quality as needed for the next edition of the report, which is planned for issuance in 2007. Even though agency officials informed us that they anticipate that the overall availability and quality of the data supporting the 58 indicators will be maintained, they also indicated that, in some cases, data weaknesses or uncertainties exist that could affect the usefulness of the data for the Heinz Center's 2007 report. For example, the information on the nation's forests will not be as current for some states as for others because of funding limitations. Furthermore, agency officials responsible for 2 of the 20 data programs stated that data will not be of an overall comparable level of quality and availability for 2007, and officials responsible for the remaining 3 data programs were uncertain as to the availability or quality of the data for 2007.

Examples of Ecological Attributes, Their Associated Descriptions, and Example Indicators

Essential ecological attribute	Description	Example indicator
Landscape condition	The extent, composition, and pattern of habitats in a landscape	Status and change in extent of ecosystems
Biotic condition	The condition or viability of communities, populations, and individual biota	Trends in invasive and noninvasive birds in grasslands and shrublands
Ecological processes	Metabolic functions of ecosystems–energy flow, element cycling, and the production, consumption, and decomposition of organic matter	Movement of nitrogen
Chemical and physical characteristics	Physical parameters (e.g., temperature) and concentrations of chemical substances (e.g., nitrogen) present in the environment	Nitrate, phosphate, and other chemical levels in streams
Hydrology and geomorphology	The interplay of water flow and land forms	Soil erosion
Natural disturbance regimes	The historical functions of discrete and recurrent disturbances that shape ecosystems	Forest disturbances: fire, insects, and disease

Source: EPA.

Contents

Tables

Figures

Abbreviations

AQS	Air Quality System
AREI	Agricultural Resources and Environmental Indicators
AVHRR	Advanced Very High Resolution Radiometer
BEA	Bureau of Economic Analysis
BRD	Biological Resources Discipline
CDC	Centers for Disease Control and Prevention

CRP	Conservation Reserve Program
DOC	U.S. Department of Commerce
DOI	U.S. Department of the Interior
EDC	EROS Data Center
EDS	Environmental Data Service
EMAP	Environmental Monitoring and Assessment Program
EPA	U.S. Environmental Protection Agency
EROS	National Center for Earth Resources Observation & Science
ERS	Economic Research Service
ESI	Environmental Sensitivity Index
FIA	Forest Inventory and Analysis Program
FSA	Farm Service Agency
HHS	U.S. Department of Health and Human Services
MODIS	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NASQAN	National Stream Water Quality Accounting Network
NASS	National Agricultural Statistics Service
NAWQA	National Water-Quality Assessment Program
NCA	National Coastal Assessment
NCCOS	National Centers for Coastal Ocean Science
NESDIS	National Environmental Satellite, Data, and Information Service
NLCD	National Land Cover Dataset
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRI	National Resources Inventory
NSIP	National Streamflow Information Program
NSRE	National Survey on Recreation and the Environment
NWI	National Wetlands Inventory
NWIS	National Water Information System
OMB	Office of Management and Budget
PART	Program Assessment Rating Tool
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WBDO	waterborne-disease outbreak
WRD	Water Resources Discipline

GAO
Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, D.C. 20548

September 2, 2005

The Honorable Sherwood L. Boehlert
Chairman
Committee on Science
House of Representatives

The Honorable Vernon J. Ehlers
Chairman
Subcommittee on Environment, Technology and Standards
Committee on Science
House of Representatives

Comprehensive and reliable information on the nation's environment and natural resources is a cornerstone of effective environmental management and an integral part of a national strategy to anticipate and address problems. Governments, businesses, and the general public depend on relevant, accurate, and timely environmental information to make informed decisions in evaluating the performance of environmental programs, aligning the efficiency of markets with environmental protection, assessing the state of the environment and natural resources, and identifying emerging issues and options for action. Although reliable data and statistical information is rarely the sole factor that determines how society should address any particular issue, such information is essential to support the assessment of various alternatives and to inform policy decisions.

The federal government supports numerous data programs that assemble and analyze quantitative measures on the nation's environmental conditions and trends (known as indicators). These data programs are housed primarily in agencies within the Departments of Agriculture, Commerce, Health and Human Services, and the Interior; the Environmental Protection Agency; and the National Aeronautics and Space Administration. Twenty of these data programs, which provide various types of data used routinely by decision makers from the private sector and all levels of government, provided data used by the H. John Heinz III Center for Science, Economics and the Environment to prepare its 2002 *State of the Nation's Ecosystems* report. This report portrays on a national scale what is known and not known about the state of our lands, waters, and other living ecosystems using a comprehensive, science-based effort. The report lists 103 indicators relating to six major ecosystem types (coasts and oceans, farmlands, forests, fresh waters, grasslands and shrublands, and

urban and suburban areas). The report both provides a blueprint for periodic reporting on the condition and use of the nation's ecosystems and identifies major gaps in the data available for each of the ecosystems.The Heinz Center is currently working with federal agencies and other organizations to identify the efforts necessary to fill the data gaps identified in its 2002 report.

While closing the data gaps identified in the Heinz Center report is essential to fully characterize the state of the ecosystems, it is equally important that the quality and availability of the data that formed the foundation of the report in 2002 do not erode over time. In this regard, periodic uninterrupted monitoring to develop data and trends is crucial to decision makers and scientists in accurately describing the extent or seriousness of an environmental problem or, conversely, the extent to which a condition may be improving. Changes in environmental conditions occur, sometimes imperceptibly, as a result of a complex web of natural and human factors such as changes in economic conditions, weather patterns, pollution, and environmental policies. Consequently, establishing cause and effect relationships is difficult and relies on periodic monitoring of data over a long period of time. For example, the dynamic mechanisms of how freshwater ecosystems change in response to contaminants, water withdrawals, fishing activity, and the introduction of nonnative species are often understood only after gathering comparable data on numerous water characteristics, from many locations, and at regular intervals.

In this context, you asked that we determine whether the data programs used to generate or support the ecological indicators included in the 2002 *State of the Nation's Ecosystems* report will continue to provide comparable data in the future. Specifically, for each of the data programs under review, we were asked to determine whether the federal agency responsible for the program anticipates that changes during fiscal years 2005 and 2006 related to funding, shifting priorities, or other factors will affect the ability of the program to continue to generate data comparable with data from past years and sufficient to compare environmental conditions in 2002 with conditions in 2007, the expected date of the Heinz Center's next *State of the Nation's Ecosystems* report. As agreed with your offices, we limited the scope of our review to the 20 data programs that provided the information used for 58 of the 103 ecological indicators identified in the Heinz Center report. The 58 indictors are those that the Heinz Center identified as suitable for national reporting in 2002 because they were supported by data of sufficiently high quality, with adequate

nationwide geographic coverage, and from established monitoring activities offering a reasonable prospect for future data availability.

For each of the 20 data programs, we used a data collection instrument along with follow-up contact with key officials responsible for the program, to obtain the agency's views on funding, program priorities, anticipated changes, data quality, and other related issues. We analyzed the information obtained and placed the programs in categories according to the agencies' responses to our questions. The categories reflect whether the information we obtained from the agencies indicates that the 20 data programs will continue to provide (1) all of the types of data provided in 2002 at a comparable level of availability and quality and (2) the specific data on the 58 ecological indicators reported in the Heinz Center's 2002 report as having data sufficient for national reporting. Appendix I provides a more detailed description of our scope and methodology. We performed our work from July 2004 through August 2005 in accordance with generally accepted government auditing standards.

In summary, our analysis of the information we obtained indicates that agency officials are confident that 14 of the 20 programs will provide all of the types of data that they provided in 2002 at a comparable or higher level of availability and quality. Several of these programs are likely to benefit from enhancements, such as improved sampling and methodological techniques. Agency officials do not believe that two data programs will provide all of the types of data they produced in 2002 at a comparable or higher level of availability and quality, and are uncertain whether four other programs will do so.

However, in the near term, regarding the specific data used to support the 58 ecological indicators discussed in the Heinz Center's report, agency officials are confident that 15 of the 20 programs will provide all of the types of data that they provided in 2002 at a comparable or higher level of availability and quality. Agency officials responsible for two data programs stated that data will not be available at comparable levels of quality and availability, and officials responsible for the remaining three data programs were uncertain as to the availability of data needed for the Heinz Center's 2007 report. In some cases and as shown in table 1, even though agency officials informed us that they anticipate that the overall availability and quality of the data will be maintained, data weaknesses or uncertainties exist that could affect the usefulness of the data for the Heinz Center's 2007 report. Following are some examples:

- While the data provided by the Earth Resources Observation and Science Data Center for the 2007 Heinz Center report will be more recent than that used for the 2002 report, having been acquired before a Landsat 7 satellite malfunction that occurred in May 2003, updates of these more recent data that were planned by the United States Geological Survey and other sponsors of the data sets will likely not be possible before the 2009 launch of the Landsat Continuity Mission, which will replace the Landsat 7 satellite.

- The overall availability and quality of the data provided by the Forest Inventory and Analysis program will be improved, according to Forest Service officials. However, data for six states (covering about 23 percent of the nation's forests) may not be as accurate as data provided in prior years because of a lack of funding to perform field validation of data obtained from remote sensors.

- The Forest Service anticipates that the National Survey on Recreation and the Environment will provide comparable data for the next Heinz Center report. Nevertheless, potential reductions in funding from other federal agencies that support the survey could result in a decline in the availability and quality of the data.

- The 2002 Heinz Center report utilized the Agriculture Department's *Census of Agriculture* that included the latest available data from 1997. Similarly, the 2007 Heinz Center report will have access to the latest available *Census of Agriculture* that includes data from 2002. While Agriculture will have collected census data for 2007 by the time the next Heinz Center report is issued, the census data will not have been processed and published by that time for use in the Heinz Center's report.

Table 1 shows the data programs we reviewed and the results of our analysis of agency responses related to the continuity of program data in future years and data availability for the Heinz Center's planned *2007 State of the Nation's Ecosystems* report. See appendixes II through XXI for specific information on the future direction of each data program we reviewed.

Table 1: Data Programs and the Continuity and Availability of Data in the Future

Data program	Continuity of program data in future years	Data availability for the planned 2007 Heinz Center report
National Stream Water Quality Accounting Network (NASQAN), U.S. Geological Survey (USGS), Department of the Interior	**No** • Water sampling frequency has continued a decline begun in 1980, from monthly to bimonthly or quarterly.	**No** • While data used by the Heinz Center in its 2002 report came from more than 400 sampling stations, data for the center's planned 2007 report will be from fewer than 30 sampling stations.
National Water Quality Assessment (NAWQA), USGS, Interior	**No** • Study units dropped from 51 to 42 over the last decade, and the funding reductions in fiscal year 2005 have resulted in a reduction in long-term surface water monitoring sites from 145 to 84.	**No** • Some data used by the Heinz Center in its 2002 report are no longer collected (e.g., contaminants in fish tissues and streambed sediment), while others are still collected but at reduced frequency.
Forest Inventory and Analysis (FIA) Program, U.S. Forest Service, USDA	**Yes** • According to program officials, by 2007, the FIA program will be able to provide some of the most complete data in its history, on a much timelier basis. Newly designed information systems that use new software will integrate data and map-based information.	**Yes** • Although data for 6 states, covering about 23 percent of the nation's forests, may not be as fresh as the data for the other 44 states due to funding constraints, the set of forest data that will be available for the planned 2007 Heinz Center report will be superior in coverage, detail, and timeliness to the data available in 2002. In 2002, 80 percent of the data were from "old" periodic inventories and 20 percent was from "new" inventories based on an annual data collection using a new, technologically superior system that began in 1999. For the 2007 Heinz Center report, 80 percent of the data will be from the new system and 20 percent of the data will be from the older periodic inventory approach.
Biological Resources Discipline (BRD), USGS, Interior	**Yes** • BRD data will continue to be collected in similar form in coming years.	**Yes** • Officials expect that BRD data the Heinz Center used in 2002 will continue to be available in satisfactory form for the planned 2007 report.
National Survey on Recreation and the Environment (NSRE), U.S. Forest Service, USDA	**Uncertain** • Reductions in funding of NSRE by the Forest Service mean that the survey program will be more dependent on funding from other sources, including other federal agencies with interests in various facets of outdoor recreation activities and participation.	**Uncertain** • With adequate support from collaborating agencies for the 2005-2006 NSRE, recreation data used by the Heinz Center for its 2002 report will be matched in quality and comprehensiveness for the planned 2007 report. Funding insufficient to match the coverage of the 2000-2001 NSRE, however, may result in fewer responses and data that are less geographically rigorous.
Economic Research Service (ERS), USDA	**Yes** • ERS develops four data sets the Heinz Center used in its 2002 report, all of which are integral to its programs.	**Yes** • Officials expect their data will be available in comparable or better form for use in the planned 2007 Heinz Center report, and suggest that additional ERS data that will be available could be used to develop new ecological indicators.

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Data program	Continuity of program data in future years	Data availability for the planned 2007 Heinz Center report
National Agricultural Statistics Service (NASS), USDA	**Yes** • NASS data are developed in part through a Census of Agriculture that is prepared every 5 years and will provide data of the type used in the Heinz Center 2002 report. In addition, NASS officials expect that some crop data will improve as a result of a NASS initiative to restore the collection of certain survey data that were suspended for budgetary reasons in fiscal year 2003.	**Yes** • The previous Heinz Center report, published in 2002, utilized the latest available Census of Agriculture data from 1997; similarly, the planned 2007 Heinz Center report will be able to include the latest available Census of Agriculture results from 2002, released in the spring of 2004. The Heinz Center will add data for its ecological indicators as they become available from the 2007 Census of Agriculture.
Conservation Reserve Program (CRP), Farm Service Agency, USDA	**Yes** • The CRP is USDA's largest conservation program. The data generated by the program are essential to program administration and are expected to be available for as long as the program exists.	**Yes** • CRP officials are confident that the data used for the 2002 Heinz Center report will continue to be available in comparable form for the center's planned 2007 report.
National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce	**Yes** • Officials expect to generate data similar in quality and comprehensiveness to those in previous years.	**Uncertain** • Funding cuts or rising costs could result in lower sampling levels and delayed processing and reporting for data used in the 2002 Heinz Center report.
National Ocean Service (NOS), NOAA, Commerce	**Uncertain** • According to agency officials, minor budget cuts may affect the breadth and comprehensiveness of certain data collection and fieldwork activities.	**Yes** • Officials believe that data collection and analysis will continue for all programs, and that data will be available at similar or improved quality for the Heinz Center's planned 2007 report.
National Wetlands Inventory (NWI), U.S. Fish and Wildlife Service (USFWS), Interior	**Yes** • The quality and comprehensiveness of wetland status and trends data will be comparable or superior to that of past reports. Agency officials also indicated that the President has directed that these wetland reports be prepared more frequently, beginning in 2006.	**Yes** • 16 U.S.C. § 3931(a)(4) requires USFWS to produce wetland status and trends reports. These data were used in the 2002 Heinz Center report, and the data are expected to continue to be available for the next iteration of the center's report. These data and reports continue to be the highest priority of the NWI program.
National Center for Earth Resources Observation and Science (EROS), USGS, Interior	**Yes** • The quality and comprehensiveness of data collection and analysis will be similar or superior to that of past years. Changes in analytical approaches may expand the utility of datasets such as the National Landcover Dataset. Data on vegetation condition from planned satellite missions are also expected to be of higher quality.	**Uncertain** • Data for the 2007 Heinz Center report will be more recent than the 1992 data used for the center's 2002 report, having been acquired in 2001, before a May 2003 Landsat satellite malfunction. However, further significant updates of these data will likely not be possible before the planned 2009 launch of the Landsat continuity mission.

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Data program	Continuity of program data in future years	Data availability for the planned 2007 Heinz Center report
National Environmental Satellite, Data, and Information Service (NESDIS), NOAA, Commerce	**Yes** • As reflected in NOAA's strategic plan, efforts are under way to build and advance the capabilities of an ecological component of the NOAA global environmental observing system to monitor, assess, and predict national and regional ecosystem health, as well as to gather information consistent with established social and economic indicators. Under this direction, NESDIS will be supportive of sustaining, and improving, the ability of its data programs to provide data and information at a level and quality of previous years.	**Yes** • According to agency officials, NESDIS environmental data are expected to be available in an equivalent or improved form for the expected 2007 Heinz Center report. For example, bathymetric mapping and physical oceanographic data products are continually improving the resolution and accuracy of coverage as new data sources become available. Looking into the next decade, next-generation satellites will reduce atmospheric contamination of the data compared to the present, and is also expected to significantly improve sea surface temperature data.
National Resources Inventory (NRI), Natural Resources Conservation Service, USDA	**Yes** • According to program officials, improved estimates at both national and regional scales are expected to be available in coming years.	**Yes** • Officials expect NRI data to be available in 2007 in a form comparable to or better than that used for the 2002 Heinz Center report.
Bureau of Economic Analysis (BEA), Economics and Statistics Administration, Commerce	**Yes** • BEA officials will devote a proposed fiscal year 2006 budget increase to initiatives to improve the accuracy and timeliness of its data by upgrading information technology for sampling and data input techniques and expanding the budget of the Regional Economics Directorate, the source of data on county personal income used by the Heinz Center in its 2002 report.	**Yes** • Officials expect their data will be available in comparable or better form for use in the 2007 Heinz Center report.
Environmental Monitoring and Assessment Program (EMAP), Office of Research and Development, U.S. Environmental Protection Agency	**Uncertain** • Funding cuts for extramural ecological research have affected the nature, scope, and timing of EMAP research and required EMAP managers to adjust the program's research strategy and devise new ways of accomplishing its research objectives. The loss of this funding may result in extending the completion dates of program components or scaling back the size of research efforts and the extent of data produced.	**Yes** • According to agency officials, ongoing and projected EMAP research, data collection, and data analysis efforts will yield data for the projected 2007 Heinz Center report similar in quality and comprehensiveness to that used by the Heinz Center in its 2002 report.
Air Quality System (AQS), Office of Air Quality Planning and Standards (OAQPS), U.S. Environmental Protection Agency	**Yes** • According to agency officials, planned improvements to AQS will make data reporting more timely and will optimize the Photochemical Air Monitoring Stations (PAMS) used to measure chemical precursors for ground-level ozone.	**Yes** • U.S. Environmental Protection Agency and OAQPS officials predict that AQS data of the type used in the 2002 Heinz Center report will be available in improved form for the center's 2007 report.

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Data program	Continuity of program data in future years	Data availability for the planned 2007 Heinz Center report
Sea-viewing Wide Field-of-view Sensor (SeaWiFS), Moderate Resolution Imaging Spectroradiometer (MODIS), and Advanced Very High Resolution Radiometer (AVHRR) measurements, National Aeronautics and Space Administration	**Yes** • Officials believe that there are no changes in program funding or priorities that would preclude generating data in coming years that are comparable with data produced in the past. Sea-surface temperature data are expected to be superior as a result of merging microwave and infrared sensors.	**Yes** • According to agency officials, data used in the 2002 Heinz Center report will be available in improved form for use in the center's planned 2007 report.
National Streamflow Information Program and National Water Information System (NWIS), Water Resources Discipline, USGS, Interior	**Uncertain** • According to agency officials, the USGS-operated streamflow information program and NWIS will continue to collect and analyze streamflow and other key water-related data but at slightly reduced levels due to budget declines since fiscal year 2001. Heavy reliance on streamgages funded by cooperators and partners rather than USGS makes the network inherently unstable.	**Yes** • WRD officials said data used to support the 2002 Heinz Center report will be available at comparable levels of quality and comprehensiveness for the center's planned 2007 report.
Surveillance and Reporting of Waterborne Disease Outbreaks (WBDO), Centers for Disease Control and Prevention, Department of Health and Human Services	**Yes** • Officials predict that system enhancements should improve collection, analysis, and reporting of WBDO information.	**Yes** • Agency officials expect that data used to support the Heinz Center's 2002 ecological indicators will be available at similar or superior levels of quality and comprehensiveness for use in the center's expected 2007 report.

Source: GAO analysis of agency information.

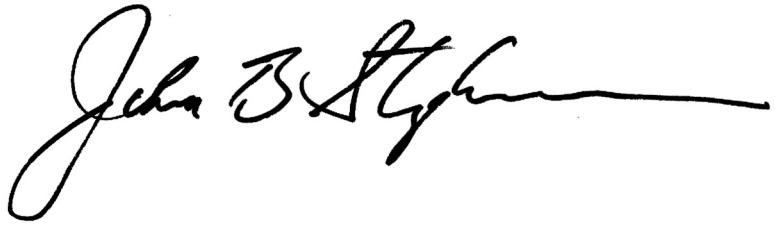
Agency Comments and Our Evaluation

We provided a draft of this report for review and comment to the Departments of Agriculture, Commerce, Health and Human Services, and the Interior; the Environmental Protection Agency; and the National Aeronautics and Space Administration. The agencies generally agreed with the information in the report, and in some cases provided additional information regarding the availability and quality of the data that will be available for the planned 2007 Heinz Center's report. We incorporated such information and the agencies' technical comments, as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 14 days from the report date. At that time, we will send copies to the appropriate

congressional committees; the Secretaries of Agriculture, Commerce, Health and Human Services, and the Interior; the Administrators of EPA and the National Aeronautics and Space Administration; and other interested parties. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report or need additional information, please contact me at (202) 512-3841 or stephensonj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are included in appendix XXIV.



John B. Stephenson
Director, Natural Resources
and Environment

Scope and Methodology

The overall objective of this review was to examine the likelihood that various data programs relied on to generate ecological indicators identified in *The State of the Nation's Ecosystems*—a report issued in 2002 by the H. John Heinz III Center for Science, Economics and the Environment—will continue to provide comparable data. Specifically, for each data program under review you asked us to determine whether the federal agency responsible for the program anticipates that changes related to funding, shifting priorities, or other factors will affect the ability of the program to continue to generate data comparable to data from past years.

Scope

We gathered information on 20 federal data programs housed within the Departments of Agriculture, Commerce, the Interior, and Health and Human Services as well as the Environmental Protection Agency and the National Aeronautics and Space Administration. We limited our scope to include only those federal data programs providing information used for 58 of the 103 ecological indicators in the Heinz Center report. These 58 indicators were identified in the Heinz Center report as being supported by data with sufficiently high quality, with adequate geographic coverage on a nationwide scale, and from established monitoring programs offering a reasonable prospect for future data availability.

Design and Methodology

For each of the 20 data programs we reviewed, we sent a data collection instrument that contained basic questions for each agency to answer. These questions covered budget issues, data-quality issues, and expected changes to the respective programs and data collection efforts, among other things. We pretested a basic set of questions with officials from two agency data programs, and then revised these questions before sending them to officials from the other 18 data programs. In addition, we added, on a case-by-case basis, questions that were unique for each agency and its respective data programs. The agencies had from November 2004 to May 2005 to review and respond to the questions. Once we received and reviewed the program responses, we made follow-up contacts to clarify remaining issues and to ensure we completely understood the agency responses. All of the agencies responded to our questions. We did not independently corroborate the responses from the agencies with regard to nonbudget questions. We determined that agency responses to our questions met our criteria for budget-data reliability. These criteria included independent verification or audits of financial reports, and data corroborated by inspector-general reports or financial statements. Because

agency expenditures associated with data collection, archiving, and dissemination are at times embedded within other agency programs or functions and are not explicit line items in budget requests or determinations, some of the funding totals we obtained represent the agencies' best estimates. We conducted our work from July 2004 through August 2005 in accordance with generally accepted government auditing standards.

We compiled a summary table of agency responses to identify possible changes in data availability and continuity when compared with past years. We assigned a "yes" to responses if agency officials indicated that data were expected to be available at similar or improved levels when compared with previous years. We assigned a "no" to responses if agency officials indicated that data were decreasing in availability. We assigned an "uncertain" if agency officials indicated that some aspect of the data being generated from the program was compromised or expected to be compromised in other ways. Similarly, with respect to data availability between the 2002 and the planned 2007 Heinz Center reports, we presented the agencies' assessments with respect to the expectation the data will be available at the same quality and comprehensiveness for the 2007 update. In all cases, our determinations were based on a review of written and oral testimony provided by agency officials.

Conservation Reserve Program, Farm Service Agency, U.S. Department of Agriculture

Background

The Conservation Reserve Program (CRP) is the U.S. Department of Agriculture's (USDA) largest and most ambitious conservation effort. Administered by USDA's Farm Service Agency (FSA), CRP was established by the Food Security Act of 1985[1] and currently operates in all 50 states and Puerto Rico. CRP encourages and assists farm owners and operators to conserve and improve soil, water, air, and wildlife resources by withdrawing environmentally sensitive cropland and pastureland from agricultural production and keeping them under long-term vegetative cover. Program participants enroll eligible acreage for at least 10 years, and for up to 15 years by arrangement, during which they agree to adopt a variety of approved conservation practices (CP), specific actions such as installing structures, planting vegetation, or implementing management techniques recognized by USDA as protecting, conserving, and enhancing natural resources such as soil, water, air, plants, and wildlife.[2]

In return for implementing these conservation practices, program participants receive annual rental payments that average about $48 an acre (payments vary with prevailing local rental rates). Participants receive cost-share payments for up to half the cost of implementing approved conservation practices such as planting grasses and trees, installing windbreaks, and preserving wildlife flora. Participants also receive technical assistance from USDA's Natural Resources Conservation Service (NRCS), which provides technical land-eligibility determinations and advice on conservation planning and implementation techniques. The U.S. Forest Service provides technical advice on tree selection and planting.[3]

Farm owners and operators can enroll their land in CRP in two ways, through general or continuous sign-up.[4] General sign-up occurs for a few weeks every year or so. During this period, program staff accepts enrollment applications and evaluates them using an Environmental Benefits Index (EBI) that weighs six factors: (1) wildlife habitat benefits;

[1]Pub. L. No. 99-198 § 1231, 99 Stat. 1354, 1509.

[2]16 U.S.C. §§ 3831-3832 sets forth the elements of the CRP. See the glossary at the end of this enclosure for descriptions and examples of CRP-approved conservation practices.

[3]The USDA Service Centers are sometimes co-located with FSA county offices, although they do not correspond strictly to the nation's approximately 3,100 counties.

[4]7 C.F.R. § 1410.6 contains criteria to establish the eligibility of land for enrollment in the CRP.

(2) water-quality benefits from reduced erosion, runoff, and leaching; (3) on-farm benefits of reduced soil erosion; (4) enduring environmental benefits; (5) air-quality benefits from reduced wind erosion; and (6) cost. During the most recent general sign-up, in 2004, more than 26,000 applications (or "offers") totaling 1.7 million acres were received. Over 19,700 offers were accepted for an enrollment of about 1.2 million acres. About 32 million acres of CRP's enrolled acreage have been brought into the program through general sign-up.

Continuous sign-up, in contrast to general sign-up, is available at any time of year for owners who agree to adopt certain high-priority conservation practices. These practices include installation of filter strips, riparian buffers, grass waterways, shelterbelts, field windbreaks, living snow fences, salinity reducing vegetation, shallow water areas for wildlife, and wetland restoration. Under continuous sign-up, there is no weighting of applications, and farmers and farm operators do not compete for acceptance into the program. Continuous sign-up enrollees may also receive added up-front and annual financial incentives for participation.

Incentive payments to encourage practices supported by continuous sign-up include $100 to $150 an acre for selected practices and cost-share payments up to 50 percent for implementing conservation practices (applies to all CRP, general and continuous). Additional practice incentive payments of up to 40 percent are allowed for selected continuous signup practices.

As of March 2005, general CRP sign-up had enrolled 31.8 million acres and continuous sign-up nearly 3 million acres, for a total of approximately 34.8 million acres. The Farm Security and Rural Investment Act of 2002 extended CRP enrollment authority through 2007 and increased the program's maximum acreage from 36.4 million to 39.2 million.[5] For fiscal years 1986 through 2005, total CRP spending has amounted to $30.5 billion. Rental payments have totaled $27.4 billion, cost-share payments $1.9 billion, incentive payments $478 million, and technical assistance outlays $682 million. Nine-tenths of the technical assistance outlays have gone to the NRCS and 1/10th to the Forest Service. Table 2 shows CRP's enrollment and outlay activity for fiscal years 2000 through 2005 (as of March 2005).

[5]16 U.S.C. § 3831.

Table 2: Conservation Reserve Program Enrollment and Outlays

	Millions of acres	Dollars (in millions)				
Fiscal year	Cumulative enrollment[a]	Rental payments[b]	Cost-share payment[c]	Incentive payments[d]	Technical assistance outlays[e]	Total outlays
2000	31.4	1,333	133	10	35	**1,511**
2001	33.6	1,397	150	78	32	**1,657**
2002	33.9	1,527	143	115	20	**1,805**
2003	34.1	1,580	101	104	55	**1,840**
2004	34.7	1,581	120	85	60 (est.)	**1,846 (est.)**
2005	35.2 (est.)	1,660 (est.)	102 (est.)	86 (est.)	90 (est.)	**1,938 (est.)**
Total		**9,078 (est.)**	**749 (est.)**	**478 (est.)**	**292 (est.)**	**10,597 est.)**

Est.= Estimate

Source: USDA.

[a]Acres under contract at end of fiscal year.

[b]Rental payments in a fiscal year apply to acres under contract in the previous fiscal year. Includes miscellaneous adjustments and adjustments for haying/grazing usage.

[c]Cost-share payments are made after cover establishment work is done. For contracts beginning in a given year, payments can occur over several years.

[d]Signing and Practice Incentive payments for continuous sign-up enrollment.

[e]Technical assistance outlays are generally paid to NRCS and the Forest Service in the year sign-ups occur.

For both general and continuous sign-up, applicants must appear at one of FSA's 2,351 offices (most are colocated with USDA service centers or county offices) and formally enter into a CRP contract. The CRP contract is between the Commodity Credit Corporation (CCC) and the program participant, and payments are disbursed by the CCC.[6] The contract requires information on the participant (e.g., name, address, Social Security number, and phone number) and information on the conservation practices agreed to, the acreage enrolled, and the acreage committed to each practice.

[6]The Commodity Credit Corporation is a federally owned and operated corporation created in 1933 to stabilize, support, and protect farm income and prices. Exec. Order No. 6340 (Oct. 16, 1933). CCC helps maintain balanced and adequate supplies of agricultural commodities and aids in their orderly distribution. Initially managed and operated in close affiliation with the Reconstruction Finance Corporation, CCC was transferred to the United States Department of Agriculture (USDA) in 1939. CCC was reincorporated on July 1, 1948, as a federal corporation within USDA by the Commodity Credit Corporation Charter Act, 15 U.S.C. § 714.

Participants agree to apply specific conservation practices on their land, to file forms used by the CCC to determine limits on payments, and to perform certain management work such as breaking up the soil or burning specified cover. For its part, the CCC agrees to calculate and make cost-share payments, rental payments, and interest payments for cost-share disbursals not made on time. Both parties agree to a conservation plan that describes the vegetative or water cover to be established, trees to be planted, completion dates, and estimated environmental benefits. Agency representatives make occasional spot checks of the land entered into CRP but routinely rely on data provided by participants.

As contracts are written at each local USDA office, FSA creates a data file that includes all contract-related information, including information on the conservation practices agreed to, the acreage enrolled, and the rental and cost-share estimates. At the end of each workday, computer programs in the service centers record and store these new contract details, and once a week contract data are transmitted electronically to a USDA national computer processing center in Kansas City, Missouri. Held in this central file are all of the conservation practice, acreage, and payment details for 690,000 active CRP contracts. These records are integral to contract oversight and management and serve an essentially administrative purpose. At the same time, however, they contain valuable information for tracking environmental trends. This is especially true because the data are updated weekly and summarized monthly down to the state level. Conservation practices described in the records include, for example, plantings of new native grasses, development of wildlife food plots, and plantings of salinity-reducing vegetation (see table below). CRP payments to participants are made by the CCC.

In table 3, conservation practices are reported as of March 2005 for general and continuous sign-up. Distinctions are made for acreage enrolled by the CRP and the Conservation Reserve Enhancement Program (CREP)—both administered by the FSA. CREP was initiated after enactment of the 1996 Farm Bill as a federal-state conservation partnership targeting designated areas—such as the Chesapeake Bay and the Pacific Northwest—to address specific state and nationally significant agriculture-related environmental problems. Of foremost concern to CREP are issues relating to water supplies and areas around wells, wildlife species endangered by loss of critical habitat, soil erosion, and reduced habitat for fish such as salmon.

CREP offers additional financial incentives, such as sign-up bonuses beyond those available under CRP, to encourage farmers and ranchers to enroll in 10- to 15-year contracts to retire land from production. Like CRP, CREP is funded through the Commodity Credit Corporation, but unlike CRP, CREP receives part of the program's costs from the federal government and part from state or tribal governments. Enrollment in CREP is on a continuous basis, without the competition involved in CRP's general sign-up. CREP supports particular conservation initiatives such as installing filter strips and forested buffers to protect streams, lakes, and rivers from sedimentation and agricultural runoff. CREP also encourages landowners to develop and restore wetlands by planting appropriate ground cover. This year, federal-state CREP agreements are in effect in 25 states.

Table 3: Conservation Practices by Sign-Up Type Installed on CRP/CREP Acreage as of March 2005

Acres

	General	Continuous			
Conservation practice	**CRP sign-up**	**CREP sign-up**	**Non-CREP sign-up**	**Farmable wetland**	**Total**
CP1 New introduced grasses and legumes	3,269,470	108,669	72,090	0	**3,450,229**
CP2 New native grasses	6,448,277	62,391	19,393	0	**6,530,061**
CP3 New softwood trees (not longleaf)	427,355	372	320	0	**428,046**
CP3A New longleaf pines	185,281	0	0	0	**185,281**
CP3A New hardwood trees	526,583	8,270	877	0	**535,729**
CP4 Permanent wildlife habitat	2,318,006	38,506	3,066	0	**2,359,578**
CP5 Field windbreaks	833	2,714	70,383	0	**73,930**
CP6 Diversion	834	0	0	0	**834**
CP7 Erosion control structures	653	1	1	0	**655**
CP8 Grass waterways	1,009	581	107,289	0	**108,880**
CP9 Shallow water areas for wildlife	1,943	2,284	46,046	0	**50,274**
CP10 Existing grasses and legumes	15,147,916	11,785	37,587	0	**15,197,289**
CP11 Existing trees	1,093,763	357	0	0	**1,094,120**
CP12 Wildlife food plots	75,407	1,733	0	0	**77,141**
CP13 vegetative filter strips	29,467	0	0	0	**29,467**
CP15 Contour grass strips	36	115	78,062	0	**78,213**

(Continued From Previous Page)

Acres

	General	Continuous			
Conservation practice	**CRP sign-up**	**CREP sign-up**	**Non-CREP sign-up**	**Farmable wetland**	**Total**
CP16 Shelterbelts	364	384	28,657	0	**29,406**
CP17 Living snow fences	2	0	4,128	0	**4,130**
CP18 Salinity reducing vegetation	0	0	294,766	0	**294,766**
CP19 Alley cropping	52	0	0	0	**52**
CP20 Alternative perennials	23	0	0	0	**23**
CP21 Filter strips (grass)	0	127,711	841,236	0	**968,947**
CP22 Riparian buffers	0	146,817	561,557	0	**708,374**
CP23 Wetland restoration	1,568,820	91,683	0	0	**1,660,502**
CP23 Wetland restoration (floodplain)	0	0	67,118	0	**67,118**
CP23A Wetland restoration (nonfloodplain)	0	0	4,512	0	**4,512**
CP24 Cross wind trap Strips	0	38	645	0	**683**
CP25 Rare and declining habitat	655,671	38,279	0	0	**693,950**
CP26 Sediment retention	0	6	0	0	**6**
CP27 Farmable wetland pilot (wetland)	0	0	0	36,641	**36,641**
CP28 Farmable wetland pilot (upland)	0	0	0	89,657	**89,657**
CP29 Wildlife habitat buffer (marginal pasture)	0	1,889	14,464	0	**16,353**
CP30 Wetland buffer (marginal pasture)	0	219	10,906	0	**11,125**
CP31 Bottomland hardwood	0	58	9,645	0	**9,703**
CP33 Upland bird habitat buffers	0	26	25,623	0	**25,649**
Unspecified	-21	668	130	0	**678**
Total	**31,751,747**	**645,557**	**2,298,502**	**126,299**	**34,822,105**

Source: USDA.

Note: Data sources used for the 2002 Heinz Center report indicator land use (grasslands and shrublands) are shown in bold-faced type.

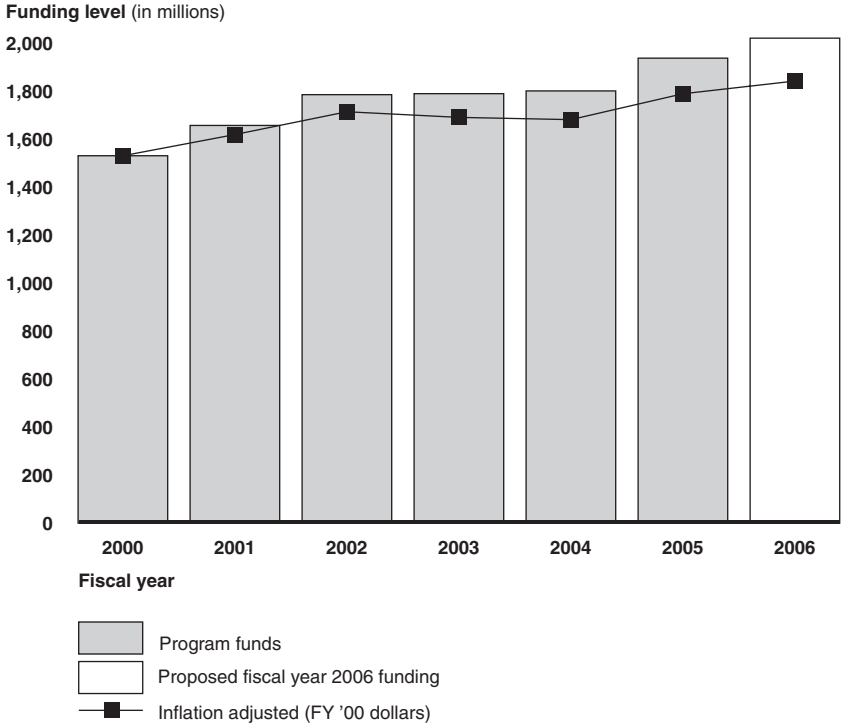
Six of the approved CRP conservation practices are by far the most widely used. Of the 34,822,105 acres enrolled in the program as of March 2005, nearly half are contracts to maintain existing grasses and legumes. New plantings of grasses and legumes compose another third of the acreage.

Other widely used conservation practices include creating permanent wildlife habitat, preserving existing trees, creating filter strips using grass to secure the soil, and restoring wetlands. Together, these six practices account for 28,631,268 (82 percent) of the total acres enrolled in CRP.

As indicated in table 3, CRP data were used to support the ecological indicator land use (grasslands and shrublands) in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*.[7] For its calculations, the Heinz Center reported on acreage for 14 of the 35 CRP-approved conservation practices: introduction of new grasses and legumes, new native grasses, permanent wildlife habitat, grass waterways, existing grasses and legumes, wildlife food plots, vegetative filter strips, contour grass strips, living snow fences, salinity reducing vegetation, alternative perennials, filter strips (grass), cross wind traps strips, and rare and declining habitat.

[7]To assist the Heinz Center with its first ecological indicators report in 2002, FSA analysts reviewed prior-year data files to provide the Heinz Center with trend information for 1994 through 2001. Specifically, the Heinz Center used data issued April 30, 2001, in a report titled *Summary of Practices Acreages for Active Contracts Beginning in Program Year 1998*. The latest edition of this annual report was published on August 31, 2004.

Figure 1: Conservation Reserve Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USDA.

Note: Funding levels were adjusted for inflation using a chained gross domestic product (GDP) price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Summary

According to agency officials, CRP budgets have more than kept pace with inflation since fiscal year 2000, an advantage expected to continue with the proposed fiscal year 2006 budget. Data collection and analysis of the conservation practices and acreages are not likely to entail additional expenses. In fiscal year 2005, CRP was funded at $1,937,211,000. For fiscal year 2006, the President has requested $2,020,503,000 for the program. In view of its recent funding history and long-range financial commitments (10- to 15-year contracts), program officials indicated that CRP is well-positioned to continue to provide data similar in quality and comprehensiveness to that used by the Heinz Center in its 2002 report, including data for use in the center's projected 2007 report.

According to agency officials, the data CRP collects to administer its contracts are intrinsic to the program and are not affected by policies or priorities. For example, unless CRP discontinues support for a particular conservation practice, its application (e.g., acreage and locale) can be expected to appear in the weekly, monthly, and annual tabulations that CRP prepares.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USDA officials provided the following information on funding levels and program priorities relative to CRP's ability to continue providing environmental and ecological data comparable with past years:

- The CRP data provided to the Heinz Center will continue to be available in the future, even if funding for CRP acreage enrollment were to be reduced at some point. This data comes from active CRP contracts overseen and managed by FSA's National CRP Contract Administration system (the National CRP Contract File), which, among other things, provides monthly and annual tabulations of acreage by conservation practice installed. Budget reductions to the Conservation Reserve Program would have no direct effect on this data collection and reporting process.[8]

- CRP data may potentially contribute additional ecological and environmental information in the future to support Heinz Center indicators. For example, CRP data could be used in support of the Heinz Center ecological indicators riparian condition and carbon storage, once these indicators are better defined by the center's staff and advisers. Riparian condition describes streamside areas using an index that combines key factors such as water flows, streambed physical condition, riparian vegetation's composition and structure, and use by various species. Carbon storage describes how much carbon—a major component of all organisms—is stored in forests.

[8]CRP's computerized data and contract administration system at the FSA center in Kansas City, Missouri, requires 2.5 full-time equivalent employees to operate, at a total annual cost of about $155,000 per year.

Glossary of Conservation Reserve Program Terms

Conservation Practices

CP1 New permanent introduced grasses and legumes: a vegetative cover of introduced grasses and legumes on eligible cropland that will enhance environmental benefits.

CP2 New permanent native grasses: a vegetative cover of native grasses on eligible cropland that will enhance environmental benefits.

CP3 New softwood trees (not longleaf): a stand of trees in a timber planting that will provide multipurpose forest benefits.

CP3A New hardwood trees: a stand of predominantly hardwood trees in a timber planting that will provide multipurpose forest benefits, includes Longleaf Pine and Atlantic White Cedar trees.

CP4 Permanent wildlife habitat: a permanent wildlife habitat cover to enhance environmental benefits for the wildlife habitat of the designated or surrounding areas.

CP5 Field windbreaks: a windbreak established to reduce cropland erosion below soil loss tolerance and to enhance the wildlife habitat on the designated area.

CP6 Diversions: structures designed to divert water away from farmland and farm buildings, and from agricultural waste systems, in order to reduce runoff damage, control erosion, and protect terrace systems from degrading.

CP7 Erosion control structures: structures such as dikes on river and stream banks to prevent loss or damage to land uses and protect adjacent facilities.

CP8 Grass waterways: strips of grass planted where water tends to move across a field, planted to prevent gully erosion.

CP9 Shallow water areas for wildlife: areas of shallow water (average depth 6 to 18 inches) near or within crop fields that are protected by permanent trees, shrubs, and grasses.

CP12 Wildlife food plots: plantings of foods for wildlife in plots up to 5 acres in size.

CP15 Contour grass strips: narrow bands of perennial vegetation established across the slope of a crop field and alternated down the slope with wider strips of crops. Properly designed and maintained, they can reduce soil erosion, minimize transport of sediment and other waterborne contaminants, and provide wildlife habitat.

CP16 Shelterbelts: rows of trees, shrubs, or other plants used to reduce wind erosion, protect young crops, and control blowing snow. They also provide excellent protection from the elements for wildlife, livestock, houses, and farm buildings.

CP17 Living snow fences: similar in design to field windbreaks and shelterbelts, living snow fences serve the added function of being used to help manage snow deposits to protect buildings, roads, and other property. They can be designed and placed to help protect nearby areas for livestock, provide wildlife cover, and collect snow to enhance soil moisture and nearby water supplies.

CP18 Salinity seducing vegetation: plantings of trees or shrubs that either install salt-tolerant vegetative cover within a saline seep area or establish permanent vegetative cover in areas causing saline seeps.

CP21 Filter strips (grass): strips of grass planted between crops that are used to trap sediment, fertilizers, pesticides, and other pollutants from surface runoff and subsurface flow before they reach streams and creeks. The minimum width is 30 feet, the maximum 120 feet.

CP22 Riparian buffers: trees, shrubs, and grasses planted along stream banks to catch pollutants in both surface runoff and groundwater before those pollutants reach the stream. Buffers also trap nutrients and sediment. Native trees and grasses are planted for this practice. The minimum width is 35 feet, the maximum 180 feet.

CP23 Wetland restoration: restores wetlands for return to agricultural use by increasing sediment trapping, reducing flood flows, constructing

barriers such as dams or levees, and introducing grasses and legumes to stabilize the soil.

CP24 Cross wind trap strips: one or more strips of permanent, vegetative, wind-resistant cover planted perpendicular to the prevailing wind to reduce erosion and trap wind-borne sediments and contaminants.

CP29 Wildlife habitat buffer (marginal pastureland): grass, shrub, and forb (nongrass herb) cover planted to provide wildlife protection and to remove nutrients, sediment, organic matter, pesticides, and other pollutants from surface runoff and subsurface flow.

CP30 Wetland buffer (marginal pastureland): planting of vegetative cover adjacent or parallel to a stream (with perennial or seasonal flow) to remove nutrients, sediment, organic matter, pesticides, and other pollutants before they reach the stream.

CP31 Bottomland timber establishment on wetlands: establishing stands of trees to control erosion, reduce water and air pollution, promote carbon sequestration, and extend wildlife habitat.

CP32 Expired CRP hardwood tree planting on marginal pastureland: land established to trees under CP1 that expired on or before September 30, 2001, and reoffered to grow hardwood trees.

CP33 Habitual buffers for upland birds: allows for enrollment of field borders to provide valuable habitat for quail and other upland birds in cropland areas.

Economic Research Service, U.S. Department of Agriculture

Background

The Economic Research Service (ERS), an agency of the U.S. Department of Agriculture (USDA), is the department's main source of economic information and research on agriculture and related topics. Officially established in 1961, ERS has its origins in the 1905 formation of the Office of Farm Management, which was set up to examine economic aspects of farming within USDA's Bureau of Plant Industry.[1] For nearly a century, ERS and its predecessor agencies have supported USDA programs with economic data, research, and analysis needed for sound decision making and policy formulation. ERS continues to inform and enhance public and private decision making on economic and policy issues related to agriculture and rural development—the central traditional concerns of USDA economic research activity. At the same time, however, ERS's mission has broadened to reflect the changed environment of the nation's food and agricultural system and now includes research on such diverse topics as food safety and nutrition, natural resources, conservation, rural development, and the environment.[2]

ERS, along with the National Agricultural Statistics Service (NASS), the Cooperative State Research, Education, and Extension Service, and the Agricultural Research Service, is located within USDA's Research, Education and Economics Mission Area. The Administrator of ERS reports directly to the USDA Undersecretary for Research, Education and Economics. ERS carries out its work under a single USDA appropriations line item—economic analysis and research. Between fiscal years 2000 and 2005, ERS funding has consistently amounted to less than 0.4 percent of the total USDA discretionary budget, which was $21.2 billion in fiscal year 2005.

[1]From 1922 until 1953, these economic analysis and research functions were carried out by the Bureau of Agricultural Economics within USDA and from 1953 until the creation of ERS in 1961 by the Agricultural Marketing Service and the Agricultural Research Service. In 1977, ERS merged briefly with USDA's statistical agency and was called the Economics, Statistics and Cooperatives Service, but was returned to agency status in 1981. ERS was established pursuant to the authority of the Secretary of Agriculture under section 203 of the Agricultural Marketing Act of 1946, 7 U.S.C. § 1622. The agency sometimes conducts specific studies pursuant to annual appropriations laws and related congressional conference reports.

[2]Five major areas of research define the scope of ERS activity: (1) a competitive agricultural system; (2) a safe food supply; (3) a healthy, well-nourished population; (4) harmony between agriculture and the environment; and (5) an enhanced quality of life for rural Americans.

ERS's work is structured among three program divisions and one support division: the Food and Rural Economics Division, the Market and Trade Economics Division, the Resource Economics Division, and the Information Services Division. The ERS program encompasses research, analyses of food and commodity markets, policy studies, and development of economic and statistical indicators.[3] ERS employs approximately 450 full-time staff, all in Washington, D.C. For primary data, which it does not collect, ERS relies on other agencies, particularly within USDA. Developing and analyzing secondary data, on the other hand, are an essential part of ERS's short-term and long-term research efforts.

The Resource Economics Division is the ERS division that produces all data used to support indicators in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*.[4] This division conducts research in three primary areas: (1) the interactions among natural resources, environmental quality, and agricultural production and consumption; (2) the economics of agricultural research and development and technological change; and (3) the structure and financial performance of the agricultural sector. Specific research topics within the division's purview include conservation and environmental programs, technology and sustainability, production practices and the environment, water use and management, farm finance, and farm-sector economic performance. The Resources Economic Division has 100 full-time staff, about 75 of whom are economists working in such specialty areas as industrial organization, international economics, natural resource/environmental economics, production economics/farm management, regional economics, and research and development/technological change.

One key activity carried out by the Resource Economics Division is the estimation of agricultural cash receipts, which are calculated from sales of

[3]ERS disseminates economic information and research results through an array of outlets, including: (1) agency published research reports, market analysis and outlook reports; (2) the agency's Web site (www.ers.usda.gov); (3) oral briefings, written staff analyses, and congressionally mandated studies; (4) articles published in high-quality journals; and (5) papers presented to academic colleagues at annual meetings of scientific and professional organizations.

[4]Data compiled and reported by ERS's Resource Economics Division were used exclusively or in part to support Heinz Center report indicators for ecosystem extent (a core national indicator), production of food and fiber (also a core national indicator), total cropland (including pasture and hayland), agricultural inputs and outputs, and monetary value of agricultural production.

more than 25 agricultural commodities.[5] Cash receipts include data from about 150 crop and livestock communities collected by NASS and the Commodity Credit Corporation. ERS analyzes and publishes these data annually under the title "Farm Income Forecasts." ERS will continue to generate these data in future years. Moreover, these data go directly into the Department of Commerce's National Income and Product Accounts as the farm-income component and into the Bureau of Economic Analysis's regional and county estimates of personal income, which are used to distribute Federal Revenue Sharing Funds.[6]

The Heinz Center also employed data from the Resource Economics Division's Agricultural Resources and Environmental Indicators (AREI) compilations, specifically for various cropland uses, to support its indicator total cropland. Also used by the Heinz Center were the AREI land use indicator and NASS's Crop Production Annual Summary.[7] ERS officials said they plan to continue publishing the AREI indicators and will update the entire series with new information later this year. The Heinz Center used ERS cropland categories when developing its indicators for total cropland and ecosystem extent.

Summary

ERS officials indicated that funding for the agency for fiscal year 2005 and funding proposed in the President's budget for fiscal year 2006 (as shown in fig. 2) are expected to result in the continuation of research activities and

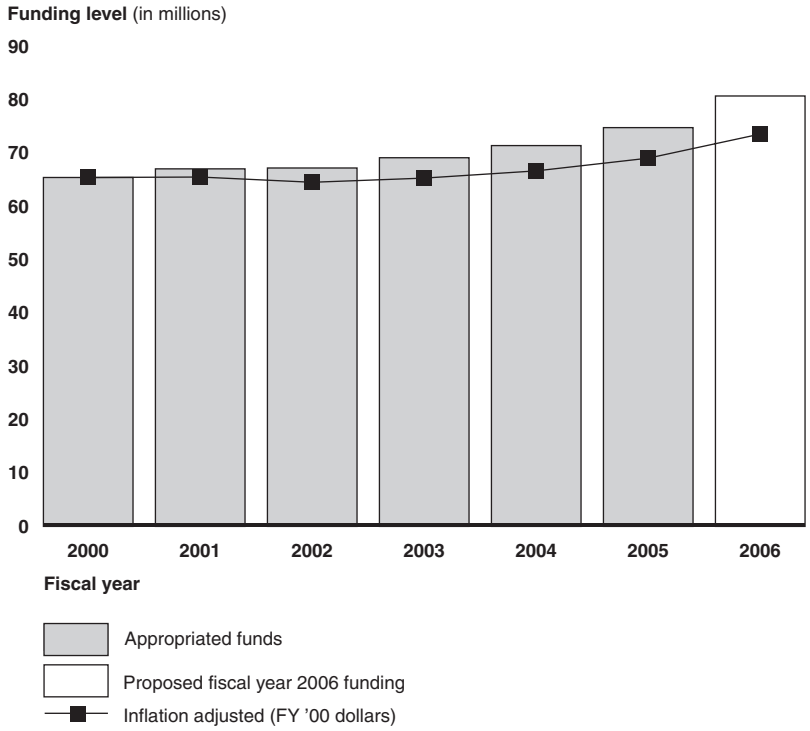
[5]Cash receipts data were used by the Heinz Center to support its indicator for the monetary value of agricultural Production. The gross monetary value of agricultural production figures used by the Heinz Center were determined by multiplying the amount of physical output of major crops and livestock by the prices (in dollars) received by farmers (converted to 1999 dollars).

[6]ERS staff is not involved in the collection of the data that serve as the basis for estimates of farm cash receipts. The estimating system used to estimate cash receipts comprises an integrated set of computer applications with numerous equations that simulate the value of marketing from agricultural production. The system incorporates the use of USDA's mainframe computer and ERS's PC-LAN.

[7]As noted previously, ERS does not engage in the primary collection of data, including agricultural land use data. Instead, it takes existing data, primarily from NASS field crop acreages and makes various adjustments, including adding adjusted acreages of orchards, vegetables, and other minor crops, to arrive at an overall figure for cropland used for crops. To that figure, ERS adds cropland pasture and idle cropland to arrive at a figure for total cropland. The ERS cropland data series is compiled every 5 years, which is the reporting cycle for the NASS Census of Agriculture data on which the data series is based.

data analysis such that ERS data will be of similar or superior quality and comprehensiveness compared with that used to support ecological indicators in the 2002 Heinz Center report.[8] Moreover, they anticipate no budget-driven changes to the activities supporting these indicators.

Figure 2: Economic Research Service Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USDA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

[8]While the overall ERS budget request for fiscal year 2006 is $80,700,000, representing a 6 percent increase over fiscal year 2005 funding, the funding of staff resources dedicated to those activities whose data were used to support the ecological indicators in the 2002 Heinz Center report is expected to remain at the fiscal year 2005 level of $250,000.

Table 4 reflects funding for staff time devoted to the key ERS data analysis activities that were cited as sources of data to support Heinz Center indicators in the Center's 2002 report:

Table 4: Cost of Selected ERS Data Analysis Activities for Fiscal Years 2000-2005

Dollars in thousands						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Agricultural productivity measures	$23	$24	$25	$26	$27	$28
Land use data	17	17	18	19	20	20
Cash receipts	164	171	179	186	195	202
Totals	**$204**	**$212**	**$222**	**$231**	**$242**	**$250**

Source: USDA.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

ERS officials provided the following information on funding levels and program priorities relative to ERS's ability to continue providing environmental and ecological data comparable with past years:

- Program priorities in the current ERS strategic plan, including increasing the "quality and sustainability of the nation's agricultural resources" by evaluating conservation policies on working and retired farmlands and analyzing the dynamics of land use change, should enhance ERS's ability to produce useful data for the planned 2007 edition of the Heinz Center report.

- Overall ERS funding (adjusted for inflation) has increased by less than 1 percent from fiscal year 2000 through 2005, while funding for ERS data programs increased by 12 percent in the same period. ERS staff time devoted to the data activities cited by the Heinz Center as sources of support for its indicators increased by 2 percent from fiscal year 2000 through 2005.

- Data programs are essential to the mission of ERS, an applied economic research organization. The agency requires data to provide decision makers with accurate, timely, and scientifically rigorous analysis of issues facing the agricultural sector, rural America, and consumers. Thus, the agency has no plans to reduce its data activities, including those cited as data sources by the Heinz Center. Should ERS's budget be cut in the future, the agency would "make every effort to protect the

scope, extent, and quality of [its] data programs." Such efforts would be undertaken in consultation and collaboration with NASS and other USDA agencies that are responsible for collecting the primary data that ERS uses. As a last resort, funding reductions could force changes in ERS data collection procedures by, for example, necessitating smaller sample sizes or less frequent sampling. ERS would adopt such changes before actually eliminating any data program.

- ERS could potentially have provided data to support other indicators used in the 2002 Heinz Center report. For example, ERS has a research program on rural economics and maintains indicators on urban/rural differences, definitions of rurality, rural (nonmetropolitan) conditions and trends, etc. These data could be relevant to the issues discussed in the Heinz Center's report chapter on farmlands. The data are readily available, and ERS plans to continue reporting on a range of rural (nonmetropolitan) conditions in the future.

Forest Inventory and Analysis Program, U.S. Forest Service, U.S. Department of Agriculture

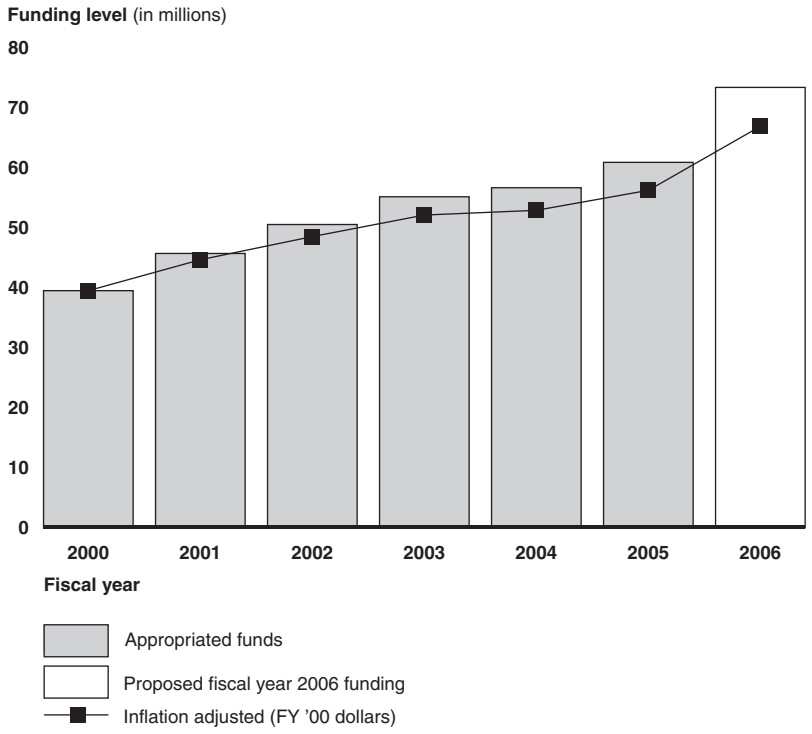
Background

For nearly 80 years, the Forest Inventory and Analysis (FIA) program has provided state and national lawmakers, environmental organizations, private industry, research institutions, and the media with information regarding resource management and protection, wildlife habitat conditions, the sustainability of current ecosystem management practices, forest health, and the effects of global change. FIA provides periodic data on the area and location of forests; the structure and composition of forests in terms of species, sizes, and volume; tree growth rates, mortality, and removals; patterns of forest ownership; and harvest efficiency and wood product flows.

Summary

According to FIA officials, the funding for fiscal year 2005 will have only a minimal effect on the program's ability to generate data of a quality and comprehensiveness similar to data generated in previous years. Furthermore, the fiscal year 2005 funding and the estimated funding for fiscal year 2006 would enable the agency to fulfill its overall program objectives and incorporate updated information into its annual forest inventory. However, for six states the funding levels will provide for only remote sensing and not actual data from on-the-ground observations (field data), which are needed to facilitate the validation of the remote-sensing estimates. The existing field data for the six states are several years old. If that information is not updated with new measurements in the next few years, FIA officials recognize that for those states, the old data will offer a weaker basis for estimating ecological indicators, planning forest management activities, and making estimates of the health, productivity, and sustainability of the forests.

Figure 3: Forest Inventory and Analysis Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USDA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Agency officials told us that FIA has no planned program priorities that will affect its ability to generate data in the coming years that are comparable to data generated in previous years. Furthermore, they told us they believe that FIA data will be available in an improved form for the expected 2007 update of the Heinz Center's *The State of the Nation's Ecosystems* report.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USFS officials provided the following information on funding levels and program priorities relative to the FIA program's ability to continue providing environmental and ecological data comparable with past years:

- When the next Heinz Center report is issued in 2007, the FIA program will be able to provide some of the most complete data in its history on a

much timelier basis. Newly designed information systems that use new software will allow the integration of data and map-based information. To allow for meaningful trend analysis, historical data will be loaded into these systems. In the case of the 2002 Heinz Center report, the FIA data used were 80 percent "old" data (from older, periodic inventory systems that were done cyclically, state by state) and 20 percent "new" data. By the time the Heinz Center is ready to prepare its next report, these proportions will be reversed: Fresh data will be obtained in every state each year, so the Heinz Center data could be updated on an annual basis with "new" data.[1]

- The fiscal year 2005 funding and the proposed fiscal year 2006 funding could affect the FIA program's data provided in support of the Heinz Center indicators in that the data would be older for six states (Hawaii, Mississippi, New Mexico, Oklahoma, Wyoming, and interior Alaska) that include about 23 percent of the nation's forests. FIA program officials plan to continue gathering remote-sensing estimates for these regions, but without updated field data, the remote-sensing estimates are difficult to validate. Such data, some of which were collected 10 years ago, are distinctly less valuable for forest management planning and for use in supporting ecological indicators. For example, as estimates of forest growth get older, it becomes more difficult to determine allowable harvest levels and sustainability.[2]

- Delay in transitioning to an annualized inventory system is expected to have minimal effect on the ability of FIA's data users to compare data from the new inventory system with data generated under the old system (i.e., data used in the 2002 Heinz Center report). According to program officials, the main reason for delay in implementing a complete annualized inventory cycle is the significantly increased cost that this

[1]One major goal of the FIA program's strategic plan for fiscal years 2004-2008, not yet fully achieved, is to implement an FIA program that involves (1) generating 10 state-level reports every year over a 5-year cycle (all 50 states would be covered after 5 years), and (2) preparing a national summary report every 5 years describing the same forest and ecological categories at regional and national scales that are described in the state-level reports.

[2]Generally, if net annual growth exceeds annual removals (i.e., what was cut), then the forest is not being diminished and the volume of the forest is "sustainable." However, the concept of sustainability is much more complex than whether total volume is sustainable. For example, "sustainability" is contingent on species composition, structure, and landscape juxtaposition in the "proper" mix to sustain the goods and services we want from the forest.

change represents. This is particularly the case for Alaska, which contains about 17 percent of the nation's forestland and has vast tracts of forestland that are difficult to access for field validation activities. A recent inventory of a portion of Alaska indicated that 2.1 million acres of what were believed to be trees based on remote-sensing data were actually acres of tall shrubs (and thus not forest by definition). FIA officials intend to utilize sophisticated remote sensing technologies to determine the minimum amount of field data necessary for validation, thus optimizing the cost of obtaining data of good quality. However, as FIA develops remote-sensing technologies, more ground data are generally needed in the short term in order to develop the models that will in turn reduce the need for extensive ground-level data. FIA expects a "big payoff" from the short-term additional field validation investments in the long-run.

- Major challenges to the FIA program in recent years have included the following:

  - State contributions, which are used to leverage FIA work, have not matched increases in federal funding for the FIA program over the past few years.[3] Fluctuations in state budgets can undermine FIA program goals and associated data collection activities. Historically, states provided about 15 to 20 percent of total annual funding for the FIA program. But in fiscal year 2004, the percentage fell to an all-time low of 12 percent.

  - Assessments made at the department or agency level, which are generalized reductions of FIA program funds for such things as GSA rent, worker compensation, unemployment compensation, transit subsidies, and the National Finance, Visual Communication, and National Information Technology Centers, have risen. Such assessments rose from just over $1 million for fiscal year 1999 to an

[3]According to Forest Service officials responsible for the FIA, Congress in April 1999 determined that the cost of the annualized inventory was too high and instructed FIA to complete, annually, 15 percent of all plots in each eastern state and 10 percent of all plots in each western state (and 7 years for complete plots in the East and 10 years for complete plots in the West). These activities, also outlined in the FIA strategic plan, are collectively known as FIA's "base program." FIA indicated that it was the intent of Congress that states participate financially to bring the coverage up to 20 percent annually in each state. Currently, 25 states provide funds to meet this objective, primarily in the East. Any increase in the number or percentage of plots measured annually would be an enhancement at the client's expense, known as the "extended program."

estimated $5.7 million for 2006. While FIA program funding increased by approximately $5 million from fiscal year 2004 to 2005, about $900,000 of the increase went to assessments.

- FIA officials are exploring new ways to use and deliver FIA data. Spatial analysis and remote-sensing technologies are being coupled with field-sampling verification activities and will produce improved spatial products, such as maps of known statistical quality that will be relied upon more heavily for effective and timely inventories.[4] In cooperation with the Forest Health Monitoring Program, the National Forest System, and the Remote Sensing Applications Center, FIA is using these technologies to develop maps showing information on forest types, biomass, fuel loading, and fire risks. FIA is currently performing accuracy assessments and peer reviews of these maps.

[4]The initial phase of the sampling process is done by remote sensing. In this phase, remotely sensed data is used to estimate the area of forest and nonforest land. Then, in the field, the forest land is sampled to acquire information about and validate various attributes, such as biomass. These validated data can then be used to develop much more detailed and useful maps of forests and their attributes.

National Agricultural Statistics Service, U.S. Department of Agriculture

Background

The history of collecting data on U.S. agriculture extends back to the earliest days of the nation. In 1791, President Washington wrote to several farmers requesting information on land values, crops, yields, livestock prices, and taxes. It was, in effect, the nation's first agricultural survey. The next major step forward in agricultural data collection came in 1839, when the Commissioner of Patents prevailed upon Congress to designate $1,000 from the Patent Office Fund for "collecting and distributing seeds, carrying out agricultural investigations, and procuring agricultural statistics." Then, in 1840, detailed agricultural information was collected through the first Census of Agriculture, which provided a nationwide inventory of agricultural production. When the 1840 federal census information arrived, the Commissioner of Patents was able to combine it with other information to estimate production by states and territories. These estimates, made yearly through 1844, established the general pattern of annual agricultural reports that continues to this day.

The U.S. Department of Agriculture (USDA) was itself established by Congress in 1862, and its first crop report appeared in 1863. The National Agricultural Statistics Service (NASS) traces its roots to that year, when USDA established a Division of Statistics. The creation of USDA's Crop Reporting Board in 1905 (now called the Agricultural Statistics Board) was another landmark in the development of a nationwide statistical service for agriculture. A USDA reorganization in 1961 led to the creation of the Statistical Reporting Service, known today as the National Agricultural Statistics Service (NASS), of which the Agricultural Statistics Board is a part. The board prepares and releases the NASS reports. It consists of a permanent chairperson, secretary and other NASS staff members chosen to participate in the preparation of a specific report based on their detailed knowledge of a particular topic.

The mission of NASS is to provide timely, accurate, and useful statistics in service to U.S. agriculture.[1] NASS's Agricultural Statistics Program is responsible for collecting, processing, analyzing, and disseminating statistical information on agricultural production, market structures, economics, and environmental impacts. Each year, the Agricultural Statistics Program conducts hundreds of surveys and prepares reports

[1]NASS activities are based on the Secretary of Agriculture's authority under the Organic Act of 1862 that created the Department of Agriculture (USDA), 7 U.S.C. § 2204; section 203 of the Agricultural Marketing Act of 1946, 7 U.S.C. § 1622; and the Census of Agriculture Act of 1997, 7 U.S.C. § 2204g.

covering virtually every facet of U.S. agriculture, including production and supplies of food and fiber, prices paid and received by farmers, and farm labor and wages. NASS publications cover agricultural products and topics as diverse as production and prices of traditional agricultural crops (e.g., corn and wheat), specialty crops (e.g., mushrooms and flowers), number of live births of calves, number of hogs slaughtered, and land in farm use. In any given year, NASS publishes more than 400 national reports for 120 crop and 45 livestock items. NASS's 46 state statistical offices (also called field offices) publish data about many of the same topics for local audiences.[2]

In addition to the many statistical activities directly related to its mission, NASS conducts surveys for and lends technical assistance expertise to other federal agencies, state governments, and private organizations. NASS provides support and assistance in the areas of questionnaire and sample design, data collection and editing, analysis of survey results, and training. Among its more notable projects, NASS conducted a farm injury survey for the National Institute for Occupational Safety and Health; carried out a pilot study on Native American contributions to agriculture for the Intertribal Agriculture Council; and surveyed producers' sources of agricultural information for USDA's Office of Communications. Field offices have also become increasingly involved in performing special surveys in cooperation with land-grant universities and state departments of agriculture. Data have been collected on such diverse subjects as specialty fruits and vegetables, nursery products, waste management in rural communities, and producers' opinions of farm bill proposals.

NASS's field offices serve all states and Puerto Rico. These offices publish more than 8,000 reports a year. Through these field offices, NASS conducts its many surveys by relying on data from state agriculture departments, land-grant universities, and the agricultural industry.[3] The field offices are the primary NASS units to collect, process, evaluate, and estimate agricultural data. Each field office collects and summarizes data, prepares estimates, and submits them to the Agricultural Statistics Board in Washington, D.C. Production forecasts for some products are considered

[2]NASS has about 1,100 employees divided between its Washington, D.C., headquarters and state statistical offices (field offices).

[3]NASS maintains a series of cooperative agreements with its various in-state sources. Cooperative federal-state programs first began in 1917.

"speculative" because these products are traded on commodity markets.[4] Thus, field offices send the board data and comments on these products via encoded computer transmissions. Preparing official crop estimates involves tight security until these data are publicly released according to a set schedule each year.

Since 1997, NASS has had responsibility for developing, administering, compiling and reporting data from the quinquennial Census of Agriculture. In prior years, the agricultural census was conducted by the Commerce Department's Bureau of the Census. The transfer of responsibility reduced response burden on the public and made planning, collection, and release of agricultural census results more efficient. The Census of Agriculture is the most comprehensive source of agricultural statistics available and the only one with uniform agricultural data for every U.S. county.[5] It is the only attempt to enumerate every farm and ranch operation in the country.[6] Data are collected every 5 years on a wide array of topics, including corporate structure, chemicals employed in agriculture, energy expenditures, farm programs, irrigated land, machinery and equipment, land use and ownership, market value of products, and production expenses. Using mailings, telephone calls, and rare personal visits by enumerators, data are collected and then aggregated to protect confidentiality and proprietary information. The census is released in print, on CD-ROM, and on the

[4]Corn, wheat, cotton, soybeans, and oranges are "speculative" crops, but NASS maintains strict secrecy for other crop reports, as well, in order to forestall economic advantages from early knowledge.

[5]The Census of Agriculture Act of 1997 § 2, 7 U.S.C. § 2204g, requires the Census of Agriculture. It provides county-level census coverage and is administered via mail-out/mail-back data collection. USDA uses census data to provide local farm income and production costs, evaluate agricultural programs and policies, administer farm programs, and plan contingencies for disease or pest emergencies. The Farm Credit Administration uses the data to evaluate farmer loan programs. Congress uses census data to oversee farm programs and assess legislative proposals. State and local governments and farm organizations use census data to analyze and develop policies on land use, water use and irrigation, rural development, and farmland assessments. Agribusinesses use census statistics to develop sales territories, and determine the best locations for wholesale and retail outlets. Rural electric companies use statistics to forecast future energy needs.

[6]The definition of a "farm" has changed several times over the history of agricultural data collection. Since 1975, a farm has been defined by joint agreement among USDA, the Office of Management and Budget, and the Bureau of the Census as "any place from which $1,000 or more of agricultural products (crops and livestock) were sold or normally would be sold during the year under consideration." USDA estimates include institutional farms, experimental and research farms, and Indian reservations. The department counts government payments as part of farm sales.

Internet. In print, volume 1 of the census contains "U.S. National Level Data" and "U.S. State Level Data." Other volumes, 50 in total, present data for individual states. The Census of Agriculture was last conducted in 2002. The next census will provide statistics for calendar year 2007.[7]

Congress has mandated that several federal programs use NASS data in their operations and when making payment calculations for program beneficiaries. For example, NASS data are used by other USDA programs in the calculation of countercyclical payments and crop insurance;[8] and the Agriculture Secretary is required to report, using data from NASS's Census of Agriculture, the rate of increase or decrease by which socially disadvantaged groups participate in agriculture.[9] In addition, NASS conducts annual data user meetings to assess the relevance of its work to government, business, academic, and private applications.

In its 2002 report, *The State of the Nation's Ecosystems*, the Heinz Center used NASS data in support of three ecological indicators. The indicator for total cropland was based on the 1997 census, which used data from 1945 through 1997.[10] The indicator for major crop yields was based on NASS historical track records, on United States crop production data for May 2001, and annual Agricultural Statistics for 2001. Finally, the indicator for production of cattle was based on data from NASS surveys of livestock herd size, which are conducted and reported in January and July of each year. Data on cattle and calves come from state-level reports by NASS, and data on the value of cattle are from NASS Agricultural Statistics for 2000. NASS Historical Track Records are national-level statistics that include historic estimates and final plantings for crops, grain stocks, and livestock. U.S. crop production data are tabulated annually for more than 100 products.[11] The Heinz Center used crop production records from 1950

[7]Funds for the Census of Agriculture, a separate line item in NASS's budget, are appropriated and available until obligated.

[8]7 U.S.C. § 7914(b)(1).

[9]16 U.S.C. § 590h(b)(5)(B)(v)(II).

[10]The Heinz Center used data from the 1997 Census of Agriculture for its total cropland indicator when generating the 2002 report, *The State of the Nation's Ecosystems*. Census data on Total Cropland were collected using mail-in forms, direct enumeration, and telephone and personal interviews.

[11]The Heinz Center indicator was supported with data from NASS Historical Track Records and U.S. crop production data, both published in 2001.

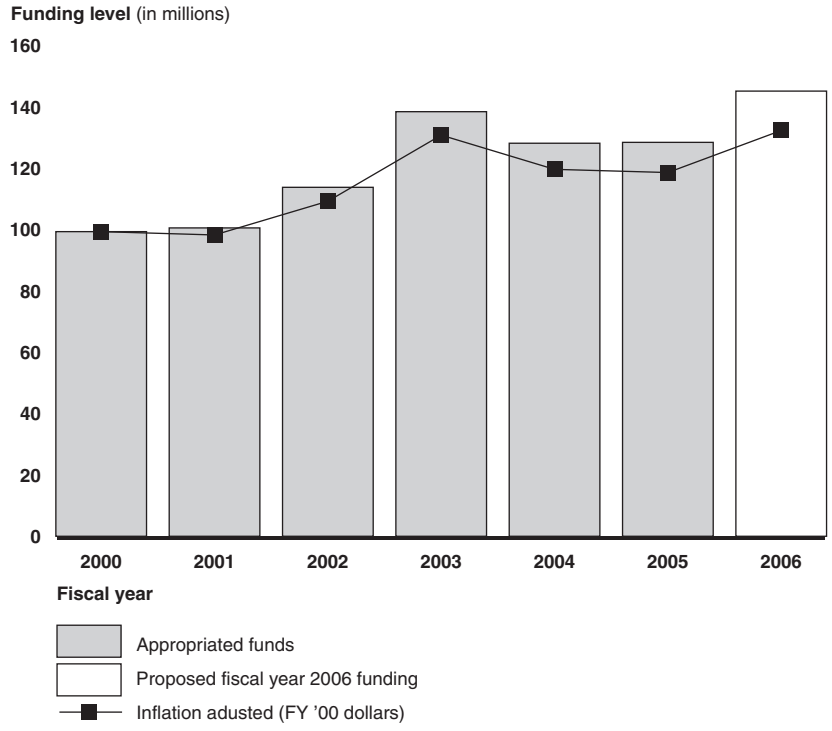
through 1998 to prepare its major crop yields, augmented by NASS annual statistics for 1999 and 2000. While there are numerous legislative mandates for statistical data in the U.S. crop production reports, such as for cotton acreage, crop reports throughout the growing season, and miscellaneous fruits and vegetables, none specifically mention any of the data used in the Heinz Center report.

Summary

NASS officials indicated that actual funding for fiscal year 2005 and projected funding for fiscal 2006 will have no adverse effect on the ability of NASS programs to generate data comparable in quality and comprehensiveness with data from previous years. The officials indicated, in particular, that there should be no effect on the ability of its programs to generate data used to support indicators in the 2002 Heinz Center report. In important respects, NASS officials expect their data to improve in the future. For example, the agency plans to continue efforts begun in 2004 to restore and modernize its survey and estimation programs. In fiscal year 2006, NASS expects to achieve target precision levels for 83 percent of its data, a 12 percent improvement over 2004 levels. The long-term target is 90 percent precision.

The NASS budget contains two line items: agricultural estimates and the Census of Agriculture. Total appropriated funds for NASS for fiscal years 2000 through 2005 and proposed funding for fiscal year 2006 are shown in figure 4.

Figure 4: National Agricultural Statistics Service Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: NASS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NASS officials provided the following information on funding levels and program priorities relative to NASS's ability to continue providing environmental and ecological data comparable with past years:

- Funding for NASS typically fluctuates over a 5-year cycle, rising around the time of activities related to the conduct and analysis of the Census of Agriculture and falling thereafter. Because of the cyclical pattern of the census, $29,115,000 of the proposed fiscal year 2006 funding total of $145,159,000 will remain available until obligated for the 2007 census's preparation and publication. Funding levels will rise in a predictable manner within the funding cycle for the 2007 census, peaking in fiscal

year 2008 when the census tabulations are made.[12] Such cyclical fluctuations will have no effect on NASS's ability to generate data of similar quality and comprehensiveness when compared with data from previous years.

- NASS's Agricultural Estimates budget more closely parallels inflation as it supports routine activities that occur throughout the year. For example, appropriations for Agricultural Estimates were $79 million in fiscal year 2000, and increased yearly to $82 million (fiscal year 2001), $84 million (fiscal year 2002), $93 million (fiscal year 2003), $103 million (fiscal year 2004), and $106 million (fiscal year 2005). The President has proposed a budget of $116,044,000 for Agricultural Estimates in fiscal year 2006. Using $7 million from this increase, NASS plans to continue efforts begun in 2004 to restore and modernize its survey and estimation programs. NASS has set three goals: to (1) restore sample sizes that have been reduced in recent years; (2) provide staff to manage surveys and better review and summarize data; and (3) meet research, training, travel, and other expenses. In fiscal year 2006, NASS expects to achieve target precision levels for 83 percent of its data, a 12 percent improvement over fiscal year 2004 levels. (The long-term target is 90 percent).[13]

- Lacking appropriations to cover the full cost of congressionally mandated salary increases, NASS finds its annual operating budget constrained, necessitating economies elsewhere, such as less-frequent sampling. For example, fewer farms in a state might be sampled in the preparation of crop estimates, or production figures might aggregate several crop types.[14] However, NASS officials cited no examples of such economies affecting the data used by the Heinz Center to support its indicators. In addition, in an effort to compensate for recent unfunded

[12]In the case of the 2002 Census of Agriculture, the highest level of appropriations occurred in fiscal year 2003, when the 2002 data were collected, compiled, and analyzed.

[13]Funding for NASS varies with sample sizes to improve precision and the coverage provided on U.S. agriculture.

[14]However, NASS officials cited no examples of such economies affecting the data used by the Heinz Center to support its indicators. In addition, they noted that increased workloads were being accomplished with fewer staff primarily through efficiencies in methodologies and technology, such as enhanced electronic data capture and data analysis procedures. For example, upgraded computers can now tabulate and process data streams directly from field offices, requiring less work at USDA headquarters.

pay increases, the proposed fiscal year 2006 NASS budget includes a net increase of $16.7 million, with $1.3 million designated for salary costs.

- Beginning in 2004, NASS instituted an Agricultural Restoration Initiative to restore the collection of certain statistical data. For example, NASS had dealt with budget shortfalls in fiscal year 2003 by dropping "objective yield" cotton surveys, and the initiative restored them. Crop production forecasts and estimates employ both subjective and objective probability surveys. Subjective evaluations come from a sample of farmers, ranchers, and agribusinesses. In objective yield probability surveys, selected fields are visited during the growing season by enumerators, who count the plants and later the actual ears, pods, or bolls produced. These are accurate measurements, but are also labor intensive and costly, requiring enumerators to walk into fields and record growth in randomly sampled plots. Less-intensive surveys collect most data by mail or telephone.

- The results of the 2002 Census of Agriculture were published in 2004. The five-year schedule for the census means that data from the 2007 Census of Agriculture is scheduled to be released in February 2009, too late to be used in the next iteration of the Heinz Center report, in 2007. However, with the continuous upgrading by the Heinz Center of its own Web site, the center will add data for its ecological indicators as they become available from the 2007 census and from other sources.

- A Program Assessment Rating Tool (PART) review of NASS was conducted by the Office of Management and Budget (OMB) for the fiscal year 2006 budget. It found the Census of Agriculture and annual crop-reporting programs to be rated "moderately effective" because there were no recent external reviews of the program data. Specifically, OMB concluded that reviews by USDA data users meeting in 2002 and 2003, and a report by USDA's Advisory Committee on Agricultural Statistics, did not provide sufficient "independent evaluations of sufficient scope and quality conducted on a regular basis" to evaluate its effectiveness and relevance. NASS is now working to establish an external, independent evaluation system. In most other respects, OMB found NASS's performance to be exemplary, granting perfect scores of 100 percent for program purpose and for design and management.

National Resources Inventory, Natural Resources Conservation Service, U.S. Department of Agriculture

Background

The National Resources Inventory (NRI), conducted by the Natural Resources Conservation Service (NRCS) in cooperation with Iowa State University's Center for Survey Statistics and Methodology, is a statistical survey of land use and natural resource conditions and trends on U.S. nonfederal lands.[1] It produces a nationally consistent database capturing data on land cover and use, soil erosion, prime farmland, soils, wetlands, habitat diversity, selected conservation practices, and related resource attributes. Information derived from the NRI is used by a wide variety of users, including natural resource managers; policymakers; analysts; consultants; the media; other Federal agencies; state governments; universities; and environmental, commodity, and farm groups. These users employ NRI information to formulate effective public policies, fashion agricultural and natural resource legislation, develop state and national conservation programs, allocate Department of Agriculture (USDA) financial and technical assistance to address natural resource concerns, and enhance the public's understanding of natural resource and environmental issues.

The NRI was first conducted in 1977, then every 5 years through 1997. In 2000, the NRI transitioned to an annual inventory process to provide more timely data to support the development and assessment of agricultural and conservation policies and programs. Data collected from 1982 to 2003 enable trend analysis extending over 21 years. Data used for the most current NRI were primarily collected using high-resolution aerial photography, field office records, historical records and data, and a limited number of on-site visits.

[1]According to NRI definitions, nonfederal lands include privately owned land, tribal and trust land, and lands controlled by state and local governments.

- The primary sampling units in the NRI are areas of land called segments. Segments vary in size, from 40 acres to 640 acres. Data such as urban land and water area are collected for an entire segment. Detailed data on soil properties and land use are sampled from random points within the segment. Generally, there are three sample points per segment, but 40-acre segments contain two points. Some data variables, such as total land area, federally owned land, and area in large water bodies, are collected on a census basis separate from the sample survey. A typical national sample contains about 70,000 segments.[2]

- Two possible ways to classify the surface of the Earth in the NRI are land cover and land use. Land cover is the kind of vegetation, constructed material (such as roads or buildings), or natural material (such as sand, water, or ice) that actually covers the Earth's surface. Categories for land use include crop production, residential zones, and wildlife habitat. In the NRI, all land is placed into mutually exclusive and exhaustive categories, called "coveruse" categories. As the name suggests, the classification is based on both the land cover and the land use. For example, land is classified as urban if it has a certain building density, even if the predominant cover is trees. Roads in rural areas are classified as roads, while roads within the urban area are classified as urban area. Other coveruse categories include cultivated cropland, forest, rangeland, and pastureland.

The NRI program continues to evolve as cost-effective methods are developed to collect more timely and relevant data that address emerging agricultural and environmental issues. New inventory approaches will incorporate new tools, methodologies, and technologies. In addition to the transition to an annual NRI report, efforts are under way to implement a continuous inventory process, incorporate various assessment tools for measuring resource health, and more fully use inventory data for modeling and policy analysis.

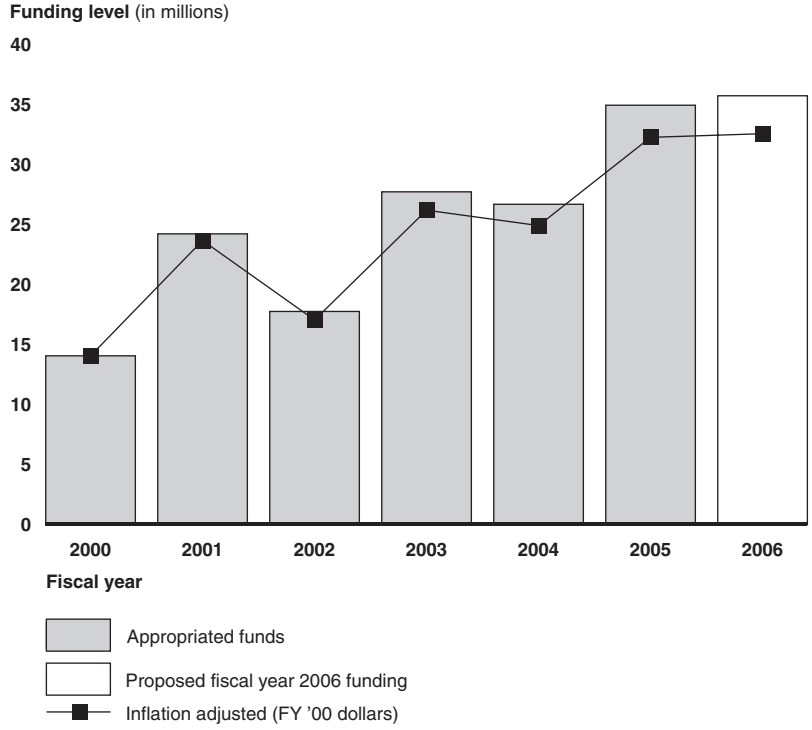
Summary

NRI and NRCS officials indicated that actual NRI funding for fiscal year 2005 and funding proposed in the President's budget request for fiscal year 2006 (as shown in fig. 5) are expected to assure the continuation of data collection and analysis, and will allow for data generation of similar quality

[2]The national annual sample size of 70,000 segments is selected from the NRI framework sample of 300,000 segments, which were used for the 5-year cycle through 1997.

and comprehensiveness when compared with data from previous years. The officials indicated, in particular, that data used in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, are expected to be available with similar or improved quality and comprehensiveness when compared with data from prior years.

Figure 5: National Resources Inventory Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USDA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

In addition, agency officials reported that planned program activities will improve the ability of NRI to produce data in the coming years comparable with data generated in previous years. As used in the 2002 Heinz Center report, agency officials stated that data are expected to be available in a

similar form for the Heinz Center's expected 2007 follow-on indicator report, with new estimates available at both national and regional scales.[3]

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NRI and NRCS program officials provided the following information on funding levels and program priorities relative to NRI's ability to continue providing environmental and ecological data comparable with past years:

- Specific funding amounts for the various NRI activities for fiscal years 2000 through 2005, as well as proposed funding for fiscal year 2006, are portrayed in table 5 (aggregate totals are presented in fig. 5):

Table 5: NRI Funding Levels for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Dollars in thousands

Activity	2000	2001	2002	2003	2004	2005[a]	2006[b]
Resources inventory support[c]	$1,076	$1,175	$1,176	$1,180	$1,211	$5,622	$5,668
Data collection, photo-interpretation and support[d]	8,497	15,573	11,020	14,907	9,844	4,359	3,700
On-site data collection[e]				882	3,389	3,933	4,006
Imagery[f]	3,400	5,789	4,074	5,700	5,636	5,920	6,000
Statistical unit[g]	1,100	1,700	1,500	1,600	2,213	2,000	2,400
Remote-sensing laboratories (established June 2004)[h]						9,600	10,000
NRI-CEAP data collection (initiated 2003)[i]				3,470	4,409	3,522	4,000
Total	**$14,073**	**$24,237**	**$17,770**	**$27,739**	**$26,702**	**$34,956**	**$35,744**

Source: USDA.

[a]Current fiscal year 2005 estimate.

[b]President's fiscal year 2006 budget.

[3]The 2003 Annual NRI data are being prepared for public release starting in spring of 2005. These data will be used to produce a series of reports, available at the national and regional level, covering status and trends in use of the nation's rural land, soil erosion, wetlands, irrigation patterns, and conversion of rural lands to urban uses. The Heinz Center report used NRI data on land use extent and trends for cropland and cropland erosion; the 2003 annual NRI data should provide comparable estimates. The Annual 2005 NRI will be the first of the annual inventories to include sub-state-level estimates for many topics previously reported through the 5-year inventory cycle, with the exception that most sub-state-level trend estimates will still have unacceptable levels of statistical uncertainty.

[c]State-level staff support–represents one-quarter staff year per state for fiscal year 2000 through fiscal year 2004, and a full staff year per state for fiscal year 2005 and fiscal year 2006.

[d]Derived based on the number of sample points selected for photo-interpretation data collection in the survey year and the staff time required to complete the inventory cycle.

[e]Derived based on the number of on-site points for data collection and the estimated amount of staff time required for conducting the on-site data acquisition.

[f]Obtained via contract, this number reflects the amount expended for acquisition of high-resolution imagery.

[g]Obtained via contract (cooperative agreement), this number reflects the amount allocated in the fiscal year for statistical services from Iowa State University.

[h]Fiscal year funds allocated for contracted data collection staff, facilities, and infrastructure.

[i]Fiscal year funds transferred to National Agricultural Statistical Service (NASS), plus NRCS field office support for conducting the NRI Conservation Effects Assessment Project (NRI-CEAP).

- Changes between 2004 and 2005 funding estimates for remote-sensing or photo-interpretation activities constitute the difference in overall NRI funding for these years. This should not be interpreted as a general increasing trend in overall NRI funding levels. At the time, photo-interpretation data collection and support activities were shifted from 21 nationally distributed Inventory Collection and Coordination Sites to newly-formed Remote Sensing Laboratories (RSL) as part of NRCS outsourcing initiatives. Fiscal year 2004 funding for this shift included only RSL start-up costs, while fiscal year 2005 funding included additional costs for interpretation of the imagery obtained in 2004.

    - Preparation of imagery for photo-interpretation acquired in 2004 is in progress—delayed by the transition to the new inventory organization and structure, as well as by unanticipated problems in securing RSL facilities and staffing. The estimates provided for photo-interpretation in 2004 (as shown in table 5) reflect completion of 2003 Annual NRI photo-interpretation, preparation for conducting 2004 and 2005 photo-interpretation, and limited state-level photo-interpretation activities, such as acquiring information for sample points from field office files.

    - The shift to the RSL structure, along with the adoption of improved digital technology, and the acquisition of higher-resolution imagery, will enhance quality assurance and control procedures for data collection and statistical processing. Consolidation of data collection and interpretation under full-time, permanently staffed RSLs will facilitate stricter adherence to rigorous data collection and quality assurance protocols based on scientific principles, will improve data confidentiality, and will improve security requirements for safeguarding data. Plans are being developed for additional quality

assurance components for the NRI, including a calibration study and more comprehensive data review procedures.

- The transition to an annual NRI provides continued capacity for long-term trend analysis while accelerating the acquisition and delivery of new information on natural resource conditions and trends. However, the scale of NRI estimates is affected during this transition to full implementation of the Annual NRI approach. It will take a number of years before the Annual NRI provides reliability levels comparable with those of the 1997 NRI. The 2001 Annual NRI provided national scale estimates for a limited number of topics. The 2002 Annual NRI provided national and regional scale estimates, but again on a limited number of topics. Estimates from the 2003 and 2004 Annual NRIs will cover more topics and provide estimates at finer scales. Reliability levels for results from the 2005 Annual NRI should approach those from the 1997 NRI, with the exception that many sub-state-level trend estimates will still have unacceptable levels of statistical uncertainty.

- An expansion of the NRI to include a number of issues of national significance is expected with respect to assessment of the environmental benefits of conservation practices, measurement of soil quality, and development of nonfederal grazing land sampling protocols.

    - The Conservation Effects Assessment Project (CEAP) was formed in 2003 as a five-year effort to study the collective environmental benefits of conservation projects on agricultural lands implemented through 2002 Farm Bill programs. It is composed of two parts: a nationwide assessment of conservation benefits and more in-depth studies of those benefits in 20 selected watersheds. Specifically, CEAP will evaluate conservation practices and management systems for nutrient, manure, pest management, buffer systems, tillage, irrigation, and drainage practices, as well as for soil quality enhancement, wildlife establishment, and wetland protection and restoration. As NRI is used as the sampling basis for estimating environmental benefits of conservation practices, the inventory's cropland field sample points will be used in conjunction with National Agricultural Statistical Service (NASS) farmer surveys to study farm-field-level management and data on conservation practices. The CEAP assessments will be reported annually starting in 2006.

- Beginning with the 2003 NRI, new protocols were introduced to improve the information available on nonfederal grazing land—rangeland, pastureland, and grazed forestland. Data collected during 2003, 2004, and 2005 will be used to provide estimates on rangeland conditions by employing the updated field-based inventory protocols. Improvements in field-based inventory protocols for pastureland and grazed forestland are under development and are planned for inclusion in future annual NRI data collection efforts.

- A Soil Conditioning Index (SCI) will be developed for each NRI sample site that uses NRI data on soil type, characteristics, and interpretations, along with historical information on land use, management practices, erosion, and historical climate data. This index will quantify cropping sequences, tillage, and other management influences on soil organic matter content, which serves as an indicator of soil quality. Future NRI reports will present long-term trends in soil quality using this index.

- A February 2004 Office of Management and Budget Program Assessment Rating Tool review on the NRI indicated that NRI has a "results not demonstrated" rating, stating that "improvements are needed in the NRI's long-term performance measures." The NRCS response includes expanded language and clarification of plans to provide updated natural resources information to the scientific community, decision makers, and the public on an annual basis (Annual NRI). The Annual NRI process will address more resource concerns, at greater levels of geographic reliability, and increasing levels of data accuracy (statistical reliability) over time. Ongoing and expanded onsite data collection activities for increased data quality (ground truthing), support of new measures such as grazing land health, and reporting on conservation program environmental effects (e.g., reductions in surface water pollution from agricultural runoff) will increase the utility of the data set. The next phase in long-term measure development is to establish targets and associated performance periods. These measures and targets then will be reviewed for approval by agency leadership. The present schedule calls for completing this effort by the end of the third quarter of 2005.

National Survey on Recreation and the Environment, U.S. Forest Service, U.S. Department of Agriculture

Background

The National Survey on Recreation and the Environment (NSRE) is the latest in a continuing series of surveys begun in 1960 as the National Recreation Survey (NRS).[1] The NSRE serves as the only consistent source of recreation participation data for the U.S. population, providing outdoor recreation trend and demand data on regional and national scales. The NSRE serves the data needs of federal land management and other agencies (including the U.S. Forest Service, Bureau of Land Management, National Park Service, Environmental Protection Agency, and National Oceanic and Atmospheric Administration), as well as state and other governmental agencies, educational institutions, and private-sector organizations. It is a collaborative, interagency effort that combines data needs across programs of different sponsoring agencies that have different legislative mandates for evaluating and reporting outdoor recreation and related information.

The current NSRE, NSRE 2005-2006, is the eighth in the continuing series of U.S. national recreation surveys.[2] Although similar to the previous surveys, it explores the outdoor recreational needs and environmental interests of the American people in greater depth. Reflecting continued growth of interest in outdoor recreation and the natural environment, NSRE 2005-2006 is an in-the-home phone survey of over 40,000 households across all ethnic groups throughout the United States. Survey questions broadly address such areas as outdoor recreation participation, demographics, household structure, lifestyles, environmental attitudes, natural resource values (e.g., concerning wilderness), constraints to participation, and attitudes toward management policies. For example, the NSREs seek

[1]The first NRS, renamed the NSRE in 1990, was conducted by the now defunct congressionally established Outdoor Recreation Resources Review Commission (ORRRC). Between 1960 and 1982, four additional surveys in the series were conducted, keeping to the schedule recommended by ORRRC. Financial constraints eliminated the next NRS, and 10 years elapsed until the next survey, the 1994-1995 NSRE. This was the first NSRE to address outdoor recreational uses of coastal and ocean resources. The management of the NSRE was turned over to the Forest Service by the National Park Service in 1987-1988. NSRE 2000-2001 is the latest to be completed and reported.

[2]The aim of the NSRE is to repeat the core data collection cycle every 5 years in order to be able to describe trends. NSRE 2005-2006 was recently begun after receiving the approval of the Office of Management and Budget (OMB). The National Oceanic and Atmospheric Administration (NOAA) portion of NSRE 2005-2006 was under way as of February 2005. Additional content will be added to the survey as funding becomes available. The full cycle of the survey, generating 40,000 responses, is expected to run through calendar year 2006, perhaps lasting into 2007. The approximate cost for data collection is estimated to be about $900,000, of which the Forest Service expects to cover $150,000 or about 17 percent.

information on participation in such outdoor activities as visiting nature centers, bird-watching, hunting, backpacking, camping and rock climbing, as well as participation in these various activities by age and ethnic groups. The information resulting from the NSREs can be reported both nationally and on a regional basis.

The NSRE is managed by a unit of the Forest Service's Southern Research Station in Athens, Georgia. Forest Service direct funding for the data collection phases of the NSRE comes from the Forest Service's Research and Development (R&D) and State and Private Forestry appropriation accounts. The Forest Service share of the total NSRE data design and collection costs has typically amounted to just over 40 percent, not including in-kind contributions (such as scientist and technician salaries, technical services, and administrative support).[3] These funds are used for cooperative agreements with universities, specifically with the University of Tennessee, which collects the data by phone interviews, and with the University of Georgia, which collaborates in the design and testing of data collection processes and in the analysis of collected data. For fiscal years 2000 through 2004, direct costs for NSRE-related data collection totaled approximately $1,407,000, of which the Forest Service's contribution was approximately $570,000.[4]

Other federal agencies, under their various authorities and mandates, contribute approximately 59 percent of the direct costs for NSRE-related data collection. For example, for NSRE 2000-2001 the primary "other

[3]Of the Forest Service contribution to data costs, 75 percent is funding through R&D and 25 percent through State and Private Forestry accounts. R&D funds are from two sources: (1) funds appropriated directly to the Forest Service's Southern Research Station and (2) funds allocated to the Southern Research Station through the Strategic Planning and Resource Assessment Staff in Washington, D.C., headquarters. In-kind contributions, primarily for salaries, amount to approximately $50,000 annually.

[4]The NSRE does not have a budget line item in the Forest Service budget and is not mentioned in budget justification documents sent to the Congress.

agency" contributing funding was NOAA.[5] For fiscal years 2000 through 2004, NOAA funding for data collection totaled $514,700, not including the 13.6 percent overhead assessed by the Southern Research Station.[6] NOAA is expected to be a major contributor to NSRE 2005-2006 as well, having already contributed $280,000. Other federal agencies that have supported the NSRE (NSRE 2000-2001) include: the National Park Service ($17,280), Environmental Protection Agency ($95,040), Bureau of Land Management ($46,928), and Economic Research Service ($17,280). Support from these and other agencies for NSRE 2005-2006 is yet to be developed and is currently unknown. Different state agencies over different periods have also provided funding for the NSRE. For NSRE 2000-2001, this funding amounted to about 1 percent of the total.[7]

Summary

Forest Service officials responsible for managing the NSRE were unable to indicate precisely the effect of future funding on the ability of the survey program to generate data of similar quality and comprehensiveness when compared with data from previous NSREs. This is because of uncertainty regarding the level of funding from Forest Service R&D as well as uncertainty regarding support that will be forthcoming in future years from other federal agency sponsors. The officials noted that all aspects of the NSRE are vulnerable to budget reductions, both across-the-board and more specifically targeted reductions, and that recreation research (and, more broadly, research in the social sciences) is among the areas of Forest

[5]Different agency sponsors add modules of questions to the NSRE specific to their interests. However, the core modules of participation in activities and demographics remain the same and are consistent back to the 1960 survey. Other agencies support the design, testing, analysis and reporting of only their own modules of questions but also partially support the NSRE core modules of participation and demographics. NOAA's needs for state-level data in support of development of its mandated coastal damage assessment capacity required a target of 50,000 completed interviews across recreational activities. NOAA's contribution to "other federal agency funding" for NSRE 2000-2001 represented approximately 63 percent of this "other" 59 percent of total funding.

[6]NOAA's annual contributions in this period were as follows: 2000, $281,700; 2001, $168,200; 2002, $0; 2003, $43,200; 2004, $21,600.

[7]States use the NSRE for their statewide comprehensive outdoor recreation plans. For NSRE 2000-2001, four states contributed relatively small amounts of funding to the NSRE: California ($2,729), Missouri ($880), Tennessee ($4,700), and Vermont ($4,401).

Service R&D to be cut first.[8] Reductions in Forest Service funding for recreation research have already occurred in fiscal year 2005, and in fiscal year 2006 there are proposed cuts to recreation research funding that could further erode the Forest Service's ability to contribute toward funding of the NSRE.[9] The outlook, according to NSRE managers in the Forest Service's Southern Research Station, is that the NSRE will increasingly depend on external, or "other agency," funding sources.

Table 6: Forest Service Direct Funding for the NSRE, Fiscal Years 2000-2004 and Projected for Fiscal Years 2005 and 2006[a]

2000	2001	2002	2003	2004	2005	2006[b]
$175,000	$75,000	$187,274	$33,800	$90,390	$90,000	$60,000

Source: USDA.

Notes: Funding for fiscal years 2005 and 2006 are to be determined.

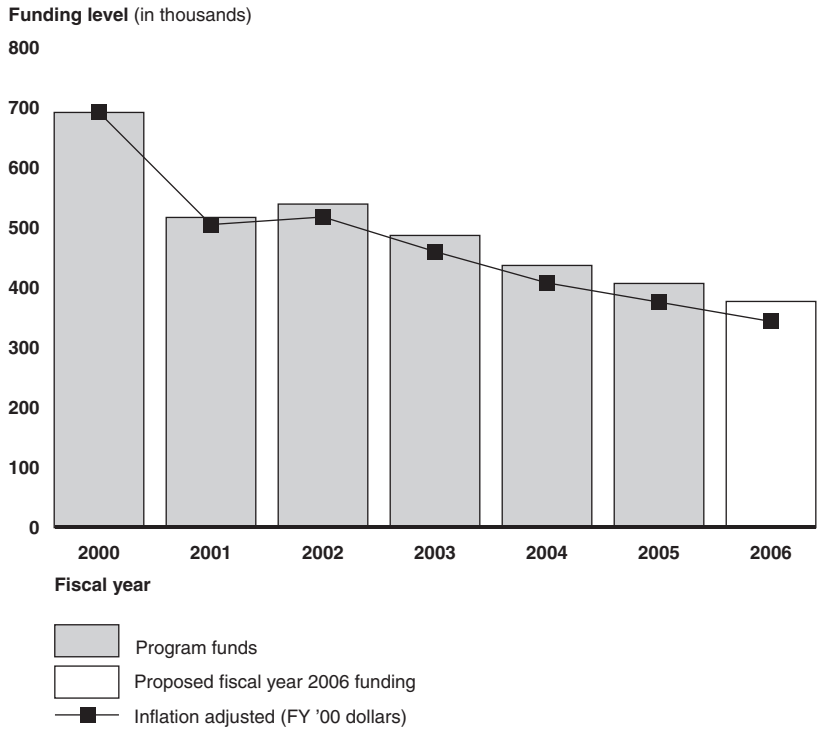
[a]The unit of the Southern Research Station that manages the NSRE receives notification of its budget from the Southern Research Station. None of this funding is specifically designated for funding the NSRE. In fact, very few individual studies are identified and earmarked for specific funding.

[b]Estimated.

[8]Across-the-board reductions would include government wide funding cuts and reductions to a parent agency's overall budget. NSRE officials explained that there is not as strong a constituency for recreation and social science research as there is, for example, for Forest Inventory and Analysis research, which has strong industry backing.

[9]A 5-year plan of research, called a Research Work Unit Description, includes mention of the NSRE as one of the Southern Research Station unit's primary studies for fiscal years 2005 and 2006, without, however, specifying the amount of support for the survey.

Figure 6: National Survey on Recreation and the Environment Funding for Fiscal Years 2000-2005 and Proposed Fiscal Year 2006



Source: USDA.

Notes: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

The precise amounts of fiscal year 2005 and 2006 funding for the NSRE have yet to be determined because of uncertainty regarding the Forest Service's contributions as well as contributions from other agencies.

Apart from the potential effects of future funding levels, Forest Service NSRE managers indicated that there were no planned changes in the recreation research program that would affect the ability of the NSRE to produce data of similar comprehensiveness and quality compared with that used to support ecological indicators in the first Heinz Center report published in 2002. In fact, they said, the NSRE, adequately funded, has the ability to produce a considerably more comprehensive and robust set of data in support of the Heinz Center indicator "outdoor recreation," across all of the ecosystems that the center reported on, including coasts and oceans, farmlands, forests, fresh waters, grasslands and shrublands, and

urban and suburban areas. The primary problem is financing sufficient numbers of observations for each of the six categories of ecosystems to permit the reporting of valid and reliable estimates nationally and regionally. In fiscal year 2003, NSRE staff conducted a pilot test that included in the NSRE questions that would differentiate recreation participation across all of the Heinz ecosystem categories. The pilot produced promising results, officials said, but with small sample sizes, they were not able to estimate confidence levels. They added that they are committed to meeting the outdoor recreation-related data needs of the Heinz Center and others as much as possible within the constraints of available funding.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NSRE program management officials provided the following information on funding levels and program priorities relative to NSRE's ability to continue providing environmental and ecological data comparable with past years:

- The NSRE in the future will remain much the same, except that there are likely to be fewer interviews completed for the full array of recreational activities covered, and there is likely to be an increased emphasis on boating and related activities because of the participation of the U.S. Coast Guard in the survey to satisfy a need for boating safety data. The core modules of the NSRE, i.e., activity participation and demographics, will change little, however. These modules contain questions relating to a variety of outdoor recreational activities, the frequency of participation, the age and ethnicity of participants, the geographic location of participants, etc. Because there will be fewer observations, it is anticipated that the data will be somewhat less geographically resolute. Funding sponsors are still developing, however, meaning that ultimately a number of observations similar to NSRE 2000-2001 may be collected in NSRE 2005-2006. The pattern of funding portrayed in figure 6, in particular the pattern of funding between fiscal years 2000 and 2004, represents a fairly typical cycle of funding for the NSRE.[10] The bulk of the NSRE surveying was completed in fiscal years 2000 through 2002, and data were compiled, analyzed and published in fiscal years

[10]Funds for the NSRE must be committed before data collection begins. While some data were still being collected in 2003, some of the funding for this activity had already been committed in 2002. As noted previously, the NSRE is not a line item funded project, and typically there is not a steady stream of funding for the survey.

2003 and 2004. Whether this cyclical pattern will hold in coming years, however, is uncertain, given the pattern of spending reductions across the federal government in many program areas.

- It is unclear how Forest Service management will prioritize the NSRE. Recreation is one of six goals for the Forest Service for fiscal years 2004 through 2008.[11] In addition, broad-scale assessments of national and regional demand for recreation constitute one of the primary targets within R&D goal No. 3. Recreation research is also identified as one of seven strategic program areas for Forest Service R&D in the agency's projected R&D strategic plan.[12] Thus, it would seem that the NSRE would be a relatively high priority for the agency, even though program funding for recreation research in fiscal years 2005 and 2006 would suggest otherwise.

- Operation of the NSRE program for fiscal year 2005 will depend primarily on non-Forest Service funding. The same will be true for fiscal year 2006 and likely for the foreseeable future. To the degree that outside sponsorship continues, the NSRE data collection, analysis, and reporting will continue. Work is scheduled as funding is made available. The Forest Service portion of NSRE 2005-2006 data collection has not yet begun; and, thus, the agency has not yet obligated funds to NSRE direct data costs.[13]

- Rising annual salary obligations for the Southern Research unit are steadily eroding discretionary funding that would normally be obligated

[11]The six Forest Service goals are: (1) reduce the risk of catastrophic wildfire, (2) reduce the impacts from invasive species, (3) provide outdoor recreation opportunities, (4) help meet energy resource needs, (5) improve watershed conditions, and (6) other mission related work.

[12]The strategic plan for Forest Service R&D is slated for implementation in fiscal year 2007. Recreation is one of seven strategic program areas. Developing, interpreting and reporting data from the NSRE would be important to meeting "Creditability through Accounting" targets within the plan. The other six Forest Service R&D goals are: (1) wildlife fire R&D, (2) invasive species R&D, (3) fish and wildlife R&D, (4) air and water R&D, (5) resource management R&D, and (6) resource data and analysis R&D.

[13]The full cycle of NSRE 2005-2006 to generate 40,000 responses could perhaps last into winter/spring 2007. Additional content will be added to the survey as funding becomes available. In addition, as new sponsors are identified with special needs, their question modules will be designed and included to meet those needs. The exact timing and objectives of such specially sponsored modules are yet to be determined.

to the NSRE, and thus affect the unit's ability to continue personnel, administrative, design analysis, and other "in-kind" contributions to the NSRE. Other factors also impact this ability, including increased costs of acquiring data (up 25 percent) because of more costly procedures required by OMB, rising Forest Service overhead costs, rising costs of official travel, and increased costs of almost all other input factors for operation of the NSRE. The areas particularly affected by these cost increases are survey design and testing, data collection, and data analysis. "In-kind" financing is also essential to the development and reporting of national and regional recreation statistics, since no other agency would be doing such reporting.

Bureau of Economic Analysis, Economics and Statistics Administration, Department of Commerce

Background

The Bureau of Economic Analysis (BEA) is part of the Economics and Statistics Administration (ESA) in the U.S. Department of Commerce. BEA's mission is to promote understanding of the U.S. economy by providing timely, relevant, and accurate economic accounts data in an objective and cost-effective manner.[1] To do this, BEA collects source data, conducts research and analysis, develops and implements estimation methodologies, and publishes statistics.

BEA prepares economic accounts that present essential information on such key issues as economic growth, regional economic development, interindustry relationships, and the nation's position in the world economy. Among these economic accounts and other statistics, BEA produces the gross domestic product (GDP) estimate, the market value of goods and services produced by labor and property in the United States.[2] It also produces the balance of payments account, which records transactions between U.S. residents and foreign residents during given periods. These payments include transactions in goods, services, income, assets, and liabilities.

In addition, BEA produces state personal income estimates as well as input-output accounts that show the relationships between all of the industries in the economy and all of the commodities that these industries produce and use. Government and business decision makers, researchers, and the general public use BEA's information to follow and understand the performance of diverse sectors of the nation's economy. For example, the Office of Management and Budget (OMB) and Congress use the GDP estimates and national accounts to prepare budget estimates and projections; and the Federal Reserve uses them to set interest and exchange rates. Federal agencies employ BEA's regional income and product account estimates in formulas used to distribute more than $190 billion in program funds to states, tribes, and localities. This includes payments for Development Block Grants, Medicaid, Foster Care, Child

[1]Economic accounts record flows in the national economy. An "account" is a numerical record of all flows (outputs, costs, income, etc.) during a given period. Accounts can be international, national, regional, local, industry, financial, etc., depending on the economic activity they measure.

[2]Gross domestic product replaced gross national product as the primary measure of U.S. production in 1991.

Care and Adoption Assistance, Vocational Education, and a number of other programs.

BEA state personal income estimates are important for a variety of indicators because they have been made over many years and are prepared quarterly. Since 1969, BEA has developed annual personal income estimates,[3] for all metropolitan areas, and for all counties and county equivalents (e.g., parishes in Louisiana and boroughs in Alaska).[4] BEA's annual estimates of personal income for local areas provide the most detailed economic pictures of local areas that are available because they are the only data sets covering the entire country over an extended period, allowing for both short- and long-term trend analyses. State and local governments use these data to plan spending, make revenue estimates, and track their economies; businesses use them to measure business development and regional growth. BEA's per-capita personal income estimates serve as a measure of the economic well-being of the residents of an area.

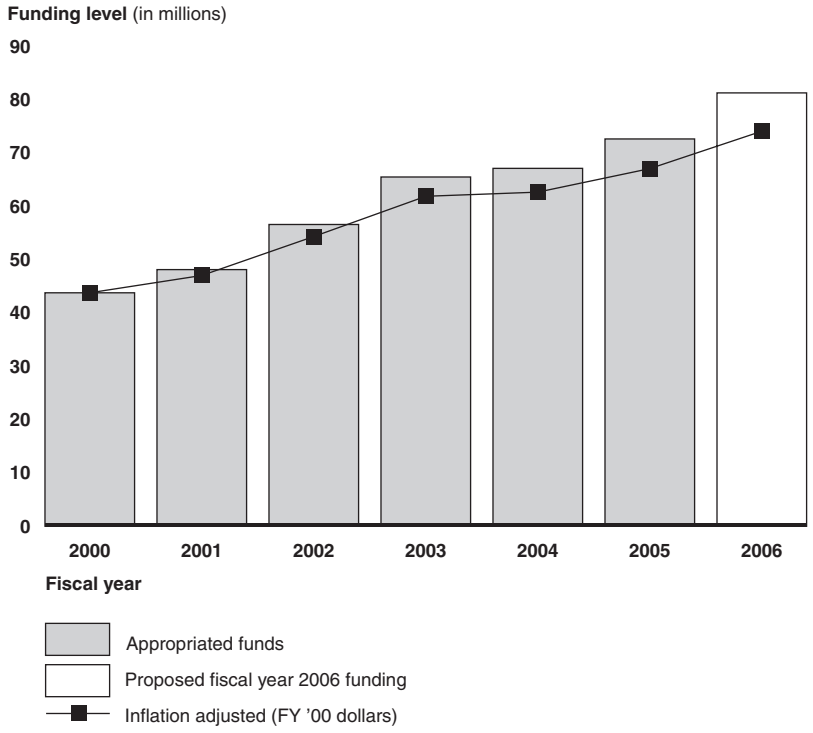
Summary

Based on funding proposed in the President's fiscal year 2006 budget, BEA officials expect that total agency funding levels for fiscal year 2006 will increase by more than 10 percent, following a 7 percent rise in fiscal year 2005. These increases allow the BEA to continue to generate data of similar or superior quality and comprehensiveness when compared with data from previous years. In general, the proposed fiscal year 2006 budget increase is to be devoted to initiatives to improve the accuracy and timeliness of BEA's statistics.

[3]The BEA defines personal income as income received by persons from all sources. Estimates are derived by including income received from participation in production as well as from government and business transfer payments. Personal income is the sum of compensation of employees (received), supplements to wages and salaries, proprietors' income with inventory valuation adjustment and capital consumption adjustment (CCAdj), rental income of persons (with CCAdj), personal income receipts on assets, and personal current transfer receipts, less contributions for government social insurance.

[4]BEA prepares estimates for 3,111 counties and county equivalents, as well as for 361 metropolitan areas, 575 micropolitan areas (urban clusters with 10,000 to 50,000 inhabitants), and 179 BEA economic areas (centers of economic activity defined by commuter patterns and information focus).

Figure 7: Bureau of Economic Analysis Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: BEA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

BEA's Regional Economics Directorate is the source for the data series on county personal income, which was used by the Heinz Center in its 2002 report, and this directorate's budget is projected to increase 17 percent in fiscal year 2006. This increase will be used to improve regional economic accounts by enhancing data accuracy, timeliness, cost-effectiveness, and accessibility through the Internet and other electronic media. For example, three key regional statistics will be released on accelerated schedules: gross state product (12 months sooner), metropolitan personal income (8 months sooner), and county personal income (7 months sooner, i.e., appearing 10 months after the reference year instead of the current 17 months).

The 2002 Heinz Center report, *The State of the Nation's Ecosystems*, relied on BEA data to support one of its ecological indicators: the monetary value of agricultural production. The monetary value of agricultural production indicator used BEA county-level estimates of cash receipts from farm marketings to derive agricultural sales per square mile.[5] The county-level cash receipts from farm marketings were divided by the number of square miles in a county to calculate agricultural sales per square mile.

BEA officials reported that planned activities and goals for the Regional Economics Directorate will have a positive effect on the agency's ability to produce data in the coming years comparable with or superior to data produced in previous years. For example, officials expect that the BEA data that the Heinz Center relied on to support indicators in its 2002 report will be available in an improved form for the center's planned 2007 follow-on report.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

BEA officials provided the following information on funding levels and program priorities relative to BEA's ability to continue providing environmental and ecological data comparable with past years:

- The BEA regional economic accounts activity is expected to increase from 100 to 116 staff persons with the President's proposed fiscal year 2006 budget request for the Regional Economics Directorate. This 20 percent funding increase (approximately $2.5 million) constitutes recognition of the labor-intensive nature of data analysis and is intended to generate more timely data for several programs, including the state and county personal income data relied on by the Heinz Center. With additional staff and computer enhancements, BEA economists expect to be able to accelerate their release of regional statistics. As a continuing effort, BEA is also developing new regional statistics and extended timeline data, as well as conducting research to develop substate gross product data and alternative ways to measure income.

[5]For 16 states that are major agricultural producers, state offices affiliated with the USDA's National Agricultural Statistics Service (NASS) prepare annual county estimates of farm cash receipts. For other states, state-level cash receipts estimates based on Economic Research Service data are allocated to counties in proportion to the Census of Agriculture data in census years. For noncensus years, BEA extrapolates the Census of Agriculture data from annual production data for commodities.

- By the time the next Heinz Center report is issued in 2007, BEA should be in a position to provide some of the most complete data in its history and in a timelier manner. Newly designed information systems will improve response times by coordinating related data more comprehensively and more quickly. Response times will also be shortened by more rapid computation and reporting methods. Improved reporting on long-term trends will be possible because BEA will have data for total and per-capita income for counties and their equivalents extending back to 1969.

- BEA has the flexibility, if need be, to find alternative source data needed to prepare and publish state and county personal income calculations. For example, should NASS, its current data source, discontinue producing the necessary primary data, BEA could find alternate means to continue making these estimates that are a key part of its responsibilities. One example of an alternative technique for determining income is that used by BEA when the state of Nebraska ceased publication of annual cash receipts because of state budget cuts. In this case, BEA estimates Nebraska's cash receipts using Census of Agriculture data for the census years, although it still lacks year-to-year changes. For the intervening noncensus years, BEA makes interpolations with annual agricultural production data from NASS, where appropriate.

National Environmental Satellite, Data and Information Service, NOAA, Department of Commerce

Background

The mission of the National Environmental Satellite, Data, and Information Service (NESDIS) is to provide timely information and access to global environmental data from satellites and other sources to promote, protect, and enhance the nation's economy, security, environment, and quality of life. NESDIS was formed in 1982 by combining two pre-existing NOAA components, the Environmental Data Service (EDS) and the National Environmental Satellite Service (NESS). It collects data and statistics under various legislative authorities.[1] The operation of environmental satellites goes back to the April 1960 launch of the first weather satellite.[2] Over the years, the capabilities of satellites have steadily improved, and new environmental applications have been added to the array of space-based sensors.

Summary

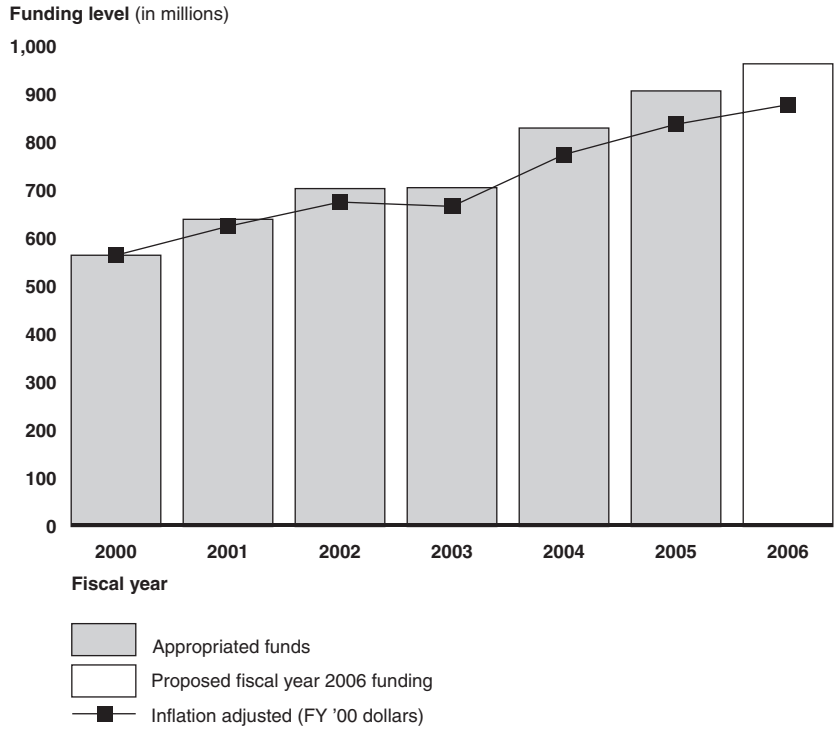
NOAA and NESDIS officials indicated that actual NESDIS funding for fiscal year 2005 and funding proposed in the President's budget request for fiscal year 2006 (as shown in fig. 8), are expected to result in the continuation of data collection and analysis across all programs. The officials indicated in particular that data used in the 2002 Heinz Center report, *The State of the*

[1]Some of the statutes giving NESDIS data collection, analysis, and dissemination authority include: (1) 15 U.S.C. § 313, which authorizes meteorological forecasting and warning responsibilities, as well as monitoring and recording climatic conditions; (2) the Supplemental Appropriation Act, 1962, Pub. L. No. 87-332; 75 Stat. 733, 734 (1961), which authorizes NOAA to establish and operate a system for the continuous observation of worldwide meteorological conditions from space satellites and for the reporting and processing of the data obtained for use in weather forecasting; (3) the Federal Records Act of 1950, 44 U.S.C. §§ 3101-3107, which is the authority for retention of data by NESDIS; (4) 33 U.S.C. § 883d, giving the Secretary of Commerce authority to conduct investigations and research in the geophysical sciences (including oceanography) in order to increase engineering and scientific knowledge; and (5) the Land Remote Sensing Policy Act of 1992, 15 U.S.C. § 5621, which authorizes the Secretary of Commerce to issue licenses for private (commercial) remote-sensing satellite space systems.

[2]Round-the-clock operation of all NESDIS satellites is the responsibility of the Office of Satellite Operations (OSO), which oversees a constellation of Geostationary Operational Environmental Satellites (GOES), Polar Orbiting Environmental Satellites (POES), and satellites within the Defense Meteorological Satellite Program (DMSP). The Office of Satellite Data Processing and Distribution (OSDPD) handles operational data processing and distribution. The Office of Research Applications (ORA) oversees development of algorithms and new products based on the satellite data streams. The POES carries five sensors, one of which, the Advanced Very High Resolution Radiometer (AVHRR), was integral to the collection of data used in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*.

Nation's Ecosystems, are expected to be available at similar or improved quality and comprehensiveness when compared with data from prior years.

Figure 8: National Environmental Satellite, Data, and Information Service Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: NOAA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Agency officials told us that NESDIS has no planned program changes that would adversely affect its ability to generate data that can be compared with data generated in prior years. Furthermore, they told us that NESDIS data will be available in an improved form for the expected 2007 update of the Heinz Center's *The State of the Nation's Ecosystems* report.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NOAA program officials provided the following information on funding levels and program priorities relative to the NESDIS program's ability to continue providing environmental and ecological data comparable with past years:

- NESDIS data collection and statistics programs have been well supported through the federal budget process over the past 5 fiscal years. Based on this history, it does not appear that any programs are particularly vulnerable to budget reductions. In addition, no budget reductions are planned or requested. Specific funding amounts for the various NESDIS programs for fiscal years 2000 through 2005, as well as proposed funding for fiscal year 2006, are portrayed in table 7 (aggregate totals are presented in fig. 8):

Table 7: NESDIS Funding Levels for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Dollars in thousands

	2000	2001	2002	2003	2004	2005	2006[a]
Operations, research and facilities							
Environmental satellite observing[b]	$56,903	$60,167	$77,891	$85,612	$82,945	$101,460	$100,278
Data centers and information services[c]	52,363	64,792	64,417	64,032	68,725	74,600	53,704
Subtotal	**$109,266**	**$124,959**	**$142,308**	**$149,644**	**$151,670**	**$176,060**	**$153,982**
Procurement, acquisition and construction							
Satellites	$455,856	$500,032	$558,125	$555,739	$661,600	$705,911	$792,813
Nonsatellite	0	14,967	3,542	497	13,839	25,477	17,091
Subtotal	**$455,856**	**$514,999**	**$561,667**	**$556,236**	**$678,439**	**$731,388**	**$809,904**
Total	**$565,122**	**$639,958**	**$703,975**	**$705,880**	**$830,109**	**$907,448**	**$963,886**

Soruce: NOAA.

[a]Estimate based on President's proposed budget.

[b]Representing costs associated with the operation of existing satellites and their data processing and distribution functions.

[c]Representing costs of operating data centers (e.g., National Climatic Data Center, National Geophysical Data Center, and National Oceanographic Data Center) and related services.

- The funding totals are from all sources, including standard appropriations, other NOAA programs, other federal agencies, and nonfederal sources.[3] The two most substantial funding increases from fiscal year 2004 through 2005 include the following:

  - For "Environmental Satellite Observing," an $18.5 million increase is planned. This total includes $7.4 million for sustaining capacity in existing operations within the Office of Satellite Operations, Office of Satellite Data Processing and Distribution, and the Office of Research Applications; $0.7 million for "Coral Reef Monitoring" (previously appropriated in the National Ocean Service budget); and $10.4 million for services requested by congressional direction or planned program changes. These services or planned program changes include operations, maintenance, and rent of a new satellite command and control facility; a partnership with the National Aeronautics and Space Administration (NASA) for research-to-operations projects; and funding for two new NESDIS responsibilities, the Office of Space Commercialization, and the Secretariat of the Interagency Global Positioning System Executive Board.

  - For the multiyear acquisition for new and replacement satellites, a $44.3 million increase is planned. Spending for the new satellite series increases by $82.5 million, while spending for replacement satellites of the present series decreases by $38.2 million. The comparable fiscal year 2005 to 2006 increase is $86.9 million. Of this amount, $11 million is for a Landsat replacement—a new NESDIS responsibility added in fiscal year 2006. The remaining $75.9 million is the net increase for polar and geostationary satellite acquisitions.

- Other NOAA programs and federal agencies provide funds to NESDIS as a result of at least two general types of determinations:

[3]The primary source of nonfederal funds is from sales of data sets and products. This source has been declining in recent years as more customers access data from Internet sources rather than purchasing data on media such as publications, compact discs, and magnetic tapes. The proportions of receipts have been roughly consistent over recent years with about 78 percent from commercial firms, 12 percent from foreign organizations, and 5 percent each from academic institutions and the general public. NESDIS data centers provide products at prices set to recover the cost of reproduction and distribution only, and the costs recovered do not pay for data collection or analysis activities.

- A NOAA program may require some form of specialized data management service and decide that NESDIS data centers are the most effective organization to implement the service on the program's behalf. Such NOAA programs often extend funding over several years, terminating when the programs no longer need the service. One example is the NOAA Coral Reef Information System (CoRIS)—which is a "Web portal" to coral reef information resources that the National Oceanographic Data Center (one of four NESDIS data centers) operates and maintains on behalf of multiple NOAA program activities.

- Competitive research proposals emerge where the needs of a research topic are a good match with a NESDIS data center's capabilities and, through a competitive process, the agency or program sponsoring the research selects a NESDIS data center from among the various proposals they receive from service providers. These service arrangements tend to be short-lived, providing only 1 or 2 years of funding to work on a specific topic.

- Although NESDIS does not anticipate any funding reductions for its data collection and analysis activities across its data centers, in the event of NESDIS funding reductions, the following are some factors that would apply in the process of deciding how NESDIS components would be affected and what priorities would apply:

  - *Environmental satellite observing.* The first priority would be to sustain current operational satellite services used for protecting life and property. This includes such products as those delivered to the National Weather Service for weather forecasts and warnings, volcanic ash plume images for warnings to air traffic, and wildfire imagery to support firefighting operations. The impact on data collection pertinent to the Heinz Report would likely be minimal. For example, much of the data collection and processing to create sea surface temperature information requires the Advanced Very High Resolution Radiometer (AVHRR) data set, a high-priority data set

likely to be funded in order to provide service to other customers, such as the National Weather Service.[4]

- *Data centers and information services.* Any impact would not affect data collection activities, as the data centers and information services section of the budget is not used to fund such activities. The NESDIS data centers gather data collected by other programs, preserve it for users, compile new products, and provide public access to the data and products. Funding for the centers and services is used for archiving, accessing, and assessing data. Failing to fund and preserve new observations (reducing the archive activity) would harm the future capability to document changes in the environment. Similarly, reducing the assessment activity would halt production of some products that assist users in interpreting the past and present state of the environment. Finally, reducing the access budget would pose more difficulty to users in obtaining information from the archives and the assessment products. One priority consideration would be to sustain the archiving activity because it would not be possible to go back in time and replace missing observations. Unless observations are archived on a regular basis, it is likely that they will be lost forever. The access and assessment capabilities, on the other hand, could be rebuilt later as long as the observations have been archived.

- *Procurement, Acquisition and Construction (PAC).* This section of the budget deals with building future capability, so any potential reductions would have impacts on future data collection activities. Funding reductions that reduce or eliminate the acquisition or construction of future satellites—for example, the National Polar-orbiting Operational Environmental Satellite System—would not be felt immediately; however, there would be a significant impact on future data and information services if those satellites cannot be

[4]AVHRR data is used by multiple federal agencies, nonfederal entities, and commercial firms for a variety of products related to measurements of the atmosphere, ocean, and land. Typical applications include day and night cloud mapping, snow and ice detection, land-water boundaries, sea surface temperature, and the vegetative index. For example, the cloud imagery seen on many local television weather reports often comes from AVHRR data. Department of Defense weather centers also regularly use AVHRR data to supplement their Defense Meteorological Satellite Program (DMSP) sources. AVHRR is a radiation-detection imager used for remotely determining cloud cover and the surface temperature (the surface of the Earth, the upper surfaces of clouds, and the surface of a body of water).

launched on schedule with the planned suite of sensors and capabilities.

- NESDIS will be supportive of sustaining and improving the ability of its data programs to provide data and information at a level and quality of previous years, including data that were used to support indicators in the 2002 Heinz Center report. NESDIS contributes to the outcomes and strategies of all of the NOAA goals and programs by providing long-term archive and access services for environmental observations and information. The NESDIS strategic plan states a goal of building and advancing the capabilities of an ecological component of the NOAA global environmental observing system to monitor, assess, and predict national and regional ecosystem health, as well as to gather information consistent with established social and economic indicators.

- Officials expect capability improvements to NESDIS satellites and to its data centers over time that portend significant improvements to all types of environmental observations in the future:

  - National Polar-orbiting Operational Environmental Satellite System (NPOESS) and geostationary operational environmental satellites will have improved observational capabilities, including higher resolution and more accurate sea surface temperature and ocean color products.

  - Integration of observing systems—for example, the Integrated Ocean Observing System and the Global Earth Observing System—are being emphasized at the national and international levels.[5]

  - New capabilities in support of agriculture and forestry, such as drought monitoring, fire and fire risk, and monitoring of vegetation condition and health will be developed and improved.

[5]The Integrated Ocean Observing System is being designed to satisfy user needs for coastal and ocean data, and will facilitate the study of short- and long-term ocean resource issues. The system is envisioned as a coordinated national and international network of observations, data management and communications, and data analysis and modeling that systematically acquires and disseminates data and information on past, present, and future states of the oceans and coasts, including the Great Lakes. The Global Earth Observing Systems are intended to facilitate the sharing and applied usage of global, regional, and local data from satellites, ocean buoys, weather stations, and other surface and airborne Earth-observing instruments. The goal is to provide environmental information that is integrated into new data products, benefiting societies and economies worldwide.

- Through the application of information technology and by providing more services over the Internet, more data users are being served despite a declining federal workforce and during a period when the NESDIS budget for data and information services has grown at less than the rate of inflation.

- Following are anticipated changes to the programs that were used in support of ecological indicators, in particular, those used in the 2002 Heinz Center report:

  - With respect to topography and bathymetry products, mapping programs of various U.S. agencies and others are continually improving the resolution and accuracy of coverage, and this trend is expected to continue.

  - With respect to salinity data, the emergence of a national effort to implement an Integrated Ocean Observing System (IOOS) will help to increase the observing capability for such critical parameters at a national level.

  - With respect to sea surface temperature, two developments are expected to significantly improve the capability to provide this data. The first is the planned increase in capabilities of the next-generation satellites (NPOESS) that will replace existing ones (POES) and the AVHRR used to make measurements.[6] The "threshold" specification for sea surface temperature calls for one-kilometer resolution globally with 0.5 degree centigrade uncertainty. That alone is better resolution than now achieved by AVHRR. But the "objective" specification, which may likely be achievable, is 250-meter resolution with only 0.1 degree centigrade uncertainty. A second development is the type of research now under way to produce sea surface temperatures by blending observations from multiple sources, rather than relying on a single satellite system. The present research is

[6]When launched in 2010, the NPOESS will carry a different sensor suite with improved capabilities compared with the AVHRR. Specifically, the next generation of visible and infrared radiometers (that will replace the current AVHRR) will have a wavelength range for both visible and near-infrared data that has been narrowed to reduce atmospheric contamination of the data compared with the present AVHRR, which may impact the Normalized Difference Vegetation Index (NDVI) values used to derive the Plant Growth Index included in the Heinz Center Report. Research is ongoing within NOAA, supported with funds provided by the NPOESS Integrated Program Office, to assess the impact of these future instrument changes.

being done under the GODAE High-Resolution Sea Surface Temperature Pilot Project. One particularly attractive aspect of that research is that blending of multiple measurements will allow an objective estimate of the uncertainty in the resulting values, which will be useful when using the values as input to predictive models or assessments.

- Two factors bear on the data gap for the ecosystem extent ecological indicator used in the Heinz Center report, where national reporting on the extent of brackish coastal water was not possible:

  - As noted in the Heinz Center report, many of the nearshore observations now being taken are collected by state and local entities for their own purposes and are not reported to a national or even regional repository.

  - A major effort is currently required to adequately sample these waters. The coastline of the U.S. is a highly dynamic environment in terms of both space and time, with tidal mixing, varying river discharges, and coastal storms, and is estimated at about 20,000 kilometers long. The inventory of oceanographic observing stations near coastal waters, however, is only about 250 stations—many of which are buoys located miles offshore that do not collect salinity or other important habitat characterization measures such as nutrient concentrations and dissolved oxygen. Covering 20,000 kilometers of coastal waters with a few hundred stations does not provide enough observations to address the gap raised by the Heinz Center report. The relative dearth of coastal observations and the failure to share those observations that are collected are recognized problems nationally. Recent national efforts toward building an Integrated Ocean Observing System will help address these types of gaps.

National Marine Fisheries Service, NOAA, Department of Commerce

Background

The National Marine Fisheries Service (NMFS), within the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, is responsible for the stewardship of the nation's living marine resources and their habitat through science-based conservation and management and the promotion of healthy ecosystems. Among its many responsibilities, NMFS assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations, and works to reduce wasteful fishing practices. NMFS coordinates with partners to collect data on landings, harvest levels, catch, effort, participation, economic, sociocultural, and biological data on commercial and recreational fisheries through surveys, registration and reporting systems, and observation.[1] This data is the foundation of information upon which fishery policy and management decisions are made.

NMFS carries out various activities pursuant to legislative mandates and other requirements for managing programs that rely on environmental data or necessitate monitoring, reporting, and the collection of such data. Those activities include the following:

- The Marine Mammal Protection Act of 1972 (MMPA) vests responsibility for the protection and monitoring of all cetaceans and pinnipeds, except walrus, to NOAA.[2] All other marine mammals fall under the jurisdiction of the Department of the Interior. Congress found that knowledge of marine mammals was inadequate[3] and required stock assessment

[1]Landings are defined as the number of pounds of fish that is selected and kept during the sorting procedures on vessels and discharged at dockside by commercial or recreational fisherman; harvest levels are defined as the total number or weight of fish caught and kept from an area over a period of time; catch is defined as the total number (or weight) of fish caught and killed by fishing operations, including fish that are discarded; effort is defined as the amount of time and fishing power used to harvest fish; economic data include employment harvest revenues by species, harvesting costs, capital expenditures and other fishing expenses; sociocultural data includes demographic characteristics of individuals and communities and community public health and social problems.

[2]See 16 U.S.C. § 1362(12). Cetaceans, warm-blooded mammals that spend their whole life in water and nourish their young with milk, include whales, dolphins, and porpoises. Pinnipeds are carnivorous aquatic mammals that use flippers for movement on land and in the water. Examples of pinnipeds are the seal and sea lion. Pinnipeds spend the majority of their lives swimming and eating in water and have adapted their bodies to move easily through their aquatic habitat.

[3]16 U.S.C. § 1361(3).

reports, based on the best scientific information available.[4] Each stock assessment report is required to have a base set of information.[5]

- The Endangered Species Act (ESA) vests responsibility for some marine and anadromous species with the Department of Commerce.[6] Among other things, the ESA requires use of the best scientific and commercial data available for (1) decisions to list a species as threatened or endangered, (2) designation of critical habitat, and (3) consideration of petitions to list animals as endangered.[7] The Department of Commerce is also required to monitor the status of all species for which a petition is warranted and monitor the status of all species that have recovered for not less than 3 years.[8]

[4]16 U.S.C. § 1386.

[5]Under 16 U.S.C. § 1386, each stock assessment must include a description of the stock's geographic range, a minimum population estimate, current population trends, current and maximum net productivity rates, optimum sustainable population levels and allowable removal levels, and estimates of annual human-caused mortality and serious injury through interactions with commercial fisheries and subsistence hunters. These measures will be used to evaluate the progress of each fishery toward achieving its goal of zero mortality and serious injury.

[6]Anadromous refers to fish that spawn in freshwater and live most of their lives in saltwater; it is often used interchangeably with diadromous, which refers to fish that migrate between saltwater and freshwater.

[7]See 16 U.S.C. § 1533(b)(1)(A), 16 U.S.C. § 1533(b)(2), and 16 U.S.C. § 1533(b)(3), respectively.

[8]See 16 U.S.C. § 1533(b)(3)(C)(iii) and 16 U.S.C. § 1533(g)(1) respectively.

- Congress established the Marine Mammal Health and Stranding Response Program to, among other things, "correlate the health of marine mammals and marine mammal populations, in the wild, with available data on physical, chemical, and biological environmental parameters."[9] The section of the MMPA that specifically addresses response to unusual marine mortalities directs the Secretary of Commerce to be able to evaluate whether an unusual mortality event (UME) has occurred and to develop a contingency plan for responding that includes identification of the types of marine mammal tissues and analyses necessary to assist in diagnosing causes of UME, determining the effects of UME on the affected population, and identifying physical, chemical, and biological factors that may have played a role in the UME.[10]

- In 1996, the Magnuson-Stevens Fishery Conservation and Management Act was reauthorized.[11] Included in the reauthorization were the following requirements intended to improve data collection and information efforts within NOAA. The reauthorization required NMFS to develop a plan for a nationwide Fisheries Information System, and to develop a recommendation for the implementation of a standardized fishing vessel registration.[12] Fisheries Information System requirements were developed to fix the problems of imprecise data on assessed stocks and extremely limited data on many exploited stocks; burdensome collection and data management processes requiring duplicate reporting by stakeholders; and inadequate economic and social impact analyses resulting in court challenges with dramatic staff

[9]16 U.S.C. § 1421(b)(2). The Marine Mammal Health and Stranding Response Act of 1992, 16 U.S.C. §§ 1421c(c), designated NMFS as the lead agency to coordinate activities of the Marine Mammal Health and Stranding Program, which responds to unusual mortality events. Complete pathologies to investigate diseases and parasites can be performed on UMEs, and they provide an opportunity to collect and validate reproductive biology data, life history (what do the animals eat; how long do they live; how many calves do they have; how old are they when they first reproduce), pollution, and normal biology and physiology parameters. These types of sampling opportunities also provide validation and increased understanding and interpretation of data collected from wild populations. UMEs have also provided data on the incidence of human interactions including ship strikes, entanglements, hooks, and marine debris ingestions. These data help NMFS to make better management decisions about these stocks of marine mammals.

[10]16 U.S.C. § 1421c.

[11]Sustainable Fisheries Act, Pub. L. No. 104-297, 110 Stat. 3559 (1996).

[12]16 U.S.C. § 1881(a).

costs and burdens on the agency. In 1998, NMFS submitted a report to Congress entitled *Proposed Implementation of a Fishing Vessel Registration and Fisheries Information System*, which put forth a strategy to coordinate regional efforts for data collection, facilitate the dissemination of data and statistics, and integrate vessel registration and fisheries information systems nationally. The Fisheries Information System was envisioned as a highly collaborative process with stakeholder involvement to include regional implementation in cooperation with states, fishery management councils, and marine fisheries commissions.[13]

NMFS Environmental and Ecological Data Collection Activities Are Diverse

Across NMFS, a diverse set of offices, divisions, and programs are charged with collecting environmental and ecological data with respect to fisheries and marine-related matters. Among the primary entities are the six regional Fisheries Science Centers; the Office of Science and Technology—in particular, its Fisheries Statistics and Economics Division (FSED) and its Assessment and Monitoring Division; and programs within the Office of Protected Resources (OPR). NMFS also supports numerous regional, state, and local data collection efforts and programs.

[13]According to NOAA officials, by 2003 the Fisheries Information System (FIS) provided a context for the design, development, and implementation of data collection and data management for fishery dependent statistics nationwide to improve the timeliness and accuracy of data. FIS is a data portal that identifies the existing federal and state fisheries information systems or databases (data collections) and provides integrated business solutions for effective information sharing.

Regional Fisheries Science Centers

Because marine ecosystems, and the fisheries within them, differ regionally, the field component of the NMFS science enterprise is divided into six regional Fisheries Science Centers.[14] These centers provide the scientific knowledge base on which the NMFS, in concert with its six regional offices, the eight regional fishery management councils, interstate fishery commissions, and other agencies, formulates stewardship policies for sustainable fisheries, protected resources, and endangered species. The six centers encompass 25 principal laboratories employing over 1,550 scientific and support personnel. The scope of their work is temporally and spatially broad and multidisciplinary.

The science centers collaborate extensively with other federal and state agencies, international entities, nongovernmental organizations, academia, and the private sector, including the fishing industry. These partnerships enhance and extend NMFS's research capabilities. Many NMFS scientists serve as university adjunct professors, which enhances the ability of agency scientists to remain on the cutting edge while expanding the teaching capabilities of the universities and bringing NMFS's expertise into the academic community. Academic scientists also play an important role in the periodic review and evaluation of NMFS's research program.

Fisheries Statistics and Economics Division

As the principal source of U.S. national fishery statistics, the Fisheries Statistics and Economics Division (FSED) provides authoritative advice, coordination, and guidance on matters related to the collection, analysis, and dissemination of biological, economic, market, and sociological statistics by NMFS and state agencies. FSED is primarily concerned with fisheries data, including domestic recreational fisheries, domestic

[14]The six Fisheries Science Centers are as follows: (1) Alaska Fisheries Science Center (responsible for research in the marine waters and rivers of Alaska), (2) Northwest Fisheries Science Center (conducts multidisciplinary research to provide fisheries management information and technical advice in the Pacific Northwest), (3) Southwest Fisheries Science Center (conducts integrated research programs in biology, mathematics, oceanography, economics, and computer sciences for the purpose of developing scientific information to support the management and allocation of Pacific coastal and high-seas fishery resources; also conducts Antarctic research and monitoring), (4) Northeast Fisheries Science Center (manages a multidisciplinary program of basic and applied research in New England and the Mid-Atlantic), (5) Southeast Fisheries Science Center (conducts multidisciplinary research in waters adjacent to the southeastern United States, as well as Puerto Rico and the U.S. Virgin Islands); and (6) the Pacific Islands Fisheries Science Center (conducts multidisciplinary basic and applied research on insular and oceanic pelagic living resources and fisheries of the Pacific islands and central Pacific).

commercial fisheries, and foreign commercial fisheries.[15] FSED coordinates with other federal agencies, states, interstate commissions, and regional councils on the collection of data and market information, the publication of official fishery statistics for the United States, and the representation of NMFS on federal and international statistical agencies. FSED provides statistics to U.S. government agencies, foreign governments, national and international organizations, private businesses, and individuals interested in the management and development of U.S. fishery resources.

According to NOAA officials, the FSED budget is derived from various congressional budget lines based on the specific tasks that this division performs. The primary source of funding for FSED salaries and expenses has been the Fisheries Statistics line item, which also funds salaries and expenses for fisheries statistics staff in the NMFS regional offices and science centers. Some funds obtained in this line item are used to fund contractors or grantees to conduct data collection, data processing, and information management tasks. As an example, recent-year funding for FSED programs came from a number of additional budget line items, as follows:

- *Fisheries Statistics—Economics & Social Sciences Research*. This funding (approximately $4 million in fiscal years 2004 and 2005) is used to conduct economic and sociocultural surveys of commercial fisheries and to cover salaries and expenses of the additional professional staff needed to analyze these data and provide the economic and social assessments needed to support existing fishery management plans. It is also used to support economics and social-sciences research for all of NMFS and is distributed among headquarters offices, the regional offices, and the regional science centers. Only a portion of this funding actually covers staff and projects by FSED.

- *Fisheries Statistics—National Fisheries Information System*. This funding (approximately $2.5 million each in fiscal years 2004 and 2005) supports NMFS projects designed to implement the National Fisheries Information System. The funding is distributed according to a

[15]According to NOAA information sources, FSED also (1) develops national standards, policies and operational guidelines for the coordinated collection and publication of fishery statistics; (2) coordinates regional commercial statistics surveys and market data programs; and (3) designs and conducts national commercial and recreational statistics surveys.

cooperatively developed annual spending plan to fund projects in headquarters offices, regional offices, and regional science centers.

- *Fisheries Statistics—National Standard 8*. This funding (approximately $1 million annually) is used to support the staffing and data collections needed to comply with the fisheries information requirements laid out in National Standard 8 of the Magnuson-Stevens Act.[16] This funding is distributed among headquarters offices, regional offices, and regional science centers. Only a portion of this funding actually covers staff and projects by FSED.

- *Recreational Fishery Harvest Monitoring/Recreational Fisheries Information Network (RecFIN)*. This budget line item has been providing approximately $3.5 million annually since 2000 to support marine recreational fishery surveys. Congressional budget language specifies that $500,000 of this amount is to be used each year to support economic data collection and analyses. It also specifies that the funds must be split equally between the Pacific, Atlantic, and Gulf of Mexico coasts.

Assessment and Monitoring Division Science Centers

The Office of Science and Technology's Assessment and Monitoring Division represents the NMFS Fisheries Science Centers at NOAA headquarters. The division supports at-sea resource surveys, stock assessments, fisheries observer programs, and cooperative research, and manages the Center for Independent Experts, which provides independent peer reviews of NMFS science through a contract with the University of Miami. All of these activities are vital for maintaining and enhancing the NMFS science enterprise. The division develops policies, procedures, and budget initiatives to ensure that NMFS's science is high quality, cost effective, productive, and fully supported. It coordinates and prepares annual budget formulations and annual spending plans to improve stock assessments and modernize and expand observer programs.

[16]National Standard 8 states that "conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of over fishing and rebuilding of over fished stocks), take into account the importance of fishery resources to fishing communities in order to: A) provide for the sustained participation of such communities, and B) to the extent practicable, minimize adverse economic impacts on such communities." 16 U.S.C. § 1851(a)(8).

Office of Protected Resources

The Office of Protected Resources provides oversight and guidance on the conservation of marine mammals, endangered species, and their habitats in cooperation with NMFS regions, science centers, and various partners. The office has four divisions: (1) Permits, Conservation, and Education Division (it implements policies and regulations for issuance of permits and authorizations under the Marine Mammal Protection Act and Endangered Species Act and coordinates national policy to minimize harassment of marine mammals), (2) Marine Mammal and Turtle Conservation Division (it develops policies and regulations to implement the requirements and provisions of the Marine Mammal Protection Act and to protect turtles under the Endangered Species Act), (3) Endangered Species Division (it develops policies and regulations to implement the provisions of the Endangered Species Act with the goal of protecting and recovering endangered and threatened marine and anadromous species and their habitats), and (4) Planning and Program Coordination Division (it provides guidance and support to the office on budget, strategic planning, personnel management, information technology, and education).

Regional Fisheries Information Systems and Programs

NMFS also supports a number of regional fisheries information systems and programs that coordinate data collections, management, and dissemination of data among NMFS, interstate commissions, state agencies, and regional councils. These programs were developed to provide a common framework for the monitoring and management of fisheries statistics needed to support both resource assessments and regional management strategies.[17] The regional information systems and programs include the following:

- *Atlantic Coastal Cooperative Statistics Program*. This is a cooperative state-federal program to design, implement, and conduct marine fisheries statistics data collection programs and to integrate those data into a single management system that will meet the needs of fishery managers, scientists, and fishermen on the Atlantic Coast. According to NOAA officials, this program is currently funded annually at $3.5 million

[17]According to NOAA officials, the regional programs or networks gather and audit data by one or more of the partners using rigorous quality-control protocols. Partners participate in regularly scheduled reviews of data or preliminary catch and effort statistics to identify and resolve possible problems. Once data have been finalized by consensus, final catch and effort statistics are generated and integrated into the regional information system, where they can be accessed by stock assessment scientists and fishery managers.

by two line items.[18] Program partners include NMFS, the U.S. Fish and Wildlife Service (USFWS), the Atlantic States Marine Fisheries Commission, and the marine fishery agencies of 15 Atlantic Coast states.

- *Gulf of Mexico Fisheries Information Network*. The network is a state-federal cooperative program for the collection, management, and dissemination of statistical data and information on fisheries in Texas, Louisiana, Alabama, Mississippi, and Florida. It is funded annually at approximately $4.2 million by two line items.[19] Participating agencies include NMFS, the Gulf States Marine Fisheries Commission, USFWS, the National Park Service, the Caribbean Fishery Management Council, the Gulf of Mexico Fishery Management Council, and the marine fishery agencies of Alabama, Florida, Louisiana, Mississippi, Puerto Rico, Texas, and the U.S. Virgin Islands.

- *Pacific Recreational Fisheries Information Network*. This is a state-federal cooperative program to coordinate collection, management, and dissemination of Pacific Coast marine recreational fishery data. The program has been funded annually at about $2.2 million by as many as three line items.[20] Participating agencies include NMFS, the Pacific States Marine Fisheries Commission, and the state marine fishery management agencies of California, Oregon, and Washington.

- *Pacific Fisheries Information Network*. This is a state-federal cooperative program to coordinate collection, management, and dissemination of Pacific Coast marine commercial fishery data. The program is currently funded annually at $3 million by its own line item. Participating agencies include NMFS, the Pacific States Marine Fisheries Commission, and the state marine fishery management agencies of Alaska, California, Oregon, and Washington.

[18]The Fish Statistics—Atlantic States Marine Fisheries Commission line item provides $2 million, and the "Interstate Fish Commissions—Atlantic Cooperative Management" line item provides an additional $1.5 million.

[19]The two line items that contribute to this funding are Gulf of Mexico Fisheries Information Network and Recreational Fishery Harvest Monitoring/Recreational Fisheries Information Network.

[20]In fiscal year 2004, funding was provided by these line items: (1) Recreational Fishery Harvest Monitoring/Recreational Fisheries Information Network, (2) Expand Stock Assessments—Improve Data Collections, and (3) the Fish Statistics—National Fisheries Information System.

- *Alaska Fisheries Information System*. This is a cooperative program involving the Pacific States Marine Fisheries Commission, the Alaska Department of Fish and Game, the Commercial Fisheries Entry Commission, the North Pacific Fisheries Management Council, and NMFS.[21] The program is currently funded annually at $3.2 million by its own line item. It supports the collection, entry, transfer, analysis, and management of Alaska fishery information.

- *Recreational Fishery Harvest Monitoring/Recreational Fisheries Information Network—South Carolina*. This budget line usually provides $250,000 to 500,000 annually to support a recreational fishery tagging program for red drum in South Carolina.

- *Alaska Groundfish Monitoring—Field Fishery Monitoring*. Two budget lines provide approximately $2.3 million in fiscal year 2005 to fund monitoring programs for commercial groundfish fisheries in Alaska. This funding goes directly to the NMFS Alaska Fisheries Science Center.

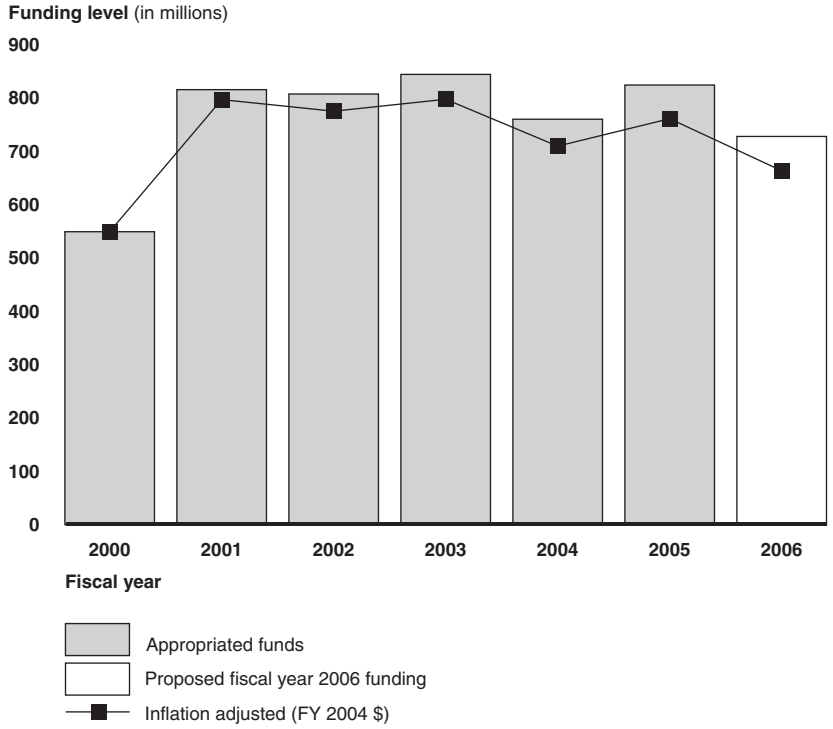
Summary

NOAA officials indicated that funding levels for NMFS activities in fiscal year 2005 and proposed for fiscal year 2006 (as shown in fig. 9) will not have an effect on the ability to generate data of similar quality and comprehensiveness when compared with data from previous years. In addition, priority would be given to maintaining data that was and is expected to be used in generating the Heinz Center indicators from the 2002 report, *The State of the Nation's Ecosystems*. However, officials stated that certain data efforts are vulnerable, in particular those data collection and statistical programs that are funded but not required by Congress. In addition, while most of these NMFS data collection or statistics programs are equally vulnerable to funding reductions, significant funding cuts to NMFS data and statistics programs would most likely result

[21]Authorized by Congress in 1947, the Pacific States Marine Fisheries Commission is one of three interstate commissions dedicated to resolving fishery issues. Representing California, Oregon, Washington, Idaho, and Alaska, it does not have regulatory or management authority; rather, it serves as a forum for discussion and works for coastwide consensus to state and federal authorities. Its goal is to promote and support policies and actions directed at the conservation, development, and management of fishery resources of mutual concern to member states through a coordinated regional approach to research, monitoring, and utilization.

in less-timely reporting, lower levels of sampling, and less-timely processing and dissemination of statistics.

Figure 9: National Marine Fisheries Service Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: NOAA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

- Agency officials told us that NMFS will continue to promote program initiatives and activities that will support comprehensive data collections, and at least provide baseline assessments of all federally managed fish species. If faced with the need to prioritize data activities, however, the agency would: (1) maintain core fishery-independent resource surveys and assessment staff salaries, (2) ensure the continuance of dealer and vessel trip reporting programs, and (3) reduce sampling levels in some geographic areas with respect to biological and recreational fishery catch and effort data. With respect to unusual

marine mortalities, priority would be to focus on investigating events in "hot-spot" areas based on past occurrences. Agency officials indicated that any such priority changes would still result in the availability of data at a similar or improved form for the expected 2007 update of the Heinz Center's *The State of the Nation's Ecosystems* report. In addition, improved availability of information through the Internet, such as an improved Fisheries Information System and regional information systems like the Atlantic Coastal Cooperative Statistics Program, will facilitate more rapid access to all of the fisheries information needed for ecological indicator reporting.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NOAA and NMFS program officials provided the following information on funding levels and program priorities related to the ability of certain NMFS data and statistics programs to continue providing environmental and ecological data comparable with past years:

- Between fiscal years 2000 and 2005, NMFS funding levels have consistently exceeded the agency's requested amounts. Funding increased from fiscal year 2000 through 2003 with a decrease in fiscal year 2004. The fiscal year 2004 decrease was due to a $100 million Fisheries Disaster appropriation in fiscal year 2003 that was not appropriated in 2004, along with a decrease in the appropriated amount for the Pacific Salmon Recovery fund from about $130 million to $90 million.

Fisheries Statistics and Economics Programs

As shown in table 8, total funding for the agency's fisheries statistics and economics programs has remained relatively steady between fiscal years 2000 and 2005, and proposed funding for fiscal year 2006 is expected to be at or above previous years. Overall, these programs have composed approximately 25 percent of the NMFS annual budget.

Table 8: Fisheries Statistics and Economics Funding for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Dollars in thousands

Fiscal Year	President's budget request	Actual enacted
2000	$23,557	$28,931
2001	28,171	33,692
2002	43,854	38,762[a]
2003	39,262	36,209
2004	39,482	38,791
2005	40,482	39,516
2006	44,880	TBD

Source: NOAA.

[a]Fiscal year 2002 funds for the Fisheries Information System that were not made available until fiscal year 2003 are counted in fiscal year 2003.

- The Fisheries Statistics and Economics Division (FSED) of the NOAA Fisheries Headquarters Office of Science and Technology receives only a portion of the funds that NMFS allocates to support fisheries statistics and economics programs, as some funds are allocated directly to regional offices and science centers to support regional state/federal cooperative programs to coordinate the collection, processing, management, and dissemination of fisheries information. Broadly, most of the allocations for each NMFS Fisheries Science Center are permanent; each science center is provided an annual amount sufficient to cover its annual operating expenses, including labor costs. Some of these funds are used to cover full-time equivalent costs and contracts for recreational fishery data collections. Funding for regional commercial fishery data collections is directed to the respective regional offices or science centers, while funding for economic or sociocultural data collections and research is generally split between headquarters offices, the regional offices, and the regional science centers. FSED, however, has been responsible for coordination, planning, and strategic distribution of those funds.

- Table 9 table shows fiscal year 2000 through 2005 funding amounts, as well as proposed fiscal year 2006 funding, directed to the FSED within the headquarters Office of Science and Technology:

Table 9: FSED Headquarters Funding for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Fiscal year	Actual enacted
2000	$10,044,700
2001	12,169,900
2002	15,342,200
2003	12,711,500[a]
2004	15,542,875
2005	17,232,647
2006	To be determined

Source: NOAA.

[a]Fiscal year 2002 funds for FIS that were not made available until fiscal year 2003 are counted in fiscal year 2003.

- Data and statistics programs not mandated by law would be most vulnerable to significant funding reductions. Given this, NMFS would prioritize data program activities or take the following actions if faced with budget reductions:

  - Core fishery-independent resource surveys (which is a characteristic of information or activity obtained or undertaken independently to avoid any biases inherent in fishery-related data) and assessment staff salaries would have priority over other program reductions.

  - Dealer reporting and vessel trip reporting programs (which are mandatory programs under state and federal regulations requiring seafood dealers who purchase fish or shellfish to obtain federal or state permits and requiring vessel operators to record data on fishing efforts, locations, and landings on a trip-by-trip basis) would have second priority, and would be maintained by expanding time-frame requirements for the reporting and processing of data.

  - Programs for biological data or recreational fishery catch and effort data would be the third priority, and would be maintained by reducing sampling levels in some geographic areas or for certain time periods or by reducing sample sizes and maintaining coverage of all geographic areas and time periods.

- Funding cuts would most likely result in less-timely reporting for commercial fishery monitoring programs, lower levels of sampling for

commercial and recreational fishery survey programs, and less-timely processing and dissemination of commercial and recreational fishery statistics. Priority would be given to maintaining complete coverage of the respective fisheries for the collection of the minimum set of data elements needed to support production of the fishery statistics used for the Heinz Center report indicators. Statistics should continue to be representative, but they would likely be less precise and less readily available. Any change of sampling would be done in cooperation with respective interstate commissions and state agency partners.

Office of Protected Resources

- The Office of Protected Resources data collection and statistics programs, including those providing data on UMEs, are vulnerable to budget reductions. Funding for such programs has been relatively stable over the past 3 years, between fiscal years 2002 and 2004.
  - Table 10 shows fiscal year 2000 through 2005 funding amounts, as well as proposed fiscal year 2006 funding, directed to the Office of Protected Resources:

Table 10: Office of Protected Resources Funding for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Dollars in thousands

Fiscal year	Actual enacted
2000	$90,173
2001	143,600
2002	142,448
2003	144,701
2004	145,118
2005	175,530
2006	To be determined

Source: NOAA.

- Between fiscal years 2002 and 2004, an increasing amount of program funds (approximately $9.5 million between fiscal years 2003 and 2004) were expended as earmarks that shifted resources away from base protected species activities.[22] At the same time, there were decreases in base funding for general marine mammal surveys and assessments in fiscal year 2004. The limited amount of discretionary funds available severely limits the program's ability to respond to high-priority, timely research needs and to continue comprehensive long-term monitoring and research needs. This was evident in fiscal year 2004 when Congress significantly decreased funding for base marine mammals activities and those activities targeted at "other species."

- In cooperation with agency partners, NMFS would reduce sample sizes before reducing sampling coverage areas. Unusual marine mortalities would prioritize its data collection efforts by focusing on and investigating events in "hot-spot" areas based on past occurrences.

Regional, State, and Industry Fisheries Activities

- Between fiscal years 2000 and 2004, the fishing industry provided approximately $13 million annually to support data collections by observers in three major fisheries across the nation.[23] Nearly all of this funding is provided by fishermen in the North Pacific Groundfish Observer Program, designed to collect and disseminate information essential for the management of sustainable fisheries in the Gulf of Alaska and eastern Bering Sea. This program is administered with federal funding, but the observer services (including observer compensation, travel, and insurance) are paid for by the fishing vessels.

[22]The earmarks directed funds toward efforts such as right whales, Hawaiian sea turtles, Puget Sound orca whales, and Stellar sea lions, and to specific entities, including the North Pacific Universities Marine Mammal Consortium, the Alaska Sea Life Center and Charleston Health and Risk Assessment.

[23]Observers are fishery biologists deployed onboard commercial fishing vessels to collect data and information on fishery catch and bycatch (i.e., the incidental capture of unintended fish species and protected species). This includes data on fishing practices, vessel and gear characteristics, fishing locations and times, environmental conditions on the fishing grounds, compliance with fishing regulations, and, for some fisheries, socioeconomic data. Observers also collect biological samples and may assist in fish tagging and tag recovery, or special data collections for stock assessment programs. The level of required observer coverage is based on the size of the vessel, with the largest vessels paying for 100 percent observer coverage.

The other two fisheries also provide funding to place observers on board their vessels: (1) the At-Sea Hake fishery ($350,000) and (2) the Northeast Closed Area Scallop Fishery ($490,000). The At-Sea Hake observer program was a voluntary program until 2004, when mandatory coverage became required. The Northeast Closed Area Scallop observer program requires the industry to pay for an observer to fish inside the closed area. However, vessels are able to retain an additional amount of scallops, thereby offsetting the cost of the observer.

- A number of state marine fishery agencies contribute funding to support recreational fishery survey data collections, which are accomplished in two different ways.[24] First, some states contract directly with NMFS data collection contractors to fund state-specific survey sample size increases. For example, states increase sampling by committing additional labor and resources beyond what is paid for with federal funds. Second, states can opt to collect survey data through federally funded cooperative agreements or as subcontractors of NMFS contractors.

    - Without access to state budgets, it is difficult for NMFS to assess the actual amount of funds contributed directly by individual states, or contributed by payment through NMFS contractors, for data collections. Estimates of state agency funding contributions, based on an assessment of actual sample sizes obtained in recreational fishery survey data collections in 2004, total about $3 million and are shown in table 11. These estimates are considered to be representative of the relatively stable levels of annual contributions made from 2000 to 2004.

[24]Since 1979, recreational fishery surveys have provided a reliable database for estimating the impact of recreational fishing on marine resources. In 1997, nearly 17 million anglers made 68 million marine fishing trips to the Atlantic, Gulf, and Pacific Coasts. The estimated marine recreational fish catch was 366 million fish, more than 50 percent of which was released alive.

Table 11: Estimated State Marine Fisheries Agency Funding of Recreational Fishery Surveys in 2004

State	Estimated state contributions
California	$700,000
Connecticut	78,000
Delaware	150,000
Hawaii	150,000
Maine	50,000
Maryland	30,000
Massachusetts	160,000
New Hampshire	50,000
North Carolina	380,000
Oregon	550,000
Rhode Island	150,000
Virginia	85,000
Washington	700,000
Total	**$3,233,000**

Source: NOAA.

- Recreational survey sample sizes funded with federal dollars are adequate for producing coastwide recreational fishery landings statistics that are sufficiently precise for most common fish species for possible use in conjunction with commercial landings statistics as reliable Heinz center indicators. The recreational fishery survey sample size increases funded by state agencies are primarily aimed at improving the precision of landings statistics for individual states in support of state fishery monitoring and management practices. However, such state sample size increases have also resulted in even more precise coastwide recreational fishery landings statistics.

Advances in NMFS Data Collection Activities

- In some regions, NMFS is testing electronic sampling methods that allow the samplers to gather biological data on field computers and transfer acquired data via the Internet, to all end users.

- NMFS takes advantage of electronic vessel monitoring systems that have been developed to gather daily landings, discards, and bycatch of selected species in some commercial fisheries. In addition, days-at-sea reporting systems provide fishery managers with information related to

fishing effort and latent capacity by requiring up-to-date reporting of days at sea for certain regulated commercial fisheries.

- At least two identified activities being undertaken by NMFS are important in supporting the Heinz Center indicator work. First, improvements to the National Fisheries Information System—efficiency, integration, and standardization of data collection, quality assurance, quality control, data processing, statistical estimation, and information management across geographic regions and state/federal partners—make it easier to combine data from different sources in a meaningful way to provide summary coastwide and nationwide statistics. Second, the Atlantic Coastal Cooperative Statistics Program and other regional, state/federal cooperative fisheries information programs are important in supporting the Heinz Center indicator work. These programs result in fewer steps needed to access and combine data and statistics, bringing the information closer to potential users. The ultimate goal of these improvements is to provide both regional and national information via the Internet through which users can readily gain access to all of the publicly available fisheries data and statistics provided by state/federal partner agencies. The national FIS and the regional systems will facilitate more rapid access to all the fisheries information needed for the indicator report.

National Ocean Service, NOAA, Department of Commerce

Background

The National Ocean Service (NOS) of the National Oceanic and Atmospheric Administration (NOAA) performs multiple functions. NOS performs data and information activities to support safe marine navigation, collects and analyzes oceanographic data, provides geopositioning reference information and standards, manages marine resources, responds to hazardous spills, performs coastal damage assessments and restoration activities, and monitors and predicts the consequences of natural and human-induced marine environmental disturbances. In fulfilling many of these diverse responsibilities NOS provides a variety of services, information products, and environmental data. For example, NOS develops assessments of coastal and ocean resources and habitats, creates and maintains data on ambient coastal pollution, and forecasts algal blooms. Such assessments and other environmental data are provided by NOS primarily through its National Centers for Coastal Ocean Science and its programs within the Office of Response and Restoration.

National Centers for Coastal Ocean Science

The National Centers for Coastal Ocean Science (NCCOS) were formed within NOS in March 1999 to evaluate environmental, societal, and economic issues through assessments that describe ecosystem conditions, forecast future ecological health, and evaluate management strategies and their consequences.[1] In doing so, NCCOS provides scientific information and tools needed to balance society's environmental, social, and economic goals.[2] NCCOS includes the following entities:

[1]One of the primary legislative mandates for NCCOS is the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, Pub. L. No. 105-383, 112 Stat. 3447. In addition, the following give NOAA and NCCOS authority: Title II of the Marine Protection, Research, and Sanctuaries Act of 1972, 33 U.S.C. §§ 1341-1344, requires the Secretary of Commerce to establish a comprehensive monitoring and research program on the effects of ocean dumping; Title V of the National Oceanic and Atmospheric Administration Authorization Act of 1992, 33 U.S.C. § 2803, directs the Administrator of EPA and the NOAA Under Secretary to jointly develop and implement a program for the long-term collection, assimilation, and analysis of scientific data to measure the environmental quality of the nation's coastal ecosystems.

[2]According to NOS officials, scientists within NCCOS conduct applied research and manage complex long-term research projects. The projects provide a link between research science in academia and the needs of those who make decisions on the use of coastal and marine areas. NCCOS scientists integrate research across scientific disciplines to examine future scenarios of coastal ecosystem conditions. NCCOS strives to maintain a balance between basic and applied research and provides the capability to anticipate future environmental issues and technologies.

- *Center for Coastal Monitoring and Assessment.* The center assesses and forecasts coastal and marine ecosystem conditions through research and monitoring. It provides the best available scientific information for resource managers and researchers, technical advice, and accessibility to data. Scientists conduct field observations on regional and national scales with a focus on contaminant, biogeographic assessments, and coastal remote sensing. One of the primary ways this center addresses pollution is through the National Status and Trends Program (NS&T). Scientists in this program conduct long-term monitoring of toxic chemicals and environmental conditions at approximately 300 sites along U.S. coasts. The program also documents the nature and severity of the biological effects associated with toxic chemicals in sediments in 30 coastal ecosystems.[3]

  In addition to the data and research activities, a National Estuarine Eutrophication Assessment (NEEA) was performed by NOAA initially in 1992, representing the first comprehensive assessment of estuarine eutrophication conditions across the United States.[4] The NEEA mission was to provide the basis for sound nutrient management (including development of analytical tools for managers) in U.S. estuaries and coastal water bodies by measurement and analysis of: (1) status and trends of water quality related to nutrient enrichment, (2) causes of observed problems (e.g., susceptibility and nutrient loads), (3) socioeconomic impacts of nutrients as they relate to water quality

[3]Established in 1984, the NS&T's primary objective is to determine the status of environmental quality in the nation's coastal and estuarine waters by monitoring contaminants in sediments, bottom-dwelling fish, and bivalve tissues. It is the only nationwide source of long-term data on toxic contaminants in U.S. coastal waters and estuaries, and provides temporal and regional trends in levels of toxic chemicals in the coastal environment and in sentinel organisms like bivalves. The Heinz Center's 2002 report, *The State of the Nation's Ecosystems*, lists contaminants in shellfish and contamination in bottom sediments as major ecological indicators for coasts and oceans. NS&T's data and information products are available to the public via publications and the Internet.

[4]Eutrophication is a process in which nutrients (primarily nitrogen and phosphorus) are added to water bodies, stimulating algae growth. Increased algae growth can lead to depleted oxygen, which in turn can result in fish kills and losses of submerged grasses that act as habitat for nursery fisheries. Estuaries have always received nutrients from natural sources in the watershed and from the ocean, but in recent decades, population growth and urban runoff, agricultural practices, wastewater treatment plants, and the burning of fossil fuels have increased nutrient inputs beyond what occurs naturally.

degradation, and (4) alternative management responses and the impacts of those alternatives.[5]

In 2002, NOAA facilitated a multidisciplinary workshop of federal officials and academics to review the results of the 1999 NEEA. In the workshop summary published in April 2004, participants provided a framework for the design of a long-term monitoring and assessment program to address nutrient overenrichment and consequent water-quality problems in estuaries and coastal waters. Participants highlighted the importance of classifying estuaries and coastal water body types, establishing appropriate variables for characterization of nutrient overenrichment status, assessing methods for determination of nutrient pollution status and trends, understanding human use impairment, developing methods for translation and transfer of data and information from scientists to managers, identifying and developing a database or data access framework, identifying long-term data sources, and identifying potential partnerships to support long-term efforts.

- *Center for Sponsored Coastal Ocean Research.* The center develops and improves predictive capabilities for managing the nation's use of its coastal resources through competitive research programs. It supports efforts to translate the results of its research investments, and those of others, into accessible and useful information for coastal managers, planners, lawmakers, and the public to help balance the needs of economic growth with those of conserving the resources of the nation's Great Lakes, estuaries, and coastal oceans.

- *Center for Coastal Fisheries and Habitat Research.* The center supports research such as habitat dependence, ecosystem modeling, food webs, physiology, genetics, and oceanography. In addition, the center maps and characterizes coastal habitats such as salt marshes, seagrass meadows, and coral reefs to develop an understanding of the processes that determine their functioning and utilization by humans and other species. A primary use of this knowledge is to plan and monitor restoration of damaged habitats.

[5]The NEEA was based on nutrient related loading and water quality data and information acquired from scientists and resource managers for 138 US estuaries and coastal waters. The data and information for individual systems was summarized to show conditions on a regional and national basis, painting a picture of the conditions, causes and future outlook of eutrophic symptoms in the nation's coastal waters.

- *Center for Coastal Environmental Health and Biomolecular Research.* The center conducts interdisciplinary research to resolve issues related to coastal ecosystem health, environmental quality, and related public health impacts. Chemical, biomolecular, microbiological, and microscopic cell tissue research is conducted to describe, evaluate, and predict the significant factors and outcomes of natural and human influences on marine and estuarine habitats.

- *The Hollings Marine Laboratory.* The laboratory provides science and biotechnology applications to sustain, protect, and restore coastal ecosystems, emphasizing linkages between environmental and human health in a multiinstitutional and multidisciplinary environment. Partner institutions include NOAA's NCCOS, South Carolina Department of Natural Resources, the University of Charleston, the National Institute of Standards and Technology, and the Medical University of South Carolina.

These NCCOS entities facilitate and conduct research on five key stressors or causes of ecosystem change (pollution, land and resources use, invasive species, climate change, and extreme natural events):[6]

- **Pollution**. Pollutants, such as toxic metals, petroleum hydrocarbons, industrial chemicals, pesticides, and nutrients can cause a wide range of adverse biological effects in organisms, including direct chemical toxicity, genetic damage, physiological abnormalities, compromised immune systems, biochemical alterations, and behavioral aberrations. Excessive input of nutrients in coastal waters causes unwanted algal growth, oxygen depletion, species death, and altered food chains or species composition.

- **Land and resource use**. NCCOS develops products, applications, and processes for defining and interpreting the relationships between species distributions and their environments in coastal ecosystems. In doing so, NCCOS engages in cooperative efforts among several agencies, including NOAA's National Geodetic Survey, the U.S.

[6]The geographic scope of NCCOS's research includes coastal watersheds to the outer boundary of the U.S. 200 mile Exclusive Economic Zone. Because of the large size of this research area, NCCOS focuses primarily on those ecosystems managed directly and indirectly by NOAA. These ecosystems include coastal estuaries, national marine sanctuaries, and coral reef ecosystems.

Department of the Interior, state and local governments, and various educational institutions.

- **Invasive species.** The introduction of nonnative species to coastal U.S. ecosystems has profound environmental effects. For example, invasive algae and nonnative fishes are wreaking havoc with Hawaiian coral reefs, zebra mussels are overwhelming native shellfish populations in the Great Lakes, and the European green crab is exceedingly prevalent in the Northeast, where it competes more successfully than native crabs for local resources. NCCOS is conducting assessment studies to examine species ecology in coastal waters and estuaries that are being impacted by invasive species.

- **Climate change.** Climate affects sea level, sea temperature, ocean currents, storm frequency and intensity, and levels of precipitation. Changes in climate can cause stress on coastal communities and ecosystems. Research suggests that climate change may lead to rising sea levels or changes in ocean salinity, which can alter geographical ranges of species. It may also lead to temperature shifts, coastal erosion, and increased sediment and pollutant delivery to sensitive ecosystems. NCCOS assesses the impacts of climate change on coastal ecosystems using satellite imagery provided by NASA and data from NOAA's National Environmental Satellite, Data, and Information Service to examine the conditions of an area. Other projects include habitat mapping, particularly in coral reef environments, that will help to determine a habitat's baseline conditions and to assess changes over time.

- **Extreme events**. Extreme natural events, such as hurricanes, earthquakes, and floods, cause major stress on the natural environment. To assess and monitor a variety of extreme events, the centers partner with several other NOAA agencies, including the National Weather Service, National Data Buoy Center, Coastal Services Center, and the National Ocean Service's Center for Operational Oceanographic Products and Services.

Office of Response and Restoration

Among other things, the Office of Response and Restoration (ORR) provides environmental data in the form of the Environmental Sensitivity Index (ESI), which is a product of the Hazardous Materials Response

Division within ORR.[7] ESI maps are generated to identify vulnerable coastal locations before a potential hazardous spill occurs, so that protection priorities can be established and oil and chemical cleanup strategies identified. The data are directed primarily to the spill response community, which uses the data both for planning and response. The spill response community is composed of individuals from ORR and other NOAA programs, a wide array of other federal, state and local government agencies, industry, and academia. Secondary users are coastal zone managers, and nonprofit organizations use the data to track changes in shoreline usage and to examine species distribution. The maps, available for nearly all of the continental U.S. coastline, Alaska, Hawaii, and U.S. territories of Puerto Rico, Guam, American Samoa, and the Virgin Islands, are composed of three parts: (1) shoreline classified by physical and biological characteristics, (2) sensitive biological resources, and (3) human use resources.[8] ESI shoreline types are classified using a combination of overflight information, aerial photography, local habitat maps, National Wetlands Inventory data, and ground verification.[9]

According to NOAA officials, ESI maps are the product of collaboration with local user communities. Local interest and often financial support are major influences in determining what areas will be mapped. Once a project is undertaken, resident experts provide information regarding the presence and geographic extent of both the biological and human-use resources.

[7]Established on February 28, 1999, ORR brought together three programs previously housed in NOS's Office of Ocean Resources Conservation and Assessment. ORR currently consists of the Hazardous Materials Response Division, the Coastal Protection and Restoration Division, and the Damage Assessment Center. Broadly, the legislative mandates for ORR are the Oil Pollution Act of 1990, the Clean Water Act, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

[8]The ESI shoreline classification system is based on 10 standard shoreline types, with a variety of subtypes specific to particular geographic regions.

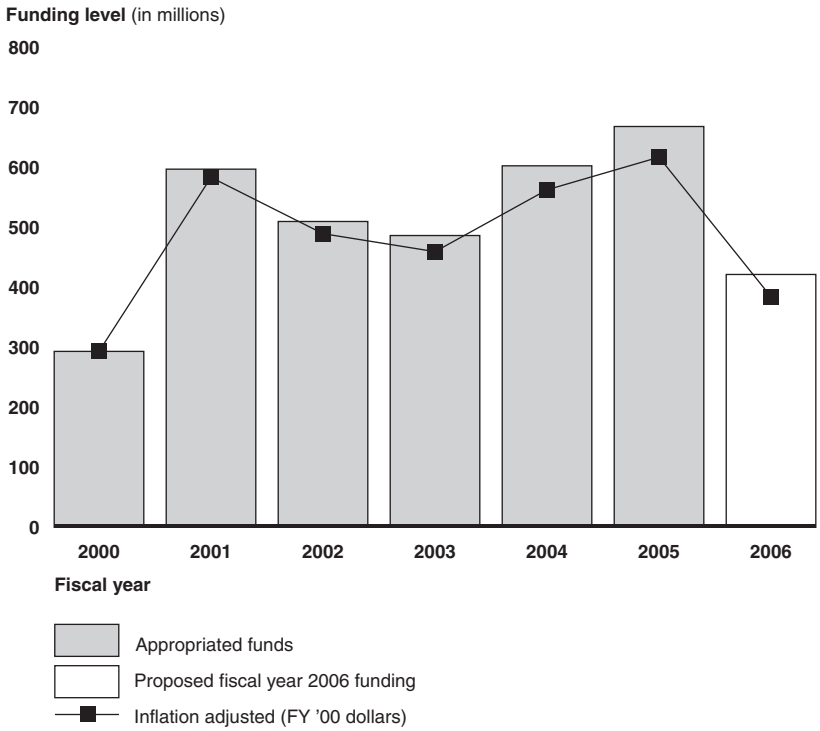
[9]According to NOAA officials, the Heinz Center chose to place shoreline types into five categories. ORR worked with experts from the Heinz Center to determine what shoreline categories were appropriate and how the NOAA ESI types would collapse into these five shoreline types. All of the existing ESI data were then processed to determine the number of miles of each shoreline type present within the geographic regions specified by the center. The shoreline types were determined by consolidating atlases by region, and were placed into five primary categories based on substrate and slope: (1) steep sand, rock or clay; (2) mud or sand flats; (3) beaches (sand or gravel); (4) wetlands and mangroves; and (5) armored (e.g., exposed, solid man-made structures and riprap). Some of the atlases used for areas in the Pacific Northwest region were 15 years or older. In addition, data are not currently available for the majority of coastal regions.

Experts may include individuals from state and local government agencies, other federal agencies, academic institutions and nonprofit organizations. Data gathered are then compiled and mapped by ORR. All mapped data are reviewed by each of the data providers. Ultimately, the published data reflect the species and resources of critical importance mapped as defined by the user community.

Summary

Overall, agency officials indicated that actual NOS funding levels for fiscal year 2005 and proposed for fiscal year 2006 (as shown in fig. 10) are expected to result in the continuation of data collection and analysis across all programs; in particular, the data used in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, is expected to be available at similar or improved quality and comprehensiveness when compared with data from previous years. The major differences between fiscal year 2000 and 2001 funding were attributed to additional program increases and targeted congressional funding in the following areas: (1) Great Lakes Community Grants, (2) Pribilof Island cleanup, (3) National Estuarine Research Reserves, (4) Nonpoint pollution implementation grants, and (5) construction projects. The primary reason given for the disparity between fiscal year 2005 funding and the President's fiscal year 2006 funding proposal is that the latter does not include congressional earmarks and program increases that were provided for in the fiscal year 2005 Consolidated Appropriations Act. For example, the fiscal year 2005 Consolidated Appropriations Act provided $41.6 million (with the rescissions) for the Coastal and Estuarine Land Conservation Program. The President's fiscal year 2006 budget proposal did not provide funds for the program.

Figure 10: National Ocean Service Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: NOAA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

According to NOAA officials, only in the event of a severe budget reduction would NCCOS, ORR, and other agency data activities be halted; however, minor budget reductions may have an impact on the breadth and comprehensiveness of certain data collection and fieldwork activities.

- The National Status and Trends Program (NS&T) has experienced moderate fluctuating budgets with an overall decline over 20 years but is expecting an increase in fiscal year 2006. A major challenge of the NS&T program is that fiscal year 2005 funding, as well as proposed fiscal year 2006 funding, does not provide sufficient staff and the necessary skill sets to produce data products and services that keep pace with the quantity and quality of data generated by the program annually.

- A reduced effort on data collection—for example, in the Mussel Watch program within the NS&T—could impact the scope of analyses and the ability to report on such ecological indicators as contaminants in sediments, benthic fish, and bivalve tissues and on emerging contaminants of concern. At the same time, however, a recent external NS&T program review recognized the value of the program for NOAA and recommended that NOAA take steps to increase and stabilize support for the program. NOAA plans to maintain this data program as long as marine pollution remains a serious issue for the nation. NOAA recognizes its unique role in contaminant monitoring and in the development of bioeffects and eutrophication assessments for the nation's coastal ecosystems.

- A reduction in fieldwork would require NOS to rely heavily on external data sources, over which the agency has limited or variable influence. For example, if NS&T data collection efforts had to be severely reduced, then NOS would rely most heavily on data from such programs as the Environmental Protection Agency's Environmental Monitoring and Assessment Program, the Gulf of Maine's Mussel Watch project, and the USGS's National Water Quality Assessment program. However, these alternative data sources do not cover the same temporal period or spatial distribution as the NS&T data.

- Any further reduction in funding to the NEEA project would eliminate the staff necessary to conduct, summarize, and synthesize the data that is held in other agencies and organizations. At present, there is only one full-time federal staff position and one contractor part-time position assigned to the NEEA update. Any reduction in funds would eliminate the contract position, and preclude travel required to host scheduled NEEA workshops.

- Only under a severe budget reduction would there be an impact to the continued reporting of data as used in the Heinz Center report. Agency officials stated that, on the whole, data utilized in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, is expected to be available in a comparable form in subsequent report iterations.

Agency officials reported anticipated modifications to programs that support ecological indicators to reflect new approaches assessing nationwide contaminant trends in coastal ecosystems. This is based largely on the findings stemming from a recent NS&T program review, conducted by NOAA scientists and by an external panel of scientists from other

federal agencies and academia. The report from the second review session, held in February 2005, was received in the spring of 2005. A positive change in the way data is being delivered to users has already been implemented as of February 2005, and will continue to be improved in the coming months: Data is now publicly available via a new data portal, accessed through a Web site, and users of the site may create reports based on parameters they choose. This change was initiated to make the scientific information collected through the program more widely available to, and more easily used by, coastal and ocean resource managers, academics, and others.

Efforts are also under way within NOAA to obtain raw data records, perform quality assurance, develop digital data for long-term archival, and disseminate data in digital format as a means to addressing challenges in maintaining and building data programs with currently available funds. According to agency officials, the change in the way data is being delivered should make it easier to include relevant data in the follow-on Heinz Center ecological indicator report, anticipated in 2007.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NOS officials provided the following information on funding levels and program priorities relative to the ability of certain NOS data programs and centers to continue providing environmental and ecological data comparable with data provided in past years:

- The NOS budget is derived from numerous "line items" in the NOAA budget. NOS is considered one budget "activity" with three "subactivities": (1) Navigation Services, (2) Ocean Resources Conservation and Assessment, and (3) Ocean and Coastal Management. NOS funds dedicated to environmental data collection, analysis, processing, and dissemination have composed approximately 80 percent of the entire NOS budget for fiscal years 2000 through 2005, and proposed for fiscal year 2006.[10]

[10]This assumes that the following items were not included: the Coastal Zone Management Grants program, which was not considered as being dedicated to environmental data collection; the Coastal and Estuarine Land Conservation Program, created by Congress in 2001 to provide grants to states or local units of government in order to protect coastal and estuarine areas with significant conservation, recreation, ecological, historical, or aesthetic values (or areas that are threatened by conversion from their natural state to other uses); and construction projects.

- Estimates of specific funding amounts for the various NOS programs from fiscal year 2000 through 2005, as well as proposed funding for fiscal year 2006, are portrayed in table 12 (aggregate totals are presented in fig. 10):

Table 12: Selected NOS Entities Responsible for Environmental Data and Respective Funding Levels for Fiscal Years 2000-2005 and Proposed for Fiscal year 2006[a]

Dollars in millions

	2000[b]	2001[c]	2002[d]	2003[e]	2004[f]	2005[g]	2006
National Centers for Coastal Ocean Science							
Center for Coastal Monitoring and Assessment	$4.7	$6.2	$7.2	$10.4	$9.2	$14.0	$8.9
National Status and Trends Program	1.0	0.8	0.9	0.8	1.0	0.8	1.0
Center for Sponsored Coastal Ocean Research	19.3	28.0	29.2	21.0	14.9	30.5	19.0
Center for Coastal Fisheries and Habitat Research	1.9	2.4	2.4	4.8	5.3	7.9	6.0
Center for Coastal Environmental Health and Biomolecular Research[h]	8.4	8.7	9.8	14.0	18.0	20.1	9.2
The Hollings Marine Laboratory	0.5	1.3	1.5	4.0	5.2	4.5	3.8
Subtotal	**$35.8**	**$47.4**	**$51.0**	**$55.0**	**$53.6**	**$77.8**	**$47.9**
Office of Response and Restoration							
Hazardous Materials Response Division	$3.5	$3.9	$5.0	$5.0	$5.4	$5.0	$5.0
Environmental Sensitivity Index (ESI) mapping activities	0.2	0.3	0.1	0.2	0.4	0.2	0.2
Subtotal	**$3.7**	**$4.2**	**$5.1**	**$5.2**	**$5.8**	**$5.2**	**$5.2**
Total	**$39.5**	**$51.6**	**$56.1**	**$60.2**	**$58.2**	**$83.0**	**$53.1**

Source: NOAA.

[a]Funding estimates based on enacted appropriation for fiscal years 2000-2005. The fiscal year 2006 column is based on the President's proposed budget.

[b]Fiscal year 2000 funding includes part or all of the following budget lines: Ocean Assessment Program, Oceanic and Coastal Research, and Coastal Ocean Program.

[c]Fiscal year 2001 funding includes part or all of the following budget lines: Ocean Assessment Program, Oceanic and Coastal Research, and Coastal Ocean Program. In addition, funding includes $5 million for Harmful Algal Blooms provided under the Coastal and Ocean Activities heading.

[d]Fiscal year 2002 funding includes part or all of the following budget lines: Ocean Assessment Program Base, Pfiesteria and HAB Rapid Response, South Florida Ecosystem, Harmful Algal Bloom Research, Oceanic and Coastal Research Base, Fish Forensics/Enforcement, MEHRL, Pfiesteria/Toxins Research, Coastal Ocean Program Base, ECOHAB, Hypoxia, and South Florida Ecosystem.

[e]Fiscal year 2003 funding includes part or all of the following budget lines: Ocean Assessment Program Base, Pfiesteria and HAB Rapid Response, South Florida Ecosystem, Harmful Algal Blooms, Beaufort NC, Oxford MD, Oceanic and Coastal Research Base, Fish Forensics/Enforcement, MEHRL,

Pfiesteria/Toxins Research, Coastal Ocean Program Base, ECOHAB, Hypoxia, and South Florida Ecosystem.

[f]Fiscal year 2004 funding includes the National Centers for Coastal Ocean Science line item, and a portion of NOS Salaries and Expenses.

[g]Fiscal year 2005 funding includes the National Centers for Coastal Ocean Science line item, and a portion of the Ocean Assessment Program base budget line South Florida Ecosystem.

[h]The Center for Coastal Environmental Health and Biomolecular Research includes facilities in both Charleston, South Carolina, and Oxford, Maryland.

- Approximately $823,000 was provided to the Center for Coastal Monitoring and Assessment in fiscal year 2005 through NOAA's Ecosystems Observation Program. This included $458,000 for programmatic funds (contracts) for the NS&T program and an additional $365,000 for staff salaries.

NOAA Environmental and Ecological Data Sets

- NOAA and NCCOS conduct a wide variety of coastal environmental monitoring and research studies that generate invaluable data sets on the biodiversity, abundances, and distributions of marine benthic (bottom-dwelling) species. Recent efforts have set out to capture this information and make it available as a readily accessible resource to support the needs of other related programs dealing with important coastal management, research, and educational issues.

  - A primary outcome of recent efforts is the centralized NOAA National Benthic Inventory (NBI), set up as a dynamic quantitative database on the biodiversity and abundances of marine benthic species that is accessible through a corresponding Web site.[11] The NBI is intended to provide access to relevant biological information through automatic database queries by species name, project name, or geographic region; and provides links to additional NCCOS data sources on other environmental data from corresponding sites (e.g., the NOAA NS&T Web site for chemical contaminant and toxicity data). The framework for the NBI was completed in 2003 and the Web site was approved for public release in March 2004.

  - An additional significant accomplishment in fiscal year 2005 has been the successful completion of a digital gateway linking the NBI with the Ocean Biogeographic Information System (OBIS), a Web-based

[11]See http://www.nbi.noaa.gov.

provider of worldwide geo-referenced data on marine species.[12] OBIS is the information component of the Census of Marine Life, a 10-year initiative involving more than 45 nations to assess and explain the diversity, distribution, and abundance of life in the oceans. OBIS includes information on all types of marine species (plants, algae, protozoans, invertebrates, and vertebrates) from various parts of the world. The new link to the NBI provides OBIS with an additional source of data on marine-benthic invertebrate species from studies conducted throughout the United States by NCCOS and its partners. The link also provides an opportunity for the NBI, in serving as a source of biological observations, to become an integral component of a larger integrative ocean observing system with access to a broader range of species and geographic regions. Users of OBIS include scientists, marine resource managers and policymakers, educators, students, and the public.

- NCCOS has a project titled "Development of Indicators for Assessing and Mitigating Risks of Biological Effects from Sediment-Associated Stressors" that is devoted specifically to the development of new ecological indicators. The purpose of this project has been to develop reliable indicators and associated thresholds for detecting and predicting risks of adverse effects of sediment-associated stressors on the integrity of ambient bottom-dwelling (benthic) organisms.[13] A key goal of the project is to use information on the responses of these organisms in the development of optimal sediment-quality targets and restoration goals in order to sustain healthy coastal conditions and maintain the integrity of living resources. Specifically, work in recent years by NCCOS and its partners has resulted in two related types of products: (1) development of indices of biotic integrity as indicators of the condition of ambient benthic fauna in relation to the quality of their surrounding sediment environment; and (2) derivation of benthic-based sediment quality targets for assessing and predicting the incidence of degraded benthic condition within different ranges of sediment

[12]See http://www.iobis.org.

[13]Bottom-dwelling or benthic biota are a key component of coastal ecosystems, playing vital roles in detrital decomposition, nutrient cycling, and energy flow to higher trophic levels. Benthic fauna live in close association with bottom substrata, where contaminants tend to accumulate and where low-oxygen conditions are typically the most severe. Because of their relatively stationary existence, it is difficult for these organisms to avoid pollutants and other adverse conditions in their immediate surroundings, and as such, they are good signals of human-induced stress.

contamination. The products have been put to use in various coastal assessment applications, including state and national coastal condition reports.

National Status & Trends (NS&T) Program

- The Center for Coastal Monitoring and Assessment's NS&T program has experienced moderately fluctuating budgets with an overall decline over 20 years and is expecting an increase in fiscal year 2006. A major challenge of the NS&T program is that fiscal year 2005 funding, as well as proposed fiscal year 2006 funding, does not provide for sufficient staff and the necessary skills to produce data products and services that keep pace with the quantity and quality of data generated by the program annually. Furthermore, additional NS&T activities supplemental to the key program activities, including recovering historical data, conducting bioeffects assessment studies, and building a Web-based statistical analysis tool for NS&T data, are desired but currently not budgeted, and are estimated to cost $200,000 in fiscal years 2005 and 2006.

- Due to past funding levels, NS&T has had to adjust the geographic scope and magnitude of sampling activities for each of the projects that constitute the integrated NS&T program—namely the Mussel Watch and BioEffects projects.[14] The Mussel Watch project uses shellfish to measure general ambient contaminant concentrations in the nation's estuaries and whether these contaminants are increasing or decreasing. Similarly, the BioEffects project identifies and assesses biological effects associated with contaminant exposure. Thirty intensive regional studies, of 2- to 4-year durations, have been conducted since 1986. The BioEffects databases, when complete, will include: sediment, tissue, and water chemistry for over 80 organic and inorganic contaminants; toxicity bioassays; biomarker assays; histopathology; and benthic community assessment.

    - The NS&T program has continued to characterize the extent of sediment contamination in the nation's estuaries since 1986 and has

[14]Coastal states with contaminant "hot spots" and those where restoration or remedial activities have taken place have asked NOAA to consider establishing long-term environmental monitoring sites, using natural populations or caged mussels as sentinel species. These requests have not been made to alter the program, but instead to tailor aspects of the program to meet user needs.

the longest-running primary data record for such information. In previous years, some of NOAA's monitoring and assessment activities, including the characterization of chemical contamination in bottom sediments and the condition of bottom-dwelling animals, have been conducted in collaboration with the estuarine component of the EPA Environmental Monitoring and Assessment Program.[15] Such joint activities included work in the Chesapeake Bay, along the coasts of the Carolinas, and in the Hudson-Raritan and Long Island Sound estuaries.

- Half of the Mussel Watch project sites are now sampled every other year, rather than annually, due to funding limitations. If Mussel Watch samples were collected at sites on a further reduced schedule—for example, on a 3-year cycle—the ability to determine changes in environmental trends would take years longer and the likelihood of not identifying the release of regulated chemicals would become more likely. Data quality, however, would not be adversely affected by a reduction in sample collection and the resultant analyses in the Mussel Watch project.

- In fiscal year 2005, approximately $823,000 is required to operate the Mussel Watch component of the NS&T.[16] Of that total, $413,000 will be used to collect and analyze bivalve mollusks for a suite of over 100 toxic contaminants at coastal sites from around the United States. An amount of $8,700 was used in fiscal year 2005 to conduct an outside review of the NS&T program, done periodically to ensure the program is meeting its goals and objectives, and the needs of the user community.[17] In addition, $15,000 was used to reinstitute "specimen banking," in which some of the tissues collected are archived for later analysis. Specimen banking allows for retrospective analyses of

[15]The joint Environmental Monitoring and Assessment Program-NCCOS Estuaries sediment data were of use to the Heinz Report, and data from subsequent collaborative efforts in near coastal shelf waters along the West and East Coasts of the United States (sampled in 2003 and 2004) will be useful in future relevant reports.

[16]In fiscal years 2004 and 2005, Mussel Watch was included under the "Ecosystems Observations Program (EOP)," and is included in the Center for Coastal Monitoring and Assessment base budget estimate in table 12.

[17]The recent NS&T program review recognized the value of the program for NOAA and recommended that NOAA take steps to increase and stabilize support for the program. Plans are to maintain this important record as long as marine pollution remains a serious issue for this country.

chemicals that have not yet been recognized as a threat. The remaining funds will be used for salaries/overhead ($353,214) and for NS&T program-related travel, supplies, and equipment ($33,086).

- The NS&T program has recently undergone thorough reviews, the latest being in February 2005, and a scientific review panel provided their recommendations in early April. The review panel was composed of some of the world's most respected scientists in the field, each bringing their unique academic, federal, state, regional, and international perspectives to the review. The NS&T program was the beneficiary of applying the group's collective knowledge to streamlining program operations, and optimizing its business practices.[18] In total, the panel provided more than 85 comments and recommendations. These ranged in theme from optimizing statistical design to strengthening partnerships and outreach. The panel's key findings, as well as a short discussion of how NS&T has already begun to act on many of the recommendations provided, are described below:

  - Due to its unique history, scope of data collection, exacting quality-control standards, and a developing Web site to deliver data and derived products, the NS&T program is poised to become the leader in national contaminant monitoring, and in the development of bioeffects and eutrophication assessments for the nation's coastal ecosystems. The group felt that success in this endeavor could be catalyzed by expanding and enhancing internal NOAA and domestic U.S. partnerships, by linking relevant initiatives to the Integrated Ocean Observing System (IOOS), and by focusing on the needs of the nation's resource managers. NS&T scientists have been working closely with agency partners to finalize the data portal, which will

[18]According to NOAA officials, the panel praised NS&T as one of the most successful and longest-running monitoring programs in the United States, and recommended expanding the program to include monitoring "emerging contaminants of concern," as well as continued monitoring of existing legacy contaminants. In response, NS&T program scientists organized a workshop held in partnership with several other NOAA programs in May 2005. The workshop was designed to prioritize expansion of monitoring and research efforts based on the consensus of many of the nation's experts in the field.

provide resource managers with easy access to program data, and is expected to be ready by the end of fiscal year 2005.[19]

- The panel recommended that NS&T should strive to become the primary program for contaminant information within NOAA. As a recognized data clearinghouse within NOAA, NS&T should consider developing "knowledge products" (e.g., fact sheets, annual summaries, site assessments, etc.) that synthesize data for the general public and for coastal mangers (e.g., ranking estuarine contamination, completing a national scorecard of coastal contamination, etc.), and that this information stream (both data and products) should be delivered using the data portal. This Web-enabled system can then be used to ensure NS&T maintains an explicit link and prominent role within IOOS. NS&T specialists who engineered the data portal have already initiated substantive conversations with the NOAA IOOS community, and are developing a strategy to implement the link as soon as the portal comes online.

- The panel suggested that the NS&T team must first revisit its stated goals and objectives to better clarify its vision, to re-establish the program's important work within the "general public's consciousness," and to articulate its relevance to NOAA, its partners, coastal managers, and the broader scientific community. Addressing this recommendation was the first action that came from the program reviews. Since the February 2005 review, NS&T management and personnel have been developing a cogent and forward-thinking strategic plan which recognizes the needs of the program customers. This 5-year strategic plan is due to be completed by August 2005, and will reflect many of the recommendations provided by NS&T program review panels.

- Because the NS&T program is the longest-running element of national coastal monitoring in the federal government, it should

[19]When completed, the database will include quality-assured data from the Mussel Watch, Benthic Surveillance, Bioeffects studies, and other components of the program, some of which have existed since 1984. The Web site dissemination of data is intended not only to improve data accessibility, but also to allow mapping and analyses (e.g., identification of point sources of contaminants, trends in specific contaminant loading, etc.) and visualization capabilities through a variety of data display and analytical tools. Its use will greatly facilitate sharing of coastal environmental data among researchers, resource managers, and the public at large, thereby promoting more informed and transparent decisions.

contribute to the backbone of the National Water Quality Monitoring Network as envisaged under recommendations of the U.S. Commission on Ocean Policy and as included in the U.S. Ocean Action Plan.[20] NS&T has acted swiftly on this guidance by assigning senior personnel to participate from start to finish as members on the National Water Quality Monitoring Council, charged with developing the National Water Quality Monitoring Network. This will ensure that NS&T capabilities play prominently among components of the Network once in place.

Environmental Sensitivity Index (ESI)

- Stakeholders such as local-use communities contribute financial support and are major influences in determining areas for Environmental Sensitivity Index (ESI) maps. ESI maps are often the product of collaboration among such stakeholders, and assurances of their participation are sought with respect to data collection before an ESI atlas project is begun. For example, the Coast Guard and Minerals Management Service often provide funding for ESI mapping. Much of the Alaska ESI work was funded by the Prince William Sound Oil Spill Recovery Institute, a program authorized by Congress through the Oil Pollution Act of 1990, in part to identify and develop the best available techniques for preventing and responding to oil spills in the Arctic and sub-Arctic. State and local governments, environmental agencies, and industry occasionally contribute funds for ESI mapping activities, but probably influence the ESI mapping efforts more by demonstrating interest and acceptance in the ESI methodology.

- Although there are anomalies in ESI maps dictated by local environmental variations and needs, NOAA has made a significant effort to assure uniformity of ESI maps across regions. In the early 1990s, NOAA began an association with a number of states, including California, Florida, Texas, and New Jersey in order to obtain input on environmental mapping needs and the best way to provide a standard

[20]Recognizing the importance of the ocean, coasts, and Great Lakes to the United States, in 2000, Congress established the U.S. Commission on Ocean Policy. Oceans Act of 2000 § 3, Pub. L. No. 106-256, 114 Stat. 644. The commission began work in September 2001, and pursuant to its legislative mandate, completed a thorough and expansive report, *An Ocean Blueprint for the 21st Century*, on September 20, 2004, which contains proposals for the establishment of a comprehensive and coordinated ocean policy for our nation. The U.S. Ocean Action Plan was formed to identify immediate, short-term actions that provide direction for ocean policy and also outline additional long-term actions for the future.

mapping product from one locale to the next. Out of this effort, the first draft of the Environmental Sensitivity Guidelines was published in April 1993. It has since been updated twice, providing greater detail and refined methods for ESI data mapping. Among other things, the guidelines include information on how data should be collected and categorized, database structure, a master species list and description of ESI shoreline types, and information on how ESI data should be symbolized and displayed. This document has helped a few states develop their own environmental sensitivity maps that mimic the standard NOAA product. The guidelines are strictly followed by NOAA and contractors with the intent that a responder can be on any coast and have an ESI product that appears just like every other ESI product they may have used.

- Coastal areas that have not been mapped digitally or that do not include the full suite of standard ESI elements include Maine, Maryland, the outer coasts of Washington and Oregon, and the Great Lakes. The development of an ESI atlas covering a state or geographic region typically takes 12 to 24 months to complete. Costs vary based on the complexity and extent of the geographic region, but a typical ESI mapping project generally costs $200,000 to $350,000.

- The biggest shortcoming of ESI maps is the length of time between updates for a given atlas. The few atlases that are still not available digitally were published in the early 1980s. The goal, until now, has been to get as much of the coastline mapped as possible and to place the maps in GIS formats. Though this goal is nearly met, an update strategy has not been developed, and funds are not available to proceed with timely updates. The first GIS produced atlases are now around 10 years old, while the user community in these areas is established and the desire for more current data exists. Lack of annual funding for ESI updating efforts is an impediment.

National Estuarine Eutrophication Assessment (NEEA)

- To complete the update of the NEEA, a streamlined survey collection tool is being developed for use by investigators who will enter data which will be validated by a simultaneous data collection and synthesis effort for a select number of systems. In the 1999 assessment, rather than collecting data directly, NEEA staff collected categorical responses from survey respondents and participants based on their own synthesis and analysis of data for their estuaries or waterbodies.

- It is difficult to acquire updated data for the NEEA. Due to a lack of funding to support a national level data collection and synthesis effort, NEEA staff are

  - creating and implementing an online data collection survey tool that will result in a national database of chlorophyll-*a* values representing the highest measurement levels in the system on an annual basis, in terms of spatial area and frequency (there will also be simultaneous case studies for select estuaries where data will be collected and analyzed in order to validate the results of the survey results); and

  - collecting data for 14 estuaries in a pilot study in the North and mid-Atlantic Ocean (including the Gulf of Maine), and designing an online data collection survey tool to comprehensively collect data and information on a national basis for the 138 systems in the 1999 NEEA report.

- There is no comprehensive sampling program within NOAA that collects chlorophyll-*a* data, though some samples are collected by the National Estuarine Research Reserve Program and those working on remote-sensing observations. If it were collected, it could be used to determine concentrations within estuaries and zones within estuaries, if the data were spatially distributed. The 1999 NEEA was based on regional reports that show where, within the estuaries studies, the elevated chlorophyll-*a* concentrations occur.

Air Quality System, Office of Air Quality Planning and Standards, Environmental Protection Agency

Background

The Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS) serves to enhance and protect the quality of the nation's air by managing programs to improve air quality where the current quality is unacceptable and to prevent deterioration in areas where the air is relatively free of contamination. The Clean Air Act required that EPA establish a national network to monitor pollutant concentrations in ambient air.[1] This network comprises monitoring stations throughout the country that are operated by state and local agencies. Accordingly, EPA regulations direct states to collect and report air quality data to EPA's Air Quality System (AQS).[2] States are also required to use standardized ambient monitoring methodologies and to follow EPA guidelines for monitoring siting and other technical requirements, such as the process of choosing a location for a monitor.

OAQPS evaluates the status of the atmosphere by comparing ambient air conditions with clean air standards and historical information using a variety of methods and tools, at the heart of which is a network of ambient air quality and meteorology monitoring stations. The data collected from these stations are stored in the AQS, which provides data for a variety of functions in both the public and the private sectors. The data are used to assess air quality, assist in determining attainment/nonattainment designations, evaluate state implementation plans for nonattainment areas, perform modeling for permit review analysis, enable scientists to study the relationships between air quality levels and health and ecological effects and evaluate options for emissions control strategies.

Summary

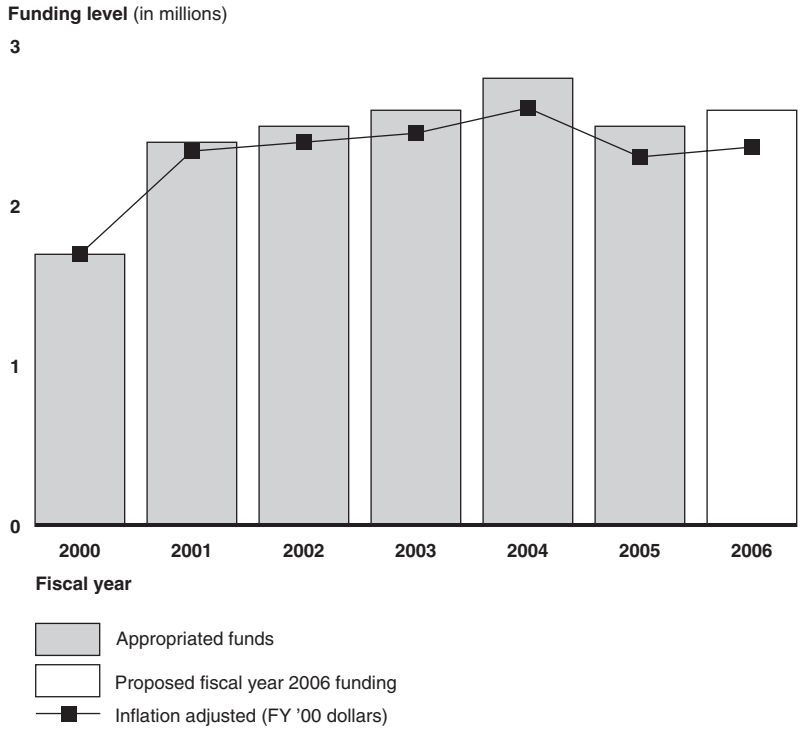
Agency officials indicated that the AQS data management system is funded entirely from the EPA budget and that the expected funding level for fiscal year 2005 and the proposed funding for fiscal year 2006 for operating AQS will not have an effect on the ability to provide data of similar quality and comprehensiveness when compared with data from previous years. These funding amounts represent preinflation-adjusted decreases of about 11

[1]42 U.S.C. § 7403(c)(2).

[2]40 C.F.R. § 58.35.

percent and 7 percent, respectively, when compared with funding received for AQS in fiscal year 2004.[3]

Figure 11: Air Quality System Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: EPA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

In addition, agency officials reported that planned improvements to the ambient air- monitoring program will result in improved timeliness in reporting data to AQS and optimization of the Photochemical Air Monitoring Stations (PAMS), which provides information on chemical precursors for ozone. Although this may require minor enhancements to AQS, officials indicated that it will not have an effect on the system's ability

[3]EPA officials indicated that funding for AQS for fiscal year 2005 is subject to change as the fiscal year progresses.

to produce and compare data in the coming years with data generated in previous years. As utilized in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, agency officials stated that AQS data related to ground-level ozone and ozone precursors is expected to be available in an improved form for the expected 2007 follow-on indicator report.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

EPA officials provided the following information on funding levels and program priorities relative to the ambient air-monitoring program's ability to continue providing environmental and ecological data comparable with past years:

- Because the ambient air-monitoring program is a high priority within EPA's Office of Air, it is likely that the current data system would continue to be funded in the event of funding reductions to EPA's budget for air-quality programs (i.e., funding reductions would be absorbed by other, lower-priority air-quality programs). However, funding reductions would be likely to adversely affect EPA's ability to develop enhancements to the current data system and, if the funding reduction were significant enough, changes could be made to the basic spatial and temporal framework of the ambient air-monitoring program, lowering the quality of the existing AQS data. In the event of such changes, EPA would examine ways to develop alternative monitoring strategies.

- The cost of monitoring pollutants is significantly greater than the cost of operating the AQS. For example, in fiscal year 2003, the costs of monitoring and collecting ozone data reported into AQS were an estimated $34 million, or about $28,000 per monitoring site for the 1,194 sites. Funding for AQS in fiscal year 2003 was $2.6 million. Operating the ambient air-monitoring program, including AQS, requires costs associated with contracting for services, staffing, and data processing and data storage. Pollutant monitoring activities include costs for computer data processing, site installation of monitoring devices, sampling and analyses, maintenance, data management, quality assurance, supervision within the operating program, and the costs associated with coordinating with other agencies. Since the AQS is designed to provide data for numerous pollutants, it is difficult to identify the costs associated with any one pollutant (such as ozone data that were included in the Heinz Center report), and EPA has not attempted to do so. Estimates of ozone-monitoring sites and data collection costs (using the total number of ozone-monitoring sites and prorating the full costs of ozone monitoring and reporting) and AQS

funding between fiscal years 2000 and 2006 were provided by EPA and are shown in table 13:

Table 13: Estimates of Ozone Monitoring Sites and Data Collection Costs and Overall AQS Funding for Fiscal Years 2000-2006

Year	Number of ozone sites reporting to AQS	Costs of monitoring ozone	AQS funding
2000	1,123	$30,068,849	$1,700,000
2001	1,170	32,059,993	2,400,000
2002	1,180	32,906,268	2,500,000
2003	1,194	33,839,222	2,600,000
2004	1,182	33,939,729	2,800,000
2005	TBD	TBD	2,500,000
2006	TBD	TBD	2,600,000[a]

TBD = To be determined

Source: EPA.

Notes: AQS funding includes the annual costs for the development, operation, and maintenance of the AQS data management system. The costs are for contracts, staffing, and system support (e.g., password and other user support activities). Not included in these figures are computer related costs (e.g., central-processing unit-hours and data storage) for loading and retrieving data from the system for all users. These additional costs amount to approximately $0.9 million annually. Funding for fiscal year 2005 is subject to change as the year progresses.

Ozone monitoring is performed during the warmer months of the year. EPA does not yet have specific estimates of the number of monitors that will be reporting in 2005 and 2006. However, it expects the number to be similar to the 1,182 reporting in 2004.

[a]President's proposed budget.

- Regarding changes anticipated in the ambient air-monitoring program, specifically with respect to the collection and analysis of monitoring data for ozone, over the past several years EPA has been developing a new Ambient Air Monitoring Strategy that is intended to change the size, composition, and distribution of the current ambient monitoring network. The strategy is expected to produce more relevant measurements at representative urban and rural locations across the country. Minor changes would occur in certain technical specifications of the system and the pollutants they measure. For example, in addition to having access to ozone data, AQS users are expected to have access to a robust set of data on total reactive nitrogen, which is a precursor to ozone. The strategy also includes improvements in the timeliness of reporting data to AQS and optimization of the Photochemical Air Monitoring Stations (PAMS) used to characterize chemical precursors

for ozone. Although the AQS system is fairly flexible and can handle many of the anticipated changes, officials noted that some minor enhancements to the system may be needed to implement all of the changes expected as a result of implementing the new monitoring strategy. Such enhancements typically would expand or improve AQS's operation to support the needs of EPA's national ambient monitoring program. They provide a more user-friendly system for state, local, and tribal agencies to submit and retrieve data from the AQS. Most of the enhancements are designed to improve the overall operation of the ambient air-monitoring program and are not directly related to a particular pollutant, such as ozone.

- States, localities, and tribal agencies must monitor and report ambient ozone concentrations as well as data on concentrations of five other air pollutants that EPA uses as indicators of air quality.[4] EPA provides grants to partially fund the establishment and operation of some types of monitoring stations, including those for monitoring ozone and its precursors. EPA provides funding for monitoring to state, local, and tribal air-monitoring agencies under the authority of section 105 of the Clean Air Act.[5] Under section 105, EPA may fund up to three-fifths of the costs of implementing programs for the prevention and control of air pollution or implementation of national primary and secondary ambient air-quality standards. Grantees are to provide two-fifths of the costs. EPA typically uses section 105 grant authority for programs that are ongoing. EPA typically uses different grant authority under section 103 of the Clean Air Act to provide for full funding of new programs to accelerate their deployment.[6] For fiscal year 2005, the actual amount of funding to support all ozone-related activities provided to state, local, and tribal agencies through section 105 grants was $64,960,023. This includes activities that go beyond monitoring and data handling, such as development of state implementation plans. Ozone-monitoring activities carried out by state, local, and tribal agencies generate data that are reported to EPA and processed by the AQS. Some state, local, and tribal agencies use AQS as their primary data management system for air-quality data. Many other agencies use some of the capabilities of AQS to supplement their own systems' capabilities.

[4]42 U.S.C. § 7410(a)(2)(B).

[5]42 U.S.C. § 7405(a).

[6]42 U.S.C. § 7403(b)(3).

- In general, the factors driving changes to EPA's air-quality data management system have been: (1) changes in the characteristics (e.g., size, composition, and location) of the national monitoring program with concomitant growth in the volume of data collected; (2) the need for additional types of information (e.g., information about other pollutants, detailed monitoring site descriptions, and information on monitoring methods used to collect the data); (3) the need for the data system to perform more sophisticated analyses and provide expanded retrieval capabilities; and (4) advances in information technology, especially recent advances associated with the widespread use of personal computers and the Internet.

Environmental Monitoring and Assessment Program, Environmental Protection Agency

Background

The Environmental Monitoring and Assessment Program (EMAP) was initiated in the late 1980s within the Environmental Protection Agency's (EPA) Office of Research and Development (ORD).[1] EMAP is essentially a long-term research and technology transfer program with an internal research component and, until recently, an important external research component funded by competitively awarded grants. EMAP focuses on developing indicators and unbiased statistical design frameworks that allow the condition of aquatic ecosystems to be assessed at the local, state, regional, and national levels. The current condition of the nation's aquatic ecosystems and the stressors most closely associated with impaired condition are key assessment activities. Developing sound scientific approaches for these activities has been and continues to be EMAP's primary mission.

Through a probability-based sampling design, the EMAP approach provides a statistically valid basis for determining ecological condition with a known statistical confidence. When implemented over time, the approach can provide quantifiable estimates of the environmental benefits derived from EPA's protection and restoration strategies. Using the EMAP approach, ORD hopes to reduce data gaps, develop new hypotheses for testing cause-and-effect relationships in ecosystems, and provide scientifically defensible assessments of changes and trends in ecosystem conditions.

At the national level, EMAP's efforts toward comprehensive and comparable methods are aimed at permitting, for the first time, meaningful assessments and regional comparisons of aquatic ecosystems across the

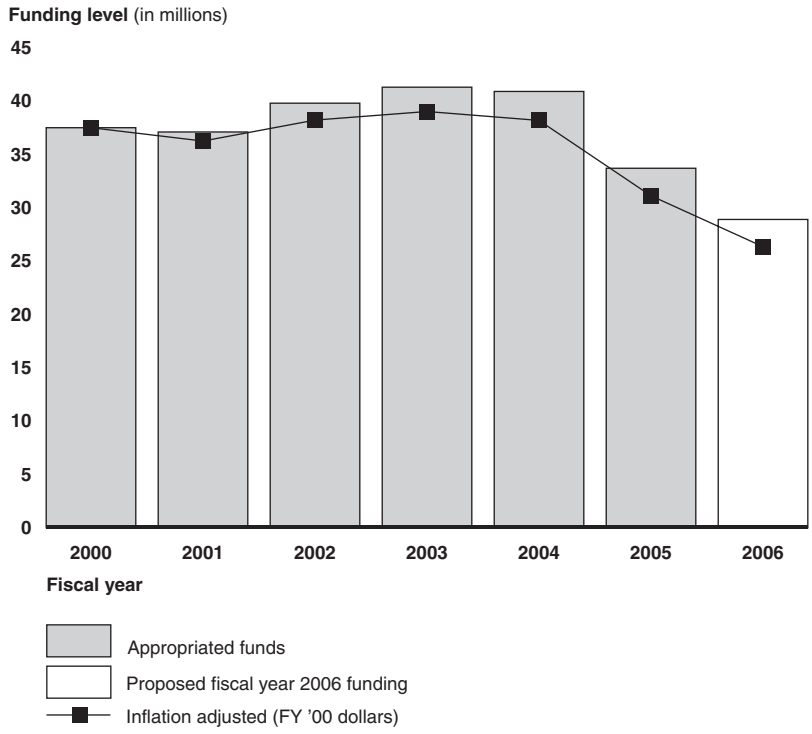
[1]The need for significant advances in the way EPA and other federal agencies monitored the condition of the environment had long been recognized. A 1988 report by EPA's Science Advisory Board (SAB), *Future Risk: Research Strategies for the 1990s*, concluded that EPA needed more research relating the effects of cumulative, regional, and long-term anthropogenic disturbances to ecosystems. Increased research was also needed, the SAB said, to develop ecological indicators and protocols for monitoring and to analyze and quantify uncertainty in assessments resulting from monitoring data. The goals were improved detection of ecosystem status and greater predictive capability. Toward these ends, SAB recommended that EPA undertake research on techniques that can be used to help anticipate environmental problems and make a more concerted effort to be aware of and interact with the research efforts of other federal agencies concerned with these problems. SAB's recommendations, the emerging vision of ecological risk assessment within EPA, and the importance of high-quality monitoring in this risk assessment paradigm were together responsible for the creation of EMAP. EMAP's challenge was to develop the tools necessary for measuring the condition of ecological resources and the designs for detecting both spatial and temporal trends.

United States. EPA regions will benefit as well from consistent and comparable environmental data as a result of the EMAP approach, since regional decision makers must also prioritize protection activities across multiple states and environmental media and often seek to develop unbiased state-of-the- region reports for their stakeholders. Finally, at the state and local levels, managers and technical staff frequently struggle to balance local information needs with federal reporting requirements. The goal that EMAP seeks to achieve with state and tribal partners is the adoption of a cost-effective monitoring methodology that simultaneously serves both levels of decision making.

Summary

EPA officials indicated that funding for EMAP for fiscal year 2005 and proposed funding for fiscal year 2006 are expected to result in the continuation of EMAP research, data collection, and analysis activities that will produce data of similar or superior comprehensiveness and quality compared with that used to support ecological indicators in the first Heinz Center Report, published in 2002. They noted that the strength of the EMAP science, the program's focus on working with the states to produce large-scale and national demonstrations of the program's ecological monitoring approach, and the focus on key agency research needs should continue to make EMAP a high priority within ORD. Nevertheless, recent reductions in the funding of EMAP research, specifically the elimination of funding for an important category of extramural research in fiscal year 2005 and subsequent years, have the potential to adversely affect the nature and mix of EMAP activities and the implementation of the program's multiyear research strategy promulgated in mid-2002.

Figure 12: Environmental Monitoring and Assessment Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: EPA.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Despite these funding challenges, program officials reported that progress in EMAP research achieved since publication of the first Heinz Center report and the expected results of ongoing EMAP studies should enhance the ability of the program to provide data in support of ecological indicators in future iterations of *The State of the Nation's Ecosystems* report and in EPA's own *State of the Environment Report*.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

EPA officials provided the following information on funding levels and program priorities relative to EMAP's ability to continue providing environmental and ecological data comparable with past years:

- All of the direct funding for EMAP has come from the federal government, specifically from funds provided through EPA's Science and Technology (S&T) appropriation. Funding of each major component of EMAP between fiscal years 2000 and 2005 is shown in table 14.

Table 14: EMAP Enacted Funding Levels for Fiscal Years 2000-2005

Dollars in millions

EMAP Program	2000	2001	2002	2003	2004	2005
National Coastal Assessment Program	$7.0	$7.5	$7.3	$7.6	$7.5	$8.2
Central Basin Program	0.0	0.0	0.0	4.7	5.7	6.6
Western EMAP Program	8.1	8.1	8.1	6.8	8.0	5.0
Regional EMAP Program	2.1	2.1	2.0	1.5	2.5	2.0
EMAP – Other[a]	20.3	19.4	22.4	20.7	17.2	11.9
Total[b]	**$37.5**	**$37.1**	**$39.8**	**$41.3**	**$40.9**	**$33.7**

Source: EPA.

[a]The EMAP-Other category comprises three components: (1) the STAR grants program, until fiscal year 2005, when this component of the Ecosystem Protection research program was eliminated; (2) workforce support-related costs, which account for the major part of the category (EMAP staff support the programmatic design, coordination, planning, and administrative oversight and support of the program and its components); (3) the remainder of the category funds general support contracts related to the full-time equivalents.

[b]Total includes Central Basin resources from the President's budget for fiscal years 2003 through 2005. Fiscal year 2005 funding is subject to congressional approval of the enacted fiscal year 2005 budget.

- In many instances, other federal agencies and states partnering with EMAP have provided in-kind contributions. Depending on the particular EMAP geographic demonstration, states have contributed in-kind support ranging from between 25 percent and 50 percent of the overall investment. For example, the National Coastal Assessment (NCA) has used cooperative agreements with the 23 marine coastal states and territories. These states and territories have met between 10 percent and 50 percent of the costs necessary to complete the estuarine surveys and the subsequent laboratory processing and reporting. The Western EMAP program has 11 cooperative agreements with states involved in the program. These agreements are augmented by the participation of other agencies (primarily United States Geological Survey, or USGS) that have

secondary agreements with some states to conduct the field sampling. Additionally, each of the 12 western states contributes staffing and, in many cases, equipment that supports the collection of field data for Western EMAP. EMAP-Large and Great Rivers (EMAP-GRE) are being conducted using partnerships with USGS, states, and the Ohio River Sanitary Commission (ORSANCO). Interagency agreements with USGS were created to fund state and USGS field crews and laboratory analyses. Cooperative agreements with states will be the primary vehicle for funding fiscal year 2005 EMAP-GRE activities.

- ORD's ecosystems protection research program, of which EMAP has been an important part since its inception, underwent an OMB Program Assessment Rating Tool (PART) review for the President's fiscal year 2005 budget request. As a result of that review, the Ecosystems Protection Research program received a rating of "results not demonstrated." OMB's recommendations included a $22 million reduction in fiscal year 2005 funding for ORD's ecosystems research. The fiscal year 2005 EMAP research program was reduced by $11.7 million as part of the overall ($22 million) ecosystems research reduction, even though the quality of EMAP and its cost-effectiveness were not commented upon by OMB. Reductions to EMAP research were taken from the Science to Achieve Results (STAR) grants, a program of extramural research that was relied upon to build much of the basic scientific underpinnings of EMAP. Because of the elimination of STAR grants funding for ecological research, including EMAP-related research, for fiscal year 2005 and beyond, the integration of EMAP research with academic research through STAR will no longer be possible.[2] STAR grant funding was the primary source of academic research contributing to EMAP, and the elimination of this research will slow the development of new monitoring designs and indicators, the adaptation of existing indicators for new uses, and the integration of probability designs into state-based impaired water listings for all current and proposed EMAP programmatic areas.[3] Within EMAP, some

[2]EMAP STAR funding for fiscal years 2001 through 2004 was as follows: fiscal year 2001, $10.2 million (27.6 percent of total EMAP research funding); fiscal year 2002, $11.6 million (29.1 percent of total EMAP research funding); fiscal year 2003, $8.5 million (20.6 percent of total EMAP research funding), fiscal year 2004, $7.5 million (18.3 percent of total EMAP research funding).

[3]Under section 303(d) of the Clean Water Act, states must identify bodies of water that are not meeting applicable state water-quality standards and submit a list of those waters to EPA, along with an explanation of the methodology used to identify them.

of the intramural personnel (as opposed to STAR-funded external researchers) would continue working on these issues. However, the effort would be much smaller and less encompassing than that which had been previously associated with the STAR program.[4] Moreover, as currently configured, EMAP would not be able to fill the void for developing new indicators in any of its programs with non-STAR extramural funding, with the possible exception of Great Rivers.[5] Moreover, if EMAP, as it is currently constituted, is to continue pursuing its research goals in conjunction with its state and federal partners, it cannot not rely on non-STAR extramural funding to compensate to any substantial degree for the loss of the STAR research program.

- While EMAP developed a multiyear research strategy that envisioned substantial reliance on extramural research in fiscal years 2005, 2006, and 2007, the strategy is flexible and a certain amount of what the program seeks to accomplish could be achieved through a combination of other means, including intramural research, reduced reliance on major national studies, increased use of regional scale studies involving EPA regions and states, partnerships and collaborative arrangements with other federal agencies (to leverage ORD resources), and by extended study time frames. For example, the National Coastal Assessment (NCA) is slowing the pace of its national assessments. In 2005, NCA will embark on a transitional period for state-level estuarine condition surveys where a complete national level monitoring will occur every 2 years. The first of these survey periods (2005-2006) will be completed using ORD resources. ORD will continue to work with EPA's

[4]For example, according to EMAP officials, since approximately fiscal year 1999, the development of new or improved indicators for establishing ecological condition has been viewed as a research area particularly well-suited to external academic research and has been funded through the STAR grants program.

[5]EMAP's attempt to estimate the biological condition of Great Rivers is a "first-of-its-kind" research. Because work on large rivers is difficult and dangerous, little work on the development of large river condition indicators has been conducted. Recognizing that there was not an extensive scientific literature or experience to build from or major centers of academic excellence in this field, an indicator development component was built into EMAP-GRE. Even in the case of EMAP-GRE, however, EMAP had intended to augment and integrate its "in-house" research with academic research through the STAR program.

Office of Water, EPA regions and the states with the intent of transitioning the state-based monitoring to other funding sources.[6]

- In the case of EMAP-GRE, work is being conducted using partnerships with USGS, states, and the Ohio River Sanitation Commission. Interagency agreements with USGS were created to fund state and USGS field crews and laboratory analyses. Cooperative agreements with states will be the primary vehicle for funding fiscal year 2005 activities. Due to the loss of funding for the STAR grants program associated with EMAP, EMAP-GRE has developed its own research strategy. EMAP officials are committed to moving EMAP into new areas of high-impact research based on the scientific strength of previous accomplishments.

- Further changes in EMAP research would likely occur in response to future budget changes. The areas most vulnerable to budget reductions would likely be the continuation of state-level condition surveys for aquatic resources through cooperative agreements with the states. Integration of new assessment approaches into state monitoring programs requires sufficient time and funding to demonstrate the efficacy of the approach in the states and educate them on the benefits of adopting the approach. It is through state adoption of these approaches (i.e., successful technology transfer and institutionalization) that aggregation of state-level data into national condition assessments would be ensured. Other vulnerable areas would be research affecting the ability to conduct regional and national verifications and validations of new Clean Water Act section 303(d) listing approaches for impaired waters in support of improved total maximum daily load (TMDL) development. If further budget reductions were to occur, the new approaches would be demonstrated on a smaller scale and with a longer time frame. Some EMAP personnel would continue to work on this research; however the program would likely no longer have sufficient funds to engage large numbers of state partners to participate in multiregional or national demonstrations of such approaches. Without such large-scale demonstrations of the effectiveness of the improved approach to 303(d) listings, EPA's Office of Water would not have

[6]The NCA has used cooperative agreements with the 23 marine coastal states. These states have provided between 10 percent to 50 percent of the costs necessary to complete the estuarine surveys and the subsequent laboratory processing and reporting. Memoranda of Understandings with NOAA have resulted in NOAA providing an oceangoing research vessel at no cost to EPA to conduct the offshore surveys of the West and Southwest coasts and plans to do the same for Northeast, Mid-Atlantic, and Gulf of Mexico surveys.

widespread data to support development of national guidance to the states regarding use of a new approach. In the final analysis, all EMAP components and activities could be modified. Modifications could range from complete elimination of component programs, transition of program components to an EPA program office (e.g., the Office of Water), reduced activities in one or more program areas, no further large-scale demonstrations, or delaying or eliminating new key research areas.

- EMAP-NCA provided information regarding dissolved oxygen, chlorophyll, water clarity, nutrient concentrations, and fish tissue contaminants to the Heinz Center prior to publication of its 2002 report, but the center did not use this information in its report. Subsequently, NCA provided the same information for the Heinz Center's update activity in 2003, based on findings from NCA work from 1999 to 2000. NCA has collected information on water quality, sediment quality, benthic condition, and tissue contaminant variables for marine coastal areas of the United States from 1999 to 2004. These data have been, and will continue to be, made available to the Heinz Center. The data will expand the sediment contaminants and benthic condition information to allow a national evaluation. NCA has and will continue to provide its water quality and fish tissue contamination to the Heinz Center, as well, so that it may be used in future iterations of the center's report on the *State of the Nation's Ecosystems*.

- EMAP could provide lake indicators and stream/river indicators for the Heinz report. Data collected in EMAP-West is being combined with data being acquired on streams in the remainder of the contiguous United States by EPA's Office of Water (OW). EMAP developed a compatible design for OW's stream assessment and is also providing technical guidance and analysis support to OW. By combining western stream data and data from the remainder of United States streams in OW's assessment, the first National Wadeable Streams Assessment will be produced near the end of 2005. This would be available for inclusion in the Heinz Center's report after fiscal year 2005.

- In terms of long-term availability of information to inform and support ecological indicators, it is important to bear in mind that EMAP is primarily a research and development program, not a long-term monitoring program. EMAP's goal and intent is to transfer its research findings and technology to the appropriate entities, typically states, for adoption and long-term implementation. If funding reductions were of

such magnitude as to prevent the EMAP monitoring approach from being adopted by all of the states or mandated by EPA program offices or regions, it would not be possible over the long run to realize the full potential of this approach for augmenting the body of data needed to support ecological indicators, including those contained in the Heinz Center report series or in EPA's own *State of the Environment Report*.

Surveillance and Reporting of Waterborne Disease Outbreaks, Centers for Disease Control and Prevention, HHS

Background

Since 1971, a voluntary, collaborative reporting system involving the Centers for Disease Control and Prevention (CDC), the Environmental Protection Agency (EPA), and the Council of State and Territorial Epidemiologists (CSTE) has been in place to track the occurrences and causes of waterborne disease outbreaks (WBDO) associated with drinking water.[1] Tracking recreational water-associated outbreaks began in 1978.[2] Under this collaborative surveillance system, state, local, and territorial health officials and epidemiologists use a standard form to report outbreaks of waterborne diseases to CDC.[3] Through the compilation and reporting of WBDO data in periodic summaries, local and state health departments and others involved in the implementation of water protection programs have become more aware of factors involved in WBDOs. Moreover, through this collaborative system it has been possible to make assessments of trends in causative agents, focus attention on common errors in water handling, assist in setting program priorities and planning activities, and institute better training programs. Information from the WBDO surveillance system has influenced EPA's research priorities and has

[1]The reporting of waterborne diseases in the United States began in 1920 when state and territorial health officers, concerned about high morbidity and mortality caused by typhoid fever and infant diarrhea, recommended that cases of enteric fever be investigated and reported. Statistical data regarding U.S. WBDOs were collected by different researchers and federal agencies between 1920 and 1970. With the exception of a few waterborne diseases, however, there are no specific federal legislative or regulatory mandates for collecting or reporting information on WBDOs associated with either drinking water or recreational water. Public health departments in states, territories and localities continue to have primary responsibility for detecting and investigating WBDOs. At the outset of this collaboration in 1971, the WBDO Surveillance System served three objectives: (1) disease control, (2) improved knowledge of disease causation, and (3) provision of administrative guidance. These objectives continue to provide the basic rationale for the system.

[2]The unit of analysis for the WBDO surveillance system is an "outbreak," not an individual case of a waterborne disease. Two criteria must be met for an event to be defined as a water-associated disease outbreak. First, two or more people must have experienced a similar illness after exposure to water. This criterion is waived for single cases of laboratory-confirmed primary amebic meningoencephalitis, single cases of wound infections associated with exposure to recreational water, and for single cases of chemical poisoning, if water-quality data indicate contamination by the chemical. Second, epidemiologic evidence must implicate water as the probable source of the illness. Reported outbreaks caused by water or ice contaminated at the point of use (e.g., a contaminated water faucet or serving container) are not classified as water-associated outbreaks.

[3]CDC uses a standard form (form 52.12) to collect this data. Numeric and text data are abstracted from the form and supporting documents and are entered into a CDC database system that tracks the occurrences and causes of WBDOs associated with drinking water and recreational water.

influenced the development of improved drinking-water-quality regulations and the development of guidelines for recreational activities in freshwater and coastal waters as well as documenting decreases in drinking-water-related outbreaks following institution of new EPA regulations.

Periodically (typically once every 2 years), CDC publishes summary statistics on waterborne disease outbreaks in a publication series referred to as the *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries*.[4] In 1989, management of the waterborne disease surveillance system within CDC moved to the Division of Parasitic Diseases (DPD), a division of the National Center for Infectious Diseases, and continues to be managed by that group. In collaboration with EPA, CDC staff receives, analyzes, and compiles the information submitted via the collaborative reporting system.[5] CDC has no full-time staff dedicated to the WBDO surveillance system; staff time is devoted to the activity as available. Furthermore, CDC does not track the use of staff time for this purpose and does not seek or obtain reimbursement for it. After the WBDO surveillance data has been analyzed and summarized and is ready for publication, it is made available in printed copies of the *MMWR Surveillance Summary* and posted to CDC's Web site, which can be freely accessed.

Summary

CDC officials indicated that while their agency's participation in the collaborative WBDO surveillance system is not mandated, they are confident that CDC will continue to play the role that it has played in this system over the past 30-plus years. They indicated, in particular, that data from the WBDO surveillance system used to support ecological indicators in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, are expected to continue to be available at similar or superior levels of quality

[4]All *MMWR* publications are in the public domain, and the majority of issues from 1992 to the present are available on the Internet. The first surveillance summary of WBDOs was published in the *MMWR* on June 1, 1988. Prior to this, surveillance data from 1971 through 1984 were published in a series of status reports by the Enteric Diseases Branch of the Division of Bacterial Diseases of CDC.

[5]DPD and EPA each play important roles in evaluating and ranking the reports that are received and in follow-up activities, as necessary, to address gaps, discrepancies, or ambiguities in the reports. If any discrepancies, errors, or other inconsistencies are found during this process, the CDC WBDO Surveillance System Coordinator contacts the health department in question for clarification. An extensive clearance process is undertaken with EPA staff and key experts within CDC that have relevant expertise (parasitic, bacterial, viral, or environmental health).

and comprehensiveness when compared with data from prior years. CDC officials also indicated that there are no planned changes for the WBDO surveillance system that would adversely affect the system's ability to provide data that can be compared with data in prior years. In fact, planned enhancements to the system should improve the collection of WBDO information and its analysis and reporting.[6]

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

CDC officials provided the following information on funding levels and program priorities relative to the ability of the WBDO surveillance system to continue providing environmental and ecological data comparable with past years:

- Costs that are specifically accounted for by CDC in connection with the WBDO surveillance system are for publication of the *MMWR Surveillance Summaries* of WBDOs. These costs have varied in recent calendar years, totaling, for example, $4,882 in 2000, $10,285 in 2002, and $10,696 in 2005. The total costs of publications for fiscal years 2000 through 2005 have amounted to $25,863. CDC officials reported that there have been discussions with EPA that resulted in EPA paying for publication costs of the 2001-2002 *MMWR Surveillance Summaries*. Discussions are also ongoing regarding the possibility of that agency sharing the costs of publication of the *MMWR Surveillance Summaries* in the future.

- Despite there being no statutory or other requirements for CDC's participation in the WBDO surveillance system, officials said that there is a demonstrated commitment on the part of CDC to continue to support the system in the same way it has done for the past 30-plus

[6]The consensus among experts is that the actual incidence of WBDOs is far greater than that reported by the *MMWR Surveillance Summaries*. The sensitivity of the WBDO surveillance system (i.e., the probability that an actual outbreak will be identified correctly, reported to CDC, and recorded into the surveillance database) is unknown because the actual number of WBDOs cannot be determined. However, the sensitivity of the system is probably low because of underreporting of WBDOs, likely caused by lack of recognition that an outbreak is occurring or has already occurred. Multiple sequential barriers exist to reporting cases of outbreak-related illness, including that many people who become ill after exposure to drinking water or recreational water do not make a connection between their exposure and their illness and may not seek medical treatment. To complicate matters, standardized clinical and environmental laboratory methods that are both sensitive and specific are lacking for many viruses, and routine testing for parasites in fecal samples is not always done.

years. The information on WBDOs that has been obtained through the WBDO surveillance system is very important to CDC, state and local health and environmental authorities, and the EPA. CDC's strategic objective for the surveillance system is to continue to work collaboratively to meet the goals for which it was originally established and to make improvements to the system wherever possible.

- EPA and CDC scientists recently determined that more information needed to be collected through the WBDO reporting system. As a result, the WBDO surveillance system report form was revised to allow for more specific reporting of water source or setting, water treatment, and factors contributing to water contamination, particularly pertaining to recreational water-associated outbreaks.

- More options are now provided on the report form for listing the types of problems and deficiencies encountered in drinking water systems (e.g., lack of filtration, lack of back-flow prevention, cross-connection, and negative pressure) and in recreational water settings (e.g., heavy bather density, and animal or human fecal contamination). The system has also expanded the types of outbreaks that it includes, including legionellosis and single cases of wound infections associated with exposure to recreational water.

- In 2007 and 2008, it is anticipated that public health departments in all 50 states and in other territories and localities will be able to report their WBDO surveillance data either by completing and mailing or faxing the paper-based form currently in use, or by entering and transmitting the data electronically. Discussions are under way between the DPD and Diarrheal Diseases Branch at CDC to integrate the WBDO surveillance system with the Electronic Foodborne Outbreak Reporting System (EFORS). EFORS is an Internet-based system designed for state health departments to report foodborne disease outbreaks.[7] Integration with the EFORS system will facilitate transitioning to electronic reporting of WBDOS, a transition that has been requested by various state health departments.

[7]EFORS is available in all 50 states and in Washington, D.C., U.S. Virgin Islands, American Samoa, Guam, Puerto Rico, Northern Mariana Islands, Federated States of Micronesia, Johnston Atoll, Marshall Islands, U.S. Minor Outlying Islands, Navassa Island, Wake Island, Baker Island, Howland Island, Jarvis Island, Kingman Reef, and Palmyra Atoll.

- Both CDC and EPA have responded to trends observed in the WBDO surveillance data.

  - In response to the increase in reported recreational water outbreaks, CDC has developed a Healthy Swimming Program, including a Web site (http://www.cdc.gov/healthyswimming) with information for the general public, the aquatics sector, and health professionals. It also includes information for public health professionals on how to report such outbreaks and how to investigate them. Over 800,000 visits to this site have been recorded since its inception in 2002. Similar efforts have been made in the development of a CDC drinking water Web site in response to the observed relative increase in the number of drinking water outbreaks associated with private wells.

  - EPA has responded to trends in the WBDO surveillance data by enacting drinking water regulations and providing recreational water guidelines. Outbreak trends have also stimulated EPA and CDC-sponsored research, such as the National Epidemiologic and Environmental Assessment of Recreational Water (NEEAR) study. As a result of data from the *MMWR Surveillance Summaries*, the Council of State and Territorial Epidemiologists passed a 2004 position paper requesting that CDC convene a national workshop to develop a national prevention plan for infectious diseases spread through chlorinated swimming venues. The national workshop was held in February 2005. CDC's National Center for Environmental Health has also allocated a portion of a full-time employee to work on recreational water issues resulting from CDC's response to the WBDO surveillance data.

Biological Resources Discipline, U.S. Geological Survey, Department of the Interior

Background

The Biological Resources Discipline (BRD) provides the scientific understanding and technologies needed to support sound management and conservation of the nation's biological resources. In October 1996, BRD was established within the U.S. Geological Survey (USGS), bringing an important living resources dimension to the USGS earth sciences orientation, thus making it possible for the bureau to bring physical plus biological science to natural resource management problems. BRD supports federal stewardship responsibilities and mandates to estimate the availability and abundance of fish and wildlife resources, determine the distribution and abundance of migratory birds, investigate and report on North American birds, conduct inventories of all public lands and their resources, implement programs for endangered and threatened wildlife and plants, conserve marine mammals, and implement the Convention on Great Lakes Fisheries.[1] BRD works cooperatively with federal and state agencies to share information necessary to develop a comprehensive picture of the nation's biological resources.

The majority of BRD programs and resources remain directed toward the needs and responsibilities of Department of the Interior resource management bureaus, such as studies supporting development of annual waterfowl regulations, research leading to better land protection strategies for national parks, and investigations seeking optimal water control practices for enhancement of fisheries.

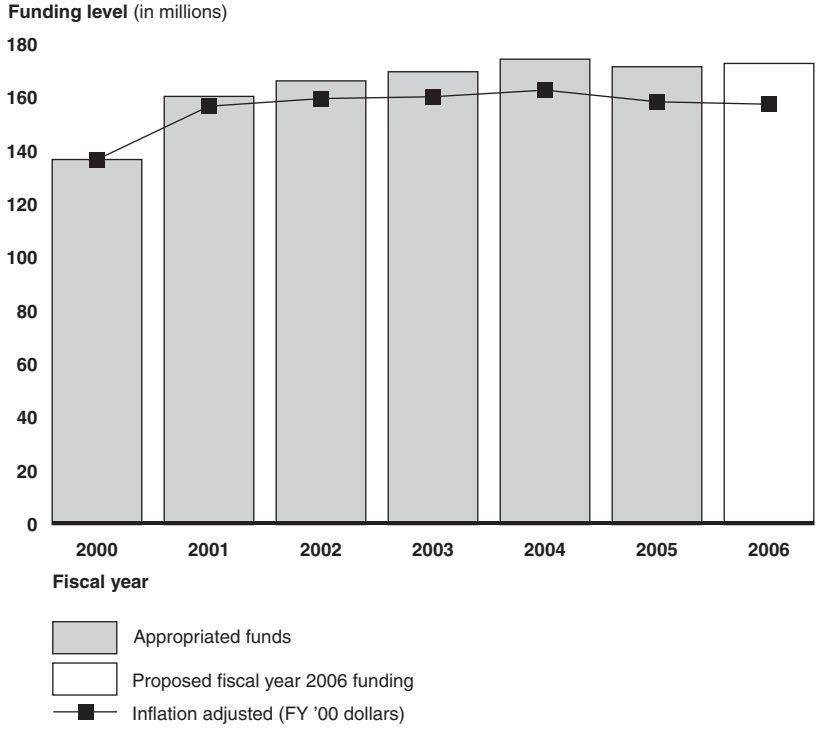
However, an equally important BRD objective has been the establishment and ongoing development of a National Biological Information Infrastructure (NBII), a network of distributed databases and information sources on biological resources. NBII information is being used by federal and state agencies, researchers, universities, museums, planning and environmental consultants, private companies, landowners, and the public.

[1]These legislative mandates include the Organic Act of 1879, 7 U.S.C. § 2204; Migratory Bird Treaty Act (enacted 1918), 16 U.S.C. § 704; Migratory Bird Conservation Act (enacted 1929), 16 U.S.C. § 715d; Fish and Wildlife Coordination Act of 1934, 16 U.S.C. § 661; Fish and Wildlife Act of 1956, 16 U.S.C. § 742a *et seq.*; Great Lakes Fishery Act of 1956, 16 U.S.C. § 939a; Marine Mammal Protection Act of 1972, 16 U.S.C. §§ 1361 - 1421h; Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544; Federal Land Policy and Management Act of 1976, 43 U.S.C. § 1701 *et seq.*; Fish and Wildlife Improvement Act of 1978, 16 U.S.C. § 666g; Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 U.S.C. § 4721; Water Resources Development Act of 1990, 33 U.S.C. § 2317(a)(3)(A).

Summary

USGS officials indicated that actual funding for biological programs for fiscal year 2005 and anticipated funding for fiscal year 2006 will not have an adverse effect on the ability of these programs to generate data of similar quality and comprehensiveness when compared with data from previous years. The officials indicated, in particular, that there should be no effect on the ability of these programs to generate data used to support indicators in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*.

Figure 13: Biological Resources Discipline Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USGS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

In addition, agency officials indicated that planned BRD program activities and priorities set out in its strategic plans will not have a significant effect on the ability to produce data in coming years when compared with data in previous years. The officials added, however, that BRD does not anticipate

any significant new resources becoming available to significantly expand its ecological monitoring efforts. Barring significant budget reductions, they said, BRD recognizes the importance of continuing the research and monitoring efforts cited above, primarily in response to the legislative mandates these projects were first developed to address. As utilized in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, agency officials stated that data is expected to be available in a satisfactory form for the next Heinz Center report on the nation's ecosystems, expected in 2007.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USGS officials provided the following information on funding levels and program priorities relative to BRD's ability to continue providing environmental and ecological data comparable with past years:

- Biological Research is a budget activity (budget line item) within the USGS appropriation "Surveys, Investigations, and Research." BRD officials indicated that budget allocations for the BRD programs for fiscal year 2005 are about 1.6 percent below enacted appropriations for fiscal year 2004 (as depicted in Figure 13) but nearly 2.5 percent above the President's fiscal year 2005 budget request for BRD. The officials added that this slight reduction in enacted funding from fiscal year 2004 to fiscal year 2005 has had no effect on the ability of BRD programs to collect data supporting ecological indicators.

- The BRD program components that generated data utilized by the Heinz Center in its 2002 report and the 6-year funding history of those programs are as follows:[2]

[2]USGS/BRD officials indicated that the President's proposed fiscal year 2006 budget maintains the current fiscal year funding for all three data programs on which the Heinz Center relied for data to support the indicators in its 2002 report.

Table 15: BRD Funding for Program Components for Fiscal Years 2000-2005

	2000	2001	2002	2003	2004	2005
North American Breeding Bird Survey	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Nonindigenous Aquatic Species Database	$262,000[a]	$250,000[b]	$255,000[c]	$277,000[d]	$477,000[e]	$593,000[f]
Animal Deaths and Deformities	1,072	1,147	1,228	1,313	1,403	1,539

Source: USGS.

[a]USGS provided $167,000, FWS provided $55,000, and EPA provided $40,000.

[b]USGS provided $170,000, and FWS provided $80,000.

[c]USGS provided $175,000, and FWS provided $80,000.

[d]USGS provided $222,000, and FWS provided $55,000.

[e]USGS provided $422,000, and FWS provided $55,000.

[f]USGS provided $538,000, and FWS provided $55,000.

- BRD officials indicated that congressional appropriations are not the sole source of funding to support their program activities. BRD has various models for obtaining funding from other sources, including other federal agencies, states, nongovernmental organizations, and industry associations. The extent of supplemental funding from outside sources varies among BRD programs. As an example, the Cooperative Research Program is funded through appropriations used to staff, support, and manage USGS/BRD participation in this partnership with states. Similarly, the research and technical assistance activities of individual BRD units are supported by reimbursable funds from state, federal, and local governments.

- With regard to possible future budget reductions, agency officials indicated that their response would depend upon the degree of severity of the cuts and any guidance that might come from the Department of the Interior, the Office of Management and Budget, and Congress. They said that any substantial reductions in funding would slow the collection and input of data and databases would no longer be as up-to-date, resulting in incomplete data for indicators. They noted that under past budget reductions, USGS generally received specific guidance regarding the types of projects and activities to cut. They anticipate that USGS would receive and follow such guidance in the future and, where possible, would modify data program activities so as to have the least adverse impact on its customers' highest-priority needs.

Earth Resources Observation Systems Data Center, U.S. Geological Survey, Department of the Interior

Background

The mission of the U.S. Geological Survey's (USGS) Earth Resources Observation Systems (EROS) Data Center encompasses three areas: (1) science (promoting knowledge of land information to better understand our planet), (2) data access (ensuring that scientists, researchers, businesses, policymakers, and the public have ready access to this information), and (3) data archiving (safeguarding and expanding the national archive of remotely sensed land data).

EROS traces its origins to the 1960s and the development and use of remote-sensing technology to survey the Earth's surface for land management, natural hazard analysis, and resource analysis applications. An Earth-observing program was formally established in 1969 through a joint initiative of the USGS and the National Aeronautics and Space Administration (NASA). In July 1972, the first Earth Resources Technology Satellite, later named Landsat-1, was launched. From its inception, EROS was designed to be interdisciplinary in nature, which is reflected in its mix of federal and contractor workforce skills, including experts, among others, in geology, hydrology, forestry, satellite systems engineering, satellite data acquisition, and information science.[1]

EROS comprises satellite operations, long-term data preservation and access, and remote-sensing research and data utilization. EROS holds the world's largest collection of civilian remotely sensed data covering the Earth's land surface, archiving millions of satellite images and aerial photographs. The archive holdings, coupled with engineering and scientific expertise at EROS, provide a unique capability for developing and promoting science applications of remotely sensed data to identify, monitor, and understand changes on the landscape and across the interface between nature and human activity.

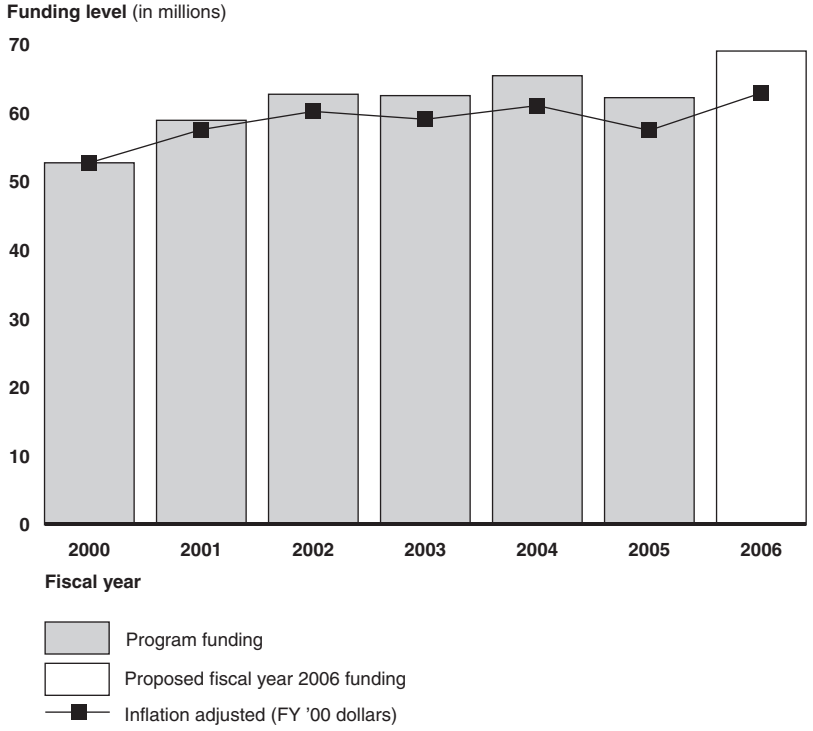
Summary

USGS officials indicated that the fiscal year 2006 budget includes funding for the continuation of Landsat 7 operations and begins to fund the planning and preparation for receiving, archiving, and providing access to the next-generation satellite data in 2010. This funding will result in the continuation of data collection and analysis such that in future years the

[1]The Land Remote Sensing Policy Act of 1992, 15 U.S.C. §§ 5601-5672, and Presidential Decision Directive National Science and Technology Council-3 (signed May 10, 1994, and revised Oct. 16, 2000) give EROS a mandate for collecting data.

data used in the Heinz Center report will be of similar or superior quality and comprehensiveness when compared with past years. However, for purposes of the center's 2007 report, the data will not likely be as current as initially planned because of a May 2003 malfunction of the Landsat 7 satellite.

Figure 14: Earth Resources Observation Systems Program Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USGS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Agency officials reported that in the next 5 to 10 years, largely due to planned satellite deployments, the next-generation satellite data can improve the ability to produce data for most of the Heinz Center ecological indicators used for the 2002 report, *The State of the Nation's Ecosystems*. Changes in analytical approaches may expand the utility of data sets such as the National Land Cover Dataset (NLCD) used in the Heinz Center

report, and may result in higher quality national digital elevation data; also, data on vegetation condition expected from planned satellite missions are expected to be of higher quality.[2]

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USGS officials provided the following information on funding levels and program priorities relative to EROS's ability to continue providing environmental and ecological data comparable with past years:

- Reimbursable funds received from other federal agencies, international cooperators, and other USGS disciplines constitute about half of EROS's total funding.[3] The operations and research conducted at EROS have relied equally on appropriated and reimbursable funds. The largest source of reimbursables historically was the sales income from satellite images and other digital remotelysensing products. Other reimbursable funding was derived from camera calibration support, service, and assistance to other Department of the Interior agencies as well as federal and international agencies, and ground station fees charged to international cooperators receiving Landsat data. However, as a result of Landsat 7 satellite malfunction in May 2003, that degraded the quality for portions of the Landsat 7 images transmitted by the satellite, images became less marketable, and reimbursable income dropped sharply with fewer data sales. The loss of Landsat 7 income had a significant affect on the development of NLCD and the phenology dataset. All EROS programs were affected by the income loss, including research, which funds NLCD and plant growth datasets. The loss of Landsat 7 income therefore slowed the creation of the NLCD by at least a year. In

[2]USGS established the USGS Land Cover Institute as a help center for users of land cover data, such as the NLCD. The institute staff provides on-demand assistance in determining the data requirements for user applications. The staff of the forerunner to the Land Cover Institute, the Land Cover Applications Center, provided the consultative and data processing support services needed for the 2002 Heinz Center report.

[3]Other USGS disciplines (water, biology and geology), and other Department of the Interior agencies, including the Bureau of Land Management, Fish and Wildlife Service, and National Park Service, are sponsors of and partners in EROS projects and provide reimbursable funds. Non-Interior agencies such as the U.S. Agency for International Development, U.S. Department of Agriculture, Environmental Protection Agency, U.S. Forest Service, National Oceanographic and Atmospheric Administration, Federal Emergency Management Agency, Bureau of the Census, and United Nations Environment Program are also major partners with EROS.

fiscal years 2003 and 2004, USGS reprogrammed funds to compensate, in part, for this drop in revenue. EROS funding is shown in table 16:

Table 16: EROS Appropriated, Reprogrammed, and Reimbursable Funds for Fiscal Years 2000-2005, and Proposed for Fiscal Year 2006

Dollars in millions

	2000	2001	2002	2003	2004	2005	2006[a]
Appropriated[b]	$27.9	$29.9	$32.5	$30.7	$29.8	$30.6	$43.4
Reprogrammed/Working Capital Fund[c]	--	--	--	2.2	3.8	6.0	--
Reimbursable	24.9	29.1	30.3	29.7	31.9	25.7	25.7
Total	**$52.8**	**$59.0**	**$62.8**	**$62.6**	**$65.5**	**$62.3**	**$69.1**

Source: USGS.

[a]President's proposed budget.

[b]Appropriated amounts include funding from other USGS programs. The majority of the EROS's appropriated funding comes from the Land Remote Sensing Program (LRS), and from two other programs: the Geographic Analysis and Monitoring (GAM), and Cooperative Topographic Mapping (CTM). For example, in fiscal year 2004, EROS received about $3,010,000 from GAM, $4,844,000 from CTM, $18,688,000 from LRS, and about $3,300,000 from other USGS programs.

[c]In fiscal year 2003, funds were reprogrammed by reducing training, supplies, equipment and non-labor contracts, and cancellation of planned deposits to a working capital fund for maintenance of the EROS facility. In addition, contract funds were reprogrammed from both the Cooperative Topographic Mapping (CTM) Program and from an emergency facility contingency fund used to cover repairs to other USGS facilities. In fiscal year 2004, the Mapping, Remote Sensing, & Geographic Investigations Activity reprogrammed funds from the CTM Program, resulting in a reduction of funds for mapping contracts, National Academy of Sciences studies, and funds for travel, training, recruitment/hiring, and equipment purchases. In fiscal year 2005, USGS will use a working capital fund to cover costs.

The requested appropriation of $43.4 million for fiscal year 2006 reflects an increase of $6 million to provide base funds to continue Landsat 7 satellite operations until the 2009 launch of the Landsat Data Continuity Mission (LDCM), and $7.4 million to begin system development activities that ensure capabilities are in place to ingest, archive, process, and distribute LDCM data from the first National Polar-orbiting Operational Environmental Satellite System (NPOESS) satellite that year.[4] This additional funding request for both the Landsat continuity operations and the preparation for NPOESS is the beginning of a 4-year effort; after the

[4]The data from NPOESS is expected to be of higher quality and comprehensiveness when compared with earlier data as used in the 2002 Heinz Center report, as colocated atmospheric and weather instruments will allow for better atmospheric correction of data than can currently be achieved.

expected launch in 2009, operation and maintenance costs are estimated to be approximately $23 million a year.

- EROS archiving costs have been kept relatively constant for fiscal years 2000 through 2005 by taking advantage of technological advances to manage the ever-increasing volume of data. However, as more data are collected at an unprecedented rate, there is some potential of overwhelming the archiving capacity. One of the specific legislative mandates of EROS is to archive data generated by Landsat and other Earth-observing satellites.[5] This includes the transfer of old data to state-of-the-art electronic storage media for long-term preservation and access as well as archiving and preserving a considerable amount of legacy data (e.g., old aerial photographs) and declassified images from military intelligence satellites of an earlier era. The dollar amounts dedicated to archiving (in data management/information technology funding) and each of the other major components of EROS's operations are shown in table 17:

Table 17: EROS Funding by Operation for Fiscal Years 2000-2005

Dollars in millions

	2000	2001	2002	2003	2004	2005
Imagery acquisition[a]	$8.0	$8.0	$8.0	$8.0	$8.0	$8.0
Data management/information technology[b]	11.9	13.6	16.3	13.6	13.0	12.7
Science application[c]	7.0	7.2	6.5	7.1	6.5	6.6
Facilities[d]	1.0	1.1	1.7	2.0	2.2	3.1
Landsat 7 reprogramming[e]	0.0	0.0	0.0	2.2	3.8	6.0
Total Funding	**$27.9**	**$29.9**	**$32.5**	**$32.9**	**$33.5**	**$36.4**

Source: USGS.

[a]Costs of operation and control of the Landsat satellite system, including scheduling acquisition of satellite images and controlling the satellite.

[b]Costs of data archiving and information technology support of desktop and computer-room computer systems, networks, and help desk functions.

[c]Costs of applied and research science and training utilizing data from the EROS archive and other data center archives for internal projects and for partnership projects with reimbursable customers.

[d]The appropriated share of costs of operations and maintenance of the EROS facility, including security, custodial, and operations and maintenance contracts, materials and supplies for the

[5]15 U.S.C. § 5652.

contracted activities, employee safety, government vehicles, grounds maintenance, and various other facilities-related activities.

[e]Costs of providing Landsat operations functions normally funded by data sales, but funded by reprogramming funds due to the loss of data sales revenue.

- Funding levels have not kept pace with mandated cost-of-living adjustments affecting all USGS programs, including operations and research at EROS. Salaries for 80 or more federal employees and 600 or more contactor employees at EROS have risen steadily from year to year as a result of cost of living increases. In fiscal year 2002, staff costs constituted 83 percent of available funding. By fiscal years 2003 and 2004, these costs accounted for 85 percent of funding at EROS. For fiscal year 2005, staff costs are projected to account for nearly 90 percent of available funds. Federal employee cost of living pay increases are covered by legislated pay increases; the contract employees are entitled to receive the same pay increases that federal employees receive. However, there is no provision in the USGS budget request for covering these increased contract costs. The salary costs and total number of staff at EROS are shown in table 18:

Table 18: EROS Salary Costs and Staffing Levels for Fiscal Years 2000-2005

Dollars in millions

	2000	2001	2002	2003	2004	2005
Total funds (appropriations, reprogramming ,and reimbursables)	$52.8	$59.0	$62.8	$62.6	$65.5	$62.3
Salary costs (federal employees and contractors)	$42.7	$47.7	$52.2	$53.4	$55.6	$56.2
Salary costs as a portion of EROS budget	81%	81%	83%	85%	85%	90%
Total staff	**648**	**668**	**656**	**647**	**655**	**665**

Source: USGS.

- The malfunction of the Landsat 7 satellite in May 2003, which degraded the quality for portions of images transmitted by the satellite, is not expected to impact the type of data used by the Heinz Center in its report.[6] The next NLCD is being developed using Landsat 7 data acquired in 2001, prior to the data anomaly. Thus, it is not expected to

[6]The Heinz Center used data from the 1992 NLCD derived from Landsat 5 Thematic Mapper data for most of its purposes, and also, from Advanced Very High Resolution Radiometer (AVHRR) data spanning a number of NOAA polar orbiters for plant condition analysis.

have a negative effect on the portrayal of ecological conditions or usein the projected 2007 Heinz Center report.[7] While the malfunction of Landsat 7 does not seriously affect the currently planned NLCD effort, it does jeopardize planned future updates. The USGS and agencies that sponsor and fund the development of the NLCD would like to update the 2001 database, once completed, using 2006-2007 remotely sensed data. The Landsat 7 malfunction, uncertain Landsat 5 status and projected LDCM launch in 2009 threatens the update.

- EROS supports current satellite missions and missions under development that are expected to provide increasingly detailed assessments of land characteristics and conditions, collecting data with improved specifications and analytical capabilities.

  - The Office of Science and Technology Policy (OSTP) recently released a Landsat data continuity strategy that calls for transitioning the Landsat program from a series of independent missions to an operational program by incorporating Landsat-type sensors on future satellites within the National Polar-orbiting Operational Environmental Satellite System (NPOESS) series. The program is to be operated jointly by the Department of Defense and NOAA. The first NPOESS spacecraft is scheduled for launch in December 2009.

  - Next-generation satellite data are expected to improve the ability to produce the Heinz Center ecological indicators ecosystem extent and fragmentation and landscape pattern. In addition, satellite-derived data (e.g., data on land cover) can serve as inputs to at least five additional indicators: (1) those using data on nutrients such as carbon and oxygen, (2) chemical contaminants, (3) condition of plant and animal communities, (4) soil biological conditions, and (5) production of food, fiber, and water. These Heinz Center ecological indicators may benefit the most from such improved satellite data. The specific advantages provided will depend on the specifications of the mission, satellite, instrument, and ground data processing. Key design factors in the next-generation satellites essential to improved environmental indicator data sets are as follows:

[7]Up to nine federal agencies have contributed funds to purchase the Landsat data needed to develop the NLCD. Development of the NLCD is funded through partnerships with USGS, EPA, Interior, and USDA. While the specific funding varies from year to year, USGS contributes approximately half of the funds needed to provide for the NLCD. The funding level for NLCD in fiscal year 2006 is expected to be flat.

- *Availability.* The most urgent issue is the long-term availability of data. Without access to appropriate remotely sensed data, it will not be possible to develop current indicator datasets.

- *Continuity* (comparable spatial and spectral coverage, temporal frequency). It is important that future generations of data be comparable to data from the past. While identical specifications are not necessary, data collected in the future must be compatible with the characteristics of legacy data.

- *Calibration for comparison over time.* Improved sensor and data calibration will greatly enhance comparisons of measurements over time by reducing the uncertainty and error resulting from comparing data. This is particularly crucial for quantifying trends in ecological conditions.

- *Improved geometry.* The precision of image geometry will ensure that data measurements represent specific places on the Earth. This is also important when comparing data over time. The greater the precision to the Earth's surface, the more reliable are trends based on comparisons of data from different times.

- *Improved spectral characteristics*. This will permit improved characterization of key vegetation attributes, including chemical and physiological status.

- Surface imperviousness data and tree canopy density data are being developed for the newest generation NLCD. Surface imperviousness provides a representation of the amount of paved material covering each 30-meter Landsat 7 pixel. Canopy density is an estimate of the percentage of woody vegetation in each 30-meter pixel. These data layers may be quite useful in addressing indicators related to human activity and disturbance as well as vegetation condition and biogeochemistry status.

- USGS is engaged in a national assessment of the rates, causes and consequences of 1973-2000 land use and land cover change for each of the 84 conterminous U.S. ecoregions and selected Alaska ecoregions. In this study, for each ecoregion, detailed analysis of the types, rates, and causes of change are being estimated, trends in landscape fragmentation and patterns are being derived, and estimates of changes in ecoregional carbon dynamics are being modeled.

- Future data on vegetation condition should improve in quality as the USGS transitions from the use of the Advanced Very High Radiation Radiometer (AVHRR) to the Moderate Resolution Imaging Spectroradiometer (MODIS) and then NPOESS.[8] While data quality will improve due to advanced calibration, as well as spectral and geometric properties, research is needed to ensure the continuity of measurements from those datasets.

[8]AVHRR is a radiation-detection imager used for remotely determining cloud cover and the surface temperature to generate a variety of products related to measurements of the atmosphere, ocean, and land. Typical applications include day and night cloud mapping, snow and ice detection, land-water boundaries, sea surface temperature, and the vegetative index. MODIS is an instrument aboard select satellites that collect data to improve our understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere, in particular supporting models to predict global change accurately enough to assist policymakers in making sound decisions concerning the protection of our environment.

National Stream Water Quality Accounting Network, U.S. Geological Survey, Department of the Interior

Background

The National Stream Water Quality Accounting Network (NASQAN) consists of 35 stations at which systematic and continuing measurements are made to determine the quality of the nation's largest rivers (Mississippi—including the Missouri and Ohio river basins—Columbia, Colorado, Rio Grande, and Yukon) and their major tributaries.[1] The network measures a range of characteristics selected to aid in the utilization and protection of these major rivers at regional and national levels. The network's objectives are to (1) account for the quantity and quality of water moving within and from the United States, (2) detect changes in water quality, (3) depict area variability, and (4) lay the groundwork for future assessments of changes in stream and river quality.[2]

NASQAN produces data used by the Environmental Protection Agency and the National Oceanic Atmospheric Administration for reports related to important off-continent resources, such as the Gulf of Mexico. NASQAN data and information have been prominent in identifying the amount of nitrogen, phosphorus, and other nutrients leaving the million-square-mile Mississippi River Basin and contributing to Gulf of Mexico hypoxia conditions. NASQAN provides information needed to improve and eventually validate management actions needed to control the size of the hypoxic zone in the gulf. The link between Mississippi River Basin influences on Gulf of Mexico hypoxia is one reason the Mississippi sampling by NASQAN remains the highest priority for the network.

From 1973 (when sampling began) until 1980 (at the peak of NASQAN's operations), water at the stations was sampled monthly, but as resources declined, sampling frequency decreased to bimonthly and then quarterly. Reduction in sampling frequency and the number of sites sampled began in 1981, when there were about 515 sites with about 165 sites measured

[1]NASQAN was originally established in 1973 to address the following problems associated with the nation's streams and waterways: (1) a relatively small amount of hydrologic records, (2) frequent changes in sampling location and frequency of observations, (3) chemical measurements that did not include hydrologic measurements (stream flow was not included), and (4) a lack of data to determine temporal variability of specific constituents of the streams and rivers, so trends could be identified.

[2]NASQAN operates primarily through federal appropriations to achieve its objectives; however, it also participates in collaborative efforts with some states that use NASQAN data for their information needs under the Clean Water Act, section 305(b). In some cases, states collect additional samples at NASQAN sites to complete their data needs, thus building on the base-level information NASQAN provides. According to USGS officials, given NASQAN's modest size, its ability to meet site-specific state needs is limited.

bimonthly (six times a year), with the remaining sites measured monthly. By 1986, there were about 496 sites—one site measured monthly, 285 sites measured bimonthly, and the remaining 210 sites were sampled quarterly. From 1987 to 1992, about 410 sites operated, with about 240 bimonthly and the remaining 170 quarterly. Finally, in 1994, about 285 sites were operating, with about 160 bimonthly and the remaining 125 quarterly.[3]

During 1995, the NASQAN network was redesigned consistent with existing budgets to focus on the transport of constituents within and from the four largest river basins in the conterminous United States: the Mississippi, Rio Grande, Colorado, and Columbia.[4] USGS chose to make NASQAN's objective the transport of constituents in large rivers of the United States because, at the national level, no other organization was able to provide such data and information. Further, large rivers transport constituents like nutrients that have a major influence, seasonally and even year-to-year, on the condition of receiving waters like the gulf. In 1996, the new design for NASQAN included 47 stations in the four large river basins, with monthly sampling, plus three high-flow samples per year. The monthly samples, taken on a fixed time interval—like the first week of each month—cover many different water conditions, and allow scientist to determine how conditions vary by seasons (e.g., spring versus fall) and over years. The three high-flow samples help to ensure that the most important flows for transport estimates are sampled during times when the

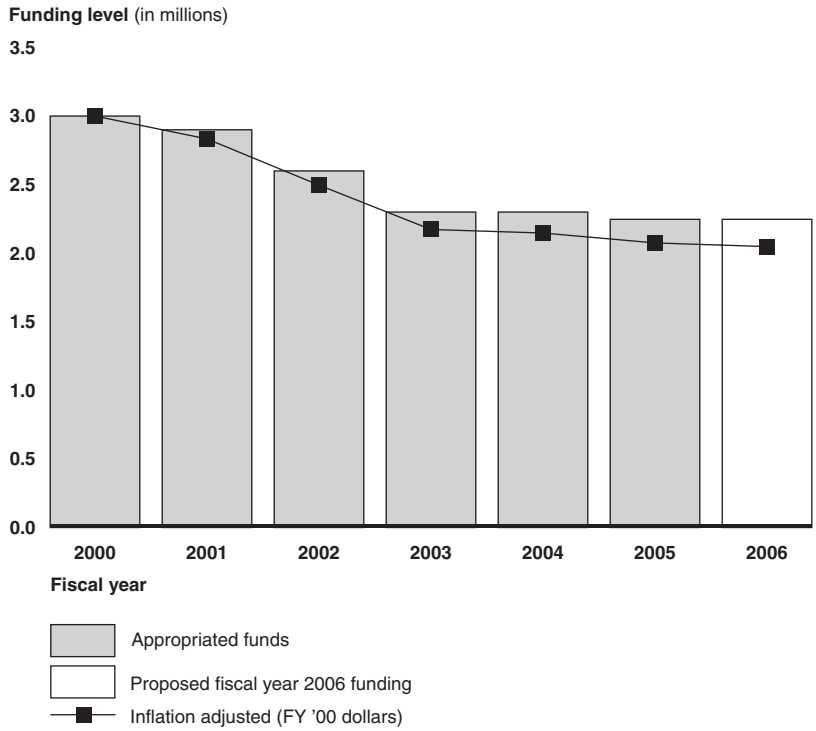
[3]By multiplying the sites and sampling frequency, at the peak of operation in 1980, NASQAN collected about 6,200 samples annually. By 1994, NASQAN collected only about 1,450 samples.

[4]The transport of constituents here refers to the movement of nutrients, metals, pesticides or other components of a water sample down a river, expressed as a mass measurement such as pounds per year. Since that time, NASQAN has been measuring nutrients like nitrogen, phosphorus, carbon, and silica; metals like lead, zinc, copper, and cadmium; and pesticides like atrazine, diazinon, and simonizes.

river flows are largest, or highest.[5] NASQAN now samples constituents such as nutrients, metals (both dissolved and metals on sediment particles), major ions, pesticides, and field parameters such as flow, temperature, dissolved oxygen, specific conductivity, pH, and alkalinity. The two major differences between samples collected prior to 1996 and more recently are: (1) more frequent sampling now (12 to 15 times per year versus about 4 times per year previously, allowing coverage of many more flow conditions), and (2) the addition of pesticides, and metals associated with sediment particles, neither of which were previously collected prior to 1996 (metals associated with particles may be the major transport mechanism for some metals). Since transport is the primary objective, adding the metals associated with particles was an important change.

[5]High flows do not always occur during the preselected times for monthly samples to be collected. NASQAN sampling crews have the flexibility to both sample the regularly scheduled monthly sample, plus at other times of the month if the flows are high and should be sampled to improve our transport estimates. Transport is the result of multiplying concentration (e.g., pounds per gallon) with flow (gallons per day) to provide a result of pounds per day. So, since transport values (pounds per day or pounds per year) result from a multiplication of flow and concentration, high flows are important in influencing the results of pounds per year. For some streams, 90 percent of more of the annual transport may occur over the span of just a few days (3 to 5 days, for example) in a given year. That is why the high flow sampling can be important, and must be included in the sample scheme when transport is one of the sampling objectives.

Figure 15: National Stream Water Quality Accounting Network Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USGS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Summary

Information provided by USGS officials indicated that NASQAN is not reducing the quality of data collected, and remains committed to maintaining the highest level of its water-quality data nationwide. However, due to funding reductions over the previous three years and the impact of inflation, there has been a reduction in the geographic coverage of data collected under the program.[6] In 1996, when NASQAN began operations

[6]USGS officials indicated that the fiscal year 2006 budget request includes an inflation adjustment equal to about $30,000, or about 1.3 percent of its budget, but otherwise, the funding request is equal to the enacted fiscal year 2005 amount. Officials believe that this is less than what is needed to keep pace with inflation for one year. As a result of this and program reductions in real dollars, NASQAN operations will continue to be reduced.

with the new design for the network, NASQAN was operating with an annual budget of $3 million. Even with the 2006 request of about $2,277,000, 10 years after redesign, NASQAN is operating with about 76 percent of the 1996 operating budget. According to USGS officials, inflation impacts simply exaggerate that reduction over 10 years. Furthermore, the 2002 Heinz Center report relied considerably on NASQAN data collected when more than 400 stations were being used for sampling; the current NASQAN network now gathers data from only 35 stations, which is about 8 percent of the previous total. NASQAN cannot duplicate the data used for the 2002 Heinz Center report, as there are many areas of the country that are no longer covered by NASQAN. Most of the coastal and Great Lakes stations no longer operate, the stations in the arid West are generally no longer part of NASQAN, stations in the Mid-Atlantic and the southeastern United States are no longer operative, and the Mississippi River Basin, while still in operation with 18 stations, is just a sparse presence compared with the approximate 175 stations previously operating in the Mississippi River Basin. NASQAN can still provide valuable insight on loading for a large river like the Mississippi, whose watershed includes about 40 percent of the continental landmass of the nation.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USGS officials provided the following information on funding levels and program priorities relative to NASQAN's ability to continue providing environmental and ecological data comparable with past years:

- A major factor influencing future NASQAN operations is the effect of economic inflation. Because about 88 percent of NASQAN funding goes to sample collection and chemical analysis in river basins, future inflation (or any other network resource reductions) would likely result in the sampling of fewer sites.

- NASQAN funding declined from about $4 million in fiscal year 1990 to about $3 million in 1995. In fiscal year 2005, funding is about $2.2 million.[7]

    - Reductions in available operating funds have reduced the number of geographic locations included in NASQAN. Of the five major river

[7]USGS does not reduce the quality of data collected even as the funding levels have declined. Regardless of the number of samples and geographic extent of data collected, data quality would remain high and comparable with past data.

basins, sampling in the Yukon will end in fiscal year 2005. As necessary, to accommodate any future funding reductions, fewer sites would be sampled and the frequency of the samples performed would be reduced for the Columbia, Colorado, and Rio Grande, in that order. Continued funding reductions could ultimately limit operations in the Mississippi River Basin.

- Reductions in available funds often reduce the number of geographic sites at which samples are collected. Overall, in fiscal year 2000, NASQAN operated 41 stations, and in fiscal year 2005, it plans to operate 35 stations. An estimated 29 stations will be operated in fiscal year 2006.

- NASQAN is a perennial activity, and as such, the following major components of the program do not change substantially from year to year:

  - *River basins*—where data is collected. These are the major geographic components of NASQAN, and consume most of the resources for field collection and processing of samples, with subsequent analysis at the USGS National Water Quality Laboratory in Denver, Colorado. River basin activities consume 88 percent of the program's resources.

  - *Network coordination and database operations*—support the field logistical operations and quality assurance of the data generated by NASQAN. Database operations are focused on ensuring the data are of high quality and are freely available over the Internet through the USGS National Water Information System. Together, these activities consume the remaining 12 percent of the program's resources.

  - *Analysis and reporting*—review and analysis of data and creation of meaningful reports and information products. Historically, these activities have been important to NASQAN; however, no funds are currently available for analysis and reporting.

- In fiscal year 2006, following conclusion of field work in the Yukon in fiscal year 2005, funds totaling about 10 percent to 15 percent of the total NASQAN funds will become available and be devoted to analysis and reporting, with an equal decrease in resources devoted to river basin data collection activity. The decrease in river basin data collection is mostly from the planned conclusion of sampling in the Yukon. Since

fiscal year 2000, NASQAN has operated five fixed stations in the Yukon and has also done additional sampling along the length of the Yukon each summer from 2000 through 2005. However, after fiscal year 2005, the stations will cease operating and the summer sampling will end. NASQAN will redirect some of its resources from the Yukon to sampling at the remaining network stations and to analyzing and reporting on NASQAN data. The analysis and reporting function of NASQAN has largely been absent since 2000 because of the Yukon sampling, NASQAN funding decreases, and inflation impacts.

- Over the last 4 years, the National Water Quality Laboratory has reduced the number of personnel needed to produce a consistent level of data. This reduction has helped offset annual salary increases due to cost-of-living increases provided to federal employees.

  - Monitoring at five stations in the Yukon River basin began in fiscal year 2001. To provide the resources for the Yukon monitoring, monitoring in the Colorado basin was reduced from eight stations to two and in the Columbia basin from six stations to one. The objective of the Yukon River basin monitoring is to establish baseline water-quality conditions for comparison with future conditions. These comparisons will be important for understanding the release of carbon, nitrogen, and other nutrients from the expected partial melting of permafrost in the Yukon basin. A broad range of chemicals—including nutrients, mercury, natural and manmade organic chemicals, and trace elements—are being measured at five stations from the Canadian border to the mouth of the river.

- Resources in fiscal year 2006 are projected to be insufficient to restore the monitoring stations that were closed in the Columbia and Colorado river basins in prior years in order to provide funding for monitoring in the Yukon River basin. In addition, sampling is expected to stop in the Columbia, Colorado, and much of the Rio Grande river basins in order to provide funding for data analysis and interpretation of data on the Mississippi River basin, and to finalize reports on the results of the monitoring activity in the Yukon River basin.[8] Table 19 shows the river

[8]For the Rio Grande, negotiations are not complete, but USGS officials anticipate that of the eight stations, six will remain in operation in 2006. Officials also anticipate that 2006 will be the last year of operation for those six stations. These NASQAN operational plans may have to change if the NASQAN 2006 budget turns out to be less than currently projected.

basins and number of stations operated in fiscal years 2000 and 2005, along with an estimate for fiscal year 2006:

Table 19: NASQAN Stations in Operation, Fiscal Years 2000, 2005, and 2006

	Mississippi River basin	Rio Grande River basin	Columbia River basin	Colorado River basin	Yukon River basin	Total NASQAN sites
2000	18	9	6	8	0	**41**
2005	19	8	1	2	5	**35**
2006[a]	18	8	1	2	0	**29**

Source: USGS.

[a]Estimated.

National Water Quality Assessment Program, U.S. Geological Survey, Department of the Interior

Background

The U.S. Geological Survey (USGS) proposed the National Water Quality Assessment (NAWQA) program in 1985 to (1) provide a nationally consistent description of current water-quality conditions for a large part of the nation's water resources; (2) define long-term trends (or lack of trends) in water quality; and (3) identify, describe, and explain, to the extent possible, the major factors that affect observed water-quality conditions and trends.[1] NAWQA was established in large part because of the complexity of water-quality issues, including the challenges of managing diffuse sources of pollution; the introduction into the environment of hundreds of synthetic organic compounds, such as pesticides and volatile organic compounds in solvents and gasoline; and the need to better understand the interrelatedness of groundwater and surface-water systems.

The NAWQA program is a primary source for long-term, nationwide information on the quality of streams, groundwater, and aquatic ecosystems. This information supports national, regional, and state, and local decision making and policy formation for water-quality management. At river basins and aquifers across the nation, USGS scientists collect and analyze information on water chemistry, hydrology, land use, stream habitat, and aquatic life.

NAWQA studies focus on streams and groundwater. Lakes, reservoirs, estuaries, and coastal areas are monitored in only a few selected areas for specialized studies. Because many of the assessed streams and rivers contribute to lakes, reservoirs, and estuaries, an ongoing goal is to collaborate with other USGS programs, such as the national stream quality accounting network; the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, and other federal agencies; and states to assess major receiving waters, such as the Great Lakes, Chesapeake Bay, Long Island Sound, San Francisco Bay, and the Gulf of Mexico. In these collaborations, NAWQA provides quantitative information on (1) amounts, and long-term trends in concentrations, of nutrients, pesticides, and sediment that enter receiving waters from major tributaries; (2) regional source areas of contaminants; and (3) effects of

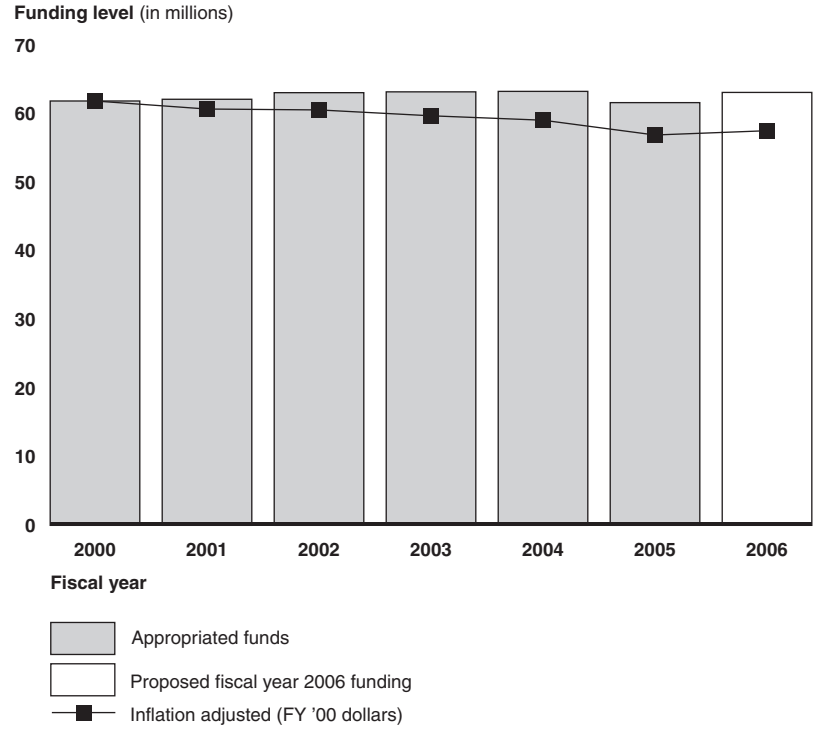
[1]In 1987, the National Academy of Science's Water Science and Technology Board reviewed the NAWQA pilot program and in 1989 concluded that the implementation of the program was in the best interest of the nation, and that USGS was well qualified to establish and implement the program. In 1991, the administration requested and Congress appropriated $18 million to begin the full NAWQA program.

population growth and land use on the amounts and concentrations of contaminants. This information is critical for developing strategies aimed at reducing contaminants in individual river basins and their effects on receiving waters.

Summary

USGS officials indicated that the fiscal year 2006 budget request includes a cost-of-living adjustment equal to about 2.7 percent of the NAWQA program; however, years without full cost-of-living adjustments and the actual funding reduction in fiscal year 2005 have required substantial changes to the planned NAWQA data collection and analysis activities. As utilized in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, agency officials stated that only some of the NAWQA data are expected to be available in a similar form for the expected 2007 follow-on indicator report.

Figure 16: National Water Quality Assessment Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USGS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

NAWQA is not reducing the quality of data collected regionally or nationally, and remains committed to maintaining the highest level of its water-quality data nationwide. However, the collection and measurement of contaminants in fish tissues and in streambed sediment is expensive, and, given resource constraints, USGS determined that other information on measurements and trends had higher priority. While data on contaminants in fish tissues and streambed sediment will no longer be available, NAWQA officials expect all other data used in the Heinz Center report to be available, although the data will be based on fewer stream-monitoring sites and groundwater information networks.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USGS officials provided the following information on funding levels and program priorities relative to the NAWQA program's ability to continue providing environmental and ecological data comparable with past years:

- Data collection activities have been altered by a reduction in program funds (by about $1,640,000) in fiscal year 2005.[2] About 60 percent of the NAWQA program budget is used for data collection and field activities. In the fiscal year 2005 budget, about $500,000 has been cut from data collection activities.
    - The time period for data collection is being lengthened for some activities. For example, in some cases, data will be collected over 4 rather than 3 years.
    - Inflation and about $861,000 in funding cuts in fiscal year 2005 have forced the geographic scope of sampling to be reduced. For example, in fiscal year 2005, NAWQA officials reduced from 145 to 84 the number of long-term surface-water monitoring sites, forcing managers to redesign their programs and approaches to data

[2]NAWQA requested a decrease of $779,000 for fiscal year 2005, reflecting an intended restructuring of USGS, moving some of the expenses from programs such as NAWQA to the Geographic Information Office (GIO). GIO, in turn, will provide directly for the information technology needs of programs, including NAWQA. The proposed budget restructuring was anticipated and will not adversely impact NAWQA activities; however, the additional reduction from the rescission accompanying the fiscal year 2005 omnibus appropriations bill impacts the amount of data collection NAWQA can accommodate.

collection.[3] If additional budget reductions were required of the program, officials said they would probably further reduce the number of "study units" participating in the program—rather than eliminate specific goals and objectives or further dilute the assessment efforts in any one particular geographic area.[4]

- Because of program changes and inflation, only selected sites and measurements made during the first decade of the NAWQA program will be repeated during the program's second decade. Cycle 1 of the NAWQA program occurred approximately from 1992 through 2001. This cycle focused on describing the status and condition of waters (or "current water quality conditions") in some of the nation's largest and most important rivers and aquifer systems.[5] The NAWQA program has since begun a second 10-year cycle (Cycle 2) that is focused on identifying changes in water-quality trends and understanding factors affecting water quality, rather than determining current water-quality conditions. The change in focus will result in the elimination of some types of data used in the Heinz Center report. Specifically, data suited to describing water conditions will be decreased or not sampled again, and data for establishing trends or providing insights into causative factors will be increased. For example, data on the contaminants in fish tissue or in streambed sediment will not be reproduced as a result of the shift in emphasis and the impact of inflation. Some of these data (from 1993 to 1998) were used in the Heinz Center report of 2002, and will no longer be available. Many of the organic compounds measured in these media

[3]Fewer surface-water sites at both the regional and national level decreases the comprehensive coverage that was provided by the larger number of sites. As a result, there are fewer sites in individual study units to represent the range of important environmental settings, such as watersheds, and range and grasslands, and agricultural and urban areas.

[4]Study units represent major river basins and aquifers across the nation, and were selected to represent important hydrologic and ecological resources; critical sources of contaminants, including agricultural, urban, and natural sources; and a high percentage of the population served by municipal water supply and irrigated agriculture. A study unit is the primary building block of the program, and about 60 percent of the program funding is allocated to study unit activity.

[5]All of the NAWQA data (from about 1993 to about 1998) used to support the 2002 Heinz Center report resulted from Cycle 1 (the data collected between 1998 and 2001 were not available at the time the Heinz Center report was published).

have been banned or controlled.[6] It is known that concentrations of these contaminants, while still present, are generally declining.

- The NAWQA program is vulnerable to losses in purchasing power at all levels of the program, chiefly due to a lack of full cost-of-living adjustments in its appropriations. At its inception, NAWQA was intended to provide data on 60 study units across the nation. Over the years, USGS has opted to keep the quality of the data generated by individual study units at as high a level as possible. Because of the impacts of inflation, however, to maintain the quality of the data from individual study units, USGS has found it necessary to reduce the number of study units included in NAWQA.

From the outset of the NAWQA program, available resources limited the initial assessments to 51 study units, rather than the 60 study units initially planned.

- After a decade of operation, with the program's transition in a second cycle to study trends in water quality and understand the factors that cause changes in water quality, the number of study units has been further reduced to 42.[7] Data collection activities are the most expensive, and thus the most vulnerable, of NAWQA's activities. However, all aspects of the program, including analysis, synthesis, research, and management must also be reduced since, according to program officials, this is the only way to keep data collection efforts as robust as possible.

- NAWQA's funding level for fiscal year 2005 forced cuts in the number of studies within each study unit that address the factors causing water-quality changes. Study units will perform an average of one study, rather than two studies, during the year, substantially reducing

[6]Such contaminations include, for example, dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCB).

[7]Commenting on this reduction in its most recent review of the program in 2001, the National Research Council (NRC) stated that "[the program] cannot continue to downsize and still be considered a national water quality assessment. Though it could certainly be redesigned, this would likely undo the basis for assessment of trends and would waste a decade or more of effort." As a result of NRC's comments, NAWQA program managers have chosen to maintain the 42 study unit design and reduce specific activities within the design. In addition, the Cycle 2 design that was reviewed and endorsed by NRC in 2001 was based on the erroneous assumption that full cost-of-living adjustments would occur.

the ability to identify such causes and doubling the time required to cover a wide range of environmental settings around the nation. Prioritization of study units in the past has been based on a combination of factors, including: (1) ensuring representation of the diverse hydrologic landscapes and ecological regions of the nation, (2) examining water use for public and domestic supply, and (3) ensuring representation of the major contaminant sources (urban, agricultural, and natural).

- Given current financial constraints, NAWQA has begun to reduce some program activities, such as its work involving volatile organic compound (VOC) synthesis, and applying the related funds elsewhere. NAWQA is in the process of completing its national synthesis of VOC information with respect to aquifers and groundwater used for drinking water. Once completed, the related financial resources can be applied to other synthesis topics, such as those involving nutrients and pesticides.[8]

- The implementation of continuous monitors and the application of new data collection schemes over the past 30 years have provided additional data and insights not obtainable through conventional sampling schemes by providing the capability to enhance knowledge of conditions and address new questions. Following are examples of NAWQA efforts to improve approaches to measuring contaminants and water constituents:

  - NAWQA's research budget includes efforts to develop new methods to measure water contaminants at low concentrations and efforts to measure new contaminants that are not currently studied by NAWQA.

  - Newly developed continuous monitors, such as those that measure nutrients, are deployed to obtain additional information, even though they are costly and often require increased maintenance to keep them in calibration. At present, NAWQA sends sampling crews to stream or well locations to physically obtain a water sample, process

[8]NAWQA work on the subject of VOCs has had a major influence on how the nation thinks about gasoline additives, specifically methyl-tert-butyl ether (MTBE), which has been shown to move long distances under the ground and contaminate drinking-water wells. Partly as a result of NAWQA data, California, Maine, and New Hampshire have either restricted or banned the use of MTBE in gasoline products to protect their drinking-water wells.

the sample, and send it to NAWQA analytical laboratories in Denver, Colorado. New monitoring instruments pump samples from streams, process them internally, and produce measurements that are stored digitally. While improving efficiency, these instruments cost over $100,000, require considerable maintenance, and require verification that the samples they pump and analyze represent the conditions of the stream. Typically, the additional work and costs do not end up saving the USGS funds and are often difficult to justify, although the instruments provide more-frequent sampling, which can be important for understanding stream conditions and what influences those conditions. By using and evaluating new instruments, USGS officials have learned that the instruments provide new types or amounts of data, increasing their value. These devices also allow measurement in locations without the need for people to be present.

- NAWQA has made efforts to improve or deploy new instruments for measuring surrogates, which can substitute for the measurement one wants to make, but can be made more frequently or cheaply than the measurement of interest. For example, a turbidity monitor could be used in lieu of taking direct phosphorus measurements. In order to obtain phosphorus measurements, a person is required to visit a stream site, remove a water sample, process the sample, and send it to a laboratory for analysis, or, as described above, utilize a continuous monitoring station at a significantly greater cost. Alternatively, a turbidity monitor costs much less (usually under $10,000), does not require as much maintenance as a nutrient analyzer, and does not generate the chemical wastes that must be addressed with a nutrient analyzer. Thus, if a turbidity instrument can serve as a substitute for a nutrient analyzer for phosphorus, one can operate the turbidity monitor for less cost than the nutrient monitor. The problem is that turbidity (a physical measurement) does not always work as a replacement for the direct measurement of phosphorus, and thus may not be an adequate surrogate for phosphorus in many situations. In such situations, the phosphorus measurement has to be made by a site visit, collecting a sample, and sending it to the laboratory.

National Wetlands Inventory, U.S. Fish and Wildlife Service, Department of the Interior

Background

The National Wetlands Inventory (NWI) provides federal, state, tribal, and local governments, business, and the public with wetlands data that are used for a wide range of applications, such as helping conserve and restore wetland resources and providing information to assess the efficacy of resource policies. The three strategic goals of the NWI include: (1) updating wetlands maps in priority resource areas, (2) intensifying wetlands status and trends reporting at national and regional scales, and (3) identifying threats to aquatic habitats at risk.[1] The Emergency Wetlands Resources Act of 1986, as amended, directs the U.S. Fish and Wildlife Service (USFWS) to map the nation's wetlands and deepwater habitats, and produce scientific information on their characteristics, extent and status at 10-year intervals (published as the *Status and Trends* report).[2] The *Status and Trends* report represents the most comprehensive, technically advanced federal effort to track wetlands on a national scale.

Summary

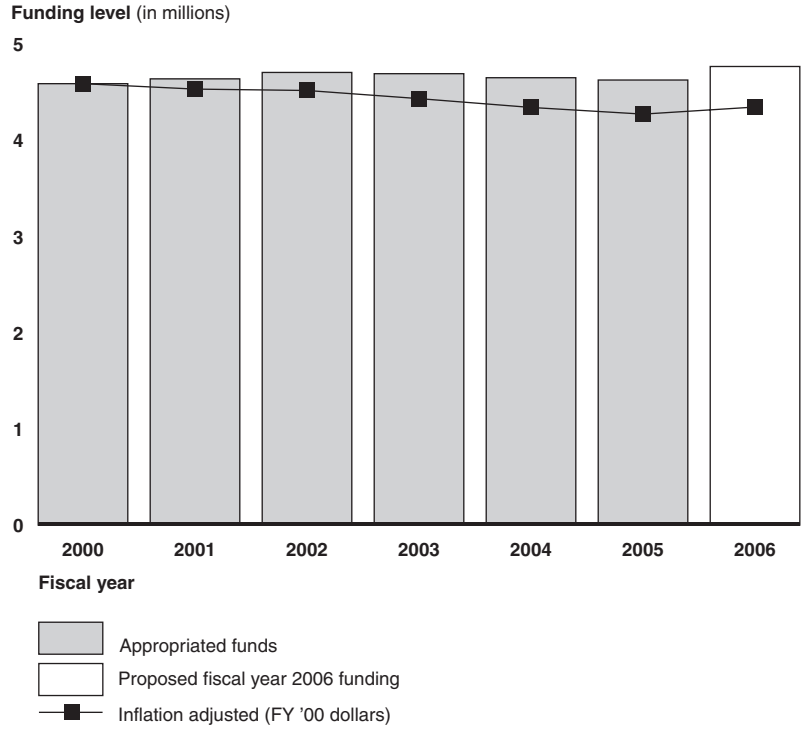
USFWS officials indicated that funding has been consistent with requests, and actual NWI funding for fiscal year 2005 and funding proposed in the President's budget request for fiscal year 2006 will enable the NWI to produce results and accomplishments as presented in its budget document requests. In particular, the officials told us that they do not foresee any impacts to the data used in the 2002 Heinz Center report, *The State of the Nation's Ecosystems*, as the NWI *Status and Trends* report and the data therein is mandated by law.[3]

[1]In a general sense, USFWS strives to map wetlands and deepwater habitats and to produce information on their location, type, and size. Maps are prepared from the analysis of high-altitude imagery, where wetlands are identified based on vegetation, visible hydrology, and geography. A margin of error is inherent in the use of remotely sensed imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

[2]16 U.S.C. § 3931(a)(4).

[3]According to USFWS officials, the *Status and Trends* report is a strategically important and long-standing national monitoring program, and is a crucial element of the President's Wetlands Initiative. Without it, they say, the success or failure of wetland program investments cannot be conclusively determined.

Figure 17: National Wetlands Inventory Budget for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: U.S. Fish and Wildlife Service.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

Agency officials told us that there are no planned program changes for the NWI that would adversely affect its ability to generate data that can be compared with data from prior years. Furthermore, they told us that the President requested more frequent wetland reports in the future. Because of this, NWI data is expected to be available in an improved form for the expected 2007 update of the Heinz Center's *The State of the Nation's Ecosystems* report.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USFWS officials provided the following information on funding levels and program priorities relative to the NWI's ability to continue providing environmental and ecological data comparable with past years:

The NWI has been well-supported through the federal budget process over the past 5 fiscal years, although reimbursable funding amounts (funding provided by other federal agencies) have varied and their availability in future years remains uncertain.[4] Funding for the NWI—both appropriated and reimbursed—for fiscal years 2000 through 2005, as well as proposed funding for fiscal year 2006, are portrayed in table 20:

Table 20: NWI Funding Levels for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006

Dollars in thousands

	2000	2001	2002	2003	2004	2005	2006[b]
Appropriated	$4,528	$4,516	$4,607	$4,540	$4,468	$4,636	$4,777
Reimbursables (reimbursables as a percentage of total funding)	847 (18.7%)	731 (16.2%)	278 (6.0%)	228 (5.0%)	461 (10.3%)	595[a] (12.8%)	TBD
Total	**$5,375**	**$5,247**	**$4,885**	**$4,768**	**$4,929**	**$5,231**	**TBD**

TBD = To be determined

Source: Department of the Interior.

[a]As of February 2005.

[b]Estimate based on President's proposed budget.

- USFWS is currently conducting the analysis to complete an updated NWI *Status and Trends* report by December 31, 2005, 5 years ahead of schedule. The President requested this updated report on Earth Day in 2004, and also has requested that USFWS conduct more-frequent updates in the future.[5] The *Status and Trends* report is required by law each decade, although many users would like the report to be done on 5-

[4]"Appropriated" dollar amounts are defined as the amount provided by Congress for the National Wetlands Inventory program, while "reimbursed" dollar amounts are monies from other federal or state agencies or entities that were used for mapping activities. For example, if the Bureau of Land Management had an interest in mapping riparian wetlands in the Southwest, it would directly contribute funding to USFWS that, in combination with USFWS funds, would be used to perform the mapping activity.

[5]The data from the previous *Status and Trends* report was used by the Heinz Center in its 2002 report, *The State of the Nation's Ecosystems*.

year cycles. USFWS is considering doing additional regional status and trends reports as needed or requested on a shorter time scale.

- Currently, updating the *Status and Trends* report involves funding contributions from a consortium of federal agencies (including the Departments of Agriculture, Commerce, and Defense, as well as the Environmental Protection Agency), although the extent to which such funding will be available in future years is uncertain. Funding *Status and Trends* in this manner does not assure stable funding for future monitoring and reporting cycles and may ultimately affect NWI data collection.

- The *Status and Trends* report costs approximately $2.7 million to produce and it would be unlikely that the report could be done without a consortium approach.[6]

- No changes in NWI mapping activities are planned in fiscal years 2005 and 2006, although maps are updated at little more than 1 percent annually at current funding levels.[7] About 17 million to 19 million acres of wetlands have been or are expected to be updated annually between fiscal years 2004 and 2006, with total digital wetlands coverage for 46 percent of the nation.[8] However, despite the conversion of the mapping process to a digital system and the development of new tools, in the present budget environment, less than 3 percent of all wetlands maps

[6]One portion of the costs of this report is the selective procurement of imagery from USGS (e.g., the Earth Resources Observation Systems Data Center) and other USGS (Mid-Continent Mapping Center) and USDA (Aerial Photography Field Office) units in support of digital wetland mapping and wetland status and trend analyses.

[7]The number of maps produced in a given year is a performance measurement for the NWI.

[8]Certain wetland habitats are excluded from the NWI mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery. By policy, USFWS also excludes certain types of "farmed wetlands" as may be defined by the Food Security Act.

are 10 years old or newer.[9] Maps will continue to be less accurate each year as natural and man-made landscape changes occur, and the backlog of priority map updating projects for areas experiencing rapid change will continue to grow. However, data quality and comprehensiveness can be expected to continue to improve as USFWS enters into partnerships to update maps of high-priority resource areas, conducts analyses of habitats at risk, converts existing paper maps to digital format, and digitally maps areas not yet mapped.

- Currently the NWI has 28 full-time employees for the 38 approved program positions. Eight occupied positions provide coordination of wetlands issues and strategic digital mapping in the seven regions of the service. There are 13 employees for technical program support at the NWI Center, in St. Petersburg, Florida.[10] Seven occupied positions in headquarters provide program, budget, and policy direction, as well as status and trends capabilities. No more than 2 employees have been devoted full-time to wetlands status and trends. To accomplish wetlands status and trends reporting, the service has drawn on expertise within the NWI as well as from cooperators.

[9]In an attempt to reposition the National Wetlands Inventory for the future, USFWS highlighted the need for the availability and application of contemporary digital information in support of resource management and decision-making. USFWS digitized its wetlands data in a centralized Wetlands Master Geodatabase. This is a storage mechanism for spatial data and allows for much easier storing, editing, analyzing, and archiving of natural resource inventory information. The digital wetlands data set is registered and available via the Department of the Interior's Geospatial One-Stop Web portal.

[10]The National Wetlands Inventory comprises three units: (1) the Washington, D.C., headquarters, (2) Regional Wetlands Coordinators, and (3) the NWI Center. The Washington Office coordinates national budget preparation, program planning, national-level program administrative issues, wetlands policy issues, and national-level interagency coordination. Wetlands coordinators in each service region direct and coordinate all regional technical activities, and provide wetlands expertise to the Regional Director, service field offices, and the public. The National Wetlands Inventory Center, in St. Petersburg, Florida, coordinates the procurement of imagery, provides technical assistance and review of digital wetlands data, and serves digital data over the Internet.

National Streamflow Information Program and National Water Information System, Water Resources Discipline, USGS, Interior

Background

The U.S. Geological Survey (USGS) is the primary federal agency charged with acquisition and quality control of data on water, including data on water levels and discharge rates, and the transformation of this data into usable information. High quality information about the elevation and discharge of our rivers and streams is important for forecasting floods and managing droughts; ensuring water supply for agriculture, industry, cities and towns; maintaining in-stream flows for game fish and other aquatic species as well as for canoeing, white-water rafting and other recreational purposes; and enforcing legal agreements between states and nations. Users of the information include land and resource managers and planners, municipal and state governments, private citizens, academic institutions, and federal agencies such as the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the National Weather Service. USGS placed its first streamgage in the arid West in 1889 to determine if there was adequate water to open the region for irrigation and agriculture. Since then, societal needs have changed, science and technology have advanced, and the USGS streamgaging program has evolved accordingly. Examples of this evolution include satellite data transmission, use of Doppler technology for discharge estimates, and improvements in flood forecast models, all of which have combined to make USGS streamflow data much more valuable for flood forecasting today than in the past.[1]

The increase in the amount of streamflow information about the nation's waters has been accompanied by innovations in information technology that are changing old paradigms regarding the access, storage, and generation of water-related information—including streamflow information. In 1975, USGS established the National Water Information System (NWIS) as a distributed network of computers, databases, and supporting software for the storage and retrieval of water data collected at approximately 1.5 million sites around the country. Among other things, NWIS serves as a national archive for national records of groundwater quality and levels, surface water quality, and streamflow stage and discharge. As a long-term database (with over a century of data on U.S. water resources) and an information delivery system that makes extensive

[1]Information from the USGS streamgaging program is the primary source of the nation's streamflow statistics and is used for trend reporting. These statistics include mean annual flows and flood and drought frequency statistics (including statistics used for design and regulatory purposes, such as the 100-year flood and the 7-day, 10-year low flow measures). Streamflow data are also used to explore issues such as trends due to urbanization, groundwater development, and climate change.

use of the Internet, NWIS provides both real-time and historic streamflow information, along with information on groundwater and water quality.

In 1999, in response to congressional concern that there had been a decade-long decline in the number of streamgages—even as the need for streamflow data for flood forecasting and long-term water management uses and new needs such as for total maximum daily loads (TMDLS) continued to grow—USGS performed a study that showed that the ability of its network to meet long-standing federal needs had declined due to: (1) an absolute loss of streamgages, (2) a disproportionate loss of streamgages with a long data record, and (3) the declining ability of USGS to continue operating high-priority streamgages when program cooperators and partners (i.e., local jurisdictions, states, and other federal agencies) discontinued funding. USGS also reported increased demand for streamflow information, caused in part by new data delivery capabilities (such as the Internet) and by a Clean Water Act program that requires states to monitor water quality. New technologies were needed to improve the reliability and application of streamflow information and decrease the cost and uncertainty of the information. To remedy this situation, USGS proposed a plan for a National Streamflow Information Program (NSIP), a new approach to the acquisition and delivery of streamflow information. As part of NSIP's design, USGS established five goals intended to satisfy minimum national streamflow information needs and conducted an analysis to locate streamgage sites that meet these goals.[2] These sites constitute NSIP's "base" or "backbone" streamgage network, and were intended to satisfy the "federal interest" in streamflow information and

[2]The five national goals (or needs) that NSIP was intended to provide streamflow information for: (1) meeting legal and treaty obligations on interstate and international waters (to monitor legal requirements for deliveries of water at state and national borders), (2) flow forecasting (providing data for validation and improvement of forecasts where the National Weather Service and other federal agencies carry out flood or water supply forecasts), (3) measuring river basin outflows (for calculating regional water balances over the nation), (4) monitoring sentinel watersheds (providing data from basins that are minimally affected by human activities for regionalization of streamflow characteristics and assessments of trends in streamflow due to factors such as changes in climate, land use, and water use), and (5) measuring flow for water-quality needs (for purposes of characterizing the quality of surface waters). A total of 5,293 streamgages are listed under the five criteria, but some serve more than one criterion, thus the actual number of streamgages identified as NSIP base gages is 4,425.

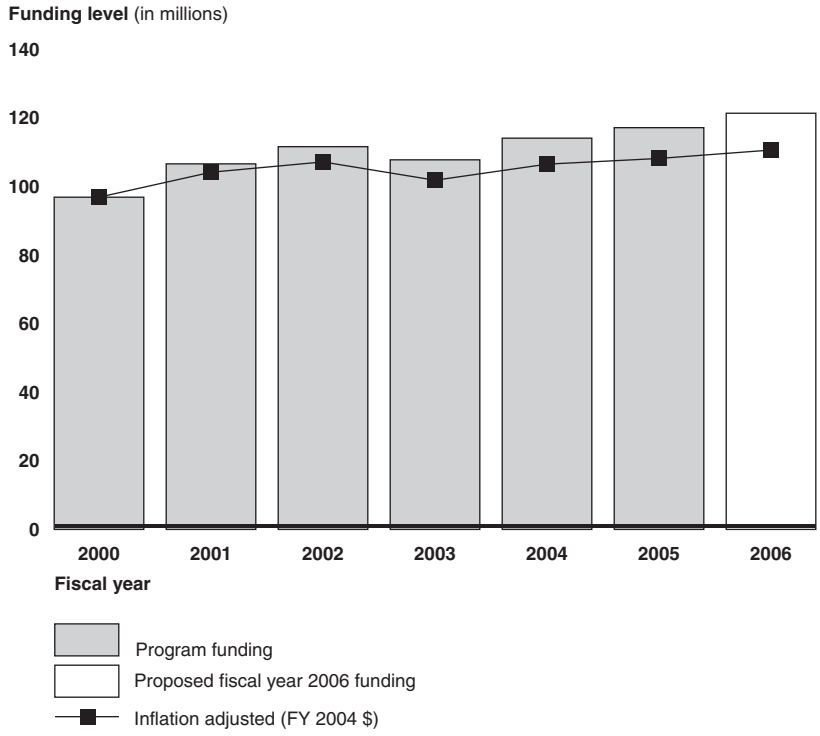
would be entirely supported by federal funding.[3] This federal need backbone network would be supplemented by streamgages cooperatively funded with partners to better meet state and local needs for streamflow information. In addition, the proposed NSIP had four other components: (1) intense data collection during floods and droughts, and additional analysis of these data; (2) periodic regional and national assessments of streamflow characteristics; (3) enhanced information delivery; and (4) data collection and analysis methods development and research.

Summary

USGS officials indicated that actual funding for the streamgaging network and for NWIS in fiscal year 2005 and anticipated funding for fiscal year 2006 (as shown in fig. 18) are expected to result in the continuation of data collection and analysis across key programs but at a slightly reduced level as a result of slightly declining budgets since fiscal year 2001. The officials indicated, in particular, that data used to support indicators in the 2002 Heinz Center Report, *The State of the Nation's Ecosystems*, are expected to be available for the center's 2007 report at similar levels of quality and comprehensiveness. However, because of uncertainties regarding funding in fiscal year 2007 and beyond, the long-term ability of the USGS streamgaging network to provide data to support ecological indicators at comparable or improved levels of quality and quantity is less clear.

[3]According the National Research Council, the national economy is inseparably bound to the adequacy of water supplies. By mass, consumptive use of water is the single-largest material flow in the U.S. economy, by a factor of more than 20. The national interest in economic information on commodity flows has long been recognized and supported with federal funding. The NSIP, as proposed by USGS, includes a set of minimum national streamflow information needs that should be met by the federally funded portion of the streamgage network. Federal support of a base streamgaging network is needed to ensure the long-term viability of the network for national needs and is justified because many national interests are served by providing streamflow information, which has many of the properties of a public good.

Figure 18: Funding for USGS Streamgaging Activities from Federal and Nonfederal Sources for Fiscal Years 2000-2005 and Proposed for Fiscal Year 2006



Source: USGS.

Note: Funding levels were adjusted for inflation using a chained GDP price index based on information from the U.S. Department of Commerce's Bureau of Economic Analysis and the Congressional Budget Office.

USGS officials also indicated that the agency has no changes planned for the national streamgaging network or for NWIS that would adversely affect their ability to provide data that can be compared with data from prior years. In fact, there are planned improvements to both systems that, if implemented over a period of years, would significantly improve the quantity, quality, and availability of information to support future iterations of the Heinz Center's report. The officials noted, however, that realization of these improvements and their potential for enhancing streamflow information depend on funding being made available to implement the plans that have been developed. Likewise, adoption of technological innovations that have the potential to increase the quantity, variety, timeliness, accessibility, and utility of streamflow information will depend on the future availability of funding.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

USGS streamgage program officials provided the following information on funding levels and program priorities relative to the ability of the national streamgaging network and NWIS to continue providing environmental and ecological data comparable with past years:

- While NSIP has been extensively reviewed and widely supported by a number of expert bodies, including the National Research Council, and has been accepted and endorsed essentially as originally developed, its implementation has proceeded far more slowly and haltingly than anticipated by USGS and its funding has been insufficient for realization of a base federal streamflow network and satisfaction of the federal interest in streamgage information that was envisioned in NSIP:[4]

  - NSIP's fiscal year 2005 budget is only about 15 percent of what would be required under full implementation, according to USGS's 5-year NSIP plan, developed in 2003. In fact, none of the five NSIP goals proposed are currently being met. Only about 17 percent of the 4,425 streamgages that make up the base or backbone network designed to satisfy the federal interest in streamflow information are currently fully or partially federally funded; regional assessments of streamflow characteristics are currently only about 7 percent of full funding; data collection to enhance understanding of floods and droughts is about 5 percent of full funding; and, while improved information delivery is almost fully funded, the needs and goals as proposed in 1999 will take many years to be met.

  - Appropriations for NSIP in fiscal year 2000 amounted to $5.8 million, as shown in table 22. In fiscal year 2001, NSIP experienced a significant increase in funding, with appropriations of $14.1 million. Since that time, however, funding for NSIP has been level or slightly declining. Because of the effects of inflation and the program's priority of keeping existing streamgages operational, other

[4]USGS is developing a contract to perform a cost-benefit analysis of the streamgaging program. The intent of the analysis is to perform a semiquantitative evaluation of the program and its benefits in comparison with the program's costs. Evaluation of benefits can help to sharpen USGS's understanding of the linkage of the basic data to public and private decisions and to public benefits, perhaps pointing to changes in the design or operation of the program that could enhance the level of benefits the program provides. The analysis will not be extensive. It will be limited initially to evaluating the costs and benefits associated with only a few of the many uses of streamflow information. It will be performed by an organization external to and independent of USGS.

components of the program have taken most of the cuts required to maintain funding for streamgages. These other components, including development of new technologies, regional statistical analysis, flood and drought monitoring, and database enhancements, are currently barely functioning at a markedly reduced level and cannot absorb additional reductions and still perform the functions for which they were designed. As a consequence, any future funding reductions will result in discontinuing existing streamgages.

- Because USGS appropriations for NSIP fund such a small proportion (less than 20 percent) of the current active NSIP federal interest streamgages, the majority of the network is heavily dependent on partner funding, and, as a result, the continued operation of streamgages largely depends on partner interests, priorities, and needs. This situation creates great instability in the network and results in many streamgages being vulnerable to cuts in state, local, and other partner funding. At present, of the 4,425 streamgages planned to make up the backbone streamgaging network to meet federal needs for streamflow information, only approximately 63 percent are active streamgages. Of these, approximately 750 streamgages (17 percent) receive some funding from NSIP. Approximately 400 streamgages (9 percent) receive all of their funding for operation and maintenance from NSIP, and the other 350 (8 percent) receive only partial funding from NSIP.

- To fully implement the 5-year NSIP plan and the five related federal goals for NSIP for fiscal years 2006 through 2010 would require: (1) total funding of approximately $103 million spread over the 5 years to cover one-time costs, and (2) funding of approximately $95 million per year for the continued operation of the program. The full $95 million per year for operations would not be needed from year one because the full streamgage network would not be operational until year five. The total costs, one-time costs, and recurring operational costs to accomplish the 5-year buildup to full implementation of NSIP result in the annual funding needs shown in table 21:

Table 21: Projected Costs for Full Implementation of NSIP for Fiscal Years 2006-2010 and Operating Costs in Subsequent Years[a]

Dollars in millions

Fiscal Year	One-time costs	Recurring costs	Total cost	Already funded	Total additional funding needed
2006	$31	$31	**$62**	$14	**$48**
2007	31	47	**78**	14	**64**
2008	26	63	**89**	14	**75**
2009	15	79	**94**	14	**80**
2010	0	95	**95**	14	**81**
2011[b]					

Source: Department of the Interior.

[a]The funding needs depicted in this table reflect a particular funding scenario. If contributions to additional funding needed were to vary from this scenario from year to year, then the total additional funding needed in any particular year would also vary. For example, if in fiscal year 2006 the total additional funding of $48 million is received (for a total of $62 million), then in fiscal year 2007 the total additional funding needed is not $64 million , but $16 million to make the total cost for the year $78 million ($62 million + $16 million). The total additional funding needed column for the five year "ramp up" or full implementation of NSIP ignores the increases in the previous years and goes back to the existing $14 million as the starting point.

[b]$95 million plus inflation into the future for continued operation of NSIP.

- At the current rate of federal spending, full implementation of NSIP will not be achieved. The rate of federal spending has been flat or slightly declining since fiscal year 2001, and, as a result, NSIP is not able to progress toward full implementation. In fact, NSIP has recently experienced degradation in its ability to achieve its goals. The costs of operating the streamgaging network and of carrying out the other NSIP goals have increased due to inflation, and because of the flat or declining funding, NSIP has had to do less each of the past several years. From the perspective of the percentage of the base network streamgages that are currently in operation and the NSIP goals that they serve, the sentinel watershed goal is the one that is most directly affected, with about 60 percent currently in operation by USGS or other agencies. Flow forecast sites are the second lowest, with about 70 percent currently in operation. In terms of absolute numbers, the flow forecast goal has the largest shortfall, with about 920 streamgages short of the goal of NSIP for the base federal network. The second-largest shortfall is about 330 streamgages for the sentinel watershed goal.

- With insufficient federal funding to establish the full NSIP network, the ability of the current network to satisfy the federal interest is basically dependent on cooperator funding and not federal funding to USGS. The

result is that the NSIP goals cannot be achieved. For example, one of the goals of the federal streamgaging network design is to have a streamgage at each of the National Weather Service (NWS) flood forecast locations, so that NWS can more accurately predict floods and better issue warnings to protect life and property. Because many of the streamgages at these forecast locations are funded by cooperators, their continued existence is dependent on the cooperators and is outside the control of USGS. If the cooperators decide they do not need the streamgages or cannot afford to fund them, USGS is not in a position to step into the breach to keep the streamgages operating, and the federal need is, as a result, not met. Modifications to program activities are constantly being made in response to the changing priorities of USGS funding partners, since they provide most of the funding to maintain the network. Any budget reductions would cause the streamgaging network to shrink. Streamgages identified for termination due to reductions in federal appropriations would be selected based on the priorities used to design and establish the NSIP federal interest streamgaging network. Any funding reductions would have a direct proportionate impact on the ability of the streamgaging network to support ecological indicators. In the same way, loss of streamgages would proportionately reduce information available to the Heinz Center to support its ecological indicators.

Table 22: Funding for USGS Streamgaging Activities for Fiscal Years 2000 through 2005 and Proposed for Fiscal Year 2006

Dollars in thousands							
Federal appropriations for NSIP	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Requests	Unknown	Unknown	$9,321	$12,214	$14,356	$14,254	$14,200
Appropriations[a]	5,839	14,127	14,310	14,217	14,179	13,814	14,200[b]
Cooperative Water Program (CWP)[c]							
CWP appropriations	$26,590	$23,281	$24,449	$21,639	$22,506	$22,400	$22,500
Contributions from partners							
Nonfed coop partners	$38,956	$43,526	$46,808	$46,232	$49,605	$52,580	$55,736
Other federal agency partners	25,512	25,687	26,106	25,711	27,826	28,382	28,949
Total[d]	**$96,897**	**$106,621**	**$111,637**	**$107,799**	**$114,116**	**$117,176**	**$121,385[e]**

Source: USGS.

Notes: Total funding figures for fiscal year 2005 and fiscal year 2006 represent estimates, since key appropriations decisions regarding CWP appropriations, fiscal year 2006 NSIP appropriations, and data on contributions from partners are not yet available.

[a]NSIP became a separate line item in the USGS budget in fiscal year 2003, under the subactivity "Hydrologic Monitoring, Investigations, and Research" within the budget activity "Water Resources

Investigations." Prior to that, USGS funds for streamgaging were embedded in a line item that contained a wide range of scientific activities.

[b]For purposes of estimating fiscal year 2006 funding for streamgaging, we have assumed that Congress will enact the entire amount requested by the President.

[c]The Federal State Cooperative Water Program (CWP) was established in 1895 to share the costs of streamgaging and certain other water-related activities between the federal and state governments. This program funds a significant amount of streamgaging based on matching funds from USGS partners. The total cost for the USGS streamgaging program in fiscal year 2004 was approximately $114.1 million. Of this amount, $14.2 million was from the USGS appropriation for NSIP and $22.4 million was from the appropriations for CWP. USGS does not submit a budget request specifically for streamgaging within CWP; hence, this amount can be determined only with respect to actual 'expenditures at the close of each fiscal year.

[d]For fiscal years 2000 through 2005, appropriated funding for the USGS streamgaging program has ranged between 17 percent and 22 percent of the Water Resources Discipline (WRD) budget. During the same period, funding for streamgages has averaged about 4 percent of the overall USGS budget.

[e]USGS officials indicated that since fiscal year 1990, nonfederal cooperative partners have increased their contributions to the streamgaging program by an average of 6 percent per year. Assuming continuation of this trend, contributions in fiscal year 2006 could be as high as $55.7 million. Over the same period, federal partners have increased their contributions to the program by an average of 2 percent per year. Assuming, again, that this trend continues, contributions in fiscal year 2006 could be as high as $29 million. Together with USGS contributions, total funding for streamgaging activities in fiscal year 2006 could be as much as $121.4 million. However, given the multitude of political and economic factors that influence availability of funding from partners, USGS believes that to protect the nation's investment in the streamgaging network and ensure continuity of data, it must be conservative when estimating partner funding for future years. As a result, agency officials currently estimate total fiscal year 2006 funding at no more than $115 million.

- For fiscal year 2005, the following is the distribution of USGS funds invested in selected streamgaging activities from funds appropriated for NSIP and estimated funding from appropriations for the Cooperative Water Program (CWP):

Table 23: USGS Funds for Selected Streamgaging Activities for Fiscal Year 2005

Dollars in thousands

Activity	Funding	Percentage of funds invested
Data collection	$37,289	83
Data analysis	135	< 1
Database support	849	2
New streamgages	3,000	7
Research and development	959	2
Quality assurance/quality control and oversight	2,679	6

Source: USGS.

- Database support funds are used to help develop and maintain the NWIS database. Data analysis funds are those from NSIP appropriations used to develop regional assessment techniques and to better understand floods and droughts. Database support funds are used to develop and maintain the NWIS database. New streamgage funds are those invested in CWP to establish new streamgages and to help decommission existing streamgages due to changing local needs for streamflow information. Research and development funds are used to develop new techniques and tools to provide streamflow information more accurately, at a lower cost, and to obtain it more safely. Quality assurance/quality control and oversight funds are for national quality control and oversight of NSIP and related surface water activities.

- Funding for NWIS, the repository for historical and real-time data on streamflow as well as a host other data related to surface water and groundwater characteristics, remains steady at about $7.1 million per year. This level of funding allows NWIS to maintain system viability with minimal improvements, but is not sufficient to allow significant modernization efforts. In the last few years, NWIS has had to undertake a series of costly measures to comply with new information technology security requirements. Most of the funds that would have been used to improve system functionality have been absorbed by these security efforts. In addition, because the NWIS funding has been flat, the costs due to inflation and federal pay raises (with no increase in budget to cover those pay raises) have slowly diminished the level of maintenance and enhancement that can be done for NWIS each year. NWIS is not a line item in the USGS budget, and its funding is not shown in table 22. NWIS receives funding from the Hydrologic Networks and Analysis Program, NSIP, the National Water Quality Assessment Program (NAWQA), and individual USGS water offices across the nation. USGS does not believe that NWIS should be counted as a cost of streamgaging because NWIS includes many other types of real-time and historic water-related data in addition to streamflow data. It is not possible to separate the NWIS costs related to streamflow data from the costs associated with other types of data. Furthermore, the NWIS costs are not related to the size of the streamgaging network.

  - NWIS has been successful in making some technological improvements in the past few years, but available funding has restricted the number of improvements that can be made and has increased the time needed to implement the improvements. The

advancement in technologies that USGS would like to implement has outpaced the funding needed to incorporate them into NWIS. Examples of some of the technologies that have been deferred are: (1) systems to provide users with ready access to continuous time series data (currently they have ready access only to daily averages of these continuous time series data), (2) an ability to approve and release finalized streamflow data on an incremental basis (e.g., a few months at a time) rather than waiting for a complete release at the end of the year, (3) full utilization of graphical systems for editing hydrographs and rating curves, and (4) systems for storing the full set of depth and velocity data collected during the operation of new acoustic Doppler current profiler systems.

- At the current average annual funding level of approximately $7.1 million, improvements to NWIS require multiple funding years or cycles to implement. Although some improvements are complex and necessitate longer development time, the current schedule for implementing improvements could be shortened with additional funding. With funding flat and primarily consumed by maintenance of NWIS, the level of work that can be done for enhancements is minimal.

Most of the changes in the way that the agency does streamgaging in the future will be due to advances in technology. Some changes, however, will be driven by demand, such as requests for more unit-value data (e.g., data based on hourly instead of daily or weekly averages). In addition, some changes will be driven by requirements, such as the National Oceanic and Atmospheric Administration's requirement to convert to high data rate transmitters for real-time data transmission. Providing users with better information and better access to data will occur because more streamgages will be equipped with higher data rate transmitters that will allow data transmission more frequently, providing users with quicker access to the streamflow information. As funding permits, new technologies will also be used to improve streamflow measurement capabilities. New hydroacoustic technologies for measuring the velocity or rate of streamflow will allow USGS to obtain higher-quality data at lower costs, especially during periods of hydrologic extremes (floods and droughts). Although USGS's goal is to provide users with better information and better access to data, it is more realistic to expect that there will be only incremental improvements to information and data access in the near term.

Sea Viewing Wide Field-of-view and Related Sensors (MODIS and AVHRR), National Aeronautics and Space Administration

Background

It is part of the National Aeronautics and Space Administration's (NASA) mission to look at the Earth from satellites in space to better understand how the Earth works and changes. Satellites provide quantitative data on ocean biological, physical, chemical, and geological properties. Subtle changes in the ocean's color can signify the presence of or changes in various types and quantities of marine phytoplankton (microscopic marine plants), the knowledge of which has both scientific and practical applications. Phytoplankton accounts for the largest amount of marine plant production and serves as the direct or indirect food source for most marine organisms. In addition to helping monitor the short-term spatial and temporal variability in the ocean's biology, physics, chemistry, and geology, satellites also provide the means for NASA to quantify the ocean's long-term biological response to global environmental change.

Some of NASA's satellites estimate the amounts of phytoplankton chlorophyll-*a*, which is a proxy for phytoplankton biomass. NASA proved the concept of remote detection of phytoplankton by placing into orbit the Coastal Zone Color Scanner (in operation from 1978-1986), and continued the measurement of phytoplankton chlorophyll-*a* with the Sea Viewing Wide Field-of-view Sensor, known as Sea WiFS (in operation from 1997-2003); these efforts were followed by two versions of the Moderate Resolution Imaging Spectoradiometer (MODIS), which were launched in 1999 and 2002. Both MODIS sensors remain in operation.

Under a joint program (Pathfinder) with the National Oceanic and Atmospheric Administration (NOAA), NASA obtains data on sea surface temperature, based on measurements from space using NOAA's Advanced Very High Resolution Radiometer (AVHRR). Sea surface temperature is a fundamental oceanographic indicator of climate change, and is used to support various ecosystem indicators. In addition, AVHRR data are used in support of a vegetation index, known as the Normalized Difference Vegetation Index, created in cooperation with the U.S. Geological Survey, the European Space Agency, and the International Geosphere-Biosphere Program. Scientists collect images of the Earth's surface and quantify the concentrations of green leaf vegetation around the globe. Such data allow the scientists to create detailed maps of the Earth's green vegetation density that identity where terrestrial plants are thriving and where they are under stress, for example, due to a lack of water. The vegetation index is the core of the data set that was used for the Heinz Center's ecological indicator for plant growth.

Summary

NASA officials told us it is difficult to provide annual funding information for the production of a specific type of measurement based on satellite observations because funding is generally allocated within NASA for broader missions or for satellites and sensors that collect multiple forms of data. NASA officials told us that no planned changes in program priorities will affect NASA's ability to generate data in the coming years that will be comparable with data from previous years. Furthermore, they told us they believe that NASA data will be available in an improved form for the expected 2007 update of *The State of the Nation's Ecosystems* report. For example, future sea surface temperature data will have the same spatial and temporal resolution as earlier data, but will be superior by merging microwave and infrared sensors to mitigate problems associated with performing satellite observations during times when clouds obstruct the view of the Earth from space.

Agency Perspectives on Potential Impacts of Funding Levels and Program Changes

NASA program officials provided the following information on funding levels and other factors relative to NASA's ability to continue providing environmental and ecological data comparable with past years:

Phytoplankton Chlorophyll-*a*

- Estimates for activities associated with collecting chlorophyll data from fiscal year 2000 through 2005 from satellite observations are $2.9 million, $3 million, $3.1 million, $1.4 million, $1 million and $1 million, respectively. These funding estimates include costs such as the portion of the total costs of multiple satellite missions that can be prorated to the specific function of collecting chlorophyll data and the costs of analyzing the data. The substantial reduction of from $3.1 million to $1.4 million from fiscal year 2002 through 2003 reflects the end of the Sea WiFS project. Agency officials told us that the actual NASA funding level of $1 million for fiscal year 2005 and the proposed level of $1 million for fiscal year 2006 should be sufficient to allow NASA to generate chlorophyll data from the MODIS sensor, which is expected to provide higher-quality data than previous sensors.

- NASA is currently working with the Department of Defense and NOAA to manage the Integrated Program Office (IPO), which was created by NASA and the Departments of Commerce and Defense in 1994 to

develop, acquire, manage, and operate the next generation of polar-orbiting operational environmental satellites. As such, IPO will oversee the future operational missions and continuity of phytoplankton chlorophyll-*a* data in the National Polar-orbiting Operational Environmental Satellite System (NPOESS). The first IPO mission is planned to be launched in October 2006.

Sea Surface Temperature

- NASA's expects that sea surface temperature data using AVHRR Pathfinder will be better documented and more comprehensive in future years. Such data are a few years away from being fully developed, although prototypes of the data will be available in the summer of 2005. NASA officials stated that there will be no gaps in sea surface temperature (SST) data or its availability for use by the Heinz Center and other users.

- Responsibility for sea surface temperature data has never been placed with one entity. Instead, a wide range of project managers and scientists have overseen data collection, research, calibration, and validation activities because NASA had never placed into orbit a sensor that was dedicated to determining sea surface temperature. NASA will continue this approach through the Multi-sensor Improved Sea Surface Temperature (MISST) Project and the Global Ocean Data Assimilation Experiment High Resolution Sea Surface Temperature (GHRSST) Pilot Project. MISST is to be funded by NASA, NOAA, and the Office of Naval Research through the National Oceanographic Partnership Program, with approximately $600,000 per year for 5 years (fiscal years 2004 through 2008). A goal of these projects is to combine, in an optimal and documented way, data from different sensors so as to provide a global sea surface temperature independent of the constraints of cloud cover and the limited coverage provided by any single sensor.

    - While the AVHRR Pathfinder sea surface temperature data set has been useful for multiple users, it has shortcomings that will need to be addressed through future research. The primary challenges to be overcome by further research include the optimal merger of in-situ and remotely sensed sea surface temperature sensors, merging infrared and microwave measurements, and providing a comprehensive error estimate for data sets.

    - To address current challenges in obtaining quality sea surface temperature measurements, the Global Data Assimilation

Experiment Sea Surface Temperature Pilot Project (GHRSST-PP) was formed. GHRSST-PP is intended to provide a significant improvement over current data sets, which have recognized deficiencies in a number of areas—especially in consistent global coverage and the characterization of sea surface temperature data accuracy and uncertainties (e.g., cloud contamination and diurnal warming effects). GHRSST-PP does not replace AVHRR Pathfinder SST but provides an emerging framework and "product line" that will be better in many respects. The lessons learned in the development of Pathfinder are being used in GHRSST.

- The input data streams to GHRSST-PP will come from several different sources, including both microwave and infrared sensors on polar orbiting and geostationary platforms. GHRSST-PP supports a process whereby satellite data streams from a number of sources will be reformatted into a standardized format, complete with error statistics and ancillary data, which will significantly enhance their usability for assimilation into climate and ocean/atmosphere models.

- GHRSST-PP involves the integration of new technologies that will improve current data transmission, validation, and processing. These technologies potentially will be applicable across a wide range of satellite-derived data sets.

- GHRSST-PP provides an opportunity to deliver data under standardized formats and error characterization to an international user community. Activities sponsored by the U.S. include data distribution and management through a Global Data Assembly Center. International partners include Australia and several European countries (additional international partners are expected as the project matures).[1]

In sum, GHRSST-PP has several important features that will serve to test future strategies involving both international data management and the creation of satellite-derived measurements suitable for both near-real-time research and climate studies:

[1]The European Medspiration project will provide sea surface temperature data products to specific operational European users in near real time. The project will consist of a data processing system, an off-line data archive, and a data product dissemination service. The Australian Bluelink Project centers on ocean prediction and analysis, and forecasting of day-to-day variations in ocean currents, ocean eddies, and temperatures.

- rigorous calculation of error statistics for each estimate of sea surface temperature data;
- near-real-time distribution of data, in collaboration with international partners (the Web interface also allows global data to be chosen for a specific area of interest defined by the user);
- standardized formats for all data products that include ancillary data sets for complete error characterization of sea surface temperature data; and
- models to calculate sea surface temperatures at predefined depths, enabling users to know the exact depth of the sea surface temperature.[2]

Vegetation index

NASA plans to continue research involving its Normalized Difference Vegetation Index. In particular, a 5-year research and development data project that began in fiscal year 2004 is planned through fiscal year 2008, at approximately $800,000 to $900,000 per year. The objective of this project, which relies on AVHRR, is to create and make available a consistent record of the index, dating from 1981.

[2]NASA believes that the temperature at the surface of the ocean and at one meter below the surface may vary significantly, up to 1 degree Celsius, as the surface of the ocean more directly responds to winds and heat from the sun. To understand changes in climate, for example, such differences must be understood and modeled correctly. This is also critical because, although satellite infrared sensors measure the skin temperature (the very top of the ocean surface), most in-situ measurements are taken at depths of several meters. A clear understanding of the depth of the temperature measurement is critical to properly using sea surface temperature data.

Comments from the Department of Commerce

THE DEPUTY SECRETARY OF COMMERCE
Washington, D.C. 20230

August 2, 2005

Mr. John B. Stephenson
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, D. C. 20548

Dear Mr. Stephenson:

Thank you for the opportunity to review and comment on the Government Accountability Office's draft report, *Environmental Information: Status of Federal Data Programs that Support Ecological Indicators* (GAO-05-376). I enclose the U.S. Department of Commerce's recommended changes and comments regarding factual or technical information.

Sincerely,

David A. Sampson

Enclosure

Comments from the Department of the Interior

United States Department of the Interior
OFFICE OF THE ASSISTANT SECRETARY
POLICY, MANAGEMENT AND BUDGET
Washington, DC 20240

JUL 2 1 2005

Mr. John B. Stephenson
Director, Natural Resources
and the Environment
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Stephenson:

Thank you for providing the Department of the Interior (DOI) the opportunity to review and comment on the draft U.S. Government Accountability Office (GAO) report entitled: "ENVIRONMENTAL INFORMATION: Status of Federal Data Programs that Support Ecological Indicators," (GAO-05-376). The GAO has done an excellent job of synthesizing a large volume of information into a concise table and supporting appendices. We found the information provided by GAO to be accurately stated and applied, but note a few issues for comment:

Readers could benefit from knowing the Heinz Center is in the process of identifying what it would take to fill data gaps identified in the 2002 report. Currently, the Heinz Center has a draft report in review entitled: "National Reporting on Ecosystem Condition: Priority Data Needs and Key Management Challenges." The Heinz Center has worked with many agencies and organizations to identify what efforts would be needed to fill key data gaps. Their report will help identify what is required to produce and improve future Heinz Center reports on Ecosystem condition.

The National Stream Quality Accounting Network and the National Water Quality Assessment Program are two U.S. Geological Survey (USGS) programs identified in Table 1 as not having continuity of data or data availability for the 2007 Heinz Center Report. While it is true that these two Programs will not be able to produce the same data as was used in the 2002 report, nevertheless, the USGS is continuing to work with The Heinz Center to provide data and information on indicators these Programs can support. USGS data and information contributed to 28 of the indicators used in The Heinz Center 2002 Report. We anticipate the USGS will be able to contribute to many key indicators in 2007 as well.

Since this review was initiated 1 year ago, the indeterminate budget prognosis for the National Wetlands Inventory Program has been resolved. Therefore, we do not agree with the "Uncertain" designations for the columns headed by "Continuity of program data in future years" and "Data availability for the 2007 Heinz Center Report" in Table 1 on page 8 for the National Wetlands Inventory (NWI). We request the GAO change both columns to "Yes" and amend the draft findings in Table 1 to be consistent with the statements presented in Appendix XIX of the report. We believe affirmative designations are appropriate and consistent with the

statements and budgetary information for the NWI that is presented in the report. We therefore recommend Table 1 be revised to reflect these findings in the final report.

For example, Appendix XIX states on pages 1 and 2 that "In particular, the officials told us that they do not foresee any impacts to the data used in the 2002 Heinz Center Report . . . ," and "Because of this, NWI data is expected to be available . . . for the expected 2007 update of the Heinz Center's *The State of the Ecosystems* report." Appendix XIX also states on page 3 that "The USFWS is presently conducting the analysis to complete an updated NWI Status and Trends report by December 31, 2005, 5 years ahead of schedule." The Service has received the contributed funding requested from other Federal agencies in support of this report requested by the President, and we anticipate it will be completed on schedule. Because of the President's directive for more frequent reports, the highest priority usage of available NWI funding will be for wetland status and trend reports to maintain the continuity of this program data in future years.

Additional comments are included in the enclosure and are organized by bureau and program with a content contact noted in case additional questions arise. We hope our comments will assist you in preparing the final report.

Sincerely,

P. Lynn Scarlett
Assistant Secretary, Policy,
Management and Budget

Enclosure

GAO Contact and Staff Acknowledgments

GAO Contact

John Stephenson, (202) 512-3841

Staff Acknowledgments

In addition to the contact named above, Nancy Bowser, Nancy Crothers, Denise Fantone, Tim Guinane, Ed Kratzer, William Lanouette, Ralph Lowry, Omari Norman, Aaron Shiffrin, and Jay Smale made key contributions to this report.

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