SMITHSONIAN TROPICAL RESEARCH INSTITUTE

	APPLICATION OF OPERATING RESOURCES							
	FEDERAL APPROPRIATIONS		GENERAL TRUST		DONOR/SPONSOR-DESIGNATED		GOV'T GRANTS & CONTRACTS	
	FTE	$000	FTE	$000	FTE	$000	FTE	$000
FY 2007 ACTUAL	244	12,482	17	950	39	4,901	18	1,134
FY 2008 ESTIMATE	248	12,405	13	879	33	5,599	14	916
FY 2009 ESTIMATE	248	12,677	13	880	33	5,950	12	520

STRATEGIC GOALS: INCREASED PUBLIC ENGAGEMENT; STRENGTHENED RESEARCH; AND ENHANCED MANAGEMENT EXCELLENCE

Federal Resource Summary by Performance Objective and Program Category

Performance Objective/ Program Category	FY 2008		FY 2009		Change	
	FTE	$000	FTE	$000	FTE	$000
Increased Public Engagement						
Public Programs						
Engage and inspire diverse audiences	7	301	7	308	0	7
Provide reference services and information	3	85	3	87	0	2
Strengthened Research						
Research						
Engage in research and discovery	109	7,111	109	7,267	0	156
Enhanced Management Excellence						
Facilities						
Execute an aggressive, long-range revitalization program and limited construction of new facilities	4	383	4	391	0	8
Implement an aggressive and professional maintenance program	21	986	21	1,008	0	22
Improve the overall cleanliness and efficient operation of Smithsonian facilities	22	529	22	541	0	12
Security and Safety						
Provide world-class protection for Smithsonian facilities, collections, staff, visitors, and volunteers	26	647	26	661	0	14
Provide a safe and healthy environment	2	117	2	120	0	3
Information Technology						
Modernize the Institution's information technology systems and infrastructure	6	309	6	316	0	7

Performance Objective/ Program Category	FY 2008		FY 2009		Change	
	FTE	$000	FTE	$000	FTE	$000
Management Operations						
Strengthen an institutional culture that is customer centered and results oriented	12	421	12	430	0	9
Ensure that the Smithsonian workforce is efficient, collaborative, committed, innovative, and diverse	8	452	8	462	0	10
Modernize the Institution's financial management and accounting operations	13	567	13	579	0	12
Enhance the reputation of the Smithsonian by maintaining good relations with the news media and with federal, state, and local governments	4	225	4	230	0	5
Modernize and streamline the Institution's acquisitions management operations	11	272	11	277	0	5
Total	**248**	**12,405**	**248**	**12,677**	**0**	**272**

BACKGROUND AND CONTEXT

The Smithsonian Tropical Research Institute (STRI) is the principal U.S. organization dedicated to advancing fundamental scientific discovery and understanding of biological diversity in the tropics and its contribution to human welfare. STRI plays a critical role for the U.S. Government and the Smithsonian by maintaining world-class research facilities in Panama where last year more than 1,000 resident and visiting scientists representing 44 states in the United States and 40 countries around the world accessed diverse tropical environments, including rain forest and coral reef ecosystems. STRI serves as official custodian for the Barro Colorado Nature Monument (BCNM) in Panama under the terms of the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, ratified by the U.S. Senate in April 1941. The BCNM is the only mainland tropical reserve under U.S. stewardship.

The long-term research conducted by STRI scientists and collaborators is a critical contribution to the Smithsonian Institution's strategic plan "Science Matters" set forth in 2005. The relevance, quality, and performance of STRI scientists is top tier, as evaluated biannually by a Visiting Committee of outside experts. In 2006, the Visiting Committee used National Research Council criteria to measure the productivity and impact of STRI science compared to 142 of the best university research departments in the United States; STRI scientists ranked first in all measures of scientific relevance (e.g., publication citations), quality (e.g., scientific honors), and productivity (e.g., publication numbers). In addition, the number of young scientists who choose STRI as the base for their graduate and postgraduate research training provides an annual measure of the relevance and quality of STRI science to the future of tropical biology and policy. FY 2007 marked the fifth year in a row that the number of

visiting scientists choosing to base their research at STRI has increased, in recent years by as much as 20 percent from the previous year.

As part of its core mission, STRI will begin to transform its network of tropical forest plots into a system of Smithsonian Institution Global Earth Observatories (SIGEO) to monitor the impact of climate change on carbon budgets, nutrient cycling, forest dynamics, and biodiversity in tropical and temperate forests, and to provide these objective and rigorous scientific data quickly via the World Wide Web to scientists, policy makers, and people around the world who need to make informed decisions. SIGEO will extend a well-established network of 20 research plots in 15 countries named the Center for Tropical Forest Science (CTFS), which is administered by STRI. STRI established the first CTFS/SIGEO plot in 1980 and since that time directs 7 FTEs and $608,000 per year in SI federal funds and more than $38 million from other federal and private sources toward the global network of Earth observatories. Each plot is managed in each country by one or more partner institutions and the SIGEO network involves hundreds of scientists from around the world.

Although tremendous advances in tropical forest research have resulted from more than 27 years of research, SIGEO can make an even larger contribution through monitoring the effects of anthropogenic increases in atmospheric CO_2 and general air pollution on tree growth and related biodiversity measures at local, regional, and global scales; extend its studies to the temperate zone; and, in addition to continuing its long-term monitoring of trees, begin standardized global censuses of key organismal indicators of environmental health. Efforts funded with private support will link climate change expertise across Smithsonian science units, such as the Smithsonian Environmental Research Center (SERC) and STRI, and, as funding becomes available, will also include the National Zoological Park's (NZP) Conservation and Research Center (CRC), the National Air and Space Museum (NASM), National Museum of Natural History (NMNH), and the Smithsonian Astrophysical Observatory (SAO) in a concerted effort to dramatically improve our understanding of the environment.

The FY 2009 budget estimate includes an increase of $272,000 for mandatory pay increases for existing staff funded under this line item.

MEANS AND STRATEGY

Smithsonian science aims to initiate the transformation of the STRI/CTFS network of tropical forest plots into a system of SI Global Earth Observatories (SIGEO) through a private-public partnership that will require, in the long term, an infusion of federal support to provide necessary continuity.

Future federal investment will be required to ensure that SIGEO can recruit the number and caliber of scientists required to provide long-term, reliable oversight of the network and data quality; make fundamental observations regarding the nature of forest change over time; and develop a predictive science capable of informing policy makers of the potential consequences for forests of global climate change and biodiversity loss. The need for these staff positions results from the success of the CTFS network, which has grown in global representation and in the sheer quantity of data collected, maintained, distributed, analyzed, and interpreted. Some of the new scientists will be responsible for the long-term quality, reliability, and consistency of the data across the different forest plots in the network. Other scientists will be responsible for maintaining the distributed network database and for developing the database tools, analytical approaches, and the predictive environmental science required to take full advantage of the SIGEO.

It is worth noting that the network is extremely well used by independent, university-associated faculty and network partners; thus, the SIGEO leverages huge intellectual horsepower. More than 200 scientists have published research from the CTFS data sets, attesting to the broad usability and benefits of the network. One measure of this effective leveraging is the large number of National Science Foundation (NSF) funded research projects based within the network. Also, Harvard and Yale universities have pledged $8 million, in addition to $10 million pledged from a single private donor, to support the network for the next five years, maintain partnerships with SIGEO, and strengthen the network's basic and social research programs. Initially, SIGEO will establish a Global Carbon Research Program to provide *in situ* measures of above- and below-ground carbon and its change over time in response to rising levels of carbon dioxide (CO_2). A recent publication by SIGEO scientists, using 25 years worth of data from two forest plots (Barro Colorado Island, Panama and Pasoh, Malaysia), has shown that, despite increased atmospheric carbon fertilization, the growth rates of tropical forest trees have decreased, perhaps in response to global warming. Objective long-term data from a global network of forest plots provide critical empirical data for modeling carbon dynamics in the future, and permit direct measurement of the effectiveness of efforts to reduce carbon emissions.

In FY 2009, SIGEO will expand the CTFS program to the temperate zone. Tropical and temperate forests are believed to behave differently with regard to carbon, owing to differences in seasonality and other climate factors. Currently, no temperate-zone forest plots follow the same methodology as the tropical plots but the SIGEO initiative will take advantage of long-term forest plot-associated research at SERC, located in the Chesapeake Bay watershed in Maryland, to quickly establish a series of large-scale temperate plots that will permit direct comparison to the forests in the tropical plot network.

Partnerships in temperate China and Europe are being developed to help expand temperate-tropical and temperate-temperate comparisons to a global scale. The Hong Kong Shanghai Bank (HSBC), a major donor, has recently formed a climate partnership with the Smithsonian and the environmental organization Earthwatch Institute to establish a regional training center on climate change at SERC. Furthermore, the National Zoo's Conservation and Research Center is currently a candidate as one of the National Ecological Observatory Network (NEON) sites, which provides a tremendous opportunity for cross-fertilization and synergy between SIGEO and NEON, which may lead to the establishment of forest plots at other NEON sites.

SIGEO will directly support the 2007 Administration Research and Development Environment priority to improve the nation's "ability to observe, model, assess, and adapt to impacts of climate change and to assure the availability of critical long-term climate data." The expanded methodology and objectives of SIGEO will ensure even better observation, data, and models in the future.

In the environmental sciences, the CTFS stands as one of the premier U.S.-led international partnerships, and SIGEO aims to integrate the SI network of forest dynamics plots with the U.S. Group on Earth Observations (USGEO) and toward implementation of an international Global Earth Observation System of Systems (GEOSS) to further advance the progress of science across borders. SIGEO contributes to fulfilling the strategic plan of the U.S. Climate Change Science Program (CCSP) and addressing its proposed FY 2009 priority of reducing scientific uncertainty about potential effects of climate change on ecosystems. The Smithsonian collaborates with the Environmental Protection Agency (EPA), United States Geological Survey (USGS), U.S. Department of Agriculture (USDA) Forest Service, the National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA) in the context of Global Earth Observatories. SIGEO promotes large-scale environmental monitoring and maintains enormous banks of data and metadata, which help galvanize advanced data networks and sophisticated analyses, extending from single forest plots to outer space.

STRATEGIC GOALS AND FY 2009 ANNUAL PERFORMANCE GOALS

Increased Public Engagement

Engage and inspire diverse audiences (7 FTEs and $308,000)

- Engage and inspire diverse audiences in a lifelong exploration and understanding of science through high-quality public programs at four STRI sites, and with tools based on the Institute's research, such as exhibits in Panama's Biodiversity Museum set to open in 2009
- Continue to provide *in situ* research training opportunities by increasing the number of postdoctoral fellowships and internships

Provide reference services and information to the public (3 FTEs and $87,000)

- Increase the amount of the scientific data available on the World Wide Web to make research results accessible to scientists, policy makers and the public
- Provide reference services and information derived from ongoing research to the public through the STRI library

Strengthened Research

Engage in research and discovery focused on biological diversity and human culture (109 FTEs and $7,267,000)

- Begin to transform the CTFS network monitoring forest dynamics at 20 sites in 15 nations into the system of SIGEO to develop a predictive science of global change and biodiversity
- Initiate experiments to quantify the ecosystem services provided by tropical forests (e.g., quality and quantity of water and carbon) in the Panama Canal watershed
- Use DNA-based studies to increase understanding of the ecology and evolution of forests with high biodiversity and their functional responses to climate change
- Begin to develop predictive models for the roles of temperate and tropical forests in the global carbon cycle and their likely impact on climate change
- Publish at least 250 books and scientific papers in peer-reviewed journals to share research results with the scientific community worldwide on the origins, maintenance, and loss of tropical biodiversity
- Facilitate tropical research for at least 900 visiting scientists and students working in STRI facilities, including projects funded by the NSF and the National Institutes of Health (NIH)
- Continue to strengthen the SI Marine Science Network collaborative projects on marine environments, such as on coral reefs and mangroves in the tropical eastern Pacific Ocean and Caribbean Sea,

to better understand their diversity, vulnerability, and conservation opportunities
- Build inter-unit, inter-agency, and international coalitions through collaborative projects, meetings, and workshops conducted at STRI facilities
- Take advantage of Panama Canal expansion work to obtain fossils that can allow STRI to reconstruct the diversity of plants and animals before, during, and after the rising of the Central American isthmus
- Continue archaeological research aimed at revealing the importance of prehistoric tropical societies in New World cultural development
- Develop improved understanding of human occupation in neotropical forests, from the first colonization 15,000 to 11,000 years ago

Enhanced Management Excellence

Execute an aggressive, long-range revitalization program and limited construction of new facilities (4 FTEs and $391,000)

- Continue to execute plans to revitalize Gamboa facilities as an integrated educational and research center that meets current safety and laboratory standards

Implement an aggressive and professional maintenance program (21 FTEs and $1,008,000)

- Advance structural assessment of STRI facilities to ensure their continued safe and effective use for tropical research and education

Improve the overall cleanliness and efficient operation of Smithsonian facilities (22 FTEs and $541,000)

- Conduct regular monitoring of all facilities, including buildings, vessels, vehicles, and docks, to ensure their safety and operational capacity to conduct ongoing research

Provide world-class protection for Smithsonian facilities, staff, visitors, and volunteers (26 FTEs and $661,000)

- Provide additional surveillance of contractors participating in the Panama Canal expansion, from the perspective of safety, security, and logistics, to ensure continued effective operations at the Barro Colorado Nature Monument

Provide a safe and healthy environment (2 FTEs and $120,000)

- Bring STRI facilities into compliance with recognized safety standards to ensure safety and protection of staff, visitors, volunteers, collections, infrastructure, and equipment

Modernize the Institution's information technology systems and infrastructure (6 FTEs and $316,000)

- Increase information-sharing within the Institute via improved connectivity between STRI facilities through the Local Area Network (LAN) system

Strengthen an institutional culture that is customer centered and results oriented (12 FTEs and $430,000)

- Increase internal customer satisfaction (i.e., STRI staff and visitors) by streamlining the acquisitions process and adopting the Enterprise Resource Planning (ERP) system for financial, budget, procurement, and human resources management

Ensure that the Smithsonian workforce is efficient, collaborative, committed, innovative, and diverse (8 FTEs and $462,000)

- Update the STRI local salary scale to attract and retain the best bilingual employees in a highly competitive market due to the improving local economic situation (e.g., growth of tourism and mega-projects)

Modernize the Institution's financial management and accounting operations (13 FTEs and $579,000)

- Advance modernization of financial management and accounting operations by continuing training and development of staff

Enhance the reputation of the Smithsonian by maintaining good relations with the news media and with federal, state, and local governments (4 FTEs and $230,000)

- Conduct targeted seminars and visits to research sites for journalists and policy makers to keep them informed about relevant research discoveries

Modernize and streamline the Institution's acquisitions management operations (11 FTEs and $277,000)

- Review current acquisition practices for cost effectiveness and client satisfaction, and propose alternatives adhering to established policies

NONAPPROPRIATED RESOURCES — General trust funds support salaries for a small percentage of STRI employees involved in research, public outreach, and fund raising. Donor/sponsor-designated funds support specific programs and projects to investigate key indicators of global environmental health. Donor-designated support includes an endowed staff position in tropical paleoecology that studies past climates and environments in the tropics, postdoctoral positions that study the relationship between brain size and behavioral complexity, and postdoctoral fellowships in tropical marine biology, using STRI's Bocas del Toro field station.

Government grants and contracts support programs such as the Panama International Cooperative Biodiversity Group (ICBG), funded by the NIH and administered by STRI, which conducts innovative biomedical research and training, and monitors wildlife that could be carriers of avian influenza and other animal-borne diseases.