BUDGET JUSTIFICATIONS

The United States
Department of the Interior

and Performance Information
Fiscal Year 2012

U.S. GEOLOGICAL SURVEY

NOTICE: These budget justifications are prepared for the Interior, Environment and Related Agencies Appropriations Subcommittees. Approval for release of the justifications prior to their printing in the public record of the Subcommittee hearings may be obtained through the Office of Budget of the Department of the Interior.

U.S. GEOLOGICAL SURVEY
FY 2012 BUDGET JUSTIFICATION

TABLE OF CONTENTS

Organization
Organization Chart v
Acronyms vi
Program Abbreviations xviii

A – General Statement
Table: Total 2012 Budget Request A-1
Table: FTEs A-1
Introduction A-1
The USGS 2012 Budget Request A-3
Technical Adjustments A-4
Accountable Government Initiative (Administrative Cost Savings) A-4
Real Property Cost Savings and Innovation Plan A-5
Funding for 2012 Fixed Costs Increases A-5
Government Wide Initiatives A-5
Tribal Consultation A-5
Strategic Plan A-5
Department Crosscuts A-6
Secretarial Initiatives A-7
Priority Goals A-8
Climate Change Adaptation A-8
Youth in the Great Outdoors A-9
Response to the Deepwater Horizon Oil Spill A-11
Research and Development A-11
Addressing National Science and Technology Priorities A-11
Ensuring the Quality of USGS Science Programs A-14
Partnerships that Foster Innovation and Leverage Resources A-15

B – Science Strategy Realignment
Background B-1
Management Alignment B-2
USGS Organization Chart B-3
Budget Structure Alignment B-4
Table: Budget Structure Alignment B-5
Table: Budget Structure Crosswalks B-6
Geographic Research, Investigations, and Remote Sensing (Geography) B-7
Geologic Hazards, Research, and Processes (Geology) B-8
Water Resources Investigations (Water) B-9
Biological Research (Biology) B-10
Enterprise Information B-11
Global Change B-12
Science Support B-13
Facilities B-13

C – Goal Performance Information
Updates to Performance Measures C-1
Updates to Performance Targets C-1
2012 Goal Performance Table C-3

D – Key Changes
National Land Imaging D-1
Ecosystem Restoration D-5
Program Overview D-6
Chesapeake Bay D-7
Columbia River D-9
Great Lakes D-12
Puget Sound D-14
Upper Mississippi River D-16
Enterprise Publishing Network D-19

E – 2012 Budget at a Glance
2012 Budget at a Glance Table E-1
Program Increases E-7
Program Decreases E-13
Related Changes and Technical Adjustments E-23

F – USGS Accounts
Analysis by Account and Activity F-1
Surveys, Investigations, and Research
Appropriation Language F-2
Appropriation Language and Citations F-3
Expiring Authorizations F-8
Administrative Provisions Language F-9
Justification of Proposed Administrative Provisions Language Change F-10
Administrative Provisions Language and Citations F-11
Summary of Requirements F-14
Details for Fixed Costs & Related Changes and Administrative Cost Savings F-16
National Land Imaging
Appropriation Language F-20
Appropriation Language and Citations F-20
Summary of Requirements F-21
Details for Fixed Costs & Related Changes and Administrative Cost Savings F-22
USGS Justification of Fixed Costs and Related Changes F-24

G – Regional and Crosscutting Activities
2012 Regional Management G-1
On the Landscape G-2
Interior Crosscuts G-2

H – Ecosystems
Activity Summary H-1
Status and Trends Subactivity H-7
Fisheries: Aquatic and Endangered Resources Subactivity H-11
Wildlife: Terrestrial and Endangered Resources Subactivity H-17
Terrestrial, Freshwater, and Marine Environments Subactivity H-23
Invasive Species Subactivity H-27
Cooperative Research Units Subactivity H-31

I – Climate and Land Use Change
Activity Summary I-1
Climate Variability
National Climate Change and Wildlife Science Center/DOI Climate Science Centers . I-11
Climate Research and Development I-17
Carbon Sequestration I-23
Science Support for DOI Bureaus I-27
Land Use Change
Land Remote Sensing I-31
Geographic Analysis and Monitoring I-37

J – Energy, Minerals, and Environmental Health
Activity Summary J-1
Mineral Resources Subactivity J-9
Energy Resources Subactivity J-15
Contaminant Biology Subactivity J-27
Toxic Substances Hydrology Subactivity J-31

K – Natural Hazards
Activity Summary K-1
Earthquake Hazards Subactivity K-9
Volcano Hazards Subactivity K-21
Landslide Hazards Subactivity K-27
Global Seismographic Network Subactivity K-31
Geomagnetism Subactivity K-35
Coastal and Marine Geology Subactivity K-39

L – Water Resources
Activity Summary L-1
Groundwater Resources Program Subactivity L-11
National Water Quality Assessment Program Subactivity L-17
National Streamflow Information Program Subactivity L-23
Hydrologic Research and Development Subactivity L-27
Hydrologic Networks and Analysis Program Subactivity L-31
Cooperative Water Program Subactivity L-35
Water Resources Research Act Program Subactivity L-39

M – Core Science Systems
Activity Summary M-1
Biological Information Management and Delivery Subactivity M-9
National Geological and Geophysical Data Preservation Program Subactivity M-15
National Cooperative Geologic Mapping Subactivity M-17
National Geospatial Program Subactivity M-23

N – Administration and Enterprise Information
Activity Summary N-1
Science Support Subactivity N-5
Security and Technology Subactivity N-15
Information Resources Subactivity N-25

O – Facilities
Activity Summary O-1
Rental Payments and Operations and Maintenance Subactivity O-5
Deferred Maintenance and Capital Improvements Subactivity O-9
Construction O-23

P – National Land Imaging
Activity Summary P-1

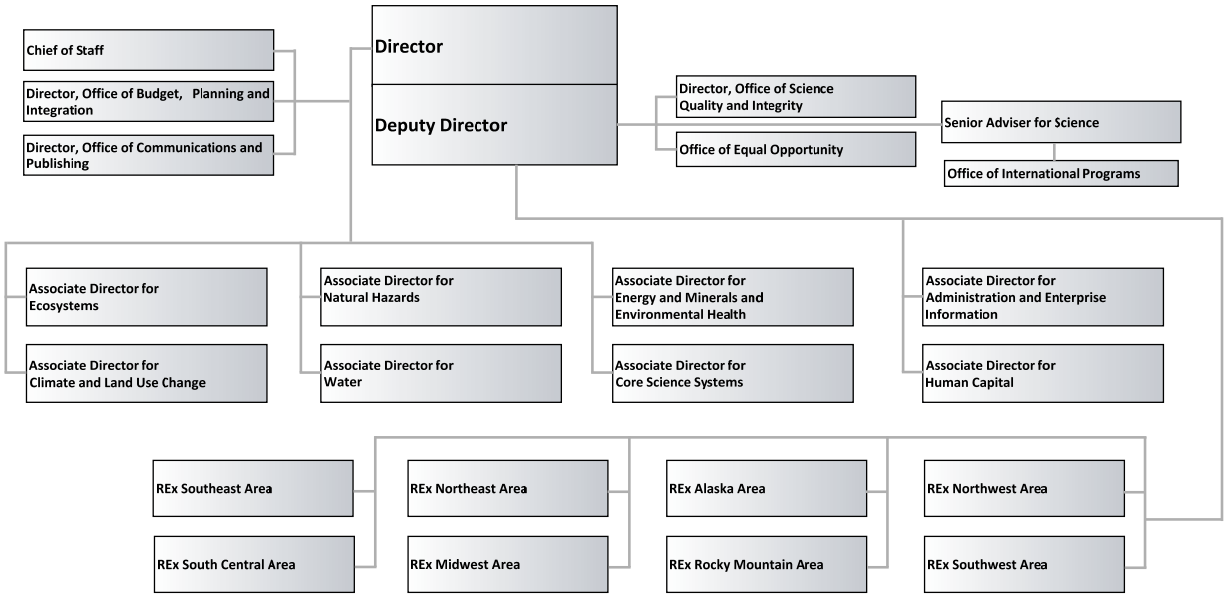
Q – Working Capital Fund
Working Capital Fund Overview Q-1
Appropriation Language and Citations Q-4
Program and Financing Q-6
Balance Sheet Q-7
Object Classification Q-8
Employment Summary Q-8

R – Account Exhibits
Surveys, Investigations, and Research
Summary of Requirements by Object Class R-1
Program and Financing R-3
Object Classification R-5
Employment Summary R-7
National Land Imaging
Summary of Requirements by Object Class R-8
Program and Financing R-9
Object Classification R-10
Employment Summary R-10

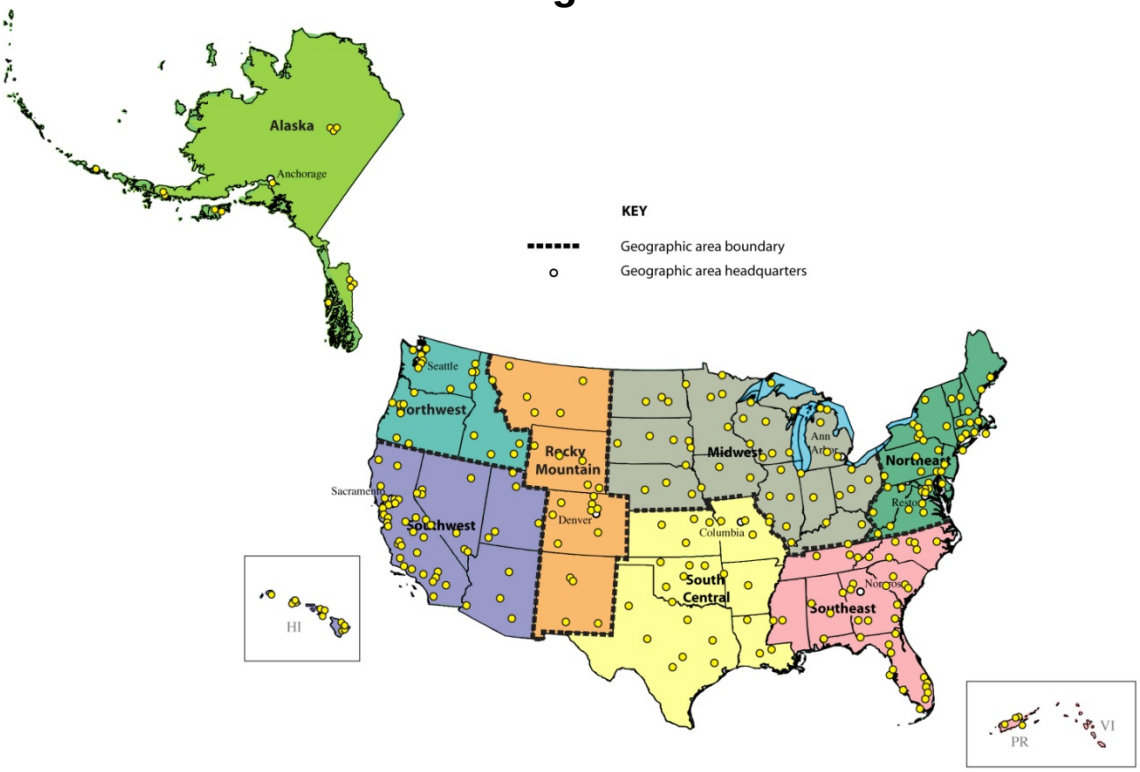
S –Sundry Exhibits
Funding of U.S. Geological Survey Programs (Obligations) S-1
Contributed Funds S-16
Employee Count by Grade S-18
Mandatory Budget and Offsetting Collection Proposals S-19
Program/Project Support of Bureau, Department, and Government Wide Costs S-20

T – Authorizations
Authorizations T-1

U.S. Geological Survey



USGS Regional Structure



Alphabetical List of Acronyms

AAAS	American Association for the Advancement of Science
AAPG	American Association of Petroleum Geologists
ABC	Activity-Based Costing
ABC/M	Activity-Based Costing/Management
ABP	Asset Business Plan
ACI	American Competitive Initiative
ACP	Arctic Coastal Plain
ACWI	Advisory Committee on Water Information
ADA	Americans with Disabilities Act
AFS	American Fisheries Society
AFWA	U.S. Air Force Weather Agency
AMD	Aviation Management Directorate
AMP	Asset Management Plan
AMWG	Adaptive Management Work Group
ANS	Alaska North Slope
ANS	Aquatic Nuisance Species
ANSS	Advanced National Seismic System
ANWR	Arctic National Wildlife Refuge
APHIS	Agricultures Animal and Plant Health Inspection Service
API	Asset Priority Index
APS	Administration and Policy Services
AR	Accounts Receivable
ARMI	Amphibian Research and Monitoring Initiative
ARRA	American Recovery and Reinvestment Act
ASC	Alaska Science Center
ASIWPCA	Association of State and Interstate Water Pollution Control Administrators
AVHRR	Advanced Very High Resolution Radiometer
AVO	Alaska Volcano Observatory
AWiFS	Advanced Wide Field Sensor
BASIS+	Budget and Science Information System
BBL	Bird Banding Laboratory
BBS	Bird Breeding Survey
BEN	Balkan Endemic Nephropathy
BF&E	Budget Formulation and Execution Team
BGN	Board of Geographic Names
BIA	Bureau of Indian Affairs
BIMD	Biological Information Management and Delivery
BIS	Commerce - Bureau of Industry and Security
BLM	Bureau of Land Management
BLT	Business Leaders Team
BMPs	Best Management Practices
BNP	Biscayne National Park
BOR	Bureau of Reclamation
BPC	Bureau Program Council
BPXA	BP Exploration (Alaska)
BRD	Biological Resources Discipline
BRM	Biological Research and Monitoring
BSR	Business Strategy Review
CA	Condition Assessment

CAC	Civil Applications Committee
CALFED	California Federal (Bay-Delta Authority program)
CAP	Cooperative Agreements Program
CARA	Circum-Arctic Resource Appraisal
C&A	Certification and Accreditation
CC	Cost Center
CBERS	China/Brazil Earth Resources Satellite
CBLCM	Chesapeake Bay Land Cover Management
CBM	Coal bed Methane
CBP	Chesapeake Bay Program
CCI	Collaborative Communications Infrastructure
CCOAT	Coast Chesapeake Online Assessment Tool
CCSP	U.S. Climate Change Science Program
CDC	Centers for Disease Control and Prevention
CDR	Critical Design Review
CDI	Council for Data Integration
CEN	Climate Effects Network
CENR	Committee on Environment and Natural Resources
CEAP	Conservation Effects Assessment Project
CEGIS	Center of Excellence for Geographic Information Science
CEOS	Committee on Earth Observation Satellites
CEQ/NSTC	Council on Environmental Quality/National Science and Technology Council
CERC	Columbia Environmental Research Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERP	Comprehensive Everglades Restoration Plan
CESU	Cooperative Ecosystems Study Unit
CFO	Chief Financial Officer
CISN	California Integrated Seismic Network
CITES	Conventional on International Trade in Endangered Species
CMG	Coastal and Marine Geology
CMGP	Coastal and Marine Geology Program
CMSP	Coastal and Marine Spatial Planning
CNS	Central portion of the North Slope
CO_2	Carbon Dioxide
COAST	Chesapeake Online Adaptive Support Toolkit
CoML	U.S. National Committee for the Census of Marine Life
CORE	Committee on Resource Evaluation
CPIC	Capital Planning and Investment Control
CR	Central Region
CRADA	Cooperative Research and Development Agreement
CRSSP	Commercial Remote Sensing Space Policy
CRTF	Coral Reef Task Force
CRU	Cooperative Research Units
CRUISE	Columbia River USGS Integrated Science Explorer
CRV	Current Replacement Value
CRWA	Charles River Watershed Association
CSIRC	Computer Security Incident Response Capability
CSMP	California Seafloor Mapping Program
CSRS	Civil Service Retirement System
CTBTO	Comprehensive Test Ban Treaty Organization

CTM	Cooperative Topographic Mapping
CUES	Comprehensive Urban Ecosystems Studies
CUSEC	Central United States Earthquake Consortium
CVJV	Central Habitat Joint Venture
CVO	Cascades Volcano Observatory
CWD	Chronic Wasting Disease
CWP	Cooperative Water Program
CWS	Canadian Wildlife Service
DCIA	Debt Collection Improvement Act
DEM	Digital Elevation Model
DEP	[State] Department of Environmental Protection
DEQ	[State] Department of Environmental Quality
DFRs	Departmental Functional Reviews
DGH	Indian Directorate General of Hydrocarbons
DHS	Department of Homeland Security
DiGIR	Distributed Generic Information Retrieval
DMC	Data Management Center
DMC	Disaster Monitoring Constellation
DMCI	Deferred Maintenance and Capital Improvements
DNR	Department of Natural Resources
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOGAMI	Oregon Department of Geology and Mineral Industries
DPAS	Data Processing and Archiving
DRAGON	Delta Research and Global Observation Network
DROT	Drift River Oil Terminal
DRTO	Dry Tortugas National Park
DSS	Decision Support System
EA	Enterprise Architecture
EAD	Enterprise Active Directory
EAL	Energy Analytical Laboratory
ECMs	Energy Conservation Measures
ECO	Energy Conserving Opportunities
ECS	[U.S.] Extended Continental Shelf
EDCs	Endocrine Disrupting Chemicals
EDEN	Everglades Depth Estimation Network
EDMAP	Education Mapping Program (in National Cooperative Geologic Mapping Program)
EDRR	Early Detection, Rapid Assessment and Response
EEOC	Equal Employment Opportunity Commission
EFT	Electronic Funds Transfer
EGIM	Enterprise Geographic Information Management
EGS	Enhanced Geothermal Systems
EHP	Earthquake Hazards Program
EHP	Enterprise Hosting Platform
EI	Enterprise Information
EIR	Enterprise Information Resources
EISA	Energy Independence and Security Act of 2007
EIS&T	Enterprise Information Security and Technology
ELA	Enterprise License Agreement
ELT	Executive Leadership Team

EMS	Environmental Management System
E.O.	Executive Order
EOL	Encyclopedia of Life
EOP	Executive Office of the President
EPA	U.S. Environmental Protection Agency
EPCA	Energy Policy and Conservation Act of 2000
EPM	Ecosystem Portfolio Model
EPN	Enterprise Publishing Network
ER	Eastern Region
ERA	E-Risk Assessment
ERAS	eRemote Access Services
EROS	Earth Resources Observation and Science
ERP	Energy Resources Program
ESD	Earth Surface Dynamics
ESI	Environmental Sensitivity Index
ESN	Enterprise Services Network
ESRI	Environmental Systems Research Institute
ET	Evapotranspiration
ETM+	Enhanced Thematic Mapper Plus
EVMS	Earned Value Management System
FAA	Federal Aviation Administration
FAC	Federal Advisory Committee
FACA	Federal Advisory Committee Act
FAER	Fisheries: Aquatic and Endangered Resources
FASAB	Federal Accounting Standards Advisory Board
FBAT	Facilities Budget Allocation Team
FBMS	Financial Business Management System
FBWT	Fund Balance with Treasury
FCI	Facilities Condition Index
FEA	Federal Enterprise Architecture
FECA	Federal Employee Compensation Act
FEDMAP	Federal lands Mapping Program (in National Cooperative Geologic Mapping Program)
FEGLI	Federal Employees Group Life Insurance
FEHB	Federal Employees Health Benefit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act of 1996
FFS	Fire and Fire Surrogate
FGDC	Federal Geographic Data Committee
FICA	Federal Insurance Contributions Act
FICMNEW	Federal Interagency Committee for the Management of Noxious and Exotic Weeds
FISC	Florida Integrated Science Center
FISMA	Federal Information Security Management Act
FMT	Field Managers Team
FMFIA	Federal Managers' Financial Integrity Act of 1982
FMMS	Facilities Maintenance Management System
FOS	Flight Operations Segment
FOT	Flight Operations Team
FRAMES	Fire Research and Management Exchange System

FRB	Federal Reserve Board
FRPC	Federal Real Property Council
FRPP	Federal Real Property Profile
FSA	Farm Service Agency
FSAM	Federal Segment Architecture Methodology
FTE	Full-Time Equivalent
FWS	U.S. Fish and Wildlife Service
GAAP	Generally Accepted Accounting Principles
GAM	Geographic Analysis and Monitoring Program
GAP	Gap Analysis Program
GAO	Government Accountability Office
GBIP	Great Basin Information Project
GBIS	Global Biodiversity Information Facility
GCDAMP	Glen Canyon Dam Adaptive Management Program
GC-IMS	Global Change-Information Management System
GCP	Global Change Program
GCMRC	Grand Canyon Monitoring and Research Center
GEO	Group on Earth Observations
GEODE	GEO-Data Explorer
GeoMAC	Geospatial Multi-Agency Coordination Group
GEOSS	Global Earth Observation System of Systems
GFDL	Geophysical Fluid Dynamics Laboratory
GFL	Global Fiducials Library
GIO	Geographic Information Office
GIRT	Geospatial Information Response Team
GIS	Geographic Information System
GLS	Global Land Survey
GLSC	Great Lakes Science Center
GNIS	Geographic Names Information System
GOES	Geostationary Operational Environmental Satellites
GOS	Geospatial One-Stop
GPRA	Government Performance and Results Act
GRB	Green River Basin
GHG	Greenhouse Gas
GPS	Global Positioning System
GPSC	Geospatial Products and Services Contract
GSA	General Services Administration
GS-FLOW	Groundwater and Surface-water flow model
GSN	Global Seismographic Network
GWRP	Ground-Water Resources Program
HAZUS	Federal Emergency Management Agency’s Earthquake Loss Estimation Program
HBN	USGS Hydrologic Benchmark Network
HDOA	Hawaii Department of Agriculture
HDR	High-Data Rate Radio
HEDDS	Highly Pathogenic Avian Influenza Early Detection Data System
HDDS	Hazards Data Distribution System
HHS	Department of Health and Human Services
HIF	Hydrologic Instrumentation Facility
HLI	Healthy Lands Initiative
HNA	Hydrologic Networks and Analysis Program

HPO	High Performing Organization
HPPG	High Priority Performance Goal
HR	Human Resources
HR&D	Hydrologic Research and Development Program
HRS	Helibourne electromagnetic Surveys
HSPD -12	Homeland Security Presidential Directive 12
HUD	US Department of Housing and Urban Development
HVO	Hawaii Volcano Observatory
HWATT	Hemlock Woolly Adelgid Action Team
I&M	Inventory and Monitoring – NPS
IAGA	International Association of Geomagnetism and Aeronomy
ICAO	International Civil Authorization Organization
ICL	International Consortium on Landslides
ICRP	Internal Control Review Plan
ICWP	Interstate Council on Water Policy
IDWR	Idaho Department of Water Resources
IEAM	Integrated Environmental Assessment and Management
IGPP	Institute for Geophysics and Planetary Physics
IIE	Integrated Information Environment
ILM	Integrated Landscape Monitoring
IOOS	Integrated Ocean and coastal Observing System
IP	Investment Plan
IPCC	Intergovernmental Panel on Climate Change
IPDS	Information Product Data System
IRB	Investment Review Board
IRIS	Incorporated Research Institutions for Seismology
IRS	Indian Remote Sensing Satellite
InSAR	Interferometric Synthetic Aperture Radar
ISO	International Organization for Standardization
ISSP	Information Security Strategic Plan
IT	Information Technology
ITAP	Invasive Terrestrial Animals and Plants
ITILOB	Information Technology Infrastructure Line of Business
ITIS	Integrated Taxonomic Information System
ITSOT	IT Security Operations Team
ITSSC	IT Security Steering Committee
IUCN	International Union for the Conservation of Nature
IUCN	International Union of Conservation Nations
JFA	Joint Funding Agreement
JV	Joint Venture Partnerships
KSF	Thousand Square Feet
LAS	Local Action Strategy
LCAT	Land Cover Analysis Tool
LCC	Landscape Conservation Cooperatives
LDCM	Landsat Data Continuity Mission
LDGST	Landsat Data GAP Study Team
LEAG	Long-term Estuary Assessment Group
LHP	Landslide Hazards Program
LiDAR	Light Detecting and Ranging
LIFE	NBII Library of Images from the Environment

LIMA	Landsat Image Mosaic of Antarctica
LMV	Lower Mississippi Valley
LMVJV	Lower Mississippi Valley Joint Venture Office
LOA	Level of Authentication
LRS	Land Remote Sensing
LST	Landsat Science Team
LTRMP	Long-Term Resource Monitoring Program
LTWG	Landsat Technical Working Group
LUPM	Land Use Portfolio Model
MARCO	Mid-Atlantic Research Consortium for Oceanography
MBTU	Million British thermal units
MD	Management Directive
MEO	Most Effective Organization
METRIC	Mapping EvapoTranspiration with high Resolution and Internalized Calibration
MHDP	Multi-Hazards Demonstration Project
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MOC	Mission Operations Center
MODIS	Moderate Resolution Imaging Spectroradiometer
MODFLOW	Modular Ground-Water Flow Model
MOU	Memorandum of Understanding
MRBI	Mississippi River Basin Healthy Watersheds Initiative
MRDS	Mineral Resources Data System
MRERP	Mineral Resources External Research Program
MRLC	Multi-Resolution Land Characteristics Consortium
MRP	Mineral Resources Program
MSCP	Multi-Species Conservation Program
MSH	Mount St. Helens
MSS	Multi Spectral Scanner
MTBE	Methyl Tert-Butyl Ether
MTBS	Monitoring Trends in Burn Severity
MUSIC	MIT-USGS Science Impact Collaborative
MW	Megawatt
MWE	Megawatt electric
NABCI	North American Bird Conservation Initiative
NACO	National Association of Counties
NADP	National Atmospheric Deposition Program
NANPCA	Non-indigenous Aquatic Nuisance Prevention and Control Act
NARA	National Archives and Records Administration
NAS	National Academy of Sciences
NAS	USGS National Non-indigenous Aquatic Species Database
NASA	National Aeronautics and Space Administration
NASQAN	National Stream Quality Accounting Network
NAWQA	National Water-Quality Assessment
NBC	Department of the Interior – National Business Center
NBII	National Biological Information Infrastructure
NCAR	National Center for Atmospheric Research
NCAP	National Civil Applications Program
NCCWSC	National Climate Change and Wildlife Science Center
NCDE	Northern Continental Divide Ecosystem

NCEP/NOAA	National Centers for Environmental Prediction
NCGMP	National Cooperative Geologic Mapping Program
NCIA	National Competitiveness Investment Act
NCPP	USGS National Coastal Program Plan
NCRDS	National Coal Resources Data System
NDMC	National Drought Mitigation Center
NDOP	National Digital Orthoimagery Program
NED	National Elevation Dataset
NEHRP	National Earthquake Hazards Reduction Program
NEIC	National Earthquake Information Center
NEON	National Ecological Observatory Network
NEPA	National Environmental Policy Act
NEST	National Environmental Status and Trends
NETL	National Energy Technology Laboratory
NFHAP	National Fish Habitat Action Plan
NGA	National Geospatial-Intelligence Agency
NGAC	National Geospatial Advisory Committee
NGGDPP	National Geological and Geophysical Data Preservation Program
NGIC	National Geomagnetic Information Center
NGMDP	National Geologic Map Database Project
NGO	Nongovernmental organization
NGP	National Geospatial Program
NGTOC	National Geospatial Technical Operations Center
NGWMN	National Ground Water Monitoring Network
NHD	National Hydrography Dataset
NHWC	National Hydrologic Warning Council
NIEHS	National Institute of Environmental Health Sciences
NIFC	National Interagency Fire Center
NIH	National Institute of Health
NISC	National Invasive Species Council
NIISS	National Institute for Invasive Species Science
NISMP	National Invasive Species Management Plan
NIST	National Institute of Standards and Technology
NIWR	National Institutes for Water Resources
NLC	National League of Cities
NLCD	National Land Cover Database
NLIC	National Landslide Information Center
NLIP	National Land Imaging Program
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NORTHCOM	U.S. Northern Command
NOSC	National Operations and Security Center
NPN	National Phenology Network
NPRA	National Petroleum Reserve Alaska
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
NRIS	Natural Resource Information System
NRC	National Research Council
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service

NRMP	National Resource Monitoring Partnership
NROC	Northeast Regional Ocean Council
NRP	National Research Program (research organization in USGS Water discipline)
NRPP	National Resource Preservation Program
NSDI	National Spatial Data Infrastructure
NSF	National Science Foundation
NSGIC	National States Geographic Information Council
NSIP	National Streamflow Information Program
NSLRSDA	National Satellite Land Remote Sensing Data Archive
NSMP	National Strong Motion Program
NSPD	National Space Policy
NSTC	National Science and Technology Council
NSVRC	Northern Shenandoah Valley Regional Commission
NTN	National Trends Network
NVCS	National Vegetation Classification Standard
NVEWS	National Volcano Early Warning System
NWAVU	National Water Availability and Use Assessment
NWHC	National Wildlife Health Center
NWIS	National Water Information System
NWQL	National Water Quality Laboratory
NWQMN	National Water Quality Monitoring Network
NWS	National Weather Service
O&M	Operations and Maintenance
OAFM	USGS Office of Accounting and Financial Management
OAG	USGS Office of Acquisition and Grants
OAP	Ocean Action Plan
OBIS	Ocean Biogeographic Information System
OBIS	USGS Office of Business Information Systems
OBP	USGS Office of Budget and Performance
OC	USGS Office of Communications
OEPC	Office of Environmental Policy and Compliance
OES	Office of Emergency Services
OFDA	Office of Foreign Disaster Assistance
OFEE	Office of the Federal Environmental Executive
OFR	Open-File Report
OGC	Open Geospatial Consortium
OHC	USGS Office of Human Capital
OIA	Office of Insular Affairs
OICR	USGS Office of Internal Control and Reporting
OIG	Office of the Inspector General
OGDB	Organic Geochemistry Database
OLI	Operational Land Imager
OMB	Office of Management and Budget
OMS	USGS Office of Management Services
OPA	USGS Office of Policy and Analysis
OPM	Office of Personnel Management
ORPP	Ocean Research Priority Plan
ORPPIS	Ocean Research and Priorities Plan and Implementation Strategy
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining

OSTP	Office of Science and Technology Policy
OWRS	Office of Western Regional Services
PAGER	Prompt Assessment of Global Earthquakes for Response
PAR	Performance and Accountability Report
PBO	Plate Boundary Observatory
PBX	Private Branch eXchange
PCR	Polymerase Chain Reaction
PDA	Personal Digital Assistant
PDF	Portable Document Format
PDR	Preliminary Design Review
PES	Priority Ecosystem Science
PFM	(Department) Office of Financial Management
PI	Principal Investigator
PII	Personally Identifiable Information
PIP	Performance Improvement Plan
PIP	Program Improvement Plan
PMO	Project Management Office
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
POA&M	Plan of Action and Milestone
PP&E	Property, Plant, and Equipment
PPM	Planning Performance Management
P&PM	Planning and Performance Management Team
PRB	Powder River Basin
PSNER	Puget Sound Near Shore Ecosystem Restoration
PSS	Perimeter Security Standard
PTWC	Pacific Tsunami Warning Center
PWRC	Patuxent Wildlife Research Center
QOL	Quality of Life
R&D	Research and Development
RASA	Regional Aquifer-System Analysis
RCCRC	Regional Climate Change Response Centers
RCM	Regional Climate Models
RCOOS	Regional Coastal Ocean Observing Systems
REE	Rare Earth Elements
REMS	River Ecosystem and Modeling Science
RFP	Request for Proposal
RGIO	Regional Geospatial Information Office®
RIF	Reduction in Force
RIM	River Input Monitoring Program
RISA	Regional Integrated Science and Assessments – NOAA
RPM	Real Property Management System
RSAC	Remote Sensing Application Center
RSSC	Reston Supply Service Center
RSSI	Required Supplementary Stewardship Information
RTS	Reports Tracking System (Water Resources)
R/V	Research Vessel
RWRPC	Regional Water Resources Policy Committee
S&T	USGS Status and Trends of Biological Resources program
SAC	USGS Science Advisory Council
SAFOD	San Andreas Fault Observatory at Depth

SAIN	Southern Appalachian Information Node
SAP	Synthesis and Assessment Product
SAR	Synthetic Aperture Radar
SAUS	Storage Assessment Units
SBFD	San Francisco Bay and freshwater delta
SBSP	South Bay Salt Pond Restoration Project
SCEC	Southern California Earthquake Center
SCR	System Concept Review
SDI	Spatial Data Infrastructures
SDR	Subcommittee for Disaster Reductions
SDRT	Supervisory Development Review Team
SES	Senior Executive Service
SETAC	Society of Environmental Toxicology and Chemistry
SFBD	San Francisco Bay Delta
SFWMD	South Florida Water Management District
SHC	Strategic Habitat Conservation
SLC	Scan Line Corrector
SGL	Standard General Ledger
SIR	Surveys, Investigations, and Research
SOGW	Subcommittee of Ground Water
SoIVES	Social Values for Ecosystem Services
SOW	Statement of Work
SPARROW	Spatially Referenced Regressions on Watershed Attributes
SPOC	Security Point of Contact
SPOT	Satellite Pour L'Observation de la Terre
SPRESO	South Pole Remote Earth Science Observatory
SRR	Systems Requirement Review
SRTM	Shuttle Radar Topographic Mission
SSRIs	Selective Seronin Reuptake Inhibitors
STATEMAP	State Mapping Program (in Cooperative Geologic Mapping Program)
STIG	Security Technical Implementation Guides
SWAQ	Subcommittee on Water Availability and Quality
SWPC	Space Weather Prediction Center
TAA	Technical Assistance Agreements
TANC	Transport of Anthropogenic and Natural Contaminants
TCOM	Tahoe Constrained Optimization Model
TDWG	Biodiversity Information Standards
TIC	Trusted Internet Connection
TIRS	Thermal Infrared Sensor
TM	Thermatic Mapper
TMDL	Total Maximum Daily Loads (Clean Water Act requirement)
TRIGRS	Transient Rainfall Infiltration and Grid-Based Regional Slope-Stability Analysis
TRIP	The Road Indicator Project
TROR	Treasury Report on Receivables
TRPA	Tahoe Regional Planning Agency
TSP	Thrift Savings Plan
UAS	Unmanned Aerial Systems
UHM	University of Hawaii-Manoa
UIC	Underground Injection Control
URISA	Urban and Regional Information System Association

U.S.	United States
USACE	U.S. Army Corps of Engineers
USAID	U.S. Agency for International Development
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USFS	U.S. Forest Service
USGCRP	U.S. Global Change Research Program
USGEO	U.S. Group on Earth Observations
USGS	U.S. Geological Survey
UMESC	Upper Midwest Environmental Services Center
USNG	United States Nation Grid
VANS	Volcano Activity Notices
VBNS	Very Broadband Network Services
VCP	Vegetation Characterization Program
VDAP	Volcano Disaster Assistance Program
Veg	Vegetation Characterization
VegDRI	Vegetation Drought Response Index
VHP	Volcano Hazards Program
VHSV	Viral Hemorrhagic Septicemia Virus
VOIP	Voice over IP Systems
VONA	Volcano Observatory Notifications for Aviation
VSIP/VERA	Voluntary Separation Incentive Payment/Voluntary Early Retirement Authority
WAN	Wide Area Network
WCCI	Wyoming Cooperative Conservation Initiative
WCF	Working Capital Fund
WCMC	UNEP-World Conservation Monitoring Center
WFRC	Western Fisheries Research Center
WLCI	Wyoming Landscape Conservation Initiative
WNS	White-Nose Syndrome
WNV	West Nile Virus
WPA	World Petroleum Assessment 2000
WR	Western Region
WRD	Water Resources Discipline
WRIR	Water Resources Investigation Report
WRRA	Water Resources Research Act
WRRIs	[State] Water Resources Research Institutes
WSC	[USGS State] Water Science Center
WSWC	Western States Water Council
WTER	Wildlife: Terrestrial and Endangered Resources
WUI	Wildland-Urban Interface
YMP	Yucca Mountain Program
YVO	Yellowstone Volcano Observatory

Activity/Subactivity/Program Element	Program Abbreviation used in Summary of Program Change
Appropriation: Surveys, Investigations, and Research	**SIR**
ECOSYSTEMS	
Status and Trends	Status & Trends
Fisheries: Aquatic & Endangered Resources	Fisheries
Wildlife: Terrestrial & Endangered Resources	Wildlife
Terrestrial, Freshwater & Marine Environments	Environments
Invasive Species	Invasive Species
Cooperative Research Units	CRU
CLIMATE AND LAND USE CHANGE	
Climate Variability	
National Climate Change and Wildlife Science Center/DOI Climate Science Centers	NCCWSC/DOI CSCs
Research and Development	CR&D
Carbon Sequestration	Carbon
Science Support for DOI Bureaus	SS for DOI
Land Use Change	
Land Remote Sensing	LRS
Geographic Analysis and Monitoring	GAM
ENERGY, MINERALS, AND ENVIRONMENTAL HEALTH	
Mineral Resources	Minerals
Energy Resources	Energy
Contaminant Biology	Contaminants
Toxic Substances Hydrology	Toxics
NATURAL HAZARDS	
Earthquake Hazards	Earthquakes
Volcano Hazards	Volcanoes
Landslide Hazards	Landslides
Global Seismographic Network	GSN
Geomagnetism	Geomag
Coastal and Marine Geology	Coastal & Marine
WATER RESOURCES	
Groundwater Resources	Groundwater
National Water Quality Assessment	NAWQA
National Streamflow Information Program	NSIP
Hydrologic Research and Development	HR&D
Hydrologic Networks and Analysis	HNA
Cooperative Water Program	Coop
Water Resources Research Act Program	WRRA
CORE SCIENCE SYSTEMS	
Biological Information Management and Delivery	BIMD
Nat'l Geological & Geophysical Data Preservation Program	NGGDPP
National Cooperative Geologic Mapping	NCGMP
National Geospatial Program	NGP

ADMINISTRATION AND ENTERPRISE INFORMATION	
Science Support	Science Support
Security and Technology	Security & Technology
Information Resources	Information Resources
FACILITIES	
Rental Payments and Operations & Maintenance	Rent & O&M
Deferred Maintenance and Capital Improvement	DMCI
Construction	Construction
Appropriation: National Land Imaging	**NLI**
NATIONAL LAND IMAGING	**NLI**

This page intentionally left blank.

General Statement

Total 2012 Budget Request

(Dollars in Thousands)

Budget Authority	2010 Enacted	2010 Enacted/ 2011 CR	2012 Budget Request	Inc (+) / Dec (-) from 2011
Discretionary - SIR	1,111,740	1,111,740	1,018,037	-93,703
Discretionary - NLI	0	0	99,817	99,817
Mandatory	1,970	1,314	1,362	48
Total	**1,113,710**	**1,113,054**	**1,119,216**	**6,162**
FTEs	*8,600*	*8,563*	*8,333*	*-230*

FTE	2010 Enacted	2010 Enacted/ 2011 CR	2012 Budget Request	Inc (+) / Dec (-) from 2011
SIR Direct	5,432	5,432	5,206	-226
ARRA Direct	14	0	0	0
NLI Direct	0	0	40	40
Subtotal, Direct	**5,446**	**5,432**	**5,246**	**-186**
SIR Reimbursable	2,850	2,836	2,836	0
ARRA Reimbursable	1	0	0	0
Subtotal, Reimb	**2,851**	**2,836**	**2,836**	**0**
Working Capital Fund	286	278	234	-44
Allocation Accounts	17	17	17	0
Total	**8,600**	**8,563**	**8,333**	**-230**

Introduction

The 2012 U.S. Geological Survey (USGS) budget estimate is $1.1 billion; this is $6.1 million over the 2010 Enacted/2011 Continuing Resolution (CR) level. The 2012 budget strategically focuses constrained resources on core USGS science missions, which are aligned with the President's and the Secretary's priorities. A new account is proposed for National Land Imaging. The USGS request includes an increase for this account to maintain current and provide future Landsat satellites to ensure data continuity. The proposals described in this budget submission support the science needs of the Department of the Interior's (Interior) Bureaus and the needs of various State and local organizations.

Starting in 2011, the management structure of the USGS is realigned to move from an organizational structure of single and separated disciplines in order to form interdisciplinary mission areas outlined in the USGS Science Strategy: *"Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007-2017"* (U.S. Geological Survey, 2007). Science Strategy areas include: Ecosystems; Climate and Land Use Change; Energy, Minerals, and Environmental Health; Natural Hazards; Water Resources; Core Science Systems; Administration and Enterprise Information; and Facilities.

These mission areas include expertise from several Earth science disciplines (e.g., hydrology, geochemistry, biology) working together to address relevant issues of concern to people and other living things on the planet. Organization around these mission areas allows the USGS to better address the needs of customers and partners. For additional information, including crosswalk tables showing changes in organizational and budget structures, see the Science Strategy Section.

The choice of strategic science directions is based on the concept that complexities of measuring, mapping, understanding, modeling, and predicting status and trends of natural and managed resources in the United States transcend traditional USGS scientific discipline structure and require broad interdisciplinary thinking and action. The Strategy defines priority areas and opportunities where the USGS can serve the Nation's and the world's pressing needs. The Strategy also provides a framework to unite and integrate USGS capabilities and takes advantage of its strengths and unique position as a non-regulatory Federal science agency with national scope and responsibilities. Implementing these strategic directions will strengthen the USGS's role as the premier science agency that equips the Nation with information needed to meet the challenges of the 21st century.

For example, the USGS is applying science to reduce the impact of future natural hazards on loss of life and property. The Little Missouri River in southwest Arkansas experienced a flash flood in June 2010, with waters that rose more than three feet in less than 20 minutes, and ultimately rose 20 feet in approximately five hours, killing 20 people. In response to this severe and unusual flooding, the USGS initiated work to document and study the flow and height of the floodwater as it coursed down the Little Missouri River and its tributaries. Flash floods are hard to predict, but the USGS effort to document flood characteristics and construct computer models will assist forecasters, resource managers, and emergency responders in Arkansas to better prepare and minimize the impacts of future flash floods as well as improve the base of knowledge used to warn the public. The USGS, in collaboration with other agencies, has relied on the expertise of a team of hydrologists, geologists, engineers, geographers, and statisticians to conduct this work.

The USGS is also providing the information necessary to ensure that the United States can respond to a competitive global economy that is fueled by the availability of key mineral resources. The United States once was largely self-sufficient in rare earth elements (REE) that are critical inputs for high-tech products including computers and emerging renewable and nuclear energy technologies. However, over the past decade, the United States has become dependent upon imports from other countries. To ensure the United States has the information available to plan for use of REE, the USGS published a report that includes the first Nation wide estimate of REE, availability of global sources for REE, and information on known deposits that might provide domestic sources of REE in the future.

The USGS 2012 Budget Request

The following principles guided the USGS decision making process in determining budget allocations:

- Reallocate funding from projects that have not met planned expectations, have been completed, may continue without USGS support, or need to move in a new direction.
- Protect core capabilities that are essential to maintaining the integrity of USGS science in the future.
- Align new funding with science priorities, in order to ensure that the future of USGS is consistent with the needs of the science community and key Administration initiatives.

Along with these guiding principles, the USGS also considered the following criteria: interdisciplinary conduct and application; collaboration and partnerships; results of program evaluations; demonstration of progress toward advancing the USGS Science Strategy; and research and development investment criteria—performance, quality, and relevance.

Within our requested funding level, the USGS will continue to fund Secretarial priorities such as the New Energy Frontier, Cooperative Landscape Conservation, and WaterSMART, at levels similar or above the 2010 Enacted/2011 CR level. Youth in the Great Outdoors is funded at $1.6 million below the 2010 Enacted/2011 CR level, while there is an increase of $12.0 million for Ecosystem Restoration. In addition, the USGS is creating a new account to support a National Land Imaging program, a critical piece of the Administration's National Space Policy.

Decreases total $114.2 million, offset by increases of $120.3 million, including a $48.0 million increase for National Land Imaging. Other USGS core science programs will be reduced $40.2 million; which includes, among other things, the implementation of Interior wide management efficiencies, $8.4 million; Administrative savings, $11.8 million; and Enterprise Publication Network Bureau wide savings, $5.5 million.

Surveys, Investigations, and Research Budget Change Summary ($ in Thousands)	
2010 Enacted/2011 CR	**1,111,740**
Program Changes	
Program Increases	64,464
Program Decreases	-83,614
Fixed Costs and Related Changes	
DOI Wide Management Efficiencies	-8,381
Administrative Savings	-10,625
Bureau Efficiencies	-3,267
Enterprise Publication Network	-4,990
Fixed Costs	1,940
Separation Costs	5,920
Technical Adjustments	-53,500
Shared Program Change	-1,650
2012 Request	**1,018,037**

National Land Imaging Budget Change Summary ($ in Thousands)	
2010 Enacted/2011 CR	**0**
Program Changes	
Program Increases	48,000
Program Decreases	0
Fixed Costs and Related Changes	
DOI Wide Management Efficiencies	0
Administrative Savings	-1,173
Bureau Efficiencies	0
Enterprise Publication Network	-510
Fixed Costs	0
Separation Costs	0
Technical Adjustments	53,500
Shared Program Change	0
2012 Request	**99,817**

Total USGS Budget Change Summary ($ in Thousands)	
2010 Enacted/2011 CR	**1,111,740**
Program Changes	
Program Increases	112,464
Program Decreases	-83,614
Fixed Costs and Related Changes	
DOI Wide Management Efficiencies	-8,381
Administrative Savings	-11,798
Bureau Efficiencies	-3,267
Enterprise Publication Network	-5,500
Fixed Costs	1,940
Separation Costs	5,920
Technical Adjustments	0
Shared Program Change	-1,650
2012 Request	**1,117,854**

Significant programmatic reductions in the budget would:

- Eliminate Climate Effects Network projects designed to develop the national climate change backbone monitoring network for the Department of the Interior;
- Eliminate geochemical analysis of soil samples collected across the United States between 2006 and 2010, and research on relationships between minerals and human health;
- Eliminate new data collection activities for the National Biological Information Infrastructure;
- Reduce external assistance for earthquake research;
- Eliminate funding for the Water Resources Research Institutes;
- Delay Cycle III of the National Water Quality Assessment; and
- Decentralize the funding model for publishing activities.

The Federal Government investment in the USGS is in its people—a highly trained, highly technical, and primarily scientific workforce. For this investment, taxpayers are assured that the brightest minds and best monitoring and modeling capabilities are brought to bear on issues that present crucial natural resource management challenges. The USGS mission is different from other Interior Bureaus; there are no construction or land acquisition budgets that can be reduced or delayed to accommodate budget-reduction scenarios of this magnitude without immediately impacting the workforce.

The USGS has no income-generating activities to offset budget reductions. The proposed budget will result in about a three percent reduction in the USGS workforce, or approximately 230 FTE. The budget includes $5.9 million to implement workforce management initiatives to address projected staff reductions, including attrition, relocation, early retirement, separation incentives, and a potential reduction in force.

Technical Adjustments

The 2012 budget includes the following technical adjustments:

- Realignment of the budget structure to parallel realignment of the USGS Science programs to match Science Strategy themes. Crosswalks from the former to the current budget and organizational structures can be found in the Science Strategy Section.
- Realignment of the Facilities mission area to create a construction subactivity.
- A new account, National Land Imaging, will be established to support Interior's role in land imaging and remote sensing. Information on the new account is provided in the National Land Imaging Section.

Accountable Government Initiative (Administrative Cost Savings)

In support of the President's commitment to fiscal discipline and Federal spending restraint, the USGS is participating in an aggressive Interior wide effort to curb non-essential administrative spending. In accordance with this initiative, the USGS justification assumes $11.8 million in savings in 2012 against actual 2010 expenditures. The general activities where savings will be realized include: advisory contracts; travel and transportation of people and things, including

employee relocation; printing; and supplies. There will be no programmatic impact of implementing these savings initiatives; functions will be performed in a more efficient and more effective manner. These cost savings build upon management efficiencies that the Bureau is implementing in 2011. These management efficiencies are in the areas of IT infrastructure consolidation, travel and relocation, and strategic sourcing. Examples of 2012 administrative cost savings opportunities within the USGS include: utilizing technological advances for tele-, video-, and Web-conferencing; utilizing strategic sourcing contracts for the purchase of printing and supplies; and limiting the use of advisory contracts wherever possible.

Real Property Cost Savings and Innovation Plan

The 2012 budget proposes a management efficiency reduction of $4.5 million in the Facilities activity for rent and operations and maintenance costs; $1.0 million over Interior's proposed goal for the USGS. In addition, the USGS is responding to the Administration's requirement to reduce real property costs by reducing its facility footprint. The USGS depends on General Services Administration (GSA) owned and leased buildings for nearly 70 percent of its space needs, and the USGS has no authority to reduce fixed rental rates at these sites. The USGS can only reduce facility costs by vacating blocks of space and returning them to GSA's inventory. Primary emphasis will be on consolidating space use in GSA-provided offices at major USGS centers in Reston, VA; Denver, CO; and Menlo Park, CA. At these centers, and wherever it is cost-effective, the reduction in facilities costs by $4.5 million will be achieved by expanded space-sharing, hoteling, teleworking, and relinquishing space.

Funding for 2012 Fixed Costs Increases

To provide maximum funding possible for priority program needs, the 2012 request includes $1.9 million for fixed costs.

Government Wide Initiatives

In response to requirements issued in OMB Memorandum M-10-19 about Government wide initiatives, the USGS partnered with offices and other Bureaus of the Department of the Interior in a coordinated, Department wide approach to the planning and implementation of each initiative. Interior is coordinating initiative efforts through steering committees or implementation groups that engage each Bureau and office. This approach enables a consistent and structured response across Interior. Descriptions of Interior's strategies and accomplishments for each initiative are provided in the General Statement of the Department-Wide Programs' budget justification.

Tribal Consultation

While many USGS programs interact with Tribes and their input is taken into account for the development of USGS programs, no formal consultation process with the Tribes is required for development of the budget.

Strategic Plan

In accordance with the Government Performance and Results Act of 1993, the Department of the Interior's Strategic Plan has been reviewed and updated in compliance with the three-year update requirement. Interior, in consultation with the Bureaus, reviewed the organization and

construct of the Strategic Plan in light of the Administration's priorities, goals, and objectives; recent innovations and efficiencies in delivering mission objectives; and the goal to provide a more integrated and focused approach to track performance across a wide range of Interior programs. Although many of the outcome goals and performance measures remain consistent from the previous Strategic Plan, the organizing principles for those goals and measures reflect the new approach to meeting the Interior's mission responsibilities. The Department of the Interior Strategic Plan for 2011-2016 is the foundational structure for the description of program performance measurement and planning for the 2012 President's Budget Request. Budget and program plans for 2012 are fully consistent with the goals, outcomes, and measures described in the new version of the Department of the Interior's Strategic Plan. The USGS contributes to two sections of the strategic plan: Provide a Scientific Foundation for Decision Making and Building a 21st Century Interior.

For the first time, science has earned a prominent focus as one of the five goals outlined in the new Interior Strategic Plan. Overall, Science is a core mission of the Department of the Interior, connected to land and resource management and regulation goals, and addresses issues for all Interior Bureaus, other Federal agencies, and State, regional, and local entities. Upon release of Interior's Strategic Plan, Secretary Salazar said, "This new Strategic Plan ensures science has its rightful place as a primary source for the Interior Department's decision making process."

The USGS is linking the Interior's Strategic Plan with Bureau planning processes. The USGS has chartered Science Strategy Planning Teams (SSPT) to develop long-term (10-year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The plans will also provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that the USGS meets the goals of the USGS Science Strategy.

Department Crosscuts

For most Interior crosscutting activities, USGS funding for science is largely preserved in this budget. Crosscutting activities range from environmental issues such as Everglades restoration and combating invasive species to environmental and climate change issues addressed in the Climate and Land Use Change mission area. The USGS also contributes to activities that are part of the interagency efforts to restore vital ecosystems, including the: Great Lakes, Everglades, Chesapeake Bay, Columbia River (Salmon), Puget Sound, Upper Mississippi River, and California Bay-Delta. For more on the associated crosscuts, see the Regional and Crosscutting Activities Section.

Secretarial Initiatives

Funding for Secretarial Initiatives in 2012 Budget Request ($ in Thousands)			
Initiative	**2010 Actual**	**2010 Enacted/ 2011 CR**	**2012 Estimate**
New Energy Frontier Initiative	3,575	3,575	6,575
Cooperative Landscape Conservation Initiative*	63,177	63,177	72,919
WaterSMART Initiative	1,949	1,949	10,949
Youth in the Great Outdoors Initiative	4,950	4,950	3,350
Ecosystem Restoration	55,309	55,309	67,323
TOTAL, 2012 Initiatives	**128,960**	**128,960**	**161,116**

*Funding for the Cooperative Landscape Conservation is rebaselined in 2012 as part of the USGS realignment

The 2012 budget proposal continues support of Secretarial priorities:

- **New Energy Frontier –** The USGS will continue work on impacts of wind development on ecosystems. Efforts will focus on solutions to minimize risk and ecological impacts of proposed large-scale wind-farm developments and on improving data management, collaboration, and viability of information products that contribute to understanding effects of wind energy generation. More information can be found in the Energy, Minerals, and Environmental Health Section.
- **Cooperative Landscape Conservation –** The USGS will call for proposals to establish the remaining DOI Climate Science Centers (CSCs), advance national assessments of geologic and biological carbon sequestration, and create the scientific base for the U.S. Fish and Wildlife Service's Landscape Conservation Cooperatives (LCCs). For more information see the Climate and Land Use Change Section.
- **WaterSMART –** The USGS will advance this initiative by continuing to develop nationally consistent products to characterize water availability and providing grants to States to make their water data easier to access and share. More information can be found in the Water Resources Section.
- **Youth in the Great Outdoors –** The Secretary challenged Interior Bureaus to increase youth employment. To respond to this challenge, the USGS will seek ways to expand opportunities for youth engagement through activities and partnerships. The USGS will engage youth by providing meaningful work experiences, offering training, and supporting graduate research in the natural sciences. These programs help the USGS meet its scientific mission today, while preparing the workforce of tomorrow. Improving retention of the next generation of USGS employees will continue to be a top priority. Part of the strategy to achieve this goal is raising the visibility of and participation in USGS mentoring programs. More information can be found in the Administration and Enterprise Information Section.

- **Ecosystem Restoration –** As part of America's Great Outdoors initiative, the 2012 budget includes increased funding for the USGS to contribute to ecosystem restoration efforts in the Chesapeake Bay, Columbia River, Great Lakes, Puget Sound, Upper Mississippi River, and maintains base funding activities in the Everglades, California Bay-Delta and Gulf Coast. The USGS is working with the National Oceanic and Atmospheric Administration (NOAA), and other agencies to provide scientific tools for strategic decision making in support of restoring clean water, conserving treasured places, restoring habitats for fish and wildlife, and adapting to climate change. Information on the increases proposed for Ecosystem Restoration can be found in the Key Changes Section; details on these ecosystems can be found in the Regional and Crosscutting Activities Section.

Priority Goals

In 2009, OMB proposed an initiative to identify Federal agencies' Priority Goals (PGs) as a way to develop "the President's agenda for building a high-performing Government." As a result, the Department of the Interior chose five goals to reach beginning in 2010 and through 2012. The USGS will participate in two PGs: Climate Change Adaptation and Youth in the Great Outdoors.

Climate Change Adaptation

The USGS is a primary contributor to the Climate Change PG: *By the end of 2012, for 50 percent of the Nation, the Department will identify resources that are particularly vulnerable to climate change and implement coordinated adaptation response actions.*

Bureau Contribution: Climate and Land Use Change is one of six mission areas of the USGS realignment. The USGS is a primary contributor to this goal through the following programmatic areas:

- Science and data integration necessary to characterize the impact of climate change on lands and wildlife; and
- Science based tools for adaptive management.

These areas work in collaboration with one another and with other Interior Bureaus to identify, understand, and document components of change in climate and its effect on ecosystems and individual floral and faunal species.

The USGS funding for Climate Change in 2010 is $63.2 million, $63.2 million at the 2010 Enacted/2011 CR level, and $72.9 million in 2012.

Implementation Strategy: While Interior Bureaus may have been working in parallel on climate change, the Climate Change Adaptation goal presents an opportunity to unite the work Interior Bureaus have been doing for decades. A coordinated strategy is imperative. Strategies that focus on common goals and leverage resources from all Bureaus and external partners ensure maximum benefit from the limited dollars available.

Interior's implementation strategy for the Climate Change Adaptation PG includes:

- Climate Change Impact Science: Regional CSCs and LCCs will conduct research and monitoring; and communicate research findings to improve understanding of climate change impacts and vulnerabilities. This joint effort will support strategic decisions in

response to vulnerabilities: CSCs will be centers for basic climate change science associated with broad regions of the country; and LCCs will focus on applied science at the landscape level.

- Data Integration and Dissemination: This activity supports integration, availability, and dissemination of climate change impact and vulnerability information to scientists, resource managers, decision makers, and the public through *www.data.gov*.
- Determination of Most Vulnerable Areas and Species Ranges to Climate Change Impact: Interior's Energy and Climate Change Council will review Bureau proposals for candidate areas and species ranges considered to be most vulnerable to climate change. These submissions will be based on vulnerability assessments conducted by the Bureaus through the LCCs.

Much of the USGS contribution to this goal will be led by the National Climate Change and Wildlife Science Center (NCCWSC) and DOI Climate Science Centers. By the end of 2012:

- The USGS will provide ecological and population modeling capacity to the LCCs and provide information and training to the FWS to characterize species-habitat interactions in site-specific projections at landscape, local or species scales for Strategic Habitat Conservation; and
- The NCCWSC will move from concept to implementation where it will establish the remaining regional CSCs to help support high-priority research and modeling, share expertise, and begin collaborations with Interior and other resource managers to test and validate climate adaption strategies. Information on the NCCWSC and the DOI CSCs is located in the Climate and Land Use Change mission area.

Performance Metrics: Interior employs internal measures and milestones to monitor and track achievement of the PGs. Progress in these areas will be reported and reviewed throughout the year by the Deputy Secretary's Principals' Operations Group to identify and address needs for enhanced coordination or policy measures to address barriers to achieving the PG. The USGS identified the following existing performance measures and planned performance for 2012 relating to this PG:

- Complete 10 Fish and Wildlife climate-based habitat and population models developed by scientists to forecast changes, and by managers to assist development of adaptive management strategies; and
- Establish final three of eight DOI CSCs and complete research priority documents for each CSC.

Youth in the Great Outdoors

The USGS is also a contributor to the Youth in Natural Resources Priority Goal: *By the end of 2011, increase by 50 percent (from 2009 levels) employment of youth between the ages of 15-25 in the conservation mission of the Department; to be maintained through 2012.*

Bureau Contribution: The USGS contributes to Interior's goal by engaging youth through meaningful hands-on work experience, training, professional mentoring and graduate research in the natural sciences. Investing in Science, Technology, Engineering and Mathematics (STEM) education and increasing the number of youth hired at USGS is critical to achieving our mission now and in the future. Work with youth links learning to on the ground problem-solving

and innovation that is necessary to provide quality science today, and train the workforce of tomorrow. The USGS budget contribution to Youth in Natural Resources in 2010 is $5.0 million, $5.0 million at the 2010 Enacted/2011 CR level, and $3.4 million requested in 2012. In addition to this initiative funding, there is also base funding included in several USGS programs that also support Youth activities.

Implementation Strategy: The USGS goal is a 35 percent increase in youth employed by the end of 2011 over 2009 baseline levels. Based on historical data, the USGS will achieve this goal by the end of the third fiscal quarter in 2011.

As a Bureau of scientists, the USGS has a rich culture of mentoring, engaging, employing and educating youth in the geosciences. In 2010, the USGS achieved growth in Youth efforts through the following program examples:

- The USGS hired 45 students through the National Association of Geoscience Teachers (NAGT) summer cooperative intern program, an increase of 33 percent over previous years. Evaluations were conducted on both students and scientists at the conclusion of the internship. Students found the experience invaluable and received outstanding reviews from their mentors.
- Hundreds of student interns have been hired through the USGS Youth Program using local partnerships between science centers and schools, recruitment at schools in urban areas such as The City College of New York, and career development programs with schools such as Gateway Community College in Phoenix, AZ, Vermilion Community College in Minnesota, and West Dakota Technical in Rapid City, SD.
- The Students In Support of Native American Relations program provided 24 students an opportunity to participate in USGS research directly related to tribal lands.

The USGS is also working on other youth engagement activities through partners:

- The Education Mapping (EDMAP) program supported the training of at least 60 Students in 2010. Since 1996, EDMAP has trained 850 students from 144 universities; 95 percent of these students stay in the geosciences.
- The SGS collaborates with GeoFORCE, a pre-college program that provides hands-on science learning experiences for middle and high school students (primarily underserved minorities) from Houston and rural southwest Texas. The USGS is currently developing a similar partnership with James Madison University in Virginia.
- Under the direction and mentorship of the Cooperative Research Units, 89 students achieved degrees for Masters, PhD, and postdoctoral programs in 2010 and 90 more are planned for 2011.

In 2011, the USGS plans to expand current 2010 programs and is moving forward in the following areas:

- The NAGT program has gained heightened attention from USGS scientists and expects to place 50 students in 2011.
- The USGS Mendenhall Postdoctoral program has 22 new postdoctoral candidates hired for 2011. The program is developing the concept for a comparable Master's Program.
- The USGS is working with the National Science Foundation and Geological Society of America to establish a recruitment network of minority faculty; and with the Geological

Society of America as participants in their GEOCORP program, providing jobs for student geoscientists on public lands.

In 2012, the USGS will maintain the number of employed youth. Improving retention of youth will continue to be a top priority. The USGS plans to increase the visibility of, and participation in, mentoring programs. In addition, the USGS will start the development of career programs in biologic and geologic field assistance at community colleges across the country, as well as develop a new degree program in Hydrologic Sciences, scheduled to begin in the fall semester of 2012 at Langston University in Oklahoma. The planned degree program will be modeled after degree programs at Gateway Community College in Phoenix, AZ, and Tennessee State University in which USGS participates.

Performance Metrics: The Department of the Interior employs a set of internal measures and milestones to monitor and track achievement of the PGs. Progress in these areas will be reported and reviewed throughout the year by the Deputy Secretary's Principals' Operations Group to identify and address any need for enhanced coordination or policy measures to address barriers to the achievement of the PG.

Response to the Deepwater Horizon Oil Spill

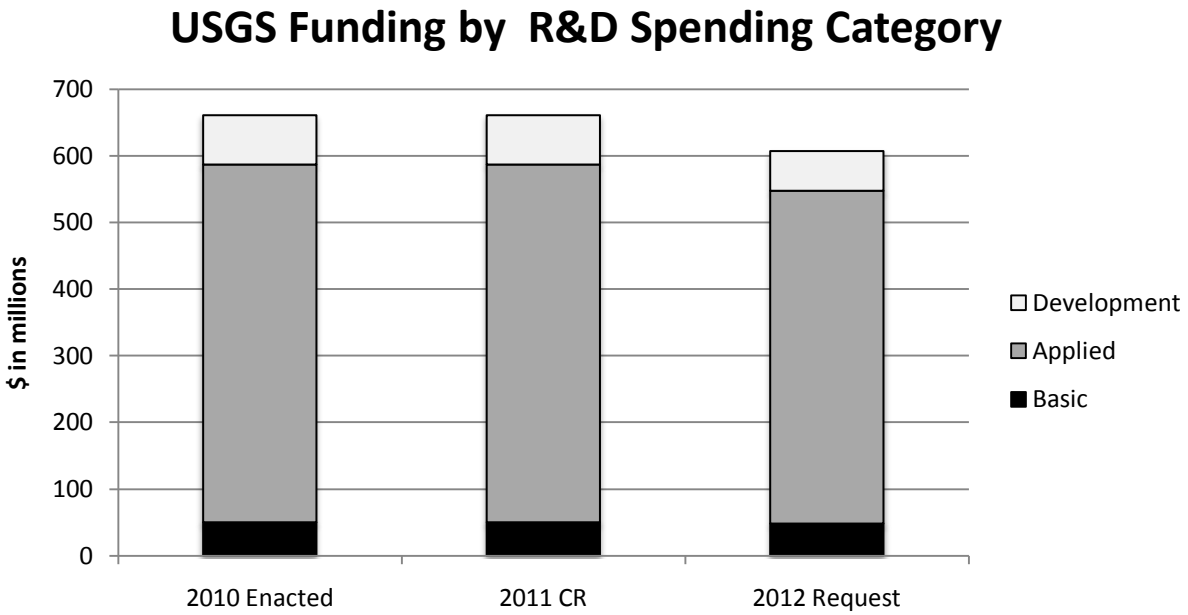
The USGS response to the Deepwater Horizon Oil Spill of 2010 took many forms. First, under the International Charter for Space and Major Disasters, the USGS activated its Geospatial Information Response Team (GIRT) to provide coordination and timeliness of geospatial information during the spill. The International Charter provides emergency response satellite data free of charge to those affected by disasters anywhere in the world. The satellite data are distributed by the USGS Hazards Data Distribution System (HDDS), a data repository that holds and distributes geospatial information collected by multiple agencies including NOAA, NASA, USGS, the U.S. Department of Agriculture (USDA), the National Geospatial-Intelligence Agency, and other State and non-Government Organizations.

The USGS Director provided geophysical expertise for the Deepwater Horizon event. The Director worked directly with U.S. Coast Guard leadership and British Petroleum executives. She formed and led teams to estimate oil flow, evaluate well integrity, and assess "well kill" options. The USGS provided onsite geospatial mapping capabilities; assessments of berm options and contaminated sediment disposition; collected and analyzed water, geological and biological samples; and worked with other Federal and State agencies to determine impacts. The USGS will continue its involvement in restoration activities through the Natural Resource Damage Assessment process.

Research and Development

Addressing National Science and Technology Priorities

Investments in Research and Development (R&D) promote economic growth and innovation and ensure American competitiveness in a global market. R&D is the core of the USGS mission. The USGS 2012 R&D funding request is $606.6 million, which is 54 percent of the USGS budget. This level is a net decrease of $54.0 million, or eight percent, below the 2010 Enacted/2011 CR level.



The 2012 Office of Science and Technology Policy (OSTP) outlined six R&D priority areas. USGS alignment along Science Strategy themes is consistent with these priorities and will facilitate the Bureau's response.

Promoting sustainable economic growth – The USGS collects and synthesizes baseline information on land, biological, water, energy and mineral resources to inform decisions about resources that impact our national economy.

The United States is the world's largest user of mineral resources, using them to build homes and cities, fertilize food crops, and create wealth that allow purchase of goods and services. The USGS is the sole Federal source of scientific information and unbiased research on nonfuel mineral potential, production, and consumption, as well as on the environmental effects of extraction and use of mineral resources. To support creation of economic and national security policies in a global context, the USGS collects and analyzes data on essential mineral commodities from around the world.

In 2011, the USGS will deliver results of a nine-year cooperative project providing the first-ever global assessment of undiscovered deposits of copper, potash, and platinum-group metals, commodities essential to maintain a stable economy, support infrastructure development, assure food security, and sustain environmental health. This USGS-led international cooperative effort was conducted on a regional, multi-national basis with the cooperative participation of dozens of interested national and international geologic, mineral resource, and other governmental and non-governmental institutions.

Defeating diseases and achieving better healthcare outcomes – The USGS realignment created a mission area which includes environmental health, an element of the USGS Science Strategy. This mission area will emphasize health issues and coordinate health related research across the USGS. For more information, go to the Energy, Minerals, and Environmental Health Section.

The USGS addresses environmental aspects of human health with an interdisciplinary approach. Using its research and monitoring capabilities, the USGS provides information on animal disease transmission to humans, drinking water contaminants, and air-dust-soil-sediment rock contaminants. For example, the USGS recently released a study of *Emerging Contaminants in Wastewater Effluent*, which found that pharmaceutical manufacturing facilities can be a significant source of pharmaceuticals in the environment. This is the first study in the United States to identify this link. These findings are useful in evaluating best manufacturing practices, wastewater treatment alternatives, and assessing environmental and ecological health implications of pharmaceuticals in the environment.

Moving toward a clean energy future to reduce dependence on imported energy resources while curbing greenhouse gases – The 2012 Budget estimates support studies of renewable energy development. By the end of 2011, the USGS will publish life-cycle models for geothermal systems that characterize and quantify the relations between geologic and geochemical parameters and their control on fluid and heat transport. Characterizing these parameters will improve understanding of what is necessary to successfully exploit this energy resource. Research on the nature and evolution of geothermal systems in diverse environments will support development of improved geothermal resource assessment methodology using geospatial observations to predict the frequency and distribution of geothermal reservoirs. For more information, go to the Energy, Minerals, and Environmental Health Section.

Understanding, adapting to, and mitigating impacts of climate change – The USGS Pliocene Research, Interpretation, and Synoptic Mapping (PRISM) Project created a conceptual model and comprehensive view of the Earth during the Pliocene era, a warmer era than the current modern one. Reasons for Pliocene warming are only partially identified. Data compiled by PRISM suggest a combination of increased greenhouse gases and increased ocean heat acted concurrently to warm the climate. This research is useful to the paleoclimate community and increases awareness of the value of research to evaluate, accurately simulate, and predict Earth's past, present, and future climate.

The USGS was a leader in establishing the USA National Phenology Network (USA-NPN), a partnership between Federal agencies, the academic community, and the public. The USA-NPN is a national biological science and monitoring initiative to understand how plants, animals, and landscapes respond to environmental variation and climate change. In 2010, the USA-NPN went live with a national animal phenology monitoring system that provided an enhanced data-entry user interface built on the national plant monitoring program established in 2009.

Managing competing demands on land, freshwater, and the oceans for production of food, fiber, biofuels, and ecosystem services based on sustainability and biodiversity – Led by the USGS, the Mass Balance Team of the Deepwater Horizon Flow Rate Technical Group used NASA AVIRIS airborne sensor data collected May 17, 2010, from the Gulf of Mexico to determine minimum discharge rates of the Deepwater Horizon oil spill. The Mass Balance Team approach combined remote-sensing-based estimates of oil volumes at the sea surface with estimates provided by NOAA, NASA, and the U.S. Coast Guard (USCG) on volume of oil skimmed, volume of oil burned, and percentage of oil evaporated or dissolved in seawater.

In a study of the effects of urban development on stream ecosystem health, the USGS determined the magnitude and pattern of the physical, chemical, and biological response of streams to increasing urbanization and how these responses vary throughout nine metropolitan areas. Study results will help water managers and land-use planners protect and manage

impacts of urban development and will help them set realistic stream restoration goals in urban areas.

Developing technologies to protect troops, civilians, and national interests – The USGS Natural Hazards programs are critical to public safety. The Bureau initiated a multi-hazard approach to natural hazards that integrates research, monitoring, and reporting on earthquakes, volcanoes, tsunamis, landslides, and flood-related hazards. In addition, the USGS and the National Science Foundation fund the Global Seismographic Network to monitor seismic activity around the world; this capability also supports non-proliferation goals of the Comprehensive Test Ban Treaty Organization because seismic monitors can also detect nuclear tests conducted anywhere on Earth.

USGS scientists worked with the Building Safety Council and American Society of Civil Engineers (ASCE) code committees to integrate National Seismic Hazard Maps for engineering practice. For example, the maps served as a basis for ASCE building codes for new buildings and other structures.

The Landslides Hazard program assessed rockfall hazards at Timpanogos Cave National Monument and Bryce Canyon National Park in Utah and Yosemite National Park in California. The National Park Service will use the hazard assessments to evaluate visitor safety programs and their planning processes.

Ensuring the Quality of USGS Science Programs

As part of the annual budget formulation, the Bureau reviews R&D investments across its mission areas and weighs the value of existing programs against changing needs and priorities. The Director prioritizes proposed initiatives on the basis of:

- Interdisciplinary science;
- Collaboration and partnerships with Interior Bureaus, other government agencies, and universities;
- Results of program evaluations; and
- Demonstration of progress toward meeting Interior's performance goals and objectives.

The USGS considers the integrity, objectivity and utility of its science as paramount. To ensure the USGS maintains these high standards, all research is peer reviewed using the Fundamental Science Practices. This mechanism is an internal control to maintain the quality of our science. In addition, customer satisfaction surveys on USGS science products and services and listening sessions with stakeholders and customers to obtain feedback on product usefulness and use to ensure relevance.

Fundamental Science Practices – The USGS regularly conducts internal control reviews on its programs and organizations in accordance with the OMB Circular A-123, *Management's Responsibility for Internal Controls*. In 2008, the USGS began using the internal control review process to validate adherence to fundamental science practices to ensure quality of science and to support the Director's Assurance Statement regarding the USGS programs delivering its missions. The peer review process addresses:

- Scientific excellence, integrity and objectivity;

- Conflict of interest issues;
- Impartiality and non-advocacy;
- Methodology and documentation of data;
- Public benefit and access;
- Natural hazards and public or wildlife health; and
- Accessibility and corporate identity.

Roles and responsibilities of those in the review and approval process were tested and were found to be performing as intended. In addition to validating the process, the control testing identified areas that could be further improved, and these recommendations were provided to the USGS Fundamental Science Practice Advisory Council for consideration. Starting in 2011, the Office of Science Quality and Integrity has oversight of Fundamental Science Practices and the evaluation and review of employees and programs.

Partnerships that Foster Innovation and Leverage Resources

The USGS values collaborative relationships and seeks opportunities to build mutually productive partnerships that keep science relevant, foster innovation and allow leveraging of appropriated funds. USGS programs employ a variety of partnership vehicles described at *http://www.usgs.gov/aboutusgs/working_with_us/partnerships.asp*

Examples of the depth and breadth of partnerships are documented throughout this document. The following is a representative listing of USGS services to Federal, State, local and non-governmental, and international organizations. Key among these relationships is the legacy of collaborative research with colleges and universities, throughout the nation and across the globe.

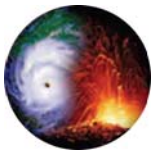
Federal
Agriculture(USDA)/USFS: Endangered species, conservation genetics, habitat management, forest planning, wildlife, invasive species, fire science, National Forest maps, drought/fire fuel monitoring and management, energy and mineral resources, natural hazards, mine lands, land cover characteristics, hydrologic data collection/studies, topographic maps, digital orthophoto and elevation data, *The National Map,* national hydrography dataset, and geographic names, assessment of agricultural best management practices, biological carbon sequestration
Commerce/NOAA: Endangered species, salmonid restoration, coral reefs, hazards monitoring and research, geomagnetism, vegetation change, coastal erosion, fish habitat, marine sanctuaries, Geographic Information System (GIS)
Commerce/National Institute of Standards and Technology: Earthquake hazards, coastal and bathymetric mapping, hydrologic data for (National Weather Service) flood warning
DOD: Geospatial coordination with States, endangered species, salmonid restoration, coral reefs, coastal erosion, mapping support during conflict, natural hazards, test ban monitoring, strategic minerals and energy resources, geomagnetism, terrain visualization, hydrologic data collection/studies, environmental contamination and remediation studies on military bases, NORTHCOMM, high-resolution imagery over urban areas
DOD/Army Corp of Engineers: Endangered species, habitat assessment, fish behavior, fish physiology, dam impacts, wetlands restoration, seafloor mapping, shoreline stability, floodplain morphology, mine lands, energy resources, natural hazards, hydrologic data collection/studies, biological carbon sequestration
Energy: Endangered species, bio-resource monitoring, contaminant cause and effects, gas hydrates, mining technology, energy resources, geologic hazards, groundwater framework, coalbed methane, hydrologic data collection/studies, geologic carbon sequestration, biologic carbon sequestration

EPA: Endangered species, endocrine disruption, contaminant effects, environmental indicators, mine lands and drainage, emissions modeling/clean air, water quality, seafloor mapping, geochemical analyses, coal resources and mining, urban dynamics/land characterization, hydrologic data collection/studies, remote sensing, mineral baselines, GAP analysis, national hydrography dataset, biological and geological carbon sequestration
Federal Energy Regulatory Commission Permittees/Licensees: Hydrologic data collection/studies, restoration of threatened and endangered migratory fish
Homeland Security/Federal Emergency Management Agency: Hazards monitoring and mitigation, hydrologic data collection/studies, floodplain mapping, providing emergency maps, elevation data, volcano monitoring
Health and Human Services: Chemical analyses, environmental effects of contaminants
Intelligence Community: Information coordination, environmental/resource studies, hazards support, geospatial data coordination, methods development, chemical analyses, NCAP, CAC
Interior/BLM: Rangeland health, wild horse management, invasive species, abandoned mine lands, air quality, threatened and endangered species, water quality, mineral resource assessments, prescribed fire, fire fuels mapping (Landfire), mapping of National Petroleum Reserve/Alaska (NPR/A), mapping and geospatial data and analysis, national hydrography dataset, water availability assessments, ecological assessments, remote sensing data and analysis, National Climate Change and Wildlife Science Center/DOI Climate Science Centers (NCCWSC/DOI CSC)
Interior/BOR: Water quality, ecological models, decision support systems, seismic monitoring, hydrologic data and assessments, hydrologic data collection and analysis, remote sensing data and analysis
Interior/FWS: Inventory and monitoring, aquatics and contaminants, biological resources, threatened and endangered species, water quantity and quality, Gap analysis, geospatial data, remote sensing data and analysis, biological carbon sequestration, NCCWSC/DOI CSC
Interior/Bureau of Ocean Energy Management, Regulation and Enforcement: Gas hydrates, energy resources
Interior/NPS: Water quantity/quality, geologic mapping, biological resources, volcano hazard assessment, mapping and geospatial data, national hydrography dataset, remote sensing data and analysis, biological carbon sequestration, fire science, fire fuels mapping, NCCWSC/DOI CSC
Interior/Office of Surface Mining: Acid mine drainage, remote sensing data and analysis, energy and minerals resources
Justice: Geospatial Information System (GIS)
Labor: Energy resources
National Academy of Science: Hazards studies, geographic research, evaluating licensing of geospatial data, K-12 geography curricula
NASA: Planetary research, Landsats 5 and 7 operations, design of Landsat Data Continuity Mission and Landsat 9, natural hazards, Earth science research, data management, Land Processes Distributed Active Archive Center, GIS, United Nations Environment Program clearinghouse, remote sensing, spaceflight support, Shuttle Radar Topography Mission, hydrologic data collection and analysis
National Institutes of Health: Human health and environment, toxics and contaminants
USDA/Animal and Plant Health Inspection Service and the Centers for Disease Control and Prevention: Highly pathogenic avian influenza
National Science Foundation: Hazards studies, Antarctic research and mapping, global seismology, Hydrologic Information Management Systems, National Ecological Observation Network (NEON)
Smithsonian Institution: North American vertebrate collections, volcanic hazards
State/ U.S. Agency for International Development: Natural hazards, energy resources, geologic hazards, global seismology, biological carbon sequestration, hydrologic data collection/studies, Famine Early Warning System, Atmospheric Moisture Index, Pan American Institute of Geography and History, geospatial support
Tennessee Valley Authority: Hydrologic data collection/studies
Transportation/Federal Highway Administration: Hazards studies, hydrologic data collection/studies
Transportation/Federal Aviation Administration: Volcanic hazards
State and Local Government
Airports: Volcanic hazards
American Indians/Alaska Natives: K-12 educational resources, streamgaging, water quality and quantity, technical training and capability upgrade, environmental hazards, fisheries research, invasive species, NativeView for American Indian colleges and universities, and geospatial support
Civil Defense: Hazards mitigation
Departments of Natural Resources/Geographic Information Councils: Volcanic hazards, map data integration, hydrologic data collection/studies , orthoimagery

Departments of Environmental Protection/Quality/Health: Hydrologic data collection/studies, mapping data, water quality assessments
Departments of Fish and Game/Conservation Commission/Wildlife and Parks: Endangered species, population dynamics, habitat requirements, fire management, fisheries, wildlife disease, invasive species, waterfowl surveys, bird banding, aquaculture, GAP analysis, geospatial support
Offices of Emergency Management: Hazards monitoring and mitigation, providing emergency maps, hydrologic data collection and analysis
Planning Commissions/Transportation/Engineering/Municipalities: Conservation plans, hydrologic data collection/studies, topographic mapping, hazards monitoring/assessment, creating decision support systems for local decision making
State Geological Surveys: Geologic and topographic mapping, hazards assessment
Water Resources Authorities/Public Works/Sanitation: Contaminant transport, hydrologic data collection/studies, environmental flow analyses
Non-government Organizations
American Farm Bureau/American Society of Civil Engineers/Chemical Manufacturers Association/etc.: Coordination of hydrologic programs
American Red Cross: Hazards monitoring and mitigation
Electric Power Research Institute: Coal quality
Industry: Spatial data modeling, spatial data browsing and retrieval, product development, registration, and production, environmental monitoring, acid rain deposition program, hazard monitoring, research and assessments, aerospace
The Nature Conservancy: Endangered species, species at risk, ecological research, biological status and trends, coordination of hydrologic programs, GAP analysis, decision support system
National Geographic: Geospatial information coordination
Southern California Earthquake Center (University consortium): Earthquake hazard research and assessment
Utilities: Seismic studies, hydrologic data collection and studies, source water protection studies
NatureServe: NBII, Geospatial support, decision support system
Association of Fish and Wildlife Agencies: Chronic wasting disease
Ducks Unlimited: Database development and data access for Latin American and Caribbean waterfowl surveys
Other Partners: Breeding bird survey, bird banding, water resources education and outreach, topographic maps
Earth observation: Western States Water Council, American Society for Photogrammetry and Remote Sensing (ASPRS), Association of American Geographers (AAG), American Geophysical Union (AGU), USGS Coalition, Geological Society of America (GSA), IEEE, National States Geographic Information Council (NSGIC), AmericaView (AV), American Congress on Surveying and Mapping, Urban and Regional Systems Association (URISA), Association of American State Geologists, Advisory Committee on Water Information, U.S. Group on Earth Observation (USGEO)
International
Global: The USGS has conducted earth science studies and provided natural hazards support in foreign countries for over 50 years. Authorization is provided under the Organic Act, as revised, and the Foreign Assistance Act and related legislation when such studies are deemed by the Interior and Department of State to be in the interest of the American people, Group on Earth Observations (GEO), Committee on Earth Observation Satellites (CEOS)

This page intentionally left blank.

"*Facing Tomorrow's Challenges*—U.S. Geological Survey Science in the Decade 2007-2017"



Background

The U.S. Geological Survey (USGS) Science Strategy (Strategy) is outlined in Circular 1309, *Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007–2017*. Published in 2007, the document was created to identify science goals and priorities that unite Bureau capabilities toward challenges for the future. The Strategy outlines areas where natural science can make substantial contributions to the Nation and the world. It identifies opportunities for the USGS to better use its scientific capabilities to serve the Department of the Interior and the Nation. In doing so, it is intended to inform long-term approaches to USGS program planning, technology investment, partnership development, and workforce and human capital strategies.

In 2010, the USGS received approval to realign the organization's management structure to facilitate implementation of the goals and objectives outlined in the Strategy. As the next phase in implementation, in 2012, the USGS proposes to realign its budget structure along Strategy themes. While the Strategy does not cover all facets of USGS work, it builds on a hierarchy of planning documents and provides a science-based response to the overarching Interior strategic plan.

The choice of strategic science directions is based on the concept that complexities of measuring, mapping, understanding, modeling, and predicting status and trends of natural and managed resources in the United States transcend traditional USGS scientific discipline structure and require broad interdisciplinary thinking and action. The Strategy defines priority areas and opportunities where the USGS can serve the Nation's pressing needs. The Strategy provides a framework to unite and integrate USGS capabilities and takes advantage of its strengths and unique position as a non-regulatory Federal science agency with national scope and responsibilities.

Implementing these strategic directions will strengthen the USGS's role as the premier science agency that equips the Nation with information needed to meet the challenges of the 21st century.

Management Alignment

The Strategy outlines major natural science issues facing the Nation in the next decade and focuses on areas where natural science can make a substantial contribution to the well-being of the Nation and the world. These areas include: ecosystems; climate and land use change; energy, minerals, and environmental health; natural hazards; water resources; core science systems; administration and enterprise information; and facilities. Organization around these mission areas, unlike the current structure in which staff are grouped according to a specific discipline, allows the USGS to better address needs of its customers and partners.

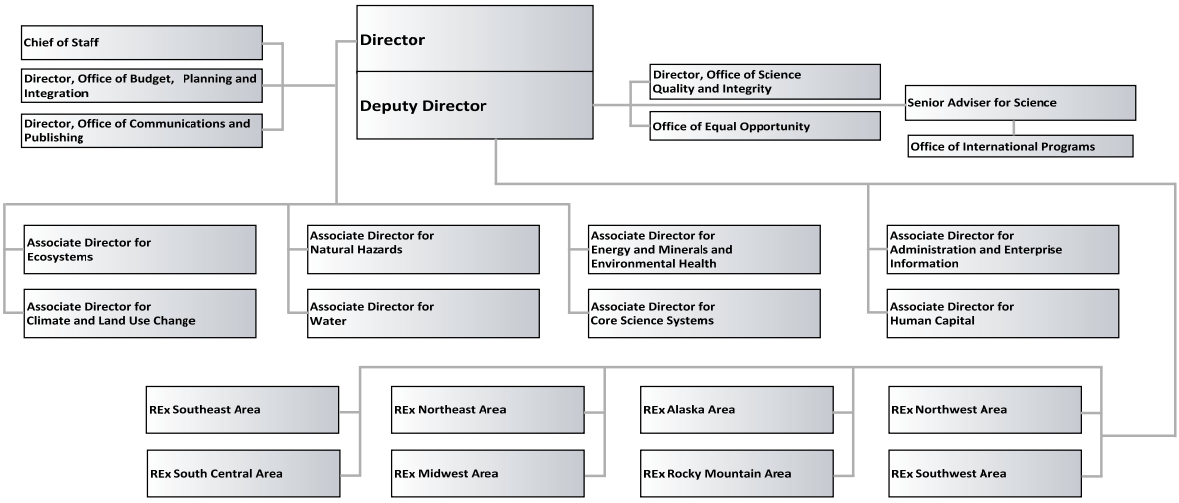
In the new structure, Associate Directors (ADs) and programs are realigned from discipline-focused responsibilities to science strategy mission areas. ADs responsible for program direction from headquarters, have for many years led programs grouped by traditional scientific disciplines spanning the work of the USGS: geography, geology, hydrology, biology, geospatial information, and global change. With the AD realignment to science strategy themes, the focus is on across-the-board interdisciplinary strategic thinking and programmatic direction. Integrated analysis of causation, long-and short-term monitoring, and development of mitigation strategies will help science programs produce the USGS's most requested and sought-after information.

Prior to the management realignment, the USGS was divided into three regions (Eastern, Central, and Western), each of which had a Regional Director (RD) who supervised three Regional Executives (RExs) in three sub-regions. The RDs reported to the Deputy Director at national headquarters in Reston, Virginia. The RDs were responsible for translating discipline-based programs from headquarters into interdisciplinary projects on the ground. In the new structure, ADs at the headquarters level assure interdisciplinary science and the management layer of RD positions has been eliminated. The RExs report directly to the Deputy Director. Regional administrative services such as human capital and finance are centralized. The number of ADs increased from seven to eight, and the three RD positions were eliminated. In 2012, as part of a proposed bureau consolidation, the USGS proposes to eliminate the North Central area and realign States assigned to that area to the Midwest and Rocky Mountain areas. This reduces the REx positions from nine to eight.

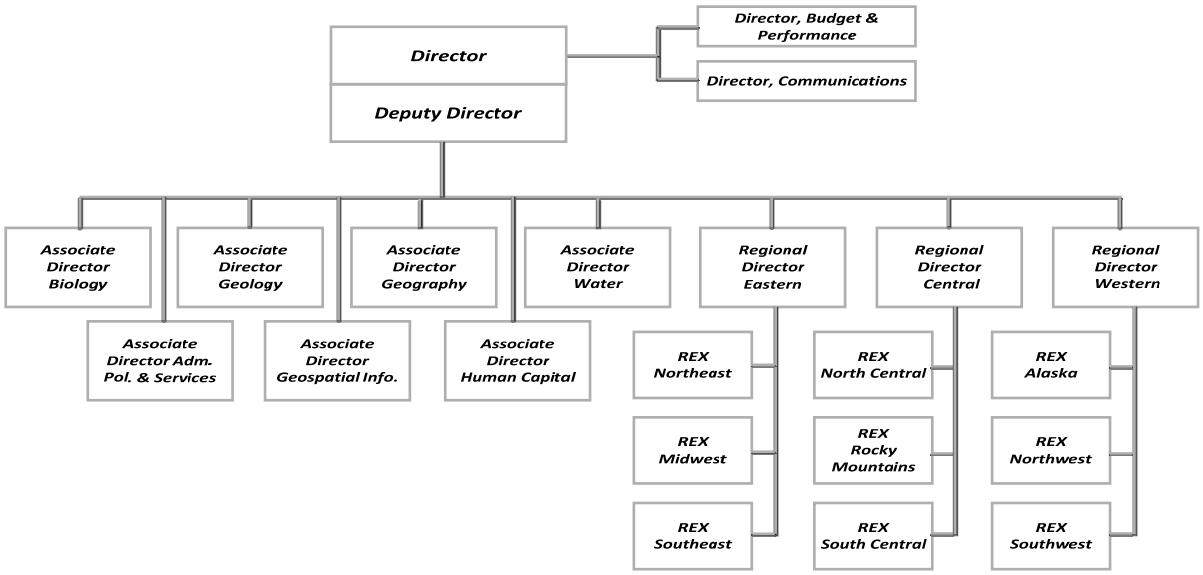
In addition, the USGS established a new Office for Science Quality and Integrity (SQI). This office ensures the Bureau maintains its high standards of integrity, quality, and health of USGS science. USGS Bureau approving officials, responsible for approving scientific publications and products, report to this new Office. Previously, approving officials were assigned to the offices of the RDs. The SQI reports to the Deputy Director and its functions include oversight of publication quality and quantity, research scientist career evaluations, the Mendenhall and other pre- and post-doctoral programs, and data policy guidelines.

U.S. GEOLOGICAL SURVEY ORGANIZATION

(CURRENT)



(FORMER)



Budget Structure Realignment

In 2012, the USGS proposes to align its budget structure to the mission areas outlined in the Science Strategy. To minimize confusion and allow for a one-to-one budget crosswalk table, the proposal moves programs and their funding intact, with a few exceptions, from the former disciplinary AD structure to the new science strategy AD structure. The following tables crosswalk the current budget structure to the proposed structure for funding in the 2010 Enacted, the 2011 Continuing Resolution, and the 2012 budget levels.

The 2012 justification is written to the proposed structure. A chapter for each proposed budget activity begins with the budget table for the activity, followed by the summary of proposed program changes, an activity overview, a management summary, and the performance change.

Realigning the USGS budget structure takes the next step in implementing to the USGS Science Strategy by ensuring the Bureau is effectively organized and managed at the highest levels to achieve the Strategy's goals. With the budget structure realignment, programs are arranged in groupings (Budget Activity/Subactivity/Program Element) that encourage complementary and supportive program planning, funding, and reporting. The new budget also increases the transparency of programs and is easier to identify programs contained within each activity and subactivity.

The new management structure and proposed budget structure will allow the USGS to maintain functionality as a valuable contributor to solving pressing issues facing the Department of the Interior, our Nation, and the world.

The following tables are crosswalks from the current budget structure to the proposed mission areas for 2010 Enacted/2011 CR and 2012 Request. To further describe the realignment, a table is included which crosswalks the funding from the former activity to the new structure:

New Budget Activities	2010 Enacted	2010 Enacted/ 2011 CR	2012 Budget Request	Change from 2011 CR	% Change from 2011 CR
Surveys, Investigations, and Research					
Ecosystems	$165.6	$165.6	$166.4	$0.8	1%
Climate and Land Use Change	$138.0	$138.0	$106.4	-$31.6	-23%
Energy, Minerals, and Environmental Health	$101.5	$101.5	$88.5	-$13.0	-13%
Natural Hazards	$139.0	$139.0	$133.9	-$5.1	-4%
Water Resources	$221.2	$221.2	$199.6	-$21.6	-10%
Core Science Systems	$124.9	$124.9	$105.9	-$19.0	-15%
Administration and Enterprise Information	$115.2	$115.2	$116.6	$1.4	1%
Facilities	$106.4	$106.4	$100.8	-$5.6	-5%
Total SIR	**$1,111.7**	**$1,111.7**	**$1,018.0**	-$93.7	-8%
National Land Imaging					
National Land Imaging	$0.0	$0.0	$99.8	$99.8	100%
Total USGS	**$1,111.7**	**$1,111.7**	**$1,117.9**	$6.2	1%

Former Budget Activities	2010 Enacted	2010 Enacted/ 2011 CR	2012 Budget Request	Change from 2011 CR	% Change from 2011 CR
Surveys, Investigations, and Research					
Geographic Research, Investigations, and Remote Sensing	$145.6	$145.6	$150.6	$5.0	3%
Geologic Hazards, Resources, and Processes	$249.1	$249.1	$230.8	-$18.3	-7%
Water Resources Investigations	$232.3	$232.3	$207.9	-$24.4	-11%
Biological Research	$204.9	$204.9	$195.6	-$9.3	-5%
Enterprise Information	$46.0	$46.0	$36.9	-$9.0	-20%
Global Change	$58.2	$58.2	$67.7	$9.5	16%
Science Support	$69.2	$69.2	$79.6	$10.4	15%
Facilities	$106.4	$106.4	$100.8	-$5.6	-5%
Total SIR	**$1,111.7**	**$1,111.7**	**$1,069.9**	-$41.8	-4%
National Land Imaging	$0.0	$0.0	$48.0	$48.0	100%
Total USGS	**$1,111.7**	**$1,111.7**	**$1,117.9**	$6.2	1%

2010 Enacted/2011 CR Former Budget Activities	New Budget Activities: Ecosystems	Climate and Land Use Change	Energy, Minerals, and Environmental Health	Natural Hazards	Water Resources	Core Science Systems	Administration and Enterprise Information	Facilities	2012 Estimate
Geographic Research, Investigations, and Remote Sensing		$74.8				$70.7			**$145.6**
Geologic Hazards, Resources, and Processes			$81.0	$139.0		$29.2			**$249.1**
Water Resources Investigations			$11.1		$221.2				**$232.3**
Biological Research	$165.6		$9.4			$24.9			**$199.9**
Enterprise Information							$46.0		**$46.0**
Global Change		$63.2							**$63.2**
Science Support							$69.2		**$69.2**
Facilities								$106.4	**$106.4**
Total USGS	**$165.6**	**$138.0**	**$101.5**	**$139.0**	**$221.2**	**$124.9**	**$115.2**	**$106.4**	**$1,111.7**

2012 Request Former Budget Activities	New Budget Activities: Ecosystems	Climate and Land Use Change	Energy, Minerals, and Environmental Health	Natural Hazards	Water Resources	Core Science Systems	Administration and Enterprise Information	Facilities	National Land Imaging	2012 Estimate
Surveys, Investigations, and Research										
Geographic Research, Investigations, and Remote Sensing		$33.5				$65.4			$53.5	**$152.4**
Geologic Hazards, Resources, and Processes			$71.6	$133.9		$25.4				**$230.8**
Water Resources Investigations			$8.3		$199.6					**$207.9**
Biological Research	$166.4		$8.7			$15.1				**$190.2**
Enterprise Information							$36.9			**$36.9**
Global Change		$72.9								**$72.9**
Science Support							$79.6			**$79.6**
Facilities								$100.8		**$100.8**
Total SIR	**$166.4**	**$106.4**	**$88.5**	**$133.9**	**$199.6**	**$105.9**	**$116.6**	**$100.8**	**$53.5**	**$1,071.5**
National Land Imaging										
National Land Imaging									$46.3	$46.3
Total USGS	**$166.4**	**$106.4**	**$88.5**	**$133.9**	**$199.6**	**$105.9**	**$116.6**	**$100.8**	**$99.8**	**$1,117.9**

Geographic Research, Investigations, and Remote Sensing (Geography)

Geography programs are moving to two mission areas in the realignment, Climate and Land Use Change and Core Science Systems in the Surveys, Investigations, and Research account. A new account is proposed for the Landsat component of the Land Remote Sensing (LRS) program. The account, National Land Imaging (NLI), will be the appropriation for development, implementation and operation of terrestrial satellites such as Landsats 5 and 7, and Landsat Data Continuity Missions such as Landsats 8 and 9. The remaining portion of the Land Remote Sensing program will continue to be part of the Surveys, Investigations, and Research account. Both LRS and National Land Imaging will be managed as part of the Climate and Land Use Change mission area.

The Geography Analysis and Monitoring program and the remaining portion of LRS are aligned as programs in a subactivity titled Land Use Change in the Climate and Land Use Change mission area. The National Geospatial Program is aligned to the Core Science Systems mission area.

$ in millions	CLIMATE & LAND USE CHANGE			CORE SCIENCE SYSTEMS			NATIONAL LAND IMAGING* (Separate Treasury Account)		
	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request
Geographic Research, Investigations, & Remote Sensing									
Land Remote Sensing	63.7	63.7	22.0				0	0	53.5
FTE	*145*	*145*	*107*						*33*
Geographic Analysis & Monitoring	11.1	11.1	11.5						
FTE	*67*	*67*	*66*						
National Geospatial Program				70.7	70.7	65.4			
FTE				*338*	*338*	*334*			

* In addition to the technical adjustment from LRS, an increase in funding for the NLI account is requested to begin development of Landsat 9. More information is available on the NLI account in the Key Change Section and the NLI Mission Area Section.

Geologic Hazards, Resources, and Processes (Geology)

The Geology programs are moving to three mission areas. Coastal and Marine Geology is joining the hazards programs in the Natural Hazards mission area. A new mission area called Energy, Minerals, and Environmental Health will include Energy Resources and Mineral Resources. The National Cooperative Geologic Mapping program is moving to Core Science Systems along with the National Geological and Geophysical Data Preservation program within Energy Resources.

$ in millions	NATURAL HAZARDS			ENERGY, MINERALS, & ENVIRONMENTAL HEALTH			CORE SCIENCE SYSTEMS		
	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request
Geologic Hazard Assessments									
Earthquake Hazards	57.0	57.0	52.3						
FTE	*253*	*253*	*250*						
Volcano Hazards	24.4	24.4	23.4						
FTE	*146*	*146*	*142*						
Landslide Hazards	3.4	3.4	3.3						
FTE	*22*	*22*	*22*						
Global Seismographic Network	5.8	5.8	5.3						
FTE	*10*	*10*	*10*						
Geomagnetism	2.1	2.1	2.1						
FTE	*17*	*17*	*17*						
Geologic Landscape & Coastal Assessments									
National Cooperative Geologic Mapping							28.2	28.2	25.4
FTE							*133*	*133*	*129*
Coastal & Marine Geology	46.2	46.2	47.5						
FTE	*233*	*233*	*233*						
Geologic Resource Assessments									
Mineral Resources				53.8	53.8	44.2			
FTE				*351*	*351*	*299*			
Energy Resources				27.2	27.2	27.4	1.0	1.0	0.0
FTE				*151*	*151*	*150*	*3*	*3*	*0*

Water Resources Investigations (Water)

The Water programs are staying together in the Water Resources mission area with one exception. Toxic Substances Hydrology is moving to the mission area for Energy, Minerals, and Environmental Health.

$ in millions	ENERGY, MINERALS, & ENVIRONMENTAL HEALTH			WATER RESOURCES		
	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request
Hydrologic Monitoring, Assessments & Research						
Groundwater Resources Program				9.7	9.7	6.9
FTE				*56*	*56*	*44*
National Water Quality Assessment				66.5	66.5	57.5
FTE				*412*	*412*	*371*
Toxic Substances Hydrology	11.1	11.1	8.3			
FTE	*87*	*87*	*73*			
Hydrologic Research & Development				13.8	13.8	12.0
FTE				*97*	*97*	*97*
National Streamflow Information Program				27.7	27.7	26.9
FTE				*52*	*52*	*52*
Hydrologic Networks & Analysis				31.4	31.4	33.9
FTE				*164*	*164*	*162*
Cooperative Water Program				65.6	65.6	62.3
FTE				*666*	*666*	*646*
Water Resources Research Act Program				6.5	6.5	0.0
FTE				*2*	*2*	*0*

Biological Research (Biology)

Biology programs will be in four mission areas. The funding for Science Support for DOI Bureaus enacted in 2010 is aligned to Climate and Land Use Change. Contaminant Biology is moved to Energy, Minerals, and Environmental Health. Biological Information Management and Delivery is moving to Core Science Systems. The remaining Biology programs will be in the Ecosystems mission area.

$ in millions	ECOSYSTEMS			CLIMATE & LAND USE CHANGE			ENERGY, MINERALS, & ENVIRONMENTAL HEALTH			CORE SCIENCE SYSTEMS		
	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request
Biological Research & Monitoring												
Status & Trends of Biological Resources	23.9	23.9	22.1	0.0	0.0	2.5						
FTE	*147*	*147*	*136*	*0*	*0*	*10*						
Contaminant Biology							9.411	9.4	8.7			
FTE							*64*	*64*	*62*			
Fisheries: Aquatic & Endangered Resources	24.7	24.7	22.7									
FTE	*192*	*192*	*180*									
Wildlife: Terrestrrial & Endangered Resources	50.1	50.1	48.5	0.0	0.0	1.5						
FTE	*310*	*310*	*302*	*0*	*0*	*8*						
Terrestrial, Freshwater, & Marine Environments	37.2	37.2	36.6	5.0	5.0	5.0						
FTE	*253*	*253*	*268*	*8*	*8*	*8*						
Invasive Species	11.4	11.4	14.1									
FTE	*53*	*53*	*59*									
Biological Information Management & Delivery										24.9	24.9	15.1
FTE										*78*	*78*	*50*
Cooperative Research Units	19.313	19.3	18.8									
FTE	*133*	*133*	*133*									

Enterprise Information

The programs in Enterprise Information are aligned to the Administration and Enterprise Information mission area.

$ in millions	ADMINISTRATION & ENTERPRISE INFORMATION		
	2010 Enacted	2011 CR	2012 Request
Enterprise Information			
Enterprise Information Security & Technology	26.3	26.3	21.1
FTE	*89*	*89*	*55*
Enterprise Information Resources	19.7	19.7	15.9
FTE	*116*	*116*	*81*

Global Change

The Global Change activity is aligned to Climate and Land Use Change as a subactivity titled Climate Variability. The components in the current structure are programs in this mission area. Funding for activities associated with the Chesapeake Bay Executive Order is moving to Ecosystems mission area.

$ in millions	ECOSYSTEMS			CLIMATE & LAND USE CHANGE		
	2010 Enacted	2011 CR	2012 Request	2010 Enacted	2011 CR	2012 Request
Global Change						
DOI Regional Climate Science Centers				15.1	15.1	25.6
FTE				*30*	*30*	*50*
Climate Research & Development			3.6	32.9	32.9	24.1
FTE			*14*	*112*	*112*	*110*
Carbon Sequestration				10.1	10.1	14.3
FTE				*12*	*12*	*24*

Science Support

The Science Support activity is aligned as a subactivity to the Administration and Enterprise Information mission area.

$ in millions	ADMINISTRATION & ENTERPRISE INFORMATION		
	2010 Enacted	2011 CR	2012 Request
Science Support	69.2	69.2	79.6
FTE	*378*	*378*	*416*

Facilities

The Facilities activity remains unchanged in this realignment.

$ in millions	FACILITIES		
	2010 Enacted	2011 CR	2012 Request
Facilities			
Rental Payments & Operations and Maintenance	99.1	99.1	93.5
FTE	*52*	*52*	*52*
Deferred Maintenance Capital Improvements	7.3	7.3	4.8
FTE	*0*	*0*	*0*
Construction	0.0	0.0	2.5
FTE	*0*	*0*	*0*

This page intentionally left blank.

Updates to Performance Measures and Targets

Updates to Performance Measures

The realignment of the U.S. Geological Survey (USGS) along the themes of the Science Strategy and the Department of the Interior (Interior) 2011-2016 Strategic Plan led to changes in the display of performance information in this budget request. The realignment of the USGS budget structure impacts the funding information and the display of performance measures as well. In order to minimize confusion and allow for a one-to-one budget crosswalk table, programs along with their funding and respective performance measures were moved intact with only a few exceptions. The crosswalk tables in the Science Strategy Section provide a useful summary for how budget activity, subactivity, and program components are being displayed and how the USGS is better aligned to achieve its goals.

Interior recently released the 2011-2016 Strategic Plan. Under the new strategic plan, the USGS has new performance measures that are identified in the Goal Performance Table and the Program Performance Change tables.

Updates to Performance Targets

The 2011 performance targets are updated to assume an annualized amount of a year-long Continuing Resolution based on the 2010 Enacted level. The 2012 performance targets are built from these 2011 assumptions. Once there is a final appropriation for 2011, the 2011 and 2012 targets will need to be updated.

This page intentionally left blank.

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Ensure the Quality and Relevance of Science Products to Partners and Customers									
Strategy: Ensure Overall Customer Satisfaction.									
% of partners or customers satisfied with scientific, technical and data products (SP)									
Performance Data	N/A	93%	93%	>90%	93%	>90%	>90%	0%	>90%
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Identify and Predict Ecosystem Change.									
Status and Trends									
% of targeted species for which monitoring and decision support information on their status and trends are available (SP)									
Performance Data	N/A	27.18% (178/655)	27.18% (178/655)	27.18% (178/655)	27.18% (178/655)	28.24% (185/655)	28.55% (187/655)	+0.31%	29.77% (195/655)
Total Actual/Projected Cost ($000)	3,581	2,987	4,790	4,415	4,415	4,978	5,032	54	5,247
% of complete historical bird banding records available electronically (Pat. Center) (ARRA)									
Performance Data	N/A	0%	0%	50%	80%	100%	N/A	0%	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
Fisheries: Aquatic and Endangered Resources									
% of targeted fish and aquatic populations and their habitats for which information is available regarding limiting factors such as migratory barriers, habitat, and effects of disturbance (fire, flood, nutrient enhancement) (SP)									
Performance Data	38.66% (46/119)	41% (49/119)	41% (49/119)	41% (49/119)	41% (49/119)	42% (50/119)	43% (51/119)	+1%	43.6% (52/119)
Total Actual/Projected Cost ($000)	39,808	37,043	36,967	33,546	33,546	33,546	32,000	-1,546	32,000
Wildlife: Terrestrial and Endangered Resources									
% of targeted wildlife populations for which science information is provided for management decision making to inform and improve conservation (SP)									
Performance Data	N/A	47.03% (166/353)	51.6% (182/353)	54.39% (192/353)	54.39% (192/353)	57.79% (204/353)	61.19% (216/353)	+3.40%	72.24% (255/353)
Total Actual/Projected Cost ($000)	13,504	18,047	25,210	25,736	25,736	26,000	26,200	200	26,400

Program Changes

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Identify and Predict Ecosystem Change.									
Terrestrial, Freshwater & Marine Environments									
% of targeted ecosystems with information products forecasting ecosystem change (SP)									
Performance Data	N/A	11% (1/9)	11% (1/9)	22% (2/9)	22% (2/9)	22% (2/9)	28% (2.5/9)	+6%	44.4% (4/9)
Total Actual/Projected Cost ($000)	37,612	34,429	37,977	38,190	38,190	38,190	40,481	2,291	46,958
Comments	The out years are the base number (2009) multiplied by the number of % of targeted ecosystems for that year. It is cumulative over time and the amount does not occur in one year. The cost / targeted ecosystem / year will probably be in the 80% of the total budget range.								
Invasive Species									
% of targeted science information products available for successful control and management of priority groups of invasive species (SP)									
Performance Data	N/A	44.7% (26.8/60)	44.7% (26.8/60)	44.7% (26.8/60)	44.7% (26.8/60)	45.0% (27.0/60)	45.7% (27.4/60)	+0.7%	47.0% (28.2/60)
Total Actual/Projected Cost ($000)	11,265	11,924	12,784	16,365	16,365	14,574	12,784	-1,790	12,784
Cooperative Research Units									
# of students complete degree requirements for MS, PhD, and post doctoral program under the direction and mentorship of Unit Scientists									
Performance Data	95	83	110	90	89	90	90	0	93
Ecosystems - All Programs									
# of systematic analyses and investigations completed									
Performance Data	1320	1211	1267	959	1169	1041	1011	+10	991
Comments	Decrease projected in systematic analyses is within the range of variability over time in program productivity; productivity lag exists between retirements of senior scientists and junior scientists hired to replace them.								
# of formal workshops or training provided to customers									
Performance Data	160	154	112	116	113	104	85	-19	107

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Identify and Model Causes and Impacts of Changes to the Earth and Ocean Systems.									
Coastal and Marine Geology									
% of regional and topical ocean and coastal studies that cite USGS products within three years of study completion (SP)									
Performance Data	80% (24/30)	80% (24/30)	80% (24/30)	80% (24/30)	80% (24/30)	80% (24/30)	78% (22/28)	-2%	82% (23/28)
Total Actual/Projected Cost ($000)	35,912	36,148	38,696	38,057	38,057	39,825	33,630	-6,195	35,630
Comments	Performance for this measure is decreasing in 2012 because the reduction to the program impacts 2 targeted studies that are factored into the calculation of this measure. Program increases provided for Coastal and Marine Spatial Planning contribute to performance of other measures and should begin to contribute to this measure in 2013 and beyond.								
Cost of collection and processing of LiDAR data for coastal characterization and impact assessments (per megabyte of data collected)									
Performance Data	0.57	0.50	0.44	0.39	0.39	0.32	0.31	-0.01	0.3
# of gigabytes of LiDAR data collected annually									
Performance Data	N/A	N/A	100	300	555	300	300	0	600
# of systematic analyses and investigations completed									
Performance Data	218	200	200	200	214	210	190	-20	185
Total Actual/Projected Cost ($000)	33,745	34,549	35,000	43,000	43,000	45,000	38,000	-7,000	38,000
Actual/Projected Cost Per systematic analyses (whole dollars)	155,000	173,000	175,000	215,000	215,000	219,000	200,000	-19,000	200,000
Comments	There will be a decrease in the number of systematic analyses in 2013 as funding for Extended Continental Shelf activities are reduced in 2012. This impacts subsequent years because resources may be shifted to address research (systematic analyses) and knowledge management requirements for Coastal and Marine Spatial Planning.								
# of systematic analyses and investigations completed for Coastal and Marine Spatial Planning									
Performance Data	N/A	N/A	N/A	N/A	N/A	0	10	+10	10
Total Actual/Projected Cost ($000)	N/A	N/A	N/A	N/A	N/A	0	4,500	4,500	4,500
Actual/Projected Cost Per systematic analyses (whole dollars)	N/A	N/A	N/A	N/A	N/A	0	450,000	450,000	450,000

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Identify and Model Causes and Impacts of Changes to the Earth and Ocean Systems.									
Land Use Change - Geographic Analysis and Monitoring									
% of U.S. surface area with contemporary land cover data needed for major environmental monitoring and assessment programs (SP) (GAM)									
Performance Data	95% (286/300)	99.3% (298/300)	46% (213/463)	95% (440/463) complete the NLCD 2006 product.	95% (440/463) complete the NLCD 2006 product.	100% (463/463) Completes NLCD 2006; develop prototype for next NLCD product	15% complete of NLCD 2011 (69/463 path & rows of imagery captured)	Begin production of next NLCD 2011 for up-to-date land cover every 5 years	95% complete of NLCD 2011 (440/463 path & rows of imagery captured)
Total Actual/Projected Cost ($000)	3,100	3,100	3,000	3,050	3,050	3,250	5,200	1,950	3,800
Comments	The National Land Cover Database (NLCD) 2006 will be completed in early 2011. This product uses 2006 imagery and compares it to the NLCD 2001 data layers to provide an update of where land cover has changed over the five-year period. During 2011, the USGS working with the Multi-Resolution Land Characteristics (MRLC) Consortium partners will begin efforts for the development of the next NLCD 2011. The funding for the NLCD is higher in 2012 than other years since the full scale production of NLCD 2011 will begin then.								
Land Use Change - Land Remote Sensing									
# of terabytes managed cumulatively (LRS)									
Performance Data	4,255.90	3,840.60	3,010.90	2,777.30	2,873.4	2,876.90	3,409.10	+532	5.5 Petabytes
# of remote sensing products distributed (LRS)									
Performance Data	N/A	417,029	3,127,040	5,626,702	5,600,000	5,795,503	5,969,368	+173,865	6,718,576
Land Use Change (Geographic Analysis and Monitoring and Land Remote Sensing Programs)									
# of systematic analyses and investigations completed									
Performance Data	75	93	90	65	79	90	90	0	100

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Identify and Model Causes and Impacts of Changes to the Earth and Ocean Systems.									
National Land Imaging									
% of critical milestones successfully reached to support the LDCM (Landsat 8) launch schedule (NLI)									
Performance Data	4% (1/23)	35% (8/23)	52% (12/23)	70% (16/23)	70% (16/23)	78% (18/23)	83% milestones complete for Landsat 8 (19/23)	+8%	Mission Operational
Comments	The achievement of this performance measure in 2011 and 2012 is dependent upon the increase of $13.35 million requested to complete the ground system development of LDCM. If the ground system is not completed, then the USGS will not have the capability to process or distribute data received from the on-orbit satellite, denying users access to the new data for 20 to 24 months.								
% of critical milestones successfully reached to support the Landsat 9 launch schedule (NLI)									
Performance Data	N/A	N/A	N/A	N/A	N/A	N/A	Planning will commence	N/A	50% milestones complete for Landsat 9
Comments	In 2012, the USGS will begin planning for next Landsat mission which includes: conducting trade studies, gathering requirements, determining contracting needs, and developing preliminary schedules/milestones.								
Strategy: Assess and Forecast Climate Change and its Effects.									
National Climate Change and Wildlife Science Center/DOI Climate Science Centers									
# of fish and wildlife climate based habitat and population models developed by scientists and in cooperation with land managers (SP) (NCCWSC/DOI CSC)									
Performance Data	N/A	N/A	1	3	3	6	10	+4	14
Total Actual/Projected Cost ($000)	N/A	N/A	3,303	9,910	9,910	9,910	9,910	0	9,910
Comments	The NCCWSC/DOI CSC program was established in 2009. While much of the program's funding is going towards standing up the DOI CSC network, the program also creates models that will be used by partners particularly in the DOI Landscape Conservation Cooperatives. The funding shown for these models is the total amount spent on research by this program.								
Number of Climate Science Centers formed (HPPG)									
Performance Data	N/A	N/A	N/A	3	3	5	8	+3	8
Number of Climate Science Center research priority documents completed (HPPG)									
Performance Data	N/A	N/A	N/A	N/A	N/A	5	8	+3	8

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Assess and Forecast Climate Change and its Effects.									
Climate Research and Development									
% climate research and development studies of which interpretive and syntheses products are cited by partners and users within 3 years of study completion (R&D)									
Performance Data	N/A	N/A	N/A	N/A	N/A	80%	80%	0%	80%
% of targeted land cover trends national assessment syntheses, research plans, or science strategies that are published (R&D)									
Performance Data	N/A	N/A	20% (1/5)	40% (2/5)	40% (2/5)	60% (3/5)	100% (5/5)	+40%	N/A
Comments	This performance measure is slated to be completed in 2012.								
% of Climate Effects Network established relative to current target (R&D)									
Performance Data	N/A	11.5% (2.3/20)	20% (4/20)	45% (9/20)	25% (5/20)	25% (5/20)	25% (5/20)	0%	25% (5/20)
Comments	Although progress has been made with science plans and science products, the USGS has proposed a significant decrease in 2012. The Climate Effects Network will not be completed at the proposed funding level.								
Carbon Sequestration									
% of the baseline, reference projection, and mitigation evaluation units completed for a national biological carbon sequestration assessment (Bio Carbon)									
Performance Data	N/A	N/A	N/A	N/A	N/A	14% (45/330)	59% (195/330)	+45%	N/A
Comments	The national biologic carbon sequestration assessment is expected to be completed by the end of 2014.								
Climate Variability - All Programs									
# of systematic analyses & investigations completed									
Performance Data	N/A	7	93	121	121	100	107	+7	120
Comments	Due to the USGS realignment, we have rebaselined the 2011, target. After 2011, the USGS will determine what changes need to be made to the 2012 and 2016 targets. Also, the additional performance in 2012 includes two systematic analyses from the additional funding of $2.6 million provided for Carbon Sequestration.								

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Monitor and Assess Water Availability and Quality.									
Groundwater Resources									
% of U.S. with groundwater availability status and trends information (SP)									
Performance Data	8% (3/40)	8% (3/40)	13% (5/40)	15% (6/40)	15% (6/40)	18% (7/40)	20% (8/40)	+2%	20% (8/40)
Total Actual/Projected Cost ($000)	2,800	2,800	3,400	2,400	2,400	2,400	400	-2,000	400
Actual/Projected Cost Per product (whole dollars)	700,000	700,000	680,000	600,000	600,000	600,000	400,000	-200,000	400,000
Comments	Despite a proposed reduction in funding, performance continues to increase in 2012 due to completion of work that was initially funded in previous years. The reduction will be considerably limited in future years (2013 and beyond) under the proposed funding constraints resulting in minimal forward progress on this measure.								
# of knowledge products on the water availability of the Nation's water resources provided to support management decisions									
Performance Data	23	21	15	25	25	25	25	0	25
National Water Quality Assessment									
% of U.S. with current streamwater quality status and trends information (SP)									
Performance Data	18% (872/4956)	34% (1707/4956)	52% (2575/4956)	69% (3409/4956)	69% (3409/4956)	86% (4242/4956)	100% (4956/4956)	+14%	40% (25184/62690)
Total Actual/Projected Cost ($000)	5,560	5,100	5,610	6,040	6,040	5,427	5,576	149	TBD
Comments	The funding reduction proposed for NAWQA in 2012 may not impact performance until 2013 and beyond. The proposed reduction in 2012 may require a reduction in the frequency or number of sites monitored to support this measure in 2013 and beyond.								
% of U.S. with current groundwater quality status and trends information (SP)									
Performance Data	45% (382/845)	56% (476/845)	67% (570/845)	78% (658/845)	78% (658/845)	89% (751/845)	91% (771/845)	+2%	40% (592/1480)
Total Actual/Projected Cost ($000)	5,470	5,560	5,670	5,790	5,790	6,314	4,834	-1,480	TBD
Comments	The proposed $1.7 million reduction in funding for this component would limit the Program's ability to meet the previous 2012 planned target to complete an additional 11 percent of the decadal national assessment of groundwater quality in support of water resource decision making; only an additional 2% of the decadal assessment would be completed in 2012. The proposed reduction in 2012 may require a reduction in the frequency or number of sites monitored to support this measure in 2013 and beyond.								

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Monitor and Assess Water Availability and Quality.									
National Water Quality Assessment									
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions									
Performance Data	70	80	50	80	80	20	30	+10	25
Total Actual/Projected Cost ($000)	14,000	16,000	10,000	16,000	16,000	4,000	6,000	2,000	6,000
Comments	There is an increase in 2012 performance due to NAWQA cycle 2 multi-year studies that will be completed in that year. The proposed funding reduction in 2012 will impact performance in 2013 and beyond. At the 2011 funding level it is estimated that NAWQA would produce about 40 knowledge product in 2016, the proposed reduction in 2012 will result in 15 fewer knowledge products in 2016.								
National Streamflow Information Program									
% of USGS planned streamgages that are fully funded by the National Streamflow Information Program (SP)									
Performance Data	N/A	11% (500/4756)	7% (349/4757)	8% (400/4757)	7% (349/4757)	8% (380/4757)	8% (380/4757)	0%	8% (370/4757)
Total Actual/Projected Cost ($000)	N/A	7,750	7,850	8,320	8,320	8,000	8,100	100	8,100
Actual/Projected Cost Per streamgage (whole dollars)	0	15,500	15,700	16,000	16,000	16,000	16,200	200	17,000
Discontinued streamgages, cableways, and ground-water well remediated (ARRA)									
Performance Data	UNK	0	384	1,102	1,052	1,102	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
# of streamgages upgraded with high data rate radios to increase frequency of radio transmission (ARRA)									
Performance Data	UNK	4,500	5,326	6,900	6,813	7,500	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
% of discharge measurements made with hydroacoustic instruments (ARRA)									
Performance Data	UNK	35%	69%	69%	73%	71%	N/A	0%	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Monitor and Assess Water Availability and Quality.									
Hydrologic Research and Development									
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions									
Performance Data	276	249	203	220	220	220	220	0	205
Total Actual/Projected Cost ($000)	5,520	4,980	4,400	4,400	4,400	4,400	4,400	0	4,400
Hydrologic Networks and Analysis									
% of U.S. with completed, consistent water availability products (SP)									
Performance Data	N/A	N/A	N/A	N/A	N/A	N/A	8% (180/2268)	+8%	40% (900/2268)
Total Actual/Projected Cost ($000)	N/A	N/A	N/A	N/A	N/A	N/A	4,900	4,900	4,900
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions									
Performance Data	15	9	11	11	12	11	11	0	11
Total Actual/Projected Cost ($000)	3,000	1,800	2,200	2,200	2,200	2,200	2,200	0	2,200
Cooperative Water Program									
# of water monitoring sites supported jointly with State, local or Tribal cooperators (SP)									
Performance Data	21,800	21,800	20,600	20,000	20,000	19,500	19,100	-400	19,100
Total Actual/Projected Cost ($000)	38,700	37,800	38,600	39,500	39,500	38,300	38,300	0	38,300
Actual/Projected Cost Per monitoring site (whole dollars)	1,777	1,736	1,873	1,974	1,974	1,964	2,005	41	2,005
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions									
Performance Data	250	250	237	230	230	225	220	-5	220
Total Actual/Projected Cost ($000)	25,600	25,000	25,500	26,100	26,100	25,300	25,300	0	28,700
Actual/Projected Cost Per knowledge products (whole dollars)	102,400	100,000	107,600	113,400	113,400	112,500	114,750	2,250	114,750

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Monitor and Assess Water Availability and Quality.									
Water Resources - All Programs									
# of retrievals of groundwater and surface-water quantity and quality data and information									
Performance Data	108 million	133 million	154 million	166 million	175 million	175 million	183 million	+8 million	206 million
Strategy: Assess National and International Energy and Mineral Resources.									
Mineral Resources									
% of targeted non-fuel mineral commodities for which up-to-date deposit models are available to support decision making (SP)									
Performance Data	0%	7%	20%	53%	53%	73%	93%	+20%	100%
Total Actual/Projected Cost ($000)	4,618	8,920	12,712	13,147	13,147	14,945	15,000	55	14,945
# of systematic analyses and investigations delivered to customers									
Performance Data	6	3	3	4	4	3	3	0	2
Total Actual/Projected Cost ($000)	22,200	14,100	14,700	17,300	17,300	30,100	10,300	-19,800	N/A
Actual/Projected Cost Per systematic analyses (whole dollars)	3,700	4,700	4,900	5,800	5,800	10,000	3,400	-6,600	N/A
Comments	A 14% cut in 2012 will require a significant reorganization of Mineral Resources Program's work, after the 49 FTE are terminated.								
# of formal workshops or training provided to customers									
Performance Data	7	6	6	8	8	6	3	-3	4
# of mineral commodity reports available for decisions									
Performance Data	717	649	707	720	748	700	620	-80	620
Energy Resources									
# of USGS energy products accessed online (SP)									
Performance Data	N/A	5.08 million	8.24 million	5.00 million	6.89 million	5.00 million	4.50 million	-.50 million	5.00 million
Total Actual/Projected Cost ($000)	N/A	20,682	21,492	23,150	23,150	22,845	21,920	-925	21,920

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Science for Sustainable Resource Use, Protection, and Adaptive Management									
Strategy: Assess National and International Energy and Mineral Resources.									
Energy Resources									
# of gigabytes collected annually									
Performance Data	37.409	1.173	17.6482	1.24	1.667	1.25	1.2	-0.05	1.2
# of systematic analyses and investigations completed									
Performance Data	5	5	6	5	5	5	4	-1	N/A
Total Actual/Projected Cost ($000)	6,500	12,300	11,244	13,750	13,750	13,750	13,750	0	N/A
Actual/Projected Cost Per systematic analysses (whole dollars)	1,200,000	2,456,000	1,874,000	2,750,000	2,750,000	2,750,000	2,750,000	0	N/A
Comments	A 7% decrease in 2012 will necessitate delaying finalizing some domestic resource assessments. Also, ERP is redefining (expanding) what it counts as systematic analyses and investigations. 2011 is a year of baselining, so targets for out years are still being developed.								
# of outreach activities provided to customers									
Performance Data	8	8	8	9	9	10	8	-2	N/A
Goal: Provide Scientific Data to Protect and Inform Communities									
Strategy: Monitor and Assess Natural Hazards Risk and Resilience.									
Earthquake and Volcano Hazard Programs									
% completion of earthquake and volcano hazard assessments for moderate to high hazard areas (SP)									
Performance Data	N/A	26.6%	28.5% (57/2)	30.8% (61.5/2)	30.8% (61.5/2)	33.0%	34.8%	+1.8%	39.0%
Total Actual/Projected Cost ($000)	34,497	34,946	37,617	39,016	39,016	37,400	37,400	0	37,400
% implementation of optimal earthquake and volcano monitoring for moderate to high hazard areas (SP)									
Performance Data	20%	24.0%	24.6% (49.1/2)	26.1% (52.2/2)	26.1% (52.2/2)	28.6%	28.8%	+0.2%	31.0%
Total Actual/Projected Cost ($000)	19,374	22,543	21,562	21,033	21,033	20,900	19,400	-1,500	19,400

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Scientific Data to Protect and Inform Communities									
Strategy: Monitor and Assess Natural Hazards Risk and Resilience.									
Earthquake Hazards Program									
Cumulative number of ANSS seismic monitoring stations (ARRA)									
Performance Data	786	805	886	1,292	1,299	1,642	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
# of systematic analyses and investigations completed									
Performance Data	152	132	146	157	146	157	146	-11	130
Total Actual/Projected Cost ($000)	27,664	24,024	26,572	28,574	28,574	28,574	26,572	-2,002	23,660
Actual/Projected Cost Per systematic analyses (whole dollars)	182	182	182	182	182	182	182	0	182
# of stations operated									
Performance Data	2,731	2,767	2,848	2,900	2,890	2,988	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
Volcano Hazards Program									
% of very high threat volcanoes with optimal level monitoring (X number of 18) (ARRA)									
Performance Data	N/A	22%	22%	22%	22.2%	27.7% (5/18)	N/A	0%	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
# of systematic analyses and investigations completed									
Performance Data	75	71	99	75	75	75	75	0	60
Total Actual/Projected Cost ($000)	22,500	21,300	29,700	22,500	22,500	22,500	22,500	0	22,500
Actual/Projected Cost Per systematic analyses (whole dollars)	300,000	300,000	300,000	300,000	300,000	300,000	300,000	0	300,000
Comments	Long-term impact due to reduction to Program in 2012.								

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Scientific Data to Protect and Inform Communities									
Strategy: Monitor and Assess Natural Hazards Risk and Resilience.									
Volcano Hazards Program									
# of monitoring stations operated by VHP									
Performance Data	714	734	743	743	743	758	765	+7	785
Comments	Slower progress than expected due to reduction to Program in 2012.								
# of monitoring and telemetry nodes upgraded (e.g., analog to digital conversion, added sensors, improved power systems, upgraded radio transmitters and receivers) (ARRA)									
Performance Data	N/A	12	14	192	73	387	N/A	N/A	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
Lanslide Hazards Program									
# of systematic analyses and investigations completed									
Performance Data	16	15	15	15	15	15	15	0	15
Global Seismographic Network									
% completion of optimal monitoring									
Performance Data	78% 79.6/102)	79% (80.6/102)	86% (87.7/102)	88% (89.8/102)	86.5% (88.2/102)	88% (89.8/102)	89%	+1%	90%
Comments	Performance increases in 2012-2016 due to continued deployment of "next generation" upgrades in 2011-2013 (ARRA-funded equipment)								
# of GSN next-generation systems deployed (of 87 needed) (ARRA)									
Performance Data	0%	9	22	40	45	54	N/A	0%	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
Geomagnestim									
% completion of optimal monitoring									
Performance Data	45% (13.5/30)	46% (13.8/30)	45% (13.5/30)	57% (17.1/30)	57.42% (17.226/30)	85% (25.5/30)	85% (25.5/30)	0%	85% (25.5/30)
Comments	The increases in performance from 2009-2010 and 2010-2011 are a result of the implementation of monitoring at 1-second frequency, achieved by investments over several years in observatory infrastructure.								

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Provide Scientific Data to Protect and Inform Communities									
Strategy: Identify the Connection Between the Natural Environment and Wildlife and Human Health.									
Contaminant Biology									
# of emerging disease outbreak (contaminants and pathogens) investigations (SP)									
Performance Data	N/A	672	669	674	673	679	503	-176	508
Total Actual/Projected Cost ($000)	11,540	11,089	11,433	11,138	11,138	11,604	8,596	-3,008	7,913
Comments	Proposed $0.5M program reduction of base funding in 2012.								
# of systematic analyses delivered to customers									
Performance Data	85	104	73	87	72	87	55	-32	56
Toxic Substance Hydrology									
# of knowledge products on environmental contamination provided to support management decisions									
Performance Data	194	149	128	115	115	115	80	-35	60
Total Actual/Projected Cost ($000)	13,300	13,500	10,800	11,100	11,100	10,800	8,300	-2,500	8,300
Goal: Develop a Comprehensive Science Framework for Understanding the Earth									
Strategy: Develop an Integrated Data Framework that is used to Guide Science-based Stewardship of Natural Resources.									
Biological Information Management and Delivery									
% of online natural resource products available via National Biological Information Infrastructure whose utility is validated through user interactions and downloads (SP)									
Performance Data	13.11%	20.52%	21.34%	21.50%	21.50%	19.00%	6.20%	-12.80%	4.00%
Total Actual/Projected Cost ($000)	16,326	16,872	16,738	16,498	16,498	16,000	9,000	-7,000	9,000
% of focal migratory bird populations for which species pages are available through the NBII									
Performance Data	8%	15%	22%	29%	29%	33%	33%	0%	33%
% of US land with land characterization and species distribution information available for resource management decision making updated in the last 5 years									
Performance Data	34%	37%	77%	80%	88%	91%	95%	+4%	95%

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Develop a Comprehensive Science Framework for Understanding the Earth									
Strategy: Develop an Integrated Data Framework that is used to Guide Science-based Stewardship of Natural Resources.									
Biological Information Management and Delivery									
# of records in the NBII Metadata Clearinghouse available to document biological data sets and information products									
Performance Data	29,170	41,000	43,366	74,000	90,732	92,000	92,000	0	92,000
Total Actual/Projected Cost ($000)	580	580	572	570	570	570	570	0	570
Actual/Projected Cost Per metadata record (whole dollars)	20	14	13	8	8	8	8	0	8
# of formal workshops or training provided to customers									
Performance Data	19	20	20	8	8	8	8	0	8
National Geological and Geophysical Data Preservation Program									
# of metadata records									
Performance Data	N/A	N/A	600,000	600,000	1,052,038	600,000	0	-600,000	0
Comments	The USGS 2012 budget proposes to eliminate funding for the National Geological and Geophysical Data Preservation Program.								
Strategy: Generate Geologic Maps and Models for Sustaining Resources and Protecting Communities.									
National Cooperative Geologic Mapping									
% of the U.S. that is covered by at least one geologic map and is available to the public through the National Geologic Map Data Base (SP)									
Performance Data	N/A	48% (1,687,637/ 3,537,438.44)	49% (1,729,771/ 3,537,438.44)	50% (1,768,719/ 3,537,438.44)	49.4% (1,746,550/ 3,537,438)	50.4% (1,782,868/ 3,537,438.44)	51.3% (1,814,705/ 3,537,438.44)	+0.9%	54.9% 1,942,053/ 3,537,438.44)
Annual production of geologic maps for the Nation (summed and represented as a % of US land area) made available to the public through the National Geologic Map Data Base									
Performance Data	5.4%	4.15%	2.90%	2.0%	2.7%	2.0%	1.8%	-0.2%	1.8%
Total Actual/Projected Cost ($000)	UNK	26,045	27,112	27,495	27,495	27,495	24,822	-2,673	24,822
Actual/Projected Cost Per geologic map (whole dollars)	N/A	177	264	389	389	389	386	-3	386

Program Changes

2012 Goal Performance Table

End Outcome Measure/Intermediate Measure/Output measure	2007 Actual	2008 Actual	2009 Actual	2010 Plan	2010 Actual	2011 Plan	2012 President's Budget	Change from 2011 Plan to 2012	Long-Term Target 2016
Mission Area: Provide a Scientific Foundation for Decision Making									
Goal: Develop a Comprehensive Science Framework for Understanding the Earth									
Strategy: Advance the Earth Science Application of Geospatial Information.									
National Geospatial Program									
% of the area of 48 States and DC published as high-resolution base geospatial databases and topographic map images that depict current geospatial information (SP)									
Performance Data	N/A	N/A	26.2% (13,203/50,414)	65.1% (32,810/50,414)	63.5% (32,013/50,414)	100% (50,414/50,414)	33.3% (17,895/53,684)	+33.3%	66.7% (35,765/53,684)
Total Actual/Projected Cost ($000)	N/A	N/A	52,328	56,758	56,758	54,200	53,100	-1,100	53,100
Comments	USGS anticipates reaching 100 percent every third year, and then resetting the target to zero for the next three-year cycle.								
The square miles of high resolution elevation data collected in Priority Areas and added to the 1/9 arc-second (3-meter) National Elevation Dataset (NED) (ARRA)									
Performance Data	N/A	N/A	0	56,000	9,981	35,000	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.								
Mission Area: Building a 21st Century Department of the Interior									
Goal: Improving Acquisition and Real Property Management									
Strategy: Overall condition of building per facility condition index.									
Facilities									
Overall condition of owned buildings and structures (as measured by the FCI) that are mission critical and mission dependent (as measured by the AEI), with emphasis on improving the condition of assets with critical health and safety needs									
Performance Data	0.124	0.134 (68,404/510,141)	0.134 (71,543/532,365)	0.098 (52,289/532,365)	0.138 (72,956/530,616)	0.078 (41,515/532,365)	0.072 (38,342/532,365)	-0.006	0.048 (25,352/532,365)
Comments	Once the $4.5M reduction is made, we expect the out year improvements to decelerate, especially for mission dependent assets.								

National Land Imaging

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Surveys, Investigations, and Research (SIR)							
Climate and Land Use Change ($000)							
Land Use Change							
LRS-Landsat Missions							
Landsat 8 Ground Systems	0	0	-13,350	0	13,350	0	0
FTE	*0*	*0*	*-3*	*0*	*3*	*0*	*0*
Landsat Missions Base ($000)	40,150	40,150	-40,150	0	0	0	-40,150
FTE	*30*	*30*	*-30*	*0*	*0*	*0*	*-30*
Total SIR ($000)	40,150	40,150	-53,500	0	13,350	0	-40,150
FTE	*30*	*30*	*-33*	*0*	*3*	*0*	*-30*
National Land Imaging (NLI)							
Technical Adjustment-Landsat Missions ($000)	0	0	53,500	0	0	53,500	53,500
FTE	*0*	*0*	*33*	*0*	*0*	*33*	*33*
Landsat 9 ($000)	0	0	0	0	48,000	48,000	48,000
FTE	*0*	*0*	*0*	*0*	*7*	*7*	*7*
EPN ($000)	0	0	-510	0	0	-510	-510
FTE	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Administrative Cost Savings ($000)	0	0	0	-1,173	0	-1,173	-1,173
FTE	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Total NLI ($000)	0	0	52,990	-1,173	48,000	99,817	99,817
FTE	*0*	*0*	*33*	*0*	*7*	*40*	*40*

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Technical Adjustment

Climate and Land Use Change – Land Remote Sensing (-$53,500,000/-33 FTE)
National Land Imaging (+$53,500,000/+33 FTE)

A technical adjustment is proposed to move funding of $53,500,000 and 33 FTE from the Survey, Investigations, and Research account in the Land Remote Sensing (LRS) program in the Climate and Land Use Change activity to a new account for the National Land Imaging Program (NLIP). This transfer includes a program increase of $13,350,000 and three FTE to complete the ground system for the Landsat Data Continuity Mission (LDCM, to become Landsat 8). Information on the Landsat 8 ground system is located in the Budget at a Glance Section.

This funding is for current operations of the Landsat 5 and 7 satellites, and completion of the LDCM and the Landsat 8 ground system. Funding for development of future satellites is described in the increase description provided below.

There is no change to performance as a result of this proposed technical adjustment.

Key Changes

$000	2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Surveys, Investigations, and Research (SIR)							
Land Remote Sensing							
Landsats 5 and 7	16,000	16,000	-16,000	0	0	0	-16,000
Landsat Data Continuity Mission	24,150	24,150	-37,500	0	13,350	0	-24,150
Total SIR	**40,150**	**40,150**	**-53,500**	**0**	**13,350**	**0**	**-40,150**
National Land Imaging (NLI)							
Landsats 5 and 7	0	0	16,000	0	0	16,000	16,000
Landsat Data Continuity Mission	0	0	37,500	0	0	37,500	37,500
Landsat 8 Ground System*	[0]	[0]	[13,350]	[0]	[0]	[13,350]	[13,350]
Landsat 9 and 10	0	0	0	0	48,000	48,000	48,000
NLI Related Changes	0	0	-510	-1,173	0	-1,683	-1,683
Total NLI	**0**	**0**	**52,990**	**-1,173**	**48,000**	**99,817**	**99,817**

*Landsat 8 Ground System is a component of LDCM

Program Change

The 2012 budget request for National Land Imaging is $99,817,000 and 40 FTE, which is a net program change of +$48,000,000 and +7 FTE from the 2010 Enacted/2011 Continuing Resolution.

National Land Imaging Program (+48,000,000/+7 FTE)

The NLI account will be established to acknowledge Interior's leadership of U.S. land management and land science. This will formalize the partnership between the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA) to maintain the continuous collection and availability of Earth imaging data provided by Landsat satellites as called for in the National Space Policy.

The Landsat series of satellites is vital to Earth observation through its archive of 40 years of recording changes on the global landscape. To date, NASA has developed and launched six Landsat satellites and is developing Landsat 8, which is scheduled for launch in December 2012. The USGS has been responsible for science operations for all Landsat missions, operates the remaining two aging Landsat satellites currently in orbit (Landsats 5 and 7), and will operate Landsat 8 following its launch and on-orbit check out by NASA.

Landsat has become vital to the Nation's agricultural, water management, disaster response, and scientific communities. State water managers in the West use Landsat's thermal sensor to measure water use more accurately and cost effectively than with traditional methods. Foresters around the country use Landsat imagery to remotely map and monitor the status of woodlands in near real-time, tracking the devastation caused by the pine bark beetle in the Rocky Mountains and monitoring drought and fire-prone areas. The military uses Landsat for mapping, surface-change detection, and graphics-display applications. New and innovative uses of Landsat data are being continually developed. For example, Google recently announced its newest product, Earth Engine, which utilizes the entire USGS archive of Landsat images to give researchers a singular, dynamic atlas of changes on the surface of the Earth. Land use planners and Earth scientists at all levels will also use this tool. By various estimates, including one conducted by the American Society for Photogrammetry and Remote Sensing, the absence of Landsat data would result in a loss of $1.0 billion per year to the U.S. economy.

Establishment of this account and the increase in funding will provide the stable budgetary foundation to provide a continuous capability. A permanent budgetary and managerial structure will ensure the continued collection and maintenance of the important data the Landsat satellite series provides. With the stability provided by the establishment of the account, the USGS will manage the budget and scientific requirements for Landsat satellites. NASA, drawing on its historic expertise, will build the Landsat satellites on a reimbursable basis for the USGS. As with NOAA's weather satellites, this development and management structure will best ensure that Landsat's vital capabilities are continuously maintained. In implementing the National Space Policy, Interior, through the USGS, will assume ownership and responsibility for the transition of Landsat satellites from a series of intermittent research missions to a reliable, continuous source of vital operational land-observation data for the Nation.

Additional information on the program can be found in the National Land Imaging Section.

This page intentionally left blank.

Ecosystem Restoration

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
California Bay-Delta ($000)	3,513	3,513	0	3,513	0
FTE	*15*	*15*	*0*	*15*	*0*
Chesapeake Bay ($000)	4,872	4,872	4,614	9,486	4,614
FTE	*20*	*20*	*18*	*38*	*18*
Columbia River - Salmon ($000)	2,589	2,589	0	2,589	0
FTE	*5*	*5*	*0*	*5*	*0*
Everglades ($000)	6,907	6,907	0	6,907	0
FTE	*30*	*30*	*0*	*30*	*0*
Great Lakes ($000)	15,785	15,785	3,500	19,285	3,500
FTE	*63*	*63*	*8*	*71*	*8*
Puget Sound ($000)	6,419	6,419	1,500	7,919	1,500
FTE	*26*	*26*	*7*	*33*	*7*
Upper Mississippi River ($000)	4,880	4,880	1,000	5,880	1,000
FTE	*23*	*23*	*5*	*28*	*5*
Sub-total Requirements - Ecosystem Restoration ($000)	**44,965**	**44,965**	**10,614**	**55,579**	**10,614**
Total FTE	***182***	***182***	***38***	***220***	***38***
Columbia River - Other Activities ($000)	10,344	10,344	1,400	11,744	1,400
FTE	*45*	*45*	*7*	*52*	*7*
Total Requirements ($000)	**55,309**	**55,309**	**12,014**	**67,323**	**12,014**
Total FTE	***227***	***227***	***45***	***272***	***45***

Summary of Program Changes

Request Component	($000)	FTE
▪ Chesapeake Bay	+4,614	+18
▪ Columbia River – Other Activities	+1,400	+7
▪ Great Lakes	+3,500	+8
▪ Puget Sound	+1,500	+7
▪ Upper Mississippi River	+1,000	+5
TOTAL Program Changes	**+12,014**	**+45**

Justification of Program Changes

Program Change **(+$12,014,000/+45 FTE)**

The 2012 budget request for Ecosystem Restorations is $67,323,000 and 272 FTE, a net program change of +$12,014,000 and +45 FTE from the 2010 Enacted/2011 CR. This funding represents USGS's commitment to deliver on the goals outlined in the Chesapeake Bay Action Plan, the Asian Control Strategy Framework, and other interagency efforts to restore these vital ecosystems.

Program Overview

America's Great Outdoors is the President's signature conservation initiative, and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. In the 2012 budget realignment, the USGS has created a new mission area for Ecosystems. This mission area addresses research and monitoring, and organizes scientific information focused on understanding how ecosystems and their inhabitants are structured, function, and provide ecosystem services. The Ecosystems mission area has been conducting this work and providing the resultant data for decades. Examples of current work are located in the Regional and Crosscutting Activities Section.

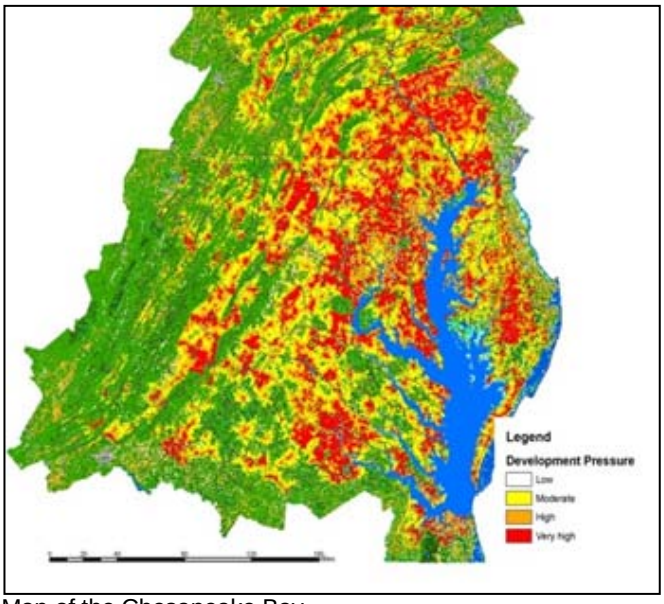
Ecosystem Restoration – Chesapeake Bay

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Ecosystems ($000)	**1,968**	**1,968**	**4,614**	**6,582**	**4,614**
Fisheries: Aquatic & Endangered Resources	308	308	0	308	0
Wildlife: Terrestrial & Endangered Resources	204	204	0	204	0
Terrestrial, Freshwater & Marine Environments	1,456	1,456	4,614	6,070	4,614
Climate and Land Use Change ($000)	**1,238**	**1,238**	**0**	**1,238**	**0**
Climate Variability					
Research & Development	808	808	0	808	0
Land Use Change					
Land Remote Sensing	110	110	0	110	0
Geographic Analysis & Monitoring	320	320	0	320	0
Energy, Minerals, and Environmental Health ($000)	**223**	**223**	**0**	**223**	**0**
Contaminant Biology	183	183	0	183	0
Toxic Substances Hydrology	40	40	0	40	0
Natural Hazards ($000)	**218**	**218**	**0**	**218**	**0**
Coastal & Marine Geology	218	218	0	218	0
Water Resources ($000)	**1,225**	**1,225**	**0**	**1,225**	**0**
National Water Quality Assessment	216	216	0	216	0
National Streamflow Information Program	189	189	0	189	0
Hydrologic Network & Analysis	186	186	0	186	0
Cooperative Water Program	634	634	0	634	0
Total Requirements Chesapeake Bay ($000)	**4,872**	**4,872**	**4,614**	**9,486**	**4,614**

Ecosystem Restoration – Chesapeake Bay (+$4,614,000/+18 FTE)

In 2009, President Obama issued Executive Order (E.O.) 13508 to increase the Federal effort for restoration and protection of the Chesapeake Bay, the Nation's largest estuary. The E.O. established an interagency Federal Leadership Committee (the Environmental Protection Agency (EPA), the Department of the Interior, the U.S. Department of Agriculture (USDA), National Oceanic and Atmospheric Administration (NOAA), and the Department of Defense (DOD) which has worked with the White House Council on Environmental Quality to prepare a restoration strategy that specifies the goals, outcomes, and Federal activities to be carried out from 2010 to 2025. Interior, through the Fish and Wildlife Service (FWS), the National Park Service (NPS), and the USGS, is providing leadership, expertise, and resources to meet the

four major goals of the strategy: restore water quality; recover habitat; sustain fish and wildlife; and conserve lands and increase public access. The USGS has been given lead responsibility in collaboration with NOAA to strengthen science to support all of these goals and address the potential impacts of climate and land use change on the Bay and its watershed.



Map of the Chesapeake Bay

The USGS has realigned its Chesapeake Bay activities to address the E.O. and meet the new USGS Science Strategy. The proposed 2012 increase will enhance USGS activities to support the E.O. strategy. These activities include:

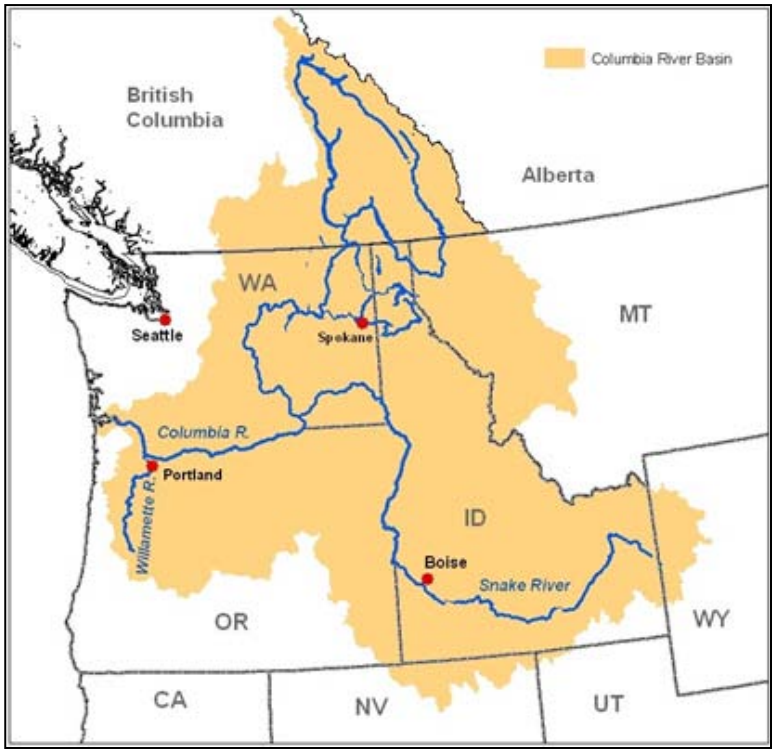
- Develop a geographic information system-based, land-conservation targeting system, which is considered a prototype by the Secretary of the Department of the Interior for the America's Great Outdoors initiative (working with the NPS);
- Conduct an in-depth analysis of the extent and sources of endocrine-disrupting chemicals impacting fish and wildlife in the Potomac basin (working with the FWS);
- Improve land cover information and models for prioritizing practices to improve water-quality in the bay (working with the EPA);
- Begin small watershed monitoring and assessment to evaluate the effect of agricultural and urban practices to reduce nutrients and sediment (working with the USDA and the EPA);
- Begin vulnerability assessments of the impact of climate and land change on water-quality in the watershed and coastal wetlands (with the U.S. Forest Service (USFS) and NOAA);
- Support Interior's need to better manage key fish and wildlife species listed in the Chesapeake Bay Executive Order (brook trout and black ducks);
- Begin efforts to assess, monitor, and forecast the combined impacts of climate and land change on stream habitats supporting brook trout and wetland habitats supporting black ducks;
- Enhance analysis of water-quality data to assess progress toward reducing sediment and nutrients in the Bay watershed; and
- Use key results to improve decision support tools and work with the FWS on implications for restoring stream and coastal habitats and considering climate adaptation strategies to manage these critical fish and wildlife species.

Ecosystem Restoration – Columbia River

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Salmon					
Ecosystems ($000)	**2,589**	**2,589**	**0**	**2,589**	**0**
Fisheries: Aquatic & Endangered Resources	2,589	2,589	0	2,589	0
Subtotal Salmon	**2,589**	**2,589**	**0**	**2,589**	**0**
Other Activities					
Ecosystems ($000)	**3,761**	**3,761**	**500**	**4,261**	**500**
Fisheries: Aquatic & Endangered Resources	3,411	3,411	0	3,411	0
Wildlife: Terrestrial & Endangered Resources	0	0	200	200	200
Terrestrial, Freshwater & Marine Environments	0	0	300	300	300
Invasive Species	350	350	0	350	0
Climate and Land Use Change ($000)	**391**	**391**	**0**	**391**	**0**
NCCWSC	291	291	0	291	0
Research and Development	100	100	0	100	0
Energy, Minerals, and Environmental Health ($000)	**320**	**320**	**200**	**520**	**200**
Contaminant Biology	320	320	100	420	100
Toxic Substances Hydrology	0	0	100	100	100
Natural Hazards ($000)	**74**	**74**	**0**	**74**	**0**
Volcano Hazards	74	74	0	74	0
Water Resources ($000)	**5,798**	**5,798**	**200**	**5,998**	**200**
Groundwater Resources	245	245	0	245	0
National Water Quality Assessment	1,567	1,567	100	1,667	100
National Streamflow Information Program	0	0	100	100	100
Hydrologic Network & Analysis	967	967	0	967	0
Cooperative Water Program	3,019	3,019	0	3,019	0
Core Science Systems ($000)	**0**	**0**	**500**	**500**	**500**
National Geospatial Program	0	0	500	500	500
Subtotal Non-Salmon	**10,344**	**10,344**	**1,400**	**11,744**	**1,400**
Total Requirements Columbia River ($000)	**12,933**	**12,933**	**1,400**	**14,333**	**1,400**

Ecosystem Restoration – Columbia River-Other Activities (+$1,400,000/+7 FTE)

The Columbia River system, in its component parts—from freshwater springs to streams to small rivers to precipitation regimes to glaciers to snowmelt—is important to the understanding and predicting of ecosystem changes in the Columbia River Basin's environment, culture and economy. The Columbia River system is essential to the region's agriculture, transportation, recreation, fisheries, and hydropower. Future water quality and availability to meet these multiple needs is of paramount concern. Three multi-agency partnerships, the Columbia River Basin Federal Caucus, the Pacific Northwest Aquatic Monitoring Partnership, and the Columbia River Toxics Reduction Working Group, will provide a foundation for interdisciplinary strategic science planning and serve as a robust forum for prioritizing and matching USGS capabilities and expertise with management, stewardship and regulatory responsibilities and needs for Federal, tribal, State and local collaborators.



Map of the Columbia River Basin

Ongoing ecosystem change in the Columbia River Basin has been linked to rising water temperatures and changing fish, wildlife, and migratory patterns. The FWS, the USFS, the NPS, the Bureau of Land Management (BLM), and the Bureau of Indian Affairs (BIA) are in need of improved identification, assessments, and interpretation of ongoing changes for making decisions about future vulnerabilities, thresholds, and response strategies, and for devising useful monitoring, adaptation and mitigation tools. Additionally, agencies with responsibilities for dam operations (U.S. Army Corps of Engineers (USACE), the Bureau of Reclamation (BOR)) and power production (Bonneville Power Administration), as well as those providing affiliated regulation (EPA, NOAA) and species and habitat stewardship (FWS, USFS, NPS, NOAA) need comprehensive and predictive modeling of surface water, groundwater and other ecosystem processes.

Developing research that supports modeling and decision analysis tools will assist a wide range of regional decision makers with science related information such as sources of water, stream conditions, land, fish, wildlife and habitat health, agriculture, and recreation. The initiative proposes to:

- Build upon aquatic and marine ecological research and monitoring, to create clearer linkages to understanding aquatic food webs, fish health and migratory patterns;

- Use data from its extensive streamgaging program, watershed modeling capabilities, and contaminant chemistry and sedimentation research to better understand the effects ecosystem change will have on ecosystem services in the Columbia River system;
- Conduct needed vulnerability assessments for aquatic and marine populations, species and habitats to provide useful scientific information for local models to help managers rank ecological and conservation activities; and
- Enhance the existing Columbia River USGS Interdisciplinary Science Explorer (CRUISE; an integrated Internet Map Service), for ease of access to USGS data and geospatial mapping technology to test proof-of-concept for two ongoing pilot efforts in the Yakima and Methow River subbasins—important water and instream flow sources to the Columbia River Basin.

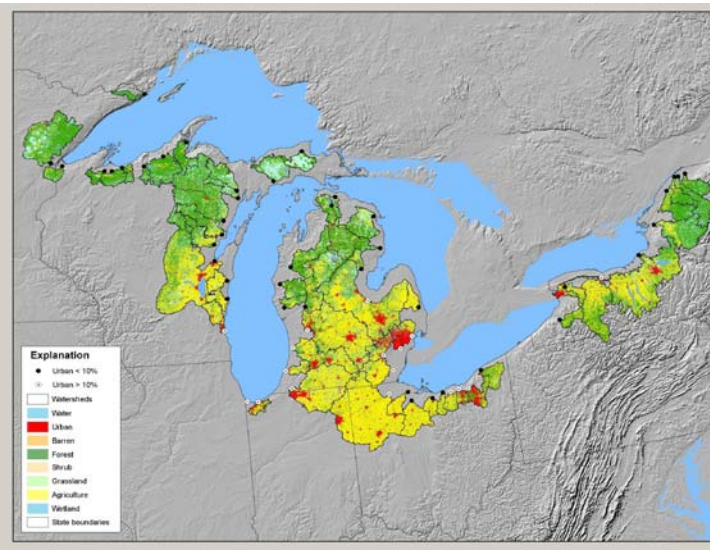
These models and tools will help local communities, stakeholders and partners to better understand and respond to ecosystem changes and choices in the Columbia River Basin ecosystem for years to come.

Ecosystem Restoration – Great Lakes

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Asian Carp					
Ecosystems ($000)	**121**	**121**	**3,500**	**3,621**	**3,500**
Fisheries: Aquatic & Endangered Resources	45	45	0	45	0
Invasive Species	76	76	3,500	3,576	3,500
Carp Subtotal	**121**	**121**	**3,500**	**3,621**	**3,500**
Other Activities					
Ecosystems ($000)	**9,088**	**9,088**	**0**	**9,088**	**0**
Status & Trends	3,617	3,617	0	3,617	0
Fisheries: Aquatic & Endangered Resources	3,807	3,807	0	3,807	0
Wildlife: Terrestrial & Endangered Resources	26	26	0	26	0
Terrestrial, Freshwater & Marine Environments	1,211	1,211	0	1,211	0
Invasive Species	427	427	0	427	0
Natural Hazards ($000)	**600**	**600**	**0**	**600**	**0**
Coastal & Marine Geology	600	600	0	600	0
Water Resources ($000)	**5,898**	**5,898**	**0**	**5,898**	**0**
Groundwater Resources	10	10	0	10	0
National Water Quality Assessment	2,607	2,607	0	2,607	0
National Streamflow Information Program	540	540	0	540	0
Cooperative Water Program	2,741	2,741	0	2,741	0
Core Science Systems ($000)	**78**	**78**	**0**	**78**	**0**
Biological Information Management & Delivery	78	78	0	78	0
Non-Carp Subtotal	**15,664**	**15,664**	**0**	**15,664**	**0**
Total Requirements Great Lakes ($000)	**15,785**	**15,785**	**3,500**	**19,285**	**3,500**

Ecosystem Restoration – Great Lakes **(+$3,500,000/+8 FTE)**

Aquatic invasive species (AIS) pose serious threats to biodiversity and have substantial effects on ecosystem function and services. Once established, control is costly and difficult. Invasive Asian carp have spread throughout much of the Mississippi River Basin and are now poised to enter the Great Lakes where they may pose a very serious ecological and economic threat. The USGS has developed an integrated, comprehensive, and systematic approach for Asian carp control that is part of a broader Integrated Pest Management Plan for AIS of concern to Great Lakes managers. This initiative will enable the USGS to respond to this threat by improving ecological understanding and control methods as outlined in the interagency Asian Carp Control Strategy Framework. As part of this Framework, the USGS will develop control tools and delivery methods to reduce impacts on other fish and aquatic biota, and boost effectiveness of control efforts by using pheromones and seismic technologies. This research will utilize the USGS's unique capabilities in development and registration of chemical control tools for use in natural resource management. Great Lakes research will build on the expertise gained from previous and ongoing research on Asian carps in the Missouri and Mississippi River Basins. The expanded Great Lakes ecological research on these fishes is critical in development of effective control methods.



Map of the Great Lakes

This funding will advance the Asian carp research that is already underway in the Great Lakes as part of the Asian Carp Control Strategy Framework. The USGS has made significant strides in detecting and understanding Aquatic invasive species populations throughout the United States. The USGS has contributed significantly to the development and testing of innovative aquatic invasive species control methods and their potential ecological effects. The USGS also carries out basic and applied research on the ecology of invasive Asian carp in the Missouri and Mississippi river basins that has improved the understanding of the life cycles of bighead and silver carp, and is being applied to the Great Lakes Asian carp control efforts. USGS scientists collaborate with Federal and State management agencies and universities, nationally and internationally, to fill critical science information gaps.

Cutting-edge carp control science will be conducted to: develop methods to orally deliver registered fish toxicants targeting Asian carp and have minimal impacts to native species; estimate minimum river length and water temperature needed to support successful spawning of Asian carp in the Great Lakes; define attractant pheromones with a high specificity for Asian carp that could help draw the carp into an area to apply chemical controls; and use seismic technology to divert or eradicate invasive Asian carp as a means to inhibit passage and reduce recruitment.

Ecosystem Restoration – Puget Sound

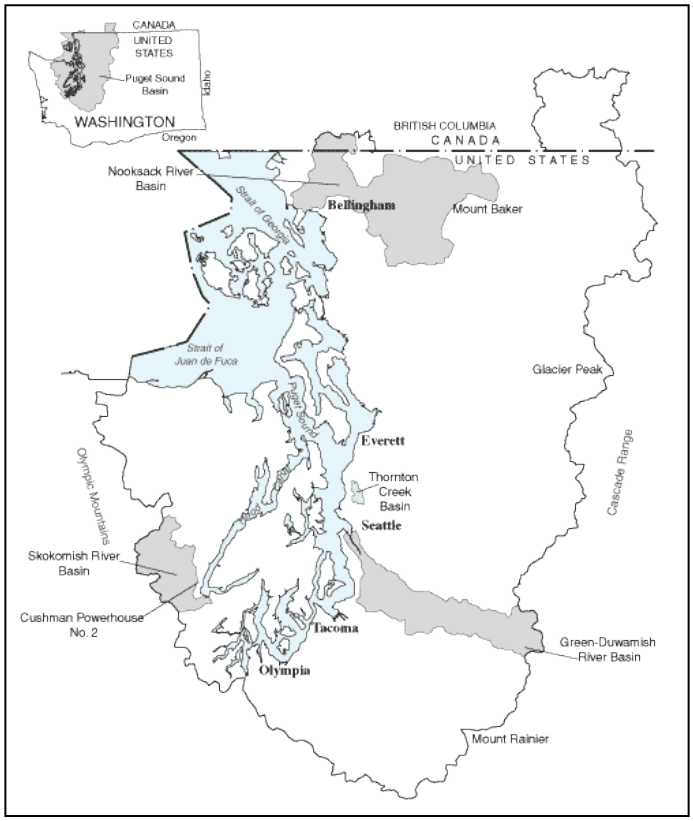
	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Ecosystems ($000)	**2,837**	**2,837**	**500**	**3,337**	**500**
Fisheries: Aquatic & Endangered Resources	2,432	2,432	0	2,432	0
Terrestrial, Freshwater & Marine Environments	0	0	500	500	500
Invasive Species	405	405	0	405	0
Climate and Land Use Change ($000)	**373**	**373**	**0**	**373**	**0**
Research & Development	373	373	0	373	0
Natural Hazards ($000)	**1,480**	**1,480**	**400**	**1,880**	**400**
Coastal & Marine Geology	1,480	1,480	400	1,880	400
Water Resources ($000)	**1,522**	**1,522**	**300**	**1,822**	**300**
National Water Quality Assessment Program	25	25	0	25	0
Hydrologic Research & Development	200	200	300	500	300
Hydrologic Network & Analysis	147	147	0	147	0
Cooperative Water Program	1,150	1,150	0	1,150	0
Core Science Systems ($000)	**207**	**207**	**300**	**507**	**300**
National Cooperative Geologic Mapping	207	207	0	207	0
National Geospatial Program	0	0	300	300	300
Total Requirements Puget Sound ($000)	**6,419**	**6,419**	**1,500**	**7,919**	**1,500**

Ecosystem Restoration – Puget Sound **(+$1,500,000/+7 FTE)**

Restoration of the Puget Sound ecosystem is being undertaken by a robust partnership of State and Federal agencies, Tribes, non-governmental organizations, and local governments. Key national and State leaders have established an *Action Agenda* to guide this restoration. Federal agencies will have key roles in ensuring restoration succeeds. Through the Puget Sound Federal Caucus, Federal activities to support *Action Agenda* initiatives are collaboratively identified, and $50.0 million in Federal funds was appropriated in 2010 through the EPA for restoration activities.

Current Federal funding largely supports restoration actions. Under the *Action Agenda*, science is identified as necessary to understand key ecosystem processes, to plan actions through forecast modeling, and to monitor outcomes in support of these actions. The USGS has conducted science in the Puget Sound area for more than a century.

With the proposed increase, the USGS will continue to provide critically needed information to decision makers and agencies as they undertake prioritized activities to restore the Puget Sound. Responsive to identified science needs, and in partnership with Tribes, Federal and State agencies, the public and international counterparts north of the border, the USGS will:



Map of Puget Sound

- Assess the health and vitality of marine habitats via spatial seafloor and habitat mapping, forage fish dynamics and food web investigations;
- Assess estuary and wetland function, resiliency, and habitat and hydrological responses to land use;
- Investigate the importance of sediment transport by small rivers that feed into Puget Sound;
- Model and forecast aquatic and marine changes to ecosystem services provided by the Puget Sound; and
- Develop future scenarios for societal dependence on the ecosystem based on predictions of natural resource capacities under alternative restoration outcomes.

This work will be integrated with other USGS programs that also address restoration needs (e.g., DOI Climate Science Centers). In carrying out the initiative, the USGS will focus on geographic locations with specific restoration needs, for example, Hood Canal, the Elwha River and estuary, Nisqually River system, Skagit River delta, and urbanizing shorelines.

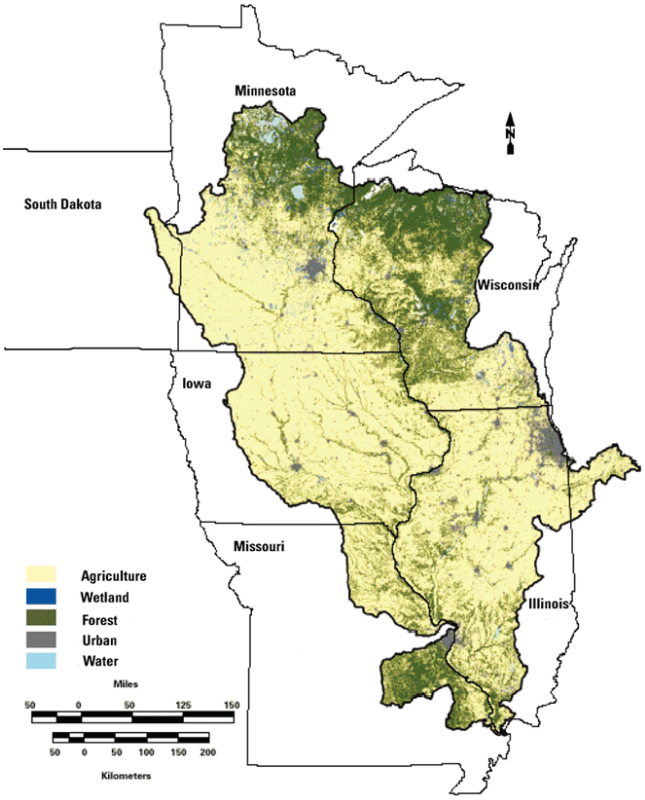
Ecosystem Restoration – Upper Mississippi River

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Ecosystems ($000)	**2,690**	**2,690**	**450**	**3,140**	**450**
Status & Trends	97	97	**0**	97	0
Fisheries: Aquatic & Endangered Resources	988	988	0	988	0
Wildlife: Terrestrial & Endangered Resources	859	859	0	859	0
Terrestrial, Freshwater & Marine Environments	523	523	450	973	450
Invasive Species	223	223	0	223	0
Energy, Minerals, and Environmental Health ($000)	**259**	**259**	**0**	**259**	**0**
Contaminant Biology	259	259	0	259	0
Water Resources ($000)	**1,931**	**1,931**	**550**	**2,481**	**550**
National Water Quality Assessment Program	406	406	350	756	350
National Streamflow Information Program	523	523	200	723	200
Hydrologic Network & Analysis	327	327	0	327	0
Cooperative Water Program	675	675	0	675	0
Total Requirements Upper Mississippi River ($000)	**4,880**	**4,880**	**1,000**	**5,880**	**1,000**

Ecosystem Restoration – Upper Mississippi River (+$1,000,000/+5 FTE)

This initiative builds on ongoing USGS activities in the Upper Mississippi River Basin (Basin). The Basin contains a wide diversity of landscape types that include major agricultural operations headwaters with major urban landscapes. Both landscape types can have negative impacts on aquatic ecosystem health of the Mississippi River and connecting rivers downstream resulting in maintaining or expanding hypoxia conditions in the Gulf of Mexico. Existing USGS programs in this region are developing a better understanding of water resources through critical streamflow measurement stations that characterize water quality. The USGS also has been collecting samples of contaminants of emerging concern and learning about the potential effects of these contaminants on aquatic organisms living in the streams and rivers. Data collections and interpretive studies addressing water-quality concerns are also shared with State and local partners in this five-State region (Minnesota, Wisconsin, Illinois, Iowa and Missouri).

Directly linked with investigations of the impacts of nutrient and sediment loading in the Basin are the ecosystem studies which build from this work to assess the changes to aquatic riverine systems, habitats and communities. The USGS currently uses its historic databases from the Long Term Resource Monitoring program to evaluate changes in aquatic communities, including fish, in highly managed and modified riverine systems. The data are also important to the understanding of changing aquatic environments, particularly backwater systems, as both the environment and the inhabiting native species respond to perturbations such as invasive species. Coupled with the investigations of backwater systems are studies evaluating changes in wetland communities and their related ecosystem services. The USGS wildlife investigations in the Basin also include assessments of changes in migratory birds (both game and non-game species) resulting from changes in river characteristics and potential impacts from a variety of aquatic contaminants.



Map of the Upper Mississippi River

The initiative will conduct large-river scientific research with a focus on the Basin in support of the Nation's efforts to manage land and ecosystems using a phased approach. The work includes implementation of a national monitoring network of 400-450 sites (including Mississippi River Basin sites) and incorporates habitat assessment, sediment excess/starvation, ecosystem sustainability and resilience, and the quantification of fluxes of nutrients and contaminants. The USGS will begin to establish a comprehensive data management structure and facilitate collaboration among State and Federal agencies through the development of technical tools and the establishment and maintenance of information products. An example of collaboration would include supplemental information to better understand progress from the USDA Mississippi River Healthy Watersheds initiative.

Large rivers are national treasures for many reasons and uses. Understanding sediment and nutrient movement in the context of ecosystem sustainability, restoration, and resilience in these rivers and their ultimate effects on coastal estuaries and waters is critical to wise future management of river flow and material sources on the landscape. Physical, chemical, and biological damage attributable to sediment, nutrients, and sediment-associated water-quality constituents has been estimated to range from $20.0 to $50.0 billion annually in North America. Knowing how natural and human factors affect those ecosystem attributes and the relations between those attributes and resource management goals are needed in the context of potential changing climate.

Program Performance Change

Ecosystem Restoration Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Wildlife: Terrestrial and Endangered Resources							
% of targeted wildlife populations for which science information is provided for management decision making to inform and improve conservation (SP)							
Performance Data	47.03% (166/353)	51.6% (182/353)	54.39% (192/353)	57.79% (204/353)	61.19% (216/353)	+3.40%	+11.05%
Total Actual/Projected Cost ($000)	18,047	25,210	25,736	26,000	26,200	200	200
Terrestrial, Freshwater & Marine Environments							
% of targeted ecosystems with information products forecasting ecosystem change (SP)							
Performance Data	11% (1/9)	11% (1/9)	22% (2/9)	22% (2/9)	28% (2.5/9)	+6%	16%
Total Actual/Projected Cost ($000)	34,429	37,977	38,190	38,190	40,481	2,291	6,477
Comments	The out years are the base number (2009) multiplied by the number of % of targeted ecosystems for that year. It is cumulative over time and the amount does not occur in one year. The cost / targeted ecosystem / year will probably be in the 80% of the total budget range.						
Invasive Species							
% of targeted science information products available for successful control and management of priority groups of invasive species (SP)							
Performance Data	44.7% (26.8/60)	44.7% (26.8/60)	44.7% (26.8/60)	45.0% (27.0/60)	45.7% (27.4/60)	+0.7%	+1.3%
Total Actual/Projected Cost ($000)	11,924	12,784	16,365	14,574	12,784	-1,790	0

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

Enterprise Publishing Network

Enterprise Publishing Network **(-$5,500,000/-44 FTE)**

Throughout its history, USGS maps and scientific reports have been the primary vehicle for communicating the results of USGS science to decision makers and the public. The USGS is widely known and relied upon for the quality, accuracy, integrity, timeliness, usefulness, relevance, and rigor of its published products. In 2005-2006, the USGS restructured its science publishing workforce and business processes from a highly decentralized function, costing $30.0 million, into a centralized Enterprise Publishing Network (EPN) that operates at $16.1 million. The efficiencies were achieved from standardization of technical and business processes, reduction of staff with duplicative skills, and the ability to balance workload. The EPN is currently funded 60 percent by direct science programs dollars through a Working Capital Fund component; two percent of its funding (proposed for elimination in 2012) comes from the Administration and Enterprise Information mission area; and the remaining 38 percent is derived from science center-level project funding through fee-for-service per project publication.

The USGS proposes to decrease EPN funding and alter the EPN funding model by moving the bulk of the cost of publishing back to science center projects through reduction of the science program-level contribution. This reduction is proposed to address higher priorities within the USGS as well as to support USGS's efforts to create efficiencies and streamline processes. This proposed reduction may impact EPN services for technical writing, editorial, cartographic, graphic design and illustration, Web, and printing support. The reduction may also impact USGS partnerships in which specific products and deadlines are mandated; USGS customers who depend on the timeliness of publications to help them make informed science-based, land- and resource-management decisions; and the public who expect taxpayer-supported research to be published and accessible by all. In this new funding model for publishing and to better describe the functions, the Science Publishing Network is proposed as the name.

Publishing is a mission-essential activity that must continue; the proposed reduction redistributes how it is funded. The EPN is not a budget line item; it is funded with science program dollars. The proposed reduction to the direct contribution by science programs has been distributed to each science program. The distribution can be found in the USGS Accounts Section.

Summary

Accurate, efficient, effective, impartial, and timely reporting of USGS science data and results are key factors that ensure the USGS remains a world leader in the natural sciences through scientific excellence and responsiveness to society's needs.

The EPN's professional publishing staff is highly trained and has extensive experience in the unique and specialized field of Earth and biological science publishing; many are former scientists and nearly half have science degrees. USGS scientists and managers, as well as USGS customers and partners within and outside Interior rely on the quality and timely publishing services of the EPN for the final step in the scientific research process—delivering the results so they can be used by policymakers at the Federal, State, local, tribal, and international levels to make critical decisions.

On average, the EPN works on 1,550 significant products each year, such as scientific reports, thematic maps, scientific and technical journal articles, fact sheets, brochures, presentation materials, Web site design and content, online documents that are Americans with Disabilities Act compliant, and interactive multimedia work. The EPN is also the USGS liaison to the Government Printing Office for all printed materials. Publishing through the EPN is done at 12 publishing service centers housed at strategic locations nearest to or within the largest science centers across the USGS.

In 2011, the EPN continues to standardize and streamline policies and business practices and implement new technologies. The EPN continues to make improvements to its internal-billing and data-tracking system, its digital workflow process, and provides guidance to authors and managers through collaborative consultation and the development of author-assistance tools such as guidelines and templates. These activities will help maintain the USGS reputation for high-quality, unbiased, timely, and rigorously-reviewed scientific publications.

Budget at a Glance
(Dollars in Thousands)

	2010 Enacted	2010 Enacted/ 2011 CR	Fixed Costs & Related Changes /1	Administrative Cost Savings	Program Changes	2012 Request
Appropriation: Surveys, Investigations, and Research						
Ecosystems						
Status and Trends	**22,877**	**22,877**	**-316**	**-482**	**0**	**22,079**
Fisheries: Aquatic & Endangered Resources	**24,674**	**24,674**	**-334**	**-510**	**-1,170**	**22,660**
Unrequested Congressional Action	[970]	[970]			-970	[0]
WaterSMART	[0]	[0]			500	[500]
Aquatic Drug Registration	[700]	[700]			-700	[0]
Wildlife: Terrestrial & Endangered Resources	**50,116**	**50,116**	**-694**	**-1,078**	**200**	**48,544**
Ecosystem Restoration	[1,194]	[1,194]			200	[1,394]
Terrestrial, Freshwater & Marine Environments	**37,227**	**37,227**	**-580**	**-881**	**4,464**	**40,230**
Unrequested Congressional Action	[1,600]	[1,600]			-1,600	[0]
Chesapeake Bay Executive Order (2011)	[0]	[0]			3,614	[3,614]
Multi-Hazards Initiative (2011)	[295]	[295]			200	[495]
Ecosystem Restoration (2012)	[6,246]	[6,246]			2,250	[8,496]
Invasive Species	**11,380**	**11,380**	**-175**	**-269**	**3,150**	**14,086**
Unrequested Congressional Action	[350]	[350]			-350	[0]
Asian Carp Control Framework	[0]	[0]			3,000	[3,000]
Ecosystem Restoration	[1,174]	[1,174]			500	[1,674]
Cooperative Research Units	**19,313**	**19,313**	**-112**	**-377**	**0**	**18,824**
Total, Ecosystems	**165,587**	**165,587**	**-2,211**	**-3,597**	**6,644**	**166,423**
Climate and Land Use Change /2						
Climate Variability	**63,177**	**63,177**	**-611**	**-1,225**	**11,578**	**72,919**
DOI Climate Science Centers	[15,143]	[15,143]			11,000	[26,143]
Climate Research and Development	[32,939]	[32,939]	[-259]	[-517]	-8,022	[24,141]
Carbon Sequestration	[10,095]	[10,095]			2,000	[12,095]
Science Support for DOI Bureaus	[5,000]	[5,000]			4,000	[9,000]
Ecosystem Restoration	[0]	[0]			2,600	[2,600]
Land Use Change	**74,842**	**74,842**	**-54,543**	**-913**	**14,100**	**33,486**
Landsat 8 Ground System	[24,150]	[24,150]			13,350	[37,500]
Multi-Hazards Initiative (2011)	[295]	[295]			250	[545]
WaterSMART	[0]	[0]			500	[500]
National Land Imaging	[40,150]	[40,150]	[-53,500]			[-13,350]
Total, Climate and Land Use Change	**138,019**	**138,019**	**-55,154**	**-2,138**	**25,678**	**106,405**

Budget at a Glance
(Dollars in Thousands)

	2010 Enacted	2010 Enacted/ 2011 CR	Fixed Costs & Related Changes /1	Administrative Cost Savings	Program Changes	2012 Request
Energy, Minerals, and Environmental Health						
Mineral Resources	**53,780**	**53,780**	**-696**	**-870**	**-8,050**	**44,164**
Unrequested Congressional Action	[650]	[650]			-650	[0]
Multi-Hazards Initiative (2011)	[0]	[0]			250	[250]
Multi-Hazards Initiative (2012)	[0]	[0]			-200	[-200]
Minerals External Research Program	[250]	[250]			-250	[0]
Minerals Resources	[53,780]	[53,780]	[-696]	[-870]	-7,200	[45,014]
Energy Resources	**27,237**	**27,237**	**-368**	**-477**	**1,000**	**27,392**
New Energy Frontier	0	0			3,000	[3,000]
Energy Resources	27,237	27,237	[-368]	[-477]	-2,000	[24,392]
Contaminant Biology	**9,411**	**9,411**	**-117**	**-199**	**-400**	**8,695**
Contaminant Biology	[9,411]	[9,411]	[-117]	[-199]	-500	[8,595]
Ecosystem Restoration	[1,022]	[1,022]			100	[1,122]
Toxic Substances Hydrology	**11,084**	**11,084**	**-142**	**-275**	**-2,400**	**8,267**
Toxic Substances Hydrology	[11,084]	[11,084]	[-142]	[-275]	-2,500	[8,167]
Ecosystem Restoration	[40]	[40]			100	[140]
Total, Energy, Minerals, and Environmental Health	**101,512**	**101,512**	**-1,323**	**-1,821**	**-9,850**	**88,518**
Natural Hazards						
Earthquake Hazards	**57,021**	**57,021**	**-619**	**-1,076**	**-3,000**	**52,326**
Unrequested Congressional Action	[1,000]	[1,000]			-1,000	[0]
Multi-Hazards Initiative (2011)	[4,300]	[4,300]			1,800	[6,100]
Multi-Hazards Initiative (2012)	[4,300]	[4,300]			-1,800	[2,500]
Earthquake Grants	[7,000]	[7,000]			-2,000	[5,000]
Volcano Hazards	**24,421**	**24,421**	**-286**	**-526**	**-250**	**23,359**
Unrequested Congressional Action	[250]	[250]			-250	[0]
Multi-Hazards Initiative (2011)	[0]	[0]			1,500	[1,500]
National Volcano Early Warning System	[0]	[0]			-1,500	[-1,500]
Landslide Hazards	**3,405**	**3,405**	**-46**	**-81**	**0**	**3,278**
Global Seismographic Network	**5,778**	**5,778**	**-75**	**-121**	**-250**	**5,332**
Unrequested Congressional Action	[250]	[250]			-250	[0]
Geomagnetism	**2,138**	**2,138**	**-28**	**-37**	**0**	**2,073**
Coastal and Marine Geology	**46,188**	**46,188**	**-588**	**-999**	**2,900**	**47,501**
Coastal and Marine Spatial Planning	[0]	[0]			8,000	[8,000]
Coastal and Marine Research and Coordination	[46,188]	[46,188]	[-588]	[-999]	-3,500	[41,101]
Extended Continental Shelf	[4,000]	[4,000]			-2,000	[2,000]
Ecosystem Restoration	[1,698]	[1,698]			400	[2,098]
Total, Natural Hazards	**138,951**	**138,951**	**-1,642**	**-2,840**	**-600**	**133,869**

Budget at a Glance
(Dollars in Thousands)

	2010 Enacted	2010 Enacted/ 2011 CR	Fixed Costs & Related Changes /1	Administrative Cost Savings	Program Changes	2012 Request
Water Resources						
Groundwater Resources	**9,714**	**9,714**	**-174**	**-213**	**-2,380**	**6,947**
Unrequested Congressional Action	[1,480]	[1,480]			-1,480	[0]
WaterSMART	[1,594]	[1,594]			1,100	[2,694]
Groundwater Resources	[9,714]	[9,714]	[-174]	[-213]	-2,000	[7,327]
National Water Quality Assessment	**66,507**	**66,507**	**-1,066**	**-1,623**	**-6,278**	**57,540**
National Water Quality Assessment Program	[66,507]	[66,507]	[-1,066]	[-1,623]	-6,728	[57,090]
Ecosystem Restoration	[3,320]	[3,320]			450	[3,770]
National Streamflow Information Program	**27,732**	**27,732**	**-618**	**-501**	**300**	**26,913**
Ecosystem Restoration	[712]	[712]			300	[1,012]
Hydrologic Research and Development	**13,822**	**13,822**	**-225**	**-289**	**-1,300**	**12,008**
Unrequested Congressional Action	[1,600]	[1,600]			-1,600	[0]
Ecosystem Restoration	[200]	[200]			300	[500]
Hydrologic Networks and Analysis	**31,387**	**31,387**	**-1,695**	**-806**	**5,054**	**33,940**
Unrequested Congressional Action	[1,346]	[1,346]			-1,346	[0]
WaterSMART	[355]	[355]			6,400	[6,755]
Cooperative Water Program	**65,561**	**65,561**	**-1,599**	**-1,710**	**0**	**62,252**
Water Resources Research Act Program	**6,500**	**6,500**	**0**	**-1**	**-6,499**	**0**
Water Resources Research Act Program (Water Institutes)	[6,500]	[6,500]		[-1]	-6,499	[0]
Total, Water Resources	**221,223**	**221,223**	**-5,377**	**-5,143**	**-11,103**	**199,600**
Core Science Systems						
Biological Information Management and Delivery	**24,946**	**24,946**	**-385**	**-520**	**-8,928**	**15,113**
Unrequested Congressional Action	[1,428]	[1,428]			-1,428	[0]
National Biological Information Infrastructure	[9,287]	[9,287]			-6,928	[2,359]
State Conservation Data Agencies	[572]	[572]			-572	[0]
National Geological & Geophysical Data Preservation Program	**1,000**	**1,000**	**0**	**0**	**-1,000**	**0**
National Geological and Geophysical Data Preservation	[1,000]	[1,000]			-1,000	[0]
National Cooperative Geologic Mapping	**28,163**	**28,163**	**-292**	**-474**	**-2,000**	**25,397**
WaterSMART	[0]	[0]			500	[500]
National Cooperative Geologic Mapping Federal and State Partnerships	[28,163]	[28,163]	[-292]	[-474]	-2,500	[24,897]
National Geospatial Program	**70,748**	**70,748**	**-860**	**-1,823**	**-2,700**	**65,365**
The National Map Partnerships	[13,900]	[13,900]			-3,500	[10,400]
Ecosystem Restoration	[0]	[0]			800	[800]
Total, Core Science Systems	**124,857**	**124,857**	**-1,537**	**-2,817**	**-14,628**	**105,875**

Budget at a Glance
(Dollars in Thousands)

	2010 Enacted	2010 Enacted/ 2011 CR	Fixed Costs & Related Changes /1	Administrative Cost Savings	Program Changes	2012 Request
Administration and Enterprise Information						
Science Support	**69,225**	**69,225**	**14,647**	**-1,461**	**-2,791**	**79,620**
Science Support reduction to Working Capital Fund	[261]	[261]			-261	[0]
Administrative Services Reduction	[2,180]	[2,180]			-2,180	[0]
Regional Executives Staff Reduction	[350]	[350]			-350	[0]
Security and Technology	**26,263**	**26,263**	**-78**	**-563**	**-4,550**	**21,072**
Information Technology reduction to Working Capital Fund	[650]	[650]			-650	[0]
Information Technology Infrastructure	[620]	[620]			-620	[0]
Information Technology "Big 9" Reduction	[780]	[780]			-780	[0]
Information Technology Security and Technology	[26,263]	[26,263]	[-78]	[-563]	-2,500	[23,122]
Information Resources	**19,706**	**19,706**	**32**	**-425**	**-3,450**	**15,863**
Biology Libraries	[1,100]	[1,100]			-1,100	[0]
Information Resources	[19,706]	[19,706]	[32]	[-425]	-1,500	[17,813]
Enterprise Publishing Management	[850]	[850]			-850	[0]
Total, Administration and Enterprise Information	**115,194**	**115,194**	**14,601**	**-2,449**	**-10,791**	**116,555**
Facilities						
Rental Payments and Operations and Maintenance	**99,076**	**99,076**	**363**	**-1,454**	**-4,500**	**93,485**
Rent and Operations and Maintenance Savings	[99,076]	[99,076]	[363]	[-1,454]	-4,500	[93,485]
Deferred Maintenance and Capital Improvement	**7,321**	**7,321**	**-2,500**	**-14**	**0**	**4,807**
Construction	**0**	**0**	**2,500**	**0**	**0**	**2,500**
Total, Facilities	**106,397**	**106,397**	**363**	**-1,468**	**-4,500**	**100,792**
TOTAL, SIR	**1,111,740**	**1,111,740**	**-52,280**	**-22,273**	**-19,150**	**1,018,037**

Budget at a Glance
(Dollars in Thousands)

	2010 Enacted	2010 Enacted/ 2011 CR	Fixed Costs & Related Changes /1	Administrative Cost Savings	Program Changes	2012 Request
Appropriation: National Land Imaging /2						
National Land Imaging						
	0	**0**	**52,990**	**-1,173**	**48,000**	**99,817**
Land Remote Sensing Base	[0]	[0]	[40,150]			[40,150]
Landsat 8 Ground System	[0]	[0]	[13,350]			[13,350]
Landsat 9	[0]	[0]			48,000	[48,000]
Total, National Land Imaging	**0**	**0**	**52,990**	**-1,173**	**48,000**	**99,817**
TOTAL, National Land Imaging	**0**	**0**	**52,990**	**-1,173**	**48,000**	**99,817**
TOTAL, USGS	**1,111,740**	**1,111,740**	**710**	**-23,446**	**28,850**	**1,117,854**

/1 Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.
/2 A new Treasury account is proposed for National Land Imaging; it will be managed as part of the Climate and Land Use Change Mission Area.

This page intentionally left blank.

Program Increases

Component	2012 Program Change ($000)
Survey, Investigations, and Research (SIR)	
New Energy Frontier	3,000
Cooperative Landscape Conservation	11,000
WaterSMART	9,000
Multi-Hazards Initiative	2,000
Landsat 8 Ground System	13,350
Science Support for DOI Bureaus	4,000
DOI Climate Science Centers	3,000
Ecosystem Restoration	12,014
California Bay-Delta - Carbon Sequestration	2,600
Coastal and Marine Planning	4,500
SIR Total	**64,464**
National Land Imaging (NLI)	
Landsat 9	48,000
NLI Total	**48,000**
USGS Total	**112,464**

Surveys, Investigations, and Research

New Energy Frontier **(+$3,000,000/+5 FTE)**

The U.S. Geological Survey (USGS) will assess the impacts to wildlife associated with new technologies used for the development of wind energy and work closely with Department of the Interior (Interior) agencies, e.g., U.S. Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), National Park Service (NPS), and the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), to provide the scientific information they need to make informed decisions concerning the permitting, implementation and operation of wind facilities on public lands.

USGS research, modeling, and monitoring will assess the ecological impacts to fish and wildlife associated with the widespread development of wind energy. Ecological and geographic studies will examine impacts to fish and wildlife from direct strikes, habitat fragmentation, and construction and maintenance of infrastructure. The infrastructure needed for energy capture and transmission would include wind turbines and generating facilities as well as towers, cables, and roads, sea bed corridors, and boat traffic. USGS science will be directed towards studying causes and identifying solutions that will minimize risk to fish and wildlife and assess the ecological impacts of projected large-scale development of wind-farms in the Great Plains and offshore in the Atlantic. In addition, USGS science will provide technical support, establish a comprehensive data management structure, facilitate collaboration, and ensure long-term viability of information products that contribute to the Nation's understanding of the management and effects of wind energy. In 2011, USGS efforts begin in the Great Plains and offshore Cape Cod region, and work toward developing an assessment methodology that can be applied nation wide.

Cooperative Landscape Conservation **(+$11,000,000/+12 FTE)**

Developing the next generation of scientists is a priority for the USGS. Utilizing existing programs such as the Cooperative Fish and Wildlife program, EDMAP in National Cooperative Geological Mapping (NCGMP), and grants to universities, the USGS is providing the opportunities for college students to work on science projects important to the mission of the Interior. The USGS will involve students in this initiative through these programs.

Biological Carbon Sequestration Assessment (+$2,000,000) – An increase of $2.0 million is requested for the USGS to continue the implementation of the methodology for the national assessment of biological carbon sequestration developed in previous years. These activities were authorized in the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140), which calls for comprehensive assessment of geologic and biologic carbon sequestration to enable decision makers to evaluate the full range of sequestration options. The 2010 budget for sequestration activities was $10.0 million, which included $5.0 million for geologic carbon sequestration assessment and $5.0 million for biological carbon sequestration assessment. The increase of $2.0 million specifically supplements the $5.0 million received in 2010 for ongoing and increased activities in biological carbon sequestration.

DOI Climate Science Centers (+$8,000,000) – Management decisions made in response to climate change impacts must be informed by science and require that scientists work in tandem with those managers who are confronting climate change impacts and evaluating options to respond to such impacts. Pursuant to P.L. 110-161, the USGS began the development of the National Climate Change and Wildlife Science Center (NCCWSC). The NCCWSC is being

expanded by the addition of regional science centers with a primary focus on providing climate change impact data and analysis geared to the needs of fish and wildlife managers as they develop adaptation strategies in response to climate change. These centers are being developed in close collaboration with Interior agencies and other Federal, State, university, and non-governmental partners.

Climate Research and Development (+$1,000,000) – In 2011, Science Applications and Decision Support are continuing its efforts to develop decision-support tools that enable resource managers and policymakers to cope with and adapt to a changing climate. Collaborations with a number of academic institutions including Cornell University, Colorado State University, the Massachusetts Institute of Technology (MIT), and Montana State University have been established, spanning the fields of social science, natural resources, artificial intelligence, statistics, and earth sciences. Decision-support will be developed through new partnerships, enhancement of existing collaborations, and in training the next generation of applications scientists.

WaterSMART Initiative **(+$9,000,000/+5 FTE)**

21st Century Water Challenge – Water is essential to the economic security of individual communities across the United States and also to the economic vitality of our Nation as a whole. An assessment of the availability and use of water resources in the United States was last completed in 1978. Much has changed in the United States since 1978 and the time has come to establish a program that will address the need for a new and ongoing assessment of our water resources.

In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. The U.S. water resources, infrastructure, and technologies became the envy of the world.

Today we are faced with a new set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortage and water-use conflict have become more commonplace in many areas of the United States—even in normal water years. As competition for water resources grows—for irrigation of crops, for growing cities and communities, for energy production, and for the environment—the need for information and tools to aid water resource managers also grows.

Multi-Hazards Initiative **(+$2,000,000/+3 FTE)**

Expanding the Multi-Hazards Demonstration Project – The Multi-Hazards Demonstration Project (MHDP) in southern California, will begin its fifth year in 2011, and this initiative proposes to build on the success of the Great Southern California ShakeOut by developing earthquake forecasting early warning capabilities and conducting impact analysis of environmental, human health and ecosystem responses to earthquakes and other hazards.

Pacific Northwest—Improving Hazard Products – The USGS hazard programs are heavily integrated into regional hazard planning and mitigation activities to address multiple hazards in

both Oregon and Washington. This initiative proposes improving risk assessments and monitoring capabilities in the Pacific Northwest to help decision makers and citizens prepare for and respond to natural hazards, building more resilient communities.

Building Resilience in Alaska Coastal Communities – Expanding the multi-hazards demonstration project approach to Alaska would improve the ability of the USGS to support emergency planning and risk assessment of potential future hazards at and near the coastal population centers of Alaska. The communities that lie along Alaska's southern coast include a number of military facilities, port facilities, and all but one major airport. The USGS would invest in earthquake, tsunami, and volcano science to support community planning. The output products from this activity would be used for planning and training for disaster response by the Interior as part of their Disaster Response Plan for Alaska in coordination with the State of Alaska, Department of Military and Veterans Affairs and the National Guard.

Improving USGS Disaster Response Capabilities – The USGS National Earthquake Information Center (NEIC) in Golden, CO, provides 24/7 detection and rapid location, analysis and dissemination of information for earthquakes worldwide. The USGS proposes to add a volcanic earthquake detection role to NEIC. Funds would be used to provide the necessary data transmission improvements for NEIC to import real-time seismic data from the five USGS volcano observatories, as well as provide two FTE at NEIC to handle the added workload. Volcanoes usually experience increased micro-seismicity well in advance of an eruption. These are much too small to cause damage or even to be felt, but they provide a critical early warning to give observatories and affected communities time to plan and prepare for an eruption. Adding volcano monitoring to NEIC would provide an important backup to observatory-based monitoring, through more frequent checking of data and the setting of automated alarm systems at a more sensitive threshold (because of a higher tolerance for false alarms), thereby ensuring that signs of volcano unrest are detected as early as possible. Once such unrest is detected, the responsible observatory would take over 24/7 operations, as is the practice now. NEIC would also provide an initial point of contact for federal agencies such as the Air Force Weather Agency and Federal Aviation Administration, both of which require 24/7 situational awareness.

Landsat 8 Ground System **(+$13,350,000/+3 FTE)**

The USGS requests an increase of $13,350,000 in 2011 to accommodate ground system requirements changes for LDCM associated with moving the Operational Land Imager (OLI) sensor to a free-flying satellite system and the addition of a Thermal Infrared Sensor (TIRS) on board the spacecraft. The Mission Operations Element (MOE) and the Flight Operations Team (FOT) are related to the implementation of LDCM as a free-flyer. The requested increase of $13,350,000 accommodates the additional ground system requirements, including the addition of a thermal sensor, and maintains NASA's mission schedule for the LDCM launch in December 2012.

Science Support for DOI Bureaus **(+$4,000,000/+16 FTE)**

The new funding will support research to increase the scientific information that will be available to FWS, BLM, and NPS to inform resource management. Every year, the demand for research to support agency decision making far exceeds the funding available. The additional funding will increase the number of USGS scientists that can work collaboratively with managers and biologists in these bureaus to develop and carry out research projects that address Bureau management problems. Funding for FWS will be augmented by $1.5 million, and will include science support for adaptive management, and strategic and tactical research to meet the

priority information needs identified by the FWS. A total of $1.5 million will be added to programs that support NPS. Projects would include research on climate change adaptation and ecosystem change in parks, and other biological research, monitoring, and technical assistance of high priority to NPS. Support for BLM will be increased by $1.0 million and will include non-forest fire research and ecoregional assessments of western systems.

DOI Climate Science Centers (+$3,000,000/+12 FTE)

This increase will allow the USGS to complete implementation of the Department of the Interior Climate Science Centers (CSC) as envisioned in Secretarial Order 3289. The planned network of eight DOI CSCs will be located at institutions with substantial climate science capabilities. The DOI CSC, along with the NCCWSC, will provide fundamental science and tools to Landscape Conservation Cooperatives (LCCs) and other natural and cultural resource managers. Funding will support integrated models that project climate change at a regional level and its effects on key resources; assessments of vulnerability of species and ecosystems to climate change; monitoring strategies to identify climate-driven alterations to ecosystems; and input to the design of adaptation strategies. At the proposed funding level, the Northeast, South Central and Pacific Islands DOI CSCs will be established, resulting in the ability to respond to the needs of LCCs and others with a full suite of scientific tools and products. More information can be found in the Climate and Land Use Change Section.

Ecosystem Restoration (+$12,014,000/+45 FTE)

America's Great Outdoors is the President's signature conservation initiative and the Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. This Ecosystem Restoration initiative will help the President advance his America's Great Outdoors initiative. The description of the work proposed in the six ecosystems can be found in the Ecosystem Restoration initiative in the Key Changes Section.

Chesapeake Bay	(+$4,614,000/+18 FTE)
Columbia River	(+$1,400,000/+7 FTE)
Great Lakes	(+$3,500,000/+8 FTE)
Puget Sound	(+$1,500,000/+7 FTE)
Upper Mississippi River	(+$1,000,000/+5 FTE)

California Bay-Delta – Carbon Sequestration (+$2,600,000/+10 FTE)

The California Bay-Delta (Bay-Delta) ecosystem, the largest estuary on the West Coast, is recognized as one of the world's threatened treasures of biodiversity, supporting unique native species and their critical tidal wetland habitats and with over eight million Californians who call the area home. Current USGS research has demonstrated that emergent marsh vegetation has tremendous carbon sequestration potential, estimated to be as much as ten times that of forests. Establishing emergent marshes on subsided lands under controlled conditions has the potential to sequester carbon at these high rates as well as protect levees, improve water quality, provide habitat, and restore subsided lands to sea level. Almost a million acres of Delta islands in the San Francisco Estuary have subsided by as much as 25 feet below sea level. Failure of the levees that protect these islands could result in contamination of drinking water for

30 million Californians. Wetlands could raise Delta islands to sea level, improve water quality—and sequester carbon in the process. The USGS has conducted scientific investigations on two pilot wetlands testing this concept on Twitchell Island since 1997. This initiative would assess the practicality of large-scale (300-600 acres) implementation. Work would be done to determine the ecological processes and environmental conditions responsible for high rates of carbon sequestration, determine greenhouse gas emissions for the farm-scale wetland and for other Delta land uses, adapt a greenhouse gas flux model to the wetland environment and determine optimization of conditions, and develop a protocol for registration of freshwater wetlands in carbon markets.

Coastal and Marine Planning **(+$4,500,000/+2 FTE)**

The proposed increase would allow the USGS to actively engage with other Interior bureaus and Federal agencies in implementation of the “Framework for Effective Coastal and Marine Spatial Planning.” The framework defines Coastal and Marine Spatial Planning (CMSP) as "a comprehensive, adaptive, integrated, ecosystem based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas.” USGS information and research products are critical to successful implementation of CMSP at regional and national levels. The USGS will, working with Federal and other partners, develop information resources, integrate existing information systems, and contribute to the development of a comprehensive CMSP Information Management System (CMSP-IMS). This will ensure that USGS data resources are accessible to and enhance CMSP planning, that new data and information products developed respond to identified needs, and that USGS technical expertise and investments in information management systems are reflected in development of the CMSP-IMS.

National Land Imaging

The 2012 budget proposes a new account, National Land Imaging (NLI), for Landsat missions transferring funding from the Survey, Investigations, and Research account in the Land Remote Sensing program ($53,500,000) and $48,000,000 for Landsats 9 and 10 and the development of an operational program. The base funding transfer of $53,500,000 includes funding of $13,350,000 for the Landsat 8 Ground System. This funding is for current satellites, Landsats 5 and 7, the Landsat Data Continuity Mission (LDCM, to become Landsat 8), and future satellites including Landsats 9 and 10. More information can be found in the National Land Imaging Section.

Landsat 9 and 10 **(+$48,000,000/+7 FTE)**

The 2012 budget request includes $48.0 million to begin development of an operational Landsat program, to build Landsats 9 and 10 as prescribed in the President’s National Space Policy.

Program Decreases

Component	2012 Program Change ($000)
Survey, Investigations, and Research (SIR)	
Unrequested Congressional Action	-11,124
Information Resources	-1,500
IT Security and Technology	-2,500
The National Map Partnerships	-3,500
Aquatic Drug Registration	-700
Climate Research and Development	-9,022
Minerals Resources	-7,200
Mineral External Research Program	-250
Energy Resources	-2,000
Contaminant Biology	-500
Toxics Substances Hydrology	-2,500
Earthquake Grants	-2,000
National Volcano Early Warning System	-1,500
Extended Continental Shelf	-2,000
Groundwater Resources	-2,000
National Water Quality Assessment Program	-6,728
Water Resources Research Act	-6,499
State Conservation Data Agencies	-572
National Biological Information Infrastructure	-6,728
National Geological and Geophysical Data Preservation	-1,000
National Cooperative Geologic Mapping Federal & State Partnerships	-2,500
Science Support Reduction to Working Capital Fund	-261
Administrative Services Reduction	-2,180
Regional Executives Staff Reduction	-350
Information Technology Reduction to Working Capital Fund	-650
Information Technology Infrastructure	-620
Information Technology "Big 9" Reduction	-780
Biology Libraries	-1,100
Enterprise Publishing Management	-850
Rent and Operations and Maintenance Savings	-4,500
USGS Total	**-83,614**

Surveys, Investigations, and Research

Unrequested Congressional Action **(-$11,124,000/-13 FTE)**

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation:

- LiDAR & Seismological Studies (Earthquakes) (-$1,000,000/0 FTE)
- Cooperative partnership between the University of Hawaii-Manoa and the USGS Hawaii Volcano Observatory (Volcanoes) (-$250,000/0 FTE)
- Remove Congressional Add-on for Global Seismographic Network (GSN) (-$250,000/ 0 FTE)
- Mineral Resource Assessment for Nye County, NV (Minerals) (-$650,000/0 FTE)
- San Diego Aquifer Mapping (Groundwater) (-$900,000/0 FTE)
- Arkansas Sparta Aquifer Recovery Initiative (Groundwater) (-$300,000/0 FTE)
- McHenry County, IL Groundwater and Stormwater Project (Groundwater) (-$280,000/ 0 FTE)
- Hood Canal Dissolved Oxygen Study (HR&D) (-$200,000/0 FTE)
- Long Term Estuary Assessment Group (LEAG) (HR&D) (-$400,000/0 FTE)
- U.S.-Mexico Transboundary Aquifer Assessment Act (HR&D) (-$1,000,000/0 FTE)
- Lake Champlain Basin Toxic Material Study (HNA) (-$346,000/0 FTE)
- Hawaii Water Resources Monitoring (HNA) (-$500,000/0 FTE)
- Maryland Coastal Plain Groundwater Modeling (HNA) (-$500,000/0 FTE)
- San Francisco Salt Ponds Studies (Environments) (-$1,000,000/-3 FTE)
- Conte Anadromous Fish Research Lab (Fisheries) (-$220,000/-1 FTE)
- General genetics and genomic research (Fisheries) (-$750,000/-3 FTE)
- Tropical ecosystems and watershed health research (Environments) (-$600,000/-4 FTE)
- Invasive species protocols in Columbia River Basin (Invasive Species) (-$350,000/ -2 FTE)
- State Conservation Data Agencies (BIMD) (-$1,428,000/0 FTE)
- National Biological Information Infrastructure (BIMD) (-$200,000/0 FTE)

Information Resources **(-$1,500,000/-21 FTE)**

The Enterprise Information Resources program includes the functions of science education, library services, information product distribution, public inquiry, and science quality oversight. This proposed reduction would eliminate 90 of the proposed 175 science education internships. This reduction would reduce education and internship activities resulting in reduced training for new jobs, a smaller increase in under-represented youth in the sciences, and educational opportunities in Earth science. Tribal training will continue at the 2010 level.

IT Security and Technology **(-$2,500,000/-28 FTE)**

The need for USGS science continues to evolve as do the technological requirements, the USGS anticipates technology costs will increase and decrease in a commensurate manner relative to programmatic needs. As a result, the program is implementing a new cost model for national technology services such as e-mail, Web, storage, bandwidth, directory and IT security services that will balance dispersion of cost commensurate with service utilization. In support of this action, the IT Security and Technology program will restructure its workforce and services to create a flexible workforce and service offering that can be incrementally mobilized for science program needs.

The National Map Partnerships **(-$3,500,000/-4 FTE)**

The USGS proposes to reduce the funding for the Partnership Implementation component of the National Map by $3.5 million which is currently funded at $13.9 million. The proposed reduction eliminates all funds used to specifically leverage with Federal, State and local agencies to acquire new data.

The proposed decrease would eliminate liaison positions responsible for partnerships in 13 States. These positions organize the agreements through which the USGS leverages its resources with those of State and local cooperators. They routinely provide coordination among Federal geospatial resources and those of State and local governments. Beyond these immediate outcomes, the reduction would result in reduced work for America's geospatial industry, which benefits by fulfilling contracts for projects that result from agreements the NGP makes with its cooperators.

Aquatic Drug Registration **(-$700,000/-6 FTE)**

The USGS delivers independent analyses of candidate therapeutic drugs for aquatic species important to fishery management. The drugs prevent disease and maintain health in more than 400 publicly managed fish hatcheries. The reduction will eliminate investigations and scientific trials that measure effectiveness, health, safety, and environmental fate of more than twenty drugs. The information from these investigations is required for registration and approval-for-use by the Food and Drug Administration and the Environmental Protection Agency for more than 50 propagated fish species at risk from disease agents. Funding to continue this activity may be available from entities needing this information. In the absence of USGS trials, registrations will not be completed in a timely or systematic manner.

Climate Research and Development – Climate Effects Network **(-$9,022,000/-3 FTE)**

The Climate Effects Network (CEN) is a collaborative effort to provide the long-term and geographically extensive data essential to forecast the effects of climate change on ecosystems, natural resources, and societal infrastructure. At the proposed funding level, the CEN is reduced to a demonstration level project in the Yukon River Basin. While the value of this type of data has not changed, the USGS is shifting focus from the CEN to the establishment of the CSCs. In the interim, the USGS and its partners will rely on independent data sets to understand and address climate impact issues across the Nation.

Mineral Resources **(-$7,200,000/-49 FTE)**

The Mineral Resources program includes activities to collect, analyze, and publish minerals information; analyze the geochemical properties of soil samples; conduct research on relationships between minerals and human health; and collect and analyze basic geologic and mineral deposit data in support of economic development. This proposed funding decrease would eliminate efforts related to international minerals information; analysis of soil samples across the United States between 2006 and 2010, used to replace a 30-year old soil survey of the United States; research on the relationship between minerals and human health; collection of basic geologic and mineral deposit data in Alaska; and research on the economic consequences of mineral deposits for the next National Mineral Resource Assessment, which is scheduled to begin in 2013. This reduction would cause delay in soil sample analyses; environmental information in the National Mineral Resource Assessment would be delayed; and the program would focus on domestic data collection.

Mineral Resources External Research Program **(-$250,000/0 FTE)**

The Mineral Resources External Research Program is the only Federal source of grant funding for research outside the Federal Government to address key problems related to nonfuel mineral resources. This proposed funding reduction will terminate this program in 2012. Support to States and universities to conduct this research would end.

Energy Resources **(-$2,000,000/-4 FTE)**

Since 1975, the Energy Resources Program's (ERP) State Cooperative Project has initiated and funded cooperative agreements with State geological agencies, focused primarily on coal resource data. State agency geologists collect and evaluate various types of geologic data that are critical to the States and the USGS for resource evaluation. The States enter the information into the National Coal Resources Data System (NCRDS), which is used for USGS coal resource assessments. Funding to more than 30 State agencies will be eliminated. While States may continue to collect this data, it would not be available in the NCRDS. The ERP also conducts research, assessment, and environmental impacts of oil shale and unconventional gas resources. This reduction will delay work for onshore U.S. basins.

Contaminant Biology **(-$500,000/-3 FTE)**

Contaminant Biology activities focus on understanding the role of environmental drivers key to sustaining human and animal health. This proposed funding decrease will reduce research to assess the impact of environmental contaminants (including endocrine disrupting chemicals) on human, animal, and ecosystem health. The decrease will reduce support for technical assistance on emerging issues and environmental disasters. This funding reduction will eliminate monitoring and data collection used by States to meet National Water Quality Criteria under the Clean Water Act. Research activities would continue at a reduced level.

Toxic Substances Hydrology **(-$2,500,000/-14 FTE)**

Toxic Substances Hydrology activities include characterizing environmental contamination by pharmaceuticals, endocrine-active chemicals, pesticides, and other understudied and emerging environmental contaminants and their degradation byproducts. Results of these studies are used by other Federal regulatory agencies to protect the environment and drinking water quality and to approve the safe use of pesticides, pharmaceuticals, and other industrial chemicals. The

proposed reduction would terminate projects in developing laboratory methods to measure emerging contaminants in various environmental sources; quantifying relative contributions of contaminants from various sources, including human- and animal-waste sources; assessing potential ecological health significance of contaminants in the environment; and assessing potential human exposure through drinking water from both domestic and public water supplies. Other Federal agencies would have to rely on existing information to protect the environment and drinking water quality and to approve the safe use of pesticides, pharmaceuticals, and other industrial chemicals. Current information, while of high quality, may not address the specific question being asked or the compound under review.

National Volcano Early Warning System (-$1,500,000/-5 FTE)

The National Volcano Early Warning System (NVEWS) is a national-scale system to ensure that volcanoes are monitored at levels commensurate to their threats. The proposed decrease would halt progress on the monitoring infrastructure element of NVEWS, resulting in continued undermonitoring of a number of high-threat volcanoes; discontinuance of efforts to modernize the existing monitoring system; and loss of upgraded monitoring stations due to deferral of maintenance. Monitoring of volcanoes would continue volcano by volcano without a national-scale approach.

Extended Continental Shelf (-$2,000,000/-2 FTE)

The USGS has participated in the collaborative effort, overseen by the Interagency Task Force on the Extended Continental Shelf (ECS) which is chaired by the Department of State and vice co-chaired by NOAA and Interior, for development of a United States submission establishing the limits of the ECS. This proposed decrease would reduce funding provided for ECS activities by half. Efforts which support field data collection, analyses, and synthesis of data and interpretive products to ensure that the United States' submissions maximize the United States' jurisdiction over sea-bed and sub-sea-bed resources beyond the currently established Exclusive Economic Zone (EEZ) would be reduced. Should the United States accede to the U.N. Convention on the Law of the Sea within the next several years, this reduction would delay work and might prevent the United States from meeting the timelines for submission (10 years from accession) established therein.

Groundwater Resources (-$2,000,000/-11 FTE)

The Groundwater Resources Program is currently conducting multidisciplinary regional studies of groundwater availability that are the building blocks for a national assessment and is the principal government entity examining this important national resource. The proposed decrease would require termination of regional groundwater availability studies along with a substantial reduction in data collection and monitoring. This information is used by Federal, State, tribal, and local water-related government agencies, academic research institutions, and the private sector to understand the status and trends in the Nation's groundwater resource availability and use and is unique because it addresses groundwater availability at regional and national scales. Local groundwater studies would continue and the regional and national focus would be lost.

National Water Quality Assessment Program (-$6,728,000/-40 FTE)

The National Water Quality Assessment Program (NAWQA) is responsible for providing nationally consistent descriptions of current water-quality conditions and changes in these conditions for the Nation's freshwater streams and aquifers. These assessments are used by

Federal, State, and local agencies to develop strategies to protect and improve water quality for the Nation's people and critical ecosystems. At the proposed funding level, the NAWQA Program would eliminate planned groundwater monitoring at 76 study areas in 33 States. NAWQA's ability to meet the Bureau's 2012 planned performance measure—to complete 11 percent of the decadal national assessment of groundwater quality in support of water resource decision making—would not be met. Instead, only two percent of the decadal assessment would be completed in 2012. In addition to halting groundwater monitoring activities, the proposed budget decrease will prohibit NAWQA's ability to start a national synthesis of suspended sediment in streams and rivers, develop implementation plans and methods critical for the third decade of NAWQA studies, and provide water quality expertise during national emergencies.

Water Resources Research Act (-$6,499,000/-2 FTE)

Established in 1984 by the Water Resources Research Act (WRRA), the Water Resources Research Act Program provides funding to 54 Water Resources Research Institutes at land grant universities—one in each State, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam, for the Federal-State partnership in water resources research, education, and information transfer. The proposed reduction will end this decades long effort. More than 225 applied research projects will be discontinued as will education and research opportunities for young people across the Nation. Institute activities to address increased water supplies or yields and water quality improvements will cease. Support provided by the Institutes to train more than 600 students and produce 1,000 publications will be discontinued.

National Biological Information Infrastructure (-$6,728,000/-26 FTE)

The National Biological Information Infrastructure (NBII) provides the Nation with a mechanism for accessing the vast amount of existing biological and natural resources data, information products, and analytical tools that support and enhance science-based decision making. The proposed reduction would reduce efforts to maintain the NBII infrastructure, which supports a number of other systems for the USGS. Ending NBII project work would eliminate partnerships including those affecting more than 40 Federal and State agencies, 20 universities, and other networks such as the Long Term Ecological Research network. USGS work on data management and integration would stop in thematic areas such as invasive species, wildlife disease, habitat loss, wetlands, and pollinators. The NBII would no longer provide technical support to the USGS and Interior for implementation of advanced information system search capabilities and content management systems impacting USGS support for data integration activities and for *Data.gov*.

State Conservation Data Agencies (-$572,000/0 FTE)

Funding was provided in 2010 for the USGS to work with the coordinators of the network of State conservation data agencies to improve access to State-based conservation related data and information. The proposed reduction would eliminate this support to the Association of Fish and Wildlife Agencies, NatureServe, State agencies and other organizations. Efforts may continue at the State level but information may not be publically available.

National Geological and Geophysical Data Preservation (-$1,000,000/-3 FTE)

The National Geological and Geophysical Data Preservation Program (NGGDPP) is the only Federal program dedicated to preserving physical and analog geoscience data. The program

cooperates with State geological surveys and other Interior Bureaus. States match Federal financial assistance 1:1 to inventory data, make the data available through a National Digital Catalog, and rescue data at risk of destruction. Because State geological surveys match Federal support 1:1, reduction in Federal support has twice the impact. Approximately 750 State and Federal collections are registered in the National Digital Catalog, comprising 1,229,439 records. The proposed reduction would eliminate the NGGDPP. No data would be added to the National Digital Catalog. It would no longer be maintained and access to it would be restricted.

National Cooperative Geologic Mapping
Federal and State Partnerships (-$2,500,000/-3 FTE)

The National Cooperative Geologic Mapping Program (NCGMP) provides accurate geologic maps and three-dimensional framework models that help to sustain and improve the quality of life and economic vitality of the Nation and to mitigate natural hazards. The NCGMP is the primary source of funds for the production of geologic maps in the United States. The reduction would prevent expansion of geologic mapping and modeling in support of WaterSMART; terminate geologic mapping projects in southern California; decrease support to the STATEMAP component of the National Cooperative Geologic Mapping Program; and eliminate 18 State geologic mapping projects needed for land use planning, resource assessments, and hazard mitigation.

Science Support Reduction to Working Capital Fund (-$261,000/0 FTE)

The USGS's contribution to the Interior's Working Capital Fund (WCF) will be reduced by $261,000 for non-IT services.

Administrative Services Reduction (-$2,180,000/-12 FTE)

The Science Support subactivity provides funding to support the administration and management of the USGS. The proposed reduction will reduce funding provided for staffing and costs in the Director's office, the Office of Communications and Publishing, the Office of Budget, Planning, and Integration, the Associate Director for Human Capital, as well as the Office of Administration and Enterprise Information (AEI). Bureau, Department, Executive Branch and congressional services provided by these offices will decrease as a result. Additionally, a reduction to science programs will likely result in a decrease to the Bureau's reimbursable program, which will further erode dollars for administrative support. AEI would reduce internal control reviews and monitoring processes and participation on Interior and Government wide forums.

Regional Executives Staff Reduction (-$350,000/-6 FTE)

The USGS proposes to eliminate positions from existing regional services offices that would have been realigned to support Regional Executives.

Information Technology Reduction to Working Capital Fund (-$650,000/0 FTE)

The USGS proposes to reduce funding for the Security and Technology subactivity of the DOI WCF. Interior has reduced the WCF bill. The DOI WCF provides various information and technology management services to the USGS.

Information Technology Infrastructure **(-$620,000/-6 FTE)**

The Security and Technology subactivity supports the advanced scientific computing needs of the USGS and Interior. Functions include information management, security, and information technology to ensure compliance with Federal IT mandates. The proposed reduction would diminish current efforts to extend collaboration and access to USGS science and resolution of IT security weaknesses. This reduction would be achieved through leveraging economies of scale and implementing appropriate assessment rates to manage these activities in a more proactive and efficient manner. Additionally, the USGS would redirect current federally mandated implementation and compliance efforts managed at the Bureau level to USGS science centers' budgets thereby eroding science program dollars to meet these IT mandates. Projects affected in 2012 include efforts to reduce the backlog of approximately 5,500 Plan of Action and Milestones (POA&M) and the recertification of USGS Scientific and Infrastructure support systems.

Information Technology "Big 9" Reduction **(-$780,000/0 FTE)**

The USGS proposes to eliminate the funding provided for the past four years to the Interior's Security and Technology subactivity for Interior initiatives ("The Big 9"). The "Big 9" included projects to improve IT compliance, security, and IT services and support. These projects will be completed by 2012.

Biology Libraries **(-$1,100,000/-12 FTE)**

The USGS has maintained specialized libraries at 12 USGS science centers which focus on ecosystem and environmental research. The reduction would eliminate support to these libraries. Scientists would lose direct access to research material, specialized journals, and research librarian support. Research materials and library assistance would be available to scientists through the USGS library system.

Enterprise Publishing Management **(-$850,000/-2 FTE)**

The USGS has centralized its publishing needs through the Enterprise Publishing Network. This reduction will eliminate support provided by the Information Resources subactivity to the Network. This will require increased efficiencies and staff reductions. Reduced product distribution support is also proposed. Increased product prices would help offset funding reductions but may result in decreased sales volume, thereby reducing the number of products distributed to the public. This budget reduction will decrease availability of USGS science products, such as maps and reports, to the public. This reduction would also impact current USGS support for the sale of America the Beautiful park passes, part of the Recreation Enhancement Act Program which includes the National Park Service, FWS, BLM, and the Bureau of Reclamation. This decrease coincides with a larger decrease of $5.5 million which is spread through the science program activities. Information on this decrease can be found in the Key Changes Section.

Rent and Operations and Maintenance Savings **(-$4,500,000/0 FTE)**

The Rent and Operations and Maintenance subactivity provides the majority of the funding required to support the facilities which house USGS staff. Facilities costs for rent and operations and maintenance are funded primarily by this subactivity and the facilities component of reimbursable agreements. The remaining cost is funded by science programs. The USGS

relies on General Services Administration (GSA) owned and leased buildings for nearly 70 percent of the space it occupies. The USGS has no ability to reduce fixed rental rates at these sites, and can only offset the higher facility costs by vacating space. Therefore, the primary emphasis will be on improving space utilization and consolidating operations in GSA-provided offices, laboratories, data centers, and warehouses at major USGS centers in Reston, VA; Denver, DO; and Menlo Park, CA. At these centers, and where it is cost-effective at other science installations, the USGS will implement expanded space-sharing through hoteling and teleworking to reduce space. This will be the beginning of a larger effort to assess the best placement of USGS staff on the landscape.

This page intentionally left blank.

Related Changes and Technical Adjustments

Related Changes	2012 Program Change ($000)
Survey, Investigations, and Research (SIR)	
DOI-wide Efficiencies	-11,648
Administrative Savings	-10,625
Enterprise Publishing Network	-4,990
SIR Subtotal	**-27,263**
National Land Imaging (NLI)	
Administrative Savings	-1,173
Enterprise Publishing Network	-510
NLI Subtotal	**-1,683**
USGS Total	**-28,946**

Related Changes

Interior Wide Efficiencies **(-$11,648,000/0 FTE)**

In 2009, the President established the Securing Americas' Value and Efficiency (SAVE) award program to challenge Federal employees across the Government to submit their ideas for efficiencies and savings as part of the annual budget process. The USGS will implement proposals to save $11.6 million in costs associated with travel, information technology, strategic sourcing and other Bureau activities.

Administrative Savings **(-$11,798,000/0 FTE)**

In support of the President's commitment to fiscal discipline and Federal spending restraint, the USGS is participating in an aggressive Interior wide effort to curb non-essential administrative spending. In accordance with this initiative, the USGS justification assumes $11.8 million in savings in 2012 against actual 2010 expenditures. A specific implementation plan will be completed in the near future; however, the general activities where savings will be realized include: advisory contracts; travel and transportation of people and things, including employee relocation; printing; and supplies. Details on the Administrative Savings can be found in the General Statement Section and the USGS Accounts Section.

Enterprise Publishing Network **(-$5,500,000/-44 FTE)**

The USGS has centralized its publishing needs through the Enterprise Publishing Network (EPN). The USGS proposes to decrease EPN funding and alter the EPN funding model by moving the bulk of the cost of publishing back to science center projects through reduction of the science program-level contribution. This reduction is proposed to address higher priorities within the USGS as well as supports USGS's efforts to create efficiencies and streamline processes. This proposed reduction may impact EPN services for technical writing, editorial, cartographic, graphic design and illustration, Web, and printing support. Publishing is a

mission-essential activity that must continue; the proposed reduction redistributes how it is funded. The EPN is not a budget line item; it is funded with science program dollars. The proposed reduction to the direct contribution by science programs has been distributed to each science program. The distribution can be found in the USGS Accounts Section.

Technical Adjustments

Construction Subactivity	**(+$2,500,000/0 FTE)**
Deferred Maintenance and Capital Improvements	**(- $2,500,000/0 FTE)**

A technical adjustment is proposed to move $2,500,000 from the Deferred Maintenance and Capital Improvements subactivity to establish a new Construction subactivity within the Facilities activity.

The technical adjustment to establish a Bureau wide Construction subactivity provides the USGS with a mechanism for budgeting and planning for needed facility construction. The establishment of the Construction subactivity provides the USGS with the capacity to modernize its real property assets and replace those that are in a state of disrepair, beyond their useful lives, or otherwise are no longer cost-effective to operate. Establishment would provide recurring funding for asset replacement, including building design and construction, and capital improvements such as building system replacements. The plan provides for much-needed improvements in building envelope (foundation, roof systems, facades, exterior doors, etc.) integrity.

Science Mission Areas	**(-$8,470,000/-51 FTE)**
Science Support	**(+$8,470,000/+51 FTE)**

A technical adjustment is proposed that would move $8,470,000 and 51 FTE from the Science mission areas to the Science Support activity (salary, benefits and operating cost for the nine Regional Executives' staffs).

Effective October 1, 2007, the USGS transitioned to an organizational structure in which the Regional Executives shifted from a single disciplinary focus in each region to a multidisciplinary focus in a geographic area. Regional Executives were realigned in order to provide oversight for all USGS organizations located within a geographic area of responsibility. This change was to encourage and facilitate integrated science within the Bureau and foster partnerships to better accomplish our mission. The regional realignment also affected the reporting of Regional Safety Officer positions and assigned roles and responsibilities. To sustain and continue to meet and exceed safety and healthy working conditions and promote a culture that recognizes and prevents workplace hazards, the adjustment is proposed to realign funds to better fit the new realignment model. Effective 2008, the Regional Executive staffs and Safety staff were no longer funded by a single discipline, instead funded by shared support from all USGS disciplines. This adjustment is proposed to realign the funds into one activity.

There is no change to performance as a result of this proposed technical adjustment.

Climate and Land Use Change **(-$284,000/-5 FTE)**
Science Support **(+$284,000/+5 FTE)**

A technical adjustment is proposed to move $284,000 and five FTE from the Climate and Land Use Change mission area to the Science Support mission area related to contract support provided to the Earth Resources and Observation Science Center.

Effective fiscal year 2008, five contracting support personnel were realigned to Science Support. This action resulted from departmental requirements to have all contracting staff with increased warrant authority report directly to an individual in the GS-1102 contracting series. This series is located only in Science Support.

There is no change to performance as a result of this proposed technical adjustment.

Climate and Land Use Change – Land Remote Sensing **(-$53,500,000/-33 FTE)**
National Land Imaging **(+$53,500,000/+33 FTE)**

A technical adjustment is proposed to move funding of $53,500,000 and 33 FTE from the Survey, Investigations, and Research account in the Land Remote Sensing (LRS) program in the Climate and Land Use Change mission area to a new account for the National Land Imaging Program (NLIP). This transfer includes a program increase of $13,350,000 and three FTE to complete the ground system for the Landsat Data Continuity Mission (LDCM), to become Landsat 8.

This funding is for current operations of the Landsat 5 and 7 satellites, and completion of the Landsat 8 ground system.

There is no change to performance as a result of this proposed technical adjustment.

This page intentionally left blank.

Analysis by Account and Activity
(Dollars in Thousands)

Activity/Subactivity/Program Element	2010 Enacted/ 2011 CR		Fixed Costs & Related Changes (+/-)		Administrative Cost Savings		Program Changes (+/-)		2012 Budget Request		Inc. (+) Dec. (-) from 2011	
	FTE	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount
Appropriation: Surveys, Investigations, and Research												
Ecosystems	*1,088*	165,587	*-24*	-2,211	*0*	-3,597	*14*	6,644	*1,078*	166,423	*-10*	836
Climate and Land Use Change / 1	*374*	138,019	*-43*	-55,154	*0*	-2,138	*50*	25,678	*381*	106,405	*7*	-31,614
Energy, Minerals, and Environmental Health	*653*	101,512	*-6*	-1,323	*0*	-1,821	*-63*	-9,850	*584*	88,518	*-69*	-12,994
Natural Hazards	*681*	138,951	*-6*	-1,642	*0*	-2,840	*-1*	-600	*674*	133,869	*-7*	-5,082
Water Resources	*1,449*	221,223	*-34*	-5,377	*0*	-5,143	*-43*	-11,103	*1,372*	199,600	*-77*	-21,623
Core Science Systems	*552*	124,857	*-6*	-1,537	*0*	-2,817	*-33*	-14,628	*513*	105,875	*-39*	-18,982
Administration and Enterprise Information	*583*	115,194	*56*	14,601	*0*	-2,449	*-87*	-10,791	*552*	116,555	*-31*	1,361
Facilities	*52*	106,397	*0*	363	*0*	-1,468	*0*	-4,500	*52*	100,792	*0*	-5,605
TOTAL, SIR	***5,432***	**1,111,740**	***-63***	**-52,280**	**[0]**	**-22,273**	***-163***	**-19,150**	***5,206***	**1,018,037**	***-226***	**-93,703**
Appropriation: National Land Imaging / 1												
National Land Imaging	*0*	0	*33*	52,990	*0*	-1,173	*7*	48,000	*40*	99,817	*40*	99,817
TOTAL, NLI	***0***	**0**	***33***	**52,990**	**[0]**	**-1,173**	***7***	**48,000**	***40***	**99,817**	***40***	**99,817**
TOTAL, USGS	***5,432***	**1,111,740**	***-30***	**710**	***0***	**-23,446**	***-156***	**28,850**	***5,246***	**1,117,854**	***-186***	**6,114**

/1 A new Treasury account is proposed for National Land Imaging; it will be managed as part of the Climate and Land Use Change Mission Area

United States Geological Survey

Federal Funds

General and special funds:

SURVEYS, INVESTIGATIONS, AND RESEARCH

For expenses necessary for the United States Geological Survey to perform surveys, investigations, and research covering topography, geology, hydrology, biology, and the mineral and water resources of the United States, its territories and possessions, and other areas as authorized by 43 U.S.C. 31, 1332, and 1340; classify lands as to their mineral and water resources; give engineering supervision to power permittees and Federal Energy Regulatory Commission licensees; administer the minerals exploration program (30 U.S.C. 641); conduct inquiries into the economic conditions affecting mining and materials processing industries (30 U.S.C. 3, 21a, and 1603; 50 U.S.C. 98g(1)) and related purposes as authorized by law; and to publish and disseminate data relative to the foregoing activities;$1,018,037,000, to remain available until September 30, 2013, of which $62,252,000 shall be available only for cooperation with States or municipalities for water resources investigations; of which $4,807,000 shall be available until expended for deferred maintenance and capital improvement projects that exceed $100,000 in cost; of which $2,500,000 shall be available until expended for construction; and of which $2,000,000 shall be available to fund the operating expenses for the Civil Applications Committee: Provided, That none of the funds provided for the ecosystem research activity shall be used to conduct new surveys on private property, unless specifically authorized in writing by the property owner: Provided further, That no part of this appropriation shall be used to pay more than one-half the cost of topographic mapping or water resources data collection and investigations carried on in cooperation with States and municipalities.

Note.--A full-year 2011 appropriation for this account was not enacted at the time the budget was prepared; therefore, this account is operating under a continuing resolution (P.L. 111-242, as amended). The amounts included for 2011 reflect the annualized level provided by the continuing resolution.

Appropriation Language and Citations

1. For expenses necessary for the United States Geological Survey to perform surveys, investigations, and research covering topography, geology, hydrology, biology, and the mineral and water resources of the United States,

   - **43 U.S.C. 31(a)** provides for establishment of the Office of the Director of the Geological Survey, under the Interior Department, and that this officer shall have direction of the Geological Survey, and the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain.

2. its territories and possessions, and other areas as authorized by law.

   - **43 U.S.C 31(b)** provides that, "The authority of the Secretary of the Interior, exercised through the Geological Survey of the Department of the Interior, to examine the geological structure, mineral resources, and products of the national domain, is expanded to authorize such examinations outside the national domain where determined by the Secretary to be in the national interest."

   - **43 U.S.C. 1332(a)** provides that, "It is the declared policy of the United States, that the subsoil and seabed of the Outer Continental Shelf appertain to the United States and are subject to its jurisdiction, control, and power of disposition as provided in this subchapter."

   - **43 U.S.C. 1340** provides that, "Any agency of the United States and any person authorized by the Secretary may conduct geological and geophysical exploration in the Outer Continental Shelf. ..."

3. classify lands as to their mineral and water resources;

   - **43 U.S.C. 31(a)** provides that, "The Director of the Geological Survey, ... shall have the direction of the Geological Survey, and the classification of public lands and examination of the geological structure, mineral resources, and products in the National domain. ..."

4. give engineering supervision to power permittees

   - **43 U.S.C. 959** provides that, "The Secretary of the Interior is authorized and empowered, ... to permit the use of right of way through the public lands, forest, and other reservations of the United States ... for electrical plants, poles, and lines for the generation and distribution of electrical power, ...**Provided**, that such permits shall be allowed within or through any of said parks or any forest, military, Indian, or other reservation only upon approval of the Chief Officer of the Department under whose supervision such park or reservation falls and upon a finding by him that the same is not incompatible with the public interest ..."

   - **43 U.S.C. 961** provides that, "The head of the department having jurisdiction over the lands be, and he is, authorized and empowered, ... to grant an easement for right of way, ... over, across and upon the public lands and reservations of the United States for

electrical poles and lines for the transmission and distribution of electrical power ... upon a finding by him that the same is not incompatible with the public interest ..."

5. and Federal Energy Regulatory Commission licensees;

   - **16 U.S.C. 797(c)** states that, "To cooperate with the executive departments and other agencies of States or National Governments in such investigations; and for such purposes the several departments and agencies of the National Government are authorized and directed upon the request of the commission, to furnish such records, papers and information in their possession as may be requested by the commission, and temporarily to detail to the commission such officers or experts as may be necessary in such investigations."

6. administer the minerals exploration program;

   - **30 U.S.C. 641** provides that, "The Secretary of the Interior is hereby authorized and directed, in order to provide for discovery of additional domestic mineral reserves, to establish and maintain a program for exploration by private industry within the United States, its territories and possessions for such minerals, excluding organic fuels, as he shall from time to time designate, and to provide Federal financial assistance on a participating basis for that purpose."

7. publish and disseminate data relative to the foregoing activities;

   - **43 U.S.C. 41** provides for the publication of geological and economic maps, illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. This section also provides for the scientific exchange and sale of such published material.

   - **44 U.S.C. 1318** provides for publication, by the Geological Survey, of various reports, including a report of mineral resources of the United States, bulletins and professional papers, and monographs. This section also specifies, in some instances, numbers of copies to be printed and the distribution thereof.

   - **44 U.S.C. 1320** provides for the distribution by the Director of the Geological Survey of copies of sale publications to public libraries.

8. and to conduct inquiries into the economic conditions affecting mining and materials processing industries...and related purposes as authorized by law and to publish and disseminate data;

   - **30 U.S.C. 3** provides for inquiry into the economic conditions affecting the mining, quarrying, metallurgical, and other minerals industries. This section also provides for the dissemination of information concerning these industries.

   - **30 U.S.C. 21(a)** provides for an annual report on the state of the domestic mining minerals, and mineral reclamation industries, including a statement of the trend in utilization and depletion of resources.

- **30 U.S.C. 1603** provides for ...improved collection, analysis, and dissemination of scientific, technical and economic materials information and data from Federal, state, and local governments, and other sources as appropriate.

- **50 U.S.C. 98g(1)** provides for scientific, technologic, and economic investigations concerning the development, mining, preparation, treatment, and utilization of ore and other mineral substances.

9. of which ( ) shall be available only for cooperation with States or municipalities for water resources investigations;

- **43 U.S.C. 48** provides that, "...amounts received by the Geological Survey from any State, Territory or political subdivision thereof in carrying on work involving cooperation to be used in reimbursing the appropriation from which the expense of such work was paid, was from the act making appropriations for the Department of the Interior for the fiscal year ending June 30, 1928, and for other purposes, act January 12, 1927, ch. 277, 1, 44 Stat. 963, and has not been repeated in subsequent appropriation acts."

- Similar provisions were contained in the following act: 1926 - May 10, 1926, ch. 277, 1, 44 Stat. 487.

10. of which ( ) shall remain available until expended for satellite operations;

- **P.L. 107–43, Department of the Interior and Related Agencies Appropriation Act, 2002**

11. of which ( ) shall be available until September 30, ( ), for the operation and maintenance of facilities and deferred maintenance;

- **P.L. 106–291, Department of the Interior and Related Agencies Appropriations Act, 2001**

12. of which $1,600,000 shall be available until expended for deferred maintenance and capital improvement projects that exceed $100,000 in cost;

- **P.L. 108–447, Consolidated Appropriations Act, 2005 (Interior and Related Agencies portion)**

13. and of which $2,000,000 shall be available to fund the operating expenses for the Civil Applications Committee;

- **P.L. 111-88 Interior Department and Further Continuing Appropriations, Fiscal Year 2010**

14. and of which ( ) shall be available until September 30, ( ), for the biological research activity and the operation of the Cooperative Research Units;

- **P.L. 104–208, Omnibus Appropriations Act, 1997 (Interior and Related Agencies portion)**

15. *Provided*, That none of these funds provided for the biological research activity shall be used to conduct new surveys on private property, unless specifically authorized in writing by the property owner:

    - **P.L. 104–208, Omnibus Appropriations Act. 1997 (Interior and Related Agencies portion)**

16. Provided further, That no part of this appropriation shall be used to pay more than one-half the cost of topographic mapping or water resources data collections and investigations carried on in cooperation with States and municipalities.

    - **43 U.S.C. 50** provides that, "The share of the Geological Survey in any topographic mapping or water resources investigations carried on in cooperation with any State or municipality shall not exceed 50 per centum of the cost thereof. ..."

Permanent authority:

17. Provided further, that in fiscal year 1984 and thereafter, all receipts from the sale of maps sold or stored by the Geological Survey shall be available for map printing and distribution to supplement funds otherwise available, to remain available until expended.

    - **43 U.S.C. 42a** Provided further, That in fiscal year 1986 and thereafter, all amortization fees resulting from the Geological Survey providing telecommunications services shall be deposited in a special fund to be established on the books of the Treasury and be immediately available for payment of replacement or expansion of telecommunications services, to remain available until expended.

    - **43 U.S.C. 50a** with the establishment of the Working Capital Fund (WCF) in FY 1991, the Telecommunications Amortization Fund account and its end of year FY 1990 balances were included in the WCF.

18. Provided further, that, heretofore and hereafter, in carrying out work involving cooperation with any State, Territory, possession, or political subdivision thereof, the Geological Survey may, notwithstanding any other provisions of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation.

    - **43 U.S.C. 50b**

19. Provided further, That in Fiscal Year 1987 and thereafter the Geological Survey is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, or private.

    - **43 U.S.C. 36c** This authority for contributions was in the appropriation language annually from FY 1983 through FY 1986 and was made permanent in FY 1987.

20. Provided, That upon enactment of this Act and hereafter, final costs related to the National Petroleum Reserve in Alaska may be paid from available prior year balances in this account.

- **P.L. 100–446, Department of the Interior and Related Agencies Appropriations Act, 1989**

21. Established a Working Capital Fund which is detailed in the Working Capital Fund section of this book.

- **P.L. 101–512, Department of the Interior and Related Agencies Appropriations Act, 1991**

22. Provided further, That beginning October 1, 1990, and thereafter, funds received from any State, territory, possession, country, international organization, or political subdivision thereof, for topographic, geologic, or water resources mapping or investigations involving cooperation with such an entity shall be considered as intragovernmental funds as defined in the publication titled "A Glossary of Terms Used in the Federal Budget Process."

- **P.L. 101–512, Department of the Interior and Related Agencies Appropriations Act, 1991**

This authority exempts non-Federal cooperative funds from sequester as defined in 1985 amendments (P.L. 99–177) to the Budget Impoundment and Control Act of 1974.

23. Provided further, That beginning in fiscal year 1998 and once every five years thereafter, the National Academy of Sciences shall review and report on the biological research activity of the Survey:

- **P.L. 104–208, Omnibus Appropriations Act, 1997 (Interior and Related Agencies portion)**

Expiring Authorizations

Program	Citation	Title of Legislation	Last Year of Auth.	Amount Authorized (000s)	Appropriation in Last Year of Authorization (000s)	2012 Budget Request (000s)	Explanation of Authorization Requirement for 2012	Program Description
National Earthquake Hazards Reduction Program	P.L. 108-360; 42 U.S.C. Sec. 7701-7709	National Earthquake Hazards Reduction Program Reauthorization Act of 2004	2009	$88,900	$55,760	$52,326	No individual programmatic authorization is necessary for the USGS to continue this effort	Monitoring, research, assessment and character-ization of earthquake hazards
National Geological and Geophysical Data Preservation Program	P.L. 109-58; 42 U.S.C. Sec. 15908	Energy Policy Act of 2005	2010	$30,000	$1,000	0	Although no individual programmatic authorization is necessary for this effort to continue; funding is not requested in 2012.	Only Federal program dedicated to preserving physical and analog geo-science data
Water Resources Research Act Program	P.L. 109-471; U.S.C. Sec. 10301-10309	Water Resources Research Act Amendments of 2006	2011	$12,000	$6,499	0	Although no individual programmatic authorization is necessary for this effort to continue; funding is not requested in 2012.	Federal/State partnership in water resources research, education, and information transfer (matching grant program)

Administrative Provisions

From within the amount appropriated for activities of the United States Geological Survey such sums as are necessary shall be available for reimbursement to the General Services Administration for security guard services; contracting for the furnishing of topographic maps and for the making of geophysical or other specialized surveys when it is administratively determined that such procedures are in the public interest; construction and maintenance of necessary buildings and appurtenant facilities; acquisition of lands for gauging stations and observation wells; expenses of the United States National Committee on Geology; and payment of compensation and expenses of persons on the rolls of the USGS duly appointed to represent the United States in the negotiation and administration of interstate compacts: Provided, That activities funded by appropriations herein made may be accomplished through the use of contracts, grants, or cooperative agreements as defined in 31 U.S.C. 6302 et seq.: Provided further, That the United States Geological Survey may enter into contracts or cooperative agreements directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purpose of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and chapter 171 of title 28, United States Code, relating to tort claims, but shall not be considered to be Federal employees for any other purposes. (Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010.)

Justification of Proposed Administrative Provisions Language Change

In the absence of a full-year 2011 appropriation, all 2012 changes are based on the 2010 Interior Department and 2011 Continuing Resolution Appropriations Acts.

The USGS does not propose any administrative provisions language changes to the 2012 President's Budget request.

Administrative Provisions Language and Citations

1. From within the amount appropriated for activities of the United States Geological Survey such sums as are necessary shall be available for reimbursement to the General Services Administration for security guard services; contracting for the furnishing of topographic maps and for the making of geophysical or other specialized surveys when it is administratively determined that such procedures are in the public interest;

   - **No specific authority**. These provisions are required by reason of rulings of the Comptroller General that specific authority is required for reimbursing the General Services Administration for guard services (B–87255); and for contracting with private persons for the performance of duties with which the agency is specifically charged (15 Comp. Gen. 951).

2. construction and maintenance of necessary buildings and appurtenant facilities;

   - **No specific authority.** The Organic Act of 1879, establishing the Geological Survey and providing for "... examination of the geological structure, mineral resources, and products of the national domain" (43 U.S.C. 31) is general authorization for construction of special-purpose laboratory buildings. Specific authorization by the Congressional committees on public works is not needed because of the highly specialized purposes of the building. 40 U.S.C. 612: "The term 'public building' means any building ... which is generally suitable for office or storage space ... but shall not include any such buildings and construction projects: ... (E) on or used in connection with ... or for nuclear production, research, or development projects." 41 U.S.C. 12: "No contract shall be entered into for the erection, repair, or furnishing of any public building ... which shall bind the government to pay a larger sum of money than the amount in the Treasury appropriated for the specific purpose."

3. acquisition of lands for gaging stations and observation wells;

   - **43 U.S.C. 36(b)** provides that, "The Secretary of the Interior may, on behalf of the

     United States and for the use by the Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...."

4. expenses of the U.S. National Committee on Geology;

   - **43 U.S.C. 31** participation in and payment of expenses of the U.S. National Committee on Geology is a proper and necessary function of the Geological Survey, and so is authorized by the Survey's Organic Act of March 3, 1879, 43 U.S.C. 31. This Act provides that, "...The Director of the Geological Survey, which office is established, under the Interior Department, shall be appointed by the President by and with the advice and consent of the Senate. This officer shall have the direction of the Geological Survey, and the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain ...."

5. and payment of compensation and expenses of persons on the rolls of the Survey duly appointed to represent the United States in the negotiation and administration of interstate compacts:

   - **66 Stat. 453.** The above language first appeared in the Appropriation Act for FY 1953, P.L. 82–470 (66 Stat. 453), and has been repeated in each Act since that date. Article I, Section 10, paragraph 3, of the United States Constitution provides that, No State shall, without the consent of Congress, lay any duty on tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit or delay." (emphasis supplied)

     Thus each interstate compact must be approved by the Congress and signed by the President. The Public Law approving each interstate compact represents the authorizing legislation.

6. *Provided*, That activities funded by appropriations herein may be accomplished through the use of contracts, grants, or cooperative agreements as defined in 31 U.S.C. 6302, et seq.

   - The above language appears in the Department of the Interior and Related Agencies Appropriations Act, 1988, as included in Public Law 100–202.

7. *Provided further,* That the United States Geological Survey may enter into contracts or cooperative agreements directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purpose of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and chapter 171 of title 28, United States Code, relating to tort claims, but shall not be considered to be Federal employees for any other purposes.

   - The above language appears in the Consolidated Appropriations Act, 2005 (Interior and Related Agencies portion), as included in Public Law 108–447.

Permanent Authority:

1. *Provided*, That appropriations herein and hereafter made shall be available for paying costs incidental to the utilization of services contributed by individuals who serve without compensation as volunteers in aid of work of the Geological Survey, and that within appropriations herein and hereafter provided, Geological Survey officials may authorize either direct procurement of or reimbursement for expenses incidental to the effective use of volunteers such as, but not limited to, training, transportation, lodging, subsistence, equipment, and supplies.

   - **43 U.S.C. 50c**

2. *Provided further*, that provision for such expenses or services is in accord with volunteer or cooperative agreements made with such individuals, private organizations, educational institutions, or State or local government.

   - **43 U.S.C 31(a)**

3. *Provided further*, that the Geological Survey (43 U.S.C. 31(a)) shall hereafter be designated the United States Geological Survey.

   - **Department of the Interior and Related Agencies Appropriations Act, 1992, as included in Public Law 102–154.**

4. *Provided further*, That the United States Geological Survey may hereafter contract directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purposes of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and Chapter 171 of Title 28, United States Code, relating to tort claims, but shall not be considered to be a Federal employees for any other purposes.

   - **Department of the Interior and Related Agencies Appropriations Act, 2000, as included in Public Law 106–113.**

5. *Provided further,* That notwithstanding the provisions of the Federal Grant and Cooperative Agreement Act of 1977 (31 U.S.C. 6301–6308), the United States Geological Survey is authorized to continue existing, and hereafter, to enter into new cooperative agreements directed towards a particular cooperator, in support of joint research and data collection activities with Federal, State, and academic partners funded by appropriations herein, including those that provide for space in cooperator facilities.

   - **Department of the Interior and Related Agencies Appropriations Act, 2004, as included in Public Law 108–108.**

Summary of Requirements
(Dollars in Thousands)

Activity/Subactivity/Program Element	2010 Enacted		2010 Enacted/ 2011 CR		Fixed Costs & Related Changes /1 (+/-)		Administrative Cost Savings		Program Changes (+/-)		2012 Budget Request		Inc (+) Dec (-) from 2011 CR	
	FTE	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount
Appropriation: Surveys, Investigations, and Research														
ECOSYSTEMS														
Status and Trends	*147*	22,877	*147*	22,877	*-11*	-316	*0*	-482	*0*	0	*136*	22,079	*-11*	-798
Fisheries: Aquatic & Endangered Resources	*192*	24,674	*192*	24,674	*-2*	-334	*0*	-510	*-10*	-1,170	*180*	22,660	*-12*	-2,014
Wildlife: Terrestrial & Endangered Resources	*310*	50,116	*310*	50,116	*-9*	-694	*0*	-1,078	*1*	200	*302*	48,544	*-8*	-1,572
Terrestrial, Freshwater & Marine Environments	*253*	37,227	*253*	37,227	*-2*	-580	*0*	-881	*17*	4,464	*268*	40,230	*15*	3,003
Invasive Species	*53*	11,380	*53*	11,380	*0*	-175	*0*	-269	*6*	3,150	*59*	14,086	*6*	2,706
Cooperative Research Units	*133*	19,313	*133*	19,313	*0*	-112	*0*	-377	*0*	0	*133*	18,824	*0*	-489
TOTAL	*1,088*	165,587	*1,088*	165,587	*-24*	-2,211	*0*	-3,597	*14*	6,644	*1,078*	166,423	*-10*	836
CLIMATE AND LAND USE CHANGE /2														
Climate Variability														
NCCWSC/DOI Climate Science Centers (CSC)	*30*	15,143	*30*	15,143	*0*	-192	*0*	-378	*20*	11,000	*50*	25,573	*20*	10,430
Research and Development	*112*	32,939	*112*	32,939	*-1*	-259	*0*	-517	*-1*	-8,022	*110*	24,141	*-2*	-8,798
Carbon Sequestration	*12*	10,095	*12*	10,095	*0*	-115	*0*	-235	*12*	4,600	*24*	14,345	*12*	4,250
Science Support for DOI Bureaus	*8*	5,000	*8*	5,000	*0*	-45	*0*	-95	*16*	4,000	*24*	8,860	*16*	3,860
Subtotal	*162*	63,177	*162*	63,177	*-1*	-611	*0*	-1,225	*47*	11,578	*208*	72,919	*46*	9,742
Land Use Change														
Land Remote Sensing	*145*	63,707	*145*	63,707	*-41*	-54,403	*0*	-679	*3*	13,350	*107*	21,975	*-38*	-41,732
Geographic Analysis and Monitoring	*67*	11,135	*67*	11,135	*-1*	-140	*0*	-234	*0*	750	*66*	11,511	*-1*	376
Subtotal	*212*	74,842	*212*	74,842	*-42*	-54,543	*0*	-913	*3*	14,100	*173*	33,486	*-39*	-41,356
TOTAL	*374*	138,019	*374*	138,019	*-43*	-55,154	*0*	-2,138	*50*	25,678	*381*	106,405	*7*	-31,614
ENERGY, MINERALS, AND ENVIRONMENTAL HEALTH														
Mineral Resources	*351*	53,780	*351*	53,780	*-3*	-696	*0*	-870	*-49*	-8,050	*299*	44,164	*-52*	-9,616
Energy Resources	*151*	27,237	*151*	27,237	*-2*	-368	*0*	-477	*1*	1,000	*150*	27,392	*-1*	155
Contaminant Biology	*64*	9,411	*64*	9,411	*0*	-117	*0*	-199	*-2*	-400	*62*	8,695	*-2*	-716
Toxic Substances Hydrology	*87*	11,084	*87*	11,084	*-1*	-142	*0*	-275	*-13*	-2,400	*73*	8,267	*-14*	-2,817
TOTAL	*653*	101,512	*653*	101,512	*-6*	-1,323	*0*	-1,821	*-63*	-9,850	*584*	88,518	*-69*	-12,994
NATURAL HAZARDS														
Earthquake Hazards	*253*	57,021	*253*	57,021	*-3*	-619	*0*	-1,076	*0*	-3,000	*250*	52,326	*-3*	-4,695
Volcano Hazards	*146*	24,421	*146*	24,421	*-1*	-286	*0*	-526	*-3*	-250	*142*	23,359	*-4*	-1,062
Landslide Hazards	*22*	3,405	*22*	3,405	*0*	-46	*0*	-81	*0*	0	*22*	3,278	*0*	-127
Global Seismographic Network	*10*	5,778	*10*	5,778	*0*	-75	*0*	-121	*0*	-250	*10*	5,332	*0*	-446
Geomagnetism	*17*	2,138	*17*	2,138	*0*	-28	*0*	-37	*0*	0	*17*	2,073	*0*	-65
Coastal and Marine Geology	*233*	46,188	*233*	46,188	*-2*	-588	*0*	-999	*2*	2,900	*233*	47,501	*0*	1,313
TOTAL	*681*	138,951	*681*	138,951	*-6*	-1,642	*0*	-2,840	*-1*	-600	674	133,869	*-7*	-5,082

Summary of Requirements
(Dollars in Thousands)

Activity/Subactivity/Program Element	2010 Enacted		2010 Enacted/ 2011 CR		Fixed Costs & Related Changes /1 (+/-)		Administrative Cost Savings		Program Changes (+/-)		2012 Budget Request		Inc (+) Dec (-) from 2011 CR	
	FTE	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount
WATER RESOURCES														
Groundwater Resources	*56*	9,714	*56*	9,714	*-1*	-174	*0*	-213	*-11*	-2,380	*44*	6,947	*-12*	-2,767
National Water Quality Assessment	*412*	66,507	*412*	66,507	*-3*	-1,066	*0*	-1,623	*-38*	-6,278	*371*	57,540	*-41*	-8,967
National Streamflow Information Program	*52*	27,732	*52*	27,732	*-2*	-618	*0*	-501	*2*	300	*52*	26,913	*0*	-819
Hydrologic Research and Development	*97*	13,822	*97*	13,822	*-1*	-225	*0*	-289	*1*	-1,300	*97*	12,008	*0*	-1,814
Hydrologic Networks and Analysis	*164*	31,387	*164*	31,387	*-7*	-1,695	*0*	-806	*5*	5,054	*162*	33,940	*-2*	2,553
Cooperative Water Program	*666*	65,561	*666*	65,561	*-20*	-1,599	*0*	-1,710	*0*	0	*646*	62,252	*-20*	-3,309
Water Resources Research Act Program	*2*	6,500	*2*	6,500	*0*	0	*0*	-1	*-2*	-6,499	*0*	0	*-2*	-6,500
TOTAL	*1,449*	221,223	*1,449*	221,223	*-34*	-5,377	*0*	-5,143	*-43*	-11,103	*1,372*	199,600	*-77*	-21,623
CORE SCIENCE SYSTEMS														
Biological Information Management and Delivery	*78*	24,946	*78*	24,946	*-2*	-385	*0*	-520	*-26*	-8,928	*50*	15,113	*-28*	-9,833
Nat'l Geological & Geophysical Data Preservation Pgm	*3*	1,000	*3*	1,000	*0*	0	*0*	0	*-3*	-1,000	*0*	0	*-3*	-1,000
National Cooperative Geologic Mapping	*133*	28,163	*133*	28,163	*-1*	-292	*0*	-474	*-3*	-2,000	*129*	25,397	*-4*	-2,766
National Geospatial Program	*338*	70,748	*338*	70,748	*-3*	-860	*0*	-1,823	*-1*	-2,700	*334*	65,365	*-4*	-5,383
TOTAL	*552*	124,857	*552*	124,857	*-6*	-1,537	*0*	-2,817	*-33*	-14,628	*513*	105,875	*-39*	-18,982
ADMINISTRATION AND ENTERPRISE INFORMATION														
Science Support	*378*	69,225	*378*	69,225	*56*	14,647	*0*	-1,461	*-18*	-2,791	*416*	79,620	*38*	10,395
Security and Technology	*89*	26,263	*89*	26,263	*0*	-78	*0*	-563	*-34*	-4,550	*55*	21,072	*-34*	-5,191
Information Resources	*116*	19,706	*116*	19,706	*0*	32	*0*	-425	*-35*	-3,450	*81*	15,863	*-35*	-3,843
TOTAL	*583*	115,194	*583*	115,194	*56*	14,601	*0*	-2,449	*-87*	-10,791	*552*	116,555	*-31*	1,361
FACILITIES														
Rental Payments and Operations & Maintenance	*52*	99,076	*52*	99,076	*0*	363	*0*	-1,454	*0*	-4,500	*52*	93,485	*0*	-5,591
Deferred Maintenance and Capital Improvement	*0*	7,321	*0*	7,321	*0*	-2,500	*0*	-14	*0*	0	*0*	4,807	*0*	-2,514
Construction	*0*	0	*0*	0	*0*	2,500	*0*	0	*0*	0	*0*	2,500	*0*	2,500
TOTAL	*52*	106,397	*52*	106,397	*0*	363	*0*	-1,468	*0*	-4,500	*52*	100,792	*0*	-5,605
SIR, TOTAL	*5,432*	1,111,740	*5,432*	1,111,740	*-63*	-52,280	*0*	-22,273	*-163*	-19,150	*5,206*	1,018,037	*-226*	-93,703

/1 Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.
/2 A new Treasury account is proposed for National Land Imaging; it will be managed as part of the Climate and Land Use Change Mission Area.

Details for Fixed Costs & Related Changes and Administrative Cost Savings
(Dollars in Thousands)

Activity/Subactivity/Program Element	Fixed Costs: Shared Program	Fixed Costs: Fixed Costs	Fixed Costs: Subtotal	Related Changes: Technical Adjustments	Related Changes: Enterprise Publishing Network	Related Changes: Separation Costs	Related Changes: Tech Adj Landsat 8 Ground System	Related Changes: Subtotal	Total
Appropriation: Surveys, Investigations, and Research									
ECOSYSTEMS									
Status and Trends	0	0	0	-185	-131	0	0	-316	-501
Fisheries: Aquatic & Endangered Resources	0	0	0	-200	-134	0	0	-334	-534
Wildlife: Terrestrial & Endangered Resources	0	0	0	-406	-288	0	0	-694	-1,100
Terrestrial, Freshwater & Marine Environments	0	0	0	-342	-238	0	0	-580	-922
Invasive Species	0	0	0	-92	-83	0	0	-175	-267
Cooperative Research Units	0	0	0	0	-112	0	0	-112	-112
TOTAL	0	0	0	-1,225	-986	0	0	-2,211	-3,436
CLIMATE AND LAND USE CHANGE									
Climate Variability									
NCCWSC/DOI Climate Science Centers (CSC)	0	0	0	-62	-130	0	0	-192	-254
Research and Development	0	0	0	-135	-124	0	0	-259	-394
Carbon Sequestration	0	0	0	-42	-73	0	0	-115	-157
Science Support for DOI Bureaus	0	0	0	0	-45	0	0	-45	-45
Subtotal	0	0	0	-239	-372	0	0	-611	-850
Land Use Change									
Land Remote Sensing	0	0	0	-791	-112	0	-53,500	-54,403	-55,194
Geographic Analysis and Monitoring	0	0	0	-81	-59	0	0	-140	-221
Subtotal	0	0	0	-872	-171	0	-53,500	-54,543	-55,415
TOTAL	0	0	0	-1,111	-543	0	-53,500	-55,154	-56,265
ENERGY, MINERALS, AND ENVIRONMENTAL HEALTH									
Mineral Resources	0	0	0	-497	-199	0	0	-696	-1,193
Energy Resources	0	0	0	-245	-123	0	0	-368	-613
Contaminant Biology	0	0	0	-77	-40	0	0	-117	-194
Toxic Substances Hydrology	0	0	0	-104	-38	0	0	-142	-246
TOTAL	0	0	0	-923	-400	0	0	-1,323	-2,246
NATURAL HAZARDS									
Earthquake Hazards	0	0	0	-399	-220	0	0	-619	-1,018
Volcano Hazards	0	0	0	-188	-98	0	0	-286	-474
Landslide Hazards	0	0	0	-32	-14	0	0	-46	-78
Global Seismographic Network	0	0	0	-53	-22	0	0	-75	-128
Geomagnetism	0	0	0	-19	-9	0	0	-28	-47
Coastal and Marine Geology	0	0	0	-388	-200	0	0	-588	-976
TOTAL	0	0	0	-1,079	-563	0	0	-1,642	-2,721

Details for Fixed Costs & Related Changes and Administrative Cost Savings

(Dollars in Thousands)

	Fixed Costs			Related Changes					
Activity/Subactivity/Program Element	Shared Program	Fixed Costs	Subtotal	Technical Adjustments	Enterprise Publishing Network	Separation Costs	Tech Adj Landsat 8 Ground System	Subtotal	Total
WATER RESOURCES									
Groundwater Resources	0	0	0	-104	-70	0	0	-174	-278
National Water Quality Assessment	0	0	0	-484	-582	0	0	-1,066	-1,550
National Streamflow Information Program	0	0	0	-346	-272	0	0	-618	-964
Hydrologic Research and Development	0	0	0	-104	-121	0	0	-225	-329
Hydrologic Networks and Analysis	0	0	0	-1,351	-344	0	0	-1,695	-3,046
Cooperative Water Program	0	0	0	-969	-630	0	0	-1,599	-2,568
Water Resources Research Act Program	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	-3,358	-2,019	0	0	-5,377	-8,735
CORE SCIENCE SYSTEMS									
Biological Information Management and Delivery	0	0	0	-316	-69	0	0	-385	-701
Nat'l Geological & Geophysical Data Preservation Pgm	0	0	0	0	0	0	0	0	0
National Cooperative Geologic Mapping	0	0	0	-178	-114	0	0	-292	-470
National Geospatial Program	0	0	0	-564	-296	0	0	-860	-1,424
TOTAL	0	0	0	-1,058	-479	0	0	-1,537	-2,595
ADMINISTRATION AND ENTERPRISE INFORMATION									
Science Support	1,323	-1,350	-27	8,754	0	5,920	0	14,674	23,401
Security and Technology	0	-78	-78	0	0	0	0	0	-78
Information Resources	0	32	32	0	0	0	0	0	32
TOTAL	1,323	-1,396	-73	8,754	0	5,920	0	14,674	23,355
FACILITIES									
Rental Payments and Operations & Maintenance	-2,973	3,336	363	0	0	0	0	0	363
Deferred Maintenance and Capital Improvement	0	0	0	-2,500	0	0	0	-2,500	-5,000
Construction	0	0	0	2,500	0	0	0	2,500	5,000
TOTAL	-2,973	3,336	363	0	0	0	0	0	363
SIR, TOTAL	**-1,650**	**1,940**	**290**	**0**	**-4,990**	**5,920**	**-53,500**	**-52,570**	**-52,280**

Details for Fixed Costs & Related Changes and Administrative Cost Savings
(Dollars in Thousands)

	Administrative Cost Savings											
	Department-Wide Management Savings					Administrative Cost Savings						
Activity/Subactivity/Program Element	Cost Cutting	Travel Reduction	IT Reduction	Acquisition Reduction	Subtotal	Travel	Transport of Things	Printing	Advisory & Assist Services	Supplies and Materials	Subtotal	Total
Appropriation: Surveys, Investigations, and Research												
ECOSYSTEMS												
Status and Trends	-57	-50	-64	-73	-244	-101	-7	-7	0	-123	-238	-482
Fisheries: Aquatic & Endangered Resources	-61	-53	-69	-80	-263	-98	-10	-4	0	-135	-247	-510
Wildlife: Terrestrial & Endangered Resources	-124	-108	-141	-161	-534	-175	-33	-2	-3	-331	-544	-1,078
Terrestrial, Freshwater & Marine Environments	-105	-91	-119	-135	-450	-191	-23	-4	-3	-210	-431	-881
Invasive Species	-29	-24	-32	-36	-121	-71	-6	-2	-1	-68	-148	-269
Cooperative Research Units	-49	-31	-58	-32	-170	-81	-33	-3	-1	-89	-207	-377
TOTAL	-425	-357	-483	-517	-1,782	-717	-112	-22	-8	-956	-1,815	-3,597
CLIMATE AND LAND USE CHANGE												
Climate Variability												
NCCWSC/DOI Climate Science Centers (CSC)	-38	-32	-18	-30	-118	-153	-18	-2	0	-87	-260	-378
Research and Development	-83	-69	-40	-65	-257	-114	-13	-5	-6	-122	-260	-517
Carbon Sequestration	-26	-21	-12	-19	-78	-62	-9	-3	-4	-79	-157	-235
Science Support for DOI Bureaus	0	0	0	0	0	-42	-5	-1	-1	-46	-95	-95
Subtotal	-147	-122	-70	-114	-453	-371	-45	-11	-11	-334	-772	-1,225
Land Use Change												
Land Remote Sensing	0	-106	-66	-232	-404	-104	-1	-1	-120	-49	-275	-679
Geographic Analysis and Monitoring	-28	-34	-31	-18	-111	-72	-3	-3	-21	-24	-123	-234
Subtotal	-28	-140	-97	-250	-515	-176	-4	-4	-141	-73	-398	-913
TOTAL	-175	-262	-167	-364	-968	-547	-49	-15	-152	-407	-1,170	-2,138
ENERGY, MINERALS, AND ENVIRONMENTAL HEALTH												
Mineral Resources	0	-87	-159	-115	-361	-146	-13	-51	-75	-224	-509	-870
Energy Resources	0	-62	-70	-54	-186	-143	-8	-8	-8	-124	-291	-477
Contaminant Biology	-24	-20	-26	-30	-100	-26	-2	-5	0	-66	-99	-199
Toxic Substances Hydrology	-28	-35	-17	-100	-180	-27	-6	-7	-1	-54	-95	-275
TOTAL	-52	-204	-272	-299	-827	-342	-29	-71	-84	-468	-994	-1,821
NATURAL HAZARDS												
Earthquake Hazards	-142	-118	-115	-156	-531	-289	-48	-7	-5	-196	-545	-1,076
Volcano Hazards	-61	-62	-66	-81	-270	-94	-14	-4	0	-144	-256	-526
Landslide Hazards	-9	-15	-10	-14	-48	-18	0	0	0	-15	-33	-81
Global Seismographic Network	-14	-5	-5	-61	-85	-3	-14	0	0	-19	-36	-121
Geomagnetism	-5	-5	-8	0	-18	-17	0	0	0	-2	-19	-37
Coastal and Marine Geology	-118	-103	-106	-156	-483	-228	-36	-11	-26	-215	-516	-999
TOTAL	-349	-308	-310	-468	-1,435	-649	-112	-22	-31	-591	-1,405	-2,840

Details for Fixed Costs & Related Changes and Administrative Cost Savings

(Dollars in Thousands)

	Administrative Cost Savings											
	Department-Wide Management Savings					Administrative Cost Savings						
Activity/Subactivity/Program Element	Cost Cutting	Travel Reduction	IT Reduction	Acquisition Reduction	Subtotal	Travel	Transport of Things	Printing	Advisory & Assist Services	Supplies and Materials	Subtotal	Total
WATER RESOURCES												
Groundwater Resources	-21	-42	-25	-44	-132	-40	-3	-1	-25	-12	-81	-213
National Water Quality Assessment	-169	-237	-176	-399	-981	-263	-50	-22	-45	-262	-642	-1,623
National Streamflow Information Program	-70	-84	-23	-55	-232	-192	-10	-36	-2	-29	-269	-501
Hydrologic Research and Development	-31	-21	-99	-11	-162	-62	-4	-2	0	-59	-127	-289
Hydrologic Networks and Analysis	-76	-154	-69	-111	-410	-182	-12	-15	-113	-74	-396	-806
Cooperative Water Program	-166	-126	-315	-387	-994	-202	-133	-12	-1	-368	-716	-1,710
Water Resources Research Act Program	0	0	-1	0	-1	0	0	0	0	0	0	-1
TOTAL	-533	-664	-708	-1,007	-2,912	-941	-212	-88	-186	-804	-2,231	-5,143
CORE SCIENCE SYSTEMS												
Biological Information Management and Delivery	-56	-66	-34	-96	-252	-13	-1	-1	-244	-9	-268	-520
Nat'l Geological & Geophysical Data Preservation Pgm	0	0	0	0	0	0	0	0	0	0	0	0
National Cooperative Geologic Mapping	-71	-51	-61	-34	-217	-154	-12	-2	-2	-87	-257	-474
National Geospatial Program	-180	-191	-153	-273	-797	-118	-3	-4	-863	-38	-1,026	-1,823
TOTAL	-307	-308	-248	-403	-1,266	-285	-16	-7	-1,109	-134	-1,551	-2,817
ADMINISTRATION AND ENTERPRISE INFORMATION												
Science Support	-101	-186	-174	-107	-568	-234	-16	-17	-191	-435	-893	-1,461
Security and Technology	0	-23	-40	-145	-208	-29	-1	-1	-299	-25	-355	-563
Information Resources	-25	-19	-52	-118	-214	-37	-8	-6	-74	-86	-211	-425
TOTAL	-126	-228	-266	-370	-990	-300	-25	-24	-564	-546	-1,459	-2,449
FACILITIES												
Rental Payments and Operations & Maintenance	-1,300	0	-25	-129	-1,454	0	0	0	0	0	0	-1,454
Deferred Maintenance and Capital Improvement	0	0	0	-14	-14	0	0	0	0	0	0	-14
Construction	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	-1,300	0	-25	-143	-1,468	0	0	0	0	0	0	-1,468
SIR, TOTAL	**-3,267**	**-2,331**	**-2,479**	**-3,571**	**-11,648**	**-3,781**	**-555**	**-249**	**-2,134**	**-3,906**	**-10,625**	**-22,273**

United States Geological Survey

Federal Funds

General and special funds:

NATIONAL LAND IMAGING

For expenses necessary for the United States Geological Survey to conduct an applied remote sensing program, including satellite operations, as authorized by 15 U.S.C. 5631 et seq., $99,817,000 shall remain available until expended.

Appropriation Language and Citations

1. *of which $99,817,000 shall remain available until expended for satellite operations;*

- **P.L. 107–43, Department of the Interior and Related Agencies Appropriation Act, 2002**

Summary of Requirements
(Dollars in Thousands)

Activity/Subactivity/Program Element	2010 Enacted		2010 Enacted/ 2011 CR		Fixed Costs & Related Changes /1 (+/-)		Administrative Cost Savings		Program Changes (+/-)		2012 Budget Request		Inc (+) Dec (-) from 2011 CR	
	FTE	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount
Appropriation: National Land Imaging														
NATIONAL LAND IMAGING \2	*0*	0	*0*	0	*33*	52,990	*0*	-1,173	*7*	48,000	*40*	99,817	*40*	99,817
NLI, TOTAL	***0***	**0**	***0***	**0**	***33***	**52,990**	***0***	**-1,173**	***7***	**48,000**	***40***	**99,817**	***40***	**99,817**

/1 Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.
/2 A new Treasury account is proposed for National Land Imaging; it will be managed as part of the Climate and Land Use Change Mission Area.

Details for Fixed Costs & Related Changes and Administrative Cost Savings
(Dollars in Thousands)

	Fixed Costs			Related Changes					
Activity/Subactivity/Program Element	Shared Program	Fixed Costs	Subtotal	Technical Adjustments	Enterprise Publishing Network	Separation Costs	Tech Adj Landsat 8 Ground System	Subtotal	Total
Appropriation: National Land Imaging									
NATIONAL LAND IMAGING	0	0	0	0	-510	0	53,500	52,990	52,990
NLI, TOTAL	**0**	**0**	**0**	**0**	**-510**	**0**	**53,500**	**52,990**	**52,990**

Details for Fixed Costs & Related Changes and Administrative Cost Savings
(Dollars in Thousands)

	Administrative Cost Savings											
	Department-Wide Management Savings					Administrative Cost Savings						
Activity/Subactivity/Program Element	Cost Cutting	Travel Reduction	IT Reduction	Acquisition Reduction	Subtotal	Travel	Transport of Things	Printing	Advisory & Assist Services	Supplies and Materials	Subtotal	Total
Appropriation: National Land Imaging												
NATIONAL LAND IMAGING	0	0	0	0	0	-623	-5	-3	-336	-206	-1,173	-1,173
NLI, TOTAL	**0**	**0**	**0**	**0**	**0**	**-623**	**-5**	**-3**	**-336**	**-206**	**-1,173**	**-1,173**

USGS: Justification of Fixed Costs and Related Changes

(Dollars in Thousands)

	2010 Budget	2010 Enacted / 2011 CR	2012 Fixed Costs Change
Additional Operational Costs from 2011 and 2012 January Pay Raises			
1. 2010 Pay Raise, 3 Quarters in 2010 Budget (2.0%)	$8,278	N/A	N/A
Amount of pay raise absorbed	*[$0]*		
2. 2009 Pay Raise, 1 Quarter (3.9%)	$5,381	N/A	N/A
Amount of pay raise absorbed	*[$0]*		
3. 2010 Pay Raise, 1 Quarter (2.0%)	N/A	N/A	N/A
Amount of pay raise absorbed		*[+$2,714]*	
4. 2011 Pay Raise, 3 Quarters in 2011 Budget (0%)	N/A	$0	N/A
5. 2011 Pay Raise, 1 Quarter (0%)	N/A	N/A	$0
6. 2012 Pay Raise (0 %)	N/A	N/A	$0
7. Non-Foreign Area COLA Adjustment to Locality Pay	N/A	$0	+$549
Amount of pay raise absorbed		*[+$744]*	

These adjustments are for an additional amount needed to fund estimated pay raises for Federal employees. Lines 1 and 2, 2010 pay raise estimates provided as a point of reference.

Line 3 is the amount needed in 2012 to fund the enacted 2.0% January 2010 pay raise from October through December 2010.

Lines 4 and 5, 2011 pay raise is shown as “0” to reflect the first year of the Administration-directed 2-year pay freeze at the 2010 level.

Line 6 is shown as “0” to reflect the second year of the Administration-directed 2-year pay freeze at the 2010 level.

	2010 Budget	2010 Enacted / 2011 CR	2012 Fixed Costs Change
Other Fixed Cost Changes			
One Less Pay Day	N/A	N/A	-$2,369

This adjustment reflects the decreased costs resulting from the fact that there is one less pay day in 2012 than in 2011.

Employer Share of Federal Health Benefit Plans	$2,158	$0	+$2,498
Amount of health benefits absorbed	*[0]*	*[+$2,502]*	*[0]*

The adjustment is for changes in the Federal government's share of the cost of health insurance coverage for Federal employees. For 2012, the increase is 6.8%.

Worker's Compensation Payments	$3,010	$0	*+$142*
Amount of workers compensation absorbed	*[0]*	*[+$90]*	*[0]*

The adjustment is for actual charges through June 2010 in the costs of compensating injured employees and dependents of employees who suffer accidental deaths while on duty. Costs for 2012 will reimburse the Department of Labor, Federal Employees Compensation Fund, pursuant to 5 U.S.C. 8147(b) as amended by Public Law 94-273.

	2010 Budget	2010 Enacted / 2011 CR	2012 Fixed Costs Change
Unemployment Compensation Payments	$668	$0	+$9
Amount of unemployment compensation absorbed	*[0]*	*[+$43]*	*[0]*
The adjustment is for estimated changes in the costs of unemployment compensation claims to be paid to the Department of Labor, Federal Employees Compensation Account, in the Unemployment Trust Fund, pursuant to Public Law 96-499.			
Rental Payments	$68,478	$0	+$3,336
Amount of rental payments absorbed	*[0]*	*[+$1,080]*	*[0]*
The adjustment is for changes in the costs payable to General Services Administration and others resulting from changes in rates for office and non-office space as estimated by GSA, as well as the rental costs of other currently occupied space. These costs include building security; in the case of GSA space, these are paid to DHS. Costs of mandatory office relocations, i.e., relocations in cases where due to external events there is no alternative but to vacate the currently occupied space, are also included.			
Departmental Working Capital Fund	$17,565	$0	-$2,225
Amount of WCF payments absorbed	*[0]*	*[-$73]*	*[0]*
The change reflects expected changes in the charges for centrally billed Department services and other services through the Working Capital Fund. These charges are displayed in the Budget Justification for Department Management.			

This page intentionally left blank.

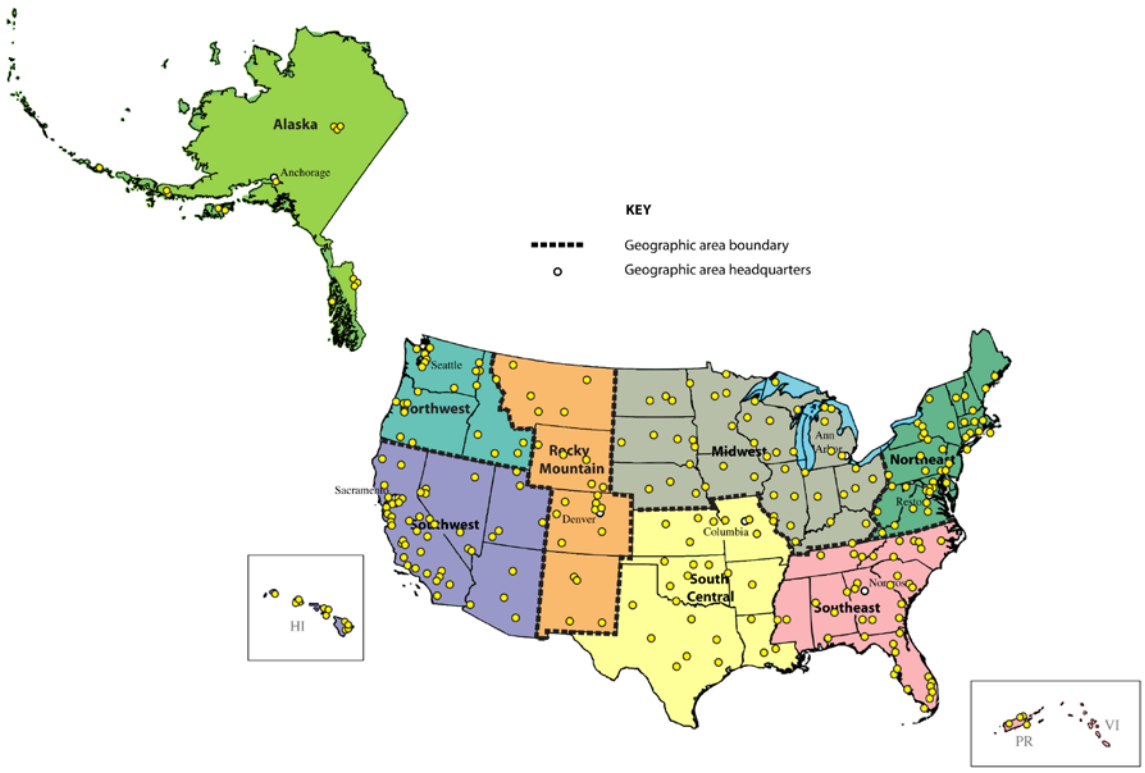
Regional and Crosscutting Activities

2012 Regional Management

In realigning the USGS management structure to facilitate implementation of the Science Strategy (see Science Strategy Realignment Section), the U.S. Geological Survey, (USGS), is eliminating three Regional Director positions (RD). The RDs were responsible for translating discipline-based programs from headquarters into interdisciplinary projects on the ground in the regions. With the realignment, Associate Directors (ADs) for the new mission areas are, by definition, interdisciplinary. This new structure no longer requires an extra layer of management to direct interdisciplinary science; the RD positions are eliminated in 2011. The Regional Executives (RExs) report directly to the USGS Deputy Director beginning in 2011. In 2012, the USGS proposes to eliminate the North Central area as part of the proposed Bureau consolidation. States now assigned to the North Central area will be assigned to the Midwest or Rocky Mountain areas. This will reduce the number of regional areas from nine to eight.

The USGS regional construct focuses on issue-based, multidisciplinary science to align USGS work more closely with partners at the local and regional level; and enhances partnerships with Interior Bureaus and other Federal, State, and local agencies. Proximity of the USGS regional offices to Interior field offices and to other partners allows USGS scientists and managers to understand and address land and resource management issues at local and regional levels, increase opportunities for partnerships, and leverage resources. Regional efforts enhance connection of the world-renowned capabilities of the USGS with the high-priority, real-time land management, urban planning, and heightened security needs of local, Federal, State, tribal, and community managers.

Regional geographic boundaries and office locations



On the Landscape

The USGS has locations in all 50 States, Puerto Rico, and Guam. At these locations, there are offices, laboratories, and field stations. In 2012, the USGS will undergo a Bureau consolidation to reduce the number of physical locations. Use of telework and hoteling opportunities will also factor into the decisions on where the USGS footprint can be reduced. The primary goal is to continue to provide world-class science to address the needs of the Department of the Interior (Interior) and the Nation.

Interior Crosscuts

As Interior's science Bureau, the USGS conducts research fundamental to numerous intradepartmental and interagency crosscutting activities. These crosscutting activities range from environmental issues such as the Everglades restoration and invasive species to environmental and climate change issues included in Climate and Land Use Change programs. The following are crosscutting activities in which the USGS contributes.

(Dollars in Millions)

	2010 Actual	**2010 Enacted / 2011 CR**	**2012 President's Request**
Great Lakes Restoration	15.8	15.8	19.3
Greater Everglades Ecosystem Restoration	6.9	6.9	6.9
Chesapeake Bay	4.9	4.9	9.5
Columbia River Basin Total	12.9	12.9	14.3
Columbia River Basin Salmon	*2.6*	*2.6*	*2.6*
Columbia River Basin Other Activities	*10.3*	*10.3*	*11.7*
California Bay-Delta	3.5	3.5	3.5
Puget Sound	6.4	6.4	7.9
Upper Mississippi River	4.9	4.9	5.9
Gulf Coast	6.0	6.0	5.5
Invasive Species	11.6	11.6	14.2
Klamath River Basin	2.8	2.8	2.6

Great Lakes Restoration – The USGS is integrating science, monitoring, and modeling efforts to create a partner-driven strategic science framework for managing the Great Lakes and meeting Great Lakes Restoration Initiative (GLRI) goals and objectives. Building on this science framework, a comprehensive suite of carefully planned research projects have been designed that address the five GLRI focus areas (Invasive Species; Habitat and Wildlife Protection and Restoration; Nearshore Health and Nonpoint Source; Toxic Substances and Areas of Concern; and Accountability, Monitoring, Evaluation, Communication, and Partnerships). The results of these projects will provide new science, information, and tools for managers and stakeholders to protect and restore the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. There is a requested increase of $3,500,000 in 2012 for the Great Lakes. Details are found in the Key Changes Section.

Greater Everglades and Coastal Ecosystems Restoration – USGS science focuses on developing a basic understanding of the Greater Everglades ecosystems through research and monitoring to develop predictive ecosystem models. Using the Greater Everglades as a 'living laboratory of change' the USGS is advancing the 'science of understanding and predicting change' as we are facing tomorrow's challenges. To help generate fundamental understanding

of Everglades ecosystems, USGS research and monitoring has and will continue to focus on ecosystem history, water quality and contaminants, surface and groundwater flows, and species response to hydropattern dynamics.

Chesapeake Bay Restoration and Protection – President Obama issued an Executive Order (E.O.) in May, 2009 directing the Federal Government to lead efforts to restore and protect the Chesapeake Bay, the Nation's largest estuary. A new restoration strategy has been proposed. The E.O. also called for the USGS and the National Oceanic and Atmospheric Administration (NOAA) to co-lead Federal activities to "Coordinate Tools and Science for Strategic Decision Making." Science activities support the major goals of the draft E.O. strategy, which are:

- Restore Clean Water;
- Conserve Treasured Places and Restore Habitats, Fish, and Wildlife; and
- Adapt for Climate Change Impacts.

In 2011, the USGS will improve and provide results from models, which allowed Federal and State agencies to prioritize water-quality practices in the Bay watershed. Results released by the USGS from updated nutrient and sediment models help the U.S. Department of Agriculture (USDA) focus funding for the Food, Conservation, and Energy Act of 2008 to improve water quality in priority watersheds. Using LANDSAT imagery, the USGS will improve the methodology to characterize the amount of urban-land change in the Bay watershed. The information is being used to improve simulation of land-change conditions and applied by the Environmental Protection Agency (EPA) and six states to focus practices to improve water-quality conditions in the Bay.

The 2012 budget proposes an additional $4.6 million for the Chesapeake Bay. Details are found in the Key Changes Section.

Columbia River Basin Protection – The Columbia River system, in all its constituent parts—streams, rivers, lakes, precipitation regimes, glaciers and snowmelt—forms the core of the Columbia Basin's environment, culture, and economy. Covering nearly 260,000 square miles, the Basin drains hundreds of smaller rivers and tributaries and provides essential habitats for numerous important aquatic and terrestrial game and trust species. Urbanization, recreation, commercial fisheries, hydropower, and agriculture have had marked impacts on the Basin's aquatic habitat and fish populations. Multiple USGS science centers have scientists from all scientific disciplines engaged in Columbia River Basin studies.

Within the larger Columbia River Basin, the Yakima River Basin is one of the most intensively irrigated areas in the United States with a population of nearly 250,000 and growing. Increasing demands for water for municipal, fisheries, agricultural, industrial, and recreational uses are impacting groundwater resources of the Basin. In order to present results to enhance understanding of the groundwater flow system and its relation to rivers and streams, in 2011, the USGS produced a Final Report documenting results of a nine-year study of groundwater resources in the Yakima River Basin of Washington. The study to assess water availability in the Basin was conducted in collaboration with the Bureau of Reclamation, the Yakama Nation, and the Washington State Department of Ecology as part of a Tri-Party Agreement. The report, the 13th in a series, documents a highly complex groundwater model that is used to predict flows in rivers and streams for different groundwater-use scenarios. Preliminary results show that at 2001 rates of groundwater pumping, flows at the outlet of the Yakima River are reduced by 200 cubic feet per second (cfs), or about five percent of the regulated annual mean flow. The

reduction is significant compared to federally-mandated target flows at Sunnyside and Prosser Dams, which range from 300 to 600 cfs, depending on the year. Study results are likely to play a significant role in future water-management decisions and may be used in potential future litigation.

The 2012 budget proposes an additional $1.4 million for research that supports modeling and decision analysis tools that will assist a wide range of regional decision makers with science related information such as sources of water, stream conditions, land, fish, wildlife and habitat health, agriculture, and recreation. Details for the proposed increase are found in the Key Changes Section.

California Bay-Delta – The California Bay-Delta ecosystem is recognized as one of the World's threatened treasures of biodiversity, supporting unique native species and their critical tidal wetland habitats. Like other urban estuaries, this system has a history of anthropogenic changes that have degraded the ecosystem. For example, half of the estuary's historic freshwater flow is exported sewage from more than two million people. Chemical and biological (exotic species) contaminants are discharged each day into the system, so that less than 10 percent of its original tidal wetland and riparian habitats remain. However, the San Francisco estuary is now the subject of aggressive and expensive restoration efforts. As one example, in the past decade, Federal, State, and non-governmental organization partnerships have purchased nearly 10,000 hectares of former salt evaporation ponds for restoration.

Using linked models, the USGS projected responses of the San Francisco Bay-Delta system to a century of ecosystem change. The responses projected included: water-supply reliability, risks to human health and safety, and sustainability of native species due to air temperature, runoff, seasonal hydrology, reservoir operations, water temperature, flood risk, extreme weather events, turbidity, salinity intrusion, water quality, and outcomes of habitat restoration. This synthesis of research conducted over the past five years will be completed in 2011 and will consist of a Journal article, targeted for Proceedings of the National Academy of Sciences, with the proposed title *"Projected Evolution of California's San Francisco Bay-Delta-River System in a Century of Continuing Climate Change"*. Policy makers now must plan for systemic, multidimensional changes that ramify across all aspects of the Ocean-Bay-Delta-River-Watershed system.

Puget Sound – In 2010, the USGS developed collaborations with tribal, local, State and Federal agencies in Washington and the Canadian Province of British Columbia to begin collecting watershed characteristics and nearshore sea otter forage data. In collaboration with the U.S. Army Corps of Engineers and the Washington Department of Fish and Wildlife, in 2011, the USGS will publish a scientific investigation report titled "Impacts of Shoreline Armoring: Implications for Puget Sound." The report includes 22 papers by experts in estuarine ecology, hydrology, coastal geology, and other related fields. This report provides state-of-the-science on the impacts of shoreline armoring to help inform decisions on permitting, restoration, and protection actions.

The requested increase of $1.5 million in 2012 will support USGS efforts to be more responsive to identified science needs in the Puget Sound. Details for the proposed increase are found in the Key Changes Section.

Upper Mississippi River – Large rivers are national treasures for many reasons and uses. Understanding sediment and nutrient movement in the context of ecosystem sustainability,

restoration, and resilience in these rivers and their ultimate effects on coastal estuaries and waters is critical to wise future management of river flow and material sources on the landscape. Physical, chemical, and biological damage attributable to sediment, nutrients, and sediment-associated water-quality constituents has been estimated to range from $20.0 to $50.0 billion annually in North America. Knowing how natural and human factors affect those ecosystem attributes and the relations between those attributes and resource management goals are needed in the context of potential changing climate.

The requested increase of $1.0 million would allow the USGS to initiate efforts to establish a comprehensive data management structure and facilitate collaboration among State and Federal agencies through the development of technical tools and the establishment and maintenance of information products. Details for the proposed increase are found in the Key Changes Section.

Gulf Coast – The overarching goal of USGS Gulf Coast science in the post-Katrina environment is to provide the scientific information, knowledge, and tools required to ensure that decisions made about land resource use, management practices, and future development in the coastal zone and adjacent watersheds, promote restoration, increase coastal resilience, and mitigate risks associated with both artificial and natural hazards. This work provided a foundation of science that has been brought to bear in addressing the environmental impacts of the Deepwater Horizon Oil Spill. Geospatial expertise both on site and remotely provide tools for responders. Expertise in coastal restoration assisted managers in decisions about berm placement and tidal inundation. Contaminant and geochemistry expertise were used to define oil plume extent. As response moves to restoration, the USGS will apply its extensive scientific capabilities to assist managers in understanding the effects of restoration strategies.

Invasive Species – The USGS plays an important role in Federal efforts to combat invasive species in natural and semi-natural areas by providing information on early detection and assessment of newly established invaders, monitoring invading populations, improving understanding of the ecology of invaders and factors in resistance of habitats to invasion, and development and testing of preventive and alternative management and control approaches.

The USGS also plays a significant role in implementing the National Invasive Species Management Plan (NISMP), developed by the National Invasive Species Council, as called for in the Presidential Executive Order on invasive species. To meet the goals of the NISMP, the USGS Invasive Species program provides management-oriented research and delivers information needed to prevent, detect, control, and eradicate invasive species and to restore impaired ecosystems. USGS researchers are leading and cooperating in efforts to integrate capabilities of the USGS and partners, including Federal and State resource agencies, to help provide information, methods, technologies, and technical assistance needed for effective responses to terrestrial and aquatic invaders threatening U.S. ecosystems and native species. The Interior Bureaus work in partnership with other Federal agencies; State, local, and tribal governments; and private sources to conduct activities related to prevention, early detection and rapid response, control and management, restoration, and organizational collaboration.

In 2010, USGS research on Asian carp control identified and characterized key physiological differences between Asian carp and native fish. Specifically, plasma concentrations of rotenone (a commonly used fish poison) lethal to Asian carp were determined and Asian carp digestive enzyme profiles were developed. This information is guiding development of targeted chemical controls that will minimize impacts on native species.

In 2011 and 2012, these studies will move from data gathering to developing and testing cutting edge controls exploiting physiological differences between different types of Asian carp and native fish. Much will have been learned about Asian carp control from this and other projects outlined in the Asian Carp Control Strategy Framework by 2012. It is projected that efficient combinations of control methods will be identified using an Integrated Pest Management approach.

The 2012 budget includes a proposed increase of $3.0 million to advance the Asian carp research in support of the Asian Carp Control Strategy Framework. For more details please refer to the Ecosystems Section.

Klamath River Basin Science – Historically, in the Klamath River Basin of south-central Oregon and northwestern California, there have been serious and litigious conflicts over water-related matters among multiple stakeholders from agriculture, ranching, logging, natural resource conservation, Tribes, and recreational and commercial fishing interests. Recently, forward-thinking efforts have charted a new path based on collaborative solutions to environmental and economic problems using best science, data, and practices.

In the Klamath Basin, USGS research provides a broad, defensible foundation for management decisions and actions regarding endangered fish population dynamics and ecosystem health, water quality impacts on salmon recovery, and modeling and forecasting seasonal run-off and other water dynamics. In addition, the Secretary of the Interior appointed a USGS scientist and Science Center Director to lead science planning associated with the Secretarial Determination for the possible removal of four dams on the Klamath River. Recent USGS science efforts have focused on information needs of the Bureau of Reclamation and the U.S. Fish and Wildlife Service related to Endangered Species Act consultation, tribal trust, and water availability. USGS work on hydrology of the Klamath Basin supports ground-water modeling and efforts to develop a reliable quantitative tool for managing seasonal water use in the upper basin and stream flows in the lower Klamath River. USGS data are used to construct future resource allocations in the basin and to understand and predict endangered fish survival and migration behaviors in response to changing environmental conditions.

Activity: Ecosystems

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Status and Trends ($000)		22,877	22,877	-316	-482	0	22,079	-798
	FTE	*147*	*147*	*-11*		*0*	*136*	*-11*
Fisheries: Aquatic & Endangered		24,674	24,674	-334	-510	-1,170	22,660	-2,014
Resources ($000)	*FTE*	*192*	*192*	*-2*		*-10*	*180*	*-12*
Wildlife: Terrestrial & Endangered Resources		50,116	50,116	-694	-1,078	200	48,544	-1,572
($000)	*FTE*	*310*	*310*	*-9*		*1*	*302*	*-8*
Terrestrial, Freshwater & Marine Environments		37,227	37,227	-580	-881	4,464	40,230	3,003
($000)	*FTE*	*253*	*253*	*-2*		*17*	*268*	*15*
Invasive Species ($000)		11,380	11,380	-175	-269	3,150	14,086	2,706
	FTE	*53*	*53*	*0*		*6*	*59*	*6*
Cooperative Research Units ($000)		19,313	19,313	-112	-377		18,824	-489
	FTE	*133*	*133*	*0*		*0*	*133*	*0*
Total Requirements ($000)		**165,587**	**165,587**	**-2,211**	**-3,597**	**6,644**	**166,423**	**836**
	Total FTE	***1,088***	***1,088***	***-24***		***14***	***1,078***	***-10***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Unrequested Congressional Action	-2,920	-13
• WaterSMART (Fisheries)	+500	0
• Multi-Hazards Initiative Environments)	+200	+1
• Aquatic Drug Registration (Fisheries)	-700	-6
• Ecosystem Restoration	+9,564	+32
o Chesapeake Bay (Environments)	[+4,614]	[+18]
o Columbia River (Wildlife)	[+200]	[+1]
o Columbia River (Environments)	[+300]	[+1]
o Great Lakes (Invasive Species)	[+3,500]	[+8]
o Puget Sound (Environments)	[+500]	[+3]
o Upper Mississippi River (Environments)	[+450]	[+1]
TOTAL Program Changes	**+6,644**	**+14**

Justification of Program Changes

The 2012 Budget Request for Ecosystems is $166,423,000 and 836 FTE, a net program change of +$6,644,000 and +14 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Unrequested Congressional Action **(-$2,920,000/-13 FTE)**

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation. A list of these actions is located in the Budget at a Glance Section.

WaterSMART **(+$500,000/0 FTE)**

21st Century Water Challenge – Water is essential to the economic security of individual communities across the United States and also to the economic vitality of our Nation as a whole. An assessment of the availability and use of water resources in the United States was last completed in 1978. Much has changed in the U.S. since 1978 and the time has come to establish a program that will address the need for a new and ongoing assessment of our water resources.

In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. The U.S. water resources, infrastructure, and technologies became the envy of the world.

Today we are faced with a new set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortage and water-use conflict have become more commonplace in many areas of the United States—even in normal water years. As competition for water resources grows—for irrigation of crops, for growing cities and communities, for energy production, and for the environment—the need for information and tools to aid water resource managers also grows.

Multi-Hazards Initiative **(+$200,000/+1 FTE)**

Expanding the Multi-Hazards Demonstration Project – The Multi-Hazards Demonstration Project (MHDP) in southern California, will begin its fifth year in 2011, and this initiative proposes to build on the success of the Great Southern California ShakeOut by developing earthquake forecasting early warning capabilities and conducting impact analysis of environmental, human health and ecosystem responses to earthquakes and other hazards.

Aquatic Drug Registration **(-$700,000/-6 FTE)**

This program delivers independent analyses of candidate therapeutic drugs for aquatic species important to fishery management. The drugs prevent disease and maintain health in more than 400 publicly managed fish hatcheries. The reduction will eliminate investigations and scientific trials that measure effectiveness, health, safety, and environmental fate of more than twenty drugs. The information from these investigations is required for registration and approval-for-use by the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) for more than 50 propagated fish species at risk from disease agents. In the absence of USGS trials, the registration will not be completed in a timely or systematic manner.

Ecosystem Restoration **(+$9,564,000/+32 FTE)**

America's Great Outdoors is the President's signature conservation initiative and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. This Ecosystem Restoration initiative contributes to the America's Great Outdoors initiative. Listed below are the ecosystems targeted by this effort. A description of the work proposed can be found in the Ecosystem Restoration initiative in the Key Changes Section.

- Chesapeake Bay +$4,614,000/+18 FTE
- Columbia River +$500,000/+2 FTE
- Great Lakes +$3,500,000/+8 FTE
- Puget Sound +$500,000/+3 FTE
- Upper Mississippi River +$450,000/+1 FTE

Activity Summary

The Ecosystems activity is comprised of six subactivities:

- Status and Trends (S&T)
- Fisheries: Aquatic and Endangered Resources (FAER)
- Wildlife: Terrestrial and Endangered Resources (Wildlife program)
- Terrestrial, Freshwater, and Marine Environments (TFME)
- Invasive Species, and
- Cooperative Research Units.

The Ecosystems activity conducts research and monitoring, and organizes scientific information focused on understanding how ecosystems (diverse communities of living organisms interacting with one another and with the physical and chemical environment) and their inhabitants are structured, function, and provide "ecosystem services." The Ecosystems mission area is itself an essential direction for the USGS to pursue in order to meet a pressing national and global need, but ecosystem-based approaches are also an underpinning of the other five USGS science mission areas, which all require ecosystem perspectives and tools for their execution.

The Ecosystem activity generates and distributes information needed for conservation and management of the Nation's fish, wildlife and other biological resources, by Federal and State government and nongovernmental organizations. Information generated by the Ecosystems activity helps improve management of the Nation's natural resources and hazards that threaten its land, coastlines, and population. This activity serves as the Interior's biological research arm, and leads the DOI strategic plan goal to identify and predict ecosystem changes. Core scientific capability is located at 17 research centers and associated field stations, and 40 Cooperative Research Units. The Cooperative Research Units provide additional research capability for State governments.

Management Summary

Program Reviews – The Ecosystems activity, formerly part of the Biological Resources discipline, underwent a programmatic review in 2010. In response to the review, guidelines have been developed for peer review of the Ecosystem Change programs. The review process includes high-level input into the formation of program goals and objectives during the five-year planning process and into the long-term direction for science to better meet natural resource management needs and maintain scientific excellence. The process for developing five-year plans will be modified in accordance with Bureau wide changes occurring in the 2011–2012 timeframe.

The first program to be reviewed under the new guidelines was the Wildlife: Terrestrial and Endangered Resources program (Wildlife program). The review panel provided recommendations at the program level and higher. The panel recognized the impressive group of scientists in the Wildlife program, specifically noting that they are "leaders in the wildlife research field, and produce immensely influential work." The recommendations in the areas of organization, funding, planning, science management and availability of products will be useful in increasing the effectiveness and performance of the program in the future and a formal response to those recommendations is in preparation.

Some recommendations suggested involving the scientists in the planning process, while ensuring that they focus their time on research at the same time (e.g., recommendations included streamlining processes such as requests for proposals). The new planning process under the USGS realignment will change the planning and funding models relating to this recommendation. It was recommended that headquarters level staff be fully engaged in setting research priorities to ensure national level issues are being addressed. It also recommended that a program-level strategic plan set strategic direction and drive research project selection at the program field level. These recommendations will also be addressed by the new Bureau realignment model, in which program plans will define clear objectives, priorities and actions for scientific activities.

Strategic Planning – The USGS has chartered Science Strategy Planning Teams charged with developing long-term (10-year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The strategic plan will provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that USGS meets the goals of the USGS Science Strategy.

Workforce Planning – Continued success in providing the Nation with outstanding biological and ecological science depends on developing and maintaining a flexible and skilled workforce that can take advantage of science and business opportunities of the future. The USGS Ecosystems Research Grade Evaluation Office maintains a database to track classification, research specialty and skills of all discipline research scientists. The Ecosystems Change activity continually reviews these data along with retirement projections and periodic skills assessment to identify workforce gaps and future skills needs. Comprehensive profiles of the current workforce and anticipated hiring needs are continually updated to ensure the activity and the USGS can meet future science needs.

Ecosystems Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Status and Trends							
% of targeted species for which monitoring and decision support information on their status and trends are available (SP)							
Performance Data	27.18% (178/655)	27.18% (178/655)	27.18% (178/655)	28.24% (185/655)	28.55% (187/655)	+0.31%	+16.4%
Total Actual/Projected Cost ($000)	2,987	4,790	4,415	4,978	5,032	54	215
Fisheries: Aquatic and Endangered Resources							
% of targeted fish and aquatic populations and their habitats for which information is available regarding limiting factors such as migratory barriers, habitat, and effects of disturbance (fire, flood, nutrient enhancement) (SP)							
Performance Data	41% (49/119)	41% (49/119)	41% (49/119)	42% (50/119)	43% (51/119)	+1%	+0.6%
Total Actual/Projected Cost ($000)	37,043	36,967	33,546	33,546	32,000	-1,546	0
Wildlife: Terrestrial and Endangered Resources							
% of targeted wildlife populations for which science information is provided for management decisionmaking to inform and improve conservation (SP)							
Performance Data	47.03% (166/353)	51.6% (182/353)	54.39% (192/353)	57.79% (204/353)	61.19% (216/353)	+3.40%	+11.05%
Total Actual/Projected Cost ($000)	18,047	25,210	25,736	26,000	26,200	200	200
Terrestrial, Freshwater & Marine Environments							
% of targeted ecosystems with information products forecasting ecosystem change (SP)							
Performance Data	11% (1/9)	11% (1/9)	22% (2/9)	22% (2/9)	28% (2.5/9)	+6%	16%
Total Actual/Projected Cost ($000)	34,429	37,977	38,190	38,190	40,481	2,291	6,477
Comments	The out years are the base number (2009) multiplied by the number of % of targeted ecosystems for that year. It is cumulative over time and the amount does not occur in one year. The cost / targeted ecosystem / year will probably be in the 80% of the total budget range.						
Invasive Species							
% of targeted science information products available for successful control and management of priority groups of invasive species (SP)							
Performance Data	44.7% (26.8/60)	44.7% (26.8/60)	44.7% (26.8/60)	45.0% (27.0/60)	45.7% (27.4/60)	+0.7%	+1.3%
Total Actual/Projected Cost ($000)	11,924	12,784	16,365	14,574	12,784	-1,790	0
Cooperative Research Units							
# of students complete degree requirements for MS, PhD, and post doctoral program under the direction and mentorship of Unit Scientists							
Performance Data	83	110	89	90	90	0	+3

Ecosystems Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Ecosystems -- All Programs							
# of systematic analyses and investigations completed							
Performance Data	1,211	1,267	1,169	1,041	1,011	+10	-20
Comments	Decrease projected in systematic analyses is within the range of variability over time in program productivity; productivity lag exists between retirements of senior scientists and junior scientists hired to replace them.						
# of formal workshops or training provided to customers							
Performance Data	154	112	113	104	85	-19	22

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

Activity: Ecosystems
Subactivity: Status and Trends

2010 Enacted	$22.9 million (147 FTE)
2011 CR	$22.9 million (147 FTE)
2012 Request	$22.1 million (136 FTE)

Budget Realignment

In 2010 and 2011, Status and Trends is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Nation's living resources and the habitats on which they depend are undergoing constant change due to changing climate, invasive species, and human activities. The Status and Trends (S&T) program supports and provides collection and analysis of biological data for use by natural resource managers, scientists, and the general public. To protect and conserve living resources entrusted to their care, land and resource managers must first understand the condition or status of those resources. The USGS inventories species, and monitors their distribution, abundance, productivity, health, and trends.

The USGS provides science information to Interior Bureaus and other land and resource-management agencies and to others throughout the world whose needs for integrated ecosystem science grow as they increase their emphasis on sustainability and landscape-based management. The S&T program develops and uses critical indicators of ecosystem condition to provide regional and national assessments of ecosystem status and trends to understand the causes, consequences, and mechanisms of ecosystem change. A rigorous monitoring program is fundamental to understanding ecosystem condition, change, and causes of change.

The S&T program measures, predicts, assesses, and reports status and trends of the Nation's biological resources to advance research, facilitate resource management and stewardship, and promote public understanding and appreciation of these resources, with emphasis on Federal lands.

The S&T program supports research in five themes of the Ecosystem activity:

Research on how ecosystems work, how and why they change

Southwest Border Monitoring – Interior has trust responsibility for natural and cultural resources along 793 miles (41 percent) of the border. In Section 102(b) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, Congress directed the Department of Homeland Security (DHS) to install fencing, barriers, roads, lighting, cameras, and sensors on not less than 700 miles of this border. The DHS and the USGS have partnered to develop a monitoring strategy to provide scientifically credible and defensible data and information to assess adverse or beneficial effects of security activities on cultural and natural resources of border ecosystems.

Monitoring of national ecosystem status and trends

North American Breeding Bird Survey (BBS) – The BBS is the primary means for determining regional and continental trends in species. The BBS was launched in 1966, using 600 roadside routes to obtain range-population data on breeding birds in the United States and Canada east of the Mississippi River. Today, the BBS provides the foundation for non-game, land bird conservation in North America with over 3,200 skilled volunteers sampling approximately 3,000 routes annually across the continental United States and southern Canada. BBS data are used to examine large-scale drivers of migratory bird population and habitat change. USGS scientists are using BBS data to quantify the risk of bird extinctions.

Bird Banding Laboratory – Bird banding is a universal technique for studying the movement, survival, and behavior of birds. The USGS Bird Banding Laboratory (BBL) manages all marking and recovery information for migratory birds for the United States, Canada and Mexico. Since 1908, more than 66 million birds have been banded and 4.1 million have been recovered. The BBL provides high-quality banding data in a timely manner for use in developing effective bird conservation and management strategies throughout North America. BBL data is critical information used in the annual regulations-setting process for migratory bird hunting.

Relations among biological and non-biological components of ecosystems

Great Lakes – USGS scientists, in partnership with State, tribal, and U.S. and Canadian Federal agencies, conduct a regional deepwater science, large vessel program that complements other Interior activities with large-scale multiyear strategic investigations. The main focus of the research is on long-term dynamics of native and non-native aquatic species and the sustainability of Great Lakes fisheries. As a product of this long-term monitoring, more than 30 years of data exist that describe abundance of predators and their prey fish in each lake and are valued resources for understanding long-term dynamics of the fish community in relation to biotic and abiotic influences, and for modeling Great Lakes ecosystem dynamics.

Techniques for Managing, Protecting, and Restoring Ecosystems

National Park Research – USGS scientists assist national parks with inventory and monitoring protocol development and other monitoring-related research needs such as assistance with monitoring planning and design, statistical data analysis, and review or revision of existing protocols. USGS scientists and technical specialists address priority issues identified by NPS that typically involve and benefit several parks and require multiyear efforts. In addition, the USGS and the NPS jointly support biological projects that provide exploratory research and technical assistance to national parks. The main objective of this project is to support new research on emerging issues that may become significant to the parks, and to develop products useful to the parks.

U.S. Fish and Wildlife Service (FWS) National Wildlife Refuge Monitoring – The USGS is assisting the Refuge System in their mission through a partnership project designed to improve landscape-scale science-based management on refuges. This project is focused on developing monitoring programs, national protocols, databases and adaptive management studies that address regional and system wide refuge needs.

Ecosystem assessment tools for health and welfare of human societies and environment

Sustainable Energy Development – The Wyoming Landscape Conservation Initiative (WLCI) is a long-term, science-based effort to assess and enhance aquatic and terrestrial habitats at the landscape scale in southwest Wyoming, while facilitating responsible development through local collaboration and partnerships. The WLCI represents the USGS partnership with other Interior Bureaus, State and local agencies, industry and private landowners committed to maintaining healthy landscapes, sustaining wildlife, and preserving recreational and grazing uses while developing natural gas energy in the Green River Basin. The USGS role is to provide the science framework and information for partners to use in making decisions on mitigation, restoration, and conservation efforts. USGS participation provides capacity to assess current and predicted changes, such as effects of climate change on habitats in the WLCI landscape, and the ability to develop predictive models that identify areas to focus conservation efforts. In addition, the data management system developed by the USGS provides all stakeholders with access to available data in a common format with appropriate metadata documentation.

Program Performance

Bird Banding Laboratory (BBL) and Deepwater Horizon Oil Spill Monitoring – Responding to the oil spill emergency in 2010, the BBL provided FWS and other groups with an unprecedented number of metal bands for brown pelicans and other species of birds. The bands were used to help monitor the success of oiled birds that had been rehabilitated and released as part of the oil spill recovery effort. Bird banding also contributed to the Natural Resource Damage Assessment (NRDA) studies that documented the effects of the oil spill on bird populations. In meeting the demands of the scientific response to the oil spill, the BBL expedited and greatly increased the issuance of new authorizations and permits for NRDA studies and rehabilitators. Both of these groups band birds with metal leg bands and the application of color markers and/or transmitters to document movements and survival of birds. BBL also supplied pelican leg-bands that were uniquely color-coded for the oil spill and coordinated their use with the entire pelican banding community. These special bands were required by groups that rehabilitate oiled pelicans, and allowed released birds to be identified from a distance without recapture and to be distinguished from unoiled birds. BBL met the needs of the interested public for information about birds and the oil spill through its online database that was submitted by rehabilitators, NRDA groups and other bird banders. In 2011, 2012, and beyond, the BBL will receive and disseminate data on the many marked and banded pelicans and other birds from the Gulf region to rehabilitators, NRDA groups, and other organizations involved in the oil spill clean-up.

Wyoming Landscape Conservation Initiative – With approximately 23 trillion cubic feet of natural gas used annually in the United States, the estimated 83 trillion cubic feet of recoverable natural gas in southwest Wyoming continues to be one of the largest sources of natural gas in the United States. The combination of energy development and industrial and residential expansion, with associated road building, drilling, pipelines, utility lines, and other human-generated activities, is occurring in some of the highest quality wildlife habitat in this region. In 2010, the Wyoming Landscape Conservation Initiative (WLCI) developed an Assessment of Wildlife Vulnerability to prioritize management, monitoring, and research needs of Wyoming's long list of Species of Greatest Conservation Need. The Assessment ranks these species

according to their potential vulnerability to disturbance related to energy development activities, including:

- Maps of species distributions;
- Maps of current and potential distribution of energy development;
- Assessment of species exposure to disturbance from energy development;
- Assessment of biological sensitivity of species to disturbance from energy development; and
- WLCI also produced an assessment of future land condition using projections of energy development and down-scaled Global Circulation Model information over the next 20-30 years.

Pronghorn Antelope graze in the Green River Basin

Activity: Ecosystems
Subactivity: Fisheries: Aquatic and Endangered Resources

2010 Enacted	$24.7 million (192 FTE)
2011 CR	$24.7 million (192 FTE)
2012 Request	$22.7 million (180 FTE)

Budget Realignment

In 2010 and 2011, Fisheries: Aquatic and Endangered Resources is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Fisheries: Aquatic and Endangered Resources (FAER) subactivity conducts multi-scale biological investigations on ecological interactions among species, communities, and their habitats within aquatic ecosystems. These investigations are routinely undertaken to understand effects of natural and human-caused disturbances. FAER is a national leader in providing robust science on genetics, life-history, behavior, and habitat requirements of aquatic organisms and species of concern, aquatic community dynamics, and indicators of healthy and functional aquatic ecosystems. This science is essential to the Interior and other Federal, tribal, and State partners engaged in ecosystem conservation and restoration for the Nation. FAER specifically addresses goals and objectives under goals and priority mission themes identified in the USGS's science strategy plan, titled "*Facing Tomorrow's Challenges—Science in the Decade 2007-2017*." FAER contributes to the Interior strategic plan and Bureau mission focus to understand and predict ecosystem change—as conceptualized in the "measure, map, understand, monitor, predict, and engage" strategy framework of mission objectives.

Research on how ecosystems work, and how and why they change

The USGS describes ecological processes responsible for healthy aquatic ecosystem functions. Scientists forecast causes for change based on scientific information about diversity, life history, and species interactions that affect the condition and dynamics of aquatic communities. The USGS provides information and expertise to assist resource managers who are developing techniques to restore species, populations, habitats, and ecosystems. By conducting basic research on ecosystem structure, functions and processes, this science links biology, population genetic diversity, and organismal health for fish, native mussels, and other aquatic organisms in relation to their habitat requirements.

- **Fish Biology** – FAER examines the ecology, genetic diversity, and health across all life-cycle stages of fish and other aquatic organisms. It also examines habitat requirements for aquatic species to assist fishery managers developing techniques to restore fish communities. For example, the USGS has discovered possible interactions among gene expression, intersex characteristics, and fish health problems in the Shenandoah River and other rivers in the Potomac River watershed.
- **Fish Genetics** – Research on genetics of fish and other aquatic organisms examines and characterizes the extent of variation, patterns of diversity, and taxonomic status of individuals, stocks, strains, and populations. This capacity allows aquatic resource

managers a more accurate method to identify and efficiently discriminate among native, cultured, introduced, and invasive aquatic species, as well as develop science-based conservation and restoration strategies.

- **Fish Disease** – Fish disease research focuses on developing new techniques for detection and identification of emerging pathogens and other causative agents, linkages between disease resistance, virulence, immunology, and the role of physiological stress and environmental factors on disease outbreaks, severity, and cycles. For example, USGS scientists are providing technical assistance to Federal, State and local agencies on viral hemorrhagic septicemia virus (VHS), considered to be the most important viral disease of finfish worldwide and is listed as reportable by many nations and international organizations. VHS is directly responsible for severe fish kills in the Great Lakes and further threatens fisheries throughout the United States.

Understanding linkages among the biological and non-biological components of ecosystems

Fisheries research determines spatially and temporally explicit linkages between biological and physical characteristics of watersheds by quantifying and describing functional relationships among aquatic species and habitats to describe aquatic community structure, function, adaptation and sustainability.

FAER research is undertaken and delivered generally within a geospatial context and ecosystem framework. The science contributes to understanding geospatially explicit ecological processes and patterns of diversity through coordination, development, and regularly updating standardized, geospatial classification models and maps of national ecosystems. Moreover, FAER identifies ecosystems vulnerable to changes in climate, contamination, and land use.

- **Large Rivers** – FAER has demonstrated the contributions of water availability and the unique aquatic resources and conditions found in America's large rivers to aquatic ecosystem health. These linkages provide vital information on fish community structure and function, aquatic community dynamics and function, critical habitat, hydrology and hydraulics of rivers, sediments, and water quality in large rivers. There are current studies in many of the Nation's rivers including the Colorado, Missouri, Mississippi, Columbia, Klamath, Yakima Rivers and their tributaries.
- **Fish and Aquatic Species-at-Risk** – These investigations lead to more effective and viable conservation actions that reduce the need for formal listing of aquatic species as threatened or endangered under the Endangered Species Act. For example, a team of international fisheries biologists led by USGS scientists updated an assessment of the conservation status of North American freshwater and diadromous fishes.
- **Native Mussels** – Native mussels are keystone components of river ecosystems, and generally serve as sensitive indicators of water quality. The USGS uncovers and describes life histories, hosts, distributions and abundances of native mussels, and identifies how invasive species and degradation of streams, rivers, and lakes are affecting mussel populations and aquatic communities.
- **Water Availability and Use (DOI WaterSMART) –** The USGS conducts water availability investigations to quantify, forecast, and secure freshwater to meet human, environmental, and aquatic species needs. Accurate assessment and forecasting of water availability, quality, and aquatic ecosystem health will inform decision makers on competing demands and environmental stresses such as agriculture, energy

development, natural and engineered infrastructure, and climate change. The Great Lakes, Colorado River, and Klamath basin are the initial sites of these investigations.

Techniques for Managing, Protecting, and Restoring Ecosystems

The USGS develops and contributes scientific expertise, research technologies, and analytical methods to permit adaptive management and effective fisheries restoration by natural resources managers.

FAER supports resource management by Interior and other partners through direct collaboration and communication with national, regional, and local groups and experts. It also contributes to development of credible forecasts and understanding biological indicators of responses to ecosystems stressors, including land use, climate change, contaminants, invasive species and other threats to ecosystems.

- **Fisheries Research for FWS and other resource managers** – FAER addresses critical biological science and research needs of the FWS in support of imperiled and at-risk species, inventory and monitoring programs, the National Fish Habitat Action Plan, fish passage programs, and fisheries and aquatic resources management. High priority fisheries research for the FWS provided in part by the Science Support Partnership is determined annually by FWS science needs.

The USGS has provided critical scientific support in documenting baseline ecosystem conditions in the Elwha River, Washington, prior to removal of two dams. This allows the USGS to evaluate changes to the ecosystem following dam removal in 2011.

- **Coastal Fisheries** – USGS scientists examine coastal and estuarine fish and other aquatic species, and how they are affected by changes in their habitats and interactions with other resident and migratory species. These investigations provide aquatic resource managers with appropriate information to conserve and restore important aquatic resources.

Ecosystem assessment tools for health and welfare of human societies and the environment

FAER provides research support, technical assistance, and refinement of tools for effective decision making where the interplay of human use and environmental health of aquatic species and their ecosystems are of concern to Interior Bureaus, other Federal and State government agencies, Tribes, and non-governmental organizations. Scientists work with Interior partners to evaluate and test restoration or mitigation methods and technologies for increasing ecosystem resilience to disturbances.

- **Fish Passage and Ecological Flows** – Research on anadromous and migratory fish passage focuses on fish physiological and behavioral characteristics as well as hydrological conditions that affect successful navigation around barriers by fish and other at-risk aquatic species. Research on the efficiency and effectiveness of artificial passage structures and fishways improves their design and effectiveness. Ecological flows projects focus on establishing the quantity, quality and timing of water required for properly functioning and healthy aquatic ecosystems. For example, USGS scientists have developed a hydro-ecological integrity assessment process for Missouri streams that can be used by resource management agencies to properly manage freshwater systems.

Fish passage requires complex engineering designs that recognize fish behavior, physiology, energetics, and hydraulics.

- **Klamath Basin** – The Klamath Basin is the focus of multi-agency endangered species and habitat restoration efforts, proposed dam removals, re-establishment of ecological flows, and competing water use. FAER is collaborating with scientists from other parts of the USGS to determine effects of changing water availability, water quality, climate, and management actions on population dynamics and aquatic habitat requirements for important endangered fishes. Moreover, the investigations examine ecological responses of these activities to wetlands and other parts of the watershed.
- **National Fish Habitat Action Planning** – As part of a broad coalition of Federal, non-Federal, and local partners, the USGS is providing high level direction as well as on the ground scientific support for conserving and restoring this Nation's important aquatic habitats for native fish, mussels, and other species. Nationally, the USGS provides coordination for the science and data needs for the national inventory of fish habitats and overall condition assessment. At a local level, at least three new partnerships, including the Desert Fish Habitat Partnership, were formally recognized with USGS scientists leading the way in providing critical science to achieving healthy fish and aquatic community habitats in 2010. The USGS also has developed techniques to identify and describe healthy fish habitat, critical tools and approaches for protection and restoration of fisheries habitat, and techniques to monitor recovery of fisheries habitat.

Program Performance

Great Lakes Restoration Science – The USGS collects and analyses data for multi-jurisdictional ecosystem management of the basin's fish, mussels, and other aquatic species vital to the ecosystem. Long-term biological monitoring of deepwater fisheries aids restoration by Federal, tribal, and State resource managers. In 2010, USGS aquatic scientists completed 20 long-term research projects, with findings on genetic diversity, bioenergetics, distributions, and population status of commercial and recreational fish populations vital to the region's economy. These investigations allow the USGS's binational managing partners to consider the ecological effects of changes in land use, habitat condition, food webs, invasive species and climate at the ecosystem level. In support of EPA's Great Lakes Research Initiative, USGS scientists in 2010 provided key science on a variety of topics ranging from changing food webs to effectiveness of habitat restoration strategies. Efforts in 2011 and 2012 will include

development of fish habitat enhancement strategies for aquatic habitat including the Huron-Erie Corridor, and studies of nutrient transfer within Great Lakes food webs, and effects on species restoration.

North American Freshwater Mussels – USGS geneticists have characterized the spatial architecture of North American freshwater mussel populations. Native mussels are considered sentinels of changes such as habitat and water quality degradation. In 2010, microsatellite DNA loci were developed for *Elliptio complanata*, the most common native Unionid (freshwater) mussel in the Northeast United States. These markers allow aquatic resource managers to consider fine-scaled population relationships that reflect habitat and water quality changes. Other USGS investigations on mussels from the Delaware River are identifying the specific fish species required as hosts for the larval life stage of freshwater mussels. In 2011 and 2012, scientists will incorporate geospatially explicit genetic information into investigations of the ecological services that mussels provide to improve water quality, and develop aquatic ecosystem models that link species and habitat information. The models allow resource managers to assess alternative management strategies to enhance native mussel populations.

This page intentionally left blank.

Activity: Ecosystems
Subactivity: Wildlife: Terrestrial and Endangered Resources

2010 Enacted	$50.1 million (310 FTE)
2011 CR	$50.1 million (310 FTE)
2012 Request	$48.5 million (302 FTE)

Budget Realignment

In 2010 and 2011, Wildlife: Terrestrial and Endangered Resources is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

USGS wildlife research focuses on meeting the information needs of Interior's natural resource management Bureaus and other partners. The program conducts basic and applied biological research to determine factors influencing distribution, abundance, and condition of wildlife populations, habitats, and their associated ecosystems. Projects develop models of alternative management scenarios to address needs of adaptive management. Studies also develop tools and methods for wildlife management and research, including preventing and managing disease in free-ranging wildlife and evaluating the effects of disease on wildlife populations and on human health and the environment. Enhancing understanding of environmental factors in wildlife health informs human health issues and this work is conducted in partnership with agencies such as HHS, USDA, and DHS. Investigations link physical, chemical, and biological factors that impact biodiversity and ecosystem resilience through coordinated responses to emerging issues like climate change and alternative energy development.

The USGS provides research results supporting management decisions under the Endangered Species Act of 1973, as amended (ESA), Migratory Bird Treaty Act, Marine Mammal Protection Act and others. To help managers achieve their goals, USGS scientists investigate species life histories, factors limiting populations, and efficacy of restoration actions. They evaluate cumulative stressors throughout the ecosystem and play an important role in delineating ecosystem function. The USGS develops and uses innovative tools and techniques in emerging areas like genetics and genomics, applying those tools in studies of biodiversity, demography, proposals for listing under ESA, contaminant exposure and wildlife disease. For example, scientists are developing rapid field diagnostic kits, feed-through vaccines and markers.

Research on how ecosystems work, how and why they change

Changes in ecosystems will affect wildlife populations through direct impacts on individuals or impacts on their habitats that affect the ability to find food and shelter. Water availability, development and emerging diseases will be key to wildlife investigations in changing ecosystems. For example, researchers are studying changes in desert ecosystems and their effects on desert tortoises in California and looking at landscape scale connectivity for wide ranging carnivores in the Southwest. Genomics approaches will help decipher the impact of genetically modified organisms on native wildlife and plants in the same ecosystem.

- Amphibian Research and Monitoring Initiative (ARMI) – World wide declines of amphibian populations have spurred USGS researchers to monitor trends and determine causes. The life history of amphibians make them particularly susceptible to changes in the environment—they have moist permeable skin vulnerable to changes in water availability and quality and amphibians disperse between aquatic sites for breeding, terrestrial sites for foraging, and into over-wintering sites, making them susceptible to habitat changes and micro-climate variation. USGS scientists divide their ARMI time between research and robust monitoring on Interior lands. The research projects vary regionally, reflecting local conservation priorities. ARMI is inter-disciplinary and draws on USGS expertise such as hydrology, biology, and geography.

Understanding the relations among biological and nonbiological components of ecosystems

This is a key part of understanding wildlife populations and habitats as all species are integrally linked to the physical, chemical and other aspects of their environment. For example, acoustic monitoring of bird and bat movements is used to evaluate potential impacts at rotor-swept heights of wind energy generators and also to relate movements to landscape features like lakes and streams, looking for patterns of activity that could shape management actions. Another example is current studies of common loons where geolocators are used to evaluate movements in relation to things like temperature, light levels and water pressure that could affect the foraging success of a deep-diving bird.

Techniques for Managing, Protecting, and Restoring Ecosystems

Use of ecosystem approaches in wildlife management is a paradigm shift that requires different scientific products to supplement traditional approaches.

- Alternative Energy and Wildlife – In 2010, the Secretary's New Energy Frontier Initiative augmented support for USGS research on the effects of solar and wind energy on wildlife by $600,000. Developers and permitting agencies need USGS science products for placement and operational guidelines to minimize environmental effects of wind farms, solar arrays and biofuel production facilities. This funding supports research on impacts of wind and solar development on wildlife and their habitats. For example, the USGS will develop and implement a scalable spatial model for managers to assess the potential risk to birds from turbines and effects of avoidance of habitat in areas under consideration for wind development in and near the Great Lakes. Additionally, the USGS is assessing the environmental effects of cultivation of terrestrial (e.g., rapeseed) and aquatic (i.e., cyanobacteria) biofuel sources.
- Migratory Birds – USGS research on migratory birds is international in scope and is coordinated with the FWS, State and tribal wildlife agencies, Canadian and Mexican Federal wildlife agencies, and private researchers. International research is critical to understanding the full life cycle of species that spend significant parts of their life outside the United States. The USGS is involved with various partnerships (e.g., Partners in Flight, Joint Ventures, Land Conservation Cooperatives) that use USGS information on the behavior and movements of migrating birds to identify the types, configuration, and management of habitats that can provide the best energy and resting opportunities for a successful migration. USGS scientists are developing and testing tools (e.g., geospatial, telemetry, molecular) to better describe long-distance movements of individual birds, determine the quality and distribution of populations, and develop potential hypotheses for the variation in survival throughout a species' life cycle. This information is critical for

the development and delivery of conservation actions to benefit migratory birds. For instance, molecular biologists have developed new sequence scanning capabilities to track populations throughout the annual cycle. New advanced satellite tags, geolocators, genetic markers, and new sequence scanning capabilities have revolutionized bird tracking, enabling insights into migratory connectivity at an ecosystem scale and beyond. This is key for managers to assess species vulnerability and adaptation to a changing environment.

- FWS and NPS Management – The USGS conducts research on species, populations and habitats to support conservation and land use decisions required by FWS and NPS. Increasingly, the focus is aimed at understanding ecosystem function to address cumulative impacts on public lands, including strategic habitat conservation and climate change. Science support is provided to FWS Landscape Conservation Cooperatives, working with the USGS Climate Science Centers, on assessment of wildlife habitats and forecasting future habitat scenarios and land use changes so the right choices can be made in conserving, restoring, and reducing impacts of these changes on DOI trust resources.
- Science Support Partnership (SSP) and Quick Response Programs (QRP) – The USGS Science Centers and Cooperative Research Units work collaboratively with the FWS to address FWS mission-critical science needs. SSP allows flexibility to address specific management issues driven by FWS priorities, but balanced by USGS requirements for sound science. This QRP addresses priorities and accommodates short-term research and technical assistance needs. USGS biologists also conduct short-term, tactical research to meet natural resource management needs of the NPS. NRPP funds help fill gaps in applied biological research in national parks that is significant to park resource managers.
- Threatened, Endangered, and Species-at-risk – The USGS endangered species research provides biological information needed to restore currently listed populations, support delisting wherever possible, or preclude future listings by clarifying species' status or suggesting timely preventive actions. For example in response to management requirements for robust estimates of grizzly bear population size to support recovery and de-listing efforts, the USGS has tested and is implementing an innovative technique for monitoring grizzly bear population dynamics. The technique uses the hair left when bears rub trees and other objects. This technique allows significantly more bears to be sampled without disturbing them—an important feature where robust population estimates of endangered species are needed. Genetics and other rapidly improving tools, like satellite tracking, improve selection of conservation options by delineating species and populations, and by assessing their genetic health and viability. For example, genes are used to study disease in free ranging otters, to define how sage grouse are affected by habitat fragmentation, and to help understand survival rates and life history of the West Indian manatee.
- Adaptive Management and Structured Decision Making – Addressing the complexity of ecosystems and its implications for managing wildlife, particularly in the face of equally complex stressors like water availability, fire, and climate change, requires managers to assimilate vast amounts of information and understand how each impacts the other. The Wildlife program funds development of tools and techniques, training and facilitation to ensure these tools are accessible to mangers for making resource decisions across the Nation.

Ecosystem assessment tools for health and welfare of human societies and environments

Arctic Ecosystems Research – This multidisciplinary research program, initiated in 2010, enhances biological data collection, modeling, forecasting, and molecular biology research. This information will reduce uncertainty about the future status of ice- and permafrost-dependent species and their habitats. New research addresses relations between habitats and ecosystems, identifies species responses to change, creates decision-support frameworks to aid forecasting of physical environment and wildlife responses, improves monitoring of polar bear and walrus, and enhances worldwide predictive capabilities for Arctic species. Many of the approaches will be applicable to other latitudes and ecosystems.

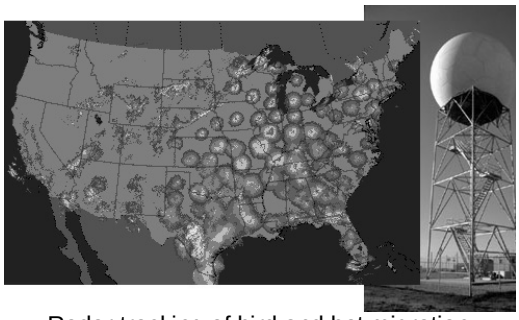
- Wildlife Disease, Human and Environmental Health – Managing wildlife losses, preventing illness in human communities and minimizing disease outbreaks depend on effective diagnostic and technical support, knowledgeable guidance, and timely intervention. The USGS has a unique mission to provide information, technical assistance, and research on State, national, and international wildlife health issues such as White-Nose Syndrome (WNS) in bats, highly pathogenic avian influenza, plague and chronic wasting disease. Like the CDC, the USGS infrastructure and interagency partnerships built around wildlife disease are a critical foundation and template for emergency disease response to future zoonotic diseases of wildlife. WNS, a devastating disease afflicting hibernating bats, will continue to be a focus in 2012. Quickly spreading from the Northeast to the mid-Atlantic region, it has killed more than one million bats in at least nine States since 2006, threatening the continued existence of species that help to control agricultural pests and disease vectors. This research bridges multiple capabilities of the USGS as it involves collaboration with the FWS, NPS, and State wildlife agencies on laboratory and field research on environmental factors influencing disease transmission and spread as well as developing national guidelines for WNS surveillance and response activities. Highly Pathogenic Avian Influenza, Sylvatic plague and Chronic wasting disease will remain research foci in 2012. These diseases represent a growing threat to human and wildlife health. Partnerships span FWS, NPS, USDA, CDC and State agencies.

USGS wildlife pathologists determine cause of death for bats suspected of having White-Nose Syndrome.

Program Performance

Wind and Solar Alternative Energy Development Impacts on Wildlife – Significant progress was made in 2010 toward evaluating impacts of wind energy on migratory birds and bats, essential information for managers and developers alike. Radar is proving to be a revolutionary tool to follow local and regional movements of birds and bats. Scientists evaluated response of birds to wind energy developments using portable radar to develop a model of crane movement in the Midwest. In the Northern Prairie, scientists are determining which grassland bird species avoid establishing their territories close to wind turbines, and have found that some species of birds avoid wind generators while others remain unaffected. A rapid assessment method,

developed during this project, gathers regional information on siting of wind farms to assist developers and agencies in the permit process.



Radar tracking of bird and bat migration

In 2011, mapping and monitoring of pelagic bird concentrations on Lake Michigan will include validation of models created in 2010 in multiple areas including the Platte River in Nebraska and other midwestern roosting areas. In addition, the USGS will complete species distribution modeling efforts for at least ten desert species and genetic landscape analyses, deliver a report of these results to BLM, and associated digital data layers will be served on *mojavedata.gov*. The USGS anticipates one to three peer reviewed publications to be published in scientific journals related to this work. In 2012, the USGS will complete model validation for cranes and begin adjusting models for waterfowl. The products will help in siting wind power facilities so as to reduce potential impacts to cranes. In addition, the USGS will complete species distribution modeling for additional species and will complete genetic data collection and analysis for at least one additional species. One to three peer reviewed publications in scientific journals related to this work are also planned in 2012.

Walrus Radio-tracking in the Southern Chukchi Sea 2010 – Researchers attached 38 satellite radio-tags on walruses in the southern Chukchi Sea during the 2010 spring northward migration and an additional 32 tags on walruses resting in the ice margins of the northern Chukchi Sea in early July. Tracking data from this study will help the USGS describe walrus movements, foraging areas, and sea ice habitats in the Chukchi Sea, including regions recently leased for oil and gas exploration and development, and provide insights on walrus foraging and movements. The USGS expects to track these walruses through early November. Walruses have been one of the marine mammal species that for years has defied population characterization because of difficulty studying these animals in their remote habitats. USGS researchers have taken advantage of developments in tracking technology and availability of new platforms to obtain unprecedented information on these animals. Understanding walrus population dynamics and habitat use is increasingly important because changes in sea ice from a warming climate have raised concerns about the species' current and future status. The USGS is just completing a Bayesian Network model to forecast the future status of walrus. In 2011, ongoing research by the USGS is expected to produce several products key to refining model outputs from this initial forecasting effort. These products include a bioenergetics model and a deterministic population model (these will eventually be coupled using Bayesian modeling, with models relating sea ice and foraging behavior, to integrate bioenergetics with population dynamics, planned for completion in 2013). Also in 2011, the USGS will release a population genetics analysis, an analysis of foraging patterns of walruses using land haulouts (non-reproductive aggregations of walruses), a methods paper on using dive profiles to describe foraging behavior, and a report on a walrus mortality event in 2009. In 2012, the USGS will complete the Bayesian population model and a major analysis of walrus movements and habitat use using the telemetry data from deployments over a period of several years.

Manatees Take Shelter Below the Cold Water – After evaluating high mortality of endangered manatee during the especially severe winter of 2010 in the Everglades National Park, researchers observed that in the Ten Thousand Islands, mortality was much lower. Using radiotracking, the USGS found that artificial canal systems in this area provided manatees with warm water refuges beneath the colder surface water. The cold water is prevented from sinking and the warm water from rising, allowing the manatees to stay warm along the bottom.

Discovery of this mechanism is important because the viability of this refuge could be affected by actions of management agencies and their efforts to prevent future large-scale mortality events.

Activity: Ecosystems
Subactivity: Terrestrial, Freshwater, and Marine Environments

2010 Enacted	$37.2 million (253 FTE)
2011 CR	$37.2 million (253 FTE)
2012 Request	$40.2 million (268 FTE)

Budget Realignment

In 2010 and 2011, Terrestrial, Freshwater, and Marine Environments is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The USGS Terrestrial, Freshwater, and Marine Environments (TFME) research program provides information, models, and tools that managers and others can use to understand how management alternatives will affect ecosystems and the services they provide under a variety of climate, land use, and other change scenarios. Informed forecasting requires understanding factors that control the structure, function, composition, and condition of terrestrial, freshwater, and marine ecosystems; their variability in space and time; and the services they provide to benefit human communities and economies. Research results provide the basis for developing forecasting models and decision support tools that integrate ecological knowledge with management options, predict future changes to ecosystems and natural resources, and develop frameworks and approaches for mitigating and restoring terrestrial, freshwater, and marine ecosystems impaired by natural hazards and human actions. Research activities also focus on understanding ecosystem vulnerability and sensitivity to change and stressors.

Scientific approaches include studies of ecosystem productivity, food-web relationships and energy flow, cycling of nutrients and other biogeochemical processes, and the diversity of biological communities. Topical areas include the ecology of various ecosystems; disturbances and landscape ecology; modeling ecological systems and quantifying ecosystem services; restoration ecology; fire ecology; and global change. In addition to the scientific community, customers of USGS ecosystem science include land and resource managers and decision and policy makers within the Interior and other Federal, State, and tribal land management and regulatory agencies, as well as NGOs and the public.

TFME focuses on three of the Ecosystem Change activity themes:

Research on how ecosystems work, how and why they change

- Science on the Landscape – The Science on the Landscape initiative continues to be a successful collaboration between USGS and regional departmental offices. The Interior's Bureaus have collaborated with the USGS in project planning and implementation by leveraging funds or in-kind services to reaffirm the partnership. Although issues vary among regions and Interior Bureaus, the common theme among all projects is recognition of the Interior's priority needs and quick response providing information to answer questions and issues posed by departmental Bureaus.

- Coastal Habitats, Wetlands, and Adjacent Uplands – USGS scientists conduct research to investigate coastal (including the Great Lakes) wetland structure and function to assess resilience of wetland functions and ecosystem services they provide to natural hazards and human activities, to predict changes in functions and ecosystem services in response to future environmental changes, to determine restoration and sustainable management practices for these systems, and to evaluate effectiveness of current management actions.
- Rangelands and Grasslands – The USGS conducts studies on native grasslands and managed rangelands to assess ecosystem condition, determine spatial patterns of rare plants, and evaluate native plant diversity and species richness affected by past management decisions, invasive species, and climate change.
- Deserts and Arid Lands – In the Southwest, USGS scientists investigate the history and effects of changes in patterns of temperature and precipitation on desert grasslands and shrublands, and mountainous ecosystems. Investigation of the effects of natural and human disturbances on discrete soil units and the biota they support are studied in the context of current and predicted large-scale changes.
- Prairie Wetlands – USGS researchers investigate factors influencing the use of restored wetlands by birds, amphibians, and macroinvertebrates, and quantifying recovery of non-wildlife functions such as sedimentation, greenhouse gas emissions, and the role of prairie pothole wetlands in sequestering carbon. Research is also conducted at a landscape scale on wetland processes, including the interactions of wetland biota with hydrology, geochemistry, and sedimentation in fragmented grassland landscapes.

Fire in the Everglades

- Forested Wetlands – This research focuses on wetland regeneration and restoration in the southeastern United States, including site selection and preparation; forest mix and biodiversity enhancements; planting and community structure; management procedures and to provide information for managing forested wetland flora and fauna and to quantify the role forested wetlands play in nutrient cycling and retention and in carbon sequestration.

Understanding the relations among the biological and non-biological components of ecosystems

- Fire Ecology – The USGS conducts fire ecology research to understand effects of wildland fire on ecosystem structure and function, and on other ecological attributes such as wildlife habitat. Research is also directed at understanding fire history and fire regimes; interactions of fire with invasive species (e.g., cheatgrass) and climate variability; fire relations with vegetation structure and effectiveness of fuels treatments; and development of guidelines for restoring and rehabilitating fire-impacted ecosystems and watersheds.
- Priority Ecosystems Science – One of the major components of the Ecosystem program is Priority Ecosystem Science (PES). Research in PES is aimed at improving

understanding of the rates, causes, and consequences of natural and human-induced processes that shape and change the landscape over time and to provide comprehensive information needed to understand environmental, resource, and economic consequences of landscape change. Through PES, the USGS provides integrated science support to better understand the interactive nature of resources and the environment.

- Chesapeake Bay Executive Order (E.O.) – In May of 2010, the Chesapeake Bay Strategy was released and called for the USGS and NOAA to co-lead Federal activities to “strengthen science for decision making” and "responding to climate change" that would support major goals of the E.O. strategy, which include restoring clean water and habitats, conserving treasured lands, and sustaining fish and wildlife. In 2011, the USGS will conduct enhanced activities to support the new Federal Chesapeake E.O. strategy including:
    - Develop a GIS-based, land-conservation targeting system, which is considered a prototype for the America’s Great Outdoors initiative;
    - Determine the extent and sources of endrocrine-disrupting chemicals impacting fish and wildlife in the Potomac basin;
    - Explain the factors affecting nutrient changes on the Delmarva Peninsula; and
    - Conduct small watershed monitoring and assessment to evaluate the effect of actions to reduce nutrients and sediment.

Management Techniques for Managing, Protecting, and Restoring Ecosystems

- Outer Continental Shelf Marine Environmental Studies – USGS research supports the needs of Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) for information on long-term ecological effects of offshore oil and gas exploration and production, including effects of active and decommissioned production platforms, on fish and deep sea corals. USGS researchers work with BOEMRE to provide information on marine benthic and pelagic communities and avian and sea bird migration and populations to address increased emphasis on offshore renewable energy development.
- Forest Ecosystems in the Pacific Northwest – USGS research focuses on healthy forest management in the Pacific Northwest, including understanding forest systems, sustaining biodiversity and ecosystem function, developing resource management options, recovery of sensitive and status species, supporting management of aquatic forest habitats, conducting landscape-scale assessments, and addressing forest stressors such as climate change, fire, and pathogens.
- Coral Reefs – The USGS conducts research on issues facing resource managers, including understanding conditions needed for productive and healthy reef communities, effects of land use on reef health and disease in support of the Coral Reef Task Force, and evaluating management options for human activities and how they influence reef integrity and biodiversity.

Program Performance

Post-fire seeding – DOI land managers lack scientific evidence to verify whether seeding grass species on non-forested lands after wildfire achieves long-term vegetation management objectives. Scientists at the USGS and the USFS initiated a chronosequence study in 2010, to

examine effects of past post-fire grass seeding treatments on plant communities in the Great Basin. When completed in 2012, this study will help determine the efficacy of post-fire seeding treatments to protect public lands from invasion by fire-prone exotic annuals, such as cheatgrass, and promoting establishment of self-sustaining desirable plant communities.

Gulf Coast Habitat Prioritization and Restoration – The USGS conducts research needed to support restoration and adaptive management of coastal ecosystems. This work will benefit multiagency groups such as the Gulf of Mexico Governors Alliance, the Louisiana Coastal Area Study, Hypoxia Task Force, the Council on Environment Quality Gulf Roadmap effort, Louisiana Coastal Wetlands Planning, Protection and Restoration Task Force, Gulf Coast Joint Venture, and the Interior's Landscape Conservation Cooperatives across the Gulf of Mexico. Multiple stresses, including increasing human population, large-scale hydrological modification, navigation, petrochemical exploration and transport, and non-point source pollution have made Gulf habitats more vulnerable to disturbances from hurricanes, sea level rise, coastal erosion and other forces.

In 2010, the USGS completed a multi-decadal regional coastal land cover classification for the northern Gulf of Mexico. Products underway on high-resolution habitat classification will be used as baseline information for future restoration projects and as inputs to environmental models. Additionally, the USGS and its partners will complete a coastal restoration ecosystem adaptive management strategy for the Mississippi River Gulf Outlet Project, to serve as a framework for future restoration projects. In 2011, the USGS is completing a spatially-explicit modeling activity that will forecast coastal land change in Louisiana through the year 2060. This activity will be based on land cover trend analysis and projected environmental benefits from current restoration projects. This information is critical for identifying naturally sustainable coastal ecosystems. In 2012, the USGS will work with other DOI agencies to complete a coastal habitat prioritization decision support effort that will characterize areas based on their potential to maximize natural sustainability, deliver essential ecosystem services to human, fish, and wildlife communities, and maximize resiliency to natural disturbances such as hurricanes and sea level rise.

Activity: Ecosystems
Subactivity: Invasive Species

2010 Enacted	$11.4 million (53 FTE)
2011 CR	$11.4 million (53 FTE)
2012 Request	$14.1 million (59 FTE)

Budget Realignment

In 2010 and 2011, Invasive Species is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Non-indigenous invasive plants and animals cause increasing harm to native species and significant economic losses by reducing productivity and diminishing opportunities for beneficial uses of forests, croplands, rangelands, and aquatic resources. Many species introduced decades ago have spread rapidly in U.S. ecosystems and pose increasing threats to lands and waters managed by the Department of the Interior. They harm native ecosystems and are “contributing factors” in listing 40 percent of threatened and endangered species. Economic costs associated with invasive species are estimated to exceed $100.0 billion per year.

The USGS plays an important role in Federal efforts to combat invasive species in natural and semi-natural areas by providing information on early detection and assessment of newly established invaders; monitoring invading populations; improving understanding of the ecology of invaders and factors in resistance of habitats to invasion; and development and testing of prevention and alternative management and control approaches.

The USGS also plays a significant role in implementing the National Invasive Species Management Plan (Plan), developed by the National Invasive Species Council, as called for in the Presidential Executive Order on invasive species. To meet the goals of the Plan, the USGS Invasive Species program provides management-oriented research and delivers information needed to prevent, detect, control, and eradicate invasive species and to restore impaired ecosystems. USGS researchers are leading and cooperating in efforts to integrate capabilities of the USGS and partners, including Federal and State resource agencies, to help provide information, methods, technologies, and technical assistance needed for effective responses to terrestrial and aquatic invaders threatening U.S. ecosystems and native species.

The Invasive Species program contributes to four themes and mission areas identified in the Ecosystem Change activity.

Research on how ecosystems work; how and why they change

Invasive species researchers provide methods and information to assess the vulnerability of native species and habitats to help managers identify and manage risks associated with invasive species. Ongoing projects are examining the interaction between biotic and abiotic factors (e.g., fire, atmospheric and climate stresses, land use changes, disease, etc.) that facilitate or otherwise change the invasion or invasion potential of non-native species.

Researchers are also identifying factors influencing species invasiveness to facilitate risk assessments and screening of potential invasive species and providing basic understanding of the biology, ecology and population dynamics of targeted invasive species including environmental requirements, tolerances and thresholds (especially related to climate change).

- **Hawaiian Invasives** – USGS research focuses on the ecology and control of highly invasive plants (e.g., miconia, faya tree, strawberry guava, Kahili ginger); animals (e.g., Argentine ant, mouflon, brown tree snake on Guam); wildlife disease organisms; and methods for reducing impacts of invasive species on the region's unique native flora and fauna.

Understanding relations among biological and nonbiological components of ecosystems

Early detection efforts are intended to help resource managers identify and report new invasives and assess risks to natural areas. USGS research focuses on developing and enhancing capabilities to forecast and predict invasive species establishment and spread. Researchers are developing spatial models and data management and decision support tools to assist land managers by documenting, mapping, and predicting the spread of invasive plants, animals and diseases. They are also developing methods for compiling and synthesizing accurate and reliable data and information resources on invasive species and developing of information products to meet the needs of researchers and other users.

An important focus is on developing forecasting and predictive modeling tools by synthesizing and disseminating data and research to help detect and predict potential ranges and effects of harmful invasive plants and animals. A recent example of this work predicts the invasive species habitat suitability of 12 plants in three timeframes (current, 2020, and 2035) under different climate change scenarios. Efforts are continuing to facilitate and promote coordination of USGS research and capabilities through the National Institute of Invasive Species Science for early detection and rapid assessment, and forecasting and prediction of invasive species.

Monitoring national ecosystem status and trends through use of objective scientifically based indicators

The USGS hosts the National Non-indigenous Aquatic Species Database, which provides the latest information on distribution of introduced aquatic species across the Nation. This publicly available online database contains illustrated fact files on species' biology, capabilities to interactively map sightings, and email alerts when a species is sighted in a geographic area. It is a primary source of invasive species information and early alert system for managers and the public with over 56,000 visits per day. Species of particular concern recently have included Asian carp, zebra mussels, quagga mussels, and lionfish.

Techniques for Managing, Protecting and Restoring Ecosystems

USGS scientists develop strategies and techniques to understand and facilitate restoration of native species and habitats impacted by invasive species. Research efforts study the ecology of invaders and identify factors affecting the resistance of habitats to invasion, as well as limitations to native recruitment following control efforts. They also work to evaluate the effectiveness of biocontrol agents in controlling invasive species populations and conduct research to develop post-control restoration strategies and techniques to facilitate restoration of native species and habitats in areas invaded by species such as tamarisk, leafy spurge and yellow star thistle.

- **Weeds in the West** – The USGS conducts multiscale, integrated assessments for mapping infestations and accurately monitoring the spread of invasive plants (i.e., weeds) in western forests and arid rangelands, improving methods for predicting areas most vulnerable to invasives, and assessing effects of management practices and natural disturbances on invasives. In the Great Basin, the USGS developed and released a Land-Treatment Digital Library, which serves as a catalog of information about land treatments on Federal lands in the western United States. Scientists and land managers can use a searchable Web form to access information to conduct analyses and syntheses, adapt future management activities, produce maps, generate reports, and respond to information requests. The USGS also assesses effects of invasives on ecosystems and native species (e.g., fire ecologists determine how invasive species alter the frequency and intensity of wild fires); and provides improved methods for reducing adverse impacts of invasive weeds and for restoring public rangelands affected by weed invasions. One project is examining fire as a restoration tool. Resource managers often use fire to control weeds and pathogens and to promote growth of certain plants. USGS scientists developed a simple framework for predicting responses of plants to fire in western arid lands. Using the framework may help land managers prescribe appropriate fire conditions to achieve desired results or develop alternative treatments or follow-up procedures that may be more beneficial than fire.

Using fire to control cheatgrass and promote the restoration of other plants.

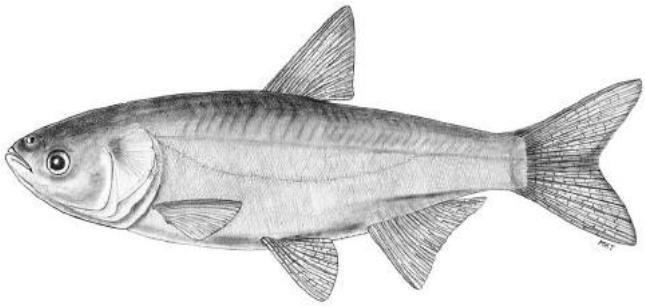
USGS researchers are developing methods to manage and control invasive species and understand and minimize their environmental impacts at landscape, regional, and local scales. The life histories and tolerances of invasive organisms are examined to identify life stages or conditions that could lead to the development of novel control alternatives. Research is improving existing control methods and assisting in the development of new control methods (including chemical, physical, molecular, and biological methods). To help facilitate these activities, an Aquatic Invasive Species Control Consortium is being established to coordinate aquatic invasive species control efforts within the USGS and with partners. Activities related to Asian carp, zebra and quagga mussels, nutria, tamarisk, brown tree snake, cheatgrass, buffelgrass and other species will continue.

- **Great Lakes Invasives** – USGS research supports cooperative efforts in the Great Lakes region to prevent and control the spread of invasive fish, such as Asian carp, reduce the pervasive impacts of zebra and quagga mussels on U.S. waterways, and manage or mitigate adverse ecological and economic impacts of the invaders. USGS research is also supporting development of novel techniques and methods to control aquatic invasive species.

Program Performance

Assessment, Monitoring, and Control of Invasive Species – In 2009, the USGS completed a risk assessment that summarized the biology of nine species of constrictor snakes and the potential environmental effects if these snakes became established in the wild. In 2010, the USGS completed a report to Congress assessing the state of the science and key research

needs related to the management of salt cedar and Russian olive in the Western United States. In 2011, the USGS began conducting research as part of the Asian Carp Regional Coordinating Committee (RCC), which is the Federal response to the threat of Asian carp becoming established in the Great Lakes. There is concern that these large, non-native planktivores would alter the food web or compete with native and sportfishes if they became established. In 2011, under the RCC, the USGS is completing research to identify tributaries of the Great Lakes that may sustain successful spawning and early life stage development of Asian carp. This research will improve the ability to detect an invasion of Asian carp at its earliest stages.



Silver Carp are one of the strains of Asian Carp that have been introduced into the U.S.

New methods to eradicate, control, and manage Asian carp are needed. Under the RCC in 2011, the USGS is completing research evaluating the utility of seismic technology for diverting or eradicating various life stages of bighead and silver carp. Although fish toxicants (piscicides) are commonly used to manage and control nuisance and non-native invasive fishes, they are expensive, labor-intensive, and typically kill both target and non-target species. In 2012 as part of the RCC, the USGS will complete initial research on delivering lethal doses of piscicides currently registered for use in the United States only to bighead and silver carp, thereby reducing effects to non-target species. Species selectivity will be achieved by exploiting differences in enzyme activity in the gills and digestive systems among fish species. Successful demonstration of this technology may pave the way for development of similar control tools for other high profile aquatic invasive species, such as zebra and quagga mussels.

Activity: Ecosystems
Subactivity: Cooperative Research Units

2010 Enacted	$19.3 million (133 FTE)
2011 CR	$19.3 million (133 FTE)
2012 Request	$18.8 million (133 FTE)

Budget Realignment

In 2010 and 2011, Cooperative Research Units is a program in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, the program is proposed to move to a subactivity in the Ecosystems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The CRU program is a unique cooperative relationship among the USGS, State fish and wildlife agencies, host universities, and the Wildlife Management Institute. The FWS is a formal cooperator in most of the individual Units. Since 1935, this cooperative relationship has provided a strong connection between the USGS, State and Federal management agencies, and the national university community. Individual resources of each cooperator are leveraged to deliver program outcomes that far exceed what any one cooperator could achieve alone.

The goals of the CRU program are to sustain and maintain:

- A cost-effective, national network of Federal, State, and university partnerships pursuant to the Cooperative Research Units Act of 1960, with a legislated mission of research, education, and technical assistance focused on fish, wildlife, ecology, and natural resources;
- A customer-oriented network of expertise for research, teaching, and technical assistance that is responsive to information needs of State and Federal resource agencies;
- Science capabilities responsive to resource management needs of Interior Bureaus; and
- A premiere program for graduate education and training of future natural resources professionals having skills to successfully serve the broad natural resources management community.

The CRU program is comprised of 40 CRUs located at universities in 38 States, with a headquarters office in Reston, VA. The program is designed to leverage cooperative partnerships with Federal and State agencies to address mutual needs of all partners in a cost effective manner. The USGS stations Federal scientists at universities to: help identify and respond to natural resource information needs through pooling of resources among agencies; participate in advanced scientific training of university graduate students; and provide Federal and other natural resource managers access to university expertise and facilities.

Federal support of the CRUs is multiplied by State and university cooperator contributions of expertise, equipment, facilities, and project funding, thereby enhancing the program's cost-effectiveness. Through university affiliations, CRU scientists train future natural resource professionals and provide opportunities through graduate education to diversify the Federal workforce.

Each CRU is directed by a Coordinating Committee comprising of Federal, State, university, and Wildlife Management Institute representatives. Each Coordinating Committee establishes goals and expectations for its unit within the program's mission of research, education, and technical assistance. The mix of priorities is established locally and is updated annually based on needs of cooperators and available funding. Program accountability measures, performance standards, and oversight of Federal scientists are used to ensure research and the resulting scientific information products support the goals of the USGS and Interior.

University and State agency contributions to the program remain strong, as does Federal, State, and local government reimbursable funding for research and technical assistance. Regular cooperator-focused satisfaction surveys continue to indicate a high satisfaction rate of 95 percent or greater with CRU program execution of the education and science mission at local units. The program's appropriated dollars continue to be matched by State, university, and Federal partners, and other entities' contributions at a ratio of approximately three matching dollars to each appropriated dollar.

Program Performance

To meet future natural resource management challenges, the program will continue to investigate new approaches to more effectively engage its cooperators in science-based decision making. In addition, the program will seek new ways for the Units and their cooperators to work together across State and regional boundaries. The CRU program is recognized by Interior as the primary source of technical expertise on structured decision making and adaptive management. These processes provide systematic ways for resource management Bureaus in Interior to include science in regulatory and management decision making. More closely knitting science with management is critical for Interior Bureaus faced with significant resource decisions and complexities in the face of unpredictable effects of climate change. Currently, however, expert knowledge of structured decision making and adaptive management approaches is limited, and at present, does not meet the management's need for this expertise.

The CRU program has a goal to advance structured decision making and adaptive management approaches with its State and Federal cooperators, including Interior Bureaus managing trust resources. A significant effort will be required to coordinate, construct, and implement strategies with CRU partners to advance knowledge development and staff expertise in structured decision making and adaptive management. CRU continues to invest significant resources to improve outreach and use of adaptive management practices in Interior's Bureaus. Programmatic challenges include developing the next generation of structured decision making and adaptive management practitioners through new approaches to graduate education and training.

Plans to develop new ways of working across State and regional boundaries have been incorporated as a key goal of this initiative. This transboundary collaboration is currently ongoing in 2011 to address climate change, the most pressing challenge natural resource managers are currently facing. CRU Units in Wyoming, Utah, and Montana are coordinating with multiple western States to evaluate habitat use and movement of elk, a widely distributed and ranging species in the west. By coordinating the assessment of elk data across western States, resource managers will be providing options for managing elk herds in ways not possible from a single-State perspective. This type of transboundary approach to wildlife research is an important precursor to the multitude of landscape-level wildlife management research issues that will arise as climate changes.

Through 2011, CRU is supporting the Nation's and Interior's interests in balanced energy development, climate change, and threatened fish and wildlife conservation. The continuing effort to strengthen science capacity in CRU will ultimately lead to enhancement and expansion of graduate education and science training as mandated in the Cooperative Units Act, and, thereby contribute to the science expertise needed to meet future natural resources challenges.

CRU cooperators support broad-scale research projects aimed at understanding mechanisms affecting species and habitats at unprecedented scales. CRUs work in climate change research directly supports and aligns with Interior's and the USGS's strategic science vision.

2010 in Review – Achieving the Unit Mission

In 2010, Unit scientists and their cooperators advanced the mission of the CRU program through joint research, education, technical assistance, and science support. Unit scientists continued their productivity in 2010, completing 790 projects for Federal and State partners. Unit scientists and their students remained actively engaged in service to professional societies delivering 662 presentations. Many of these presentations were invited seminars, indicating that Unit scientists and their research are held in high regard by the scientific and management communities. CRU's service to university cooperators continued to be strong, with 87 academic classes taught in 2010 and additional workshops and short courses delivered to partners and cooperators.

Productivity Summary	2009	2010
Peer reviewed publications	305	297
Invited Seminars	63	63
Workshops and Short Courses	36	35
Total Projects (State+Fed+other)	860	790
Papers Presented	639	662
Academic Courses Taught	68	87
Total number of students	522	541
Master's degrees awarded	80	72
Doctoral degrees awarded	30	22

Each year, over 500 students engage in graduate education and training in natural resources conservation through the CRU program. About 15 percent of these students matriculate each year and enter the natural resources management workforce as employees of State and Federal agencies, non-governmental organizations, and universities. The number of advanced graduate degrees awarded to Unit students in 2010 was 94 and is consistent with the long-term trend.

In 2011, the CRU continues to provide strong leadership in research to support Interior trust species and habitats, such as migratory birds and threatened and endangered fish and wildlife. In 2011, CRU is advancing an initiative to develop new collaborations in science-based decision making. Additionally, in 2011, CRU continues to support technical assistance and outreach to state cooperators to solve natural resource based problems using structured decision making and adaptive management. CRU continues to provide science and research support to state fish and wildlife agencies faced with the emerging and complex challenge of climate change, and predicted effects on state wildlife resources.

The CRU advanced plans to restore science capacity through 2011 by rehiring research scientists with an increase in 2010. CRU traditionally invested over 90 percent of program funding in scientists salaries, with all funding for research projects supplied by program

partners. Therefore, improvements in program performance in the form of increased publications, presentations, courses taught, and other product-oriented elements of scientific outreach will occur over the subsequent years after science staff are hired and initiate their research programs. Reinvesting in science capacity to fully staff vacant Unit positions will have a direct and near immediate benefit in improving the number of students the program can support, with an attendant 15–20 percent increase in numbers of M.S. and PhD students graduated within five to seven years.

Activity: Climate and Land Use Change

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Climate Variability								
National Climate Change & Wildlife Science		15,143	15,143	-192	-378	11,000	25,573	10,430
Center/DOI Climate Science Centers ($000)	*FTE*	*30*	*30*	*0*		*20*	*50*	*20*
Climate Research & Development ($000)		32,939	32,939	-259	-517	-8,022	24,141	-8,798
	FTE	*112*	*112*	*-1*		*-1*	*110*	*-2*
Carbon Sequestration ($000)		10,095	10,095	-115	-235	4,600	14,345	4,250
	FTE	*12*	*12*	*0*		*12*	*24*	*12*
Science Support for DOI Bureaus ($000)		5,000	5,000	-45	-95	4,000	8,860	3,860
	FTE	*8*	*8*	*0*		*16*	*24*	*16*
Subtotal Climate Variability ($000)		**63,177**	**63,177**	**-611**	**-1,225**	**11,578**	**72,919**	**9,742**
	FTE	***162***	***162***	***-1***		***47***	***208***	***46***
Land Use Change								
Land Remote Sensing ($000)		63,707	63,707	-54,403	-679	13,350	21,975	-41,732
	FTE	*145*	*145*	*-41*		*3*	*107*	*-38*
Geographic Analysis and Monitoring ($000)		11,135	11,135	-140	-234	750	11,511	376
	FTE	*67*	*67*	*-1*		*0*	*66*	*-1*
Subtotal Land Use Change ($000)		**74,842**	**74,842**	**-54,543**	**-913**	**14,100**	**33,486**	**-41,356**
	FTE	***212***	***212***	***-42***		***3***	***173***	***-39***
Total Requirements ($000)		**138,019**	**138,019**	**-55,154**	**-2,138**	**25,678**	**106,405**	**-31,614**
	Total FTE	***374***	***374***	***-43***		***50***	***381***	***7***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Landsat 8 Ground System (LRS)	+13,350	+3
• Cooperative Landscape Conservation	+11,000	+12
o DOI Climate Science Centers (NCCWSC/DOI CSCs)	[+8,000]	[+8]
o Climate Research and Development (CR&D)	[+1,000]	[+2]
o Carbon Sequestration (Carbon)	[+2,000]	[+2]
• Science Support for DOI Bureaus (SS for DOI)	+4,000	+16
• WaterSMART (GAM)	+500	0
• Multi-Hazards Initiative (GAM)	+250	0
• DOI Climate Science Centers (NCCWSC/DOI CSCs)	+3,000	+12
• Climate Research and Development - Climate Effects Network (CR&D)	-9,022	-3
• California Bay-Delta (Carbon)	+2,600	+10
TOTAL Program Changes	**+25,678**	**+50**

Justification of Program Changes

The 2012 Budget Request for Climate and Land Use Change is $106,405,000 and 381 FTE, a net program change of +$25,678,000 and +50 FTE from the 2010 Enacted/2011 Continuing Resolution.

Program Change

Landsat 8 Ground System (+$13,350,000/+3 FTE)

The U.S. Geological Survey (USGS) requests an increase of $13,350,000 to accommodate ground system requirements changes for the Landsat Data Continuity Mission (LDCM, to become Landsat 8) associated with moving the Operational Land Imager sensor to a free-flying satellite system and the addition of a Thermal Infrared Sensor on board the spacecraft. The Mission Operations Element and the Flight Operations Team are related to the implementation of LDCM as a free-flyer. The requested increase accommodates the additional ground system requirements, including the addition of a thermal sensor, and maintains the National Aeronautics and Space Administration's (NASA) mission schedule for the LDCM launch in December 2012.

Cooperative Landscape Conservation (+$11,000,000/+12 FTE)

DOI Climate Science Centers (+$8,000,000) – Management decisions made in response to climate change impacts must be informed by science and require that scientists work in tandem with those managers who are confronting climate change impacts and evaluating options to respond to such impacts. Pursuant to P.L. 110-161, the USGS began the development of the National Climate Change and Wildlife Science Center (NCCWSC). The NCCWSC is being expanded into a network of eight DOI Climate Science Centers (CSC)s with a primary focus on providing climate change impact data and analysis geared to the needs of fish and wildlife managers as they develop adaptation strategies in response to climate change. These DOI CSCs continue to be developed in close collaboration with other Interior agencies as well as Federal, State, university, and non-governmental partners.

Climate Research and Development (+$1,000,000) – Climate Research and Development (R&D) will continue its efforts to develop decision-support tools that enable resource managers and policymakers to cope with and adapt to a changing climate. Collaborations with a number of academic institutions including Cornell University, Colorado State University, the Massachusetts Institute of Technology, and Montana State University have been established, spanning the fields of social science, natural resources, artificial intelligence, statistics, and earth sciences. Decision support will be developed through new partnerships, enhancement of existing collaborations, and in training the next generation of applications scientists.

Biological Carbon Sequestration Assessment (+$2,000,000) – An increase of $2.0 million is requested for the USGS to continue the implementation of the methodology for the national assessment of biological carbon sequestration developed in previous years. These activities were authorized in the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140), which calls for comprehensive assessment of geologic and biologic carbon sequestration to enable decision makers to evaluate the full range of sequestration options.

Science Support for DOI Bureaus **(+$4,000,000/+16 FTE)**

The new funding will support research to increase the scientific information that will be available to the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM), and the National Park Service (NPS) to inform resource management. Every year, the demand for research to support agency decision making far exceeds the funding available. The additional funding will increase the number of USGS scientists that can work collaboratively with managers and biologists in these Bureaus to develop and carry out research projects that address Bureau management problems.

WaterSMART **(+$500,000/0 FTE)**

Water is essential to the economic security of individual communities across the United States and also to the economic vitality of our Nation as a whole. An assessment of the availability and use of water resources in the United States was last completed in 1978. The WaterSMART availability and use assessment will put technical information and tools into the hands of stakeholders that will allow them to evaluate water availability for the resource management questions that they are facing. The Geographic Analysis and Monitoring (GAM) program will provide remote sensing and interpretation expertise to improve understanding of water use, consumptive loss (particularly with regard to irrigated agriculture) and evapotranspiration.

Multi-Hazards Initiative **(+$250,000/0 FTE)**

The Multi-Hazards Demonstration Project in Southern California, in its fifth year, is building on the success of the Great Southern California ShakeOut by developing earthquake forecasting early warning capabilities and conducting impact analysis of environmental, human health and ecosystem responses to earthquakes and other hazards. To support those efforts, the GAM program is providing geospatial analytical support, environmental characterization, and landscape analysis in the development of decision support tools.

DOI Climate Science Centers **(+$3,000,000/+12 FTE)**

The 2012 proposed funding level for the NCCWSC and the DOI CSCs includes an additional $3.0 million to complete implementation of the DOI CSCs as envisioned in Secretarial Order 3289. The planned network of eight DOI CSCs, to be located at institutions with substantial climate science capabilities, and the NCCWSC, will provide fundamental science and tools to Landscape Conservation Cooperatives (LCCs) and other natural and cultural resource managers. Funding will support integrated models that project climate change at a regional level and its effects on key resources; assessments of vulnerability of species and ecosystems to climate change; monitoring strategies to identify climate-driven alterations to ecosystems; and input to the design of adaptation strategies. At the proposed funding level, the Northeast, South Central and Pacific Islands DOI CSCs will be established, resulting in the ability to respond to the needs of LCCs and others with a full suite of scientific tools and products.

Climate Research and Development – Climate Effects Network **(-$9,022,000/-3 FTE)**

The Climate Effects Network (CEN) is a collaborative effort to provide the long-term and geographically extensive data essential to forecast the effects of climate change on ecosystems, natural resources, and societal infrastructure. At the proposed funding level, the CEN is reduced to a demonstration level project in the Yukon River Basin. While the value of

this type of data has not changed, the USGS is shifting focus from the CEN to the establishment of the CSCs. In the interim, the USGS and its partners will rely on independent data sets to understand and address climate impact issues across the Nation.

California Bay-Delta **(+$2,600,000/+10 FTE)**

The California Bay-Delta (Bay-Delta) ecosystem, the largest estuary on the West Coast, is recognized as one of the world's threatened treasures of biodiversity, supporting unique native species and their critical tidal wetland habitats and with over eight million Californians who call the area home. Current USGS research has demonstrated that emergent marsh vegetation has tremendous carbon sequestration potential, estimated to be as much as ten times that of forests. Establishing emergent marshes on subsided lands under controlled conditions has the potential to sequester carbon at these high rates as well as protect levees, improve water quality, provide habitat, and restore subsided lands to sea level. Almost a million acres of Delta islands in the San Francisco Estuary have subsided by as much as 25 feet below sea level. Failure of the levees that protect these islands could result in contamination of drinking water for 30 million Californians. Wetlands could raise Delta islands to sea level, improve water quality—and sequester carbon in the process. The USGS has conducted scientific investigations on two pilot wetlands testing this concept on Twitchell Island since 1997. This initiative would assess the practicality of large-scale (300-600 acres) implementation. Work would be done to determine the ecological processes and environmental conditions responsible for high rates of carbon sequestration, determine greenhouse gas (GHG) emissions for the farm-scale wetland and for other Delta land uses, adapt a greenhouse gas flux model to the wetland environment and determine optimization of conditions, and develop a protocol for registration of freshwater wetlands in carbon markets.

Activity Summary

Climate change is one of the greatest natural resource challenges the world faces and is a top priority for the Administration and Interior. Climate change and its impacts on natural resources are a key concern for Interior resource managers and their partners at the State, Federal, and local level. Key components of the Climate and Land Use Change mission area include:

- NCCWSC/DOI CSCs;
- Land Remote Sensing activities (LRS);
- GAM;
- Application of the geological and biological sequestration assessment methodologies;
- Data management; and
- Continuation of rigorous scientific research that provides the data and new knowledge that is required to understand, assess, adapt to, and mitigate the impacts of climate change.

Beginning in 2012, the USGS is aligning the majority of its existing climate change efforts under a single budget activity, Climate and Land Use Change. USGS climate change research will continue to provide key opportunities to reinforce and build upon existing capabilities and to leverage new ones to help the Nation meet the challenge of understanding climate change and its impact on our Nation, its resources, and its economy.

The Climate and Land Use Change activity supports Interior's goal to assess and forecast climate change and its effects. The goal of Climate and Land Use Change programs is to be the primary provider of scientific information on the impacts of climate and land use change on Earth and human systems. The understanding of these impacts is used to provide a scientific perspective for policy makers and to support land and resource managers in their decision making.

Climate and Land Use Change projects support the goals of the U.S. Global Change Research Program (USGCRP) to:

- Improve knowledge of the Earth's past and present climate and environment, including its natural variability;
- Improve quantification of the forces bringing about changes in the Earth's climate and related systems;
- Reduce uncertainty in projections of how the Earth's climate and related systems may change in the future;
- Understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes; and
- Explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change.

Recent Climate and Land Use Change achievements:

- Established the Alaska, Northwest, and Southeast DOI CSCs;
- Finalized the methodologies for assessing the Nation's resources for biologic carbon sequestration and geologic carbon sequestration;
- Continued efforts to model regional land use in order to understand the drivers of land use change and develop scenarios of future conditions;
- Continued innovative application of GAM research to improve the scientific basis for vulnerability and risk assessments, as well as disaster mitigation, response, and recovery activities;
- Continued expansion of the understanding and applications of remotely sensed data;
- Completed datasets and documentation of land cover trends for the entire conterminous United States and updating a paleoclimate dataset now being used to test and validate predictive climate models world wide;
- Supported over two million Landsat images downloaded free of charge by users around the world;
- Continued land change science efforts that will result in the development of models, spatial metrics, and assessment tools that can be used to evaluate the consequences of landscape change at a range of scales;
- Continued development of plans and strategies for creating fundamental climate data records and essential climate variables from the Landsat data archive to enable studies of long-term global change;

- Expanded the production of national-scale data products (e.g., a national soil carbon map, coastal export of carbon in rivers, water quality and flow responses to climate change, etc.); and
- Fostered additional partnerships (especially with the LCCs) to develop tools that increase natural resource managers' ability to apply science-based adaptation programs to better understand the effects of global change on their landscapes, the uncertainties associated with that change, and how future scenarios might unfold.

Management Summary

Program Reviews – A significant Climate and Land Use Change programmatic achievement during 2010 included development of a strategy for consistent and regular program reviews. In addition, the Climate and Land Use Change activity aggressively utilized Bureau best practices in regards to budgeting and planning and successfully integrated these into the mission area. A primary mechanism to accomplish this was the use of the Bureau budgeting and project management tool, BASIS+. The entire Climate and Land Use Change project structure was realigned to increase efficiency and allow better project planning and coordination. The Climate and Land Use Change activity has a seamless structure in which all programs can be managed and timely funding allocations are tracked accurately and efficiently.

Global Change Science Strategy – In March 2010, the Global Change Science Strategy Planning team (SSPT) was chartered to develop the USGS Global Change Science Strategy. In developing the plan, the SSPT reviewed the current projects across the Bureau and inventoried the global change science needs of other Interior Bureaus. The plan expands on the Climate Variability and Change science component of the USGS 2007 Science Strategy and addresses the science required to broadly inform global change policy, while emphasizing the needs of natural-resource managers and reflecting the role of the USGS as the science provider for Interior and other resource-management agencies. It also identifies core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. Highlighted are those areas where the USGS is a science leader, recognizing the strong partnerships and effective collaboration that are essential to address complex global environmental challenges. The query-based approach lists key research questions to be addressed to create an agenda for hypothesis-driven global change science organized under six strategic goals. Those goals are to improve understanding of:

- Rates, causes, and impacts of past global changes;
- Global carbon cycle;
- Land use and land cover change rates, causes, and consequences;
- Droughts, floods, and water availability under changing land use and climate;
- Coastal response to sea level rise, climatic hazards, and human development; and
- Biological responses to global change.

The USGS Global Change Science Strategy is currently undergoing both internal and external peer review and will be published in early spring 2011.

Workforce Planning – Although the Climate and Land Use Change activity is identified as an activity in the budget with 381 FTE, these staff are located throughout the Bureau's various science specialties. The USGS has worked to identify and evaluate personnel associated with

the previous Global Change budget activity as well as their skill mix. Where necessary, the USGS has reviewed and revised work plans and developed an integrative Bureau planning model to manage cross-disciplinary efforts, including the Climate and Land Use Change activity.

Climate Change Adaptation High Priority Performance Goal (HPPG) – The USGS is a primary contributor to the Interior Climate Change Adaptation HPPG, mainly through the NCCWSC and DOI CSCs. The USGS has the primary role in establishing the NCCWSC and DOI CSCs and is working to establish an integrated climate monitoring approach for Interior. Another major component to which the USGS contributes in the HPPG is vulnerability assessments. The Climate and Land Use Change mission area is working with the Ecosystems, Natural Hazards, and Water Resources mission areas to establish a baseline of the number and types of climate change vulnerability assessments that are being conducted by the USGS. This information will be tracked quarterly and will contribute to the overall Interior count of vulnerability assessments.

Climate and Land Use Change Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
National Climate Change and Wildlife Science Center/DOI Climate Science Centers							
# of fish and wildlife climate based habitat and population models developed by scientists and in cooperation with land managers (SP) (NCCWSC/DOI CSC)							
Performance Data	N/A	1	3	6	10	+4	+4
Total Actual/Projected Cost ($000)	N/A	3,303	9,910	9,910	9,910	0	0
Comments	The NCCWSC/DOI CSC program was established in 2009. While much of the program's funding is going towards standing up the DOI CSC network, the program also creates models that will be used by partners particularly in the DOI Landscape Conservation Cooperatives. The funding shown for these models is the total amount spent on research by this program.						
Number of Climate Science Centers formed (HPPG)							
Performance Data	N/A	N/A	3	5	8	+3	0
Number of Climate Science Center research priority documents completed (HPPG)							
Performance Data	N/A	N/A	N/A	5	8	+3	8
Climate Research and Development							
% of targeted land cover trends national assessment syntheses, research plans, or science strategies that are published (R&D)							
Performance Data	N/A	20% (1/5)	40% (2/5)	60% (3/5)	100% (5/5)	+40%	N/A
Comments	This performance measure is slated to be completed in 2012.						
% climate research and development studies of which interpretive and syntheses products are cited by partners and users within 3 years of study completion (R&D)							
Performance Data	N/A	N/A	N/A	80%	80%	0	0
% of Climate Effects Network established relative to current target (R&D)							
Performance Data	11.5% (2.3/20)	20% (4/20)	25% (5/20)	25% (5/20)	25% (5/20)	0	0
Comments	Although progress has been made with science plans and science products, the USGS has proposed a significant decrease in 2012. The Climate Effects Network will not be completed at the proposed funding level.						
Carbon Sequestration							
% of the baseline, reference projection, and mitigation evaluation units completed for a national biological carbon sequestration assessment (Bio Carbon)							
Performance Data	N/A	N/A	N/A	14% (45/330)	59% (195/330)	+45%	N/A
Comments	The national biologic carbon sequestration assessment is expected to be completed by the end of 2014.						
Climate Variability -- Program Components							
# of systematic analyses & investigations completed							
Performance Data	7	93	121	100	107	+7	+13
Comments	Due to the USGS realignment, we have rebaselined the 2011, target. After 2011, the USGS will determine what changes need to be made to the 2012 and 2016 targets. Also, the additional performance in 2012 includes two systematic analyses from the additional funding of $2.6 million provided for Carbon Sequestration.						

Climate and Land Use Change Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Geographic Analysis and Monitoring							
% of U.S. surface area with contemporary land cover data needed for major environmental monitoring and assessment programs (SP) (GAM)							
Performance Data	99.3% (298/300)	46% (213/463)	95% (440/463) complete the NLCD 2006 product.	100% (463/463) Completes NLCD 2006; develop prototype for next NLCD product	15% complete of NLCD 2011 (69/463 path & rows of imagery captured)	Begin production of next NLCD 2011 for up-to-date land cover every 5 years	+95%
Total Actual/Projected Cost ($000)	3,100	3,000	3,050	3,250	5,200	1,950	-1,400
Comments	The National Land Cover Database (NLCD) 2006 will be completed in early 2011. This product uses 2006 imagery and compares it to the NLCD 2001 data layers to provide an update of where land cover has changed over the five-year period. During 2011, the USGS working with the Multi-Resolution Land Characteristics (MRLC) Consortium partners will begin efforts for the development of the next NLCD 2011. The funding for the NLCD is higher in 2012 than other years since the full scale production of NLCD 2011 will begin then.						
Land Remote Sensing							
# of terabytes managed cumulatively (LRS)							
Performance Data	3,841	3,011	2,873	2,877	3,409	+532	+2222.90
# of remote sensing products distributed (LRS)							
Performance Data	417,029	3,127,040	5,600,000	5,795,503	5,969,368	+173,865	749,208
Land Use Change (Geographic Analysis and Monitoring and Land Remote Sensing Programs)							
# of systematic analyses and investigations completed							
Performance Data	93	90	79	90	90	0	10

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

This page intentionally left blank.

Activity: Climate and Land Use Change

Subactivity: Climate Variability

Program Element: National Climate Change and Wildlife Science Center/ DOI Climate Science Centers

2010 Enacted: $15.1 million (30 FTE)
2011 CR: $15.1 million (30 FTE)
2012 Request: $25.6 million (50 FTE)

Budget Realignment

In 2010 and 2011, NCCWSC/DOI CSCs is a program in the Global Change activity. In 2012, the program is proposed to move to the Climate Variability subactivity in the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

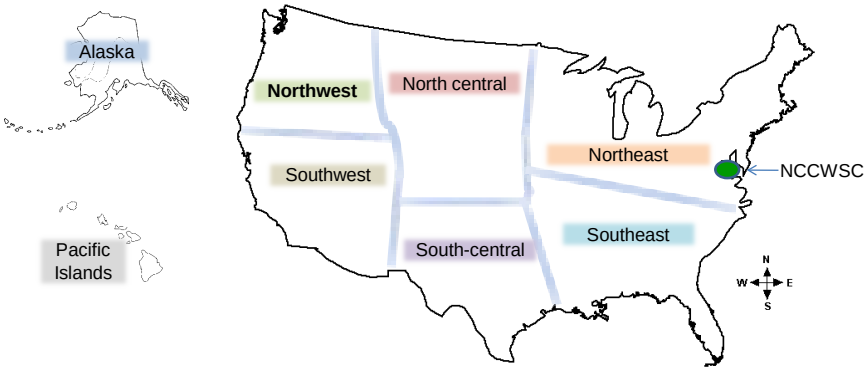
The Consolidated Appropriations Act of 2008 (PL 110-161) provided funding for the USGS to establish the National Global Warming and Wildlife Science Center. These resources allowed the USGS to hold a series of workshops with Interior agencies, other Federal and State agencies, and nongovernmental and private partners to design the USGS NCCWSC. The NCCWSC was conceived as a national network of partnership-based regional hubs that collaborate with Interior agencies and other partners to provide climate change impact data and analyses. Natural and cultural resource managers can use these analyses to develop adaptation strategies that take into account the impacts of climate change on the natural environment.

Secretarial Order 3289 created the Interior Climate Change Response Council to work with the USGS and other Interior Bureaus to develop the regional hubs outlined for the NCCWSC into the DOI CSCs. The Secretary broadened the scope of the DOI CSCs to include other climate-change related impacts on Interior resources. These DOI CSCs will integrate climate change impact data and develop tools for managers and partners to use to manage Interior's land, water, fish and wildlife, and cultural heritage resources. In 2010, Secretary Salazar established:

- The Alaska DOI CSC at the University of Alaska;
- the Northwest DOI CSC, involving a multi-institution consortium managed from Oregon State University; and
- the Southeast DOI CSC at North Carolina State University.

In 2011, the USGS will continue the process of establishing the DOI CSCs in the north central and southwest regions. The host institution consortia have been identified through competitive bidding; these are multi-institution consortia led by the University of Arizona (Southwest DOI CSC) and Colorado State University (North Central DOI CSC).

NCCWSC National & Regional Organization



The NCCWSC and the network of DOI CSCs support research, assessment and synthesis of climate change data for use at regional levels. The DOI CSCs adapt global climate models to scales appropriate for species and habitat resource managers, use the projections to understand the effects on species and habitats, and facilitate data integration and outreach to collaborators and stakeholders.

As part of the broader climate change science and adaptation community, the DOI CSCs will provide natural and cultural resource managers with tools and information to help them design successful climate adaptation strategies. The DOI CSCs will meet partners' needs when they:

- Collaborate with natural resource managers to understand their priority science needs and determine how to fill knowledge gaps;
- Work with the scientific community to develop science information and tools to generate management strategies for responding to climate change; and
- Deliver tools and information that are immediately useful to resource managers through both person-to-person collaboration and state-of-the-art electronic methods.

The DOI LCCs are the primary clients of NCCWSC and the DOI CSCs, and the activities of each DOI CSC will be guided by a stakeholder advisory committee that includes LCC representatives and other partner input.

The DOI CSCs will continue to work closely with fish and wildlife managers, other natural resource partners, and scientists within an adaptive management framework to ensure management decisions are informed by sound science. Several examples include:

- Creating a "national partners committee" to ensure national input from both its partners and the global climate science community. Members will include representatives from Interior and other Federal agencies, States, non-governmental and user interests (e.g., farm, forestry interests), and academic scientists;

- Establishing a series of joint projects with the U.S. Forest Service (USFS) on joint climate research priorities, and plans to build on this work in 2012; and

- Continuing to work under a Department of Commerce-Interior Memorandum of Understanding to interact with National Oceanic and Atmospheric Administration (NOAA) to better link regional climate services delivery and ensure maximum interoperability of climate science data and information systems.

Many of the projects supported by the NCCWSC involve the assessment of vulnerability to climate and other global changes. Establishing priorities for additional scientific research or alterations to management strategies and actions requires integrating information from multiple sources about the relative vulnerability of different species, habitats, and locales within a region and understanding how these vulnerabilities affect management decisions. Identifying ecosystem vulnerabilities at landscape scales requires the prediction of sensitivity of ecosystem components to climatic changes and species population, and system responses to those changes. Vulnerability assessments target species and biological communities or ecosystem types of regional or national conservation concern. Vulnerability assessments are an important component of the Interior Climate Change Adaptation HPPG.

Partners are particularly interested in these studies because they include:

- Species, biological communities, or ecosystem types managed by conservation agencies;
- Rare, threatened, endangered, or other species of concern to Federal and State wildlife agencies or non-governmental conservation organizations;
- Species that appear to be in accelerated decline; and
- Species or biological communities that serve as indicators of change in environmental conditions associated with changing climate.

Sage grouse habitat will be affected by changes in land use and climate.

Finally, climate change science and planning demands the integration of large quantities of disparate data. The NCCWSC and the DOI CSCs are working to ensure seamless and efficient management, identification, and acquisition of key climate change data, for use by the USGS in its research and by the LCCs and other partners in their planning and management activities. This activity involves broad collaboration, including an Interiorwide working group, coordinated activities with NOAA and other Federal partners, and engagement of the substantial assets and expertise at the DOI CSC host universities and the broader scientific community. The goal is to ensure maximum compatibility and transferability of key data.

Program Performance

Completion of the Network of DOI CSCs – To enable a rapid startup of operations in 2012, the USGS is issuing a competitive program announcement in 2011 to request proposals to host DOI CSCs in each of the three remaining regions: South Central, Northeast, and Pacific Islands. The majority of DOI CSC funds will be dedicated to research. Administrative staffing will be minimized through purchase of services from existing USGS offices. Hiring of research scientists will be undertaken only after evaluation to ensure that new hires do not duplicate available expertise in the region. Research results will allow natural and cultural managers to respond to the impacts of climate change. With the selection of three additional DOI CSCs in 2012, a national network of eight DOI CSCs will be completed as outlined in Secretarial Order 3289.

Responses of Wildlife and Vegetation to Climate Change – The NCCWSC continues to support USGS climate change research projects that began in 2009 and are scheduled for completion in 2011. Beginning in 2011 and continuing with the establishment of all eight DOI CSCs, research supported by the NCCWSC will largely be undertaken through individual DOI CSCs, will be determined by DOI CSC consultations with LCCs and other stakeholders. Ongoing investigations include:

- National or regional projects that assess aquatic or coastal and terrestrial plant and animal responses to climate change;
- Species and ecosystem vulnerability to projected climate change in the Pacific Northwest;
- Climate-induced changes in plant phenology on migration, breeding, and distribution of birds in the Arctic;
- Vulnerability of quaking aspen woodlands and associated bird communities to climate change in the Great Basin;
- Study of fish habitats at multiple spatial scales in a rapidly changing climate; and
- Studies ranging from the effects of climate change on San Francisco Bay marshes to changes in Hawaiian seabird populations.

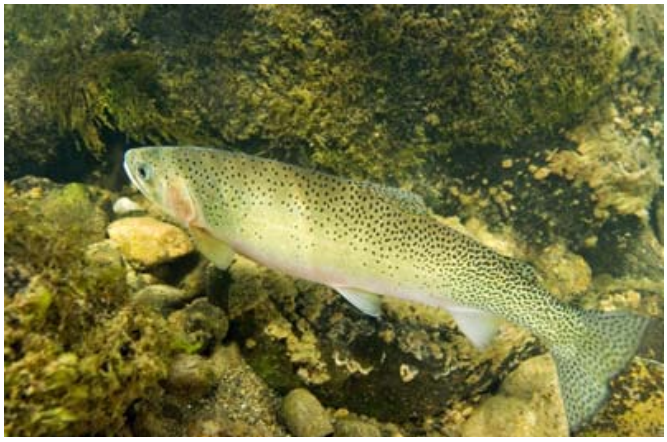
These three-year studies, most of which are scheduled to conclude in 2011, provide interim research results for application at regional and local levels. Activities in 2012 will include delivery of the resulting information to users and technical assistance in their application. As noted, most research in 2012 and beyond will be identified through consultations with LCCs and other managers, and conducted through the DOI CSCs.

Finally, the NCCWSC's Southeast Regional Assessment Pilot, involving investigators from multiple Federal and State agencies, is developing a prototype integrated regional assessment of climate change impacts. This effort includes assessments related to sea level rise, future climate-driven water availability and quality and effects on aquatic species, and the combined effect of climate and land use changes on terrestrial species, primarily birds. The current phase of the research is being completed in 2011. Activities in 2012 will include the delivery of information to users and consultation with managers about priorities for extending the main framework to additional areas, species, or other conservation endpoints.

NCCWSC National-level Scientific Program – The NCCWSC will also maintain a national-level research program. Topics will include leading the development of a national assessment

of the effects of climate change on biodiversity in the United States and on methods to improve the utilization of vulnerability assessments to provide maximum information to managers.

In 2012, the national partners committee established by the NCCWSC will develop a national research agenda for adaptation science related to fish, wildlife, habitats and ecosystems, in consultation with both DOI CSCs and other partners. This research agenda will identify key science priorities across multiple DOI CSCs, identify promising new research avenues, suggest additional opportunities for cross-CSC integration, and provide guidance about national office research activities.



USGS researchers are identifying likely changes in cold-water fish habitat as a result of climate change in the Western United States.

Data and Information Management – The NCCWSC will continue its development of information management strategies to support DOI CSC research, as well as integrate with LCCs, NOAA climate service activities, and others in the climate/impact science community. Key outputs will include data management policies to ensure rapid delivery of information to users and use of consistent standards and other conventions necessary for distributed data management. In addition, beginning in 2011 and continuing as new DOI CSCs are added in 2012, the NCCWSC will develop a national data sharing architecture that maximizes the use of Government and university high performance computing and data storage/archiving capabilities.

This page intentionally left blank.

Activity: Climate and Land Use Change
Subactivity: Climate Variability
Program Element: Climate Research and Development

2010 Enacted: $32.9 million (112 FTE)
2011 CR: $32.9 million (112 FTE)
2012 Request: $24.1 million (110 FTE)

Budget Realignment

In 2010 and 2011, the Climate Research and Development program is a program in the Global Change activity. In 2012, the program is proposed to move to the Climate Variability subactivity in the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The USGS has a long and distinguished history in the science of climate and land use change that serves as a secure foundation to expand the understanding of climate variability on different temporal and spatial scales and to evaluate the impacts of climate and land use change on Earth processes, our natural resources, and the Nation's economy. Since 2009, the Climate R&D component of this effort has integrated existing projects and FTE from four USGS science disciplines.

The impact of climate variability and change on natural resources is a growing concern for Interior resource managers and their partners at the State, Federal, and local level. The USGS will continue to meet Interior science needs as well as those of the larger community. The Climate R&D program will continue, strengthen, and integrate the existing portfolio of rigorous USGS research, emphasizing existing, new, and expanded work that:

- Fosters a multi-disciplinary approach to global change science and impacts;
- Aligns with USGS strategic goals; and
- Supports the management and policy needs of Interior and external partners and customers.

The key focus for 2011 is the completion of the alignment of the Climate R&D project portfolio with Interior goals and other components of the Climate and Land Use Change mission area. In 2011, projects initiated to close data and knowledge gaps continue, focusing on the following high priority science needs:

- Improve the understanding of the patterns and impacts of climate variability over multiple temporal and spatial scales. This information is needed to evaluate conditions and thresholds leading to abrupt changes in climate and ecosystems, and initial emphasis is placed on vulnerable systems such as the Arctic, arid lands, and wetlands;
- Analyze rates, patterns, and causes of land cover change in the conterminous United States and identify potential environmental and societal vulnerabilities to future land cover change;

- Create scientific applications and decision-support tools to assist resource managers and scientists in developing adaptive management strategies for changes in climate and land use;
- Implement a national climate impacts data management system to improve data sharing and access among agencies and programs generating data on effects of changing climate and land use; and
- Understand coastal vulnerability and change under changing climate and sea level and support decision making in coastal areas.

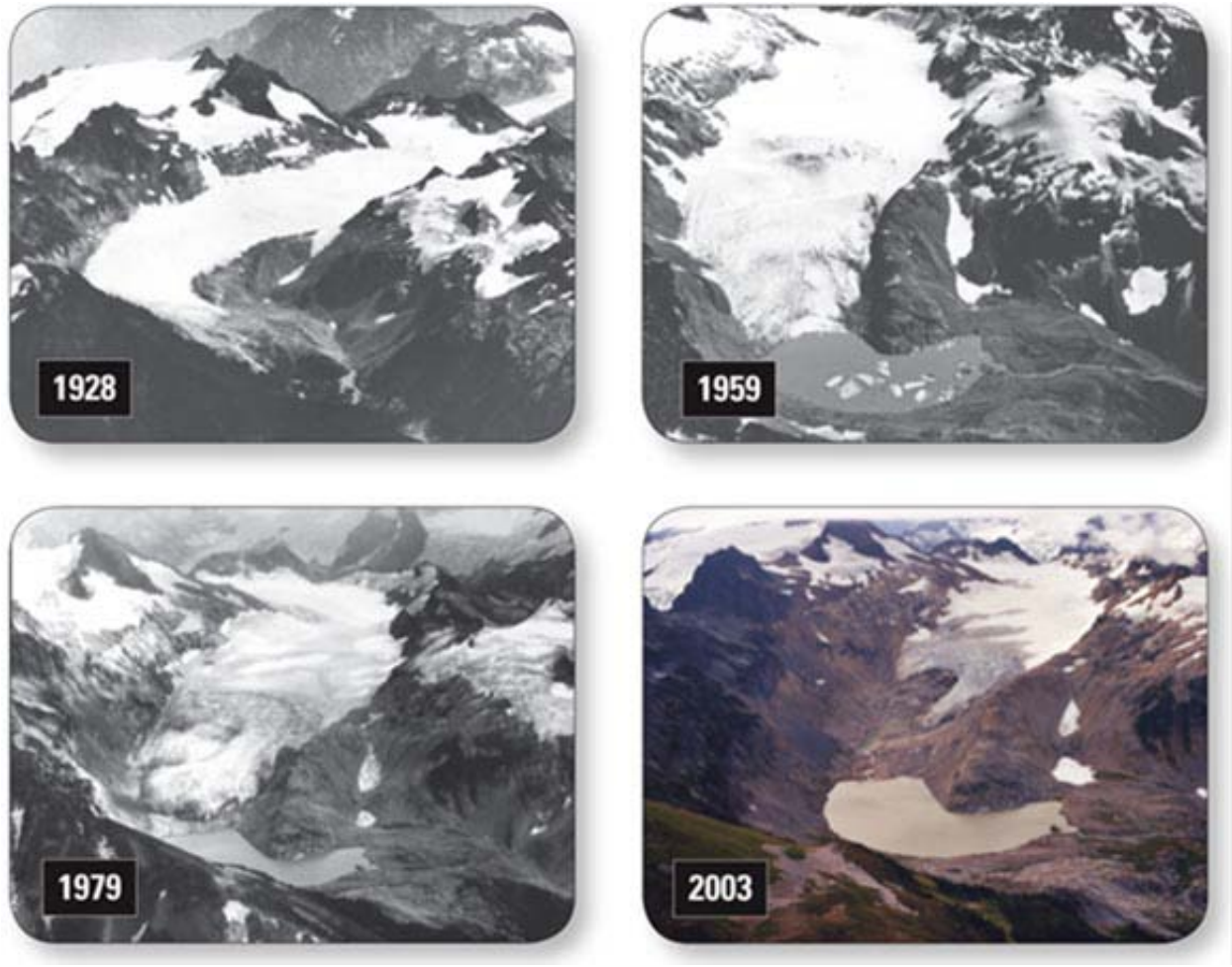
Program Performance

In 2012, Climate R&D will continue across the full range of USGS capabilities in partnership with other Federal agencies and academic institutions. Particular areas of focus will include:

Earth System Response to Climate Variability – Climate R&D projects aim to understand past climate changes, including characteristics of past climate states and variability; past rates of change; and interactions among climatic, hydrologic, biologic, geologic, and human-induced processes. This information will provide a framework to understand ongoing and projected climatic and environmental changes and will contribute to the scientific basis for management and policy decisions. In 2011, the USGS continues to augment its long-term work on patterns and impacts of climate variability over multiple spatial and temporal scales. Work in 2011 builds upon 2010 Climate R&D activities that used paleoclimate proxy data and analyses to improve understanding of regional responses of physical and biological systems to different modes of climate variability, including abrupt climate change, extremes in temperature and precipitation, and sea level rise. This research fills in knowledge gaps on natural climate variability and change and is applied to improve forecasts of impacts and consequences of future climate and land use change. Climate R&D research also focuses on testing and validating climate models used to investigate the interactions of climate, ecosystems, and the Earth's physical surface over regional to global scales. Model output from climate simulations over different temporal scales provides important climate information used by stakeholders and climate modeling groups throughout the world, and supports the USGCRP National Climate Assessment as well as the DOI CSCs and LCCs.

Anticipated 2012 activities include:

- Improving the understanding of past Earth climates to inform modeling and forecasting of current and future climates in the Arctic, Pacific Coast, Gulf of Mexico, southeastern United States, and southwestern United States, including studies of Arctic sea-ice history, regional patterns of drought, and response of terrestrial and marine ecosystems to intervals of global warmth;
- Improving the understanding of landscape and vegetation response to global changes such as sea level rise, changes in precipitation, and altered land cover; and
- Examining the implications of climate change and variability for future habitats, biodiversity, and ecosystems, including the impacts on natural resources such as water, land, and air.



Retreat of the South Cascade Glacier, Washington, during the 20th Century and the beginning of the 21st Century as documented by scientists in the Climate R&D program.

Rates, Trends, and Consequences of Contemporary Land Use and Land Cover Change – In 1999, the USGS began a comprehensive analysis of trends in land cover across the United States using the entire available satellite record. Satellite images of multiple time slices from 1973 through 2000 were integrated with statistical sampling and field verification to describe the characteristics of land cover change across the conterminous United States and to document the regional driving forces and consequences of change. In 2010, this analysis was completed, providing foundational data for the first national assessment of trends in land cover and their impacts on land management practices, economic health and sustainability, and social processes. In 2011, efforts include the publication of papers synthesizing patterns of U.S. land cover change from 1973-2000 and documenting land change dynamics in different sectors (i.e., agriculture, forest cover) and ecoregions. Additionally, Climate R&D will develop a plan to analyze rates, scale, and causes of U.S. land cover change, to model land cover change scenarios and potential vulnerabilities, and to assess environmental and societal impacts of future changes on associated feedbacks.

Anticipated 2012 activities include:

- Developing and modeling land use and land cover scenarios to improve understanding of the vulnerability and resilience of coupled human-environment systems;
- Establishing an integrated land cover change monitoring system for the conterminous United States that will provide regular updates of land cover databases for assessments of land cover change every five years; and
- Examining and quantifying contemporary and future land use and land cover changes on albedo and radiative forcing to examine past and future climate implications for the United States.

Science Applications and Decision Support – The USGS develops decision support tools that enable resource managers and policy makers to cope with and adapt to a changing climate. Decision support will be developed through new partnerships, enhancement of existing collaborations, and in training the next generation of applications scientists. In 2010, the Climate R&D program collaborated with partners at the LCCs to develop scientific applications and decision support tools to provide resource managers and scientists with means to address questions on impacts of climate and land use change. In 2011, the Climate R&D program is collaborating with the National Integrated Drought Information System to initiate a weekly web-based briefing for more than 150 drought information users and water providers. This provides a succinct review of the most up-to-date climate and water observations and forecasts available, culminating in a discussion on how to best represent drought conditions in each basin. The Climate R&D program also is to collaborating with NOAA to apply the results of climate model simulations, ecological studies, and decision analysis for trans-boundary issues in the Methow Valley in Washington. As a result, more than a dozen local partners have tools to address the availability of water (rain and snow) in relation to agricultural needs, endangered fish, and winter recreation and how this availability affects their livelihoods and their quality of life. This analytical approach will be adapted to other questions posed by LCC partners and other parties to integrate research conducted by the USGS and external collaborators to provide decision support for resource management needs.

Anticipated collaborations in 2012 will:

- Build decision-support tools and extension programs to help resource managers develop adaptive management strategies for changes in climate and land use. These tools use probabilistic relationships among critical variables to provide a spectrum of decision options designed to address management needs of specific regions;
- Evaluate time series analyses of climate, hydrologic, and ecologic data sets with regard to specific natural resource questions expressed by field managers;
- Collaborate with NOAA to apply nested climate models and related downscaling methods to management issues of the Great Northern LCC and near-shore management at the Farallon National Wildlife Refuge; and
- Provide expertise to the new DOI CSCs in the development of decision-support tools. SADS will provide both computer-based systems expertise and an extension education perspective.

Climate Effects Network – The CEN is a collaborative effort among environmental scientists to provide the long-term and spatially-extensive data essential to forecast the effects of climate change on ecosystems, natural resources, and societal infrastructure. In 2010, the CEN

completed development of a new remote sensing method for monitoring and mapping ecosystem changes over the past decade across the landscape. This method was developed by the CEN in the Yukon River Basin and was further implemented in the desert, alpine, and grasslands regions of the West. The resulting maps are used and further developed by the BLM and support NPS and FWS. This new monitoring capability was used to assess pre-fire grazing as part of a multi-agency team evaluating the Murphy Complex Fire in Idaho and Nevada. It is also used to assess invasive species and monitor cheatgrass die-offs in northern Nevada. Additional applications are being developed for the Upper Colorado River Basin and the Greater Platte River Basin.

In 2011, a national climate impacts data management system is being implemented to greatly improve data sharing and access among programs generating climate effects information. The development of new methods for mapping permafrost, glacier retreat, and ecosystem performance are being completed, and maps of recent ecosystem change in boreal forest, desert, alpine, and grasslands environments and permafrost thaw in the Yukon Flats National Wildlife Refuge are also being completed. These maps are being made available through the CEN access portal. Network design strategies developed at the national scale for carbon and sediment transport in rivers, soil carbon mapping, and river water quality as well as for future observations of ecosystem status and trends are being published, and contributions from the CEN to the development of ecosystem and hydrologic models completed.

Anticipated 2012 activities that will be focused in the Yukon River Basin include:

- Analysis of the fate of carbon, water, and habitat for migrating waterfowl and ungulates in the central Yukon River Basin as permafrost thaws; and
- Recommend network design strategies for the interdisciplinary, multi-scale observation and research of climate effects in the central Yukon River Basin based on CEN studies and new observing methods.

Coastal Vulnerability Forecasting – The USGS will invest in geospatial data, in the development of assessment and forecast modeling tools, and will further cement a partnership with the NPS, the FWS, and NOAA to develop decision-support tools for changing coastal conditions and vulnerability. These efforts will help coastal communities and coastal resource managers anticipate and respond to changes in the vulnerability of the coastal zone from persistent processes, extreme events, and climate change. This project activity complements the priorities and directions of the USGS Coastal and Marine Geology Program and will be implemented collaboratively with that program. In order to assess key needs, gaps and resources, a scoping study was conducted and several workshops were held with partners and stakeholders in 2010.

In 2011, the initial phase of the project continues with refinements in experimental design and data collection, process analyses, and data management and delivery. It is calibrating a three-dimensional groundwater flow model to be used in development of a Bayesian statistical framework to evaluate specific management questions on adaptations to sea level rise in the Assateague Island National Seashore.

In 2012, it is anticipated that this project will, with contributions from other USGS programs and in partnership with other Federal agencies:

- Provide key information that leads to easily-used and widely available products to assist coastal managers and decision makers in anticipating and responding to coastal change

due to storms, erosion, changes in groundwater hydrology, and other factors affected by sea level rise.

- Complete modeling analysis and results to further develop the statistical framework for application to a range of coastal systems throughout the Nation.

In Windley Key quarry, Florida Keys, a fossil coral reef records a higher-than-present sea level in the last interglacial period, about 120,000 years ago. The reef is about 5 meters (16 feet) above sea level, and the corals in it probably grew in water at least 3 meters (9-10 feet) deep. Thus, this reef records a geologically recent high-sea stand that was about 8 meters (26 feet) above the present. Such a high sea stand would require melting of substantial portions of the Greenland and West Antarctic ice sheets, indicating that both ice sheets might be vulnerable to future global warming.

Activity: Climate and Land Use Change
Subactivity: Climate Variability
Program Element: Carbon Sequestration

2010 Enacted: $10.1 million (12 FTE)
2011 CR: $10.1 million (12 FTE)
2012 Request: $14.3 million (24 FTE)

Budget Realignment

In 2010 and 2011, Carbon Sequestration is a program in the Global Change activity. In 2012, the program is proposed to move to the Climate Variability subactivity in the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Carbon sequestration is a method of securing carbon dioxide (CO_2) to prevent its release to the atmosphere and contribution to global warming as a greenhouse gas. Geological storage of CO_2 in porous and permeable rocks involves injecting high pressure CO_2 into a subsurface rock unit and displacing the fluid that initially occupied the pore space. Biological carbon sequestration refers to both natural and deliberate processes by which CO_2 is removed from the atmosphere and stored as carbon in vegetation, soils, and sediments. Currently, there is no quantitative, probabilistic assessment of the national potential for geologic or biologic sequestration.

EISA (P.L. 110-140) called for the USGS to develop a methodology for and complete a national assessment of geological storage capacity for CO_2. It also required the Secretary of the Interior to complete a quantitative national assessment of the carbon stored in and released from ecosystems. USGS efforts to meet these requirements are undertaken through this program.

Geological Storage of Carbon Dioxide – In 2010, the USGS published the final assessment methodology to estimate carbon sequestration storage potential suitable for uniform application to geologic formations across the United States. The USGS methodology to assess the CO_2 storage resource of individual storage assessment units in the sedimentary basins of the United States is a geology-based, probabilistic methodology.

The USGS is assembling multi-disciplinary teams to address challenges related to assessing sequestration potential. For example, a critical issue when evaluating storage resources is the integrity and effectiveness of the seal that will retain the CO_2. In January 2010, the USGS and Stanford University co-sponsored a participatory workshop on Seals and Caprocks in Geologic Carbon Sequestration. This workshop brought together scientists with expertise in petrophysical, geological, hydrological, and geochemical properties of caprocks and seals for water and petroleum retention with scientists concerned with carbon capture and storage for CO_2 storage and retention in geologic strata.

Activities in 2011, 2012, and 2013, will focus on conducting the national assessment, estimating the CO_2 that can be stored in the technically accessible pore volume in oil and gas reservoirs and saline formations. In addition to the assessment activities, complementary research

activities will be undertaken, including studying the geologic controls on storage capacity such as injectivity, factors associated with enhanced oil and gas recovery and CO_2 storage potential, issues related to storage of CO_2 in coal beds, and statistical relationships between storage assessment units, volumetric parameters, and aggregation to a national scale.

Biological Storage of Carbon Dioxide – Biological carbon sequestration refers to both natural and anthropogenic processes by which CO_2 is removed from the atmosphere and stored as carbon in vegetation, soils, and sediments. Biological carbon storage is susceptible to disturbances such as forest fire, and changes in climate and land use and land cover. Improved biological sequestration may be accomplished through forest and soil conservation practices that enhance the storage of carbon (such as restoring or establishing forests, wetlands, and grasslands) or reduce CO_2 emissions (such as reducing agricultural tillage and managing wildfires strategically). The capacity of ecosystems to sequester additional carbon is uncertain and the potential future vulnerability of biological carbon storage is difficult to predict. Decisions about biological carbon sequestration require careful consideration of priorities and tradeoffs among multiple resources. Assessment of biological carbon sequestration resources will require quantifying the factors that control potential capacities of sequestration and providing information that can be used in complex resource management decisions and policies.

USGS science data, methods and models provide a national capability to estimate existing and potential carbon sequestration capacity and greenhouse gas fluxes in a manner that is directly applicable to land management and land use policy needs. The specific technical components of the national assessment include remote sensing of land conditions, land cover mapping and land change forecasting, mapping and forecasting future wildland fires, biogeochemical analysis, and validation and uncertainty analysis. National assessment products include digital maps and reports providing estimates of carbon stocks, rate of sequestration, and greenhouse gas fluxes for different ecosystems and regions of the Nation. The effects of climate and land use change on carbon storage will also be analyzed. Interior's extensive land and resource management experience provides an essential practical context for applying information about potential rates and capacities of carbon storage in ecosystems. The USGS will continue to work with partners to prioritize areas and ecosystems most promising for managed sequestration or most at risk for rapid loss of carbon. These areas and ecosystems will have highest priority for initial implementation of the national assessment.

In 2010, the USGS published the final assessment methodology for biological carbon sequestration and greenhouse gas flux in ecosystems for uniform application across the United States. During the first stages of the assessment conducted in 2011 and 2012, particular emphasis will be placed on evaluating effects and effectiveness of land change and management/policy options on carbon sequestration in ecosystems.

Program Performance

National Geological Carbon Sequestration Assessment – The final assessment methodology was published in 2010 and has formed the basis upon which the national assessment will be conducted. Application of the new geological sequestration assessment methodology to evaluate the Nation's potential resource of geological storage began in late 2010. Assessment activities underway, beginning in 2011, and continuing through 2012 and beyond include efforts to:

- Produce a digital map of U.S. sedimentary basins with the assessment unit boundaries;

- Produce a review of the carbon sequestration potential in oil and gas fields in the United States;
- Produce a summary of the state of knowledge concerning the use of coal beds as a potential reservoir for the long term storage of CO_2;
- Produce a report on the statistical methodology for the aggregation of USGS CO_2 assessment results; and
- Conduct the national assessment—a three-year effort.

Biological Carbon Sequestration – The development of the assessment methodology for biological carbon sequestration and greenhouse gas flux in ecosystems was completed in 2010 and published in November 2010. The application of the peer-reviewed and public-commented assessment methodology to evaluate the Nation's ecosystems for carbon storage and reduction of greenhouse gas fluxes began in January 2011.

In 2011 and 2012, the USGS will apply a scientific framework to analyze natural and anthropogenic effects on long-term carbon storage, sequestration, and vulnerability of releasing carbon into the atmosphere. Within this framework, the USGS will use an extensive set of measured and observed data including field inventory data, land management data, and land change trends (including wildfires). The USGS will use these datasets as input data to run land use, biogeochemical, and hydrological models to generate carbon and greenhouse gas flux estimates for forests, wetlands, grass and shrub, cropland, and aquatic ecosystems.

Assessment activities underway, beginning in 2011, and continuing through 2012 and beyond include efforts to:

- Produce a national map showing baseline carbon (C) stocks for the forest and wetlands ecosystems for the conterminous United States (CONUS);
- Produce USGS reports and Geographic Information System maps for central, western, southeastern, northern, and northeastern U.S. regions, showing estimates of C stock and sequestration trends and capacities by ecosystems, estimates of greenhouse gas (GHG) flux in and out of the ecosystems, and analysis of contributions of natural and anthropogenic controlling processes in the terrestrial ecosystems (forests, shrub/grass, wetlands, croplands);
- Publish reports of the CONUS providing estimates of carbon lateral flux and emissions of GHG through river systems, coastal carbon sequestration in relation to nutrient flux and local productivity, and carbon production and burial in lakes and impoundments for the aquatic ecosystems (rivers, lakes, impoundments, estuaries, and coastal waters); and
- Publish USGS reports providing estimates of GHG emissions from lakes and impoundments in CONUS, carbon lateral fluxes to coastal waters in CONUS focusing on upstream areas and contributions of land management activities, and carbon lateral transport in Alaska for the aquatic ecosystems.

This page intentionally left blank.

Activity: Climate and Land Use Change
Subactivity: Climate Variability
Program Element: Science Support for DOI Bureaus

2010 Enacted: $5.0 million (8 FTE)
2011 CR: $5.0 million (8 FTE)
2012 Request: $8.9 million (24 FTE)

Budget Realignment

In 2010 and 2011, Science Support for DOI Bureaus is a component of the Wildlife: Terrestrial and Endangered Resources and Status and Trends of Biological Resources programs in the Biological Research and Monitoring subactivity of the Biological Resources activity. In 2012, this component is proposed as a program in the Climate Variability subactivity of the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Climate change presents significant management challenges to Interior. From trust species and refuges, to the Nation's national parks and public lands, the USGS provides improved scientific foundations on which the FWS, the NPS and the BLM can base management decisions in response to the effects of climate change.

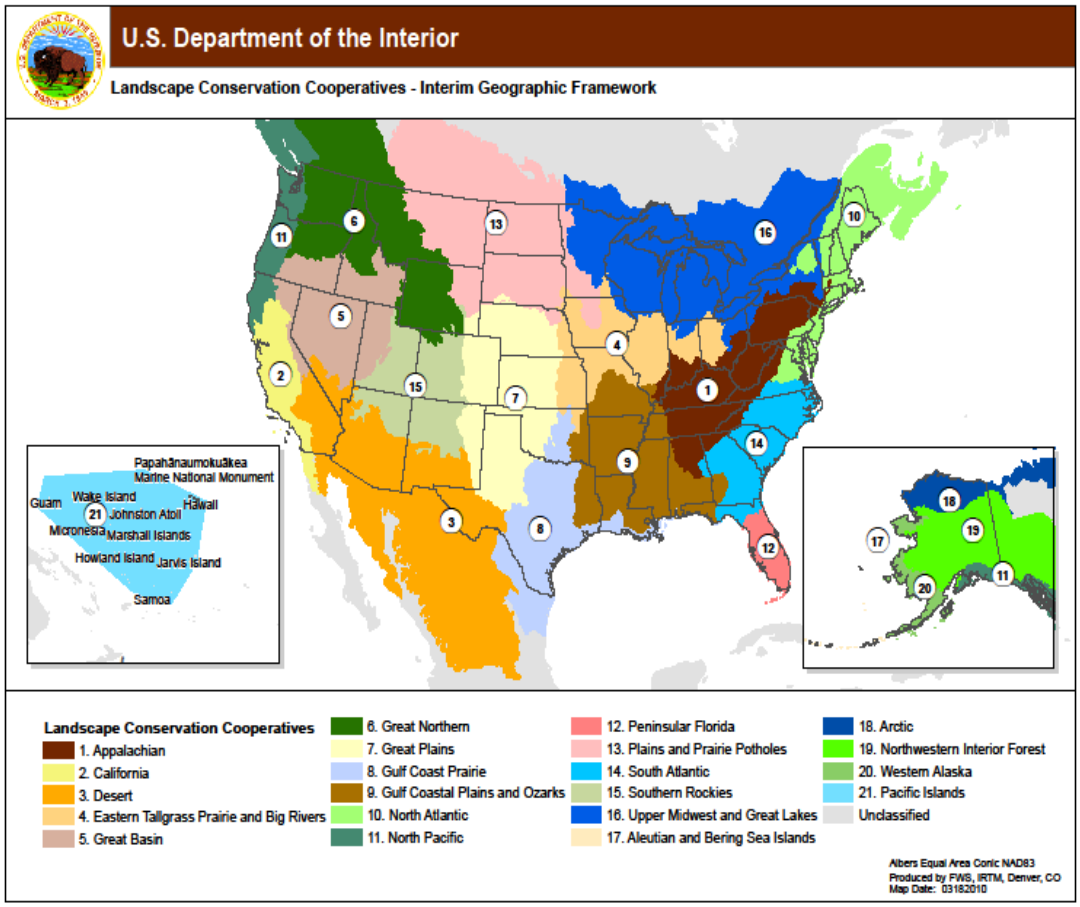
The USGS provides the ability to model current and projected physical and biological changes across extensive landscapes and aquatic systems with studies of ecosystem and population processes. The USGS can provide a multi-scale approach that will integrate large-scale global change information with more local information relevant to resource managers, thereby supporting adaptive management for fish and wildlife in the face of climate change. The USGS is working to strengthen population and ecosystem modeling capacity at regional and local levels, better integrate remotely-sensed and other existing datasets, standardize monitoring protocols, improve large-scale syntheses, and expand analytical support for Federal, State, and tribal resource managers.

The USGS will continue to provide ecological and population modeling capacity to the LCCs. USGS support for the LCCs benefits all Interior Bureaus, as well as other Federal, State, tribal, academic and private ecoregional fish, wildlife and land conservation efforts by providing integrated ecological and population modeling capacity across national efforts. Examples of 2011 activities coordinated with relevant LCCs include:

- Assessing vulnerability to climate change in the Upper Flathead River (MT) Basin;
- Developing consistent datasets to support the Great Northern LCC;
- Projecting climate and land cover effects on greater sage grouse; and
- Forecasting how changes in stream flow and temperature will affect trout populations in the eastern United States.

The FWS, the BLM, and the NPS have identified a number of high priority issues that transcend specific LCCs. These include science support for adaptive management, structured decision making and other strategic and tactical research to meet the priority information needs identified

by the FWS. NPS priorities include research on climate change adaptation and ecosystem change in parks, and other high priority biological research, monitoring, and technical assistance, and the BLM has identified nonforest fire research and ecoregional assessments of western systems.



Program Performance

Support for LCCs/Interior Bureau Science Needs – USGS climate science support will take a variety of forms, depending upon the LCC and Bureau needs. USGS climate change research, data management, modeling, and tool development can be employed to inform new Federal, State, tribal, and private management strategies for terrestrial and freshwater fish and wildlife species. For the initial eleven LCCs established in 2010 (Arctic, California, Great Basin, Great Northern, Great Plains, Gulf Coastal Plains and Ozarks, North Atlantic, North Pacific, Pacific Islands, Plains and Prairie Potholes, and South Atlantic LCC – see map), the USGS provided dedicated research scientists and other support to respond to research needs identified by each LCC. In addition, USGS efforts to support the LCCs included funding for development of database tools to deliver necessary information to LCC staff easily, inexpensively, and quickly.

The USGS will use these funds to provide direct support to the FWS, the NPS and the BLM either through the LCC science network or through existing partner-driven funding programs in the USGS, such as the natural resources preservation program. Planned activities in 2011 include:

- Expanding USGS research support to cover all 21 planned LCCs;
- Supporting LCCs in providing the framework to identify and design the monitoring for fish and wildlife resources vulnerable to climate change;
- Describing landscape-specific adaptation strategies for managers to use in developing new resource management scenarios; and
- Developing new strategies to protect and restore coastal and marine resources under climate change and sea level rise conditions.

In 2012, resources will continue to be applied to high priority issues as identified through Bureau and LCC processes, and thus will enable the USGS to continue to address the scientific needs of our partners and the LCCs to allow natural resource managers to plan for adaptation to climate change.

This page intentionally left blank.

Activity: Climate and Land Use Change
Subactivity: Land Use Change
Program Element: Land Remote Sensing

2010 Enacted: $63.7 million (145 FTE)
2011 CR: $63.7 million (145 FTE)
2012 Request: $22.0 million (107 FTE)

Budget Realignment

In 2010 and 2011, LRS is a subactivity in the Geographic Research, Investigations, and Remote Sensing activity. In 2012, this subactivity is proposed as a program in the Land Use Change subactivity in the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Nation's economic and environmental vitality and security interests rely on continuous observations of the Earth's land surface to understand changes on the landscape at local, regional, and global scales. Through the passage of the Land Remote Sensing Policy Act of 1992 (P.L. 102–555) Congress endorsed the need for continuous monitoring of the Earth and maintaining a readily available record of information displaying the status of its resources and environment. The USGS is meeting this need by providing, on national and global scales, high-quality images acquired by cameras and other remote-sensing instruments flown on aerial and space-borne platforms. This work ensures a comprehensive record of land surface data is available for environmental and economic decision making. This mission contributes to the Interior strategic plan goal.

As a world leader in managing a remotely sensed data archive, the USGS is responsible for ensuring these data are readily and easily accessible to users. Today, the USGS archive at its Earth Resources Observation and Science (EROS) Data Center in Sioux Falls, SD, holds more than 107,000 rolls of film containing over 13 million images of aerial and satellite imagery. In addition to digitally scanned versions of this film, the archive holds a large volume of other digital images, totaling four petabytes. (A single petabyte is equal to 1000 terabytes or one quadrillion bytes of information.) The USGS estimates unprecedented growth in the archival volume of satellite data to over five petabytes by 2013.

The LRS program works with film and digital land image data acquired through various kinds of remote-sensing technology operated by commercial, Government, and foreign sources, including new or experimental sensors, such as Light Detection and Ranging (LiDAR) and Synthetic Aperture Radar (SAR), to further understand how these technologies can support emergency response and environmental, economic, and security activities. The USGS also operates the Optical Science Laboratory in Reston, VA, that provides the only calibration of aerial film cameras in the country and a research laboratory at EROS Data Center that examines emerging digital aerial and satellite technologies.

Program Performance

This program has three components: Long-Term Data Preservation and Access, Remote Sensing Research and Applications, and Civil Applications Projects.

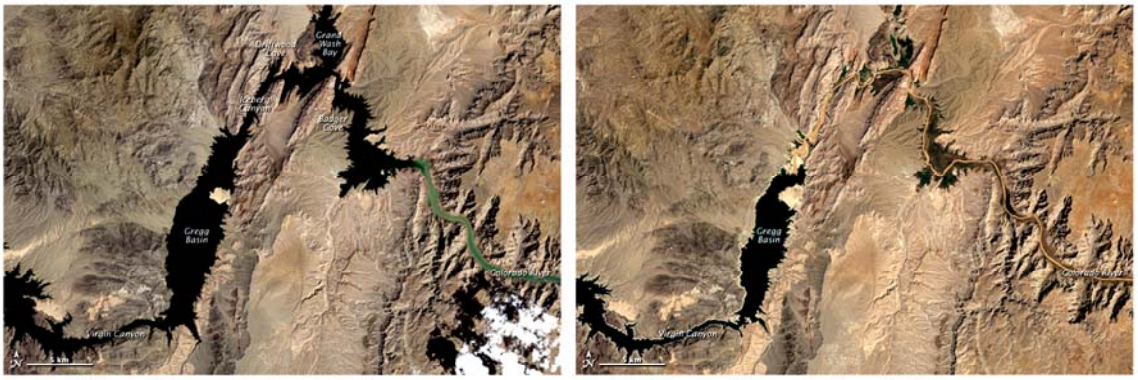
Long-Term Data Preservation and Access
(2010 Enacted, $8.2 million; 2011 CR, $8.2 million; 2012 Request, $7.3 million)

The Land Remote Sensing Policy Act of 1992 directed Interior to establish a permanent Government archive of satellite remote sensing data of the Earth's land surface called the National Satellite Land Remote Sensing Data Archive (NSLRSDA) and make its holdings readily available to the public. The NSLRSDA is a comprehensive, permanent, and impartial record of the planet's land surface derived from nearly 40 years of satellite remote sensing. Only with satellites is it practical to understand, on a global scale, such developments as deforestation, desertification, some kinds of environmental contamination, and natural hazards.

USGS long-term archiving activities in 2011 and 2012 will:

- Organize and ingest data for metadata generation and appraise and assess new candidate data sets;
- Manage newly acquired collections and review and dispose of historical collections as appropriate;
- Web-enable historical datasets for no-charge electronic distribution in order to better provide scientific and public users with data and imagery tailored to their needs;
- Operate and maintain systems to process and ingest satellite imagery for the historical record;
- Operate and maintain film and digital archives and ensure long-term preservation of archival holdings, as well as improving public access to all archive holdings through continued digitizing of USGS historical film collections;
- Conduct long-term data-preservation activities such as transcribing entire data sets from obsolete to current storage media; and
- Develop and begin executing a plan for transferring data sets into the NSLRSDA, including those from NASA's Terra and Aqua satellites, plus commercial and foreign data sets.

Continuous Provision of Landsat-type Data – Although Landsats 5 and 7 are both well beyond their design lives and could fail at any time, USGS projections indicate that sufficient fuel remains on both spacecraft to preclude a Landsat data gap, provided that Landsat 8 launches in December 2012. Although it is not possible to obtain alternate sources of data identical in every way to Landsat, the USGS receives Satellite Pour L'Observation de la Terre (SPOT) data at the USGS EROS Data Center through direct downlink during SPOT 4 and 5 overpasses. By September 2010, nearly 50,000 scenes were available for user perusal and download from the USGS Web site (*http://earthexplorer.usgs.gov/*), and over 14,000 scenes were downloaded, with more anticipated as the user community learns of these data. The USGS continues to negotiate access to foreign moderate-resolution data, such as the European Space Agency's Sentinel-2 data, to also mitigate the effects of a potential Landsat data gap.



Lake Mead, NV: Landsat 5 image acquired August 22, 1985

Lake Mead, NV: Landsat 5 image acquired August 11, 2010

Landsat data reveal stark changes on the landscape that can affect an entire region. Lake Mead's drop in water level is revealed in this Landsat image acquired August 11, 2010 (right) versus an earlier observation acquired August 22, 1985 (left).

International Coordination and Collaboration – In addition to providing national leadership for land imaging, the USGS also continues its role as a leader in remote sensing science and technology in the international arena by providing remote sensing support for disaster response, as well as playing a lead role in international Earth observation efforts. The USGS serves as the lead U.S. agency to the International Charter (Charter) for "Space and Major Disasters." The Charter is an organization that provides a unified system of emergency data acquisition by many international satellite systems and delivery to those affected by natural or anthropogenic disasters.

The Charter provided remote sensing data to a total of 292 activations in 2010 in response to major disasters world wide. The Charter continues to broaden and improve its disaster response capabilities. In 2010, four new member agencies from Brazil, Korea, Germany, and Russia joined the Charter. It also works with global and regional partners such as the United Nations, the Group on Earth Observations, and the Sentinel Asia program to expand access to satellite-derived disaster data and information products. One of many successful examples was the Charter's response to the massive flooding and humanitarian needs in Pakistan that began in July 2010. During the span of the flooding, Pakistani authorities received more than 500 images that were used to provide maps that detailed flood extent, damaged houses, bridge inventory, and crop damage.

The Charter was activated on January 13, 2010, in response to the Haitian earthquake. The USGS provided support to various response activities by coordinating commercial and civilian satellite acquisitions and hosting the satellite imagery and aerial photography collected by many different sources on the Hazards Data Distribution System. Approximately four terabytes of imagery were made available, resulting in over 54 terabytes being downloaded by many users, including first responders.

During 2011 and 2012, the USGS will continue leadership and international coordination activities through its participation in the Committee on Earth Observation Satellites (CEOS). The USGS has the lead role in development of a prototype for the "Land Surface Imaging Virtual Constellation"—a CEOS action for the Global Earth Observation System of Systems initiative. This activity serves to coordinate civil space-borne observations of the Earth through international coordination and data exchange in order to optimize societal benefit on a global scale.

Survey of Landsat Users Demonstrates Value of Landsat Data – To better understand the users, uses, and societal benefits of Landsat imagery, the USGS conducted a survey of over 2,500 U.S. based users of this imagery in the fall of 2009 through the summer of 2010. The survey disclosed that Landsat imagery is used by academic institutions, private businesses, non-profit organizations, and all levels of Government and is used at multiple scales from local to global in locations around the world. More than 80 percent of survey respondents find Landsat important to their current work and have plans to increase or maintain their use of Landsat in the next five years. Complete results of the survey will be published in an upcoming report scheduled to be completed in early 2011.

Remote Sensing Research and Applications
(2010 Enacted, $6.7 million; 2011 CR, $6.7 million; 2012 Request, $6.4 million)

The LRS program conducts and sponsors research in remotely sensed land data collection, access, distribution, and applications. Scientists and engineers investigate new types of satellite systems and sensors, study new data sources, develop new data acquisition programs and sources, and assess the potential for innovative data applications. The Remote Sensing Research and Applications component is seeking new ways to make remotely sensed data products more accessible and to expand and enhance the overall use of remotely sensed data and remote sensing technology. Below are examples of ongoing remote sensing research that will continue in 2011 and 2012.

Essential Climate Variables – The USGS is developing plans and strategies for creating fundamental climate data records and essential climate variables from the Landsat data archive to enable studies of long-term global change. Landsat data are particularly important as long-term climate data records because the measurements are at a scale that allows differentiating natural from human-induced influences for land cover change. The value of this record for understanding global change and adapting or mitigating the impacts of a changing Earth is clearly expressed in the USGCRP's strategic science plan.

The Potential of LiDAR – The USGS is currently expanding the availability and consistency of LiDAR data to address some of the Nation's most pressing climate, infrastructure, and environmental issues. The USGS LiDAR Advisory Committee has established a set of data specifications for new LiDAR procurements to ensure that data benefits mapping and science applications in the USGS and with USGS partners. The committee will convene a USGS conference in 2011, to conduct a comprehensive review of LiDAR's ability to advance USGS strategic science objectives. The USGS relies heavily on LiDAR technology for *The National Map* and uses LiDAR in many specialized science projects from detecting geologic faults to characterizing habitats and ecosystems. Members of the committee met with the National Geospatial Advisory Committee, the Federal Geographic Data Committee and a variety of other Federal, State and industry stakeholders to discuss a national LiDAR program concept.

Radar Applications Development – The USGS is using state-of-art SAR and interferometric synthetic aperture radar (InSAR) technologies and transferring satellite radar remote sensing into Bureau wide applications. Current efforts include monitoring of natural and anthropogenic hazards, such as volcanoes, earthquakes, landslides, land subsidence, and mining, etc., plus identifying landscape characteristics, such as wetland and flood mapping. Fundamental research and technologies are also underway for mapping and monitoring the Nation's ecosystem functions, water availability, natural hazards, and climate changes in the coming decade.

Climate Change Observation – Several recent studies report that changing climate at high latitudes impacts lakes, causing an increase in lake drying. If permafrost continues degrading in a warming climate, researchers expect many lakes to decrease in size until they eventually disappear. Many of the recent studies that documented decreases in surface water were based on temporally and seasonally limited remotely sensed measurements. Since many lakes and wetlands have high seasonal or annual variability, this study measured the surface water at 20 dates from a single source, Landsat. The 20 Landsat scenes capture surface water throughout the growing season during a 30-year period, from 1979 to 2009. The study found that during this 30-year period, over 96 percent of lakes did not significantly change in size.

Monitoring Burn Severity – The USGS EROS Data Center and the USFS Remote Sensing Applications Center share responsibility to carry out the mandate of the Monitoring Trends in Burn Severity (MTBS) project to map and assess all large fires that occurred in the United States since 1984. 2010 marked the last year of a five-year agreement to implement the program. At the end of 2010, over 14,000 fire assessments were available at the MTBS Web site (*http://mtbs.gov/*).

The USGS free Landsat data policy has advanced the MTBS project. Using automated techniques, all previously mapped fires throughout the United States were assessed to flag fires that need a second look to confirm the suitability of image pairs, burn severity thresholds, and perimeters. For the USGS, about 1,000 fires were flagged, reviewed, and revised as necessary. Similarly, a review of MTBS products created for the Southeast revealed that a change in assessment protocol was needed. Vegetation in the southeast grows so quickly that most fires require an “initial” assessment as soon as possible after the fire, rather than an “extended” assessment up to a year later. This change of strategy required that hundreds of previously mapped fires be revised. The free Landsat data policy makes revision economically feasible and new assessments more reliable.

A five-year follow-on agreement was signed to continue MTBS activities until 2015 to include yearly updates of fire assessments and extending the satellite-derived historical fire record back to the early 1970s using Multispectral Scanner imagery from Landsats 1, 2, and 3.

Civil Applications Projects
(2010 Enacted, $8.7 million; 2011 CR, $8.7 million; 2012 Request, $8.7 million)

National Civil Application Program – The National Civil Application Program (NCAP) serves USGS science programs and other Federal civil agencies by providing for the acquisition, dissemination, archive, and exploitation of classified remote sensing systems and data to address land and resource management, environmental, socioeconomic, hazards, disasters, and other geospatial scientific analysis and policy issues. In addition, NCAP provides support for the Civil Applications Committee (CAC), an interagency committee that provides coordination and oversight of Federal civil use of classified collections.

The USGS has fulfilled the lead Federal Government responsibility for the civil application of classified data since the 1960s. The project funds two secure facilities, in Reston, VA, and Denver, CO, which support the complex infrastructure of security precautions and information technology (hardware, software, networks, etc.) necessary to enable the dual use of classified systems and capabilities. NCAP serves as a key point of entry for the civil community to gain access to the significant resources the Intelligence Community has dedicated in areas such as: technology transfer and awareness of advanced image processing and analysis techniques; information technology; sensor research; and applications development.

In 2011 and 2012, NCAP will address geospatial requirements associated with Federal lands management and preparation for, mitigation of, response to, and recovery from hazards and other emergencies. NCAP also supports the preservation of a long-term record of classified Earth observations, which are useful for scientific evaluation of global dynamics, such as climate variability and change. Through NCAP, the USGS provides decision makers with the best available, scientifically sound information based on the awareness, utilization and synthesis of all classified, open source, and governmental remotely sensed data.

Civil Applications Committee – CAC is an interagency committee that was chartered in 1975 to foster access to and assure proper use of national systems data in support of civil agencies' mission responsibilities. Since its inception, CAC has facilitated access to, and overseen the use of, classified National Technical Means assets by its members in support of traditional mapping applications, as well as a broad range of resource management, environmental, climate, natural disaster, and remote sensing applications. CAC is operated and staffed by the USGS on behalf of Interior. CAC has a membership of six Cabinet-level Departments and six Federal agencies. In 2011 and 2012, CAC will continue to:

- Foster information sharing for the civil community and seek to provide CAC members access to the skills and information necessary to protect and maximize the use of assets;
- Facilitate relationships between the Civil and the Intelligence communities to identify and document their requirements; and
- Expand a monthly inter-community forum for technology and information exchange to a broader audience.

Activity: Climate and Land Use Change
Subactivity: Land Use Change
Program Element: Geographic Analysis and Monitoring

2010 Enacted: $11.1 million (67 FTE)
2011 CR: $11.1 million (67 FTE)
2012 Request: $11.5 million (66 FTE)

Budget Realignment

In 2010 and 2011, GAM is a subactivity in the Geographic Research, Investigations, and Remote Sensing activity. In 2012, this subactivity is proposed as a program in the Land Use Change subactivity in the Climate and Land Use Change mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Earth's surface is rapidly changing, at local, regional, national, and global scales, with significant repercussions for citizens, the economy, and the environment. While some change is due to natural processes, such as volcanic eruptions, earthquakes, or drought, other land change, such as mining and forestry operations, agricultural practices, and urban growth, is human-induced. The GAM program studies land change by creating land surface datasets, identifying the change taking place, researching the impacts of the identified change, and developing tools and models allowing resource managers and communities adapt to changing conditions and make knowledgeable decisions regarding resource use and allocation. These tools and models are important components in reducing adverse impacts of economic development and reducing a community's risk to hazard events.

Approximately, one-half of GAM resources are devoted to developing and maintaining land surface datasets that provide the basis for environmental analyses and resource management. The National Land Cover Database (NLCD) is a major dataset that gets updated every five years to reflect the nation's changing landscape. Remaining resources are used to fund geographic research critical to:

- Understanding environmental consequences of land change and its impacts on the people, environment, economy, and resources of the Nation;
- Improving the scientific basis for vulnerability and risk assessments, as well as disaster mitigation, response, and recovery activities; and
- Developing necessary tools and methods to support resource allocation and decision making.

Program researchers use Earth observation data supplied by remote sensing platforms, in-situ environmental data, and socio-economic data to quantify rates of landscape change, identify key driving forces, and forecast future trends of landscape change. Studies are conducted within a geographic context at a range of scales to provide a comprehensive, interdisciplinary perspective. This perspective is necessary to understand threats impacting quality of life issues, such as climate change, natural disasters, and suburban sprawl.

Land cover, the biophysical pattern of natural vegetation, agriculture, and urban areas, is the product of natural processes and human influences. Land cover provides an indication of the availability and quality of natural resources, as well as a historical record of resource use. Consequently, comprehensive information about land cover is essential in a wide variety of investigations, such as assessing climate change, evaluating ecosystem status and health, understanding patterns of biodiversity, and informing land use planning and land management policy.

The GAM program collaborates with other USGS science programs, such as Biological Status and Trends, National Water-Quality Assessment, and National Biological Information Infrastructure. It contributes to Bureau initiatives, including the southern California Multi-Hazards Demonstration Project, as well as disaster response and assessments, such as those for the Gulf oil spill and Western wildfires. The GAM program supports the research objectives of the USGCRP and is an active participant in international global science initiatives.

Program Performance

The GAM program has two components: Land Change Science and Assessing Societal Vulnerability to Natural Hazards.

Land Change Science
(2010 Enacted, $6.0 million; 2011 CR, $7.2 million; 2012 Request, $7.2 million)

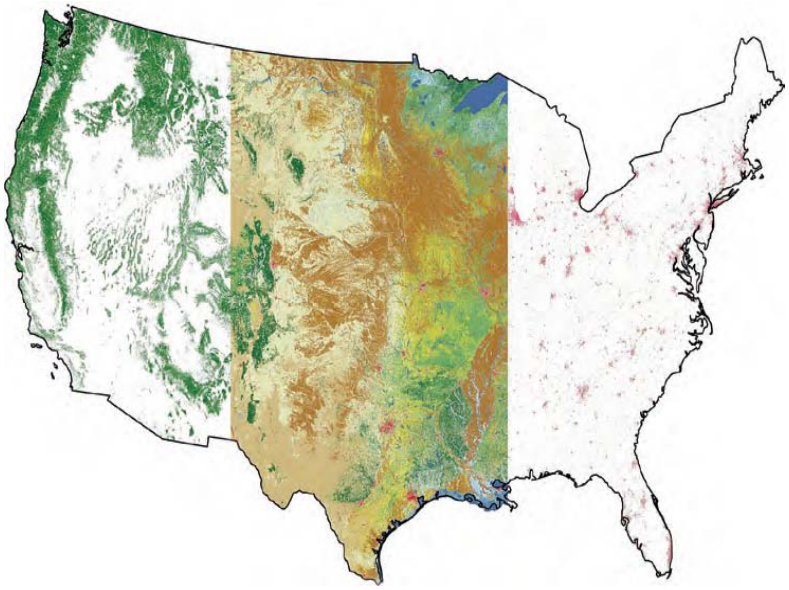
Land Change Science projects involve developing the geospatial data sets needed to evaluate landscape conditions, changes, and trends over time, as well as scientific investigations linking landscape changes to fundamental ecological, physical, chemical, and hydrologic processes. This includes identifying land cover (the NLCD), and other biophysical characterizations of the Earth's surface (ecosystems, vegetation condition, soils, phenology, etc.). It assesses major human and natural factors of change, incorporating but not limited to human infrastructure (i.e., roads), and socio-economic factors. These assessments include forecasting future environmental conditions in response to various land change scenarios. They also identify thresholds and tipping points of land changes and their impact on ecological processes and services (such as water filtration and carbon sequestration). The studies result in models, spatial metrics, and assessment tools that can be used to evaluate the consequences of landscape change at a range of spatial and temporal scales.

Recent examples of program efforts to evaluate the impacts of the Deepwater Horizon oil spill in the Gulf of Mexico include:

- Collaborating with Gulf Coast Sea Grant Programs to assess coastal community vulnerability to oil spills;
- Using Airborne Visible/Infrared Imaging Spectrometer hyper-spectral remote sensing data to identify hydrocarbon-induced vegetation stress and mapping impacted regions;
- Updating Louisiana Environmental Sensitivity Index maps, identifying coastal resources at risk; and
- Producing high-resolution coastal mangrove habitat maps identifying species composition, tree density and height.

Examples of ongoing research include:

The National Land Cover Database – The NLCD provides consistent public domain information on the Nation's current land cover characteristics. Much of this work is accomplished through USGS partnerships with Federal, State and local Government Agencies, private industry, and non-governmental organizations. The NLCD currently consists of three iterations of land cover data releases: a 1992 conterminous U.S. land cover (NLCD 1992); an updated 50-State/Puerto Rico U.S. land cover dataset (NLCD 2001); and a 2006 conterminous U.S. dataset (NLCD 2006). These comprehensive sets of scientifically credible land cover data are used to support thousands of applications in land management, environmental studies, modeling and policy decisions. All NLCD products are web enabled for download at the interagency Multi-Resolution Land Characteristics Web site at *http://www.mrlc.gov.* In 2010, full-scale production of the NLCD 2006 continued, and was completed in early 2011. This product uses imagery collected in 2006 and compares it to the NLCD 2001 data set to provide an update of where land cover has changed over the five-year period. During 2011, the USGS is working with Multi-Resolution Land Characteristics Consortium partners to conduct an accuracy assessment of the NLCD 2006 and begin efforts developing the next iteration (NLCD 2011). The USGS plans to initiate full-scale production of this data set in 2012.



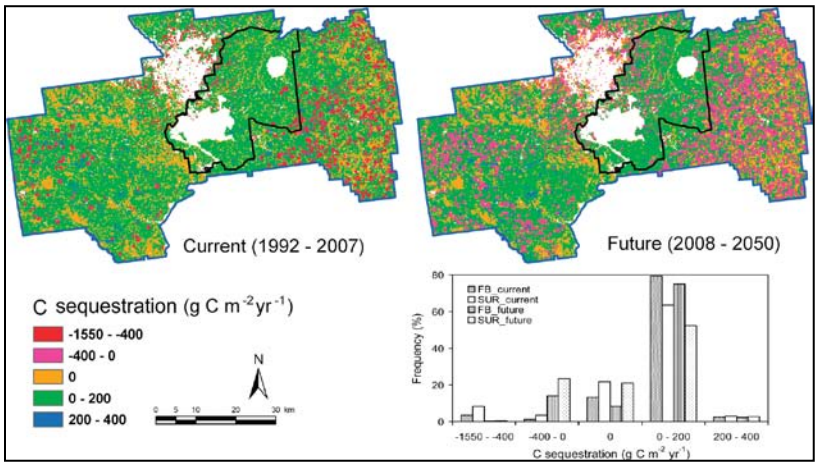
The outline of the contiguous United States displays the three land cover data layers for the NLCD product. Illustrating how data can be separated or combined, the graphic depicts various degrees of tree canopy in the west and urban imperviousness in the east. In the central States, 16 distinct classes of land cover are consolidated in a colorful mosaic with land cover data layers displayed. The NLCD contains multiple layers of precise data that can be built or deconstructed, merged with other types of data, and analyzed to answer questions about the Nation's land resources.

Regional Land Use Modeling – Land use modeling allows resource managers and local communities to evaluate the implications of resource allocation and conservation decisions. Land use modeling is challenging, given that landscapes and the drivers of change are unique in each geographic region. GAM researchers developed a flexible, scenario-based modeling system that facilitates modeling of land use change for a wide variety of applications, covering a range of spatial and temporal frameworks. In 2010, the modeling framework was used to produce both forecast and backcast land use projections for a large portion of the Western High Plains, resulting in consistent, annual land use maps representing change from 1950 to 2050. The framework was also used to produce scenario-based forecasts of land use change in a portion of the Southeastern United States from 2001 to 2050. The land use maps produced were used to analyze hydrologic processes, biogeochemical processes including fluxes of greenhouse gases, and biodiversity issues related to land use change. Researchers are now focusing on integrated modeling frameworks, directly linking the land use modeling framework

with biogeochemical, climate, and disturbance models. A significant focus for 2011 and 2012 is on understanding and modeling the potential for biologic carbon sequestration.

LANDFIRE – LANDFIRE is an interagency fire and fuel characteristics mapping program, sponsored by Interior and the USFS. This project produces consistent and comprehensive digital maps describing vegetation, wildland fuel, and fire regimes across the Nation. LANDFIRE provides nation wide wildland fuel datasets for use in decision making for fuel treatments (before fire), fire behavior modeling and decision support (during fire), and estimation of effects of fire (post-fire). In support of this effort, the USGS conducts various aspects of research related to wildland fire, including remote sensing, vegetation mapping, modeling land changes, and providing up-to-date fuel maps so that fire spread and fuel conditions can be estimated and understood for any location and any land ownership types. In 2010, the USGS LANDFIRE project began its Operation and Maintenance Refresh phase, with particular focus on developing ecosystem disturbance data (remote sensing-based change detection), developing vegetation succession classes, and fuel classes associated with disturbed lands. These data will provide information on areas of disturbance and management activities that have resulted from landscape change and these data will be incorporated into a new updated base map for the Nation. Efforts in 2010 will update the original 2001 base map to reflect landscape change through 2008. In 2011 and 2012, the USGS will continue to provide analyses that will refine and improve programmatic processes and update LANDFIRE base maps to reflect landscape change through 2010.

Modeling Carbon Dynamics on Military Installations – Land use activities can have a major impact on the temporal trends and spatial patterns of regional land-atmosphere exchange of carbon. Federal lands generally have substantially different land management strategies than surrounding areas, which have consequences on the amount of carbon being stored. Using the Fort Benning installation as a case study, GAM researchers used the General Ensemble Biogeochemical Modeling System to simulate and compare ecosystem carbon sequestration between the Fort Benning and surrounding areas from 1992 to 2050. Results indicate that the military installation sequestered more carbon than surrounding areas from 1992 to 2007, and is projected to continue sequestering more carbon from 2008 to 2050, mostly because of the proactive management approaches adopted on military training lands. These results suggest that Federal lands might play a positive and important role in sequestering and conserving atmospheric carbon because anthropogenic disturbances (e.g., urbanization, forest harvesting, and agriculture) can be minimized or prevented on Federal lands.



This research activity on carbon sequestration on military land provides foundation to the national carbon sequestration assessment.

Assessing Societal Vulnerability to Natural Hazards
(2010 Enacted, $4.6 million; 2011 CR, $4.5 million; 2012 Request, $4.5 million)

These scientific investigations use models, sensitivity analyses, geographic distributions of people and infrastructure, and probability of specific disturbance factors occurring, to evaluate a community's vulnerability and risk. The GAM program helps State and local governments by augmenting their traditional expertise in natural hazards with improved capacity to assess vulnerability, defined here as the exposure, sensitivity, and resilience of a community. These projects include case studies, interpretative assessments, and science impact studies involving stakeholders and other clients in collaborative processes.

In 2011, USGS efforts are aiding Pacific Northwest coastal communities in understanding adaptation options for and potential societal consequences of coastal-erosion hazards enhanced by changing climatic conditions, such as progressive increases in storm intensities, extreme wave heights, and sea level rise. Lessons learned here will support coastal communities throughout the Nation that must prepare locally to mitigate the impacts of climate change. Coastal communities must also plan for catastrophic hazards such as tsunamis. To reduce the potential for significant life loss from future events, the USGS is using high-resolution elevation and land cover data to model and map pedestrian-evacuation potential in Pacific Northwest coastal communities threatened by local tsunamis. This information is helping State and local emergency managers identify areas where vertical-evacuation options such as berms and elevated structures may be needed. The methods developed here can be transferred to other communities threatened by tsunamis, as well as other sudden-onset hazards such as volcanic lahars and flash floods.

Highlighted below are two projects which address vulnerability and risk to sea level rise:

LiDAR Elevation Data for Improved Identification of Lands Vulnerable to Sea level Rise – Maps of areas subject to potential inundation have great utility to planners and managers concerned with the effects of sea level rise. However, most of the maps produced to date are simplistic representations derived from older, coarse elevation data. In the last several years, large amounts of high-quality elevation data derived from LiDAR have become available. Because of their high vertical accuracy and spatial resolution, LiDAR data are an excellent source of up-to-date information for identifying and delineating vulnerable lands. GAM researchers evaluated four elevation datasets of varying resolution and accuracy to demonstrate that the use of LiDAR data leads to more precise delineation of coastal lands vulnerable to inundation.

Developing a Sea Level Rise Vulnerability Framework for South Florida – The GAM Program worked with local communities and universities in south Florida on conceptualizing and evaluating vulnerability and quality of life metrics in the context of sea level rise, and changing land development patterns. This work resulted in a workshop and a report on its conclusions. The main conclusion was that decision tools must fit into a broader planning and policy framework to be effective. Specific considerations are linkages among sea level rise, hydrologic modeling, land use changes at local scales, and local planning efforts. One challenge faced by local governments is incorporation of the human population's requirements for a sustainable high quality of life in the decisions and trade-offs necessary for sea level rise adaptation and vulnerability mitigation. Overall, the workshop demonstrated the importance of collaborative and coordinated efforts to continuously refine models and address scenarios that can benefit planning for sea level rise while maintaining human and ecosystem qualities and values.

This page intentionally left blank.

Activity: Energy, Minerals, and Environmental Health

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Mineral Resources ($000)		53,780	53,780	-696	-870	-8,050	44,164	-9,616
	FTE	*351*	*351*	*-3*		*-49*	*299*	*-52*
Energy Resources ($000)		27,237	27,237	-368	-477	1,000	27,392	155
	FTE	*151*	*151*	*-2*		*1*	*150*	*-1*
Contaminant Biology ($000)		9,411	9,411	-117	-199	-400	8,695	-716
	FTE	*64*	*64*	*0*		*-2*	*62*	*-2*
Toxic Substances Hydrology ($000)		11,084	11,084	-142	-275	-2,400	8,267	-2,817
	FTE	*87*	*87*	*-1*		*-13*	*73*	*-14*
Total Requirements ($000)		**101,512**	**101,512**	**-1,323**	**-1,821**	**-9,850**	**88,518**	**-12,994**
	Total FTE	***653***	***653***	***-6***		***-63***	***584***	***-69***

* Fixed costs and related changes include technical adjustments, management efficiencies, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Unrequested Congressional Action	-650	0
• Multi-Hazards Initiative (Minerals)	+50	0
• New Energy Frontier (Energy)	+3,000	+5
• Mineral Resources (Minerals)	-7,200	-49
• Mineral Resources External Research Program (Minerals)	-250	0
• Energy Resources (Energy)	-2,000	-4
• Contaminant Biology (Contaminants)	-500	-3
• Toxic Substances Hydrology (Toxics)	-2,500	-14
• Ecosystem Restoration (Toxics and Contaminants)	+200	+2
o Columbia River	[$200]	[+2]
TOTAL Program Changes	**-9,850**	**-63**

Justification of Program Changes

The 2012 Budget Request for Energy, Minerals, and Environmental Health is $88,518,000 and 584 FTE, a net program change of -$9,850,000 and -63 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Program Change

Unrequested Congressional Action **(-$650,000/0 FTE)**

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation. A list of these actions is located in the Budget at a Glance Section.

Multi-Hazards Initiative **(+$50,000/0 FTE)**

USGS will work with emergency responders to analyze demand for and supply of mineral commodities and other materials required to rebuild damaged infrastructure and analyze the impacts resulting from material shortages and assess the threat posed by large volumes of contaminated waters, soils, sediments, and other materials produced by natural and anthropogenic disasters.

New Energy Frontier **(+$3,000,000/+5 FTE)**

USGS research, modeling, and monitoring will assess the ecological impacts to fish and wildlife associated with the widespread development of wind energy. Ecological and geographic studies will examine impacts to fish and wildlife from direct strikes, habitat fragmentation, and construction and maintenance of infrastructure. The infrastructure needed for energy capture and transmission would include wind turbines and generating facilities as well as towers, cables, and roads, sea bed corridors, and boat traffic. USGS science will be directed towards studying causes and identifying solutions that will minimize risk to fish and wildlife and assess the ecological impacts of projected large-scale development of wind-farms in the Great Plains and offshore in the Atlantic. In addition, USGS science will provide technical support, establish a comprehensive data management structure, facilitate collaboration, and ensure long-term viability of information products that contribute to the Nation's understanding of the management and effects of wind energy. USGS efforts will begin in the Great Plains and offshore Cape Cod region, and will work toward developing an assessment methodology that can be applied Nation wide.

Mineral Resources **(-$7,200,000/-49 FTE)**

The Minerals Resources program includes activities to collect, analyze, and publish minerals information, analyze the geochemical properties of soil samples, conduct research on relationships between minerals and human health, and collect and analyze basic geologic and mineral deposit data in support of economic development. The proposed funding decrease would eliminate efforts related to international minerals information, analysis of soil samples across the United States between 2006 and 2010 that are used to replace a 30-year old soil survey of the United States, research on the relationship between minerals and human health, collection of basic geologic and mineral deposit data in Alaska, and research on the economic consequences of mineral deposits for the next National Mineral Resource Assessment, which is scheduled to begin in 2013. This reduction would delay soil sample analyses, including environmental information in the National Mineral Resource Assessment, and restrict the provision of minerals information to only domestic data.

Mineral Resources External Research Program **(-$250,000/0 FTE)**

The Mineral Resources External Research Program (MERP) is the only Federal source of grant funding for research outside the Federal Government to address key problems related to nonfuel mineral resources. The proposed funding reduction will terminate the MERP in 2012 and end support to States and universities to conduct this research.

Energy Resources **(-$2,000,000/-4 FTE)**

Since 1975, the Energy Resources Program's (ERP) State Cooperative Project has initiated and funded cooperative agreements with State geological agencies, focused primarily on coal resource data. State agency geologists collect and evaluate various types of geologic data that are critical to the States and the USGS for resource evaluation. The States enter the information into the National Coal Resources Data System, which is used for USGS coal resource assessments. Funding to more than 30 State agencies would be eliminated. While States may continue to collect this data, it would not be available in the National Coal Resources Data System. The ERP also conducts research, assessment, and environmental impacts of oil shale and unconventional gas resources. This reduction will delay work on on-shore U.S. Basins.

Contaminant Biology **(-$500,000/-3 FTE)**

Contaminant Biology activities focus on understanding the role of environmental drivers key to sustaining human and animal health. The proposed funding decrease would reduce research to assess impact of environmental contaminants (including endocrine disrupting chemicals) on human, animal, and ecosystem health. The decrease would reduce support for technical assistance on emerging issues and environmental disasters, such as the Deepwater Horizon oil spill. This funding reduction will eliminate monitoring and data collection used by States to meet National Water Quality Criteria under the Clean Water Act. Research activities would continue at a reduced level.

Toxic Substances Hydrology **(-$2,500,000/-14 FTE)**

Toxic Substances Hydrology activities include characterizing environmental contamination by pharmaceuticals, endocrine-active chemicals, pesticides, and other understudied and emerging environmental contaminants and their degradation byproducts. The proposed reduction would terminate projects in developing laboratory methods to measure emerging contaminants in various environmental sources; quantifying relative contributions of contaminants from various sources, including human- and animal-waste sources; assessing potential ecological health significance of contaminants in the environment; and assessing potential human exposure through drinking water from both domestic and public water supplies. Other Federal agencies would rely on existing information to protect the environment and drinking water quality and to approve the safe use of pesticides, pharmaceuticals, and other industrial chemicals.

Ecosystem Restoration **(+$200,000/+2 FTE)**

America's Great Outdoors is the President's signature conservation initiative and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. This Ecosystem Restoration initiative will help the President advance his America's Great Outdoors initiative. Listed below are the ecosystems targeted by this effort.

A description of the work proposed can be found in the Ecosystem Restoration initiative in the Key Changes Section.

- Columbia River +$200,000/+2 FTE

Activity Summary

The Energy, Minerals, and Environmental Health activity includes programs that conduct research and assessments on the location, quantity, and quality of the Nation's mineral and energy resources, including economic and environmental effects of resource extraction and use, and programs that conduct research on environmental impacts of human activities that introduce chemical and pathogenic contaminants into the environment and threaten human, animal (fish and wildlife), and ecological health.

The USGS is the sole Federal provider of scientific information for assessments and research on mineral potential, production, consumption, and environmental effects in the United States and around the world. The USGS conducts research to better understand energy resources, including non-traditional energy resources, and the environmental and human health effects of energy resource occurrence and use. The USGS also evaluates energy resource accumulation, distribution, and potential of the Nation and the world. Results of these mineral and energy studies, research, and assessments are provided to resource managers and policy makers to support informed policy and management decisions on resource use and assessing trade-offs and environmental risks.

The USGS is a lead Federal agency in providing information and tools to address occurrence, behavior, and effects of environmental contaminants, including impacts on susceptible ecosystems and implications for human, wildlife and fish health. This information includes identifying chemical and pathogenic environmental contaminants (pesticides, surfactants, human and veterinary pharmaceuticals, and other industrial and naturally occurring contaminants); developing methods to identify sources of environmental contamination and measuring those contaminants in habitats and biota; assessing toxicological significance of contaminant exposure to vulnerable organisms; characterizing effects on organisms exposed in susceptible environmental settings, including potential human exposure, and providing information on performance of best management practices and treatment alternatives. This information informs decision making by industry and the public and helps resource managers and policy makers: assess environmental risks; prevent contamination; license and approve chemicals; and manage, protect, and restore natural resources, contaminated lands, and important natural ecosystems, including trust resources of the Department of the Interior. These efforts complement other USGS programs by focusing on new and understudied issues and contaminants and by developing and improving methods to detect and characterize toxic substances in the environment.

Management Summary

Program Reviews – Portions of Energy Resources were reviewed by external technical committees in 2010. Each time a new assessment methodology is developed in Energy Resources, an external panel of technical experts formally reviews the methodology and approach. Energy Resources revises the methodology based on the review and does not consider a methodology final until it has received expert review. In 2010, Energy Resources had the following methodologies reviewed by external experts:

- Methodology to estimate carbon sequestration potential for uniform application to geologic formations across the Unites States;
- Methodology to assess reserve growth in oil and gas fields (assessment of both undiscovered resources and additions to reserves from discovered fields and reservoirs requires estimation of reserve growth); and
- Methodology to determine economically recoverable resources of unconventional petroleum resources (coalbed methane, tight gas sands, shale gas, shale oil).

Review of methodology to assess economically recoverable resources for unconventional petroleum will continue in 2011. Other methodologies, as they are developed, will be reviewed in 2011 and 2012.

Using guidance developed by the National Academy of Sciences Committee on Critical Minerals published in 2008, Mineral Resources identified 16 mineral commodities as the focus of the next National Mineral Resource Assessment. These commodities include metals and rare Earth elements needed for new energy and "green" technology development and industrial minerals important to agriculture. New mineral deposit and mineral environmental model development for these commodities continued in 2010. Deposit models are scheduled for completion in 2013; research on and development of mineral environmental models will be terminated in 2012.

Workforce Planning – Starting in 2011, the management structure of the USGS will be realigned along interdisciplinary mission areas outlined in the USGS Science Strategy. Prior to this realignment, the Energy and Mineral Resources programs, now included in the Energy, Minerals, and Environmental Health activity, were programs included in the Geology Discipline.

USGS updated the geology workforce strategy in 2009 and offered voluntary early retirement and separation actions in several critical areas during 2010 including the Central Region Mineral and Environmental Resources Science Center. While the organizational structure has changed, the 2009 plan can still inform workforce decisions until a new plan is in place.

Strategic Planning – The USGS has chartered Science Strategy Planning Teams charged with developing long-term (10 year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The strategic plans will provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that the USGS meets the goals of the USGS Science Strategy.

Energy, Minerals, and Environmental Health Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Mineral Resources							
% of targeted non-fuel mineral commodities for which up-to-date deposit models are available to support decision making (SP)							
Performance Data	7%	20%	53%	73%	93%	+20%	+7%
Total Actual/Projected Cost ($000)	8,920	12,712	13,147	14,945	15,000	55	0
# of systematic analyses and investigations delivered to customers							
Performance Data	3	3	4	3	3	0	-1
Total Actual/Projected Cost ($000)	14,100	14,700	17,300	30,100	10,300	-19,800	N/A
Actual/Projected Cost Per systematic analyses (whole dollars)	4,700	4,900	5,800	10,000	3,400	-6,600	N/A
Comments	A 14% cut in 2012 will require a significant reorganization of Mineral Resources Program's work, after the 49 FTE are terminated.						
# of formal workshops or training provided to customers							
Performance Data	6	6	8	6	3	-3	+1
# of mineral commodity reports available for decisions							
Performance Data	649	707	748	700	620	-80	0
Energy Resources							
# of USGS energy products accessed online (SP)							
Performance Data	5.08 million	8.24 million	6.89 million	5.00 million	4.50 million	-.50 million	0
Total Actual/Projected Cost ($000)	20,682	21,492	23,150	22,845	21,920	-925	0
Comments	A 7% decrease in 2012 will affect ERP's Strategic Plan measure of number of Energy products accessed online, by affecting number of gigabytes added, products produced, and enhancements of ERP's web site that delivers ERP information to customers. This affects short term (2012) and long term (2016) functionality and ability to grow (original long term target was 6.00 million, it is now 5.00 million). The primary vehicle for ERP information and data dissemination is through its web site. The measure, number of USGS Energy products accessed online, supports an end outcome of providing science and supporting knowledge transfer, and is built upon critical outputs --- systematic analyses, gigabytes collected, and outreach activities --- that collectively account for at least 80% of the total Program's funding.						
# of gigabytes collected annually							
Performance Data	1.173	17.6482	1.667	1.25	1.2	-0.05	-0.045
Comments	With the 2012 President's budget, USGS proposes to eliminate the NCRDS State cooperative program, thus eliminating addition of gigabytes to that database.						
# of systematic analyses and investigations completed							
Performance Data	5	6	5	5	4	-1	N/A
Total Actual/Projected Cost ($000)	12,300	11,244	13,750	13,750	13,750	0	NA
Actual/Projected Cost Per systematic analyses (whole dollars)	2,456,000	1,874,000	2,750,000	2,750,000	2,750,000	0	NA
Comments	A 7% decrease in 2012 will necessitate delaying finalizing some domestic resource assessments. Also, ERP is redefining (expanding) what it counts as systematic analyses and investigations. 2011 is a year of baselining, so targets for out years are still being developed.						
# of outreach activities provided to customers							
Performance Data	8	8	9	10	8	-2	N/A
Comments	A 7% decrease in 2012 will necessitate curtailment of activities resulting in fewer outreach events. Also, ERP is redefining (expanding) what it counts as outreach events. 2011 is a year or baselining, so targets for out years are still being developed.						

Energy, Minerals, and Environmental Health Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Contaminants							
# of emerging disease outbreak (contaminants and pathogens) investigations (SP)							
Performance Data	672	669	673	679	503	-176	+5
Total Actual/Projected Cost ($000)	11,089	11,433	11,138	11,604	8,596	-3,008	-683
Comments	Proposed $0.5M program reduction of base funding in 2012.						
# of systematic analyses delivered to customers							
Performance Data	104	73	72	87	55	-32	0
Toxics Substance Hydrology							
# of knowledge products on environmental contamination provided to support management decisions							
Performance Data	149	128	115	115	80	-35	-20
Total Actual/Projected Cost ($000)	13,500	10,800	11,100	10,800	8,300	-2,500	0

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

This page intentionally left blank

Activity: Energy, Minerals, and Environmental Health
Subactivity: Mineral Resources

2010 Enacted: $53.8 million (351 FTE)
2011 CR: $53.8 million (351 FTE)
2012 Request: $44.2 million (299 FTE)

Budget Realignment

In 2010 and 2011, Mineral Resources is a program in the Geologic Resource Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Energy, Minerals, and Environmental Health mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Nonfuel Minerals in U.S. Economy

The USGS has responsibilities deriving from the Minerals Policy Act of 1970, and the Federal Land Policy and Management Act of 1976, and the Minerals Policy, Research, and Development Act of 1980. The United States is the world's largest user of mineral commodities. Nonfuel mineral materials such as molybdenum, copper, potash, and platinum group metals underpin significant portions of the U.S. economy and influence decisions related to energy and national security. Processed materials of mineral origin accounted for an estimated $578 billion in the U.S. economy in 2010, a significant increase above the estimated $454 billion for 2009, likely reflecting rebound from the global economic downturn and demonstrating the close connection between the overall economy and the use of mineral materials. In 2010, U.S. manufacturers and consumers of mineral products depended on other countries for 100 percent of 17 mineral commodities and for more than 50 percent of 43 mineral commodities critical to the U.S. economy.

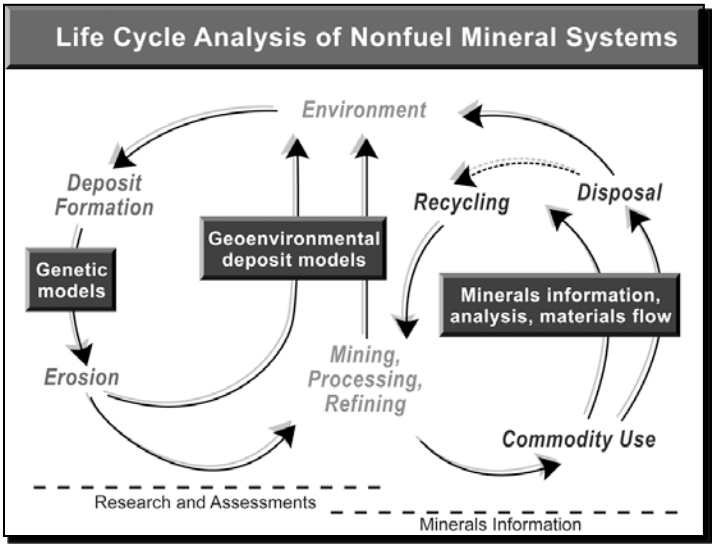
Molybdenum—A Key Component of Metal Alloys

- Molybdenum, when added to steel in small quantities, creates a substance that is remarkably tougher than steel alone and is highly resistant to heat. Today, the most common use of molybdenum is as an alloying agent in stainless steel, alloy steels, and superalloys to enhance hardness, strength, and resistance to corrosion.
- MRP-supported studies highlight how and where molybdenum resources are formed, how molybdenum resources interact with the environment, and trends in supply of and demand for molybdenum resources in domestic and international markets.
- Molybdenum is one of 80 different commodities studied by MRP.

Key partners include other Interior Bureaus, Defense logistics and stockpile agencies, the intelligence community, and the Federal Reserve, as well as State and local government agencies and private organizations with interests in managing mineral lands and anticipating future mineral supply. These partnerships succeed because they represent shared

commitment to providing the best possible information and research to support decisions affecting mineral resources. For example, domestic mineral production data reported by the USGS are supplied on a voluntary basis by 18,000 establishments who complete monthly, quarterly, or annual data reports. These data become part of the basis on which the Board of Governors of the Federal Reserve prepares its index of industrial production, a principal economic indicator. Similarly, the USGS partners with geological surveys around the world to conduct research resulting in estimates of global distribution of undiscovered mineral resources, the basis of future mineral supply.

The MRP is the Federal provider of scientific information for objective resource assessments and unbiased research results on mineral potential, production, consumption, and environmental effects. Life-cycle analysis of nonfuel mineral systems demonstrates the connections between various natural and anthropogenic processes through which minerals are made available to sustain developed societies.



MRP activities contribute to the Interior Goal to provide science for sustainable resource use, protection and adaptive management. The MRP conducts research and assessment function that provides information for land planners and decision makers about where mineral commodities are known and suspected in the Earth's crust. MRP also consists of a minerals information function that collects, analyzes, and disseminates data that describe current production and consumption of about 100 mineral commodities, both domestically and internationally for approximately 180 countries.
Each function meets the needs of different parts of the community of mineral resource information users, including: Federal, State, and local land managers; Federal, State, and international departments and agencies concerned with materials availability, defense, security, the economy, trade, environmental management, human health and safety; private sector companies concerned with materials availability, defense, security, the economy, trade, environmental management, human health and safety; academic institutions; policy makers in the U.S. Congress, and State and local governments; and the public.

Together these activities provide information ranging from that required for land planning decisions on specific management units to that required for national and international economic decisions. Results of MRP-funded projects completed 2002-2010 are available at *http://minerals.usgs.gov/about/history.html* (USGS projects) and *http://minerals.usgs.gov/mrerp/reports.html* (projects conducted outside the USGS, funded by the Mineral Resources External Research program).

Program Performance

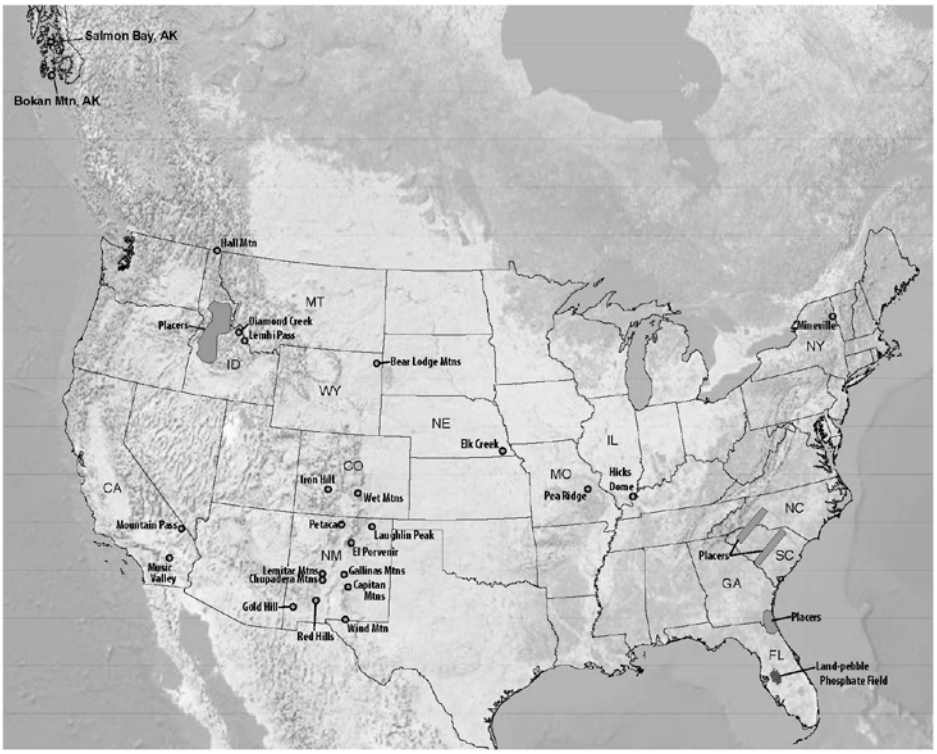
This program has two components: Research and Assessments and Minerals Information.

Research and Assessments Function
(2010 Enacted, $37.9 million; 2011 CR, $37.9 million; 2012, $31.0 million)

In 2011, the MRP will deliver results of a nine-year cooperative project providing the first-ever global assessment of undiscovered deposits of copper, potash, and platinum-group metals, commodities essential to infrastructure, food security, and environmental health. Never before have decision makers, scientists, and exploration companies had access to a publicly available, consistent global assessment of this type. This USGS-led international cooperative effort was conducted on a regional, multi-national basis with participation of dozens of interested national and international geologic, mineral resource, and other governmental and non-governmental institutions. The final products of this collaboration include maps and text describing distribution of undiscovered deposits of copper, potash, and platinum group metals world wide and the quantity of metals contained in each area. These data, together with the underpinning geologic, geochemical, geophysical, and mineral locality information, form the basis for decisions about land use and mineral supply in the United States and around the world.

The expertise and data that underpin this global mineral resource assessment were essential to assistance provided by the USGS to DOD on mineral resources of Iraq and Afghanistan in 2006-2010. The results of those studies are widely acclaimed as essential to establishing firm economic footings for both countries.

Also in 2011, the MRP will deliver results of a multi-year project investigating geologic factors that influence the occurrence and availability of minerals required for emerging technologies, including alternative energy. Priorities for these studies were established using the results of the National Academy study on critical minerals (published in 2008) and annual stakeholder meetings. The major emphasis has been on rare earth elements (REE), which are essential to the development of significant alternative energy projects, as well as for a myriad of electronics critical to defense applications. At present, China produces over 95 percent of the world's supply of REE, although there are numerous known deposits in the United States and elsewhere. Products delivered by this project are already providing data and information essential to DOD and DOE as they analyze how best to secure the REE supply required for defense and energy applications.



Locations of principal rare earth element deposits in the United States
(available at *http://pubs.usgs.gov/sir/2010/5220/*)

Finally, in 2011, MRP will deliver an updated version of the Mineral Resources Data System, a worldwide database of metallic and industrial mineral sites with related geologic, commodity, and deposit information. It currently contains information describing about 115,000 locations; new records are continually being added and existing records updated or upgraded. About 200 data fields are available for each location, permitting storage of information on location, geology, description of deposit, exploration and development, description of workings, commodities present, production, reserves and resources, and published and unpublished references. These data are used by planners, land managers, exploration companies, and the public as a means of learning about known mineral deposits, those that are currently being mined and historic sites. The data are available on CD-ROM and as part of the MRP's data delivery Web site *(http://mrdata.usgs.gov/)*.

Proposed work for 2012 includes:

- Complete and deliver three major multi-year bodies of work (systematic analyses), providing the Nation's decision makers with information required to understand the context for actions affecting current and future supplies of nonfuel mineral commodities;
- Complete two research and development projects, begun in 2007, providing tools required for the planned 2013 start for updating the 1998 National Mineral Resource assessment;
- Continue, at a reduced level, environmental and geochemical research on processes that occur at sites of mined and unmined mineral deposits;
- Complete regional-scale geologic data compilation, leading to a new State geologic map for Alaska, scheduled for delivery in 2012;

- Support geochemical, geophysical, and geographic information laboratories required to conduct MRP science and information projects;
- Manage four national-scale long-term databases; and
- Provide three formal workshops or training to customers on topics such as understanding the utility of geoscience data for land planning.

Developing and upgrading national databases, and converting those databases to standard formats, is an ongoing effort and will continue in 2012. Enhanced online data delivery tools provide information in digital format to any customer with Internet access; land-management agencies and regional-planning groups report that direct access to authoritative geologic, geochemical, geophysical, and mineral deposits data is particularly helpful when priorities change and information for new areas is required quickly. The system is available at *http://mrdata.usgs.gov/.*

Data and conclusions from USGS minerals research will continue to be available to users in easily accessible, accurate, and timely products in 2012. Information is disseminated through traditional paper products, in digital form, on the Internet *(http://minerals.usgs.gov/)*, through interagency collaborations, and in technical and non-technical public presentations. Other methods through which MRP projects provide timely results for all customers include development of new geophysical and geochemical techniques for mineral-resource studies and the application of mineral-resource expertise and techniques to other relevant societal issues such as mapping earthquake and volcanic hazards, location and evaluation of energy resources, characterization of hydrology, or location of buried ordnance.

In 2012, research related to biofuels will continue in the glaciated region of the northern midcontinent, analyzing soil carbon impacts along a land use gradient reaching from native grasslands to cultivated areas. Changes in soil erosion rate, soil carbon balance, microbiology, and soil nutrient geochemistry are among the probable consequences of biofuel production. These studies will use soil carbon dioxide (CO_2) flux measurements, stable carbon isotope data, and soil microbial studies to determine controls on soil carbon gains and losses. The studies will document combined impacts of land use and climate change on soil properties, monitor their change over time, and provide a basis for including predictions of the future course of soil development in existing models.

Minerals Information Function
(2010 Enacted, $15.9 million; 2011 CR, $15.9 million; 2012, $13.2 million)

Proposed work for 2012 includes:

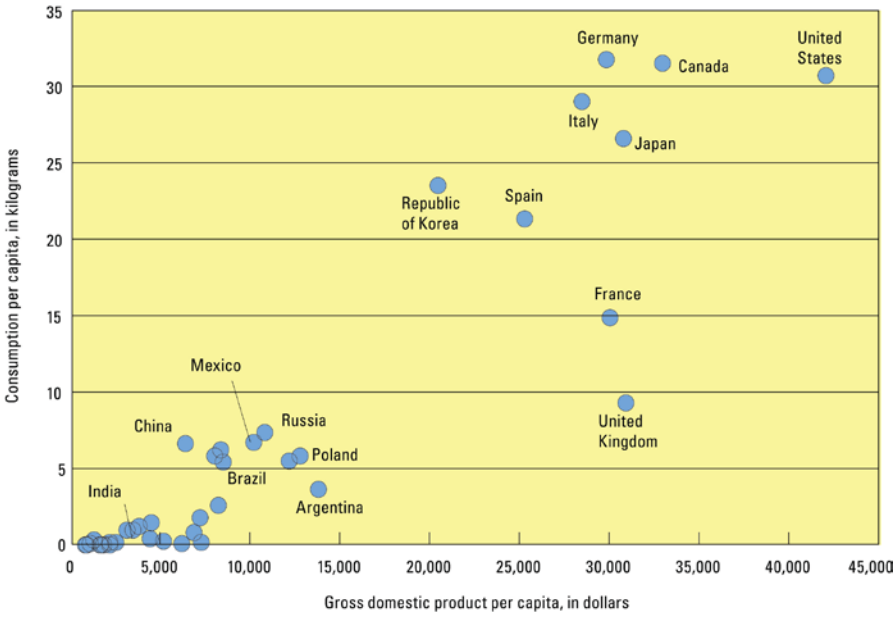
- Collect, analyze, and disseminate timely data and information on domestic supply and use for about 100 mineral commodities;
- Conduct specialized studies of materials flows and recycling of nonfuel minerals throughout the economy; and
- Deliver approximately 620 mineral commodity and related reports.

Mineral materials are essential to the U.S. economy and national security. USGS information and data includes extraction, production, and refining of mineral commodities and some of their products. Interior, the DOD, and the Department of State, the Central Intelligence Agency, the Federal Reserve, and private sector companies use USGS mineral-related data analysis in their

regional and global analyses. Information on strategic minerals is also provided to the DOD for managing the National Defense Stockpile.

USGS mineral commodity specialists provide production and capacity data for the U.S. nonfuel minerals industry to the Federal Reserve Board (FRB). The FRB uses data in USGS minerals information reports to calculate indexes of industrial production, capacity, and capacity utilization, which are among the most widely followed monthly indicators of the U.S. economy. These capacity indexes and the rates of capacity utilization based upon them are published monthly in FRB's G.17 release, *Industrial Production and Capacity Utilization*. USGS scientists also provide assistance to FRB economists and policy makers in analyzing mineral industry indicators and trends.

In 2010, USGS materials flow specialists met a request from the EPA for analysis of global flows of materials related to the production and use of aluminum. In addition to addressing the major resource flows associated with aluminum and the effects of those flows, the report provides models for understanding likely changes in use of aluminum through 2025. In addition to increases in total consumption, as developing nations increase their standards of living, the report demonstrates that at least until 2025, post-consumer aluminum scrap will not be a significant source for new aluminum goods.



Aluminum consumption per capita against gross domestic product per capita for the 40 most populous countries in 2006, showing increase in aluminum consumption with economic growth (available at *http://pubs.usgs.gov/of/2010/1256/*)

Activity: Energy, Minerals, and Environmental Health
Subactivity: Energy Resources

2010 Enacted: $27.2 million (151 FTE)
2011 CR: $27.2 million (151 FTE)
2012 Request: $27.4 million (150 FTE)

Budget Realignment

In 2010 and 2011, Energy Resources is a program in the Geologic Resource Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to be split. The component for the National Geological and Geophysical Data Preservation Program is proposed to move to a subactivity of the Core Science Systems mission area. The remaining components are proposed to move to a subactivity of the Energy, Minerals, and Environmental Health mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Nation faces simultaneous challenges from an increasing need for energy resources, dependence on imported energy resources, and growing demands to minimize environmental effects associated with energy resource development and utilization. Major consumers of ERP products are the Interior's land and resource management Bureaus, other land management agencies such as the U.S. Forest Service (USFS), Federal environmental and national security agencies, policy makers and Congressional offices, State geological surveys, the energy industry, the environmental community, the international energy community, nongovernmental organizations, academia, and the public. ERP activities contribute to the DOI goal to provide science for sustainable resource use, resource protection and adaptive management. Research and assessment activities related to geologic carbon sequestration are implemented in the Energy Resources program; however, funding resides in the Climate and Land Use Change mission area. A description of ERP's geologic carbon sequestration activities can be found in the Climate and Land Use Change section.

Program Performance

Energy Policy Act of 2005 Implementations – The Energy Policy Act of 2005 called for actions for which USGS science is a critical component. The Act also addresses a range of energy sources, with emphasis on assessment of geothermal resources, alternative energy sources such as gas hydrates and oil shale, and research on unconventional gas resources. The act also reauthorized the Energy Policy and Conservation Act Amendments of 2000 (EPCA), in which the USGS was directed to assess oil and gas resources underlying Federal lands in the United States.

Energy Independence and Security Act of 2007 Implementation – The Energy Independence and Security Act (EISA) of 2007 called for the USGS to develop a methodology for a national geologic carbon sequestration assessment and conduct a national assessment using the new methodology. Activities related to geologic carbon sequestration are implemented in the Energy Resources program; however, funding resides in the Climate and Land Use Change mission area and a description of those activities can be found in the Climate and Land Use Change section. EISA also called for the USGS to assist the BLM in evaluating

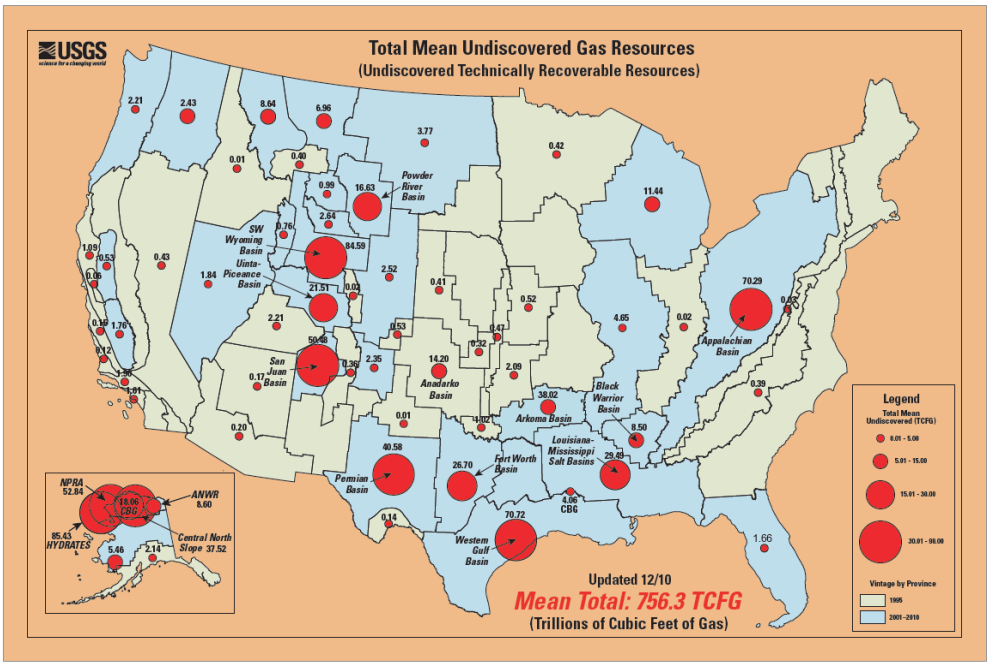
geologic carbon sequestration on public lands. In addition, EISA called for the USGS to complete a comprehensive nationwide geothermal resource assessment that examines the full range of geothermal resources of the United States.

This program is comprised of six components: National Oil and Gas Resources; Geothermal Resources; New Energy Frontier – Wind; National Coal Resources; World Oil and Gas Resources, and Energy Information and the Environment.

National Oil and Gas Resources
(2010 Enacted, $15.0 million; 2011 CR, $15.0 million; 2012, $13.6 million)

The Nation's future petroleum energy supplies will likely come from a mix of domestic oil and gas fields; oil and gas imports; and unconventional resources such as shale gas, tight gas sands, coalbed methane and, in the longer term, unconventional resources such as natural gas hydrates. Concern about greenhouse gas emissions, legislation such as the Energy Policy Act of 2005 and EISA of 2007, and concern about fuel prices and energy security have increased the importance of identifying and characterizing the Nation's domestic petroleum resources, especially natural gas. ERP research continues to focus on areas of the Nation with high potential for future natural gas production, including coalbed gas and shale gas; on those areas that have oil and gas resources under public lands; on the scientific challenge of reducing uncertainty (or “improving precision”) of petroleum resource assessments; and on studying unconventional resources such as natural gas hydrates.

The ERP is estimating the volume of undiscovered oil and gas resources in the United States, including those under Federal lands. This scientific inventory of oil and gas resources on Federal lands is mandated by the EPCA (P.L. 106-469 §604) and forms the basis for the periodic report to Congress required by the Act. The legislation mandates use of USGS estimates of undiscovered oil and gas resources. The EPCA legislation was reauthorized with the passage of the Energy Policy Act of 2005, P.L. 109-58.



USGS estimates of total, mean, undiscovered, technically recoverable gas resources in the United States (available at *http://certmapper.cr.usgs.gov/data/noga00/natl/graphic/2010/total_mean_gas_2010.pdf*)

The USGS will continue to update its oil and gas resource assessments for the United States and the world using a consistent, peer-reviewed methodology as authorized in the Energy Policy Act of 2005 (P.L. 109-58 §364). In 2011, 2012 and 2013, the USGS will complete assessments of the Anadarko Basin, Cook Inlet, portions of the Gulf Coast, Cherokee Arch, Niobrara Formation, and update the assessment of the Barnett Shale, Marcellus Shale, Uinta-Piceance, Greater Green River Basin, and Appalachian Basin.

Alaska – The North Slope of Alaska is thought to have the greatest remaining petroleum resource potential of any U.S. onshore area. The USGS is examining Alaska's geology and petroleum potential; current research is focused on synthesizing conventional and unconventional oil and gas resources information for the entire North Slope, including the National Petroleum Reserve Alaska (NPRA), Arctic National Wildlife Refuge (ANWR)-1002 area, the central portion of the North Slope (CNS), and the area west of NPRA.

The USGS updated its assessment of the NPRA in light of recent drilling there. Assessment results were published in 2010, indicating a significant reduction of estimated potential petroleum resource in comparison to past assessments, based on extensive geologic interpretation since the last assessment. During 2011, reports summarizing the aggregation of assessment results from ANWR, NPRA, CNS, and the area west of NPRA will be completed and estimates of undiscovered, technically recoverable petroleum resources for the entire northern Alaska province will be finalized. Field investigations will focus on gas-prone petroleum systems of the Brooks Range foothills, emphasizing research to reduce assessment uncertainties. Work in 2011 emphasizes unconventional resource potential on the North Slope of Alaska. Work on Cook Inlet, an area of high resource potential and importance to Alaska, is ongoing in 2011.

Gulf Coast Region – The Gulf Coast region is one of the major hydrocarbon-producing areas of the world. ERP investigations use seismic, well, and geochemical data to understand the geologic framework of this region. This effort provides geologic, geophysical, and geochemical framework studies necessary to evaluate the oil-, gas-, and coal-bearing rocks of Texas, Louisiana, Mississippi, and Alabama with the greatest potential for future oil, gas, and coalbed methane production. Understanding petroleum systems will enable USGS scientists to better assess potential for undiscovered petroleum resources; and extend potential onshore plays to the offshore for use by the Bureau of Ocean, Energy, Management, Regulation and Enforcement (BOEMRE) for its offshore Federal resource assessments. Current cooperative efforts with industry, State Geological Surveys, and the BOEMRE will continue to improve data quality and availability. During 2011 and 2012, project staff will conduct an assessment of the undiscovered petroleum resources of the Jurassic and Cretaceous sections within the Gulf Coast.

Origin and Controls on Microbial Gas Accumulations – Natural gas generated from microbial activity involving organic deposits (coal, black shale, petroleum) represents an increasingly important natural resource. It is estimated that natural gas from microbial activity accounts for about 20 percent of the world's natural gas resource. Since this gas is biologically produced, it also represents a possible renewable resource. Although a considerable body of research exists on microbial activity, there is much less known about microbially mediated conversion of materials such as coal to methane. Preliminary studies by the USGS and others have shown that coal gas in many parts of the United States is generated from microbial activity. In 2011 and 2012, the ERP will synthesize data and interpretations of coal-based microbial methane production pathways to inform scientific and resource management communities on the current state of knowledge.

Continuous (Unconventional) Resources – Estimates show the largest remaining undiscovered domestic gas resource occurs in what USGS scientists term "continuous" accumulations, e.g., coalbed methane and basin-centered gas from low-permeability geologic units such as 'tight gas sands' and 'shale-gas' reservoirs. (Note: This type of resource is also called "unconventional." The USGS uses the term "continuous" because of the geological nature of this resource.) Understanding continuous gas resources, the fastest growing resource produced in the United States, is critical for the responsible use of this energy resource and the sustainability of the domestic energy supply. This work focuses on identifying controls on continuous gas accumulations, the role of gas-generation processes, and characteristics of petroleum and associated water. The goal is to understand the evolution of present-day continuous hydrocarbon accumulations, many of which are currently being produced with difficulty. Mechanisms of the petroleum systems that create and preserve continuous gas accumulations through geologic time are poorly understood for all types of continuous reservoirs. Efforts to reduce uncertainty will substantially improve USGS's ability to conduct future natural gas resource assessments and position the USGS to better understand possible environmental effects of development of this resource. Research areas to be emphasized during 2011 and 2012 are examination of gas-water-oil production and continued integration of controls on gas preservation.

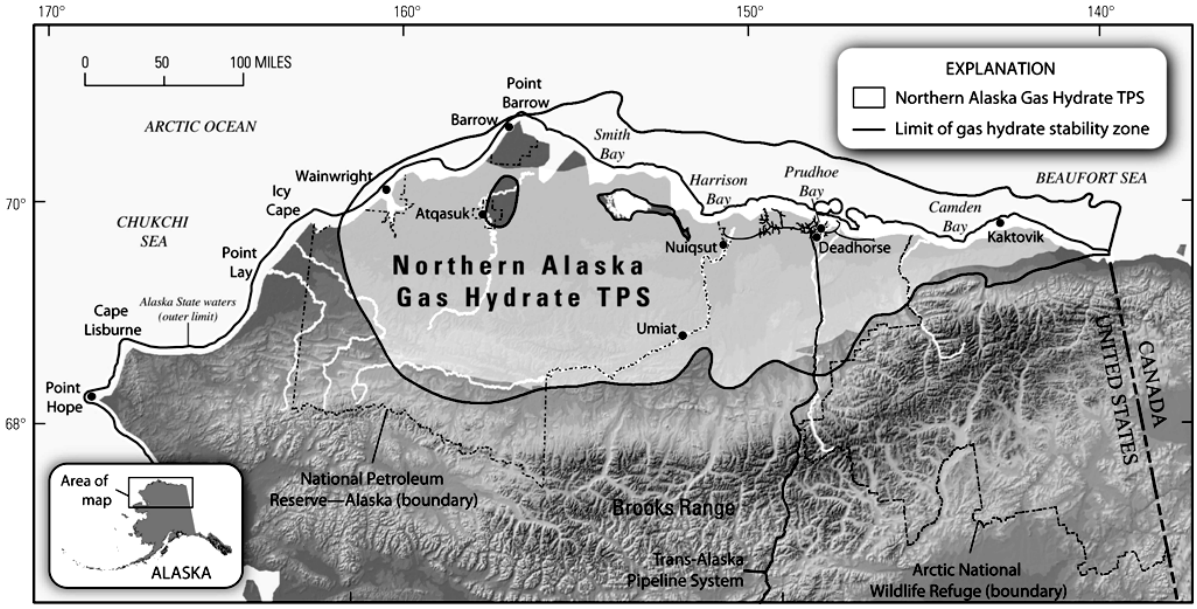
Reserve Growth – The ERP has an important role in understanding and assessing petroleum resources, both domestically and internationally. Potential additions to reserves from these resources are from discovery of new accumulations and reserve growth of existing fields. Approximately half of the world's additions to reserves are estimated to come from reserve growth. Because significant volumes of petroleum resources are involved, estimating reserve growth is an integral part of USGS assessments. Because reserve growth is so important to accurately estimate resources, the ERP has a research activity that reviewed, evaluated, and modified new and existing estimation methods and developed a strategy for assessing reserve growth that was externally reviewed before implementation. Reserve growth methods were evaluated by the American Association of Petroleum Geologists (AAPG) Committee on Resource Evaluation (CORE). We have finalized the assessment methodology for reserve growth based on recommendations of the outside peer-review panel. Activities in 2011 and 2012 will build on this new methodology and the USGS will estimate reserve growth for the United States and global petroleum resources. The ERP also hosts a Reserve Growth Conference every other year, the last one in 2010, in which the new methodology was presented. The Reserve Growth Conference brings together experts to discuss best practices and research issues in this important field.

Gas Hydrates – Currently, the ERP works closely with the governments of several countries, including the Indian Directorate General of Hydrocarbons (DGH) and the Korean Government, to study, characterize, and explore for hydrates off the coasts of India and Korea. In 2011, data from 21 sites offshore of India will be published and three-dimensional seismic data for potential new sites of study will be examined. The ultimate goal will be a second research cruise and gas hydrate production test in Indian waters, probably in 2011. Data, syntheses, and analyses from the Indian collaboration will be invaluable in understanding world class hydrate accumulations and lessons learned will be transferable to U.S. domestic gas hydrate resources.

The ERP leads a scientific research effort with the Korean Government studying, characterizing, and exploring for gas hydrates off the coast of Korea. Like the Indian project, all data and analyses will be made publicly available. Findings from this effort will improve the understanding of gas hydrates in natural settings, as well as improve the field tests needed to understand this frontier resource.

Recent efforts on the Alaska North Slope (ANS) have focused on characterizing and assessing recoverability and production characteristics of permafrost-associated natural gas hydrates in the Prudhoe Bay-Kuparuk River area. There are plans for an extended gas hydrate production test, probably in 2012. The ERP is analyzing and interpreting drilling results from the DOE/British Petroleum Exploration Alaska (BPXA)/USGS Mount Elbert Gas Hydrate Research Test Well, drilled in 2007, to continue to refine our geologic and engineering characterization of regional ANS gas hydrate occurrences and develop detailed interpretations of the Milne Point Mount Elbert gas hydrate prospect. These data will be used to develop and conduct an extended gas hydrate production test on the ANS with the DOE, BPXA, and other Government and industry partners.

The ERP recently completed the first-ever resource estimate of technically recoverable gas hydrates. The assessment of the undiscovered, technically recoverable gas hydrate resources on the ANS (see below) used a geology-based assessment methodology. The USGS estimates that there are about 85 trillion cubic feet of undiscovered, technically recoverable gas resources within gas hydrates in northern Alaska. Research in support of this assessment was a cooperative effort with the BLM and the USGS. In 2011 and 2012, the USGS and the BLM will focus on improving understanding of gas hydrates as an energy resource in general and in northern Alaska specifically so gas hydrates can be more effectively regulated and managed as a national resource.



The Northern Alaska Gas Hydrate Total Petroleum System (TPS; light-shaded area), and the limit of gas hydrate stability zone in northern Alaska (outlined area).

Oil Shale Resources – The Energy Policy Act of 2005 (P.L. 109-58 §369), recognized the need for updated information on domestic oil shale resources and in accordance with the legislation, the ERP produced an oil shale assessment of the Green River Formation, Piceance Basin, in 2009. This assessment included an evaluation of the presence or absence of minerals such as nahcolite. Nahcolite is a valuable mineral resource presently mined at other locations, but presence of nahcolite in oil shale can affect generation and extraction of oil from oil shale, as it decomposes and produces CO_2 when heated. In 2010, the ERP finished the assessment of other Green River Formation oil shales in the Uinta and Green River Basins. Efforts in 2011 will focus on studying and assessing oil shales located east of the Mississippi River, as mandated in the Act. Work on oil shale activities will cease in 2012 with the proposed budget cut to the ERP.

One important goal of the oil shale work is to make available on-line as much of the oil shale data from previous studies as possible, including geochemical (Fischer assay, a test for determining the oil yield from oil shale) data, scans of geophysical logs, core and rock descriptions, previous USGS assessments, and other publications. In addition, all USGS publications related to oil shale are now available online through the ERP Web site. Work will continue through 2011 but will cease in 2012.

Geothermal Resources
(2010 Enacted, $1.5 million; 2011 CR, $1.5 million; 2012, $1.5 million)

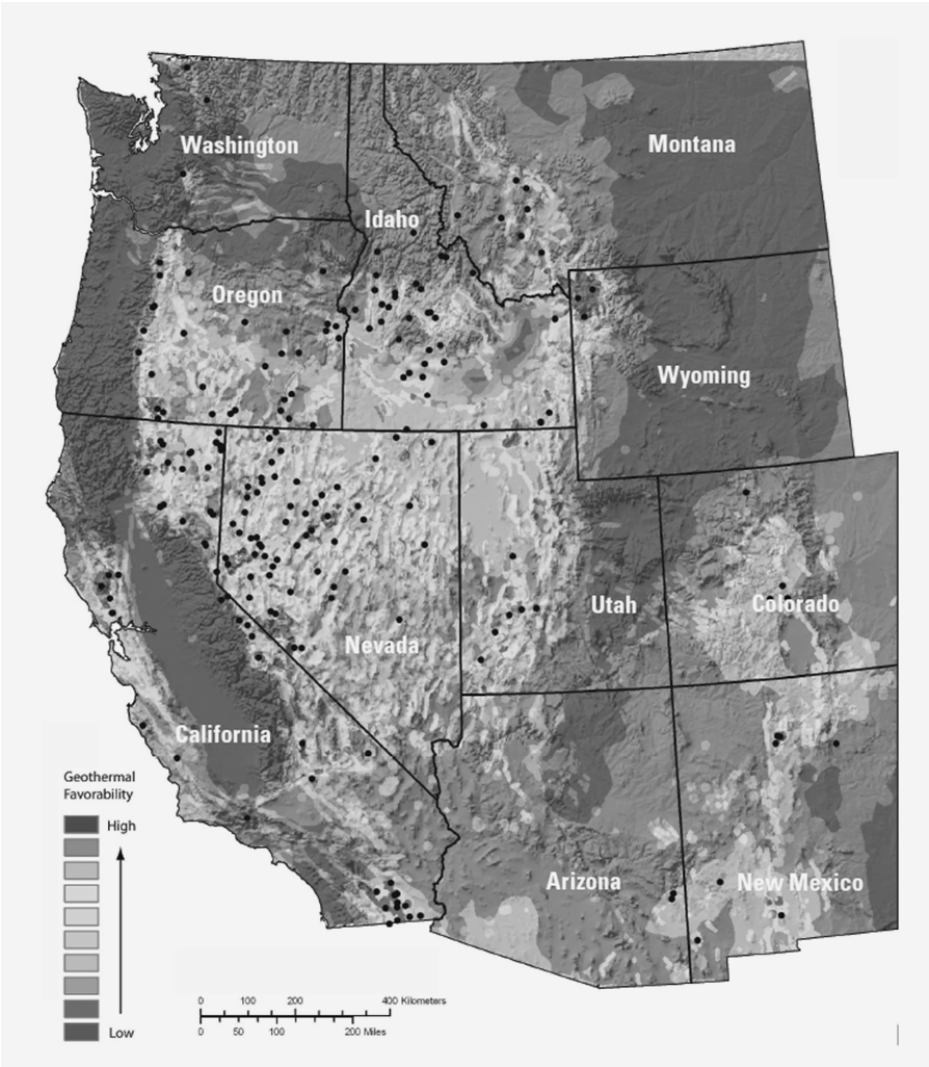
In support of the Energy Policy Act of 2005 (P.L. 109-58 §226), the USGS published a national assessment of geothermal resources capable of producing electric power. This was the first assessment of the Nation's geothermal resources in almost 30 years. New research and assessment work is critical to understand geothermal systems and to determine the extent to which geothermal resources can play a part in the domestic energy mix. Results of this assessment indicate full development of the conventional, identified systems alone could expand geothermal power production by approximately 6,500 Megawatt Electric (MWe), or about 260 percent of the currently installed geothermal total of more than 2500 MWe. The resource estimate for unconventional Enhanced Geothermal Systems (EGS) is more than an order of magnitude larger than the combined estimates for both identified and undiscovered conventional geothermal resources and, if successfully developed, could provide an installed geothermal electric power generation capacity equivalent to about half of the currently installed electric power generating capacity in the United States. The work activities in 2011-2012 include:

Life Cycle Models for Geothermal Systems – A critical issue in evaluating the nature and extent of geothermal resources is developing an improved understanding of formation and evolution of permeable faults and fractures that form most geothermal reservoirs. Characterizing and quantifying interrelationships among various geologic and geochemical parameters and effects on fluid and heat transport is critical to understanding what creates and maintains fracture permeability. Research will be focused on understanding the nature and evolution of geothermal systems in diverse environments and to the acquisition and analysis of studies to support development of an improved geothermal resource assessment methodology relating geospatial observations to accurate predictions of spatial and temporal frequency and distribution of geothermal reservoirs.

Unconventional Geothermal Resources – There are unconventional geothermal resources with potential for electrical generation; the most promising are Enhanced Geothermal Systems (EGS). EGSs are geothermal resources that require some form of engineering to develop permeability necessary for circulation of hot water or steam and recovery of heat for electrical power generation. Provisional evaluation of EGS in the new USGS assessment indicates electric power production potential from EGS is substantially larger than that from all conventional geothermal resources. Yet, significant questions remain regarding EGS development, and new research studies, in coordination with the DOE, will be dedicated to understanding geologic and hydrologic aspects of EGS development and providing a framework for future assessments of EGS resource potential, including deep sedimentary basin environments.

Online Databases and GIS Products – As part of the resource assessment effort, supporting geological, geophysical, geochemical, and hydrologic data are being combined into databases and GIS maps for analysis. To provide detailed data to complement the assessment, to

develop a solid foundation for future assessments, and to maintain comprehensive information on geothermal energy resources and development, these regional and system-specific databases will be placed online and updated on a regular basis. Availability of these types of data will also support activities of local and national land and resource managers. The majority of geothermal resources in the United States are on public lands and data are important for responsible management of public resources.



Example map from one of a series of 28 spatial models showing the relative favorability of occurrence for geothermal resources in the western contiguous United States. Identified geothermal systems are represented by black dots.

In 2011 and 2012, research will focus on regional studies to augment resolution of the national assessment. Primary objectives will be to collect, analyze, and interpret regional datasets that supplement a resource assessment and to support development of a conceptual model that ties observations of particular parameters (e.g., thermal state of the crust, variations in basin depths) to physical and tectonic processes (e.g., active extension, magmatic intrusions, fault interactions) responsible for formation of geothermal systems.

New Energy Frontier – Wind
(2010 Enacted, $0.0 million; 2011 CR, $0.0 million; 2012, $3.0 million)

The President's 2012 budget request includes efforts to study the impacts associated with new technologies used for the development of wind energy. The USGS will continue to work closely with Interior agencies (FWS, BLM, BOEMRE) to provide scientific information needed to make informed decisions concerning permitting, implementation and operation of wind facilities on public lands. Should the USGS receive the funding for these efforts, USGS research, modeling, and monitoring will evaluate the ecological and other impacts associated with the widespread development of wind energy. Ecological and geographic studies will examine impacts to fish and wildlife from direct strikes, habitat fragmentation, and construction and maintenance of infrastructure. The infrastructure needed for energy capture and transmission would include wind turbines and generating facilities as well as towers, cables, and roads, sea bed corridors, and boat traffic. In addition, USGS science will provide technical support, establish a comprehensive data management structure, facilitate collaboration, and ensure long-term viability of information products that contribute to the Nation's understanding of the management and effects of wind energy. All efforts under this initiative will work toward developing an assessment methodology of wind energy impacts that can be applied nationwide.

National Coal Resources
(2010 Enacted, $1.4 million; 2011 CR, $1.4 million; 2012, $1.4 million)

Previous ERP coal resource assessments evaluated total in-ground coal resources. ERP revised USGS assessment methodology to determine the subset of U.S. coal resources that are available for mining and technically and economically recoverable (i.e., the coal reserve base). In 2009, the ERP published a revised assessment for the Gillette Coal Field, the largest coal field within the Powder River Basin (PRB). Work on the entire PRB will be finished in 2011, and analysis of other basins, such as those in the Colorado Plateau, will begin in 2012 using this new methodology. These new studies will illustrate how much resource is available and technically and economically recoverable.

Federal and State land managers use these results to support land use decisions; environmental regulators use the information to evaluate compliance with regulations stemming from the 1990 Amendments to the Clean Air Act; and economists use the results to forecast economic trends at regional and national scales. Electric utilities, coal producers, and coal consumers also use these results and products to evaluate availability and quality of coal feedstock to electricity generating power plants and to achieve compliance with emission standards and other environmental regulations. The ERP works closely with counterparts at other organizations (BLM, the Energy Information Administration) to ensure revised products address a variety of needs.

World Oil and Gas Resources
(2010 Enacted, $2.3 million; 2011 CR, $2.3 million; 2012, $1.9 million)

The USGS World Petroleum Assessment Project conducts geologic studies to improve understanding of the quantity, quality, and geologic distribution of world oil and gas resources. In 2010, the USGS released assessments of undiscovered oil and gas in the Levant and Nile Delta Basins (eastern Mediterranean), and an estimate of recoverable heavy oil resources in the Orinoco Oil Belt, Venezuela. Location information and type of undiscovered global petroleum resource are critical to energy policy and energy security, and have important geopolitical

implications. Information provided by the ERP is unique and important to the United States' global and domestic policies and planning.

Recently, the USGS released a series of products from the Circum-Arctic Resource Appraisal (CARA). This assessment of undiscovered conventional oil and gas resources covered all areas north of the Arctic Circle, and is the only publicly available resource estimate of the Circum-Arctic. Using a geology-based probabilistic methodology, the USGS estimated the occurrence of undiscovered oil and gas in all geologic provinces thought to be prospective for petroleum. The CARA shows these resources account for about 22 percent of the undiscovered, technically recoverable conventional resources in the world, based on current USGS resource estimates. The Arctic accounts for about 13 percent of the undiscovered oil, 30 percent of the undiscovered natural gas, and 20 percent of the undiscovered natural gas liquids in the world. Results of the CARA provide information to develop new understandings of the future of petroleum, of potential for environmental conflicts, and of primary drivers of international energy politics in the Arctic. Published results include new interpretations, detailed statistical results, and links to Arctic maps and data tables.

Economic evaluations to determine the amount of resource that could be delivered are being developed and will provide an indication of the economic viability of these resources. This full-cycle analysis was completed in 2010 and will have external peer review in 2011, as the ERP does with all new methodologies. Once external technical review is complete, the new methodology will be published along with analyses of how much resource is economically viable within certain parameters. Other analyses and syntheses of the data and results from the CARA will be developed throughout 2011.

Currently, the ERP is prioritizing and re-assessing basins of the world included in the USGS 2000 World Petroleum Assessment to produce an updated estimate of the endowment of undiscovered, technically recoverable conventional resources of the world. In addition, the ERP has a screening process to detect the presence or absence of continuous resources (tight gas sands, shale gas, coalbed gas) in priority basins of the world. This screening process will allow the ERP to assess global continuous (unconventional) resources, an effort that no one has ever attempted. This is one of the most requested products from the ERP, so world petroleum assessment efforts in 2011 and 2012 will focus on continuous global resources—refining the current methodology to be able to assess unconventional resources (shale gas, tight gas sands, coalbed methane) where there is no current production. This work is receiving attention from a variety of partners and stakeholders. Coordination and assessment activities will begin in 2011.

Energy Information and the Environment
(2010 Enacted, $7.0 million; 2011 CR, $7.0 million; 2012 - $6.1 million)

ERP scientific studies focused on environmental and human health challenges include characterization of waters co-produced with oil, gas, and coalbed methane, to determine best disposal practices and beneficial uses for those waters, human health impacts of energy resource occurrence and use, and legacy environmental impacts from previous uranium mining.

Coal Quality and Human Health – ERP research addresses the natural variability of coal quality and ramifications of such variability on environmental quality and human health. For example, in many parts of the country and the world, coal deposits may act as natural aquifers and be significant sources of potable water. Balkan Endemic Nephropathy (BEN) is a disease thought to result from long-term exposure of susceptible individuals to low levels of toxic organic compounds in drinking water derived from coal in many parts of the Balkans. The USGS has

studied the occurrence of BEN in collaboration with the human health care sector and international doctors. The ERP continues to build on expertise developed during the BEN study to look for the confluence of specific human diseases and where toxic organic compounds from coal may occur. In the United States, water obtained from low-rank coal beds, either from drinking water wells or from coalbed methane production wells, may have leached toxic organic compounds from coal. The ERP is characterizing water quality in these settings.

Because more than half of the Nation's electric power supply relies on coal-fired electric generating plants and electric power demand is predicted to increase, understanding connections among coal quality, environmental quality, and human health during coal resource utilization is essential to resource managers and policy makers. The ERP will continue to work with representatives from the human health care sector, Centers for Disease Control (CDC), National Institutes of Health (NIH), National Institute of Environmental Health Sciences, and other domestic and international groups of doctors, epidemiologists, and health care providers to investigate health effects associated with energy resource use.

National Coal Resources Data System (NCRDS) – NCRDS was created more than 25 years ago and the databases contain information on location, quantity, attributes, stratigraphy, and chemical components of U.S. coal deposits, including quality analyses of more than 14,000 coal samples and 200,000 stratigraphic records. At least 136 coal-quality parameters are tracked including detailed location information and a range of physical and chemical properties. The NCRDS stratigraphic database contains more than 30 parameters describing the geologic section measured from drill holes and surface exposures including specific geo-referenced information. These data are accessible through USGS-constructed interfaces and can produce a robust suite of products addressing coal resource assessment issues, including locating coal deposits with desirable characteristics for specific uses; assessing environmental impacts of coal use; evaluating coal resources; and describing technological properties of coal from specific areas and beds. A long-term partnership of the USGS and many State geological surveys, both contributors to and users of the databases, forms the basis of this sustained effort to collect, correlate, and analyze basic data, build and verify the databases, and digitally access these USGS-maintained data sets. Currently, the USGS funds more than 30 State agencies in this project. Portions of the coal resource and geochemical databases can be found on the USGS's Energy Web site *(http://energy.usgs.gov)*, or interested parties may request selected data in different formats. The State Coop activity will be eliminated in 2012 because of the proposed reduction to ERP.

Produced Waters – Oil and gas production often uses and yields significant quantities of water. Information related to waters and fluids associated with energy resource development, especially focused in areas like the Marcellus Shale in the Appalachian Basin and the Bakken oil play in the Williston Basin, are likely to play an expanded role in energy resource development decisions, because quality and amount of produced and hydrofracturing waters vary markedly between and within basins. Also, beneficial use of produced waters is an area of expanding interest, particularly in areas with limited water resources. However, in many cases, the impacts of using produced waters in innovative ways are not well understood. This ERP effort will provide information on the volume, quality, impacts, and possible uses of water produced during oil, gas, and coalbed natural gas production and development. This information will be important for energy resource, regulatory, and policy decisions. In 2011, and 2012, this activity will develop and expand a central online clearinghouse for information associated with coalbed methane development across the United States; continue collaborative research on beneficial use of produced waters for agriculture and the environmental impacts of such use; study naturally occurring radioactive materials in produced waters and controls on

them; and develop water budgets associated with oil and gas production to supplement oil and gas resource assessments.

Uranium – Uranium resources became a significant fuel for use in electric power generation starting in the 1950s and nuclear energy now accounts for about 20 percent of U.S. generated electricity. Uranium has been mined at about 4,100 mine sites in the western states of Wyoming, New Mexico, Colorado, Utah, Arizona, and Texas. Over the past several years, interest in U.S. uranium supplies has grown as demand for nuclear energy has increased and new nuclear energy plants are under construction or in various stages of planning. Updated knowledge of the geologic setting, occurrence, and estimates of the magnitude of the undiscovered U.S. uranium resource endowment is critical to inform planning efforts about potential domestic uranium supplies necessary to sustain or increase the contribution of nuclear energy to the U.S. energy mix. The recent resurgence in uranium prices and resulting company activity in the United States has also raised visibility of legacy uranium mining impacts, which are widespread in the Western United States, especially in those areas mined prior to the development of current environmental regulations.

In 2010, this project evaluated uranium resource availability in the Grand Canyon area as part of a proposed Federal lands withdrawal action, available at *http://pubs.usgs.gov/sir/2010/5025/.* In 2011, the ERP will launch a pilot project, with scientists from the MRP, to develop a methodology and framework for an updated assessment of undiscovered uranium resource estimates of the United States. This scoping project will include a determination of how viable a "life-cycle approach" would be for the national assessment, i.e., what components could be included that evaluates the effect of mining in various geological environments. During the scoping year, the project will look across the nation and identify provinces for more detailed regional-level resource evaluation; develop a methodology for estimating undiscovered resources; and compile background information.

Energy Information – The ERP generates large volumes of research information that require long-term stewardship and easy access to support integrated science, meet Federal information mandates, and serve the public. Delivering ERP information via the internet and improving the capacity to do so is a high priority. The project is developing an integrated, map-based, interactive application through the Web portal to replace and update a number of older, obsolete applications that are hard to access and difficult to maintain. A prototype has been developed, is operational, and has been tested using geospatial datasets. To improve delivery of geospatial data, the information team works with ERP scientists to design data management systems from the beginning of an investigation with the ultimate goal of optimizing final information delivery. The project began a redesign of the ERP Web site to improve discovery and navigation, serve more information, and reduce maintenance and upgrade burdens. The redesigned Web site will be completed and made publically accessible in 2011. New server software and equipment were purchased this year to allow full failover protection through duplication and synchronizing in Reston and Denver. Responses on USGS's Bureau Web site represent a significant proportion of all visits to USGS's FAQ site. ERP's USGSENERGY Twitter feed continues to grow and to deliver notification of new publications and other ERP information. In 2011, ERP will develop and test a free application (or "app") for smartphones that is designed to deliver custom ERP-related news feeds to those who download the app.

This page intentionally left blank.

Activity: Energy, Minerals, and Environmental Health
Subactivity: Contaminant Biology

2010 Enacted: $9.4 million (64 FTE)
2011 CR: $9.4 million (64 FTE)
2012 Request: $8.7 million (62 FTE)

Budget Realignment

In 2010 and 2011, Contaminant Biology is a program in the Biological Research and Monitoring subactivity of the Biological Research activity. In 2012, the program is proposed to move to a subactivity in the Energy, Minerals and Environmental Health mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Within the global health community a new paradigm of “One World-One Health” has emerged. The One Health concept acknowledges that human, animal, and environmental health is inextricably linked. This concept promotes a global strategy for expanding interdisciplinary collaboration and communication across all aspects of human, animal, and ecosystem health. As the Nation's natural science agency, the USGS plays a lead role in supporting the Interior goal to provide scientific knowledge and information needed to improve understanding of how environmental factors, including contaminants, impact human and animal health.

Newly emerging toxicological diseases associated with natural toxicants and anthropogenically derived environmental contaminants (ex. endocrine disrupting chemicals, lead, and mercury in fish, new generation pesticides, and pharmaceuticals in waste water) are appearing with increasing frequency. Many of these contaminants pose a critical and growing threat to human health as well as the health and function of terrestrial and aquatic species and ecosystems managed by Interior. These emerging contaminants alone or in combination with legacy contaminants (e.g., lead, mercury) or infectious pathogens can have broad impacts on fish and wildlife populations. Research supported by the Contaminant Biology program is closely aligned with activities in other USGS programs such as the Wildlife: Terrestrial and Endangered Resources (wildlife and zoonotic disease activities), Invasive Species, and the Fisheries: Aquatic and Endangered Resources. These complementary activities provide a biological foundation for toxicological studies in Contaminant Biology. With these integrated health activities, the USGS provides leadership in the broader field of ecosystem health, i.e., the ecological context of health.

Program Performance

Research on how ecosystems work, how and why they change – Historically, contaminant biologists have assessed impacts of individual contaminants on populations. People and animals are frequently exposed to multiple stressors in the environment simultaneously. There is a need for a holistic approach to understand impacts of environmental contaminants at the ecosystem level. The USGS is prioritizing the development of innovative tools and techniques to identify and assess combined effects of multiple contaminants and contaminants combined with other stressors, such as infectious disease, habitat degradation, competition from invasive species, and climatic changes. USGS scientists are also engaged in research to assess the

long term impacts of exposure to oil and oil dispersants on the health of humans and animals including impact of these chemicals on immune systems of aquatic and terrestrial species.

Understanding relations among biological and non-biological components of ecosystems – The USGS has expertise on key health issues including vector-borne and zoonotic diseases, water and airborne contaminants, invasive species, and bioaccumulation of contaminants in the food chain. Emergence of new diseases (including toxicological diseases), and changing patterns of established diseases are frequently driven by human induced changes such as land use alterations (ex. patterns of urbanization and agricultural development), climatic factors, air and water quality, and geologic factors (soil type, precipitation). It is estimated that 24 percent of the global disease burden and 23 percent of all human deaths are attributable to environmental factors. Now and in the future, understanding the role of ecological and environmental drivers will be critical. The USGS is uniquely positioned to play a key role in protecting the health of humans, animals and plants in the United States and globally by compiling, synthesizing and analyzing information needed to understand and mitigate these threats.

Techniques for Managing, Protecting, and Restoring Ecosystems – Contaminant Biology provides land managers and policy makers with information on impacts of environmental contaminants on animal, human, and environmental health. The USGS combines cutting edge research, monitoring tools, and predictive models with expertise in toxicology, chemistry, epidemiology, and pathology to determine exposure rates and effects of newly emerging and legacy contaminants on fish and wildlife populations. This information will assist managers in assessing environmental risks; preventing contamination; and managing, protecting, and restoring contaminated lands and trust resources of Interior to fulfill recreational, statutory, and regulatory responsibilities. Contaminant Biology develops techniques, and evaluates contaminated sites for Damage Assessments under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). For example, Contaminant Biology scientists are participating in damage assessments related to the Deepwater Horizon Oil Spill by evaluating the toxicity of oil-contaminated soil and water and assessing long-term impacts on wildlife and environmental health.

Development of ecotoxicological methods and techniques for evaluating impacts of contamination – USGS scientists' research exposure and effects of contaminants that affect immune response, alter reproduction, and influence endocrine systems of free-ranging fish and wildlife populations. The information gained will also enhance understanding of the influence of the environment on public health.

A USGS panel of interdisciplinary experts identified priority research questions and developed a research plan dedicated to the issue of intersex fish and endocrine disrupting chemicals (EDCs). Field research on the effects of EDCs on wild fish populations led to laboratory studies to define mechanistic causes of intersex in fish and modeling to improve understanding of EDC effects on immune response and genetics of fish. Contaminant Biology and the Toxic Substances Hydrology program are co-leading an interdisciplinary effort to meet long-term research goals and address intersex fish and EDCs at the national level.

Work by USGS researchers found that atrazine, one of the most commonly used herbicides in the world, affects fish reproduction. Concentrations of atrazine commonly found in agricultural streams and rivers reduced reproduction and spawning. Substantial reproductive effects were observed at concentrations below EPA water-quality guidelines. Results of this work add ecological perspective to findings on atrazine concentrations in streams reported by the USGS

National Water-Quality Assessment (NAWQA) program and highlights potential risks to aquatic species from exposure to this high-use chemical.

Ecosystem assessment tools for health and welfare of human societies and the environment – Contaminant Biology collaborates with new partners and strengthens its relationships with existing partners such as the USFWS, the NPS, the Centers for Disease Control and Prevention, the National Institute of Health, and the Environmental Protection Agency. In 2012, Contaminant Biology will work with its State and Federal partners to develop a “One World-One Health” Initiative focused broadly on ecosystem health and impacts of climate change, water quality, and anthropogenic ecological drivers on distribution and spread of contaminants. Areas of special interest include synergistic interactions between environmental contaminants and other stressors such as infectious disease and climate change; endocrine disrupting chemicals; immunotoxicology; environmental impacts of nanotechnology; sublethal effects of pesticides and other contaminants on imperiled species; and development of geographically referenced tools to assessing and predict changes in contaminant-related disease expressions on the landscape.

This page intentionally left blank.

Activity: Energy, Minerals, and Environmental Health
Subactivity: Toxic Substances Hydrology

2010 Enacted: $11.1 million (87 FTE)
2011 CR: $11.1 million (87 FTE)
2012 Request: $8.3 million (73 FTE)

Budget Realignment

In 2010 and 2011, Toxic Substances Hydrology is a program in the Hydrological Monitoring, Assessments, and Research subactivity of the Water Resources Investigations activity. In 2012, the program is proposed to move to a subactivity in the Energy, Minerals, and Environmental Health mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

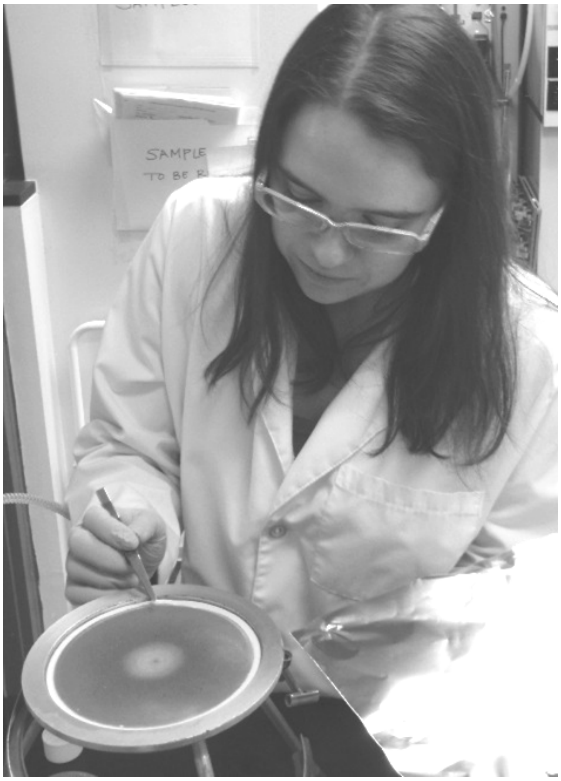
Overview

The Toxics program is a water quality research program that provides reliable scientific information and tools that explain the occurrence, behavior, and effects of toxic substances in the Nation's hydrologic environments. Results of those efforts provide a foundation for informed decision making by resource managers, regulators, industry, and the public.

Contamination problems addressed by the Toxics program are widespread and pose significant risk to human health and the environment. Based on input from many agencies and organizations, the USGS identifies high priority problems for intensive, field-based research. These field studies are conducted at representative sites, watersheds, or regions that focus on subsurface-point-source or nonpoint-source contamination. Study results help natural resource managers improve environmental monitoring, characterize and manage contamination, develop best management practices, form regulatory policies and standards, register the use of new chemicals, and guide chemical manufacture and use. The program focuses on new issues and on emerging and understudied contaminants, by identifying which issues warrant future attention, and by developing and improving methods necessary for detecting and characterizing toxic substances in the natural environment.

The Toxics program’s strengths are its long-term field-based approach, interdisciplinary research teams, ability to address contamination problems at a wide range of geographic scales and environmental settings, and fundamental scientific knowledge of the inherent clean-up capacity of our natural environments. Maintenance of long-term field research laboratories and data collection on extensive regional and national networks makes this contribution particularly unique.

The Toxics program works in partnership with other Federal agencies to ensure priorities for science needs are coordinated, including other Interior Bureaus, the EPA, the USDA, the Department of Defense (DOD), the Department of Energy (DOE), the Nuclear Regulatory Commission, and more recently, public health agencies such as the Centers for Disease Control and Prevention, the Food and Drug Administration, and the National Institute for Environmental Health Sciences. Scientists from universities, other Federal agencies, and industry find significant research opportunities through collaboration in Toxics program activities and at program research sites as evidenced by more than 150 student dissertations published as part of program research activities. Program results are distributed at briefings for regulatory agencies and industry groups, at workshops, at national scientific meetings, in USGS reports, and in scientific journals and books. In the five-year period from 2005–2009, the program contributed about 850 scientific publications.



USGS scientist collects suspended sediment filtered from stream water samples. The sediment will be analyzed for pyrethroid insecticides using a method developed by USGS scientists.

The goals of the Toxics program directly support the USGS Science Strategy focus on providing scientific information on water availability and quality of the United States as a means to inform the public and decision makers about the status of freshwater resources and how they are changing. Efforts of the Toxics program's scientists also support Interior goals and USGS Science Strategy themes of understanding ecosystems and predicting ecosystem change, providing a scientific foundation for energy and mineral resources for America's future, and the role of the environment and wildlife in human health. Toxics program activities are guided by *The U.S. Geological Survey, Toxic Substances Hydrology Program Five Year Plan, 2007–2011*, which was developed with broad input from stakeholders and from other USGS programs. The five-year plan will be updated following completion of the Environmental Health Science Strategic Plan.

More information about the Toxics program is available on the Web at *http://toxics.usgs.gov/*.

Program Performance

This program is composed of the following three components:

Investigations of Subsurface, Point-source Contamination
(2010 Enacted, $5.1 million; 2011 CR, $5.1 million; 2012, $4.2 million)

Interdisciplinary USGS research teams conduct long-term intensive field investigations of common types of subsurface contamination in a variety of hydrogeologic environments. These investigations provide information that improves capabilities to describe, manage, and remediate contamination from local sources, such as chemical spills, leaking storage tanks, industrial discharges, and leakage from landfills and other waste facilities. This knowledge and new methods are applied to similar sites across the Nation. The Toxics program is viewed by those responsible for contaminated site cleanup as a unique provider of information and methods on issues such as contamination in fractured rock aquifers and long-term performance of monitored natural attenuation. This program component also includes development of field methods and techniques for more cost-efficient characterization of subsurface contamination.

USGS hydrologic technicians sample Hallocks Mill Brook downstream of the outfall of a wastewater treatment plant receiving discharge from a pharmaceutical manufacturing plant.

In 2012, the program will contribute to the understanding of subsurface point-source contamination issues associated with:

- Hydrocarbons, fuel oxygenates, and other petroleum-related contaminants;
- Mixed (radionuclide and conventional) waste disposal and contamination in arid environments;
- Contamination in fractured-rock aquifers; and
- Contaminant plumes with complex chemical mixtures, such as landfills and treated wastewater discharges.

During 2012, research highlights of this program component will include:

- Developing new non-intrusive and cost efficient methods to characterize contamination in fractured rock aquifers and testing innovative remediation alternatives in contaminated fractured rock aquifers;

- Developing capabilities and tools to model multi-species contaminant transport at the plume scale;
- Understanding volatile organic chemicals on the transport of tritium (radioactive hydrogen isotope) in the subsurface; and
- Characterizing microbial degradations pathways.

Research on remediation alternatives is being coordinated with EPA, DOD, and DOE, via the Strategic Environmental Research and Development Program.

Investigations of Watershed-scale and Regional-scale Contamination
(2010 Enacted, $5.4 million; 2011 CR, $5.4 million; 2012, $4.0 million)

Watershed-scale and regional-scale investigations address nonpoint-source contamination problems typical of widespread land uses or human activities that may pose a threat to human and environmental health throughout a significant portion of the Nation. These investigations involve characterizing contaminant sources, investigating mechanisms by which source contamination affects aquatic ecosystems, and investigating the processes that transform contaminants into different and possibly more toxic forms. This program component also includes laboratory and field methods development to ensure accurate measurement of environmental contaminants at low levels.

During 2012, highlights of research activities of this program component include: improving approaches to setting water quality restoration targets in mined watersheds; defining environmental contamination by new and understudied pesticides in common pesticide-use settings; comparing mercury methylation and cycling mechanisms in major ocean systems; and characterizing discharge of pharmaceuticals from pharmaceutical manufacturing facilities and other sources to the environment, as well as in source (untreated) and finished (treated) drinking water.

Technical Support
(2010 Enacted, $0.6 million; 2011 CR, $0.6 million; 2012, $0.1 million)

The USGS has a long tradition of providing technical support for its geographically distributed water resources studies. This support provides quality control to ensure technical excellence of water resources field programs and provides a structured way of transferring new technology to investigative and data activities primarily conducted in USGS Water Science Centers in each State. Technical support also includes a formal way of establishing priorities for water research by the USGS and provides a mechanism to make water resources information available to other agencies, the scientific community, and the public.

Activity: Natural Hazards

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Earthquake Hazards ($000)		57,021	57,021	-619	-1,076	-3,000	52,326	-4,695
	FTE	*253*	*253*	*-3*		*0*	*250*	*-3*
Volcano Hazards ($000)		24,421	24,421	-286	-526	-250	23,359	-1,062
	FTE	*146*	*146*	*-1*		*-3*	*142*	*-4*
Landslide Hazards ($000)		3,405	3,405	-46	-81	0	3,278	-127
	FTE	*22*	*22*	*0*		*0*	*22*	*0*
Global Seismographic Network ($000)		5,778	5,778	-75	-121	-250	5,332	-446
	FTE	*10*	*10*	*0*		*0*	*10*	*0*
Geomagnetism ($000)		2,138	2,138	-28	-37	0	2,073	-65
	FTE	*17*	*17*	*0*		*0*	*17*	*0*
Coastal and Marine Geology ($000)		46,188	46,188	-588	-999	2,900	47,501	1,313
	FTE	*233*	*233*	*-2*		*2*	*233*	*0*
Total Requirements ($000)		**138,951**	**138,951**	**-1,642**	**-2,840**	**-600**	**133,869**	**-5,082**
	Total FTE	***681***	***681***	***-6***		***-1***	***674***	***-7***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Unrequested Congressional Action	-1,500	0
• Multi-Hazards Initiative (Volcanoes)	+1,500	+2
• Earthquake Grants (Earthquakes)	-2,000	0
• National Volcano Early Warning System (Volcanoes)	-1,500	-5
• Extended Continental Shelf (Coastal & Marine)	-2,000	-2
• Coastal and Marine Planning (Coastal & Marine)	+4,500	+2
• Ecosystem Restoration	+400	+2
o Puget Sound (Coastal and Marine)	[+400]	[+2]
TOTAL Program Changes	**-600**	**-1**

Justification of Program Changes

The 2012 Budget Request for Natural Hazards is $133,869,000 and 674 FTE, a net program change of -$600,000 and -1 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Program Changes

Unrequested Congressional Action **(-$1,500,000/0 FTE)**

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation. A list of these actions is located in the Budget at a Glance Section.

Multi-Hazards Initiative **(+$1,500,000/+2 FTE)**

This program change represents the volcano hazards component of a multi-hazards initiative, which would build upon the success of the Multi-Hazards Demonstration Project (MHDP) in southern California, extending the multi-hazards approach to at-risk areas of the Pacific Northwest and Alaska coastal communities. The USGS hazard programs are heavily integrated into regional hazard planning and mitigation activities to address multiple hazards in both Oregon and Washington. This initiative proposes improving risk assessments and monitoring capabilities in the Pacific Northwest to help decision makers and citizens prepare for and respond to natural hazards, building more resilience in that region. Expanding the multi-hazards demonstration project approach to Alaska would improve the ability of the USGS to support emergency planning and risk assessment of potential future hazards at and near the coastal population centers and would invest in earthquake, tsunami, and volcano science to support community planning in Alaska. Funds would also be used to provide the necessary data transmission improvements for the National Earthquake Information Center (NEIC) in Golden, CO, to import real-time seismic data from the five USGS volcano observatories. The USGS provides 24/7 detection and rapid location, analysis and dissemination of information for earthquakes world-wide. This effort would add a volcanic earthquake detection role to the NEIC, providing a 24/7 backup alerting capability for USGS volcano observatories.

Earthquake Grants **(-$2,000,000/0 FTE)**

The Earthquake Hazards Program (EHP) enlists the talents and expertise of State government, the academic community, and the private sector to conduct research on earthquake hazards. This proposed funding decrease would eliminate one-third of the funding provided by the EHP for competitive, peer-reviewed, external research grants and cooperative agreements. External research grants would continue to be provided at a reduced rate.

National Volcano Early Warning System **(-$1,500,000/-5 FTE)**

The National Volcano Early Warning System (NVEWS) is a national-scale system to ensure that volcanoes are monitored at levels commensurate to their threats. The proposed decrease would halt progress on the monitoring infrastructure element of NVEWS, maintaining the current level of monitoring of a number of high-threat volcanoes; discontinuance of efforts to modernize the existing monitoring system; and loss of upgraded monitoring stations due to deferral of maintenance. Monitoring of volcanoes would continue volcano by volcano without a national-scale approach.

Extended Continental Shelf **(-$2,000,000/-2 FTE)**

The USGS has participated in the collaborative effort, overseen by the Interagency Task Force on the ECS, which is chaired by the Department of State and vice co-chaired by NOAA and Interior, for development of a United States submission establishing the limits of the Extended Continental Shelf (ECS). This proposed decrease would reduce funding provided for ECS

activities by half. Efforts which support field data collection, analyses, and synthesis of data and interpretive products to ensure that the United States' submissions maximize the United States' jurisdiction over seabed and sub-seabed resources beyond the currently established Exclusive Economic Zone (EEZ) would be reduced.

Coastal and Marine Planning (+$4,500,000/+2 FTE)

The proposed increase would allow the USGS to actively engage with other Interior Bureaus and Federal agencies in implementation of the "Framework for Effective Coastal and Marine Spatial Planning" and the National Ocean Policy. The framework defines Coastal and Marine Spatial Planning (CMSP) as "a comprehensive, adaptive, integrated, ecosystem based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas." CMSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. In practical terms, CMSP provides a public policy process for society to better determine how the ocean, coasts, and Great Lakes are sustainably used and protected—now and for future generations.

Effective implementation of CMSP to meet policy objectives is predicated on the availability, integration, and application of diverse information resources, including data, models, and assessments based on sound science. USGS information and research products are critical to successful implementation of CMSP at regional and national levels. The USGS will, working with Federal and other partners, develop information resources, integrate existing information systems, and contribute to the development of a comprehensive CMSP Information Management System (CMSP-IMS). Development of the CMSP-IMS is led by the National Ocean Council staff working with all Federal agencies with ocean-related programs. The funds provided through this increase will:

- Provide for continued DOI/USGS leadership for development of a national Information Management System (CMSP-IMS) including regional and national stakeholder engagement;
- Construct a prototype CMSP portal for the Gulf of Mexico and evaluate its utility with targeted customers and other regions of the United States;
- Produce data standards that are adopted as National information quality standards and ensure that priority USGS data sets (to be defined through national and regional needs assessment, but including topography, bathymetry, geology, seabed characterization, and imagery-based land use/land cover) comply with standards, are accessible through the CMSP-IMS, and support CMSP in gap analyses to target priority data collection activities;
- In response to regional planning bodies' identified information needs, support data collection and integration with existing data resources in order to produce seafloor maps, habitat classification maps and data layers to meet needs and gaps identified by regional planning bodies; and
- Support model-based development of tools in pilot regions required to apply existing USGS data resources to forecast coastal vulnerability resulting from projected sea level rise and coastal storms, and to provide assessments of ocean wave and current stresses on seafloor habitats and infrastructure.

These efforts will ensure that USGS data resources are accessible to and enhance CMSP planning, that new data and information products developed respond to identified needs, and that USGS technical expertise and investments in information management systems are reflected in development of the CMSP-IMS.

Ecosystem Restoration **(+$400,000/+2 FTE)**

America's Great Outdoors is the President's signature conservation initiative and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. This Ecosystem Restoration initiative will help the President advance his America's Great Outdoors initiative. Listed below are the ecosystems targeted by this effort. A description of the work proposed can be found in the Ecosystem Restoration initiative in the Key Changes Section.

- Puget Sound +$400,000/+2 FTE

Activity Summary

Natural hazards threaten the safety, security, and economic well-being of our Nation's communities as well as impacting natural resources and surrounding ecosystems. Much of the Nation's infrastructure is aging and vulnerable to sudden extreme events. Until recently the number of lives lost to natural hazards in the United States each year had declined, but the cost of response to and recovery from disasters continues to rise. Expanding population in coastal zones, floodplains, wildland-urban interfaces, and areas prone to earthquakes and volcanic eruptions heightens risk of future disasters. In the face of these challenges, the USGS plays a critical role in providing policy makers and the public with a clear understanding of potential threats, societal vulnerability to these threats, and strategies for achieving resilience to earthquakes, volcanic eruptions, hurricanes, floods, wildfires, mud slides, and solar storms. The USGS is working with its partners, cooperators, and customers in defining and mitigating risks, building an understanding of processes associated with natural hazards, and characterizing the potential impact and consequences of natural geologic events on human activity, health, the economy, and the environment.

In addition to the USGS's hazard-focused programs, this mission area includes USGS activities that characterize and assess the coastal and marine processes, conditions, change and vulnerability. USGS expertise in marine geology, geophysics, and oceanographic disciplines provides science and information products essential to the implementation of priority objectives of the Administration's National Ocean Policy. The National Ocean Policy identifies critical needs for science and information to support broad objectives including ecosystem restoration and protection, adaptation to climate change, and sustainable development and resources use. The USGS will actively engage with other Interior Bureaus, Federal agencies, and regional ocean alliances to provide data and tools to support national and regional objectives. USGS efforts to improve and increase understanding in these areas provides managers and policy makers at all levels with tools to make better and more cost-effective decisions that anticipate changing conditions and the consequences of resource use, management, and restoration.

The Natural Hazards activity includes the Earthquake Hazards, Volcano Hazards, Landslide Hazards, Global Seismographic Network, Geomagnetism, and Coastal and Marine Geology program.

Management Summary

Program Reviews – The Scientific Earthquake Studies Advisory Committee, established by Congress in the 2000 reauthorization of the National Earthquake Hazards Reduction Program (NEHRP), reviews the EHP on an annual basis. In response to the most recent committee recommendations, the USGS is: investing more heavily in the Advanced National Seismic System (ANSS), including support for development of a prototype earthquake early warning capability; nurturing and expanding multi-hazards projects; supporting research to better understand tremor and slow-slip earthquakes; and bringing new talent to the workforce.

The 2007 review of the VHP conducted by the AAAS strongly endorsed implementing the NVEWS, and proposed that the VHP work more closely with State and local partners to develop risk-focused products that deal with future eruption scenarios. From 2008 to 2010, instrumentation and implementation plans for NVEWS were completed. NVEWS served as the blueprint for modernizing the volcano monitoring system under the American Recovery and Reinvestment Act. During 2010, the USGS strengthened existing volcano partnerships with the Universities of Washington and Utah, created new partnerships with the State of Wyoming and the University of Hawaii at Manoa, and began preparing for creation of a 24/7 seismic alert capability with the National Earthquake Information Center. These two activities will be significantly curtailed by funding reductions proposed for 2011 and 2012.

Strategic Planning – The USGS has chartered Science Strategy Planning Teams (SSPT) charged with developing long-term (10 year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The strategic plan will provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that the USGS meets the goals of the USGS Science Strategy.

Natural Hazards Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Natural Hazards -- Earthquake Hazards & Volcano Hazards							
% implementation of optimal earthquake and volcano monitoring for moderate to high hazard areas (SP)							
Performance Data	24.0%	24.6% (49.1/2)	26.1% (52.2/2)	28.6%	28.8%	+0.2%	+1.2%
Total Actual/Projected Cost ($000)	22,543	21,562	21,033	20,900	19,400	-1,500	0
% completion of earthquake and volcano hazard assessments for moderate to high hazard areas (SP)							
Performance Data	26.6%	28.5% (57/2)	30.8% (61.5/2)	33.0%	34.8%	+1.8%	+4.2%
Total Actual/Projected Cost ($000)	34,946	37,617	39,016	37,400	37,400	0	0
Earthquake Hazards							
% completion of optimal monitoring for moderate to high earthquake hazard areas							
Performance Data	22% (1562/7100)	23% (1633/7100)	26% (1846/7100)	28% (2013/7100)	29% (2038/7100)	+1%	+0.8%
Total Actual/Projected Cost ($000)	9,032	11,471	10,545	10,500	10,500	0	
% completion of earthquake hazard assessments for moderate to high hazard areas							
Performance Data	16.8% (6.06/36)	18.7% (6.73/36)	23.4% (8.44/36)	28.4% (10.23/36)	32.8% (11.82/36)	+4.4%	+6.3%
Total Actual/Projected Cost ($000)	26,119	27,729	28,561	27,000	27,000	0	0
Cumulative number of ANSS seismic monitoring stations (ARRA)							
Performance Data	805	886	1,299	1,642	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.						
# of systematic analyses and investigations completed							
Performance Data	132	146	146	157	146	-11	-16
Total Actual/Projected Cost ($000)	24,024	26,572	28,574	28,574	26,572	-2,002	-2,912
Actual/Projected Cost Per systematic analyses (whole dollars)	182	182	182	182	182	0	0
# of stations operated							
Performance Data	2,767	2,848	2,890	2,988	N/A	0	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.						
Volcano Hazards							
% completion of optimal monitoring of moderate to very high threat volcanoes							
Performance Data	26% (2291/88)	26.1% (2299/88)	26.2% (2308/88)	28.1% (2471/88)	28.4% (2503/88)	+0.3%	3.7%
Total Actual/Projected Cost ($000)	13,511	10,091	10,488	10,400	8,900	-1,500	0
Comments	Slower progress than expected due to reduction to Program in 2012.						

Natural Hazards Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Volcano Hazards							
% completion of hazard assessment framework elements for moderate to very high threat volcanoes							
Performance Data	36.3% (3742/103)	37.2% (3831/103)	38.1% (3920/103)	39.2% (4041/103)	39.4% (4063/103)	+0.2%	0.8%
Total Actual/Projected Cost ($000)	8,827	9,888	10,455	10,400	10,400	0	0
Comments	Slower progress than expected due to reduction to Program in 2012.						
% of very high threat volcanoes with optimal level monitoring (X number of 18) (ARRA)							
Performance Data	22.2%	22.2%	22.2%	27.7% (5/18)	N/A	0%	N/A
Comments	This ARRA measure will be discontinued when completed in 2011.						
# of systematic analyses and investigations completed							
Performance Data	71	99	75	75	75	0	-15
Total Actual/Projected Cost ($000)	21,300	29,700	22,500	22,500	22,500	0	0
Actual/Projected Cost Per systematic analyses (whole dollars)	300,000	300,000	300,000	300,000	300,000	0	0
Comments	Long-term impact due to reduction to Program in 2012.						
# of monitoring stations operated by VHP							
Performance Data	734	743	743	758	765	+7	+20
Comments	Slower progress than expected due to reduction to Program in 2012.						
Coastal and Marine Geology							
% of regional and topical ocean and coastal studies that cite USGS products within three years of study completion (SP)							
Performance Data	80% (24/30)	80% (24/30)	80% (24/30)	80% (24/30)	78% (22/28)	-2%	4%
Total Actual/Projected Cost ($000)	36,148	38,696	38,057	39,825	33,630	-6,195	0
Cost of collection and processing of LiDAR data for coastal characterization and impact assessments (per megabyte of data collected)							
Performance Data	0.50	0.44	0.39	0.32	0.31	-0.01	-0.01
# of gigabytes of LiDAR data collected annually							
Performance Data	N/A	100	555	300	300	0	+300
# of systematic analyses and investigations completed							
Performance Data	200	200	214	210	190	-20	+5
Total Actual/Projected Cost ($000)	34,549	35,000	43,000	45,000	38,000	-7,000	0
Actual/Projected Cost Per systematic analyses (whole dollars)	173,000	175,000	215,000	219,000	200,000	-19,000	0
Comments	There will be a decrease in the number of systematic analyses in 2013 as funding for Extended Continental Shelf activities are reduced in 2012. This impacts subsequent years because resources may be shifted to address research (systematic analyses) and knowledge management requirements for Coastal and Marine Spatial Planning.						

Natural Hazards Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Coastal and Marine Geology							
# of systematic analyses and investigations completed for Coastal and Marine Spatial Planning							
Performance Data	N/A	N/A	N/A	0	10	+10	+5
Total Actual/Projected Cost ($000)	N/A	N/A	N/A	0	4,500	4,500	0
Actual/Projected Cost Per systematic analyses (whole dollars)	N/A	N/A	N/A	0	450,000	450,000	0

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

Activity: Natural Hazards
Subactivity: Earthquake Hazards

2010 Enacted: $57.0 million (253 FTE)
2011 CR: $57.0 million (253 FTE)
2012 Request: $52.3 million (250 FTE)

Budget Realignment

In 2010 and 2011, Earthquake Hazards is a program in the Geologic Hazards Assessments subactivity of the Geologic Hazards, Resources and Processes activity. Under the new budget structure, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Of all natural hazards facing the United States, earthquakes have the greatest potential for inflicting catastrophic casualties, damage, economic loss, and disruption. Damaging earthquakes are infrequent, but their consequences can be immense. According to recent studies, a major earthquake in an urbanized region of the United States could cause several thousand deaths and possibly $250 trillion dollars in losses. Although the risk from earthquakes is high in California, many other parts of the country are also at risk, including the Mississippi River valley, Pacific Northwest, Intermountain West, Alaska, Hawaii, U.S. Territories, and parts of the Eastern seaboard. Over 75 million people live in metropolitan areas with significant earthquake risk.

As required under the Disaster Relief Act of 1974 (P.L. 92–288), the USGS has the delegated Federal responsibility for monitoring and notification of seismic activity in the United States. The USGS is the only U.S. Agency that routinely and continuously reports on current domestic and worldwide earthquake activity. The USGS provides the scientific information and knowledge necessary to reduce deaths, injuries, and economic losses from earthquakes and earthquake-induced tsunamis, landslides and liquefaction.

Through the Advanced National Seismic System (ANSS), the USGS and its State and university partners provide seismic monitoring coverage for the Nation. The EHP is the applied Earth science component of the four-Agency NEHRP, re-authorized by the Earthquake Hazards Reduction Authorization Act of 2004 (P.L. 108–360); a reauthorization bill is currently under consideration in Congress. Through NEHRP, the USGS partners with lead agencies, including the National Institute of Standards and Technology (NIST), the Federal Emergency Management Agency (FEMA), and the NSF.

Partnerships are crucial to the program's success. Approximately 25 percent of the total EHP budget is directed toward research grants and cooperative agreements with universities, State agencies, and private technical firms to support research and monitoring activities. This external funding is leveraged by funds from other Federal agencies, States, and the private sector. This 2012 request proposes to eliminate the majority of funds that support research into earthquake occurrence and effects and assessments of hazards in at-risk urban areas.

Direction for the EHP is established by a five-year plan that results from internal and external inputs. These inputs include the USGS and Interior strategic plans, results of periodic reviews by the congressionally established external Scientific Earthquake Studies Advisory Committee,

workshops with stakeholders on specific topics, and the advice of senior scientists both within and outside the USGS. The program is a critical component of the national hazards, risk and resilience assessment activity called for in the USGS Science Strategy document, *Facing Tomorrow's Challenges*. The program's activities are identified in the National Science and Technology Council's planning documents, including the Subcommittee on Disaster Reduction's (SDR) *Grand Challenges for Disaster Reduction* (2005), an earthquake-specific implementation plan (2008), the joint SDR/U.S. Group on Earth Observations document, *Improved Observations for Disaster Reduction: Near-Term Opportunity Plan* (2006), and the NEHRP strategic plan (2009). EHP funded activities undergo both management and scientific review of project concepts and of final project proposals when submitted for initial funding using a program council responsive to regional and topical needs. Additionally, periodic reviews are conducted on progress of multiyear projects and results are peer reviewed.

Program Performance

The EHP includes the following three program components: Assessment and Characterization of Earthquake Hazards, Monitoring and Reporting Earthquake activity and Crustal Deformation, and Conducting Research into Earthquake Causes and Effects. The program's strategic plan also identifies a fourth component—Earthquake Safety Policy—that features activities embedded in each of the other program components and reflects the NEHRP mission to translate improvements in understanding into loss-reduction results. At the 2011 funding level, program accomplishments include the following:

Assessment and Characterization of Earthquake Hazards
(2010 Enacted, $23.8 million; 2011 CR, $23.8 million; 2012 Request, $22.2 million)

The USGS contributes to earthquake hazard mitigation strategies by developing seismic hazard maps that describe the likelihood of and potential effects of earthquakes throughout the Nation, especially in high-risk urban areas; and making this knowledge available to others so that it can be used to reduce the impact of potentially damaging earthquakes. Federal, State, and local government agencies, architects and engineers, insurance companies and other private businesses, land use planners, emergency response officials, and the general public rely on the USGS for earthquake hazard information to refine building codes, develop land use strategies, safeguard lifelines and critical facilities, develop emergency response plans, and take other precautionary actions to reduce losses from future earthquakes.

The USGS national seismic hazard maps are used to develop new, unified model building codes for the United States. These digital maps integrate a wide range of geological and geophysical information to provide estimates of the maximum severity of ground shaking that a given location is expected to experience during the next 50, 100, and 250 years. Periodic review and updating of the seismic hazard maps to incorporate new information are among the highest priorities for the EHP. The USGS works closely with earthquake researchers, engineers, and State and local government representatives across the Nation to ensure the maps represent the most current and accurate information available.

The scale of the national seismic hazard maps precludes taking into account local variations in the size and duration of seismic shaking caused by small scale geologic structures and soil conditions. For high-to-moderate risk urban areas, the USGS is generating more detailed products that make it possible for local officials to make informed zoning and building code decisions. Modeling of ground motion is provided for engineering applications. In conjunction

with release of these targeted products, the USGS conducts workshops to assure the proper transfer of knowledge and to help design effective mitigation strategies.

Following the catastrophic earthquake of January 12, 2010, the Government of Haiti appealed to the United States for guidance on the short- and long-term seismic hazards facing Haiti, including hazard maps to help guide the rebuilding effort. To respond to this request the USGS formed an Earthquake Disaster Assistance Team (EDAT) in partnership with USAID's Office of Foreign Disaster Assistance. With logistical support from the U.S. Southern Command and the U.S. Embassy, teams of USGS geologists and seismologists visited Haiti and worked with academic colleagues and Haitian counterparts. They obtained observations of fault location and rupture, coastal uplift, landslide hazards, aftershock locations, and seismic amplification. An initial seismic hazard map was developed that vastly improves upon prior evaluations (which did not properly recognize the hazard posed by several major faults). This map and associated products under development provide the information that engineers require to rebuild a more resilient and safer nation.

Key projects in assessment and characterization include:

National Seismic Hazard Maps – In 2010, USGS scientists and engineers worked with the Building Seismic Safety Council and American Society of Civil Engineers code committees to implement the 2008 National Seismic Hazard Maps into engineering practice. These hazard maps are based on research by seismologists and geologists across the USGS. As a result of these sustained efforts, the updated USGS hazard maps were accepted in the 2009 NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures and the 2010 ASCE7 Minimum Design Loads for Buildings and Other Structures. These ASCE standards will be the reference for the 2012 version of the International Building Code (IBC); the code that has been adopted throughout most of the United States as the standard for building design.

In addition to building codes, USGS scientists have completed development of fault displacement hazard models in collaboration with the California Geological Survey that are being used for lifeline designs in California. USGS scientists reviewed the new 2010 seismic hazard model standard for nuclear power plants in the central and eastern United States and several proposed nuclear power plant seismic hazard analyses for the Nuclear Regulatory Commission to ensure that the inputs are consistent with latest scientific consensus. In addition, they have constructed preliminary seismic hazard models for regions of recent damaging earthquakes in Haiti and South America. During 2011, scientists will begin the process of developing the next version of the hazard maps that is due to the code committees in 2013. To update the hazard model project members will work with the Pacific Earthquake Engineering Center to update ground motion models across the United States and with the Southern California Earthquake Center and the California Geological Survey (with funding from the California Earthquake Authority) to develop an operational earthquake forecast for California.

Hazard Maps for Urban Areas – Urban seismic hazard maps are a refinement of the National Seismic Hazard Maps that include details about local geologic site conditions that effect earthquake ground motions and liquefaction. During 2010, the USGS focused on advancing a collaborative urban seismic hazard mapping project in the high-risk St. Louis urban area, and completing and delivering another such project in the Tri-State (Evansville) area of Indiana, Kentucky, and Illinois. In both of these efforts, the USGS served primarily as a coordinator, with most of the technical work being done by local partners. Partners in the St. Louis project

included the University of Missouri at Rolla, Missouri Department of Natural Resources, and the Missouri State Geological Survey. Partners in the Tri-State (Evansville) project include the State geological surveys of Indiana, Kentucky, and Illinois, the Southwest Indiana Disaster Resistant Community Corporation, the Central United States Earthquake Consortium (CUSEC), and Purdue University. The proposed reduction in the program's grants budget in 2012 will eliminate the majority of funding to these partners, slowing progress and delaying completion of the St. Louis area hazard assessment.

The Wasatch Front urban corridor in Utah and the Reno-Carson City area in Nevada, two of the largest urban centers in the Intermountain West region, are adjacent to known active faults. To fully evaluate the potential impact of earthquakes caused by these faults, the USGS is partnering with geoscientists from those States' geological surveys and academic institutions in a multi-year effort to collect data and develop models that will be the basis for urban hazard maps along the Wasatch Front and in the Reno-Carson City corridor. The first Wasatch Front urban hazard map will concentrate on the Salt Lake City area. Collection of field data for this map is largely complete, and current efforts are focused on developing ground-motion models for the Salt Lake basin. In the Reno-Carson City area, the USGS and its partners are expanding efforts to collect the basic geological and geophysical field data that provide the scientific foundation for urban hazard maps. The proposed cut to grant funds in 2012 will halt that expansion and substantially delay completion of urban hazard assessments in Utah and Nevada.

Monitoring and Reporting Earthquake Activity and Crustal Deformation
(2010 Enacted, $22.0 million; 2011 CR, $22.0 million; 2012 Request, $21.3 million)

The ANSS effort is focused on expanding and improving the performance and integration of national, regional, and urban seismic monitoring networks in the United States. The system consists of a national ANSS Backbone network, the National Earthquake Information Center (NEIC), 14 partner-operated regional networks in areas of moderate-to-high seismic activity, and the National Engineering Strong Motion Project for monitoring earthquake shaking in structures.

ANSS-Directed Funding within EHP

FY	Amount ($M)
2000	$1.6
2001	$3.6
2002	$3.9
2003	$3.9
2004	$4.4
2005	$8.9
2006	$8.0
2007	$8.0
2008	$8.8
2009	$8.8 SIR ($19.0 ARRA)
2010	$8.3
2011	$9.1

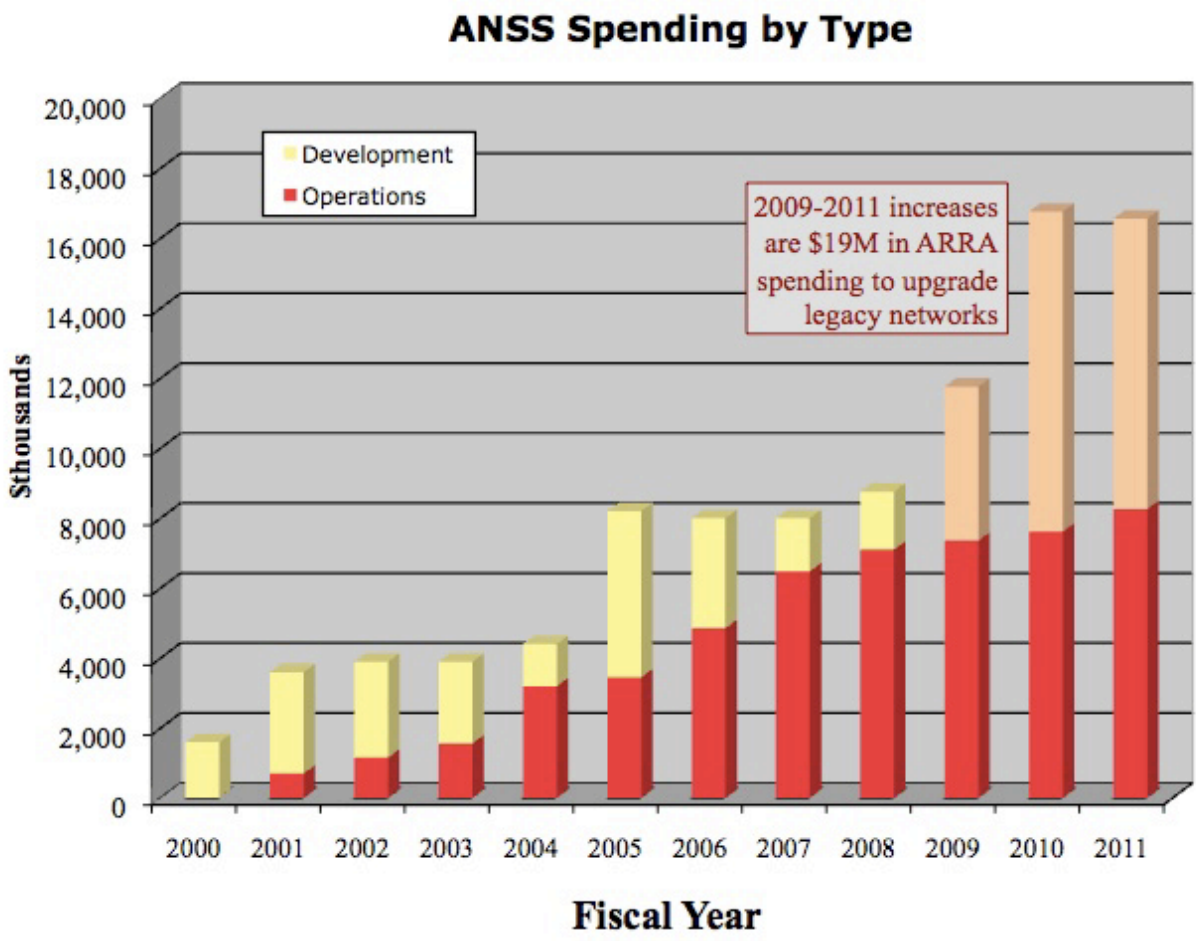
By the beginning of 2010, the USGS and partners had installed a cumulative total of 886 ANSS earthquake monitoring stations, and the network is now capable of detecting almost all felt earthquakes in the United States, except in remote areas of Alaska. The NEIC now typically reports on domestic earthquakes within minutes of their occurrence. The NEIC provides information on potentially damaging earthquakes to the National Command Center; the White House; the Departments of Defense, Homeland Security (including FEMA), Transportation, Energy, and Interior; State offices for disaster services; numerous public and private infrastructure management centers (e.g., railroads and pipelines); the news media, and the public. Rapid earthquake notifications are delivered by e-mail and text message to over 175,000 users, and a suite of earthquake information products such as *ShakeMaps*, *Did You Feel It?* maps, and technical data are available on the program's Web site, which receives more than two million hits every day. The USGS also provides near-real-time data to NOAA's tsunami warning centers, supporting tsunami monitoring in the Pacific Rim

and disaster alerting in Alaska, Hawaii, Washington, California, and U.S. Territories in the Western Pacific.

A substantial increase in the number of ANSS stations and in data processing and product generation capability was realized in 2010 and will continue in 2011 as a result of economic stimulus funding. The USGS allocated $19.0 million of the $140.0 million dollars provided to it under the American Recovery and Reinvestment Act (ARRA) for the modernization component of ANSS. Outdated equipment at hundreds of legacy seismic stations is being replaced with modern digital equipment. ARRA funding was allocated to 13 cooperating partners that perform the station and network upgrades. In addition to station modernization, ARRA funds are being used to upgrade communications and processing software and to complete some critical software development tasks. Other ARRA funds are being used to upgrade the geodetic monitoring network and the stations of the Global Seismographic Network. In total $29.5 million in ARRA funding will be spent in 2009-2011 on improving earthquake monitoring in the United States.

In addition, new sensor installations are underway as part of the USGS Multi-Hazards initiative, which is proposed for elimination in 2012. In 2010, forty new “NetQuake” sensors were installed in the greater Seattle-Tacoma area, to collect critically needed strong ground motion from future earthquakes. Combined with the ARRA network upgrades and ARRA-funded seismic and geodetic monitoring investments being made in 2010-2012 by the National Science Foundation, our capabilities for monitoring earthquakes in the Pacific Northwest have been significantly improved. In 2012, this expansion of the regional seismic network will end.

Outside of the ARRA upgrades, most resources are directed at maintaining a high level of performance of the installed system and meeting commitments to partners for data availability, management and quality.



The chart above shows total annual ANSS-directed funding (in thousands) broken down by type. The first year of ANSS funding was in 2000; the large increase in 2005 reflects supplemental funding received as part of the tsunami initiative (most of which was added to the base funding in 2006). While funding for development has expanded, operational costs have increased. ARRA funds have permitted a renewal of system development in 2009 to 2011, mostly through targeted improvement of older seismic stations to modern ANSS quality and standards.

Example projects in monitoring and reporting earthquake activity and crustal deformation include:

Regional Earthquake Monitoring – As part of the ANSS, the USGS and cooperating universities operate regional seismic networks in areas of high seismicity. Data from all U.S. seismic networks are used to monitor active faults and ground shaking, in much greater detail and accuracy than is possible with the national-scale network. Each region has appropriate local data processing capabilities; regional data are contributed to a national ANSS catalog of earthquakes. ANSS regional networks serve as State or local distribution points for information about earthquakes to the public, local and State agencies, and other regional interests. The regional data centers also relay earthquake data in real time to the USGS NEIC, as well as to other regional networks. The centers provide information about regional earthquake hazards, risks, and accepted mitigation practices, and those centers located at universities provide training and research facilities for students. To support partner activities in regional earthquake monitoring, approximately $6.4 million was provided in 2010 through cooperative agreements,

$3.4 million of which came from base program funds. The additional $3.0 million came from funds targeted for development and maintenance of the ANSS. In 2010, the USGS supported 14 regional seismic networks, structural arrays and geotechnical arrays, operated by the following colleges and universities:

Seismic Monitoring Networks Supported by the USGS	
Boston College, Weston Geophysical Observatory	University of California Berkeley
California Institute of Technology	University of California San Diego
Columbia University, Lamont-Doherty Earth Observatory	University of Memphis
Montana Tech of the University of Montana	University of Oregon
Saint Louis University	University of South Carolina
University Nevada Reno	University of Utah
University of Alaska Fairbanks	University of Washington

In 2011, funding for regional network operations remains a high priority, and is being directed toward ensuring robust regional network operations and maintenance.

Earthquake Early Warning – Modern seismic networks can, in favorable circumstances, provide seconds to tens of seconds of warning before the onset of strong shaking (Earthquake Early Warning, or EEW). In order for ANSS to deliver EEW, further expansion is needed to: increase the robustness of the current ANSS system; increase the density of seismic instrumentation to be able to quickly determine that an earthquake is underway (requiring adequate monitoring of all possible faults); integrate, improve, and test the systems that generate warnings; and develop protocols and tools to communicate seismic information and parameters of approaching seismic waves to users' decision systems.

In 2010 and 2011, ARRA funds are being used to modernize and speed-up earthquake detection equipment throughout ANSS. However, much more work remains. Communication of data from field sensors to central processing centers is still fragile and sensor density is still inadequate. Also, there is an insufficient number of staff to operate and maintain an EEW system reliably 24/7.

In 2010, USGS partially funded a three year "Phase II" research and development effort to integrate the best features of warning algorithms developed at the University of California and the California Institute of Technology, with additional evaluation and testing work by the Southern California Earthquake Center, a university consortium. This work will be expanded in 2011, focusing on working with private and public sector entities (companies, universities, and State and county emergency response organizations) to co-develop the delivery mechanisms for warnings (such as cell phone alerts) and equipment that takes action when receiving warnings (such as mechanisms to stop elevators).

In 2012, the USGS effort to establish a prototype EEW system in California will be put on hold. Since the R&D effort is funded through our External Research activity, the proposed reduction in that activity will require termination of the Phase II EEW development effort.

Monitoring Deformation of the Earth's Surface – Geodetic networks provide essential information about the massive, slow deformation (strain) of the land surface that occurs between earthquakes, forces that cause earthquakes, and surface displacements due to large earthquakes. The USGS works with universities, local agencies, and the Plate Boundary Observatory component of the NSF's EarthScope program to conduct geodetic investigations using the Global Positioning System (GPS), LiDAR, Interferometric Synthetic Aperture Radar

(InSAR), creepmeters (measures fault movement), and sensitive long-baseline and borehole strainmeters. Continuously-operating geodetic monitoring stations use precise GPS techniques to measure changes in the shape of the Earth's surface that help reveal how strain accumulates on earthquake faults, and how those faults are slipping at depth. These precise geodetic data provide new constraints on the likely rate of large earthquakes in a region.

To address hazards in the southern California and the urban Los Angeles region, the USGS operates approximately 100 stations along the San Andreas Fault and in the densely-populated urban areas. Data are processed daily on state-of-the-art, continuously operating GPS stations operated by the Scripps Institution of Oceanography and the Plate Boundary Observatory (PBO). In addition, the USGS works with partners to use LiDAR and InSAR to quickly and accurately produce large aerial maps of pre- and post-earthquake land deformation. GPS, GPS-tagged aerial photography, LiDAR, and InSAR were used by the USGS, other agencies, and universities to detect fault rupture and off-fault deformations caused by the April 4, 2010, M 7.2 El Mayor Cucapah earthquake, an event that caused damage in Mexico and the United States.

The USGS funded the Massachusetts Institute of Technology's (MIT) upgrade on its precise GPS processing software to operate in real time. MIT will maintain the software and make it freely available to the USGS and other researchers. This state-of-the-art software, when combined with robust telemetry, promises to dramatically improve the USGS geodetic earthquake response by making surface displacements quickly available to emergency responders and by providing useful constraints for finite fault models.

High-resolution LiDAR data continues to be key to identifying active faults in Oregon and Washington that have the potential to generate damaging earthquakes. The USGS is using funds from the multi-hazards initiative to collect and analyze LiDAR data in four at-risk areas in Oregon and Washington. In the Portland area, LiDAR studies have identified sites for field studies aimed at clarifying whether the Gales Creek Fault has slipped in the recent geologic past and remains a hazard. Geologists from the USGS and the Oregon Department of Geology and Mineral Industries (DOGAMI) excavated a trench across the fault to search for evidence of recent slip. Near Mount Hood, LiDAR reveals a set of faults, each with about two meters of surface displacement that may be part of the southern extension of the Saint Helens seismic zone. Geologists from the USGS and the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted trenching studies of the faults in 2010. In eastern Washington, LiDAR studies have identified a major north-south fault that is approximately perpendicular to faults previously mapped in the Yakima fold and thrust belt in the Columbia Plateau; this newly found fault was trenched during the summer of 2010. Finally, LiDAR is being used to analyze the potential interaction of faults in the Cascade Range and the Yakima fold and thrust belt in Central Washington where a massive landslide occurred on October 14, 2009.

ARRA funds supporting geodetic monitoring benefit the USGS and its cooperators by allowing much-needed upgrades of obsolete GPS and strainmeter equipment, telemetry upgrades, acquisition of new high-precision LiDAR data, and software development. Equipment and telemetry upgrades at GPS stations will improve the capacity to receive and process data in real time.

Geodetic Monitoring Networks Supported by the USGS	
Central Washington University	University of Colorado Boulder
San Francisco State University	University of Memphis
University of California at Berkeley	University of Utah
University of California at San Diego	University of Nevada Reno

Conducting Research into Earthquake Causes and Effects
(2010 Enacted, $11.2 million; 2011 CR, $11.2 million; 2012 Request, $8.8 million)

The USGS conducts research on the causes, characteristics, and effects of earthquakes. This research has direct application in increasing the accuracy and precision of the Agency's earthquake hazards assessments, earthquake forecasts, and earthquake mitigation practices.

A major focus of USGS earthquake research is understanding earthquake occurrence in space and time. USGS investigations increase understanding of the physical conditions under which earthquakes initiate and grow; the processes of earthquake triggering; how individual faults in the same region interact; why some faults slip slowly without generating earthquakes while others generate earthquakes; and factors that control variations in recurrence intervals of earthquakes along the same fault.

USGS research efforts are also directed at improving the understanding of earthquake-induced strong ground shaking and its effects. Specifically, USGS researchers are investigating how complexities in the earthquake source, Earth's crust, and near-surface soils and deposits influence seismic wave propagation and strong ground motion. Improving current techniques for forecasting the effects of strong ground motion will greatly improve seismic hazard maps for urban regions.

These efforts are necessary for cost-effective earthquake hazard mitigation. Another research priority is identifying and understanding the behavior of weak soils that liquefy and fail when subjected to earthquake shaking. Ground failure research, carried out in collaboration with structural and geotechnical engineers, will lead to improved design of earthquake-resistant infrastructure and lifelines, such as bridges and airports, commonly built on fill or weak soil. These research activities are the principal contributors to the program's output measure for systematic analyses and investigations delivered to customers.

Southern California Multi-Hazards Demonstration Project – In 2010, the southern California Multi-Hazards Demonstration Project (MHDP) funding continued to support installation of new earthquake monitoring sites and upgrading of existing sites along the southern San Andreas fault. New sites were equipped with both seismic and GPS instrumentation with real-time telemetry, capable of instant detection of ground shaking and displacement. Each existing site currently has either GPS or seismic instrumentation, and many are not currently telemetered in real-time. Upgrades are under way with support of MHDP funds so that selected key sites along the most hazardous fault zones will have both seismic and GPS instrumentation and also real-time telemetry. Along with field station upgrades, major improvements are being made in the hardening of systems by refining existing data processing systems and overall automation, error detection and computer system reporting. MHDP funding also supports algorithm testing to develop functional and eventually operational earthquake early warning (EEW) system. In 2010 and 2011, MHDP funds allowed USGS to hire new scientists in the Pasadena, CA, office to support EEW development. In 2011, MHDP funds are being used for development of EEW and continued station upgrades. As noted above, the EEW development effort will be put on

hold in 2012, as a result of the proposed reduction in external grants activity and multi-hazard initiative funding.

Since its inception nearly five years ago, MHDP has supported a special project of the Southern California Earthquake Center called Southern San Andreas Fault Evaluation (SoSAFE). Advances in understanding the San Andreas slip rate at Biskra Palms Oasis resulting from SoSAFE work led to publication of two papers in the latest issue of the *Geological Society of America Bulletin*. Work supported by SoSAFE and using the B4 LiDAR data has been published this year in *Science*, resulting in a major reinterpretation of slip in the 1857 Fort Tejon earthquake on the San Andreas Fault; apparently it was only about half as much as previously thought, suggesting that less time is required for stress to rebuild on the fault. SoSAFE succeeded in bringing paleo-seismologists together to improve our understanding of the San Andreas and San Jacinto fault zones in southern California. The success of SoSAFE led to a transition from special project status to be a part of the core SCEC program, project leadership has been transferred successfully as well.

Seismic Hazard in the Sacramento Delta – The USGS began an evaluation of the seismic hazard in the Sacramento Delta in 2010, where expected shaking from earthquakes in the San Francisco Bay Region may rupture vulnerable earth dams resulting in salt-water contamination of a substantial fraction of the State's drinking and irrigation water. The project includes four tasks: reviewing potential seismic sources and strong site effects that modify shaking; determining the three-dimensional geology and velocity structure from the East Bay through the Delta; expanding the broadband seismic deployment in the Delta with the goal of using the seismic data to estimate velocity structure and to simulate ground motions for large regional earthquakes; and modeling ground motions in the Delta for a set of scenario earthquakes in the East Bay.

Earthquake Fault Studies in Alaska – An initial version of the Quaternary Fault and Fold Database for Alaska will be completed in 2011. This database will be widely used for site-specific seismic hazard studies. In addition, a new compilation of faults and folds, which includes active structures, for the Cook Inlet region, will be published by the end of 2011. Several studies of earthquake-related hazards were also recently completed:

- A study was completed on submarine landslides and tsunamis at Valdez, Alaska, the southern terminus of the Trans Alaska Pipeline. In addition to showing in great detail what happened in Valdez in the M9.2 1964 earthquake, it also demonstrates that previous large tsunamis occurred in the bay;
- A report was published on the paleo-seismology of the Susitna Glacier Thrust fault, the fault responsible for initiating the 2002 M7.9 Denali fault earthquake. Observations from paleo-seismology show that the fault ruptures infrequently;
- New LiDAR data collected by the NSF's GeoEarthScope program was utilized to assess the ability to map the 2002 Denali fault earthquake surface rupture remotely. Using LiDAR data, USGS geologists identified traces of ruptured faults, even in areas of very dense vegetation. Moreover, robust surface offset measurements could also be obtained for some locations; and
- Results of a new high-resolution seismic survey in Prince William Sound, Alaska, presented at the annual meeting of the Seismological Society of America showed that tsunami-producing megathrust splay faults are far more common than previously thought. Additional work is needed to determine their extent.

Supporting External Research Partnerships – External collaboration advances targeted research and addresses specific needs of the USGS using the experience and knowledge of world experts. The EHP provides competitive, peer-reviewed, external research support through cooperative agreements and grants that enlist the talents and expertise of the academic community, State government, and the private sector. By involving the external community, the USGS program increases its geographical and institutional impact, promotes earthquake awareness across the Nation, encourages the application of new hazards assessment techniques by State and local governments and the private sector, and increases the level of technical knowledge within State and local government agencies.

Investigations and activities supported though the external awards are closely coordinated with and complement the internal USGS program goals. Many of the external projects are co-funded with other agencies and sources, leveraging USGS support. External program activities include: mapping seismic hazards in urban areas; developing credible earthquake planning scenarios including loss estimates; defining the prehistoric record of large earthquakes; investigating the origins of earthquakes; improving methods for predicting earthquake effects; and developing a prototype system for an earthquake early warning system (see previous discussion). The USGS also has a cooperative agreement with the Southern California Earthquake Center (SCEC), a 40-institution research consortium funded by the USGS with the NSF.

To support external work in 2010, the EHP provided competitively awarded earthquake research grants and cooperative agreements with university, State and local partners. The following table lists the institutions and agencies that received grants and cooperative agreements in 2010. It is anticipated that a similar number and range of partners will receive assistance in 2011. In 2012, the proposed reduction of funds for research grants will reduce the number of recipients by approximately two thirds.

USGS 2010 Grants for Earthquake Research and Hazards Assessments	
Association of Bay Area Governments	Brigham Young University
Boston College	California Geological Survey
Brown University	California State Polytechnic University
California Institute of Technology	Drexel University
Carnegie Mellon University	Earthquake Insight LLC
Earthquake Engineering Research Institute	Humboldt State University
Harvard University	Northeast States Emergency Consortium
Image Cat, Inc.	Purdue University
New Mexico Institute of Mining & Technology	San Diego State University
Oregon Department of Geology and Mineral Industries	Stanford University
Rensselaer Polytechnic Institute	Tufts University
Southern California Earthquake Center	University of California Berkeley
Swiss Seismology Service	University of California Irvine
University of Alaska Fairbanks	University of California at Riverside
University of California San Diego	University of California at Santa Barbara
University of Colorado Boulder	University of Durham
University of Memphis	University of Miami
University of Nevada at Reno	University of Oregon
University of Puerto Rico Mayaquez	University of Southern California
University of Washington	University of Wisconsin Madison
University of Wyoming	URS Group, Inc.

USGS 2010 Grants for Earthquake Research and Hazards Assessments	
Utah Geological Survey	Missouri Department of Natural Resources
Virginia Polytechnic and State University	Washington State Department of Natural Resources
Western States Seismic Policy Council	Woods Hole Oceanographic Institute
National Academies	National Science Foundation (NSF)
Central States Earthquake Consortium (CUSEC)	Lawrence Livermore National Lab (LLNL)
Seismological Society of America (SSA)	Neptune Canada
National Academy of Science (NAS)	Oak Ridge National Labs
University of Kentucky	Washington State University
William McCann, and William Lettis & Associates, Inc.	

Activity: Natural Hazards
Subactivity: Volcano Hazards

2010 Enacted: $24.4 million (146 FTE)
2011 CR: $24.4 million (146 FTE)
2012 Request: $23.4 million (142 FTE)

Budget Realignment

In 2010 and 2011, Volcano Hazards is a program in the Geologic Hazards Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Under the Stafford Act (P.L. 93–288), the Department of the Interior has the responsibility to issue timely warnings of potential geologic disasters, among them volcanic eruptions, to the affected populace and civil authorities. Much of the monitoring data from volcanoes are available to the public in near-real time on the Volcano Hazards Program (VHP) Web sites.

The USGS provides geoscience data, analyses, and research needed to reduce the loss of life, property, and economic and societal impacts of hazards related to volcanoes. To reduce societal exposure to the threats posed by volcanoes, the VHP conducts a range of activities that may be broadly divided into volcano-hazard-assessment and volcano-monitoring components. Process-oriented research is conducted under both components to improve accuracy of hazard assessments and accuracy of interpretations and forecasts of volcanic activity. Both components provide training and technical assistance to inform decision makers at Federal, State, and local levels on managing risks from natural hazards. Both components also work to improve hazard products and their delivery to concerned agencies and to the public.

The long-term goal for the volcano hazard assessment component of VHP is to provide hazard assessments for all dangerous volcanoes in the United States and its Territories and to establish response plans for all communities threatened by those volcanoes. Each volcano hazard assessment requires a geologic map and involves field work, laboratory analysis, and data analysis by research scientists, typically requiring three to five years to complete.

The volcano monitoring component of VHP involves collection and scientific interpretation of real-time and near-real-time geophysical data used to characterize the state of volcanic systems; integration of data collected by other groups, such as NASA and NOAA satellite imagery; management and distribution of data to provide hazard awareness, transparency of operations, and credibility of interpretations with the public and to inform decision makers about managing risk from volcanic hazards; and technical assistance to decision makers on managing risk from natural hazards.

The volcano monitoring network is maintained and operated through five volcano observatories: Alaska Volcano Observatory (AVO), Cascades Volcano Observatory (CVO), Hawaiian Volcano Observatory (HVO), Long Valley Observatory (LVO), and Yellowstone Volcano Observatory (YVO). AVO also manages volcano monitoring in the Commonwealth of Northern Mariana Islands. These observatories are operated in partnership with the Universities of Alaska,

Washington, Utah, and Hawaii, the Alaska Division of Geological and Geophysical Surveys, and Yellowstone National Park. Collaborations with NOAA, the Federal Aviation Administration (FAA), the Air Force Weather Agency (AFWA), and the International Civil Aviation Organization (ICAO) provide early warning and situational awareness of volcanic ash threats to jet aircraft. Through a partnership with the Office of Foreign Disaster Assistance (OFDA) of the U.S. Agency for International Development (USAID), VHP's Volcano Disaster Assistance Program (VDAP) provides emergency response support, infrastructure-building, and training to developing nations vulnerable to eruptive activity. The VHP also supports the Smithsonian Institution Global Volcanism programs to collect and disseminate information about volcanic activity worldwide and to conduct research about volcanic hazard potential and impacts using the Smithsonian's global volcanism database.

The VHP has made progress on both monitoring and hazard-assessment efforts and in underlying research. Using funds provided by the FAA during 1996 through 2008, the volcano monitoring network was expanded to include 31 remote volcanoes in Alaska that threaten international air routes. Currently, 52 volcanoes were monitored in real time by the VHP with multiple geophysical ground stations. Generally, one to two hazard assessments have been published each year, and there has been steady progress on development of community response plans in Washington and Oregon. Synthesis of data streams gathered from erupting volcanoes and from laboratory and numerical simulations has led to a more realistic understanding of the source magma systems and surface volcanic impacts, as documented in 60 to 100 peer-reviewed publications each year. Every eruption and period of unrest provides new information for improving the monitoring and interpretation of the next event.

During 2011, ARRA funds are continuing to support 17 new cooperative agreements between the USGS and 15 universities and State geological surveys. These new partnerships are driving advances in interpretation and modeling of volcano monitoring data, expanding hazards assessments to address vulnerabilities through GIS techniques, documenting the effects of the numerous recent explosive eruptions in Alaska, and substantially upgrading monitoring infrastructure.

Implementation of the National Volcano Early Warning System (NVEWS), a thorough modernization and unification of the observatory system and supporting facilities, is now the central goal of VHP. The framework for NVEWS was established through a systematic assessment of volcanic threat and monitoring capabilities for all 169 of the Nation's active volcanoes (USGS Open-File Report 2005-1164; *http://pubs.usgs.gov/of/2005/1164/*). That assessment concluded that many U.S. volcanoes are under-monitored. As part of NVEWS planning, a comprehensive inventory of current monitoring instrumentation and prescriptions of equipment suites constituting appropriate monitoring levels were published in 2008 (USGS Scientific Investigations Report 2008-5114; *http://pubs.usgs.gov/sir/2008/5114/*). An implementation plan for NVEWS was completed in 2010. NVEWS will move the VHP towards state-of-the-art monitoring of all hazardous volcanoes at levels commensurate with the threats posed. The NVEWS concept is also designed to provide 24/7 alerting, organized and openly accessible data for all potentially hazardous U.S. volcanoes; new hazard information products for the most vulnerable communities, businesses, and infrastructure; and advances in research on volcanic processes, technology development, and hazard evaluation and risk mitigation. Elimination of multi-hazards funding in 2011 and 2012 will delay instrumenting 64 high priority NVEWS target volcanoes in Alaska, Washington, Oregon, California, Hawaii, and CNMI that have no or inadequate ground-based monitoring now.

An external review of the VHP was conducted by the AAAS in 2007, using a panel of six outside experts. The AAAS panel determined that the VHP had successfully executed its previous five-Year Plan and previous (2000) external review recommendations, and that the current five-Year Plan was sound. The panel endorsed the NVEWS blueprint for the future, and proposed that VHP work more closely with State and local partners in developing risk-focused products that deal with future eruption scenarios and community vulnerability. The VHP is acting on these recommendations. A number of new or strengthened academic and State Agency partnerships have been implemented since 2007, hazard assessments are being expanded to consider vulnerabilities as well, and NVEWS is being formally implemented in 2011 to the extent possible.

Program Performance

Response to Eruption and Unrest – The VHP directs resources towards response to volcanoes that are erupting or exhibiting unrest (earthquakes, deformation, increased heat emission, or gas emissions) that may be precursory to an eruption. Although it is impossible to predict which volcanoes will erupt or show unrest in 2012, the ongoing eruptive activity of Kilauea volcano in Hawaiian Volcanoes National Park (entering its 28th year in 2011) will likely continue to require close attention. Explosions and high levels of toxic gas emission pose a serious danger to national park visitors and nearby residential areas, requiring close coordination among HVO, the National Park Service (NPS), and Hawaii County Civil Defense, through an Incident Command structure established by NPS. Explosive eruptions will likely occur in Alaska, following the major eruptions of Augustine in 2006, Okmok and Kasatochi in 2008, and Redoubt in 2009. Such events may require program-wide responses lasting from days to months. Eruptions are also likely in the Commonwealth of Northern Marianas, where explosions at Sarigan and Pagan triggered evacuations of U.S. Fish and Wildlife Service researchers in 2010 and SO_2 gas emission from Anatahan intermittently degrades air quality in Saipan. Recurrent episodes of unrest in Long Valley (Mammoth Lakes, California) and Yellowstone (Wyoming) calderas carry the potential for significant economic disruptions in these popular recreational destinations, which can only be mitigated by real-time monitoring data and the credibility and transparency in development of warnings and advisories that VHP provides.

The latter situation was illustrated by intense volcano-tectonic seismic swarms that occurred in Yellowstone during the winters of 2008 through 2010. There were two levels of involvement through the USGS's YVO. The first was advising the NPS-led Incident Command on the characteristics of the activity and likely scenarios. Despite the disturbing nature of continuous shaking, the YVO was able to show that the swarm was not building towards an eruption. The event attracted Nation wide attention. VHP devoted considerable resources to explaining how the Yellowstone volcanic and hydrothermal system works and that most unrest here does not lead to catastrophe. These kinds of responses may be needed in 2012 as well. The effort required will be much greater if felt unrest occurs during the summer season, when the park is crowded with visitors.

In response to the costly trans-Atlantic and European volcanic ash crisis of spring 2010 caused by eruption of the Icelandic volcano Eyjafjallajokull, the VHP is increasing its work to understand the behavior of volcanic ash clouds and their impact on aviation. The VHP personnel have been called upon to serve in leadership positions of the International Civil Aviation Organization (ICAO) ash safety task force formed in the aftermath of the crisis. This work is conducted in close consultation with NOAA, the FAA, and international colleagues. The 2010 crisis highlighted many critical questions about ash detection, ash cloud forecasting, and whether there are "tolerable" levels of ash concentration, that are as important for aircraft flying to, from,

and over the United States as they are for Europe. These are issues that require interagency, and indeed international, attention. Cooperation continues with Russian volcano observatories in detecting and tracking ash eruptions and ash clouds in the bi-national northern Pacific region and a new linkage is being established between the USGS and Icelandic volcanologists.

The VHP is working with ARRA-funded partners to upgrade volcano monitoring and related infrastructure, operations, and products. By the end of 2011, about 200 instrument sites on active volcanoes will have been upgraded. Hazard and vulnerability assessments due to mudflows from Mount Rainier near Seattle, WA and Mount Hood near Portland, OR will be completed. Telemetry backbone systems will be installed in the Cascade Range of California, Oregon, and Washington and for Kilauea and Mauna Loa volcanoes in Hawaii in order to accommodate the increased data streams.

NVEWS is being formally implemented in 2011 to the extent possible. A 24/7 backup alerting capability at the USGS's National Earthquake Information Center (NEIC) will be implemented, but major upgrades to monitoring at Makushin Volcano near Dutch Harbor/Unalaska, Alaska, the fifth and final very high-threat volcano in Alaska scheduled to receive needed upgrades will be indefinitely postponed due to the proposed 2012 funding reduction. Likewise, indefinite delay will be necessary for NVEWS plans for 2012 for initiation of a standing Volcano Hazards Advisory Committee and enhancement of inter-operability among observatories, both strong recommendations of the AAAS review. No further improvements in monitoring instrumentation will be possible, and some monitoring stations will become inoperative because of lack of maintenance.

The Volcano Disaster Assistance Program (VDAP), a joint project with USAID Office of Foreign Disaster Assistance (OFDA), will continue with Indonesian counterparts to build monitoring infrastructure and crisis response capacity in Java and North Sulawesi, an effort supported by OFDA and lauded at high levels of the Indonesian government. Noteworthy recent VDAP activities include crisis responses to unrest and eruptions in Colombia, Chile, Indonesia, and Saudi Arabia. All of VDAP's foreign responses follow requests from foreign governments made through their U.S. Embassies, which are evaluated by the Department of State and OFDA in terms of humanitarian benefit and US foreign policy. Of particular note is the role that VDAP played in directly assisting the Indonesian government's response to the violent eruption of the Merapi Volcano in October and November, 2010. The VDAP provided in-field consultation on interpretation of seismic data, development of likely eruption scenarios, corresponding mitigating actions to be taken. The VDAP also relayed vital satellite remote sensing data on the condition of the volcano, and replaced monitoring equipment destroyed during the eruption. As a result, although about 400,000 people were displaced and several villages destroyed, there were remarkably few fatalities. The Indonesian President expressed thanks to our President publicly for the USGS effort, during our President's visit to Indonesia.

With anticipated increased support from OFDA in 2011 and 2012, VDAP will expand work with Indonesian and Latin American counterparts. The VDAP will also enhance technology transfer efforts and strengthen its global rapid-response capability, for which the VDAP remains as the foremost emergency volcano team in the world. VDAP's remote sensing capabilities also provide situational awareness for other federal agencies with internationally distributed responsibilities, such as DOD. Further enhancements in 2012 to the VDAP's service to the world community may be impacted by reductions in 2012 funding to the USGS Volcano Hazards Program.

Monitoring and Operations Improvements funded by ARRA – A total of $15.2 million in ARRA funds was applied to instrument purchases, contracts for services, and cooperative agreements to accomplish these improvements. Of this, $6.9 million through 17 cooperative agreements was awarded to 15 universities and State agencies. Eleven of the awardees are new partners for the VHP, providing a broad array of expertise and perspectives that will enhance the program. ARRA improvements are currently tracked by number of stations upgraded per year, number of monitoring and telemetry nodes upgraded, percent of very high threat volcanoes with optimal level monitoring, and number of monitoring stations operated and upgraded.

Volcanic Hazard Assessments and Systematic Analyses – The VHP will continue to make progress on production of volcanic hazard assessments to guide development of community response plans and interpretation of volcanic unrest. Increasingly, this work will include quantification of risk through consideration of vulnerabilities; progress on hazard assessments may, however, be impacted by budget cuts in 2012. The VHP will also continue to publish the results of high-quality research on volcanic processes, for which it is justly acclaimed, with the goal of 75 systematic analyses (including reports, maps and hazard assessments) delivered to the public in 2011 and 2012. An important, peer-reviewed volume on the 2006 explosive eruption of Augustine Volcano, Alaska, will be completed in 2011. These publications will document lessons learned for application in future volcanic crises. The VHP's leadership in volcano research not only serves to advance the field of volcano risk mitigation, but also gives credibility to the VHP's eruption warnings and facilitates engagement with the broader scientific community. Funding reductions will inevitably result in a subsequent decline in publishing productivity because new projects cannot be initiated and existing projects will require expanded timeframes.

Eruption Response Plans – An interagency community response plan for the Mount St. Helens/Mount Adams region of Washington State was completed in 2009. A national volcanic-ash operations plan for aviation involving the FAA, USGS, NOAA, and AFWA was completed in 2007. This plan, which mirrors the operational procedures of the ICAO global ash avoidance program, supports U.S. interagency programs which detect, track, and warn about volcanic-ash clouds that affect the safety of flight operations in the National Airspace. An interagency operating plan for volcanic ash was updated for Alaska in 2008. The development of a regional ash-aviation plan for the Western conterminous United States, which was started in 2009, will be completed in 2011. Development of these plans will ensure the USGS and other government agencies directly involved in the response to volcanic activity, including the aviation community, will coordinate activities and strive to minimize societal and economic disruption. This kind of careful coordination among government agencies, conducted before a crisis occurs, is another area where the USGS and its Federal partners lead the world.

Program Improvements – ARRA funding has increased the level of monitoring of the Nation's hazardous volcanoes, and facilitated the VHP's ability to accurately interpret and communicate monitoring information. The ARRA has also substantially broadened the partnerships that help the VHP accomplish its mission. Although ARRA funds allowed the VHP to upgrade existing stations to NVEWS standards, funding reductions will prevent increasing the number of instruments upgraded to NVEWS standards.

USGS 2010 Cooperative Agreements for Volcano Monitoring and Research	
University of Alaska Fairbanks	Alaska Division of Geological and Geophysical Surveys
University of Utah	Yellowstone National Park
University of Oregon	Smithsonian Institution
University of Hawaii Hilo	USAID/Office of Disaster Assistance
University of Hawaii Manoa	Air Force Weather Agency
University of Washington	
USGS 2009 ARRA Cooperative Agreements for Volcano Monitoring and Research (2010-2011)	
University of Alabama	Alaska Division of Geological And Geophysical
Boise State University	University of Utah
California State University Fullerton	Wyoming State Geological Survey
University of Alaska Fairbanks	Washington State Division of Natural Resources
University of Wisconsin	Oregon Division of Geology and Mineral Industries
University of South Florida	University of Hawaii Manoa
University of Washington	Southern Methodist University
Northern Arizona State University	

Activity: Natural Hazards
Subactivity: Landslide Hazards

2010 Enacted: $3.4 million (22 FTE)
2011 CR: $3.4 million (22 FTE)
2012 Request: $3.3 million (22 FTE)

Budget Realignment

In 2010 and 2011, Landslide Hazards is a program in the Geologic Hazards Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Landslide hazard research concentrates on understanding landslide processes, developing and deploying instruments that monitor threatening landslides, and forecasting the onset of catastrophic movement of future landslides. Research on processes and forecasting methodologies is conducted on the types of landslides that produce losses in the United States such as landslides related to steep slopes, heavy rains, and vegetation loss due to wildfires.

The USGS deploys near-real-time monitoring systems at sites near Yosemite National Park and in the San Francisco Bay area in California, at Chalk Cliffs, Colorado, in Seattle, Washington, and in Portland and near Newport, Oregon. These sites provide continuous rainfall and soil-moisture and pore-pressure data needed to understand the mechanisms of landslide occurrence. Such understanding can form the scientific underpinnings for early warning of conditions that may trigger landslides. A landslide early-warning system based on such information is useful in reducing hazards in landslide-prone areas.

USGS scientists respond to landslide emergencies and disasters nationwide. Federal, State, and local agencies are assisted through landslide site evaluations and recommend strategies for reducing ongoing and future damages from landslides. When there is sufficient information for a particular area, such as in southern California, the LHP can provide information on potential hazards. If rainfall intensity-duration thresholds for landslide activity have been developed for an area or if landslide-hazard maps have been produced, the LHP can issue an advisory. The LHP works in conjunction with the National Weather Service (NWS) to issue advisories and press releases regarding the potential for landslide activity in previously burned areas in southern California. For foreign disasters, the USGS works with the USAID's Office of Foreign Disaster Assistance (OFDA) in responding to appeals for technical assistance from affected countries.

Consistent with Interior’s goal to protect lives, resources, and property by providing information to assist communities in managing risks from natural hazards, the USGS provides timely information through the National Landslide Information Center (NLIC). The Center communicates with the public about current emergency responses and provides information to the external user-community through fact sheets, books, reports, and press releases, The NLIC maintains several databases: the Landslide Bibliography (more than 15,000 entries), the International Landslide Experts Roster of about 2,000 entries, and Major Landslide Events of the United States (part of the USGS National Atlas). The NLIC also has real-time

measurements from ongoing landslide monitoring projects available for viewing via the Internet. These measurements are used to forecast landslide movement or changes in an individual landslide's behavior.

The USGS conducts monitoring efforts in cooperation with other Federal, State, and local agencies, including the National Park Service (NPS); the Bureau of Land Management (BLM); Federal Highway Administration; the NWS; California, Washington, Oregon, and Colorado State Departments of Transportation; Colorado Geological Survey; Colorado School of Mines; Oregon Department of Geology and Mineral Industries (DOGAMI); and private companies.

Program Performance

The LHP includes the following three program components: Landslide-Hazard Assessment Activities, Landslide Monitoring Activities, and Landslide Information Dissemination Activities. LHP accomplishments will include the following:

Landslide-Hazard Assessment Activities
(2010 Enacted, $2.0 million; 2011 CR, $2.0 million; 2012 Request, $2.0 million)

Risk/Hazard Assessments Delivered to Customers – In 2010, the LHP delivered emergency assessments of debris-flow hazards for the Station fire in the San Gabriel Mountains, which was the largest fire recorded in Los Angeles County and burned hillslopes and canyons immediately adjacent to densely populated neighborhoods, creating an urgent need for timely information. The report and maps generated from these assessments were provided to the public, the Forest Service, the NWS, and Los Angeles City and County emergency response, public works, and flood control agencies before the onset of winter rains. The LHP provided these products as part of the Multi-Hazards Demonstration Project (MHDP) for southern California where it works with other USGS disciplines, other Federal agencies and State and local government agencies. The burned areas in southern California are highly susceptible to landslides during the winter rainy season, and even small amounts of rain can have disastrous consequences. In 2010, the LHP assessed rockfall hazards at Timpanogos Cave National Monument, and Bryce Canyon National Park in Utah and in Yosemite National Park for the NPS. The assessments will be used for evaluating safety programs and for planning purposes. In 2011, the LHP will continue to work with DOGAMI to prepare landslide hazard assessments from LiDAR data that can be used by agencies in Oregon for planning and response purposes. In 2011, the LHP will begin hazard assessments and inventories of landslides in glacial-lake clays in northern Pennsylvania, which should lead to a greater understanding of similar landslides in adjacent States.

Impact of Landslide Hazard Information – In 2010, the LHP provided susceptibility maps, hazard assessments, and emergency warnings to National Forests in northern and southern California, to several national parks in California and Utah, to the California Department of Transportation and the California Coastal Commission, and to communities in Oregon, Colorado and California. All of these jurisdictions used USGS products to mitigate the effects of landslides and debris flows through land use planning, response planning, and warning systems. In 2011 and 2012, the LHP will continue to provide information to counties and other jurisdictions in Oregon, California, Colorado, Eastern United States, and the Interior land management Bureaus and other Federal agencies that incorporate this information into emergency response and land use plans and warning systems. In 2011, LHP is offering guidance to the Forest Service and to the Army Corps of Engineers to further their efforts to incorporate landslide hazards information into training and planning for natural hazards.

Landslide Monitoring Activities
(2010 Enacted, $1.0 million; 2011 CR, $1.0 million; 2012 Request, $1.0 million)

Models Used to Interpret Monitoring Data – Sustained efforts in landslide monitoring have led to significant advances in understanding of slope stability and landslide processes. In 2011 and 2012, the LHP will continue to develop rainfall thresholds for areas burned in southern California that will refine the predictive capabilities of the Joint NOAA/USGS Early Warning System. In 2011, the LHP will continue monitoring and analysis of the rainfall response of landslides and landslide-prone areas in western Oregon, at the Ferguson landslide near Yosemite National Park, along U.S. Highway 50 in California, and at Chalk Cliffs in Colorado. In 2011, LHP will complete the user's guide for SCOOPS a three-dimentional slope-stability model developed by LHP and other USGS scientists to serve numerous public and private users of landslide information.

Landslide Hazards Emergency Response – In 2011, the LHP will continue to respond to landslide emergencies in the United States and internationally and to monitor landslides where necessary. Information and maps of post-fire debris flows in southern California will be entered into interactive geographic information system (GIS) databases to provide immediate and comprehensive response tools for decision makers and the public. Landslide emergencies are posted through the Federal Government's Common Alert Protocol to reach a large audience of land and emergency managers and will continue to be posted in 2011. LHP scientists responded to numerous emergencies in 2010, including the January 10 offshore northern California earthquake, the January 12 Haiti earthquake, and rockfalls in Bryce Canyon and Yosemite National Parks and at the Timpanogos Cave National Monument. In 2010, the LHP provided information to the MNDP on debris flow probability, volume, and inundation areas from a hypothetical set of recently burned areas for ARKStorm, a response exercise in southern California, which will be held in 2011 to educate Californians on the nature of their winter storm risk. In conjunction with the exercise, the LHP will release a Web-based survey instrument, "Did You See It?," for the public to register landslide information after it happens in their neighborhoods. This Web site will be similar to the successful earthquake Web site "Did You Feel It?"

Landslide Information Dissemination Activities
(2010 Enacted, $0.4 million; 2011 CR, $0.4 million; 2012 Request, $0.3 million)

National Landslide Information Center (NLIC) – The LHP will continue to respond to inquiries from the public, educators, and public officials on hazard mitigation, preparedness and avoidance strategies for landslide hazards. The NLIC convened a session at the Geological Society of America's fall 2010 meeting in Denver, Colorado, for States and the USGS and other Federal agencies to exchange landslide data and information. The NLIC will continue to provide leadership in 2011 for the National Landslide Hazard Exchange Group including hosting a Web site.

Publications for Users of Hazard Information – In 2010, The Landslide Handbook--*A Guide to Understanding Landslides,* was translated into Portuguese, Japanese, Chinese, and Spanish with the dedicated help of the Geological Survey of China and the World Bank. This publication, coauthored by USGS and Geological Survey of Canada scientists, is an important layperson's guide that explains what citizens can do to mitigate the threat of landslide hazards. It can now reach a broader audience, and plans for translations into other languages continue to be explored. During 2011 and 2012, the LHP will complete 15 systematic analyses each year,

including maps, technical reports, and peer-reviewed research papers, for technical users of landslide information and decision makers.

Activity: Natural Hazards
Subactivity: Global Seismographic Network

2010 Enacted: $5.8 million (10 FTE)
2011 CR: $5.8 million (10 FTE)
2012 Request: $5.3 million (10 FTE)

Budget Realignment

In 2010 and 2011, Global Seismic Network is a program in the Geologic Hazards Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Global Seismographic Network (GSN) provides high-quality seismic data to support earthquake alerting, tsunami warning, hazards assessments, national security (through nuclear test treaty monitoring), earthquake loss reduction, and research on earthquake sources and the structure and dynamics of the Earth. The GSN is a joint program between the USGS and the NSF, implemented by the USGS, the Institute for Geophysics and Planetary Physics (IGPP) of the University of California, and the Incorporated Research Institutions for Seismology (IRIS), a consortium of universities. A Standing Committee of advisors oversees the GSN programs. This committee consists of external stakeholders and one USGS representative under a MOU between the USGS and the NSF and meets twice a year. The network currently consists of 150 globally-distributed stations, installed over two decades by the USGS and IGPP. The USGS is responsible for maintenance and operation, data collection, and quality control of two thirds of the GSN stations, and IRIS supports the University of California to operate and maintain the other third.

The operation of the GSN is accomplished in cooperation with many international partners who, in most cases, provide facilities to shelter the instruments and personnel to oversee the security and operation of each station. USGS tasks include station maintenance and upgrades, monitoring and maintaining telecommunications, troubleshooting problems and providing major repairs, conducting routine service visits to network stations, training station operators, providing direct financial aid in support of station operations at those sites lacking a host organization, and ensuring data quality and completeness. With proper lifecycle maintenance and upgrades the network can have expanded capabilities and provide continuous seismic data. The data acquisition systems of the GSN are currently being refreshed with ARRA funding in 2010-2011. The USGS portion of the GSN has grown from 72 to 100 stations since 1998. Through the Tsunami Warning Initiative (2006-2007), the USGS added nine GSN-affiliated stations in the Caribbean and increased the number of stations with real-time telemetry to 95 percent, providing new capabilities for the network.

As part of GSN activities, the USGS and IRIS evaluate, develop, and advance new technologies in sensors, instrument installation, data acquisition, and management. To improve performance, stations with unusually high background noise are relocated to quieter sites or configurations (e.g., burying sensors in boreholes) so that smaller events (earthquakes or explosions) or signals of interest may be detected.

The GSN has become a critical element of continuous USGS hazard warning activities. Ninety-seven percent of GSN stations transmit real-time data continuously to the USGS National Earthquake Information Center in Golden, Colorado, where they are used, with data from other stations, to rapidly determine the locations, depths, magnitudes, and other parameters of earthquakes worldwide. The high quality of GSN data allows for the rapid determination of the location and orientation of the fault that caused the earthquake and provides an estimate of the length of the fault that ruptured during the earthquake.

Rapid availability of earthquake information is critical for first responders and government officials responsible for assessing an earthquake disaster. In the case of significant domestic earthquakes, the USGS and partners provide information to Federal and State emergency management and public safety agencies, operators of transportation facilities, public utilities, and national news media. In the case of destructive events outside the United States, such as the earthquakes in Haiti and Chile in January and February, 2010, respectively, information from the NEIC is immediately sent to the Department of State, embassies and consulates in the affected region, the USAID OFDA, the Red Cross, and the United Nations, as well as national and international news media.

GSN stations provide near-real-time data to NOAA tsunami warning centers, supporting tsunami monitoring in the Pacific Rim and disaster alerting in all U.S. coastal States and Territories in the Pacific and Caribbean. NOAA relies on GSN real-time data to trigger analysis of the ocean-bottom sensors that detect tsunami waves, making it possible for NOAA to transmit tsunami alerts to response agencies within minutes of these quakes.

All GSN data are freely and openly available to the public and scientists around the world from the IRIS Data Management Center (DMC). Demand at the DMC for GSN data is high—for example, the DMC filled over 335,000 requests for GSN data in 2010. In addition, data from nearly all GSN stations are currently available within minutes following large earthquakes to the worldwide user community via the USGS Web-based *Live Internet Seismic Server*.

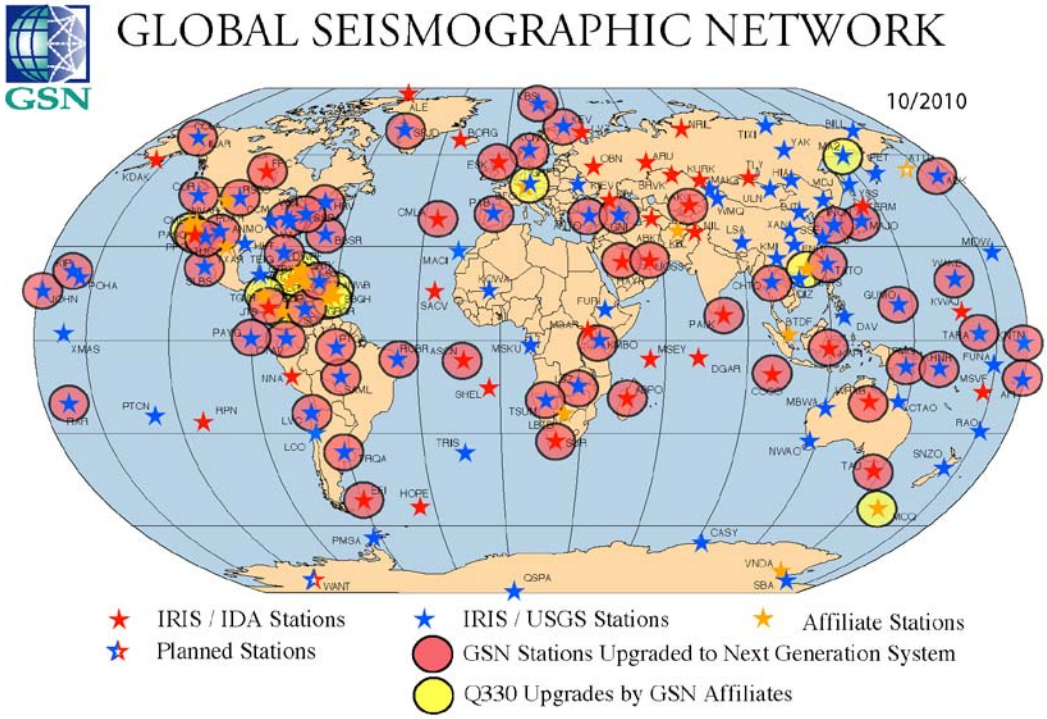
Data from the GSN are used extensively for basic and applied research on earthquakes, Earth structure, and other geophysical problems in studies conducted and supported by the USGS and other agencies like NSF, the U.S. Department of Energy, and the U.S. Air Force. Some of this research and data support national security through the seismic monitoring of nuclear explosions and the improved calibration of networks that monitor nuclear explosions.

The GSN continues close cooperation with the global deformation monitoring community, with co-located GPS instrumentation at 43 GSN sites, and shared communications (telemetry) infrastructure in Africa, Siberia, and at Easter Island in the Pacific. USGS is also evaluating GSN data for near-term climate change studies. Recent research has shown that ocean storms have been increasing in frequency and intensity over several decades.

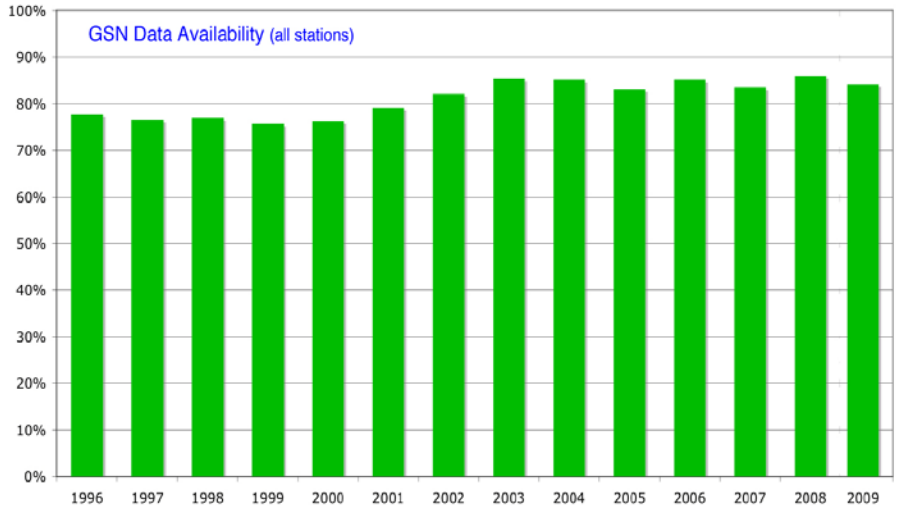
In terms of cost-performance, other Federal Government programs benefit from use of the GSN infrastructure (station sites and communications) by reducing operational costs. For example, the United States contributes seismic data from 34 GSN stations to the International Monitoring System for the Comprehensive Nuclear Test Ban Treaty, a United Nations organization. It would cost the United States at least $5.0 million per year to maintain a separate network for this purpose. By leveraging the GSN investment, another purpose is achieved at no cost.

The GSN is also an important tool in earthquake-related education and outreach. The USGS has worked with IRIS to develop educational museum displays explain the basic concepts of

seismology and earthquake occurrence based on data from the GSN. There are displays in the Smithsonian Institution in Washington, D.C., the American Museum of Natural History in New York, the Carnegie Museum in Pittsburgh, the USGS Headquarters, and a number of smaller museums across the country.



Map showing progress upgrading the stations of the GSN, through October, 2010. Upgrades will continue in 2011 using economic stimulus (ARRA) funds.



The chart shows the availability of GSN data, which typically exceeds 85 percent. This data return surpasses that of other global seismic monitoring operations such as that run by the Comprehensive Nuclear Test Ban Treaty Organization. Data availability in 2009, through November, was just 83.5 percent, due to stations in Russia being off-line because an intergovernmental agreement had expired (those data were recovered in December, 2009). All GSN data passes through a quality control process before archiving, and GSN archives are heavily used by researchers.

Program Performance

At the 2012 budget request level, the USGS will:

- continue to operate the 100-station USGS portion of the GSN at a high level of data recovery, real-time telemetry performance, and high cost-efficiency;
- make progress developing low-maintenance seismic stations for deployment at less accessible sites;
- work with partners in the U.S. Air Force, the Comprehensive Nuclear Test Ban Treaty Organization, and the International Federation of Digital Seismographic Networks, to improve the efficiency of station operations and reduce maintenance costs;

Other Agency programs will continue to be supported through this effort. Those programs include:

- NOAA's Tsunami Warning Program (part of the National Weather Service) and National Tsunami Hazard Reduction Program, which uses GSN data as a critical input to tsunami warning system and to research on tsunami sources and impacts;
- the Air Force and Department of Energy's nuclear test monitoring research programs, which use GSN data for research, public event information and exotic seismic event characterization; and
- the National Science Foundation, whose Earth science research programs use GSN data for research on Earth structure and dynamics, wave propagation, earthquake source complexity and even climate change.

Activity: Natural Hazards
Subactivity: Geomagnetism

2010 Enacted: $2.1 million (17 FTE)
2011 CR: $2.1 million (17 FTE)
2012 Request: $2.1 million (17 FTE)

Budget Realignment

In 2010 and 2011, Geomagnetism is a program in the Geologic Hazards Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Magnetic storms, caused by the dynamic interaction of the Sun, the solar wind, and the Earth's magnetic field, can adversely affect the infrastructure and activities of our modern, technology based society. Large storms can cause the loss of radio communication, reduce the accuracy of global-positioning systems, damage satellite electronics and affect satellite operations, enhance radiation levels for astronaut and high-altitude pilots, increase pipeline corrosion, and induce voltage surges in electric power grids, causing blackouts. The estimated annual economic impact of magnetic storms runs into the hundreds of millions of dollars. Continuous, real-time monitoring of the geomagnetic field is important for national security. Drilling programs undertaken by the oil and gas industries rely on magnetic orientation, and these can be degraded during magnetic storms, particularly at high latitude. Magnetic-field data are also used to check historical property boundaries, many of which were originally established using magnetic orientation from compasses.

The USGS Geomagnetism program operates a network of ground-based magnetic observatories capable of accurately measuring the geomagnetic field across a wide range of timescales. The program disseminates magnetic data to various governmental, academic, and private institutions; and conducts research on the nature of geomagnetic variations for purposes of scientific understanding and hazard mitigation. The program is an integral part of the U.S. Government's National Space Weather Program (NSWP), which also includes programs in the National Aeronautics and Space Administration (NASA), the Department of Defense (DOD), the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation (NSF). The USGS Geomagnetism program coordinates its work with foreign national geomagnetism programs through INTERMAGNET, a worldwide consortium of observatory programs, and the International Association of Geomagnetism and Aeronomy (IAGA).

Program Performance

The program consists of three main elements:

- Geomagnetic observatory operations;
- Data transportation, management; processing and dissemination; and
- Scientific research, to develop space weather diagnostics for hazard mitigation.

Geomagnetic Observatory Operations
(2010 Enacted, $1.4 million; 2011 CR, $1.4 million; 2012 Request, $1.4 million)

The USGS Geomagnetism program currently operates a network of 14 geomagnetic observatories, distributed across the United States and its Territories. Data are collected continuously from each observatory by a variety of instruments housed in buildings designed to provide environmental stability and to ensure long-term baseline accuracy. Each site is visited regularly to conduct calibrations of the instruments. Data are transmitted in real time to program headquarters in Golden, Colorado, via a set of satellite and Internet linkages. The program used ARRA funds provided in 2009 to improve the basic infrastructure at two observatories, and has focused on improvements to the temporal resolution of the measurements by increasing the sampling frequency from one minute to one second.

Within this program element, 2012 performance will build upon the following 2010 and 2011 accomplishments:

- Modifications to the real-time data management system in Golden, Colorado, were made in 2010, with the goal of preparing for fully operational one-second data transmissions. The one-second data will be available to users in 2011;
- A new building was constructed at the Barrow (BRW) Magnetic Observatory in June, 2010, with USGS funding and contributions from the Department of Energy (DOE). Operational equipment in the new building was installed in August 2010 and is co-occupied by the DOE and NOAA. The new equipment will run in parallel with the old system for approximately three to six months to ensure continuity of operations at the new location; and
- A new observatory opened in 2010 in Prudhoe, AK (see inset). This observatory was developed through a partnership opportunity and funding from the Schlumberger Corporation with operating costs covered by partners.

Installation of the observatory building at the "Deadhorse" site in Prudhoe, AK.

Users will benefit from these efforts in 2011 and beyond, primarily through improved data quality, data timeliness, and data availability. Implementation of one-second data transmissions will significantly increase the size of the program's customer base, particularly among scientists studying the magnetosphere and designing practical space-weather applications.

Data Processing, Management, and Dissemination
(2010 Enacted, $0.4 million; 2011 CR, $0.4 million; 2012 Request $0.4 million)

Once data from the observatories are received in Golden, CO, they undergo initial processing and are organized for immediate transmission to both NOAA's SWPC in Boulder, Co, and the AFWA in Omaha, NE. For longer-term studies, the magnetic data are further refined using periodic calibrations for each observatory, making them useful for research on rapid magnetic

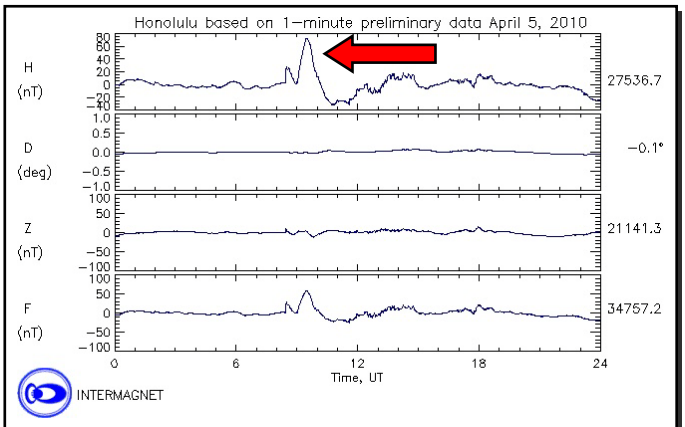
field variations and for mapping the field on a global scale. These fully calibrated, definitive data are published yearly in cooperation with foreign national geomagnetism programs working through the Intermagnet consortium. The USGS also distributes data, maps, and models of the magnetic field through the *http://geomag.usgs.gov* website, which receives an average of over 30,000 web hits per day from the public.

Within this programs element, 2012 performance will build upon the following 2010 and 2011 accomplishments:

- The phase-out of old "legacy" data-delivery applications is complete. The legacy data storage, retrieval and delivery applications have been replaced with a wave-server-based system that provides full blending of the satellite and internet data streams; and
- A variety of data output files are provided, including INTERMAG-NET standard formats. The near-real-time output of this system is available to the public on the USGS "hazards" web site.

Scientific and Applications Research
(2010 Enacted, $0.3 million; 2011 CR, $0.3 million; 2012 Request, $0.3 million)

USGS Geomagnetism program staff conduct geomagnetic research to better understand basic geomagnetic processes and their effects on the infrastructure and activities of our modern, technologically based society. Recent projects have included; development of statistical and time series methods for characterizing long term changes in geomagnetic activity; development of a method for mapping magnetic disturbance during storms; development of methods for measuring magnetic storm intensity; and analysis of claims of magnetic precursors to earthquakes.



Galaxy 15 satellite. Photo Credit: Orbital Sciences

Space Weather Damages Telecommunications Satellite:
In April 2010, strong solar activity damaged the Galaxy 15 (shown at left), which was lost. USGS geomagnetic data (above, from the observatory in Honolulu) are being used to help understand the nature of the resulting geomagnetic storm. In February 2011 real-time estimates of magnetic storm size using data from USGS and foreign observatories will be provided.

A diagnostic measure of magnetic storm intensity, *Dst*, became operational and publically available in 2010. USGS researchers and partners developed the *Dst* magnetic intensity scale and developed the capability to deliver this measurement from the data generated by our geomagnetic observatories. Over the next two years, and in advance of the up-and-coming solar maximum expected in 2013, USGS research staff will investigate more elaborate diagnostic measures of storm disturbance, especially those that use programs observatory data to quantify its geographic distribution over time. In parallel to these projects, analysis of historical magnetic data, those recording magnetic

storms from previous solar cycles, continues, with better spatial and temporal resolution expected from the use of data from numerous observatories. Results should help us to answer the important question: Is geomagnetic activity increasing, and, if so, how? At the proposed 2012 funding level, the Geomagnetism program will perform the following activities:

- Continue operation of 14 geomagnetic observatories and delivery of one-second data to customers and users;
- Continue collaboration with the NOAA Space Weather Prediction Center (SWPC), and the Air Force Weather Agency (AFWA), to ensure complementary roles and responsibilities in delivery and dissemination of geomagnetic hazards data to the space weather community;
- On the program website, provide operational space-weather diagnostics for measuring magnetic-storm intensities;
- Investigate more elaborate diagnostic measures of storm disturbance, through use of data with better spatial and temporal resolution from USGS and numerous observatories, worldwide; and
- Participate in the National Space Weather Council, to ensure the integration of USGS activities with the related program of other agencies.

Activity: Natural Hazards
Subactivity: Coastal and Marine Geology

2010 Enacted: $46.2 million (233 FTE)
2011 CR: $46.2 million (233 FTE)
2012 Request: $47.5 million (233 FTE)

Budget Realignment

In 2010 and 2011, Coastal and Marine Geology is a program in the Geologic Landscape and Coastal Assessments subactivity of the Geologic Hazards, Resources and Processes activity. In 2012, the program is proposed to move to a subactivity in the Natural Hazards mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Coastal and Marine Geology program (CMGP) maintains and applies capabilities in marine geology, geophysics, geochemistry and oceanography to provide information and research products on geologic conditions and processes critical to the management of the Nation's coastal and marine environments. Program objectives include:

- Characterization of the coastal geological setting, processes, and change at regional or system scales to provide the framework understanding for management and policy in response to a range of issues. Framework development and synthesis of geologic information and understanding is the foundation for USGS research activities to understand and model the physical processes affecting coastal and marine systems and the resulting environmental, hazard, and resource implications for human and environmental health, economic growth, public safety, and resource use, protection, and management;
- Development of regional and national hazard, resource and environmental assessments of coastal and marine conditions, change and vulnerability to human and natural processes. Regional geological framework development and topical research on geological processes provides the foundation for development of assessment products; and
- Development of broadly applicable models of coastal and marine evolution and change. Geologic framework development and process understanding provides the basis for development and evaluation of models. Application to specific issues and settings and expanding the range of relevant applications is supported by regional information and targeted studies.

The CMGP's activities are guided by the Comprehensive National Coastal Program Plan which provides direction, goals and objectives for a five-year period. The plan reflects internal and external inputs and periodic reviews of the program and program elements by the National Academy of Science. The CMGP is broadly directed by the objectives of the National Coastal Program Plan (2003) submitted to Congress by the USGS. The overall goals of this program are to provide scientific information, knowledge, and tools required to ensure that land and resource use decisions, management practices, and development in the coastal zone and adjacent watersheds can be evaluated with a complete understanding of the effects on coastal

ecosystems and communities as well as to provide a full assessment of the vulnerability of coastal and marine ecosystems and communities to natural and human-driven changes.

The CMGP supports Interior's goal to provide the scientific foundation for decision making. Goals for project and program outputs are established as part of the program planning process and engagement with the USGS Regional structure.

The CMGP develops and implements national, regional, and topical studies that advance knowledge relevant to national issues. Program activities are developed in response to long-term program objectives, partner needs, and potential to leverage USGS resources with partner resources to meet shared objectives. Leveraging or cost-sharing provides partners access to unique USGS capabilities while enhancing the cost-effectiveness of USGS mission activities. Historically, partners provide seven to ten percent of funding for program activities, with significant in-kind contributions provided through collaborative studies to respond to critical needs identified by stakeholders. This practice ensures that study products have immediate application while advancing long-term program objectives. Regional studies are designed to provide essential framework information to Federal, State, and local managers about specific issues and topics as well as provide broadly applicable information products. Topical studies, often implemented within regional efforts, are designed to develop fundamental information that has broad applicability. Synthesis of regional and topical studies provides the basis for national assessments and products. Project work plans submitted to the CMGP are reviewed annually by internal and external scientists and managers knowledgeable in the area of proposed and ongoing work and provide guidance that informs program directions and implementation.

The CMGP supports research projects at the Coastal and Marine Geology centers in Woods Hole, Massachusetts, St. Petersburg, Florida, and Santa Cruz, California. The CMGP also uses the expertise found in other USGS science centers as well as external cooperators.

Program Performance

For 2012, the program performance will reflect a significant shift in USGS activities, focusing on coastal and marine spatial planning and decreasing engagement with regional partners in the research related to beach health studies in the Great Lakes; deep sea mineral resource studies; coastal groundwater studies in New England, Florida, and Hawaii and; response to coral disease and die-off in Pacific and Caribbean.

USGS's work with other Interior agencies will leverage funding provided for Coastal and Marine Spatial Planning to better establish data standards and delivery systems, to collect and integrate data to produce near coastal and marine seafloor maps and data layers, and to characterize marine habitats and impacts of energy, communication and transportation structures on bottom stressor processes and seafloor sediment erosion and deposition. The USGS, as Interior's primary member of the Interagency Task Force on the Extended Continental Shelf, will use 2012 to analyze data and write reports about the summer 2010 research cruise in the Arctic and 2011 research cruises in the Bering Sea and Gulf of Alaska. This will result in increased systematic analyses in 2013, rather than 2012.

Program changes will affect interactions with partners as staff resources are shifted in focus to meet the challenges of implementing the President's National Ocean Policy. Additionally the number of systematic analyses produced by the core programs will decrease from 210 annually to 190 annually. Products for Coastal and Marine Spatial Planning will remain level at 10 annually.

Highlights of projects in 2010 and 2011 include:

Puget Sound Response to Dam Removal – The Nisqually Tribe, the FWS and the USGS are collaborating to examine how nearshore habitat structure and hydrodynamic processes respond to the largest dike removal project in Puget Sound at the Nisqually River Delta. The Nisqually Tribe and Nisqually National Wildlife Refuge provide guidance, study design, operational resources, and financial support, while the USGS contributes scientific input, study implementation, and interpretations. The USGS will continue systematic collection of a comprehensive data set of nearshore ecosystem metrics following dam removal to detect changes to biophysical processes. USGS will develop models that predict the evolution and interaction of geomorphology, vegetation, food-resources, and bird and salmon habitat use on 750 acres of recovered salt marsh.

Coastal Sensitivity to Sea-Level Rise – Assessing the vulnerability of the coastal zone to sea-level rise (SLR) requires integrating a variety of physical, biological, and social factors. These include landscape and habitat changes, as well as the ability of society and its institutions to adapt. Coastal managers require improved tools to understand and anticipate the magnitude and likelihood of future SLR impacts, and to evaluate consequences of different actions (or inaction).This project, started in 2010, uses a Bayesian statistical analysis framework developed from a wide range of geologic, biologic, and hydrologic information on coastal systems and the related uncertainties in physical and process characterizations. The Bayesian network integrates these data to make probabilistic forecasts of the future state of coastal environments for parameters such as shoreline change, wetland sustainability, and depth to groundwater in response to different SLR scenarios. Results from the U.S. mid-Atlantic coastal region are used to explore different scenario and to identify research needed to improve predictive skills. The project is focused on the complementary and sometimes disparate decision support needs of Interior agencies, in particular the NPS and the FWS.

Threatened Coral Species Affected by Cold Waters – In mid-January 2010, an extreme cold front settled across the Florida peninsula for a record period of six days. Direct coral mortality rates were high on many inshore patch reefs throughout Hawk Channel, as reported by partner agencies in the Florida Reef Resilience Program (FRRP). Since 2009 the USGS CREST project has been continuously recording underwater temperature and coral calcification rates throughout the Florida Keys including sites in Dry Tortugas NP, Biscayne NP, and the Florida Keys National Marine Sanctuary. Temperature data indicate that the middle Keys were inundated with chilled water more so than the upper and lower Keys, which helps explain why middle Keys patch reefs were more impacted by the cold event than other areas. In addition, CREST is using the Along Track Reef Imaging System (ATRIS) at several localities to map coral cover and benthic habitat to provide baseline information and an assessment of coral reef health. The ATRIS surveys augment surveys done by the FRRP and National Park Service.

Gas Hydrates – The USGS Gas Hydrates project conducts research related to the resource potential of methane hydrates and the impact of Late Pleistocene to contemporary climate change on the long-term stability of gas hydrates. There is a subsidiary effort focused on submarine slope stability. Following the successful government-private logging-while-drilling (LWD) research to study resource-grade gas hydrates in coarse-grained Gulf of Mexico sediments in spring 2009, 2010 was dedicated to the analysis and synthesis of these state-of-the-art data and planning of a 2011 expedition to recover cores and conduct new LWD. The USGS led planning and design of specialized devices to handle cores recovered and maintained at seafloor hydrostatic pressure. The USGS assumed a leadership role in an international, inter-laboratory comparison study of the physical properties of hydrate-bearing

sediments. In August 2010, the USGS conducted Interior's first geophysical imaging of the shallow U.S. Beaufort shelf in three decades. These studies image the top of subsea permafrost, which is degrading due to inundation of the coast since the Late Pleistocene, and seek seafloor features or water column gas plumes that might be linked to methane hydrate degassing. As part of the climate-hydrates effort, the Gas Hydrates Project has teamed with the USGS Denver noble gas lab to analyze natural and synthetic gas hydrate samples to develop noble gas signatures as a potential fingerprint for gas derived from dissociated hydrate, instead of other sources (e.g., shallow microbial activity, coal beds, deep sources).

Highlights of proposed work in 2012 include:

Coastal and Marine Spatial Planning – The USGS will engage with other Interior bureaus and Federal agencies in implementation of the "Framework for Effective Coastal and Marine Spatial Planning." The framework defines CMSP as "a comprehensive, adaptive, integrated, ecosystem based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. CMSP identifies areas most suitable for various types or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives. In practical terms, CMSP provides a public policy process for society to better determine how the ocean, coasts, and Great Lakes are sustainably used and protected - now and for future generations." This framework for CMSP includes implementation guidance for phased and collaborative development, including Federal, State, Tribal, and other partners; to develop capacity, build on existing efforts, and leverage and gain efficiencies from lessons learned.

Effective implementation of CMSP to meet policy objectives is predicated on the availability, integration, and application of diverse information resources, including data, models, and assessments based on sound science. USGS information and research products are critical to successful implementation of CMSP at regional and national levels. The USGS, working with federal and other partners, will develop information resources, integrate existing information systems, and contribute to the development of a comprehensive CMSP Information Management System (CMSP-IMS). Development of the CMSP-IMS is led by the National Ocean Council staff working with all federal agencies with ocean-related programs. The USGS will continue to participate in interagency working groups including working with regional planning bodies to identify and address priority information needs; to develop technical standards for data and metadata; and to define and launch a CMSP data portal providing access to data resources. The funds provided through this increase will:

- Provide for continued DOI/USGS leadership for development of a national Information Management System (CMSP-IMS) including regional and national stakeholder engagement;
- Construct a prototype CMSP portal for the Gulf of Mexico and evaluate its utility with targeted customers and other regions of the United States;
- Produce data standards that are adopted as National information quality standards and ensure that priority USGS data sets (to be defined through national and regional needs assessment, but including topography, bathymetry, geology, seabed characterization, and imagery-based land use/land cover) comply with standards, are accessible through the CMSP-IMS, and support CMSP in gap analyses to target priority data collection activities;

- In response to regional planning bodies' identified information needs, support data collection and integration with existing data resources in order to produce seafloor maps, habitat classification maps and data layers to meet needs and gaps identified by regional planning bodies; and
- Support model-based development of tools required to apply existing USGS data resources to forecast coastal vulnerability resulting from projected sea level rise and coastal storms, and to provide assessments of ocean wave and current stresses on seafloor habitats and infrastructure.

These efforts will ensure that USGS data resources are accessible to and enhance CMSP planning, that new data and information products developed respond to identified needs, and that USGS technical expertise and investments in information management systems are reflected in development of the CMSP-IMS. Overall, this will ensure that CMSP implementation is, as intended, based on best-available science and that federal and other information resources are provided effectively and efficiently. In implementing this effort the USGS will work closely with regional partners and other federal agencies to assess the effectiveness of the products, processes, and systems developed in advancing the objectives of CMSP.

Alternative Offshore Energy – The stress on the sea floor caused by waves and currents is a principal factor in the re-suspension, transport, and fate of particles in the coastal ocean. The spatial distribution and temporal variability of bottom stress plays a key role in issues of fundamental and societal importance, including ecosystem function and structure, present distribution of sediments, coastal erosion, the fate of contaminated sediments, selection and monitoring of ocean disposal sites, and use of the sea floor. Information on the distribution and characteristics of sea floor habitats, in part determined by the extent and frequency of particle transport, is in increasing demand in marine spatial planning and evaluation of sitting offshore energy structures. The goal of this research will be to calculate bottom stress caused by surface waves, tides, and currents over the east coast continental margin and to use these stress estimates to develop indices of disturbance of the sea floor. The indices will provide information on the magnitude, duration, and variability of bottom stress needed to plan for renewable energy development on the U.S. margin.

Extended Continental Shelf (ECS) – As a member of the U.S. ECS Task Force, chaired by the Department of State, the USGS will focus on evaluation of previously collected scientific data about the legally defined continental shelf encompassing the oceanic basins in the Atlantic and Pacific. The USGS completed three successful missions in the Arctic with NOAA and Canadian partners, determining sediment thicknesses and better definition of the shelf. During 2012, the planned cruise in the Atlantic onboard the *UNOLS vessel Langseth* will be cancelled, significantly setting back the timetable to complete the assessment of the Atlantic extended continental shelf. Additionally, the reduction in funds will delay, by at least two years, the cruise to similarly assess the Northern Marianas.

Northern Gulf of Mexico Ecosystem Change and Hazard Susceptibility – Due to increased concerns about the health of ecosystems in the Gulf of Mexico following the Deepwater Horizon oil release, this project will expand its scope to produce the best available LiDAR topography, bathymetry, and high-resolution aerial imagery of barrier islands, nearshore benthic habitats, and coastal wetlands. A new Web page will display online vulnerability maps; baseline data on pre-spill hydrocarbons, hydrocarbon by-products, inorganic trace metals, and microbiological components within the Mobile Bay and bayhead delta region; information about the potential available sand resources and effects of sand berm construction on the existing barrier islands;

and post-spill science support and long-term planning to State and Federal agencies to ensure a scientific foundation for achieving long-term, ecologic and economic goals and outcomes to succeed in sustaining and enhancing Gulf resources.

Activity: Water Resources

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Groundwater Resources ($000)	9,714	9,714	-174	-213	-2,380	6,947	-2,767
FTE	*56*	*56*	*-1*		*-11*	*44*	*-12*
National Water Quality Assessment ($000)	66,507	66,507	-1,066	-1,623	-6,278	57,540	-8,967
FTE	*412*	*412*	*-3*		*-38*	*371*	*-41*
National Streamflow Information ($000)	27,732	27,732	-618	-501	300	26,913	-819
FTE	*52*	*52*	*-2*		*2*	*52*	*0*
Hydrologic Research & Development ($000)	13,822	13,822	-225	-289	-1,300	12,008	-1,814
FTE	*97*	*97*	*-1*		*1*	*97*	*0*
Hydrologic Networks and Analysis ($000)	31,387	31,387	-1,695	-806	5,054	33,940	2,553
FTE	*164*	*164*	*-7*		*5*	*162*	*-2*
Cooperative Water Program ($000)	65,561	65,561	-1,599	-1,710	0	62,252	-3,309
FTE	*666*	*666*	*-20*		*0*	*646*	*-20*
Water Resources Research Act Program ($000)	6,500	6,500	0	-1	-6,499	0	-6,500
FTE	*2*	*2*	*0*		*-2*	*0*	*-2*
Total Requirements ($000)	**221,223**	**221,223**	**-5,377**	**-5,143**	**-11,103**	**199,600**	**-21,623**
Total FTE	***1,449***	***1,449***	***-34***		***-43***	***1,372***	***-77***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Unrequested Congressional Action	-4,426	0
• WaterSMART Program	+7,500	+5
o Groundwater Resources (Groundwater)	[+1,100]	[0]
o Hydrologic Networks and Analysis (HNA)	[+6,400]	[+5]
• Groundwater Resources (Groundwater)	-2,000	-11
• National Water Quality Assessment Program (NAWQA)	-6,728	-41
• Water Resources Research Act (WRRA)	-6,499	-2
• Ecosystem Restoration	+1,050	+6
o Columbia River (NAWQA)	[+100]	[0]
o Columbia River (NSIP)	[+100]	[+1]
o Upper Mississippi River (NAWQA)	[+350]	[+3]
o Upper Mississippi River (NSIP)	[+200]	[+1]
o Puget Sound (HR&D)	[+300]	[+1]
TOTAL Program Changes	**-11,103**	**-43**

Justification of Program Changes

The 2012 Budget Request for Water Resources is $199,600,000 and 1,372 FTE, a net program change of -$11,103,000 and -43 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Program Changes

Unrequested Congressional Action (-$4,426,000/0 FTE)

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation. A list of these actions is located in the Budget at a Glance Section.

WaterSMART Program (+$7,500,000/+5 FTE)

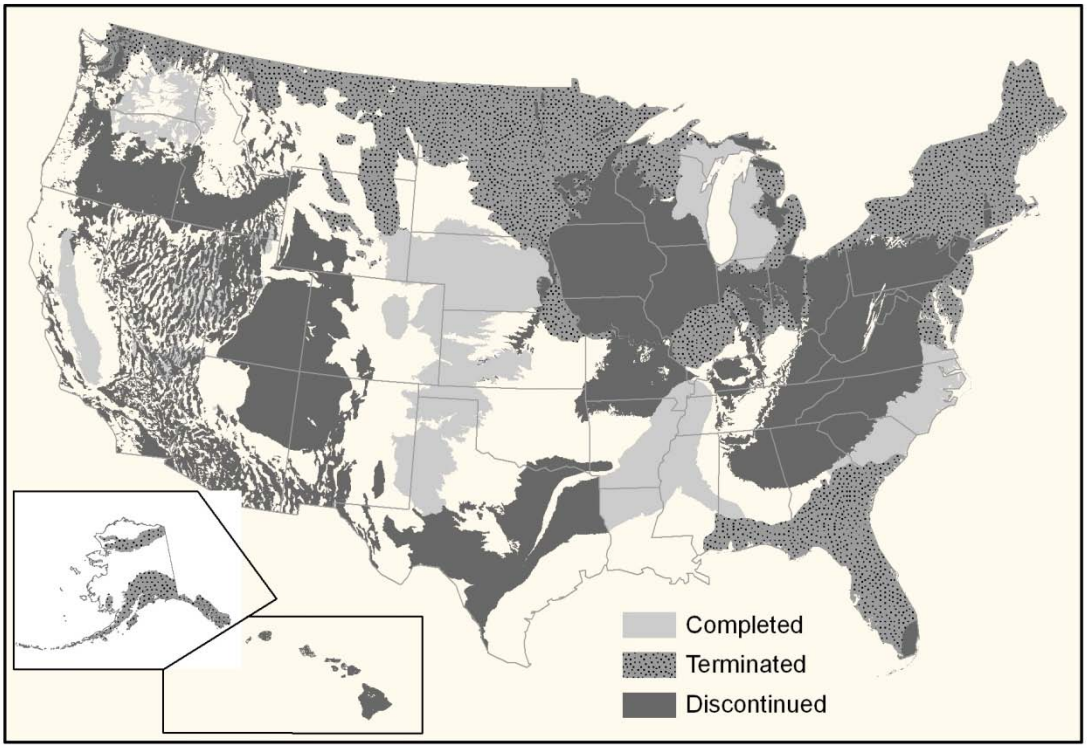
In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. Today we are faced with a new set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortage and water-use conflict have become more commonplace in many areas of the United States—even in average water years. The impacts of climate change, energy development, rural and urban land use, and other increased human use on water resources quality and availability exacerbate the need for information and tools to aid water resource managers. This need was recognized by passage of the Omnibus Public Land Management Act of 2009 (P.L. 111-11) which called for, among other things, a National Water Availability and Use Assessment to provide information on water availability, and human and ecological use through a comprehensive and coordinated approach. The USGS Science Strategy, Circular 1309, *Facing Tomorrow's Challenges – U.S. Geological Survey Science in the Decade 2007-2017,* identifies a Water Census of the United States as one of six USGS science priorities, to provide the scientific underpinnings for a coordinated assessment of water availability and use. The basic structure of this effort will include:

- Estimates of freshwater resources and how those supplies are distributed and either increasing or decreasing over time;
- Evaluation of factors affecting water availability including energy development, changes in agricultural practices, increasing population, and competing priorities for limited water resources;
- Assessments of water use and distribution for human, environmental, and wildlife needs;
- Data and information needed to forecast likely outcomes of water availability, quality, and aquatic ecosystem health due to changes in land use and cover, natural and engineered infrastructure, water use, and climate; and
- A grant program to assist State water resource agencies in integrating State water use and availability datasets with Federal databases for a more comprehensive assessment of water availability.

Groundwater Resources **(-$2,000,000/-11 FTE)**

The Groundwater Resources Program is currently conducting multidisciplinary regional studies of groundwater availability that are the building blocks for a national assessment and is the principal Government entity examining this important national resource. The proposed decrease would require termination of regional groundwater availability studies along with a substantial reduction in data collection and monitoring. Local groundwater studies would continue and the regional and national focus would be lost.

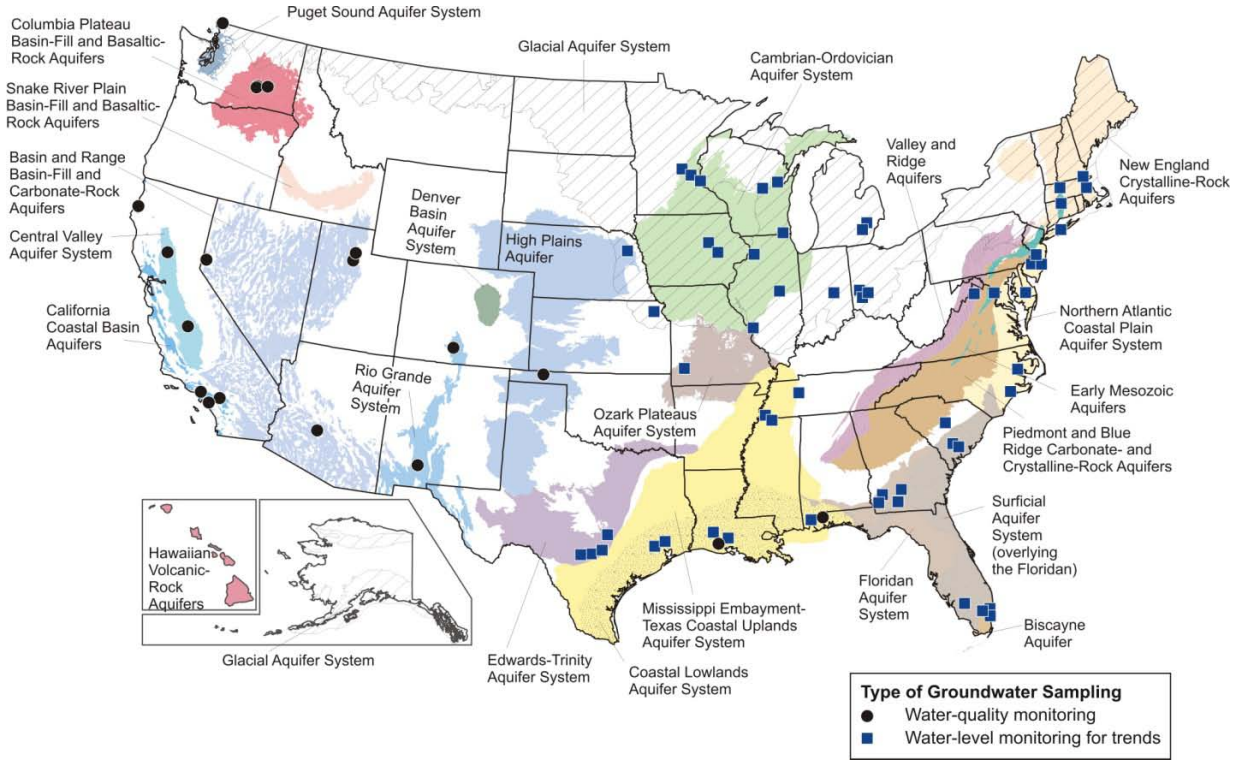
Regional Groundwater Availability Studies



National Water-Quality Assessment Program **(-$6,728,000/-41 FTE)**

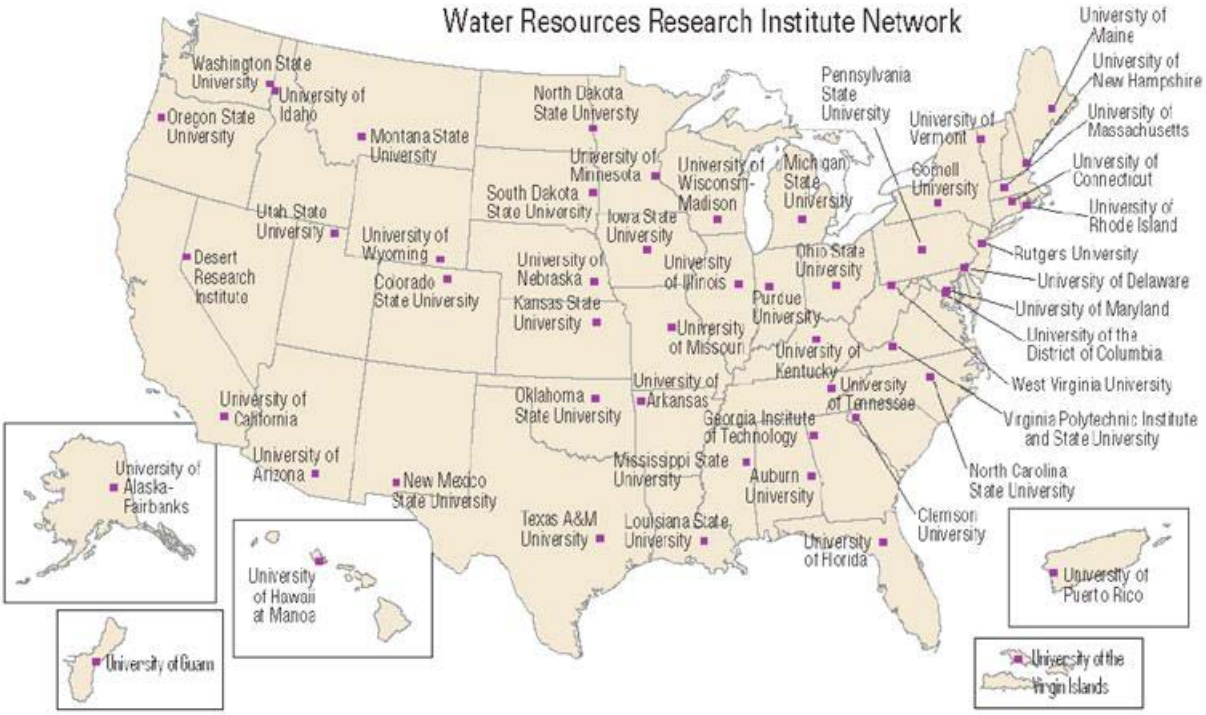
The National Water Quality Assessment Program (NAWQA) is responsible for providing nationally consistent descriptions of current water-quality conditions and changes in these conditions for the Nation's freshwater streams and aquifers. At the proposed funding level, the NAWQA Program would eliminate planned groundwater monitoring at 76 study areas in 33 States. NAWQA's ability to meet the Bureau's 2012 planned performance measure—to complete 11 percent of the decadal national assessment of groundwater quality in support of water resource decision making—would not be met. Instead, two percent of the decadal assessment would be completed in 2012.

Study areas in principal aquifers where groundwater sampling will be stopped in 2012 (Each symbol represents a well network from five to more than 30 wells)



Water Resources Research Act **(-$6,499,000/-2 FTE)**

Established in 1984, by the Water Resources Research Act, the WRRA program provides funding to 54 Water Resources Research Institutes at land grant universities—one in each State, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam for the Federal-State partnership in water resources research, education, and information transfer. The proposed reduction will end this decades-long effort. More than 225 applied research projects will be discontinued as will education and research opportunities for young people.



Ecosystem Restoration **(+$1,050,000/+6 FTE)**

America's Great Outdoors is the President's signature conservation initiative and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most significant ecosystems. This Ecosystem Restoration initiative will help the President advance his America's Great Outdoors initiative. Listed below are the ecosystems targeted by this effort. A description of the work proposed can be found in the Ecosystem Restoration initiative in the Key Changes Section.

- Columbia River +$200,000/+1 FTE
- Upper Mississippi River +$550,000/+4 FTE
- Puget Sound +$300,000/+1 FTE

.

Activity Summary

Since 1879, the USGS has addressed issues of water availability, water quality, drought, and flood hazards. This legacy continues through the efforts of hydrologic professionals and support staff located in all 50 States and Puerto Rico. As the primary Federal science agency for water information, the USGS monitors and assesses the amount (quantity) and characteristics (quality) of the Nation's freshwater resources, assesses sources and behavior of contaminants in the water environment, and develops tools to improve management and understanding of water resources. The information and tools allow the public, water managers and planners, and policy makers to:

- Minimize loss of life and property as a result of water-related natural hazards, such as floods, droughts, and land surface movement;

- Effectively manage freshwaters, both above and below the land surface, for domestic, public, agricultural, commercial, industrial, recreational, and ecological uses;
- Protect and enhance water resources for human health, aquatic health, and environmental quality; and
- Contribute to wise physical and economic development of the Nation's resources for the benefit of present and future generations.

Fundamental to USGS water science is collection and public dissemination of data describing the quantity and quality of the Nation's freshwater resources. During the past 120 years, the USGS has collected streamflow data at over 21,000 sites, water-level data at over 1,000,000 wells, and chemical data at over 338,000 surface-water (streams, rivers, natural lakes, and man-made reservoirs) and groundwater (water beneath the land surface) sites. This data is available online through the National Water Information System (NWIS) at *http://waterdata.usgs.gov/nwis.*

Water resources research, information, and monitoring activities support the USGS Science Strategy focus on providing scientific information on water availability and quality of the United States to inform the public and decision makers about the status of freshwater resources and how they are changing. Efforts of Water Resources scientists also support the USGS Science Strategy themes of understanding ecosystems and predicting ecosystem change, providing a scientific foundation for energy and mineral resources for America's future, climate variability and change, the national hazards, risk, and resilience assessment program, and the role of the environment and wildlife in human health.

Management Summary

In 2006, to ensure USGS programs were meeting water science and information needs of the Nation, the USGS commissioned the National Academy of Sciences (NAS) to conduct the first independent review of Water Resources Discipline (WRD) programs. The NAS National Research Council (NRC) formed a Committee on Water Resources Activities at the USGS. The Committee looked at a wide variety of data collection and dissemination, hydrologic investigations and analysis activities, as well as basic and applied hydrologic research. This review assessed the water program and recommended how the USGS could best address the Nation's priority water issues. The NRC assembled a panel of water resources experts from Government, academia, and nongovernmental organizations. The Committee met with USGS managers, scientists, and customers to gain insight on the current program. Many of the Committee's recommendations were directed toward the water resources role in the USGS Science Strategy and national water priorities. In its conclusion, the Committee stated that the USGS "stand(s) on a long tradition of studying the impact of human activities on water resources and ecosystems. Whether society can manage water resources sustainably in light of the growing interdisciplinary issues such as population growth, wealth production, ecosystem needs, and climatic uncertainty, has become the signature environmental issue of our age. The USGS WRD is well suited to play a critical leadership role in a national strategy for water resource management." The final report, "*Toward a Sustainable and Secure Water Future: A Leadership Role for the U.S. Geological Survey*" was published in 2009 and can be viewed online at *http://books.nap.edu/openbook.php?record_id=12672&page=1*.

During 2009, the USGS embarked on a value engineering study of selected USGS surface water, groundwater, and water-quality data collection procedures. Although the USGS works to continuously improve the quality, efficiency, and cost-effectiveness of its field and office

procedures, the USGS took advantage of an opportunity to partner with independent private-sector firms to conduct a formal value engineering study. The goal of the study was to identify new procedures, instrumentation, and computer software to improve efficiency of the USGS data program while maintaining the high data-quality standards. The first phase of the study focused on real-time water-quality monitoring and was completed in the fall of 2009. Study recommendations included improving compatibility of data acquisition and data processing software to enhance efficiency and cost-effectiveness of water-quality data processing. A study of streamflow measurement and data acquisition procedures is underway, and a study of groundwater procedures was completed in 2010. These studies demonstrate USGS commitment to state-of-the-art methodology to provide high-quality, cost effective hydrologic information for the Nation.

The USGS also plans to have the NRC review the new 10-year plan for the National Water-Quality Assessment (NAWQA) Program, 2013-2023, including recommendations on improvements to NAWQA's design and implementation to address water-quality issues of the 21st Century. This review is scheduled for completion in 2011.

The Office of Water Quality, Office of Groundwater, and Office of Surface Water, supported by all USGS Water programs, provide technical support, training, and quality assurance for USGS Water programs and water science centers. These offices provide high-level science support and technology transfer required to maintain scientific excellence. In addition, technical offices provide quality assurance independent from water science center and programmatic management. The offices assemble multidisciplinary teams to conduct scientific technical reviews of water science center activities within the Water Resources programs of the USGS. Triennial reviews are supported by technical specialists in the regions who work with water science centers to review project proposals, conduct on-site training, and provide technical advice and consultation to USGS field-based scientists. The specialists help ensure data collected by USGS field offices are derived from nationally consistent methodologies and of sufficient quality to be included in national hydrologic data bases, that field scientists apply the latest hydrologic techniques, and that new methodologies developed in the field are transferred for use by other USGS offices.

Strategic Planning - The USGS has chartered Science Strategy Planning Teams charged with developing long-term (10 year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The strategic plan will provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that the USGS meets the goals of the USGS Science Strategy.

Water Resources Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Groundwater Resources							
# of knowledge products on the water availability of the Nation's water resources provided to support management decisions							
Performance Data	21	15	25	25	25	0	0
% of U.S. with groundwater availability status and trends information (SP)							
Performance Data	8% (3/40)	13% (5/40)	15% (6/40)	18% (7/40)	20% (8/40)	+2%	0%
Total Actual/Projected Cost ($000)	2,800	3,400	2,400	2,400	400	-2,000	0
Actual/Projected Cost Per ground water availability (whole dollars)	700,000	680,000	600,000	600,000	400,000	-200,000	0
Comments	Despite a proposed reduction in funding, performance continues to increase in 2012 due to completion of work that was initially funded in previous years. The reduction will be considerably limited in future years (2013 and beyond) under the proposed funding constraints resulting in minimal forward progress on this measure.						
National Water Quality Assessment							
% of U.S. with current groundwater quality status and trends information (SP)							
Performance Data	56% (476/845)	67% (570/845)	78% (658/845)	89% (751/845)	91% (771/845)	+2%	49%
Comments	The proposed $1.7 million reduction in funding for this component would limit the Program's ability to meet the previous 2012 planned target to complete an additional 11 percent of the decadal national assessment of groundwater quality in support of water resource decision making; only an additional 2% of the decadal assessment would be completed in 2012. The proposed reduction in 2012 may require a reduction in the frequency or number of sites monitored to support this measure in 2013 and beyond.						
% of U.S. with current streamwater quality status and trends information (SP)							
Performance Data	34% (1707/4956)	52% (2575/4956)	69% (3409/4956)	86% (4242/4956)	100% (4956/4956)	+14%	40%
Comments	The funding reduction proposed for NAWQA in 2012 may not impact performance until 2013 and beyond. The proposed reduction in 2012 may require a reduction in the frequency or number of sites monitored to support this measure in 2013 and beyond.						
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions							
Performance Data	80	50	80	20	30	+10	-15
Total Actual/Projected Cost ($000)	16,000	10,000	16,000	4,000	6,000	2,000	0
Comments	There is an increase in 2012 performance due to NAWQA cycle 2 multi-year studies that will be completed in that year. The proposed funding reduction in 2012 will impact performance in 2013 and beyond. At the 2011 funding level it is estimated that NAWQA would produce about 40 knowledge product in 2016, the proposed reduction in 2012 will result in 15 fewer knowledge products in 2016.						
National Streamflow Information Program							
% of USGS planned streamgages that are fully funded by the National Streamflow Information Program (SP)							
Performance Data	11% (500/4756)	7% (349/4757)	7% (349/4757)	8% (380/4757)	8% (380/4757)	0%	+0%
Total Actual/Projected Cost ($000)	7,750	7,850	8,320	8,000	8,100	100	0
Actual/Projected Cost Per proposed streamgages (whole dollars)	15,500	15,700	16,000	16,000	16,200	200	800

Water Resources Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Hydrologic Research and Development							
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions							
Performance Data	249	203	220	220	220	0	-15
Total Actual/Projected Cost ($000)	4,980	4,400	4,400	4,400	4,400	0	0
Hydrologic Networks and Analysis							
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions							
Performance Data	9	11	12	11	11	0	0
Total Actual/Projected Cost ($000)	1,800	2,200	2,200	2,200	2,200	0	0
% of U.S. with completed, consistent water availability products (SP)							
Performance Data	N/A	N/A	N/A	N/A	8% (180/2268)	+8%	+34%
Total Actual/Projected Cost ($000)	N/A	N/A	N/A	N/A	4,900	N/A	0
Cooperative Water Program							
# of knowledge products on the water availability and quality of the Nation's water resources provided to support management decisions							
Performance Data	250	237	230	225	220	-5	0
Total Actual/Projected Cost ($000)	25,000	25,500	26,100	25,300	25,300	0	3,400
Actual/Projected Cost Per knowledge product (whole dollars)	100,000	107,600	113,400	112,500	114,750	2,250	0
# of water monitoring sites supported jointly with State, local or Tribal cooperators (SP)							
Performance Data	21,800	20,600	20,000	19,500	19,100	-400	+2,900
Total Actual/Projected Cost ($000)	37,800	38,600	39,500	38,300	38,300	0	0
Actual/Projected Cost Per site (whole dollars)	1,736	1,873	1,974	1,964	2,005	41	0
Water Resources -- NSIP, HNA, GWRP, NAWQA, & CWP							
# of retrievals of groundwater and surface-water quantity and quality data and information							
Performance Data	133 million	154 million	175 million	175 million	183 million	+8 million	+23 million

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

This page is left intentionally blank

Activity: Water Resources
Subactivity: Groundwater Resources Program

2010 Enacted: $9.7 million (56 FTE)
2011 CR: $9.7 million (56 FTE)
2012 Request: $6.9 million (44 FTE)

Budget Realignment

In 2010 and 2011, Groundwater Resources is a program in the Hydrologic Monitoring, Assessments, and Research subactivity of the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Groundwater is one of the Nation's most important natural resources and is increasingly important to daily life. Groundwater is the primary source of drinking water for approximately half the Nation's population, provides about 40 percent of the irrigation water necessary for the Nation's agriculture, sustains the flow of most streams and rivers, and helps maintain a variety of aquatic ecosystems. Continued availability of groundwater is essential for current and future populations and the economic health of our Nation.

The Groundwater Resources Program (GWRP) provides objective scientific information and interdisciplinary understanding necessary to assess and quantify availability and sustainability of the Nation’s groundwater resources. Results of those efforts provide information used in decision making by resources managers, regulators, other Government agencies, and individuals in the public and private sectors. The goals of the program are to:

- Provide fundamental information about groundwater availability in the Nation's major aquifer systems;
- Characterize natural and human factors that control recharge, storage, and discharge in the Nation's major aquifer systems, and improve understanding of these processes;
- Develop and test new tools and field methods to analyze groundwater flow systems and their interactions with surface water; and
- Provide scientific leadership across all Federal programs about the Nation's groundwater resources, including research directions, quality control, technology transfer, and information storage and delivery.

The program coordinates with and complements other USGS programs by providing new methods, tools, and information used in monitoring, assessment, and resource management activities. Goals of the GWRP directly support the USGS Science Strategy focus on providing scientific information on water availability and quality of the United States to inform the public and decision makers about the status of freshwater resources and how they are changing. GWRP scientists also support USGS Science Strategy themes of climate variability and change, understanding ecosystems and predicting ecosystem change, and the national hazards, risk, and resilience assessment program.

Program Performance

This program is comprised of the following three components:

National and Regional Groundwater Evaluations
(2010 Enacted, $3.8 million; 2011 CR, $3.8 million; 2012 Request, $1.2 million)

The GWRP is the principal entity within the USGS for assessing availability of groundwater resources of the Nation's most important regional aquifers. Studies comprise individual assessments of regional groundwater flow systems that cover a variety of hydrogeologic terrains and are used to develop a comprehensive regional and national perspective. Collectively, these individual studies are the foundation for the national assessment of groundwater availability. Availability studies, conducted in cooperation with other Federal, State, and local governments and the private sector, involve computer-based groundwater flow models to document effects of human activities and climate variability on groundwater levels, depletion, storage, and interactions with surface water.

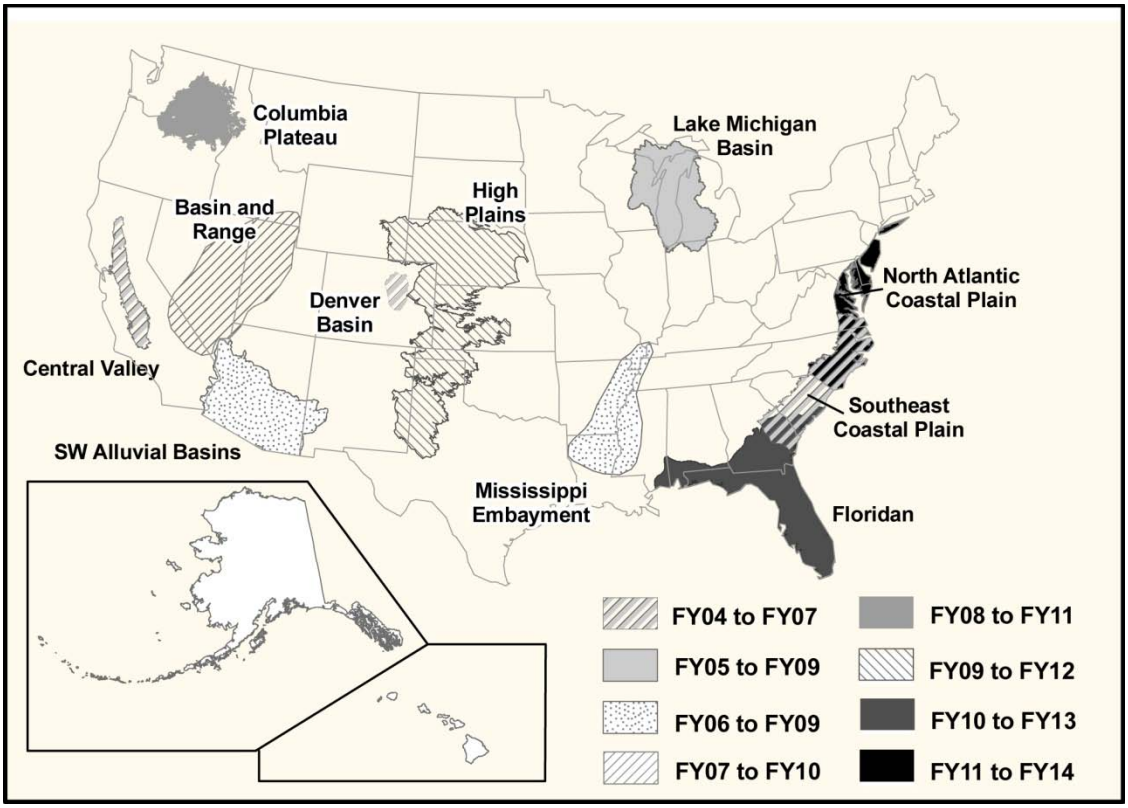
In response to the proposed funding cuts the current multidisciplinary regional studies of groundwater availability that were to be the building blocks of a national assessment will be terminated. Because the High Plains Aquifer study will be in its final year, in 2012 funding will be provided for completion; however studies of the Floridan aquifer system (AL, FL, GA, and SC); the Northern Atlantic Coastal Plain aquifer system (DE, MD, NJ, NY, and VA); and, the Glacial Aquifer System in 25 northern states (ME, NH, VT, MA, RI, CT, NY, NJ, PA, OH, IN, MI, IL, WI, MO, IA, MN, KS, NE, SD, ND, MT, ID, WA, and AK) from Maine to Washington and Alaska would be discontinued. The regional assessment of groundwater status and trends in the Lower Tertiary aquifers of the Northern Great Plains (WY, MT, ND, and SD) that was scheduled to begin in 2012 will be eliminated.

In 2010, the Great Lakes Basin Pilot team produced 20 USGS publications with 34 different authors from 12 different USGS offices, 3 State geological surveys, 4 universities, and Environment Canada's National Water Research Institute. This represents a first-of-its-kind effort to develop approaches and methods for full-scale implementation and develop understanding of water resources of this important area of the United States. The Compact specifically requires science for decision making and improved understanding of the role of groundwater. Approaches, methods, techniques, and results developed here are used by individual States in their water resources planning and policy demonstrating what can be achieved under the Water Census theme of the USGS Science Strategy.

Regional groundwater evaluations of California's Central Valley *(http://pubs.usgs.gov/pp/1766/)* and the Atlantic Coastal Plain of North and South Carolina (*http://pubs.usgs.gov/pp/1773/*) are examples of studies completed recently and made available to Federal, State, and local water-related agencies to help them address issues affecting sustainability of the area's groundwater resources. In the Central Valley, the information and tools developed through the regional study provided water managers with a detailed picture of how water flows below the ground and how it relates to surface water in rivers and canals. With this information water managers were given the ability to simulate a number of water-management scenarios and assess possible changes in both groundwater and surface-water supplies. In the Carolina Coastal Plain study, results were used to resolve long-standing differences between data and information used to delineate the hydrogeologic framework between the two States. These regional assessments are part of an effort to evaluate more than 30 regional aquifers that will eventually lead to a national

assessment of the Nation's groundwater availability. Circular 1323 describes the approach for a national assessment of groundwater availability (*http://pubs.usgs.gov/circ/1323/*).

Status and Location of Regional Groundwater Availability Studies



Groundwater Interactions
(2010 Enacted, $4.0 million; 2011 CR, $4.0 million; 2012 Request, $3.6 million)

Over the past decade groundwater issues have evolved in scope and complexity as a result of escalating demands for the resource. USGS scientists address this increasing complexity by targeting information needs with a multi-disciplinary approach to understanding groundwater and linkages to humans and the natural environment. The GWRP will continue activities related to groundwater resource assessment while investigating all aspects of groundwater and its interdependence with the environment.

Field Methods and Model Development – In 2012, the GWRP will continue to search for more efficient methods to evaluate groundwater resources at a variety of scales. The USGS has been devising new analytical techniques for the study of groundwater resources. Geophysical methods, which can replace more expensive *in situ* techniques, and application research, along with groundwater-model development, are activities that support and benefit all USGS projects addressing organizational goals. These methods and tools are used throughout the Federal, academic, and private groundwater-resource management community.

The USGS conducts research on new and emerging geophysical methods and applications for groundwater investigations. Near-surface geophysical techniques can be used to rapidly and effectively characterize the shallow subsurface and to monitor hydrologic and remediation

processes in ways not previously possible with standard technology. Current efforts are to develop:

- Fiber-optics distributed temperature sensing field applications to understand groundwater recharge and discharge;
- Rapid seismic subsurface imaging methods to characterize groundwater-bearing formations;
- Methods for quantitative interpretation of geophysical tomography data; and
- An easy-to-use stepped-frequency electromagnetic tool for subsurface characterization.

In 2012, these techniques will continue to be refined and new efforts will be directed towards quantitative investigations of the spatial and temporal nature of hydrogeologic structures and processes.

The USGS leads development of numerical techniques to solve practical problems in the study of groundwater resources. Predictive models are needed to make informed decisions in many emerging areas related to the effects of groundwater development and sustainability. New models and methods enhance all USGS water programs and provide critical tools and information needed for informed water-resource decision making. State and local governments, as well as groundwater scientists and engineers in the private sector, regularly use USGS models as an integral part of their work. The USGS Modular Groundwater Flow Model (MODFLOW) is the most widely used program in the world to simulate groundwater flow. In 2012, the Groundwater Resources Program will continue to support MODFLOW enhancements with updates to help scientists and engineers simulate common features in groundwater systems. New features will be added to the model to incorporate advancements in our understanding of groundwater hydrology, to respond to changes in user needs, and to take advantage of constantly increasing computing power. Moreover, in 2012, the GWRP will support application of USGS groundwater models in complex aquifer settings and examine challenging water-resource management issues such as assessing water availability, saltwater intrusion, and the effects of groundwater withdrawals on aquatic ecosystems in streams.

Data and Groundwater Level Monitoring – Collecting groundwater information is necessary to assess and quantify availability of the Nation's groundwater resources. The USGS maintains a database of groundwater data records compiled from about 850,000 wells used in groundwater hydrology studies over the past 100 or more years. Wells are monitored for a variety of purposes such as State wide and regional monitoring of ambient conditions, or for local monitoring of drawdown, aquifer tests, or even earthquake effects on water levels. The GWRP makes many of these data available in an easily accessible manner via the Internet *(http://groundwaterwatch.usgs.gov/).* Examples include:

- Active groundwater level network – describes water levels and well information from more than 25,000 wells measured by the USGS or USGS cooperators at least once within the past 365 days;
- Climate response network assesses changes in groundwater conditions using a network of more than 500 wells developed and maintained to monitor changes due to climate stresses, such as drought. The groundwater climate response network, although small, continues to grow as the public, water managers, and scientists better understand the connection between climatic variations and shallow groundwater aquifers;

- Real-time groundwater level network provides real-time groundwater level data at about 1,200 wells across the Nation;
- Below normal groundwater levels network contains water levels from wells where the most recent water levels in the 24th percentile or lower of the period of record statistics are displayed in order to identify unusually low groundwater-level conditions;
- Long-term groundwater data network consists of more than 14,000 wells that have periodic, continuous, and real-time data with at least 20 years of measurement;
- Regional aquifer monitoring networks monitors water-level changes in regional and State groundwater monitoring networks and provides access to those data. The High Plains, Piedmont, and Blue Ridge are part of a groundwater monitoring network whose data are served by the GWRP. For example, 9,000 wells in the High Plains Aquifer Monitoring Network are measured annually by an assortment of Government agencies and the USGS; and
- State and local monitoring networks monitors State and local groundwater levels. For example, the New Jersey groundwater level network consists of about 190 wells with different measurement frequencies that provide data to interested water managers and the public.

As a complement to these networks and in response to expanding human and environmental demands, the USGS periodically evaluates water levels on a regional scale to properly inventory groundwater reserves in areas experiencing intense development. Other aquifers and aquifer systems have been and are being monitored, such as the Atlantic Coastal Plain Aquifer System, the Sparta-Memphis Aquifer, the Columbia Plateau Regional Aquifer, and the Floridan Aquifer System.

The USGS is the lead Federal agency on the Advisory Committee on Water Information (ACWI) Subcommittee on Ground Water (SOGW). The SOGW designed a framework for a National Ground Water Monitoring Network (NGWMN) during 2007-2009 as described in the SECURE Water Act. The NGWMN is proposed as a collaborative monitoring network among Federal, tribal, State, and local agency data providers. Five one-year pilot projects have been selected and will be completed by early 2011.

Technical Support
(2010 Enacted, $1.9 million; 2011 CR, $1.9 million; 2012 Request, $2.1 million)

This support provides quality control to assure technical excellence of groundwater field programs and provides a structured way of transferring new technology to activities conducted at USGS water science centers in each State. This program component also provides a formal way of establishing research priorities and making groundwater information available to other agencies, the scientific community, and the public.

Major GWRP accomplishments anticipated from the Groundwater Resource Program in 2011 include:

- A USGS Professional Paper assessing groundwater availability of the Mississippi Embayment Regional Aquifer System (Arkansas, Louisiana, Mississippi, and Tennessee) will be released;

- Preliminary synthesis of the first five groundwater availability studies, part of the national assessment of groundwater availability, are being conducted. Lessons learned from this initial analysis will help refine the remainder of the regional assessments;
- Investigations continue, for the second year, in three “challenge areas” linked to regional groundwater availability studies: assessing saline groundwater resources; estimating groundwater withdrawals and consumptive use for principal aquifers; and monitoring effects of climate change on groundwater resources;
- Journal articles and reports on development of new geophysical methods to improve understanding of hydrogeologic structure and processes are scheduled for release. The articles will focus on development and application of fiber-optic distributed temperature sensing technology for hydrologic studies; development and application of rapid seismic, electromagnetic, and electrical resistivity imaging, characterization, and monitoring methods; and software development for quantitative analysis of flowmeter, temperature, and geophysical tomography data;
- Enhancements and updates to USGS groundwater software including MODFLOW groundwater-flow model and the recently released GSFLOW coupled watershed model based in part on MODFLOW. Embellishments will include better representation of lakes in groundwater/surface-water simulations, improved methods for solving finite-difference equations on which MODFLOW is based, and additional options to evaluate effects of existing and proposed groundwater-management activities. All enhancements will be distributed free of charge through the USGS Water Resources Software Web pages: *http://water.usgs.gov/software*; and
- An SOGW report summarizing results from the five pilot projects examining groundwater levels and water quality monitoring data will be released. Results of the pilot studies will be used as the basis for full-scale implementation of the data sharing portal and a national network for monitoring groundwater levels and quality.

Activity: Water Resources
Subactivity: National Water Quality Assessment Program

2010 Enacted: $66.5 million (412 FTE)
2011 CR: $66.5 million (412 FTE)
2012 Request: $57.5 million (371 FTE)

Budget Realignment

In 2010 and 2011, National Water Quality Assessment is a program in the Hydrologic Monitoring, Assessments, and Research subactivity of the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The NAWQA Program addresses three long-term goals:

- Describe status and trends of the quality of a large, representative part of the Nation's surface-water and groundwater resources;
- Provide improved understanding of primary natural factors and human activities affecting those conditions; and
- Provide information to support development and evaluation of management, regulatory, policy, and monitoring decisions by other Federal, State, and local agencies.

Objective and reliable data, water-quality models, and systematic scientific studies characterize where, when, and why the Nation's water is degraded—and what can be done to improve and protect it for human and ecosystem needs. The information is used by national, regional, State, tribal, and local stakeholders to develop effective, science-based policies for water protection and management (*http://water.usgs.gov/nawqa/xrel.pdf*).

The full-scale NAWQA program began in 1991. During its first decade, the program established baseline understanding of water-quality conditions and conducted interdisciplinary assessments in 51 of the Nation's most important river basin and aquifer systems, referred to as Study Units. A new cycle of studies involving selected streams and aquifers in 42 of the 51 Study Units began in 2001, and is scheduled for completion in 2012. In 2009, planning for the next NAWQA cycle (2012-2023) began.

Goals and scientific information provided by the NAWQA Program directly support the Interior goal and USGS Science Strategy for informing decision makers and the public about the availability and quality of freshwater resources, now and into the future. NAWQA science also supports the USGS mission for understanding stream ecosystem health and ecosystem changes driven by climate and human activities on the landscape. Details on NAWQA collaboration with USGS programs and other agencies are described below.

NAWQA managers partner with Federal agencies such as the U.S. Environmental Protection Agency (EPA) and U.S. Department of Agriculture (USDA), State and local agencies, non-governmental organizations, and the private sector and maintain continued relevance of science findings for decision making. For example, innovative geospatial modeling

(SPARROW), integrated with water-quality data from long-term (decadal) monitoring, is being used by the EPA Science Advisory Board and the Gulf of Mexico Nutrient and Hypoxia Task Force to inform and develop a basin-wide strategy to reduce the nutrient burden responsible for oxygen loss (or “hypoxia”) in the Gulf of Mexico. The areal extent of the hypoxic zone in the northern Gulf of Mexico is the second largest in the world and threatens the economic and ecological health of one of the Nation's largest and most productive fisheries. SPARROW helps quantify the relative magnitude of urban and agricultural sources of nitrogen and phosphorus in the basin and describes the transport of these nutrients to the Gulf of Mexico. SPARROW findings also are being used by USDA and conservation partner organizations to prioritize watersheds for nutrient management strategies, as part of the USDA Mississippi River Basin Healthy Watersheds Initiative. SPARROW findings are used by the EPA and States to define the concentrations of nutrients necessary to support healthy-stream ecosystems across the country.

Program Performance

NAWQA co-sponsored a congressional briefing in Washington, DC, with the Water Environment Federation (WEF) and Environmental and Energy Studies Institute (EESI) to release a comprehensive national analysis of nutrients in streams and groundwater. Scientific findings highlighted nutrient occurrence and trends, key sources, natural and human factors affecting nutrients, and potential effects on humans and ecosystems. Findings showed that nitrate contamination of groundwater used for drinking, particularly in shallow private wells in agricultural areas, is a continuing human-health concern and that excessive nutrient enrichment is widespread in streams. Despite major Federal, State, and local efforts to control point discharges and nonpoint sources, such as fertilizers, nutrient concentrations have remained the same or increased in many streams and aquifers across the Nation since the early 1990s. This national analysis directly addresses congressional intent in establishing the Program in 1991—to provide a scientific basis for evaluating whether conditions are improving and for tracking the effectiveness of management practices and decisions. Specifically, these USGS findings are directly relevant to local, State, regional, and national decision makers involved in efforts to develop nutrient criteria; reduce nutrients to key estuaries and other receiving waters; track changes following nutrient reduction strategies; and manage elevated nutrients in drinking water.

Also, in 2010, NAWQA hosted a congressional briefing with WEF and EESI in Washington, DC, on the quality of water sampled from high-production community water systems. About 105 million people—or more than one-third of the nation’s population—receive their drinking water from one of the 140,000 public water systems across the United States that rely on groundwater pumped from public wells. The USGS study focused primarily on source (untreated) water collected from public wells before treatment or blending rather than the finished (treated) drinking water that water utilities deliver to their customers. Findings showed that more than 20 percent of untreated public-well samples contained at least one contaminant at levels of potential health concern—in large part comprised of naturally occurring contaminants, such as radon and arsenic (accounting for about three-quarters of contaminant concentrations greater than human-health benchmarks). Man-made contaminants were also present, including herbicides, insecticides, solvents, disinfection by-products, nitrate, and gasoline chemicals. By focusing primarily on source-water quality, and by testing for many contaminants that are not regulated in drinking water, this USGS study complements the extensive monitoring of public water systems that is routinely conducted for regulatory and compliance purposes by Federal, State, and local drinking-water programs. Findings assist water utility managers and regulators in making decisions about future monitoring needs and drinking water issues.

In 2010, NAWQA released a major national study that examined effects of urban development on stream ecosystem health. Findings showed that the number of native fish and aquatic insects, especially those that are pollution sensitive, decline in urban and suburban streams at low levels of development, levels often considered protective for stream communities. For example, by the time a watershed reaches about 10 percent impervious cover in urban areas, aquatic insect communities are degraded by as much as 33 percent in comparison to aquatic insect communities in forested watersheds. The USGS determined the magnitude and pattern of the physical, chemical, and biological response of streams to increasing urbanization and how these responses vary throughout nine metropolitan areas, including Portland, OR; Salt Lake City, UT; Birmingham, AL; Atlanta, GA; Raleigh, NC; Boston, MA; Denver, CO; Dallas, TX; and Milwaukee, WI. Comparisons among the nine metropolitan areas show that not all urban streams respond in a similar way. Land cover prior to urbanization can affect how aquatic insects and fish respond to urban development. Findings are important to water managers and land use planners in protecting and managing impacts of urban development and in setting realistic stream restoration goals in urban areas.

At the proposed funding level for 2012, the program will continue national synthesis of selected topics; regional and national assessments of status and trends in streams and groundwater; studies of source-water quality associated with large community water systems; and five studies of national priority topics, including:

- Effects of nutrient enrichment on stream ecosystems;
- Sources, transport, and fate of agricultural chemicals;
- Transport of contaminants to public-supply wells;
- Effects of urbanization on stream ecosystems; and
- Bioaccumulation of mercury in stream ecosystems.

NAWQA implements and supports outreach and liaison activities at local, State, regional, and national scales. NAWQA's Web site (*http://water.usgs.gov/nawqa/*) provides rapid access to NAWQA's publications, national maps, methods documents, and an up-to-date list of current developments that allows interested parties to get new information in a timely fashion. The program hosts the largest online collection of nationally consistent water-quality data through its NAWQA Data Warehouse (*http://water.usgs.gov/nawqa/data/*), including more than 16 million records that include concentrations in water, sediment, and aquatic tissues of 2,400 chemicals from more than 7,500 stream sites and 9,500 wells and fish, aquatic insect, and algal community data for more than 20,000 stream samples. All NAWQA data will continue to be available for users in 2012.

Major products anticipated in 2012 include:

- Five USGS circulars will be released summarizing groundwater quality conditions and trends from 1993-2009 in selected principal aquifers of the United States. Nationally consistent assessment findings at the regional scale help provide context for interpreting smaller scale studies completed by local and State agencies and organizations and local and State managers.
- Two USGS circulars on NAWQA topical studies focusing on agricultural watersheds will be released that highlight effects of: environmental processes and agricultural practices on the transport and fate of agricultural chemicals in the environment; and nutrient enrichment on stream ecosystems. Findings track effectiveness of land practices and

nutrient reduction strategies, and support the Bureau's strategic plans for providing science relevant to human and ecosystem health and changes in water quality and availability due to human and natural factors.

NAWQA goals are accomplished using six major program elements. NAWQA Program activities for 2012 are described below.

National Synthesis of Key Findings Related to Important Water-Quality Topics (2010 Enacted, $7.0 million; 2011 CR, $7.0 million; 2012 Request, $6.6 million)

National syntheses compile data and science across local and regional scales and provide national assessments of water-quality conditions and trends and key factors (such as land use, hydrology, geology, and soils) controlling quality in different regions of the U.S. National syntheses planned in 2012 will focus on pesticide concentrations in urban streams and how they change over time, in large part resulting from regulatory decisions on pesticide use and regulations. Findings are critical for EPA to track effectiveness of pesticide regulations over time. A similar effort will focus on pesticides in agricultural streams, enhanced by geo-spatial modeling and decision-support tools for predicting conditions in unmonitored agricultural areas across the Nation. The $0.4 million decrease proposed for 2012 results from the planned completion of some of the Volatile Organic Compounds (VOC) national synthesis work and was intended to be used to support a national synthesis of suspended sediment in streams and rivers.

Regional and Study Unit Assessments of Status and Trends (2010 Enacted, $31.0 million; 2011 CR, $31.0 million; 2012 Request, $27.1 million)

Status and trend assessments focus on quality of streams and rivers in 42 Study Units grouped within eight major river basins in the United States and groundwater quality in about one-third of the Nation's 62 principal aquifers. These broad-scale assessments integrate modeling with monitoring to help extend water-quality assessments to unmonitored, yet comparable areas. They also involve collaboration with other USGS programs, such as the National Stream Quality Accounting Network, other Federal agencies, and regional, State, tribal, and local organizations to maximize use of available data to achieve assessment goals. Source-water-quality assessments characterize water in selected drinking-water supply wells, stream intakes, and in finished drinking water associated with large community water systems. The source-water quality assessments complement drinking-water monitoring required by other Federal, State, and local programs, which focus primarily on post-treatment compliance monitoring. The proposed reduction in funding for this component would limit the Program's ability to meet the Bureau's 2012 planned performance measure, which is to complete 11 percent of the decadal national assessment of groundwater quality in support of water resource decision making; only two percent of the decadal assessment would be completed in 2012.

Topical Studies of National Priority (2010 Enacted, $9.8 million; 2011 CR, $9.8 million; 2012 Request, $5.8 million)

Topical studies address five national priority topics that establish links between sources and transport of contaminants and the potential effects of contaminants on humans and aquatic ecosystems. Five topical studies were conducted in selected Study Units across the nation where these issues are a concern. NAWQA relies on fundamental research accomplished in other water programs like the Hydrologic Research and Development Program (HR&D) and the Toxic Substances Hydrology program. For example, NAWQA collaborates with other USGS

scientists on sampling and analytical techniques to understand key chemical and biological processes affecting water quality, such as mercury bioaccumulation in fish, stream metabolism, and contaminant degradation. The five national priority topics under study are discussed on page L-19.

2012 will be the final year of the current five topical studies. These studies will complete scientific publications and share key findings with stakeholders through reports and briefings.

The $4.0 million decrease was part of the planned completion of these studies in 2012. The field study portion of these efforts has been completed and the focus in 2012 will be on completing scientific publications and sharing key findings with stakeholders through high visibility reports and briefings.

Planning, Pilot Studies, and Methods Development for Cycle III

The NAWQA Program has invested several million dollars of staff effort since 2009 developing and prioritizing technical work and plans for the third decade of the NAWQA Program (2013-2023). These plans have been shared with the NAWQA National liaison committee and with the National Research Council (NRC), which will complete their third technical review and evaluation of the NAWQA Program in 2011. The 2012 Water Resources proposed funding level would eliminate $4.8 million in funds needed to complete Cycle 3 planning, redirected from planned and scheduled reductions to the Topical Studies ($4.0 million) and National Synthesis Component ($0.8 million), used to:

- Prepare detailed staffing and operational plans;
- Develop collaborative agreements with other agencies;
- Train and pilot real-time water quality sensors and other new field equipment; and
- Develop new laboratory analytical techniques for high priority contaminants based on stakeholder needs and recommendations of the NRC. These techniques are necessary to prepare for implementation of Cycle III plans at the start of 2013.

Supporting Research and Methods
(2010 Enacted, $6.6 million; 2011 CR, $6.6 million; 2012 Request, $5.9 million)

To ensure NAWQA data collection and analyses are relevant to emerging issues, about 10 percent of program resources are devoted to developing state-of-the-art methods of sample collection and analysis and to innovative research techniques, such as those involving age-dating, dye tracer tests, and isotope analysis. The proposed 2012 budget will result in a reduction of $0.7 million and four FTE to these efforts, resulting in a loss of capability to address new and complex water quality issues.

Technical Support of USGS Activities
(2010 Enacted, $12.1 million; 2011 CR, $12.1 million; 2012 Request, $12.1 million)

Providing national-level technical support and training for staff scientists involved with NAWQA and other USGS water-quality programs ensures use of nationally consistent methods and approaches, and consistent quality control and technical excellence for its geographically distributed water-quality studies. These technical support activities ensure that the USGS has a strong technical foundation for conducting nationally consistent monitoring and assessment

activities across the Nation. Technical support also provides efficient and effective mechanisms to make water-quality information available to other agencies, the scientific community, and the public.

Activity: Water Resources
Subactivity: National Streamflow Information Program

2010 Enacted: $27.7 million (52 FTE)
2011 CR: $27.7 million (52 FTE)
2012 Request: $26.9 million (52 FTE)

Budget Realignment

In 2010 and 2011, the National Streamflow Information Program is a program in the Hydrologic Monitoring, Assessments, and Research subactivity of the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Streamgages in the National Streamflow Information Program (NSIP) are the primary tool to provide streamflow information and understanding to meet national, regional, State, and local needs through five major objectives:

- Developing an enhanced streamgaging network fully funded by NSIP to meet national needs for streamflow information;
- Improving timeliness, reliability, and convenience of streamflow information delivery to users;
- Completing regional assessments of existing streamflow information to identify trends and estimate streamflow at locations without streamgages;
- Improving understanding of floods and droughts through expanded measurements and analyses; and
- Performing and funding research and development activities to advance equipment technologies and measurement and analysis techniques for greater accuracy at lower cost.

Other USGS Programs rely on NSIP for basic streamflow information required for their analyses, among them: NAWQA, Climate Change Research and Development, and GWRP. The USGS WaterSMART Availability and Use Assessment will require streamflow information and regional evaluations to assess water availability in different regions of the United States. Aquatic biology programs (such as the Fisheries program) require streamflow information to help determine timing and quantity of river flow required for different habitats and species.

In addition, other Federal agencies rely on streamflow data and information to meet their obligations. Examples include the National Weather Service for predicting floods, the Federal Emergency Management Agency for identifying flood prone areas, the National Park Service for managing water resources, the U.S. Army Corps of Engineers for operation of locks and dams, and the Bureau of Reclamation for dam and water conveyance systems operation. State and local water management agencies depend on NSIP-provided streamflow information to assess and manage water resources for water supply, waste assimilation, fisheries management, and recreation.

NSIP's Streamgages that Uniquely Support Federal Needs

Five goals for the core set of USGS-funded streamgages in NSIP:

- Sentinel Watersheds – Implement a network to describe responses to changes in climate, land use, and water use in 800 watersheds across the country that are relatively unaffected by flow regulation or diversion and typify major ecoregions and river basins;
- Interstate and International Waters – Provide streamflow information to support interstate compacts, court decrees, and international treaties at State-line crossings, compact points, and international boundaries;
- Streamflow Forecasts – Provide real-time stage and discharge data to support flood and streamflow forecasting by the National Weather Service and other Federal agencies across the country;
- River Basin Outflows – Account for the contribution of water from each of the Nation's 350 major river basins to downstream basins, estuaries, oceans or the Great Lakes through the streamgaging network; and
- Water Quality – Provide streamflow information to support national USGS water-quality networks that cover the Nation's largest rivers; intermediate-sized rivers; and small, pristine watersheds.

NSIP Federal-needs streamgages reflect that portion of the USGS national streamgage network funded exclusively by USGS appropriated funds. New program funds in 2010 allowed the Program to provide stability to the network by reestablishing recently-discontinued streamgages and to offset reduced funding from State and local agencies to support operation and maintenance of additional existing streamgages. This NSIP increase provided funds to water science centers for operation and maintenance of threatened streamgages that would have been discontinued because of loss of supporting State and local funds. The USGS streamgage network provides relevant, high-quality information to all users. Data is collected using nationally consistent methods, which enable comparability of data across jurisdictional boundaries and acceptance of results by water management agencies and courts at all levels of Government. Additional information on NSIP is available at *http://water.usgs.gov/nsip*.

Program Performance

This program is comprised of the following nine components:

Federal Network Operations
(2010 Enacted, $17.5 million; 2011 CR, $17.5 million; 2012 Request, $17.1 million)

This program component is dedicated to maintaining and operating a stable, reliable, and continuous nation wide Federal-interest streamgaging network for measuring streamflow and related environmental variables (precipitation, temperature). However, because of level budgets for the last two fiscal years and the NSIP absorbing associated fixed costs, it is assumed that about 50 fewer streamgages will be operated and maintained by the program. This will be in addition to the anticipated partner (other Federal, State and local agencies) reduction in funding due to national economic conditions.

In addition to funding some of the NSIP Federal-goal streamgages, these funds are used to upgrade field equipment to more technically sophisticated equipment in order to provide more

accurate streamflow information; and to flood-harden streamgages that are in harms way of floods but are critical to providing flood forecasts and warnings.

Hydrologic Extremes
(2010 Enacted, $0.2 million; 2011 CR, $0.2 million; 2012 Request, $0.2 million)

This program component is designed to improve understanding of hydrologic extremes (floods and droughts) by more intensive data collection during and immediately following the event and analyses of the collected information.

Regional Streamflow Assessments
(2010 Enacted, $0.6 million; 2011 CR, $0.6 million; 2012 Request, $0.3 million)

This program component provides regional assessments and interpretation of streamflow information to provide estimates of streamflow at ungaged locations and to identify trends in streamflow due to changing land use, water use, and climate change. These regional products directly support the USGS Science Strategy priority of a national water census to inform the public and decision makers about resource availability. As the effects of climate change on water resources are better understood, it is recognized that existing streamflow information must be continually evaluated to identify trends in streamflow. This will enable water resource managers to plan more effectively for future water supplies. Climate change will potentially effect the location, frequency, and severity of floods and droughts. In 2012, methods and technologies will be investigated and developed for future applications.

Real-Time Information Delivery
(2010 Enacted, $2.1 million; 2011 CR, $2.1 million; 2012 Request, $2.4 million)

NSIP develops, implements, and maintains a highly reliable system for real-time streamflow information delivery to customers that includes data processing, quality assurance, storage, and easy data access. The increase is to help ensure that the NWIS database, critical to the success of NSIP, is operated and maintained at peak efficiency and effectiveness.

Development of Methods and Equipment
(2010 Enacted, $1.7 million; 2011 CR, $1.7 million; 2012 Request, $1.7 million)

NSIP funds investigation, development, and implementation of new methodologies and equipment to more accurately, safely, and inexpensively obtain and deliver streamflow information. Recent examples include expanded and enhanced use of acoustic methods to measure river velocity and discharge; use of radar to measure water level directly without instrumentation in the river; and development of statistical methods to transfer flow characteristics from measured locations to ungaged locations.

Program Coordination
(2010 Enacted, $0.6 million; 2011 CR, $0.6 million; 2012 Request, $0.6 million)

Continued success of NSIP is linked to coordination efforts with other USGS programs, outside funding partners, stakeholders, and other interested parties. These efforts are central to developing and implementing short-term and long-term direction of program and the approach to meet program goals.

Technical Support
(2010 Enacted, $3.8 million; 2011 CR, $3.8 million; 2012 Request, $3.4 million)

NSIP provides technical support for geographically distributed USGS water resources studies and data collection activities, including mechanisms for quality control, technology transfer, priority setting, and method and technology standarization. Technical support is necessary for the continued success and benefit of the program.

Integrated Multi-Hazards Demonstration Project
(2010 Enacted, $0.5 million; 2011 CR, $0.5 million; 2012 Request, $0.5 million)

In 2007, the USGS began the integrated Multi-Hazards Assessment and Mitigation Demonstration Project. NSIP continues to focus on southern California and the Gulf of Mexico coastal area. NSIP funding for that effort is used to support streamgages, to provide data used in landslide predictions and tidal surges resulting from storms and in the aftermath of wildfires.

Energy Efficiency and Climate Change Initiative
(2010 Enacted, $0.8 million; 2011 CR, $0.8 million; 2012 Request, $0.8 million)

These funds will be used to implement methods to improve estimates of irrigation and thermoelectric power generation water withdrawals across the Nation and will build on the effort begun in 2010.

Activity: Water Resources
Subactivity: Hydrologic Research and Development

2010 Enacted: $13.8 million (97 FTE)
2011 CR: $13.8 million (97 FTE)
2012 Request: $12.0 million (97 FTE)

Budget Realignment

In 2010 and 2011, Hydrologic Research and Development is a program in the Hydrologic Monitoring, Assessments, and Research subactivity of the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Hydrologic Research and Development (HR&D) program conducts research on complex problems in the hydrologic sciences and supports research and development needs of the other USGS water resource programs as well as other USGS programs. HR&D program investigations integrate hydrological, geological, chemical, climatic, and biological science to address water-resources issues. Efforts of the HR&D program are multidisciplinary and require collaborative relations, both among scientists funded by the program and with scientists in other USGS programs, in Federal and State agencies, universities, and foreign countries.

The long-term goals of HR&D are to improve understanding of:

- Ecological and biogeochemical processes in the hydrologic cycle and the role of natural and human-induced changes on these processes;
- Chemical and biochemical processes affecting chemical constituents in aquatic systems and their effect on aquatic life;
- Physical processes controlling distribution of the Nation's surface-water resources to assist in mitigating effects of floods and droughts;
- Movement, availability, and transport of subsurface water to inform groundwater management decisions;
- Stream-channel morphology and erosional processes governing the source, mobility, and deposition of sediment to improve management of rivers, dams, and reservoirs, and to reduce effects of contaminated sediments; and
- Basic hydrologic processes through research in small watersheds, addressing effects of atmospheric inputs, environmental setting, and climatic variables on streamflow generation, movement of contaminants, and ecosystem needs.

Goals of the HR&D Program directly support the Interior goal and USGS Science Strategy focus on providing scientific information on water availability and quality of the United States as a means to inform the public and decision makers about the status of its freshwater resources and how they are changing. Efforts of HR&D Program scientists also support USGS Science Strategy themes of Climate Variability and Ecosystems through focused research on these issues. The HR&D program is vital to and supports other USGS programs and an array of reimbursable projects funded by partner agencies.

National Research Program in the Hydrologic Sciences

A key component of the HR&D Program is the USGS National Research Program (NRP). NRP scientists often take a lead role in designing and conducting complex projects, bringing advanced scientific thinking and tools to projects. NRP provides expertise essential for making science-based decisions in many areas of the country where large-scale ecosystem studies are underway (Everglades, California Bay-Delta, the Grand Canyon). The NRP also provides expertise in areas related to carbon sequestration, denitrification, detection and effects of man-made chemicals, effectiveness of stream restoration, and hydrologic response to global change, among others.

NRP scientists also provide leadership and scientific services through training courses for the USGS and cooperating agency staff, participating in reviews of USGS programs and water science centers nationwide, and developing new programs.

Goals of the HR&D Program directly support all elements of the USGS Science Strategy. For example:

- Detection of the effects of climate warming on snowmelt in the west and the possible effects of future warming (Climate Variability);
- Production of methods to better determine frequency of extreme floods (Hazards);
- Development of analytical methods to detect hydrocarbons in groundwater (Energy and Minerals);
- Development of applied watershed models to understand and predict streamflow (Water Availability and Use);
- Understanding of mechanisms that allow tree islands to form in the Everglades (Ecosystems and Ecosystem Restoration); and
- Documented effects of human-use compounds on aquatic ecosystems (Human and Wildlife Health).

HR&D Program research has resulted in refinement of existing groundwater and watershed models and development of new modeling techniques to describe uncertainties and forecast changes in the hydrologic cycle. These efforts directly support the USGS WaterSMART Availability and Use Assessment initiative. Research activities described in the program performance section have significantly contributed to understanding of climate change impacts on water supply and our basic understanding of climate variability and change. Research in HR&D is conducted with other USGS programs.

Program Performance

The HR&D program conducts research in collaboration with scientists in other USGS programs and provide training, workshops, reviews, and advice on water resource issues to respond to national, regional, and local needs; provide specialized laboratory services, such as chemical and isotopic analyses and methods to characterize microbes; and develop new geophysical and geochemical techniques and numerical modeling tools. The program includes two components:

Long-term Interdisciplinary Research
(2010 Enacted, $12.6 million; 2011 CR, $12.6 million; 2012 Request, $12.0 million)

Long-term interdisciplinary research funded by the program provides core funding for the NRP, which draws from other USGS programs for about 57 percent of its appropriated funding and also leverages resources from other Federal and State agencies. These linkages ensure research efforts are focused on developing new concepts and future techniques that are relevant to USGS programs, the Department, and the Nation. The NRP focuses on long-term investigations that integrate hydrological, geological, chemical, climatological, and biological information relating to water-resources and environmental problems. Study results provide the scientific basis to enable USGS scientists to address and resolve complex hydrologic problems.

Internal and external reviews evaluate progress in the HR&D program. Plans and accomplishments of each scientific project are reviewed annually. In addition, in-depth reviews of each project and associated personnel are conducted on a three-year cycle to examine the relationship of project work to the USGS mission; productivity, relevance, and scientific impact; and plans and goals for the next five years. Some key outcomes of the program follow.

Coupling land hydrology to Global Climate Models – Research on techniques and methods to link atmospheric climate models to land-surface hydrology and water resources is an ongoing effort. Recent results demonstrated that climate models can be used to analyze historical and project future streamflow trends. These results have helped the Intergovernmental Panel on Climate Change (IPCC) make projections of future changes in water availability. The NRP has a key role in developing applications of climate change science to hydrology by identifying regional areas that will either become wetter or dryer in the future. In addition, the NRP is using some of the latest satellite technology (e.g., GRACE) to gain new insights into macrohydrology, supporting major innovations in modeling tools used for improved projections and impact analyses.

Rate of groundwater recharge to the Desert Southwest – The rate of population growth in the arid and semiarid southwestern United States is roughly three times that of the country as a whole. With limited rainfall and surface water, the region relies heavily on groundwater to meet demands. Sustainability of groundwater resources, including groundwater-fed stream habitats, depends on the balance of groundwater recharge and discharge. Groundwater models developed by the NRP examine the influence of geology, soils, topography, vegetation, and climatic variation on recharge in the arid Southwest.

Human alterations along stream channels and within catchments – Alterations along stream channels and in the floodplain, such as dams, stream channelization, and levee or canal construction, typically reduce ecosystem services of the stream by negatively impacting the natural ecology of floodplains through reductions in suitable habitats, biodiversity, and nutrient cycling. Human alterations typically shift affected streams away from natural dynamic equilibrium where net sediment deposition is in approximate balance with net erosion. Identifying and understanding critical parameters such as stream gradient, grain-size, and hydrography as well as sediment deposition and erosion processes over time and space should facilitate efforts to retain or regain important ecosystem services through effective implementation of watershed management practices and stream restoration.

Carbon Sequestration in Deep Saline Aquifers – Sedimentary basins in general, and deep saline aquifers in particular, are being investigated as possible repositories for large volumes of sequestered CO_2 to mitigate changing climate. To evaluate the potential for long-term storage of CO_2 in these saline aquifers, USGS scientists are leading a research effort to inject 1600 tons of CO_2 into the Frio Formation, a saline regional aquifer along the U.S. Gulf Coast. Results from four shallow monitoring groundwater wells currently show no brine or CO_2 leakage through the Anahuac Formation, the regional cap rock.

Short-term Research
(2010 Enacted, $1.2 million; 2011 CR, $1.2 million; 2012 Request, $0.0 million)

Funding for these short-term research activities is not requested in 2012.

Activity: Water Resources
Subactivity: Hydrologic Networks and Analysis Program

2010 Enacted: $31.4 million (164 FTE)
2011 CR: $31.4 million (164 FTE)
2012 Request: $33.9 million (162 FTE)

Budget Realignment

In 2010 and 2011, Hydrologic Networks and Analysis is a program in the Hydrologic Monitoring, Assessments, and Research subactivity of the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Data on and analysis of the quantity and quality of water in the Nation's streams, lakes, and aquifers are necessary for wise planning, development, utilization, and protection of the Nation's water resources. Federal funds appropriated through the Hydrologic Networks and Analysis (HNA) program support three distinct water-quality networks described below, selected hydrologic analysis and modeling activities, and a small but vital portion of the information delivery activity of the USGS water resources programs.

Water-quality and hydrologic data and analytical information provided by this program are used by a variety of stakeholders, including other Interior Bureaus (for example, NPS Water quality partnership), EPA and USDA (both customers for water-quality information), the National Weather Service (for real-time flood level information provided through NWIS), State and local governments (for both water-quality and flood level information), academia, consulting and advocacy organizations, industry, and private citizens.

Goals of the HNA Program directly support the Interior goal and USGS Science Strategy focus on providing scientific information on water availability and quality of the United States as a means to inform the public and decision makers about the status of its freshwater resources and how they are changing. Efforts of HNA Program also support USGS Science Strategy themes of Climate Variability and Ecosystems through focused research on these issues. The HNA program is vital to and supports other USGS programs and an array of reimbursable projects funded by partner agencies.

Program Performance

Hydrologic Networks and Analysis includes five major components: Hydrologic Networks, Hydrologic Analysis, the WaterSMART Availability and Use Assessment Initiative, Information Delivery, and Technical Support.

Hydrologic Networks
(2010 Enacted, $5.3 million; 2011 CR, $5.3 million; 2012 Request, $5.2 million)

This program component supports long-term national networks to collect data on water quality and acid precipitation including the National Stream Quality Accounting Network, the Hydrologic Benchmark Network, and the National Atmospheric Deposition Program/National Trends

Network. This program component also includes activities related to the new National Water Quality Monitoring Network, a multi-agency effort conducted under the auspices of the Ocean Action Plan. Goals of this program component are to:

- Monitor the chemical quality of rain and snowfall;
- Monitor streamflow and water quality of streams to fulfill USGS obligations for specific river basin compacts and treaties; and
- Monitor water quality and trends of selected major rivers.

Hydrologic Analysis
(2010 Enacted, $11.1 million; 2011 CR, $11.1 million; 2012 Request, $8.8 million)

This program component includes studies of climate variability and change, watershed modeling activities in support of the Bureau of Reclamation, USGS water-quality partnership with the NPS, and support for the USGS National Research Program in the hydrologic sciences. The new USGS WaterSMART Availability and Use Assessment initiative also is included in this program component. The goals of this program component are:

- Provide direct technical support to Interior Bureaus for hydrologic concerns;
- Provide direct technical support to the NPS for water-quality concerns; and
- Develop decision-support systems for specific river basins in the Western United States.

Examples of HNA supported analyses are:

Warming and Water Supply Shortages in the Colorado River Basin – The high demand for water, the recent multiyear drought (1999-2007), and projections of global warming have raised questions about long-term sustainability of water supply in the southwestern United States. Research on potential effects of specific levels of atmospheric warming on water-year streamflow in the Colorado River basin are evaluated using a water-balance model. Results are analyzed in the context of a multi-century tree-ring reconstruction (1490-1998) of streamflow for the basin. Results indicate that if future warming occurs in the basin and is not accompanied by increased precipitation, the basin is likely to experience periods of water supply shortages more severe than those inferred from long-term historical tree-ring reconstruction. Furthermore, model results suggest future warming would increase the likelihood of failure to meet water allocation requirements of the Colorado River Compact.

Potential hydrologic effects of a warmer climate on the upper Yellowstone drainage – Models suggest that average temperatures in the central Rocky Mountains will increase over the next century, while precipitation may remain fairly stable or slightly decrease. Combining future predicted temperatures with slightly reduced precipitation will create numerous multi-decadal periods of stream discharge 85 percent of baseline. Model results show stream discharge during these same multi-decadal droughts declined an additional 16–34 percent under the 2025–2100 temperature regimes. While this water balance scenario exercise does not provide precise forecasts for future conditions, these results suggest a 1°–3°C warming could have major negative impacts on water availability in the upper Yellowstone.

Changes in the Northern Hemisphere snow-covered area – A monthly snow accumulation and melt model was developed for the Northern Hemisphere to generate time series of March snow-covered area (SCA) for the period 1905 through 2002. The time series of estimated

Northern Hemisphere March SCA shows a substantial decrease since about 1970. This decrease corresponds to an increase in mean winter Northern Hemisphere temperature. The increase in winter temperature resulted in a decrease in the fraction of precipitation that occurs as snow and an increase in snowmelt for some parts of the Northern Hemisphere, particularly the mid-latitudes, thus reducing snow packs and March SCA. If Northern Hemisphere winter temperatures continue to warm as they have since the 1970s, then March SCA will likely continue to decrease.

USGS WaterSMART Availability and Use Assessment Initiative
(2010 Enacted, $0.7 million; 2011 CR, $0.7 million; 2012 Request, $6.8 million)

In its early history, U.S. water management focused on alleviating or controlling impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. Today the Nation is faced with a new set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortages and water-use conflicts have become more commonplace in many areas of the United States—even in average water years. Impacts of climate change, energy development, rural and urban land use, and other increased human use on water resources quality and availability exacerbate the need for information and tools to aid water resource managers.

This need was recognized by passage of the Omnibus Public Land Management Act of 2009 (P.L. 111-11) that called for a National Water Availability and Use Assessment to provide information on water availability and human and ecological use through a comprehensive and coordinated approach. The USGS Science Strategy identifies a Water Census of the United States as one of six USGS science priorities, and the Water Resources activity is positioned through its Hydrologic Networks and Analysis Program to provide scientific underpinnings for a coordinated assessment of water availability and use. The basic structure of this effort will include:

- Estimating freshwater resources and how those supplies are distributed and whether they are increasing or decreasing over time;
- Evaluating factors affecting water availability including energy development, changes in agricultural practices, increasing population, and competing priorities for limited water resources;
- Assessing water use and distribution for human, environmental, and wildlife needs;
- Providing data and information to forecast likely outcomes of water availability, quality, and aquatic ecosystem health due to changes in land use and cover, natural and engineered infrastructure, water use, and climate; and
- Assisting State water resource agencies through a grant program to integrate State water use and availability datasets with Federal databases for a more comprehensive assessment of water availability.

Information Delivery
(2010 Enacted, $4.7 million; 2011 CR, $4.7 million; 2012 Request, $5.1 million)

This program component includes delivery of results and water information beyond immediate needs of funding agencies or programs (the USGS funds delivery of basic hydrologic data directly as a part of the overall cost of the data collection). This activity has two products: publications and the computer-based NWIS. This component of the HNA program also supports activities of ACWI, a Presidential Federal Advisory Committee, and its subcommittees. This program component goal is to maintain and enhance USGS data delivery systems to process and freely disseminate water data and study results to all users.

Technical Support
(2010 Enacted, $9.7 million; 2011 CR, $9.7 million; 2012 Request, $8.0 million)

This program component includes national technical support for geographically distributed USGS water-resources studies, including quality control, to ensure technical excellence and national consistency of water resources programs. Technical support also provides a structured way of transferring new technology to USGS investigative and data activities conducted in the USGS water science centers located in each State and a formal way of establishing priorities for water-resources research by the USGS. In addition, this program component supports various Bureau-level activities such as CALFED science coordination.

Activity: Water Resources
Subactivity: Cooperative Water Program

2010 Enacted: $65.6 million (666 FTE)
2011 CR: $65.6 million (666 FTE)
2012 Request: $62.3 million (646 FTE)

Budget Realignment

In 2010 and 2011, the Cooperative Water Program is a program in the Water Resources activity. In 2012, the program is proposed to move to a subactivity in the Water Resources mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

For more than 100 years, the Cooperative Water Program (CWP) has been a highly successful cost-sharing partnership between the USGS and States, local governments, and Tribes. This partnership provides support for the USGS national hydrologic data network, including approximately 4,700 streamgages, 10,000 groundwater observation wells, and 2,500 water-quality monitoring sites.

The CWP:

- Combines Federal and non-Federal resources to address many of the Nation's most pressing water resource issues, resulting in shared benefits and cost savings;
- Supports hydrologic studies in all 50 States, Puerto Rico, and the U.S. Trust Territories, providing the USGS with a national perspective on important water resources issues;
- Uses standardized methods of data collection and analysis across the United States, enabling hydrologic information to be aggregated into nationally consistent databases of known data quality; study results are comparable from one State to another; and
- Helps resolve inter-jurisdictional disputes by assessing conditions at and across State and basin boundaries and by assuring all parties the data and results of investigations are objective and are equally available to all parties.

In addition to providing information responsive to State and local needs, the CWP provides information that supports activities of many Federal agencies, including:

- Forecasting floods;
- Managing surface-water supplies;
- Monitoring hydroelectric power demand;
- Setting waste disposal limitations;
- Regulating industrial discharges;
- Designing highway structures;
- Measuring downstream transport of pollutants or nutrients;
- Determining total maximum daily loads;

- Evaluating mine permits;
- Evaluating fish habitat;
- Quantifying Federal reserved water rights;
- Quantifying Indian water rights; and
- Managing interstate compacts and Indian water rights settlements.

Goals of the CWP directly support the USGS Science Strategy and the Interior goal to provide scientific information on the status and changes in availability and quality of the water resources of the United States to the public and decision makers. Data and information from the CWP also support all the other USGS Science Strategy themes. For example, CWP studies in the Everglades are providing information required for water management to restore the system (Ecosystems); flood data and studies are a key element of CWP activities throughout the Nation (Hazards); investigations of produced water are providing important information for gas shale development (Energy); research on changes in streamflow patterns and trends by CWP scientists is providing information on effects of climate variability on water resources (Climate Variability); and CWP research on effects of man-made compounds in wastewater have had a revolutionary effect on our understanding of water quality (Wildlife and Human Health).

This program effectively leverages Federal appropriations, working with State, local, municipal, and tribal officials to develop a program that responds to both local and national needs and attracts more than two non-Federal dollars for each Federal dollar appropriated. This program of shared costs and shared benefits provides a foundation for the USGS national hydrologic networks that gives the USGS the ability to conduct regional and national water resource assessments. Due to the possibility of reduced cooperator funding, there may be a decrease in the hydrologic program and FTE supported by the CWP in 2012.

Program Performance

Topical areas of focus in 2012 align with the USGS Science Strategy and include the following:

Water Availability – In 2012, the CWP will support thousands of streamgages and groundwater observation wells that define availability of surface and groundwater and will conduct hydrologic investigations needed to evaluate quantity and use of available surface and groundwater. These data and investigations will serve as a foundation upon which the proposed USGS WaterSMART Availability and Use Assessment initiative will be built.

Drinking Water – With many partners, the USGS is developing understanding of natural and human factors that affect groundwater quality, providing early indications of potential water-quality problems, and contributing to long-term management and protection of groundwater resources affecting one in eight Americans.

Ecosystem Services – Through the CWP, the USGS is working with State and local agencies to evaluate instream flow requirements of aquatic ecosystems, which addresses a key issue of water availability for environmental and wildlife needs. This effort entails development of both new information and new techniques.

Hydrologic Hazards – Real-time streamflow information from streamgages funded through the CWP is used by the NWS to provide flood forecasts to local communities. Local emergency

responders use this same information in evacuating at-risk populations from flooded areas. In addition, flood-frequency analyses conducted as a part of the CWP interpretive studies serve as the foundation for design of flood control structures and delineation of flood prone areas, an essential component of the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program.

Program accomplishments in 2010 include:

Flood Response – During flooding, USGS streamgages provide critically important real-time hydrologic information needed to assess current conditions and to develop flood forecasts upon which evacuation and other flood response measures are based.

Resource Assessments – Approximately 230 new water resource assessments were completed. These assessments, conducted across the country, advance understanding of the Nation's water resources and provide local and regional water resource managers with scientific information needed to manage and sustain those water resources.

The CWP includes three major components:

Data Collection Activities
(2010 Enacted, $35.6 million; 2011 CR, $35.6 million; 2012 Request, $35.6 million)

Over the past few years, the CWP has provided sole Federal support or partial support for over half the sites where the USGS collects data on surface-water levels and flow, groundwater levels, and groundwater quality. The CWP supports data collection of surface-water quality needed for State compliance with requirements of the Clean Water Act and collection of streamflow data important to water supply planners to identify the influence of climate variability and change on water availability.

These data provide resource managers with information they need to determine suitability of water for various uses, identify trends in water quantity and quality, and evaluate effects of various stresses on the Nation's groundwater and surface-water resources. Data collected at USGS monitoring sites are provided free of charge to everyone on the Internet. This includes historical data as well as real-time data. The real-time data are routinely used by emergency management agencies, State and municipal agencies, businesses, irrigators, and recreational users.

Most USGS data collection stations serve multiple purposes and many are funded, wholly or in part, through joint-funding agreements with one or more partners. Normally, these stations, though funded by various organizations, are operated as part of an integrated network that provides benefits to a broad community of users and comprise the majority of the USGS national hydrologic data network.

Interpretive Studies
(2010 Enacted, $23.7 million; 2011 CR, $23.7 million; 2012 Request, $22.4 million)

In addition to data collection activities, the CWP supports about 700 hydrologic studies each year. Water resource studies define, characterize, and evaluate the extent, quality, and availability of water resources. Results of these investigations are published and provided to cooperating agencies that use them as the basis for managing water resources for which they are responsible. Also, these investigations provide information that is synthesized and applied

to a variety of hydrogeologic and climatic settings across the Nation, greatly expanding the usefulness and transferability of USGS study results nationwide.

Technical Support
(2010 Enacted, $6.3 million; 2011 CR, $6.3 million; 2012 Request, $4.3 million)

The USGS has a long tradition of providing national and regional technical support for its geographically distributed water resources studies. This support provides quality control to ensure technical excellence of water resources field programs and assures data collected by water science centers in each State are of equivalent quality and suitable for inclusion in USGS national hydrologic data bases. Technical support also provides a structured way of transferring new technology to USGS investigative and data activities in each State and provides a mechanism to make unbiased, high-quality, peer-reviewed water resources information available to other agencies, the scientific community, and the public.

Activity: Water Resources
Subactivity: Water Resources Research Act Program

2010 Enacted: $6.5 million (2 FTE)
2011 CR: $6.5 million (2 FTE)
2012 Request: $0.0 million (0 FTE)

Budget Realignment

In 2010 and 2011, the Water Resources Research Act Program is a program in the Water Resources activity. In 2012, the program is proposed to be eliminated. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Water Resources Research Act (WRRA) of 1984 established a Federal-State partnership in water resources research, education, and information transfer through a matching grant program that authorizes State Water Resources Research Institutes at land grant universities across the Nation. There are 54 Institutes: one in each State, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam. The Guam institute also serves the Federated States of Micronesia and the Commonwealth of the Northern Mariana Islands.

The Institutes provide new opportunities for young people through research and education efforts. Student internships supported by the Institutes provide invaluable and practical training experience for the next generation of hydrologic scientists and engineers and afford students the opportunity to participate in USGS projects while encouraging them to pursue careers in water resources.

The Water Resources Research Act Program provides an institutional mechanism for promoting State, regional, and national coordination of water resources research, training and coordination and information and technology transfer. In 2009, the program provided training and support to more than 500 undergraduate and graduate students by involving them in institute-sponsored research activities. With its matching requirements, the program is also a key mechanism for promoting State investments in research and training. In fact, the Institutes have developed a constituency and a program that far exceeds that supported by their direct Federal appropriation. According to results of a survey conducted by the National Institutes for Water Resources in 2007, the Institutes collectively generated an additional $17.0 million in support for each dollar appropriated to them under the USGS program, with $8.0 million coming from other Federal sources and $9.0 million coming from non-Federal sources.

Program Performance

Though the program contributes to the Interior goal and USGS Science Strategy focus of providing scientific information on water availability and quality of the U.S., there are no performance measures specifically linked to this program change. The proposed budget reduction would eliminate funding for this program. No further grants would be issued to the State Water Resources Research Institutes. These grants annually support training for more than 600 students and production of 1,000 publications annually.

This page intentionally left blank.

Activity: Core Science Systems

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Biological Information Management and		24,946	24,946	-385	-520	-8,928	15,113	-9,833
Delivery ($000)	*FTE*	*78*	*78*	*-2*		*-26*	*50*	*-28*
National Geological and Geophysical Data		1,000	1,000	0	0	-1,000	0	-1,000
Preservation Program ($000)	*FTE*	*3*	*3*	*0*		*-3*	*0*	*-3*
National Cooperative Geologic Mapping		28,163	28,163	-292	-474	-2,000	25,397	-2,766
Program ($000)	*FTE*	*133*	*133*	*-1*		*-3*	*129*	*-4*
National Geospatial Program ($000)		70,748	70,748	-860	-1,823	-2,700	65,365	-5,383
	FTE	*338*	*338*	*-3*		*-1*	*334*	*-4*
Total Requirements ($000)		**124,857**	**124,857**	**-1,537**	**-2,817**	**-14,628**	**105,875**	**-18,982**
Total FTE		***552***	***552***	***-6***		***-33***	***513***	***-39***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Change

Request Component	($000)	FTE
• Unrequested Congressional Action	-1,628	0
• WaterSMART (NCGMP)	+500	0
• *The National Map* Partnerships (NGP).	-3,500	-4
• State Conservation Data Agencies (BIMD)	-572	0
• National Biological Information Infrastructure (BIMD)	-6,728	-26
• National Geological and Geophysical Data Preservation (NGGDPP)	-1,000	-3
• National Cooperative Geologic Mapping Federal and State Partnerships (NCGMP)	-2,500	-3
• Ecosystem Restoration	+800	+3
o Columbia River (NGP)	[+500]	[+2]
o Puget Sound (NGP)	[+300]	[+1]
TOTAL Program Changes	**-14,628**	**-33**

Justification Program Changes

The 2012 Budget Request for Core Science Systems is $105,875,000 and 513 FTE, a net program change of -$14,628,000 and -33 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Program Change

Unrequested Congressional Action **(-$1,628,000/0 FTE)**

The budget request eliminates unrequested congressional funding from the 2010 enacted appropriation. A list of these actions is located in the Budget at a Glance Section.

WaterSMART Program **(+$500,000/+0 FTE)**

21st Century Water Challenge – Water is essential to the economic security of individual communities across the United States and also to the economic vitality of our Nation as a whole. An assessment of the availability and use of water resources in the United States was last completed in 1978. Much has changed in the U.S. since 1978 and the time has come to establish a program that will address the need for a new and ongoing assessment of our water resources.

In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. The U.S. water resources, infrastructure, and technologies became the envy of the world.

Today we are faced with a new set of water resource challenges. Aging infrastructure, rapid population growth, depletion of groundwater resources, impaired water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change all play a role in determining the amount of fresh water available at any given place and time. Water shortage and water-use conflict have become more commonplace in many areas of the United States—even in normal water years. As competition for water resources grows—for irrigation of crops, for growing cities and communities, for energy production, and for the environment—the need for information and tools to aid water resource managers also grows.

With increased funds, the National Cooperative Geologic Mapping program would provide information on the geohydrologic framework of aquifer systems.

The *National Map* Partnerships **(-$3,500,000/-4 FTE)**

For 2012, the USGS proposes to reduce the funding for the Partnership Implementation component by $3.5 million which is currently funded at $13.9 million. The proposed reduction eliminates all funds used to specifically leverage with Federal, State and local agencies to acquire new data.

The proposed decrease would eliminate liaison positions responsible for partnerships in 13 States. These positions organize the agreements through which the USGS leverages its resources with those State and local cooperators. They routinely provide coordination among Federal geospatial resources and those of State and local governments. Beyond these immediate outcomes, the reduction would result in reduced work for America's geospatial industry, which benefits by fulfilling contracts for projects that result from agreements the NGP makes with its cooperators.

State Conservation Data Agencies **(-$572,000/0 FTE)**

In this activity, the USGS works with coordinators of the network of State conservation data agencies to improve access to State-based conservation-related data and information. In 2012, the USGS proposes to eliminate remaining funds that support coordinators of the network of State conservation data agencies, including Association of Fish and Wildlife Agencies, NatureServe, and State agencies or other organizations involved in managing and providing public access to State-based conservation related data and information. Efforts may continue at the State level, but the information may not be publically available.

National Biological Information Infrastructure **(-$6,728,000/-26 FTE)**

The National Biological Information Infrastructure (NBII) provides the Nation with a mechanism for accessing the vast amount of existing biological and natural resources data, information products, and analytical tools that support and enhance science-based decision-making. The USGS proposes to reduce the NBII by terminating all NBII projects, eliminating all content-building activities such as adding new data, information, and tools, and would diminish efforts to maintain the NBII infrastructure.

National Geological and Geophysical Data Preservation **(-$1,000,000/-3 FTE)**

This program is the only Federal program dedicated to preserving physical and analog geoscience data including rock and ice cores, fossils, fluid samples of oil, gas, and water, and geochemical samples representing potentially beneficial or harmful chemical compounds in the rocks, and derived analog data including reports documenting results of activities to collect and analyze the physical data, and cooperates with State geological surveys and other Interior Bureaus. The USGS proposes to eliminate the National Geological and Geophysical Data Preservation Program. While the database would continue to exist, it would no longer be maintained and access to it would be restricted.

National Cooperative Geologic Mapping
Federal and State Partnerships **(-$2,500,000/-3 FTE)**

This program provides accurate geologic maps and three-dimensional framework models that help to sustain and improve the quality of life and economic vitality of the Nation and to mitigate natural hazards. The USGS proposes to reduce funding in the NCGMP using the formula provided in the National Geologic Mapping Act. This reduction would prevent expansion of geologic mapping and modeling in support of WaterSMART and geologic mapping projects in southern California would end. The NCGMP would continue to provide geologic maps of subsurface data important for developing models that conceptualize ground water flow, mineral deposition, and earthquake shaking but at a reduced level. Documenting landscape change for evaluating geologic hazards such as flash floods, dust storms, and drought would continue in 2012.

Ecosystem Restoration **(+$800,000/+3 FTE)**

America's Great Outdoors is the President's signature conservation initiative and Interior plays a leading role in its development and implementation. The goal is to protect and restore the health, heritage, natural resources, and social and economic value of some of the Nation's most

significant ecosystems. This Ecosystem Restoration initiative will help the President advance his America's Great Outdoors initiative. Listed below are the ecosystems targeted by this effort. A description of the work proposed can be found in the Ecosystems Restoration initiative in the Key Changes Section.

- Columbia River +$500,000/+2 FTE
- Puget Sound +$300,000/ +1 FTE

Activity Summary

By providing both big picture and specific local information, USGS Earth observation and geographic information meet an array of needs for knowledge about the landscape from tracking changes in land use and human development, to documenting devastation caused by storms and wildfires. Core Science Systems (CSS) delivers national-focused Earth-system-science and informatics programs that provide fundamental research and data, underpinning all mission areas of the USGS and the USGS Science Strategy. CSS uses its information resources to create a more integrated and accessible environment for USGS resources of past and future data. CSS participates in efforts to build global integrated science and computing platforms. Subactivities included in this activity are:

- Biological Information Management and Delivery (BIMD);
- National Geological and Geophysical Data Preservation Program (NGGDPP);
- National Cooperative Geologic Mapping Program (NCGMP); and
- National Geospatial Program (NGP).

Natural events (volcanic eruptions, earthquakes, wildland fires, floods, droughts, variable and changing climate, environmental impacts from manmade toxins, invasive species, and animal-borne diseases) all affect humans and pose significant risks to society. In addition, using and competing for natural resources on the global scale has the potential to impact the Nation's ability to sustain its economy, national security, quality of life, and natural environment. Understanding health, natural resource, and hazard risks, better defining their probabilities, and forecasting their effect on the status and future of society are essential for a resilient and prosperous United States. The Nation needs ready access to natural science information for decision makers associated with these risks. As the Nation's leading natural science and information Agency, the USGS is well positioned to accept the challenge of providing integrated information. The programs in this activity contribute to achieving Interior's goal to develop a comprehensive science framework to understand the Earth.

National decision makers and scientists within and outside the USGS require enhanced access to decades of observational data and analysis. The key to advancing new discoveries of the Earth's complex systems and processes, as well as making decisions regarding potential risks, lies in rigorous analysis of system interconnections and feedbacks. Central to identification and evaluation of these connections is accessibility of data and information across multiple scientific disciplines, geographic, temporal, and political boundaries. Data integration within the USGS is a prerequisite for joining international efforts to develop world wide science collaboration and a computing platform that can address future challenges.

Data are only useful if well-documented through metadata and are available in a format that is understandable and accessible. The USGS has made great strides in comprehension and

standardization of data. The National Geospatial Program (NGP) provides geospatial data and maps in industry-standard data formats and Web services, which allows these products and services to be readily incorporated and used by Government and industry. For example, several Federal and many State natural resource and environmental agencies map their water quality and quantity data using hydrography data from *The National Map*.

Not only is the USGS releasing its own data in more usable and accessible ways, but also aggregating data from various sources for more robust and meaningful data analysis and modeling development. The USGS works in cooperation with many organizations across the country to provide critical data and information to partners, stakeholders, customers, and the general public. Through electronic infrastructures overlaid with data management standards, the USGS delivers relevant data and information faster and in more usable formats than in the past, leading to better stewardship of our natural resources.

The National Cooperative Geologic Mapping Program, a Nation wide program of surficial and bedrock geologic mapping, provides fundamental research and data that underpin all of the themes of the USGS Science Strategy. These primary data are applied in natural hazards mitigation, water resources delineation, energy and minerals exploration, climate change studies, and ecosystem and environmental health analysis, and are readily accessible via the National Geologic Mapping Database (NGMD). In 2009, the reauthorized National Geologic Mapping Act reaffirmed the mandate of the NGMD to develop geologic map standards and to build a national catalog and archive of Federal and State geoscience maps and reports.

These are just a few examples of how the USGS is aggregating and making data available to the public. In the future, the USGS will work toward making even more data and tools available to a larger segment of users.

Management Summary

Workforce Planning – Prior to the USGS organizational realignment, the NGP was part of the Geography discipline. The program continues to change the skill mix of Government employees and uses contracts strategically. Management actions include offering a competitively-awarded career development program opportunity to existing employees, hiring new employees with new and current skills, and awarding flexible contract vehicles. In 2011, the National Geospatial Technical Operations Center is working with the USGS human resources office and academic colleagues to implement an efficient, effective way to recruit the next generation of geospatial professionals. Student appointments provide a ready source of candidates to the organization. The Voluntary Separation Incentives Program and Voluntary Early Retirement Authority will lapse in March 2011.

Prior to the USGS realignment, BIMD was part of the Biology Research discipline. BIMD will continue a close association with the Ecosystems mission area and will also work with all mission areas.

Program Reviews – The Federal Advisory Committee for the National Cooperative Geologic Mapping Program, and the National Geological and Geophysical Data Preservation Program conducts an annual review of the programs. In response to the most recent committee recommendations, the USGS is increasing cooperative research among Federal, State, and academic organizations across the country, working to increase numbers and diversity of students entering geoscience education, engaging a broad stakeholder base in development of

mid-range program plans, strengthening data preservation efforts, and enhancing outreach and program visibility.

The NGP anticipates the National Academy of Sciences will deliver their report *Spatial Data Enabling USGS Strategic Science in the 21st Century* during the spring of 2011. Recommendations from this report will guide NGP efforts to provide better integration of geospatial activities with the USGS science strategy. To keep abreast of customers' changing needs for detailed elevation data, the NGP and Land Remote Sensing program are jointly sponsoring a study of emerging needs by Federal and State agencies and other stakeholders for enhanced elevation data products and services.

Strategic Planning – The USGS has chartered Science Strategy Planning Teams charged with developing long-term (ten year) strategic plans for each of the mission areas of the USGS Science Strategy and the programs that support it. To develop the plans, the SSPT will review the current projects across the Bureau and inventory the science needs of other Interior Bureaus and partners. The plans will identify core competencies, noting critical capabilities and strengths the USGS uses to overcome key problem areas. The strategic plan will provide the vision and priorities necessary to assist national and regional leadership with development of guidance, implementation planning and accountability reporting to ensure that USGS meets the goals of the USGS Science Strategy.

The NGP will publish its 2011-2015 five-year strategic plan in 2011. Broadly, the plan describes the program vision to satisfy needs of customers both inside and outside Interior by providing geospatial services and products that customers incorporate into their decision making and operational activities. These products and services are from geospatial data organized and maintained in ways that minimize life-cycle costs. Data are developed by working with organizations whose outcomes and schedules align with those of the NGP. The plan aligns the program with the strategy to advance the Earth science application of geospatial information in the DOI Strategic Plan.

BIMD is updating its five year plan, which will update goals, reflect the USGS realignment, and synchronize goals with Interior's strategic plan.

Core Science Systems Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Biological Information Management and Delivery							
% of online natural resource products available via National Biological Information Infrastructure whose utility is validated through user interactions and downloads (SP)							
Performance Data	20.52%	21.34%	21.50%	19.00%	6.20%	-12.80%	-2.20%
Total Actual/Projected Cost ($000)	16,872	16,738	16,498	16,000	9,000	-7,000	0
% of focal migratory bird populations for which species pages are available through the NBII							
Performance Data	15.0%	22.0%	29.0%	33.0%	33.0%	0.0%	0.0%
% of US land with land characterization and species distribution information available for resource management decision making updated in the last 5 years							
Performance Data	37%	77%	88%	91%	95%	+4%	0%
# of records in the NBII Metadata Clearinghouse available to document biological data sets and information products							
Performance Data	41,000	43,366	90,732	92,000	92,000	0	0
Total Actual/Projected Cost ($000)	580	572	570	570	570	0	0
Actual/Projected Cost Per metadata record (whole dollars)	14	13	8	8	8	0	0
# of formal workshops or training provided to customers							
Performance Data	20	20	8	8	8	0	0
National Geological and Geophysical Data Preservation Program							
# of metadata records							
Performance Data	N/A	600,000	1,052,038	600,000	0	-600,000	0
Comments	The USGS 2012 budget proposes to eliminate funding for the National Geological and Geophysical Data Preservation Program.						
National Cooperative Geologic Mapping							
% of the U.S. that is covered by at least one geologic map and is available to the public through the National Geologic Map Data Base (SP)							
Performance Data	48% (1,687,637/ 3,537,438.44)	49% (1,729,771/ 3,537,438.44)	49.4% (1,746,550/ 3,537,438)	50.4% (1,782,868/ 3,537,438.44)	51.3% (1,814,705/ 3,537,438.44)	+0.9%	+3.6%
Annual production of geologic maps for the Nation (summed and represented as a % of US land area) made available to the public through the National Geologic Map Data Base							
Performance Data	4.2%	2.9%	2.7%	2.0%	1.8%	-0.2%	0.0%
Total Actual/Projected Cost ($000)	26,045	27,112	27,495	27,495	24,822	-2,673	0
Actual/Projected Cost Per geologic map (whole dollars)	177	264	389	389	386	-3	0

Core Science Systems Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
National Geospatial Program							
% of the area of 48 States and DC published as high-resolution base geospatial databases and topographic map images that depict current geospatial information (SP)							
Performance Data	N/A	26.2% (13,203/50,414)	63.5% (32,013/50,414)	100% (50,414/50,414)	33.3% (17,895/53,684)	+33.3%	0.0%
Total Actual/Projected Cost ($000)	N/A	52,328	56,758	54,200	53,100	-1,100	0
Comments	USGS anticipates reaching 100 percent every third year, and then resetting the target to zero for the next three-year cycle.						

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

Activity: Core Science Systems
Subactivity: Biological Information Management and Delivery

2010 Enacted: $24.9 million (78 FTE)
2011 CR: $24.9 million (78 FTE)
2012 Request: $15.1 million (50 FTE)

Budget Realignment

In 2010 and 2011, Biological Information Management and Delivery (BIMD) is a subactivity of the Biological Resources activity. In 2012, this is proposed to move to a subactivity in the Core Science System mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

BIMD's mission is to create an informatics framework, provide access to scientific content (data, information and tools) from scientifically reliable sources, and develop public and private partnerships needed for understanding and managing our Nation's biological resources. BIMD provides access to data and information, particularly as they pertain to conservation, management, and use of the Nation's natural resources. In addition, the program develops and makes available tools, models, visualizations, and applications to support analysis and synthesis of scientific data by research scientists to ensure that such analyses, syntheses, best practices and management plans are available to resource managers, and to inform policy and decision makers by providing the science on which to base decisions.

The USGS makes biological data and information accessible and useable. The USGS's performance in this area is reflected in availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making.

The program works collaboratively with others to ensure USGS scientists, Interior resource managers and others have consistent, one-stop access to high quality data and information that can be used to address resource management issues. To that end, the program engages USGS science centers and other USGS programs, other Federal agencies, non-governmental organizations, museums, universities, international organizations, and other partners in the creation of data content and resources to address resource management needs.

There are four interdependent components of this program specifically designed to integrate information across geographic and political scales (local to global) and biological levels of organization (genomes to biomes). These components are:

- Gap Analysis Program (GAP);
- Vegetation Characterization Program (VCP);
- Integrated Taxonomic Information System (ITIS); and
- NBII.

In addition, BIMD provides funding and support to USGS science centers for information technology and information management activities.

Program Performance

This program is composed of the following six components:

Gap Analysis Program
(2010 Enacted, $5.0 million; 2011 CR, $5.0 million; 2012 Request, $5.0 million)

As the only Federal program that provides a national assessment of biodiversity, GAP assists resource managers in keeping common species common by identifying those species and plant communities that are not adequately represented in existing conservation lands. Those species not adequately represented constitute conservation "gaps." Common species are those not currently threatened with extinction. GAP's mission is to provide regional assessments of the conservation status of native vertebrate species and natural land cover types and to facilitate application of this information to land management activities.

GAP produces and maintains current (less than five years old), high-quality datasets on the status of species and their habitats and identifies the degree to which native animal and plant species are represented in the present-day mix on conservation lands. The most recent data are available through an interactive map viewer and provide the most detailed land cover map of the entire United States in a seamless format. Currently, many of the GAP data-sets are available Nation wide. These products include digital databases describing State or region wide land cover assemblages; distributions of mammals, birds, reptiles, and amphibians; and characterizations of land stewardship. The current emphasis is to complete national scale data, building on its extensive archive of data resources, so assessments can be made for the United States. This capability, only recently attained as many national datasets have come online, has made GAP an integral part of other national efforts, such as the U.S. Environmental Protection Agency (EPA) initiative to create an Atlas of Ecosystem Services for the Nation.

First Detailed National Map of Land Cover Vegetation Released – The most detailed national vegetation U.S. land cover map was recently released by the USGS GAP. The map will enable conservation professionals to identify places in the country with sufficient habitat to support wildlife. The map can be viewed online (*www.gap.uidaho.edu*) and downloaded at no cost.

These data are important to determine the status of biodiversity, as baseline data for assessing climate change impacts, and for predicting availability of habitat for wildlife. Large datasets of this type are extremely important to land and wildlife managers because they facilitate analysis and planning across extensive geographic areas. Creation and dissemination of the national land cover dataset and online map viewer advances that goal by putting crucial information into the hands of conservation professionals. Information about land cover is a key component of effective conservation planning and management of biological diversity. The map also meets natural resources agencies' need for a way to characterize land cover.

The GAP national land cover data, based on the Nature Serve Ecological Systems Classification, is the most detailed, consistent map of vegetative associations available for the United States. The final version of the land cover map contains 551 Ecological Systems and modified Ecological Systems (the modified ecological systems represent 32 land use classes

that depict developed or disturbed land cover classes). The map combines data from previous GAP projects in the Southwest, Southeast, and Northwest United States with recently updated California data. For areas of the continental United States where ecological system-level GAP data have not yet been developed, data from the LANDFIRE (*www.landfire.gov*) project compiled by Landscope (*www.landscope.org*) was used. This allows construction of a seamless representation of ecological system distributions across the continental United States.

The online map-viewing interface is designed so users can explore land cover data at three levels of complexity. Level 1 contains eight classes: grassland, shrubland, forest, aquatic, sparse and barren, recently disturbed, riparian, and human land use. Level 2 contains 43 classes and incorporates information on elevation and climate. Level 3 contains 583 classes. This online tool facilitates exploration of ecological system distribution patterns at multiple scales and allows users to calculate statistics on types of vegetation occurring within a mapping zone, a State, or a county.

In 2011, BIMD is updating the land cover data, used to create this map, and will continue to update it in 2012 to reflect newer data and data from other sources as it becomes available.

Vegetation Characterization
(2010 Enacted, $0.8 million; 2011 CR, $0.8 million; 2012 Request, $0.8 million)

The goal of the VCP is to meet specific information needs identified by the National Park Service (NPS) with additional cooperative projects for the U.S. Fish and Wildlife Service (FWS) at Ouray and Lacreek National Wildlife refuges. Information for both refuges, as well as the Bureau of Land Management (BLM) at Gunnison Gorge National Conservation Area, are now served on the Web site.

The VCP activities are based on peer-reviewed, objective science. Comprehensive vegetation information is provided at national and regional levels, while also serving local management needs of individual parks. Stringent quality control procedures ensure products are accurate and consistent for initial inventory purposes and replicable for monitoring purposes. Spatially enabled digital products produced by the program are available on the World Wide Web. USGS scientists collaborate with the NPS on protocol design and implementation that allows integration of data analyses and field data collection (e.g., a monitoring protocol that meets both invasive inventory requirements and fire fuel monitoring needs).

Products support monitoring efforts such as planning and designing monitoring protocols, performing statistical data analyses, and achieving efficiencies such as dovetailing protocols for invasive species inventory and fire fuels related to vegetation to ensure integrated field data collection protocols.

Activities performed under this component include a suite of products for each assessed unit, and work to develop and implement the National Vegetation Classification Standard.

Integrated Taxonomic Information System
(2010 Enacted, $0.7 million; 2011 CR, $0.7 million; 2012 Request, $0.7 million)

With more than 600,000 entries, the ITIS is the premier automated and authoritative source for scientific names of species for North America and the World. Coordinated by the USGS, ITIS has become the accepted taxonomic authority in the United States, Mexico, and Canada and, with its European partner, Species2000, has produced the recognized world's authority in the

Catalogue of Life Annual Checklist, which now includes 1.3 million species names. ITIS contributes more than 40 global species database sectors to the checklist.

The USGS is completing the update of all plants in North America, comprising more than 120,000 scientific names and several thousand more associated vernacular names. This update includes all grasses in South and Central America and includes many of the world's most important weeds, crops, and biomass producers. Other notable additions to the database this year included all butterflies of North America as well as several other groups of insects that are important as pollinators, pests, and rare species.

ITIS now has taxonomic information for most of the world's vertebrates (mammals, fishes, amphibians, birds) and several reptile and invertebrate groups, including 20,000 species of bees. The *World Bee Checklist* is an important contribution that BIMD has made to pollinator informatics. Web services implemented last year to make data machine accessible to other databases have been gaining popularity. ITIS also continued a program to ensure species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora are adequately referenced and incorporated in the database. In concert with this effort, the U.S. Fish and Wildlife Service signed the ITIS Memorandum of Understanding as a full partner in March 2010.

National Biological Information Infrastructure
(2010 Enacted, $5.8 million; 2011 CR, $5.8 million; 2012 Request, $0.0 million)

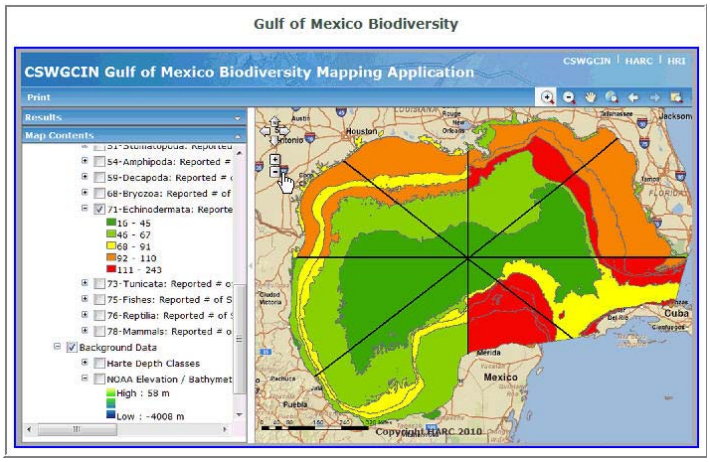
The NBII is an electronic library of biological data, information, and associated tools and technologies accessible for customers and partners to make informed decisions regarding resource management, environmental considerations, disease vectors, control of invasive species, and other issues. The USGS works with numerous public and private partners in NBII implementation to jointly determine standards, content priorities and focus, execute projects to improve access to critical data and information, and develop new tools and models. BIMD manages these activities and maintains the technological infrastructure that ties them all together.

NBII focuses activities both regionally and thematically. Regional focus areas provide services within a particular geographic area of the country. Within a region, activities address broad biological themes and issues that are high priority to stakeholders in that region. Currently, NBII has eight regional focus areas. BIMD managers coordinate and integrate activities, products and services to leverage work on a National scale.

Thematic focus areas of NBII coordinate data and information activities nationally within the scope of their assigned scientific themes. In doing so, they both initiate data gathering activities and coordinate relevant local datasets from the regions. They also place a high priority on developing tools that allow users to interact with data from diverse sources. NBII has four major thematic focus areas: invasive species; wildlife disease; bird conservation; and fisheries and aquatic resources. In addition, NBII supports high-profile projects, such as pollinator decline, climate change, and the impact of habitat change on threatened species such as sage grouse.

In 2012, the USGS proposes to terminate all NBII projects, eliminating all content building activities such as adding new data, information, and tools.

Gulf Coast Marine Biodiversity: NBII Central Southwest Gulf Coast Information Node (CSWGCIN) Gulf of Mexico Biodiversity Portal and Mapping Application – To create this portal, the USGS partnered with The Harte Research Institute for Gulf of Mexico Studies (HRI) to produce a Gulf wide interactive mapping application displaying information on benthos, plankton, pelagic organisms, and other marine life groups.



This application provides digital data representing the work of 140 taxonomists from 80 institutions in 15 countries, and provides an interactive mapping application displaying distribution for a variety of phyla, classes, and orders in the Gulf of Mexico. The Gulf of Mexico Biodiversity mapping application and portal does not represent all Gulf species, but focuses on species important to the food web with corresponding occurrence data. The mapping application allows users to search for species information by depth and by Gulf of Mexico geographic range. The scientific community can use the mapping application and portal as a resource for detailing checklists in a quick and concise manner. The mapping application provides other environmental layers to provide context to the checklist database. Specifically, taxonomists have access to the phylum and checklist data; policy makers can manage distribution decisions with the mapping application; research scientists and funding agencies can get a quick overview of what is known about a certain species; and ecologists and fishery biologists can use data on habitat, food consumption, and predators as inputs for models.

This application is being maintained and enhanced with new data in 2011. In 2012, the application will be available online but will no longer be updated.

NBII Infrastructure
(2010 Enacted, $3.5 million; 2011 CR, $3.5 million; 2012 Request, $2.4 million)

The NBII infrastructure is the backbone of the NBII network that enables users to access, download, use, and integrate natural resources-related content from multiple sources. A portion ($1.1 million) of the proposed decrease to NBII would impact the activities associated with the infrastructure. In 2012, the USGS will continue to perform basic operations and maintenance on the NBII infrastructure, and will ensure that all security requirements are met. However, no system upgrades or enhancements will be made, and the technology refresh cycle will be suspended.

This page intentionally left blank

Activity: Core Science Systems
Subactivity: National Geological and Geophysical Data Preservation Program

2010 Enacted: $1.0 million (3 FTE)
2011 CR: $1.0 million (3 FTE)
2012 Request: $0.0 million (0 FTE)

Budget Realignment

In 2010 and 2011, the National Geological and Geophysical Data Preservation Program (NGGDPP) is a component of the Energy Resources program of the Geologic Hazards, Resources, and Processes activity. In 2012, the Energy Resources program is proposed to be split. The NGGDPP is proposed to move to a subactivity in the Core Science Systems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Section 351 of the Energy Policy Act of 2005 established the NGGDPP. From 2007 to 2009, program priorities were to support State geological surveys and Interior Bureaus to inventory geological and geophysical data collections, create metadata for items in those collections, and provide a means for customers and stakeholders to discover the information through a Web-based National Digital Catalog developed with the USGS Geospatial Information Office. In 2010, the NGGDPP added two priorities, digital infrastructure and special needs for data at risk.

Data include collections of physical Earth materials (rocks, soils, fluids, minerals, fossils), digital data collected from the Earth (seismic data, chemical data, well log data), and paper maps, charts, and logs.

The 2009 USGS NGGDPP announcement invited all State geological surveys to submit proposals to continue inventorying collections and creating metadata. The NGGDPP provided over $0.5 million to fund 29 States. States matched grants funds 1:1, resulting in nearly $1.1 million to support inventory and metadata work. By the end of 2009, more than 750,000 sample records had been entered in the National Digital Catalog. In 2009, the program co-sponsored a workshop for State participants to promote standardization of metadata formats and provide training to upload metadata records to the National Digital Catalog. The workshop also provided a forum to share best practices for data preservation.

In 2010, NGGDPP priorities included inventorying collections and creating metadata to populate the National Digital Catalog of archived materials. Two priorities added in 2010 were digital infrastructure, including converting paper documents to digital formats, updating digital formats, and new computer equipment; and special needs awards for data rescue—time-dependent preservation of unique geoscience data or collections in imminent danger of loss from decaying physical surroundings, disposal, or deteriorating media. The NGGDPP awarded approximately $638,000 to fund State efforts. Twenty-four States received funding. State geological surveys provide a 1:1 match for the $638,000 resulting in about $1.3 million to support inventory, metadata, digital infrastructure, and data rescue work.

In 2011, NGGDPP priorities include inventorying collections; creating metadata to populate the National Digital Catalog of archived materials; digital infrastructure, including converting paper documents to digital formats, updating digital formats, and new computer equipment; and special needs awards for data rescue – time-dependent preservation of unique geoscience data or collections in imminent danger of loss from decaying physical surroundings, disposal, or deteriorating media. In addition, the NGGDPP will complete its five-year plan and support creation of a database of paleontological collections.

The USGS proposes to eliminate this subactivity in 2012.

Activity: Core Science Systems
Subactivity: National Cooperative Geologic Mapping

2010 Enacted: $28.2 million (133 FTE)
2011 CR: $28.2 million (133 FTE)
2012 Request: $25.4 million (129 FTE)

Budget Realignment

In 2010 and 2011, National Cooperative Geologic Mapping (NCGMP) is a program in the Geologic Landscape and Coastal Assessments subactivity of the Geologic Hazards, Resources, and Processes activity. In 2012, the program is proposed to move to a subactivity in the Core Science Systems mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Geologic maps are vital for exploring, developing, and preserving mineral, energy, and water resources; evaluating and planning for land management and environmental protection; reducing losses from natural hazards, including earthquakes, volcanoes, landslides, and other ground failures; mitigating effects of coastal and stream erosion; siting critical facilities; and planning basic Earth science research. In short, geologic maps are syntheses of Earth science data combining expertise from many aspects of geology, such as geochemistry, geochronology, paleontology, structural geology, stratigraphy, and geophysics. Geologic maps provide subsurface data important for developing models that conceptualize ground water flow, mineral deposition, and earthquake shaking.

The NCGMP was created following the passage of the National Geologic Mapping Act (NGMA) of 1992, which was reauthorized in 1997, 1999, and 2009 (P.L. 105–36, 106–148, and 111–11). The NCGMP is the primary source of multiple-purpose geologic maps that depict the distribution of the Nation's sediment and rocks and the resources they provide.

The NCGMP provides accurate geologic maps and three- and four-dimensional frameworks that contribute to sustaining and improving the quality of life and economic vitality of the Nation and mitigating geologic hazardous events and conditions.

For almost two decades, NCGMP has been a leader in successful cooperation among Federal, State, and university partners in delivering state-of-the-art digital geologic maps to the Nation in a cost-effective, timely manner.

Program priorities are outlined in the NGMA of 1992. The NCGMP Five-Year Plan of 2007-2011 has three goals:

- Produce high-quality, multi-purpose digital geologic maps and accompanying databases and reports to solve diverse land use problems in high-priority areas and develop three-dimensional geologic frameworks that extend into the subsurface for use in predictive models, such as ground-water flow, seismic shaking, landslide probabilities, landscape change, and ecosystem health. Measures under this goal aim to increase regional geologic map coverage of the United States, promote use of geologic maps by the NPS, water resource managers, and in the mitigation of natural hazards;

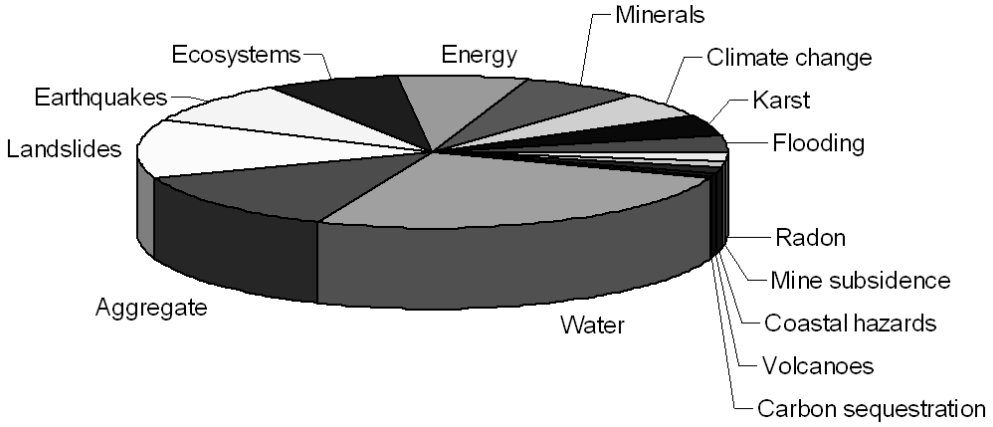
- Make geologic map information more accessible to the public by providing geologic maps, reports, and databases in a variety of digital formats. Measures under this goal document maps and reports made accessible on the internet through the National Geologic Map Database (*http://ngmdb.usgs.gov/*) and information provided to our customers through formal workshops and training; and
- Ensure the NCGMP will have the capabilities and workforce to meet future geologic mapping needs of the Nation. Measures include documenting how students trained through the EDMAP component of the program use their mapping experience to further their geoscience education and careers.

NCGMP priorities are reviewed annually by a congressionally mandated Federal Advisory Committee (FAC), which includes representatives from the Department of the Interior, the U.S. Department of Energy, the U.S. Department of Agriculture, the EPA, State geological surveys, academia, and the private sector. Progress and status reports on the NCGMP are prepared for the Secretary of the Interior to deliver to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate. Also, as charged by the Energy Policy Act of 2005, the FAC develops guidelines and procedures for and reviews progress of the National Geological and Geophysical Data Preservation Program, which archives geologic, geophysical, and engineering data, maps, well logs, and samples and provides a national catalog of such archival material.

Priorities in the States are set by State Mapping Advisory Committees in 48 States, which meet each year to analyze and rank local geologic mapping needs and assist USGS managers in modifying and prioritizing long-range plans. These priorities are based on customer needs for the maps.

For the States, geologic maps have fifteen primary applications, as shown in the diagram below:

Societal Applications of Federal and State Geologic Mapping



One of NCGMP's important partnerships is the Central Great Lakes Geologic Mapping Coalition, which is a Federal-State partnership created to produce urgently needed, detailed, three-dimensional surficial-materials maps of the Great Lakes States. The States in this region have a similar geologic heritage and work together to address common societal issues about land and water resources, the environment, and geologic hazards that are applicable to the entire region. Geologic maps produced by the project provide a foundation for making

economic and environmental decisions related to ground water resources, land, and other natural resources in the Central Great Lakes region.

Program Performance

The NCGMP carries out the Mapping Act through three main program components: FEDMAP, STATEMAP, and EDMAP. Each year, panels that include scientists from Federal and State governments, and academia critically review all work plans.

NCGMP-funded projects support all USGS Science Strategy themes. For example, geologic formations mapped in the subsurface define the shape of aquifers, how much water can be stored in them, and parameters for water movement through the ground. Approximately 70 percent of FEDMAP projects and 95 percent of STATEMAP projects contribute to ongoing investigations in water issues. The USGS can successfully meet the goals for WaterSMART by using information from geologic maps and related information.

Many NCGMP-funded projects also provide critical information for predicting and mitigating natural hazards, such as landslides, earthquakes, and volcanoes. For example, the USGS provides FEMA with landslide risk-assessment maps. These maps are used to help make decisions on road closures and home evacuations. The program also funds a project constructing three-dimensional maps through time of earthquake-induced ground shaking. These maps, based on accurate geologic parameters, offer enormous help in earthquake disaster planning and mitigation efforts.

Approximately 44 State geological surveys and 40 universities received financial support in 2010 from NCGMP through the STATEMAP and EDMAP grant programs. These projects produced over 400 new geologic maps and trained approximately 45 students.

EDMAP – Federal Geologic Mapping Science and Applications
(2010 Enacted, $18.9 million; 2011 CR, $18.9 million; 2012 Request, $17.4 million)

The FEDMAP component of the NCGMP supports about 30 regional geologic mapping and synthesis projects that cross jurisdictional boundaries or involve work on Federal lands. The NCGMP also funds interdisciplinary projects with the USGS Mineral Resources, Earthquake Hazards, Landslide Hazards, Groundwater Resources, and Climate Change programs. New and ongoing geologic mapping work plans are evaluated annually by a FEDMAP Review Panel, which includes representatives from State geological surveys, the National Park Service, and USGS scientists with diverse scientific backgrounds. The program also partially supports a number of geochronology and other common-use laboratories.

A hallmark of NCGMP is the National Geologic Map Database Project, which represents a major cooperative effort with the Association of American State Geologists, universities, the Canadian Geological Survey, and the Consejo de Recursos Minerales, Mexico, to present all geologic mapping data from North America on one Web site and with a common set of map standards such as geologic map symbols, colors, and patterns. Additionally, users can access information on current geologic mapping activities and the proper use of geologic names. The project's Web site serves more than 40,000 users each month.

Through the Science in the Parks effort, the NCGMP is the principal USGS partner coordinating and prioritizing geologic mapping studies with the NPS projects are developed and selected jointly by the NPS and the USGS to merge Earth science information needs of individual parks

with the geologic mapping mission of the USGS. Resulting geologic data are made available in digital and standard formats needed for NPS land use management, educational outreach, inventory, and natural resource monitoring. NCGMP-funded projects also work with other Federal land management agencies such as FWS, BLM, and the U.S. Forest Service.

In 2010 and 2011, USGS surficial and bedrock geologic mapping provided the Navajo Nation with the scientific information necessary for robust land use planning. The Navajo Nation, roughly the size of West Virginia, has the largest land base and reservation population of all Tribes in the United States and half of its population is currently under the age of 23To provide for the growing needs of this burgeoning population, information is needed for planning urban development and infrastructure. The rapid population growth may surpass carrying capacity of lands upon which people are dependent for their livelihood, and it is critical that the information that USGS provides fosters community-based land use planning and science education for Native Americans. The land use planning is particularly important to properly plan natural resource management. In addition, documenting landscape change provides a foundation for evaluating geologic hazards such as flash floods, dust storms, and drought. The USGS will continue this work in 2012.

STATEMAP – Serving State Priorities for National Needs
(2010 Enacted, $8.6 million; 2011 CR, $8.6 million; 2012 Request, $7.4 million)

The STATEMAP component of NCGMP currently supports geologic mapping studies conducted by 44 State geological surveys through a competitive grant program that matches every Federal dollar with a State dollar. Since STATEMAP's inception in 1993, more than $88.0 million has been matched by 48 States. Mapping priorities are determined with the help of State Mapping Advisory Committees in each State, which include representatives from all levels of government, the private sector, academia, and industry. Currently, more than 500 individuals offer their time on these committees to prioritize geologic mapping needs.

Many STATEMAP geologic mapping projects provide critical information needed by industry. In 2010 and 2011, investigations in the foothills of the Brooks Range have been widely used by industry to characterize prospective geologic units in the subsurface and constrain the risk associated with various exploration models. The structural complexity of the region has limited the utility of seismic reflection data, and thus has put an even greater emphasis on the need for geologic mapping in this resource rich area. The prospect of a natural gas pipeline has also increased exploration interest in the area and the first exploratory well in more than 30 years is planned for the inner foothills. In addition to economic benefits to the State of Alaska, Native organizations with significant land holdings in the foothills are benefiting from the exploration investment. All of this can be partly attributed to the need for, and benefit of, STATEMAP geologic mapping. The USGS will continue to provide needed information to industries in 2012.

EDMAP – Training the Next Generation of Geoscientists
(2010 Enacted, $0.7 million; 2011 CR, $0.7 million; 2012 Request, $0.6 million)

The EDMAP component of the NCGMP supports the training of a new generation of geologic mappers in universities and colleges through a competitive matching-fund grant program. Since EDMAP's inception in 1996, more than $5.0 million from the NCGMP has supported geologic mapping efforts of more than 800 students working with more than 230 professors at 140 universities in 44 States, the District of Columbia, and Puerto Rico. Graduate projects may be funded up to $17,500 and undergraduate projects, up to $10,000. These funds cover field

expenses and map production but not faculty salaries. The sponsoring college or university matches the EDMAP funding.

Since 2004, the NCGMP has conducted an annual survey of EDMAP students who receive a questionnaire three years after completion of their EDMAP projects. The survey shows that 95 percent of respondents continue on with advanced geoscience studies or obtain a job in the geosciences. The results clearly demonstrate that EDMAP students fall well above the national average for pursuing advanced academic degrees in the geoscience field, easily obtain geoscience positions due to knowledge gained through the EDMAP experience, and frequently use geologic mapping skills gained through the EDMAP. Success of the program is demonstrated by the wide variety of education and industry jobs that the students pursue. The 2010 survey data below demonstrates that success:

Organization	Position
Advanced Resources International	Research Analyst/Geologist
Alaska Division of Geological and Geophysical Surveys USGS	Engineering Geology intern Mendenhall Postdoc
Anadarko Petroleum	Geologist
Bayswater Uranium	Geologist
Colorado State University University of Wisconsin-Madison	NSF Research Experiences for Undergraduates grant student Research Assistant
Conoco Phillips	Intern
Devon Energy	Geologist
EMSI (Environmental Management Services, Inc.) GBCI (Green Building Certification Institute)	Project Manager LEED (Leadership in Energy and Environmental Design) Reviewer
Golder Associates	Staff Geologist
Holman Consulting Engineers REI	Senior Geologist Sales Specialist
Massachusetts Geological Survey	Geologist and Post-Doctoral Research
Natural Gas Industry	Operations Geologist
Nevada Bureau of Mines and Geology Desert Research Institute	Research Geologist Research Geologist
PA Department of Environmental Protection	Geologic Specialist
Unimin Corporation	Staff Geologist
University of Kansas Geography Dept. University of Kansas Environmental Studies Dept. Kansas Geological Survey	Graduate Teaching Assistant Graduate Teaching Assistant Field Research Assistant
University of Nevada-Las Vegas	Research assistant and teaching assistant
USGS	Research Geologist
USGS Environ	Contractor/Lab Technician Environmental Intern
Washington University St. Louis	Lecturer in geology

Data from 2010 Survey

This page intentionally left blank

Activity: Core Science Systems
Subactivity: National Geospatial Program

2010 Enacted: $70.7 million (338 FTE)
2011 CR: $70.7 million (338 FTE)
2012 Request: $65.4 million (334 FTE)

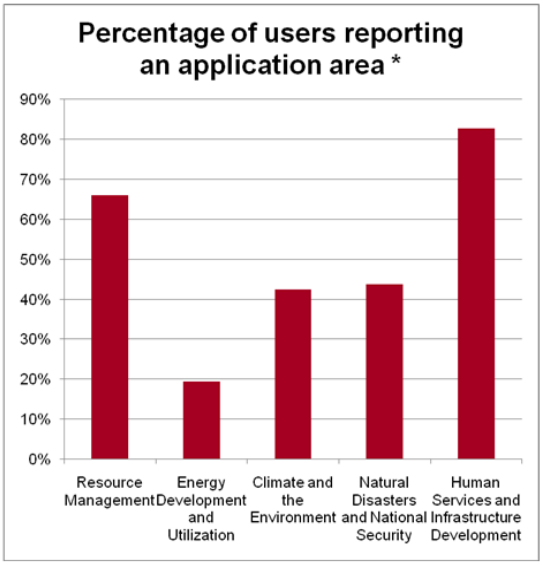
Budget Realignment

In 2010 and 2011, National Geospatial Program (NGP) is a subactivity of the Geographic Research, Investigations, and Remote Sensing activity. In 2012, this is proposed to move to a subactivity in the Core Science System mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The NGP organizes, maintains, and publishes the geospatial baseline of the Nation's topography, natural landscape, and built environment, such as transportation features. The baseline is *The National Map*, a set of databases of geospatial data and information and related services and products. The NGP provides the content of the geospatial databases that users can download, provides Web-based information services that deliver the content, and publishes products derived from the content. The program works with cooperators to share responsibilities and costs of acquiring and maintaining geospatial data, and with customers to ensure that the products and services meet their needs.

Applications That Use NGP Data



* Percentages total to more than 100 percent because some customers have more than one use.

This geospatial information is an important foundation of USGS and Interior science. It provides the geospatial framework for accomplishing the strategic directions of the 2007-2017 USGS Science Strategy.

More broadly, the NGP provides products and services to Federal, State and local governments, and the public. In a survey of customer requirements for *The National Map*, published in 2009, 2,200 individuals, including those from Federal and State agencies, identified five major areas of applications: resource management; climate and the environment; human services and infrastructure development; natural disasters and national security; and energy development and utilization. Customers incorporate the products and services from the NGP in their internal business processes to support decision making and operational activities. Open access to these same products and services allows the public to use them to understand and participate in public actions taken by Government organizations.

Another benefit the public receives from these products and services results from incorporation of NGP-provided information in commercial map products and services. These relationships result in improved products for the public and a robust American geospatial industry.

The program also hosts the Federal Geospatial Data Committee (FGDC) Office of the Secretariat (OS). The FGDC is an OMB-chartered interagency committee responsible for facilitating activities related to OMB's Circular A-16, A-16 Supplemental Guidance, and Executive Order 12906, and implementing the National Spatial Data Infrastructure (NSDI). The FGDC's responsibilities include identifying and coordinating activities and initiatives across the Federal Government and between Federal and non-Federal partners that can be integrated or collaboratively leveraged in support of Federal and national geospatial priorities and business needs.

The 2012 request for NGP includes an increase of $0.8 million for the Ecosystems Restoration initiative. A description of the work proposed can be found in the Ecosystems Restoration initiative in the Key Changes Section.

Program Performance

The NGP is organized in six budget components: *The National Map*, *The National Atlas of the United States of America*®, Emergency Operations, Center of Excellence for Geographic Information Science (CEGIS), Partnership Implementation, and FGDC OS.

The National Map
(2010 Enacted, $42.9 million; 2011 CR, $42.9 million; 2012 Request, $40.8 million)

The National Map component ensures nationwide, current, consistent, seamless, and integrated geospatial data are organized, maintained, and published. These characteristics are important to customers, especially Federal agencies, because they support business needs that require consistent and high-quality information over large parts of the Nation (e.g., land management resource applications), that occur in any arbitrary place in the Nation (e.g., disaster response or homeland security applications), or require a sampling of places from across the Nation for which there are consistent information (for example, environmental applications).

These data, available through *http://nationalmap.gov*, are published as map products and Internet-based services customers incorporate into decision making and operational processes. The NGP updates these data through cooperation with Federal, State, local government agencies (see the Partnership Implementation component for more discussion), and contracts with the private sector.

Data Themes in *The National Map*

Work under this component provides base geospatial data for seven data themes: orthoimagery; elevation; hydrography; geographic names; transportation; structures; and boundaries. It also uses the land cover data produced through the USGS Geographic Analysis and Monitoring program.

The USGS has interagency leadership of several data layers. Through *The National Map*, the NGP carries out these responsibilities for terrestrial elevation, hydrography and watershed boundaries, geographic names, and digital orthoimagery. The NGP is also responsible for uniform geographic name usage throughout the Federal Government under Public Law 80-242.

The NGP allocates most of its resources to organize, maintain, and publish elevation, hydrography, geographic names, and orthoimagery information.

National Elevation Dataset (NED) – *The National Map's* elevation data theme is focused on data acquisition and quality assurance activities. A multi-resolution, seamless dataset, the NED is updated every other month as new source data become available, and accuracy is continually improved.

Elevation data support emergency response and mitigation activities and other priority Interior programs. These data support drainage network modeling and geometric correction of remotely sensed data critical to decision support systems (for example, flood mitigation and response and wildfire behavior prediction).

In 2011, the NGP is focused on completing 10-meter resolution elevation coverage of the 48 States. It also is processing a large volume of accurate elevation data acquired through contracts or agreements with other Federal, State, and local government organizations. In 2011 and 2012, the NGP will work with the Federal Emergency Management Agency (FEMA) to take advantage of that Agency's investment in elevation data for flood hazard mapping and make the resulting elevation data available for other uses.

National Hydrography Dataset (NHD) and Watershed Boundaries – The NHD provides complete Nation wide data coverage for streams, lakes, and other surface waters of the Nation. Complementing these data are watershed boundary data that delineate the land that drains to a stream or set of streams. The NGP leads this multi-agency project to build and maintain this comprehensive geospatial dataset of the Nation's surface water to provide state-of-the-art analysis in water science. This project eliminates duplication of effort, improves scientific data sharing, and standardizes technology to apply the data to business applications. The dataset is used by many agencies: USGS scientists in the Bureau's StreamStats and SPARROW nutrient modeling projects; the U.S. Forest Service in its Natural Resource Information System water module; the Environmental Protection Agency as part of its Watershed Assessment, Tracking and Environmental Results system; the Census Bureau in its map modernization activities; the Department of Homeland Security in its Incident Command-Water program to assess risks to the Nation's surface water; and numerous State agencies to meet reporting requirements of the Federal Water Pollution Control Act.

In 2011 and 2012, the NGP will conclude the first three-year maintenance cycle for completeness and positional accuracy of NHD data. In 2011, the NGP is integrating new, very accurately positioned hydrography data from the States of Iowa, Delaware, New Jersey, and Tennessee.

In 2012, the NGP will be adding a few key structures, such as dams, gaging stations, and diversion structures, critical to users who model the flow of water. For example, for the Colorado River, USGS geospatial and water scientists are collaborating to use the NHD to model natural streamflows and the affects of water withdrawals from canals, ditches, and other divergences on the natural flow.

Geographic Names – The geographic names project comprises two functions: providing the Secretariat and staff for the United States Board on Geographic Names (BGN) and managing geographic names encoded in *The National Map*.

The BGN is an interagency body of representatives from Federal agencies. Authorized by Public Law 80-242, it issues standard geographic names for use on all materials (maps, documents, reports, data files) published by the Federal Government. Geographic names are a critical reference component for scientific investigations and emergency response, as well as for land and resource management operations. Local, State, and tribal agencies adhere to the guidelines and policies of the BGN and participate actively in the standardization effort. The BGN is also authorized to disseminate official names and locations of cultural ("administrative") features, including schools, hospitals, and emergency preparedness locations such as police and fire stations.

In 2011 and 2012, the USGS will continue to provide the BGN Secretariat National leadership responsibilities. The Bureau will implement State stewardships as the model for geographic names harmonization across Federal, State, and local government and commercial products. With completion of integrating geographic names in its other databases, the NGP will ensure that all data in *The National Map* comply with BGN principles and policies.

Orthoimagery – An orthoimage is an aerial or satellite image of the Earth processed so that accurate positions, distances, and areas can be measured from it. Orthoimagery is an essential base layer in geospatial databases for nearly all levels of government. It also is very popular in industry and the public.

The USGS ensures that orthoimagery in *The National Map* online products and services are up to date. These data serve as a primary component of its graphic program in support of the U.S. Topo electronic topographic map. These data are used by USGS science and other Interior programs that occur inside and outside of Federally managed lands.

Federal agencies are very interested in these very high-resolution data for urban areas to support homeland security, public safety, emergency response, and other applications.

The NGP collaborates annually with other Interior Bureaus and the Department of Agriculture in the National Agriculture Imagery Program to acquire one-meter resolution imagery. The imagery program acquires imagery for at least a third of the 48 States annually. The NGP funds one-half of the Interior contribution to the program. In 2012, USGS capabilities to leverage funding with State and local governments will diminish, adding cost to the Federal investment and threatening the cyclical coverage planned for the project.

In 2011, the NGP is processing and disseminating orthoimagery data acquired through contracts or agreements with other Federal, State, and local government organizations. The NGP is working with other organizations to develop options to obtain "leaf off" imagery for the Eastern United States "leaf off" imagery is captured before the start, or after the completion, of the growing season when deciduous plants do not have leaves. Users of products and services from *The National Map* who need to see features on the ground find "leaf off" imagery more helpful because vegetation does not obscure the ground.

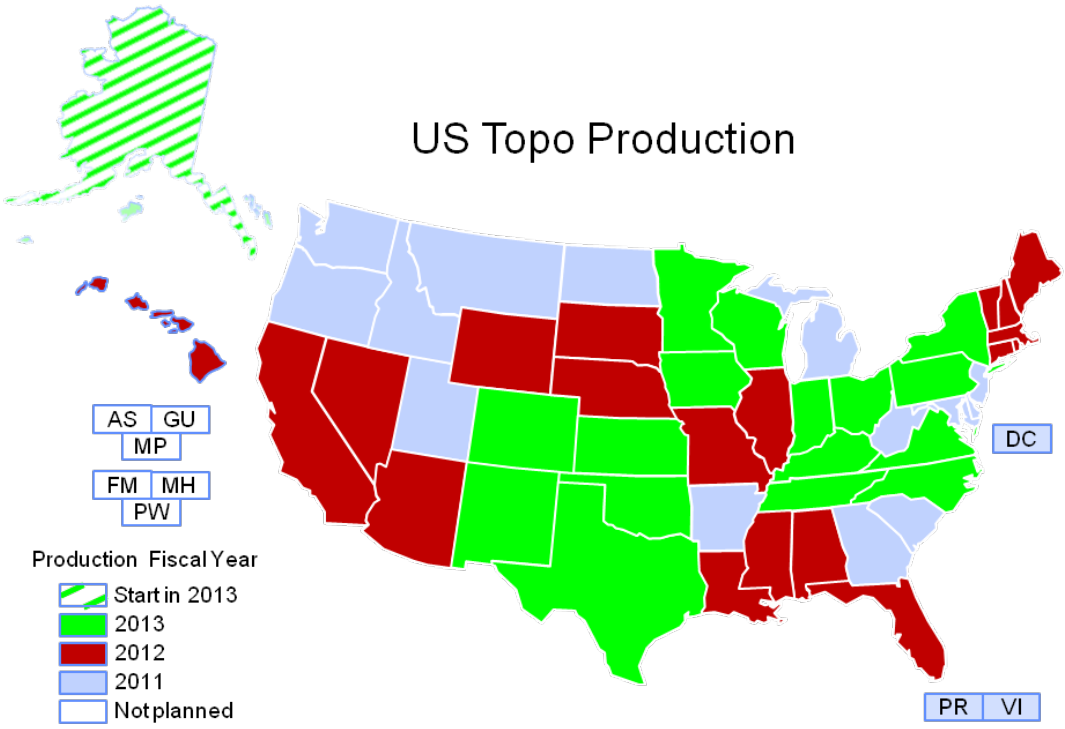
For the remaining themes of data essential to users of *The National Map* (transportation, boundaries, and structures), other Federal agencies have lead coordination responsibility under OMB Circular A-16. Currently the NGP relies on other agencies and commercial sources to supply this information for use in *The National Map*.

Topographic Maps

The U.S. Topo electronic topographic map is one of the many accomplishments of a more than decade-long effort to organize geospatial databases now included in *The National Map* and the related technical and organizational infrastructure needed to create, maintain, and publish these base geospatial data.

Available on the Web through *http://nationalmap.gov* and arranged in the traditional 7½-minute quadrangle format, digital U.S. Topo maps are designed to look and feel like the traditional topographic maps. They add modern technical advantages that support wider and faster public distribution and enable basic, onscreen geographic analysis by all users. The files are used with software that reads Portable Document Format (PDF) files. Most computer users have such software, which is available free on the Internet. Because all map information is contained in the U.S. Topo map data files, they are especially useful to customers who work in the field or in other situations where the Internet is not available.

During July 2010, production passed the half-way point for the first three-year cycle of production for the 48 States. More than 26,000 maps were produced in 13 months. In contrast, creation and publication of the first series of primary USGS topographic maps occurred from the mid-1930s until the early 1990s, and required more than 35 million hours to complete 55,000 topographic maps for the 48 States. For the U.S. Topo, the NGP plans to replace current USGS topographic maps in the 48 States with electronic topographic maps by the end of 2011, and to replace the early "beta" version of electronic topographic maps and add coverage for Hawaii in 2012.



Three-year schedule for U.S. Topo production. States with blue (or light) shading are scheduled for 2011 (including the District of Columbia (DC), Puerto Rico (PR), and the Virgin Islands (VI)); States with red (or dark) shading are scheduled for 2012; and, States with green (or medium) shading for 2013. In 2012, the

USGS will prototype production for Alaska, and anticipates some production in 2013. Production for the Pacific island territories (American Samoa (AS), Guam (GU), and the Commonwealth of the Northern Marianas Islands (MP)) and nations in Compacts of Free Association with the United States (the Federated States of Micronesia (FM), Marshall Islands (MH), and Palau (PW)) is not yet scheduled.

Data Access

The NGP ensures that public domain geospatial data associated with the eight major themes and U.S. Topo map products prepared from these data are freely accessible continually to customers, cooperators, and the public. The goal of the data access activities is to ensure that products and services are provided in a way that Federal Agency customers and others can incorporate the information in their decision making and operational systems with minimal effort. The NGP accomplishes this goal by providing methods to download (obtain a copy of) data, to access the data through industry-standard Internet map services, and to use NGP-provided methods of viewing *The National Map* and combining it with their business data. Third parties that provide map services over the Internet, such as Google and Microsoft, also incorporate data from *The National Map* in their products and services, providing a fourth method to access this information.

In 2010, the USGS launched a modernized *National Map* viewer with a unified data download front-end, including better support services and responsiveness to requests for changes. The viewing experience is much faster due to the use of a cached base map at various zoom levels, giving a response speed that customers have come to expect from Web mapping applications. The download is now a single unified interface to order all *National Map* data themes and uses the familiar shopping cart paradigm. Behind the scenes are improved processes for tracking change requests, monitoring Web services for higher reliability, and managing frequent releases to keep pace with evolving technology and consumer demands. There is also improved online help, frequently-asked questions, and support information.

In 2011, the USGS is continuing to improve and refine delivery of data, products, and Web services for *The National Map* through *The National Map* viewer. The USGS is retiring old Internet portals and map viewers as the new viewer matures and assumes roles played by the older systems. The USGS is also continuing to improve performance of *The National Map* viewer and improve the ability to use data from *The National Map* with commercial mapping systems.

In response to demand for historical map information for use in scientific studies of change on the landscape, the NGP is digitally scanning its archive of topographic maps and encoding them so they can be overlaid with other map data. It is scanning records of more than a century of decisions about geographic names. The resulting information will begin to be available on the Internet during 2011, with the remainder of the data made available in 2012.

Geospatial Data Archive

The USGS archives geospatial data and metadata to maintain original data sets such as high-resolution orthoimagery quadrangles, digital raster graphics, digital line graphs, and digital elevation information. The USGS makes archived information available online in time frames that allow them to be used in emergency response activities as well as ensuring long-term preservation.

In 2012, the USGS will continue to maintain the archive of materials and support growth of the archive as new NGP geospatial data are acquired. Activities include data organization, ingest, metadata generation, data set appraisals and assessments, dispositions including transfer to the National Archives and Records Administration, and preservation activities such as dataset transcriptions and media migrations for offsite storage and protection. These activities occur at the EROS center in Sioux Falls, SD.

National Geospatial Technical Operations Center

The National Geospatial Technical Operations Center (NGTOC), located in Rolla, MO, and Denver, CO, is the main operational component of the NGP, *The National Map*, and *The National Atlas of the United States of America®*. Staff at the NGTOC develop and enhance the usefulness of national geospatial products and services; acquire new geospatial data from the private sector; and receive, perform quality assurance, and incorporates into *The National Map* data procured under contract and delivered by cooperators. They also improve public access to this information through online data viewing and download through its support of *The National Map* viewer.

In 2010, the NGTOC awarded seven broadly-scoped architectural and engineering contracts to acquire geospatial products and services through private sector firms across the United States. These five year contracts, collectively known as the Geospatial Products and Services Contracts, provide access to capacity and capability that would be impractical for the Government to maintain in-house. The USGS awarded 50 tasks with an estimated value of $20.0 million through these contracts in 2010. These task orders brought private sector capabilities to bear to meet mission goals, and met requirements for more than 55 partner organizations from other Federal, State, and local government agencies.

In 2011 and 2012, the NGTOC will perform operations needed to undertake the receipt, quality assurance, integration, and dissemination of improved information in *The National Map* described above, and the operations of *The National Atlas of the United States of America®* described below.

The National Atlas of the United States of America®
(2010 Enacted, $2.6 million; 2011 CR, $2.6 million; 2012 Request, $2.5 million)

The National Atlas of the United States of America® (*http://www.nationalatlas.gov*) (Atlas), the small-scale component of *The National Map*, fosters an understanding of broad geographic patterns, trends, and conditions useful for national assessments. It delivers authoritative, accurate Federal geographic information carefully integrated to present a coherent look at America today. Its varied map and data services are popular with educators, businesses, and individual citizens. Included in the Atlas are documented geospatial datasets, articles and dynamic maps that tell the stories behind the data, Web services, page-sized downloadable maps, and traditional wall maps.

In 2010, the USGS completed new, more detailed transportation and boundaries datasets for use as the foundation of national mapping efforts. These data deliver on the National Spatial Data Infrastructure promise to collect information once that supports many uses.

The Atlas program also worked with mapping agencies in Canada and Mexico to offer an online Environmental Atlas of North America (see *http://www.cec.org/atlas/*) and to deliver the first in a series of annual products to characterize and describe changes occurring across the continent.

The Commission for Environmental Cooperation, created by the North American Free Trade Agreement, sponsors the North American atlas.

In 2011, the USGS is publishing a replacement small-scale base map data completed in 2010. This includes five wall maps (including an updated land cover map and satellite mosaic for the United States), forty-eight new thematic data layers for online viewing, and a dozen page-sized maps of Federal lands and new congressional district maps that users can download and print. New in 2012, the USGS will upgrade web map services to better enable customers to use Atlas data on the Internet, and upgrade and publish the only integrated digital map of Federal lands for the entire United States.

Center of Excellence for Geographic Information Science
(2010 Enacted, $2.0 million; 2011 CR, $2.0 million; 2012 Request, $1.9 million)

The CEGIS conducts, sponsors, and collaborates on research to find innovative solutions needed for *The National Map*, the NSDI, and the emerging geospatial and semantic Web.

In 2011 and 2012, the focus of CEGIS is to continue implementing recommendations from the National Research Council report, "*A Research Agenda for Geographic Information Science at the United States Geological Survey*," and to evolve research needed to develop a foundation for Web-based access and automatic processing of geospatial data from the semantic Web. These activities include using post-doctoral scientists and academic contracts to discover research answers needed to support *The National Map.* The CEGIS has active research projects for design of an electronic topographic map and user-centered design for Web map interfaces, which the NGP will use to improve the utility of the U.S. Topo and viewer for *The National Map.* Projects investigating automated data integration, generalization, and multi-resolution raster data will provide the NGP with the capability to maintain the data in *The National Map.*

Emergency Operations
(2010 Enacted, $3.5 million; 2011 CR, $3.5 million; 2012 Request, $3.4 million)

The Emergency Operations activities ensure NGP products and services provide geospatial information needed for responses to natural and human-made disasters. These activities also promote these products and services as the underpinning for Federal mapping activities that support public and private sector organizations with homeland security and defense, law enforcement, and emergency management mission responsibilities. Major activities include coordination with these communities and provision of NGP data and services responsive to unique demands of emergency response.

Another role is to support, where appropriate, the analytical needs of these communities within the USGS. In 2010, the USGS Geospatial Information Response Team (GIRT), chaired by the Emergency Operations personnel, was the first USGS hazard response team to be activated after the Deepwater Horizon oil spill in the Gulf of Mexico. The USGS provided Emergency Operations staff to support the Department's Interagency Operations Center and produce daily situational awareness maps and other products.

The events of 2010 created high demand for geospatial products and services. Support for the earthquake in Haiti resulted in 54 terabytes of data being downloaded by response organizations. The Deepwater Horizon oil spill resulted in an unprecedented "long duration, high data volume" response period for serving remotely sensed imagery and other products and

services on media and online. In addition to these events, the NGP supported responses to earthquakes in Chile, Mexico, and China, floods in the midwest and northeast United States, and fires in Washington and Arizona.

In response to critiques from customers, the Hazards Data Distribution System was improved to allow customers to interactively search and visualize data holdings based on a particular event or geographic area of interest.

Activities in 2011 and 2012 include partnership development, liaison, and coordination; information requirements definition; interbureau and discipline coordination; geospatial applications development and support; support for USGS continuity of Government and continuity of operations responsibilities; national security special events support; emergency response support; custom and special product generation; and provision of sensitive, proprietary, and classified information. These activities enable Government assets to be used for many purposes, which improves the value of these data and services to citizens. Key Federal partners and stakeholders include the Department of the Interior, the Department of Homeland Security, the U.S. Marshals Service, the National Geospatial-Intelligence Agency, the U.S. Northern Command, and the National Guard Bureau.

Partnership Implementation
(2010 Enacted, $13.9 million; 2011 CR, $13.9 million; 2012 Request, $10.4 million)

The Partnership Implementation component funds the network of geospatial liaison personnel that develop agreements to share resources with cooperators. Cooperative arrangements are the primary method through which the NGP obtains geospatial information to maintain the currentness and improve the quality of *The National Map.* This approach leverages funding across Federal agencies to provide cost savings. For example, in 2010, the Alaska liaison organized a project to modernize elevation data for Alaska in which $1.0 million of USGS funds were matched by $4.7 million in other Federal and State funds.

The liaisons develop agreements with cooperators, provide support to customers, and receive new requirements. The relationships developed during the performance of this work are invaluable during responses to emergencies, when action is needed quickly and there is little time to identify organizations that can contribute geospatial data and maps to response efforts. For example, in 2010, the Louisiana liaison coordinated requests and delivery of imagery to those responding to the Deepwater Horizon oil spill.

The USGS proposes a $3.5 million decrease for the Partnership Implementation program.

Federal Geographic Data Committee Office of the Secretariat
(2010 Enacted, $5.8 million; 2011 CR, $5.8 million; 2012 Request, $5.6 million)

The FGDC OS provides executive, administrative, and technical support to the FGDC. Established by OMB Circular A-16, the FGDC coordinates the collection, use, and dissemination of geospatial information, promotes and promulgates geospatial data and metadata standards, system interoperability, and cross-government best business practices for geospatial resources, policies, standards, and technology. The FGDC is charged with facilitating the development of the NSDI. NSDI responsibilities include identifying and coordinating activities and initiatives across the Federal Government and between Federal and non-Federal partners that can be integrated or collaboratively leveraged in support of Federal and national geospatial priorities and business needs. The Secretary of the Interior chairs the

FGDC, and the Deputy Director for Management, OMB, serves as the Vice-Chair. Numerous stakeholder organizations, representing the interests of State, local, and tribal governments, industry, and professional organizations, participate in FGDC activities.

New in 2011, the demand continues for coordination of geospatial activities as Federal leadership reemphasized the strategic importance of leveraging geospatial efforts at the Federal level. This coordination is critical to ensuring that geospatial data and resources across the Government and with its partners can be efficiently, effectively, and seamlessly leveraged to address national priorities and Federal business requirements. This is reflected in the OMB issuance of A-16 Supplemental Guidance that directs Federal agencies to implement a portfolio management approach for Federal geospatial activities. It is also reflected in the 2011 President's Budget calling for creation of a Geospatial Platform to support an integrated approach for Federal geospatial capabilities; improving the geospatial governance framework to address requirements of State, local and tribal governments; prioritizing investments based on business needs; and exploring opportunities for increased collaboration between key capabilities to emphasize reuse of architectural standards and technology.

The FGDC OS plays a central role in the support, coordination and execution of these initiatives. Likewise, the FGDC OS's roles as defined in the recently issued OMB A-16 Supplemental Guidance have increased in support of the management of the Federal geospatial data portfolio. The required FGDC OS roles in geospatial policy, planning, outreach, education, standards, and coordination continue and will be enhanced.

In 2012, the FGDC OS will support the priorities and activities described below, and will manage several activities that encourage the development of the NSDI. In addition, the FGDC OS will participate in Federal, State, and international geospatial standards and infrastructure development committees and consortia.

Geospatial Line of Business and the Geospatial Platform

The FGDC OS provides leadership and management support for the Geospatial Line of Business (GeoLoB). The GeoLoB is an initiative in the President's E-Government objectives to develop a more strategic, coordinated, and leveraged approach to producing, maintaining, and using geospatial data and services across the Federal Government. The geospatial SmartBUY contract for geospatial software and services was established by the GeoLOB in late 2009. In its first three quarters of existence, the GeoLOB saved Federal agencies approximately $8.2 million.

In 2012, the FGDC OS will continue to act as the GeoLoB managing partner and project manager and support and lead activities and tasks as appropriate. This includes the continued coordinated development of the Geospatial Platform and the implementation of OMB Circular A-16 Supplemental Guidance.

Fifty States Initiative

The FGDC OS manages the Fifty States Initiative, which supports a goal of the USGS to engage all levels of geospatial data and information providers and practitioners in the development of the NSDI. The task of involving all State, county, tribal, and community governments as well as academia, non-government organizations (NGO), and industry requires strategic approaches to leverage the capability of the FGDC as originally configured. The Fifty States Initiative engages all States in the task of developing the NSDI by supporting their

leadership in coordinating among all geospatial users and providers within their respective States.

The initiative supports the States in their development and implementation of statewide strategic and business plans. Such plans facilitate the coordination of programs, policies, technologies, and resources that enable the coordination, collection, documentation, discovery, distribution, exchange, and maintenance of geospatial information in support of the NSDI. The FGDC OS will continue to work closely with the National States Geographic Information Council to advance this initiative and ensure its results support the inclusion of State, tribal, and local government requirements in Federal geospatial efforts, including the Geospatial Platform.

NSDI Cooperative Agreements Program

Since 1994, the NSDI Cooperative Agreements Program (CAP) has played a significant role in promoting and disseminating the tenets of NSDI to thousands of NSDI advocates and practitioners. Managed by the FGDC OS, the program develops incentives for agencies and organizations to participate in the NSDI. To date, NSDI CAP awards have created collaborations at all levels of government, developed an understanding of geospatial information in organizations and disciplines new to the NSDI, provided seed money for cost-shared projects with significant return on the investments to enable geospatial organizations to participate in the National effort to implement the NSDINSDI Cooperative Agreements Program with State, local, and tribal agencies and private sector partners has shown a 218 percent return on investment over the past five years. It is viewed as highly successful by States and non-Federal partners, USGS geospatial liaisons, Census Regional Geographers, and State Geodetic Advisors, per the Measuring Progress Report 2009.

In 2012, the FGDC OS will continue to support the NSDI CAP and realign categories as required to effectively address and develop coordinated solutions that meet and align to Federal and non-Federal geospatial priorities and requirements.

National Geospatial Advisory Committee

Another goal of FGDC is to facilitate collaboration among Federal geospatial user and provider partners at the national level. The National Geospatial Advisory Committee (NGAC) was established to provide advice from a representative sample of the Nation's geospatial community to the Federal Government on the management of Federal geospatial programs, the development of the NSDI, and the implementation of OMB Circular A-16. The NGAC was established by Interior under the auspices of Federal Advisory Committee Act (FACA). It provides advice and recommendations to FGDC through the FGDC Chair (the Secretary of the Interior or designee) on behalf of FGDC member agencies. The NGAC complements other FGDC efforts to engage States, counties, Tribes, communities, NGOs, academia, and industry in its activities. The FGDC OS provides the support for the NGAC and serves as its Designated Federal Official.

At its June 2010 meeting, the NGAC provided the following endorsement:

"The NGAC endorses the Geospatial Platform concept as described in the Platform Roadmap and encourages the Administration, along with federal agency leadership, to adopt, support, and implement this initiative in partnership with State, local, regional and tribal governments.

Geospatial Data Clearinghouse

The FGDC OS coordinates the sharing of geographic data, maps, and online services through the NSDI clearinghouse, a network and supported search capability managed, monitored, enhanced, and developed by the FGDC OS. The clearinghouse enables the searching of metadata held within the NSDI Clearinghouse Network to enable users to identify and analyze available geospatial data. As further development of the Geospatial Platform and the Federal Geospatial Portfolio management capabilities occurs, the clearinghouse is continuing its integration into the Platform to facilitate quick and efficient discovery of non-Federal geospatial data. The FGDC OS continues to support the *Data.gov* Web site development team, helping them leverage the capabilities and geospatial tools developed through the NSDI Clearinghouse Network efforts and more closely integrate the capabilities of these two initiatives.

In 2012, the FGDC OS will continue to develop the Clearinghouse Network capabilities to support the capabilities of *Data.gov*; the Global Earth Observations System of Systems (GEOSS) and the Global Spatial Data Infrastructure that provide the USGS and other Federal agencies with important international data resources.

Geospatial Standards Development

The FGDC OS develops geospatial data standards for implementing the NSDI**,** in consultation and cooperation with State, local, and tribal governments, the private sector and academic community and, to the extent feasible, the international community. It develops geospatial data standards only when no equivalent voluntary consensus standards exist, in accordance with OMB Circular A-119. The FGDC OS leads the FGDC Standards Working Group and promotes and coordinates FGDC standards activities. It maintains membership in the International Committee for Information Technology Standards Technical Committee L1 on Geographic Information and the Open Geospatial Consortium, and serves as a conduit between these entities and the broader Federal community.

In 2012, the FGDC OS will also continue its collaborative efforts with the National Center for Geospatial Intelligence Standards, Geospatial Intelligence Standards Working Group to advance interoperability between the Government Defense, Intelligence, and Civil Sectors through adoption, endorsement, and implementation of common geospatial standards. These efforts will assist in efficiently enabling solutions that can meet common cross-sector business requirements, reducing the time and resource investment in vetting Federal and non-Federal authored geospatial standards, and implementing the Geospatial Platform and supporting portfolio management capabilities.

Activity: Administration and Enterprise Information

	2010 Enacted	2010 Enacted/ 2011 CR	2012 * Fixed Costs & Related Changes (+/-)	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Science Support ($000)	69,225	69,225	14,647	-1,461	-2,791	79,620	10,395
FTE	*378*	*378*	*56*		*-18*	*416*	*38*
Security and Technology ($000)	26,263	26,263	-78	-563	-4,550	21,072	-5,191
FTE	*89*	*89*	*0*		*-34*	*55*	*-34*
Information Resources ($000)	19,706	19,706	32	-425	-3,450	15,863	-3,843
FTE	*116*	*116*	*0*		*-35*	*81*	*-35*
Total Requirements ($000)	**115,194**	**115,194**	**14,601**	**-2,449**	**-10,791**	**116,555**	**1,361**
Total FTE	***583***	***583***	***56***		***-87***	***552***	***-31***

* Fixed costs and related changes include technical adjustments ($8.8 million), management efficiences, and $5.9 million in separation costs. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• IT Security and Technology (Security & Technology)	-2,500	-28
• Information Resources (Information Resources)	-1,500	-21
• Science Support Reduction to Working Capital Fund (Science Support)	-261	0
• Administrative Services Reduction (Science Support)	-2,180	-12
• Regional Executives Staff Reduction (Science Support)	-350	-6
• Information Technology Reduction to Working Capital Fund (Security & Technology)	-650	0
• Information Technology Infrastructure (Security & Technology)	-620	-6
• Information Technology “Big 9” Reduction (Security & Technology)	-780	0
• Biology Libraries (Information Resources)	-1,100	-12
• Enterprise Publishing Management (Information Resources)	-850	-2
TOTAL Program Changes	**-10,791**	**-87**

Justification of 2012 Program Changes

The 2012 Budget Request for Administration and Enterprise Information is $116,555,000 and 552 FTE, a net program change of -$10,791,000 and -87 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Program Changes

IT Security and Technology **(-$2,500,000/-28 FTE)**

The need for USGS science continues to evolve as do the technological requirements, The USGS anticipates technology costs will increase and decrease in a commensurate manner relative to programmatic needs. As a result, in 2011, the program is implementing a new cost model for national technology services such as e-mail, Web, storage, bandwidth, directory and Information Technology (IT) security services that will balance dispersion of cost commensurate with service utilization. In support of this action, the IT Security and Technology program will restructure its workforce and services to create a flexible workforce and service offering that can be incrementally mobilized for science program needs. This action will result in a reduction in force of an estimated 28 Federal employees and reduced funding for contract and student positions.

Information Resources **(-$1,500,000/-21 FTE)**

The Enterprise Information Resources program includes the functions of science education, library services, information product distribution, public inquiry, and science quality oversight. This proposed reduction would eliminate 90 of the proposed 175 science education internships. This reduction would reduce the EIR education and internship activity resulting in reduced training for new jobs, a smaller increase in under-represented youth in the sciences, and educational opportunities in earth science. Tribal training will continue at the 2010 level.

Science Support Reduction to Working Capital Fund **(-$261,000/0 FTE)**

The USGS's contribution to Interior's centralized Working Capital Fund has been reduced by $261,000 for non-IT services.

Administrative Services Reduction **(-$2,180,000/-12 FTE)**

The Science Support subactivity provides funding to support the administration and management of the USGS. The proposed to reduction would reduce funding provided for staffing and costs in the Director's Office; the Office of Communications and Publishing; the Office of Budget, Planning, and Integration; the Associate Director for Human Capital; as well as the Office of Administration and Enterprise Information. Bureau, Department, Executive Branch and congressional services provided by these offices will decrease as a result, and AEI would reduce internal control reviews and monitoring processes and participation on Interior and Government wide forums.

Regional Executives Staff Reduction **(-$350,000/-6 FTE)**

The USGS proposes to eliminate positions from existing field services offices that are planned to be realigned in 2011 to support Regional Executives. These services will be provided by central offices on the east and west coasts.

Information Technology Reduction to Working Capital Fund **(-$650,000/0 FTE)**

The Interior WCF provides various information and technology management services to the USGS. The USGS proposes to reduce funding for the Security and Technology subactivity of the Interior Working Capital Fund. Interior has reduced the centralized WCF bill.

Information Technology Infrastructure **(-$620,000/-6 FTE)**

The Security and Technology subactivity supports the advanced scientific computing needs of the USGS and Interior. Functions include information management, security and information technology to ensure compliance with Federal IT mandates. The proposed reduction would diminish current efforts to extend collaboration and access to USGS science and resolution of IT security weaknesses. This reduction would be achieved through leveraging economies of scale and implementing appropriate assessment rates to manage these activities in a more proactive and efficient manner. Projects affected in 2012 include efforts to reduce the backlog of approximately 5,500 Plan of Action and Milestones (POA&M) and recertification of the USGS Scientific and Infrastructure support systems.

Information Technology "Big 9" Reduction **(-$780,000/0 FTE)**

The USGS proposes to eliminate the funding provided for the past four years to Interior's Security and Technology effort for Interior wide initiatives ("The Big 9"). The "Big 9" included projects to improve IT compliance, security, and IT services and support. These projects have been completed.

Biology Libraries **(-$1,100,000/-12 FTE)**

The USGS has maintained specialized libraries at 12 USGS science centers which focus on ecosystem and environmental research. The reduction would eliminate support to these libraries. Scientists would lose direct access to research material, specialized journals, and research librarian support. Research materials and library assistance would be available to scientists through the USGS library system.

Enterprise Publishing Management **(-$850,000/-2 FTE)**

The USGS has centralized its publishing needs through the Enterprise Publishing Network. This reduction will eliminate support provided by the Information Resources subactivity to the Network. This will require increased efficiencies, staff reductions, and reduced product distribution support. Increased product prices would help offset funding reductions but may result in decreased sales volume, thereby reducing the number of products distributed to the public. This budget reduction will decrease availability of USGS science products, such as maps and reports, to the public. Information on this decrease can be found in the Key Changes Section.

Activity Summary

In 2012, the Science Support and Enterprise Information subactivities are consolidated to form the Administration and Enterprise Information activity, which has three subactivities: Science Support, Security and Technology, and Information Resources.

The AEI activity provides the framework for the conduct of science. AEI includes executive leadership; organizes and conducts planning and budgeting, provides policy guidance and direction; implements, monitors and enforces statutory requirements; manages people, funds, facilities and information technology; ensures scientific rigor and integrity, and communicates our mission and science to the Congress and public. Bringing these activities together is part of the realignment of the Bureau into mission areas, and increases opportunities for collaboration

between the areas that frame, support and enable science. AEI activities contribute to the 2011-2016 Interior Strategic Plan focus, Building a 21st Century Department of the Interior.

Activity: Administration and Enterprise Information
Subactivity: Science Support

2010 Enacted: $69.2 million (378 FTE)
2011 CR: $69.2 million (378 FTE)
2012 Request: $79.6 million (416 FTE)

Budget Realignment

In 2010 and 2011, Science Support is a subactivity of the Administrative and Policy Services activity. In 2012, the subactivity is proposed to move to a subactivity in the Administration and Enterprise Information mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

Science Support funds the executive and managerial functions of the USGS, as well as Bureau support services. Science Support has the following components: the Offices of the Director; Budget, Planning, and Integration; Communications and Publishing; Science Quality and Integrity; Administration and Enterprise Information; Human Capital; and Bureau wide costs. Key indications of USGS performance are reflected in its goals for increasing accountability and advancing modernization and integration.

The Office of the Director

The Director of the USGS serves as Chief Executive Officer of the USGS with ultimate authority for all strategy, policy, and program decisions. This includes direct involvement in program, budget, finance, and communications development. The Deputy Director serves as Chief Operating Officer supporting the Director in implementing policy decisions, with a focus on operational issues.

The Executive Leadership Team is composed of 27 senior policy-level leaders of the USGS including the Director and Deputy Director, Associate Directors and Regional Executives. It identifies issues of interest and concern to the USGS as a whole and functions as a senior advisory body to the Director and as the principal mechanism for building an interdisciplinary culture.

Associate Directors have oversight of national programs, establish program direction and goals, and serve as science advisors to the Director in their respective program areas. Regional Executives are largely responsible for translating discipline-based programs from headquarters into interdisciplinary projects on the ground and provide executive oversight and management for the science centers in their areas.

The Office of Budget, Planning, and Integration (BPI) reports to the Director and provides Bureau-level advice and staff assistance to the Director and executive leadership. This advice includes Bureau wide policy, guidance, and direction for:

- Budget formulation, execution, presentation, and advocacy with the Department of the Interior, Office of Management and Budget, and Congressional Appropriations Committees; and
- Strategic planning, performance management and management analysis.

Comprised of three teams—the Budget Team, the Planning Team, and the Integration Team—the BPI integrates budget and performance to help the USGS continue as a high performing organization. The Budget Team provides guidance to senior managers to formulate annual budget requests, integrate budget and performance metrics, and communicate proposals to Interior, OMB, and the Congress. This team has primary responsibility for producing annual Budget Justifications. The Planning Team develops awareness and understanding and recommends strategy to ensure USGS compliance with Executive and Legislative Branch mandates for budget and performance integration and program performance accountability to preserve the public trust. This team has primary responsibility for coordinating planning related to the DOI Strategic Plan. The Integration Team conducts organizational analyses, coordinates internal controls, monitors the working capital fund, conducts budget execution activities, and performs data systems synthesis. This team has primary responsibility for developing comprehensive management analyses that advance informed decision making.

The Office of Communications and Publishing (OCAP) reports to the Director and provides Bureau-level advice guidance and support to the Director and the Executive Leadership Team, USGS Programs, and USGS Science Centers on communications and publishing matters related to USGS research, programs, activities, and products.

The OCAP formulates and oversees policy related to communications and ensures close coordination between the USGS and the Congress, Interior, and other Bureaus for congressional, internal, and public affairs matters. The OCAP uses state-of-the-art technology to provide the Bureau with proactive, targeted communication guidance and support strategies to keep key audiences, including the White House, Congress, Interior, other Federal agencies, the news media, partners, customers, academia, industry, non-governmental organizations, USGS employees, and the public informed about the value, relevance, and status of USGS activities, programs, and research.

The OCAP formulates and oversees policy related to scientific publishing and ensures the Bureau's scientific and technical publications are of the highest quality, timely, and rigorously reviewed. The OCAP provides text and map editing, cartographic, illustration, layout, Web development, and ADA-compliance services for all USGS authors to ensure that decision makers at the Federal, State, local, tribal, and international levels are able to use USGS science information to make informed and timely decisions on issues such as climate change and land use, energy and minerals, water quality and quantity, natural hazards, ecosystem change, and wildlife and human health.

The Office of Science Quality and Integrity (OSQI) monitors and enhances the integrity, quality, and health of USGS science. The office has oversight for implementation of the USGS Fundamental Science Practices (FSP); the evaluation and review of employees and programs; implementation of education and development programs; and Native American scientific and liaison activities. Under the FSP component, the office implements and ensures compliance of

policies and procedures related to the planning, review, approval, and release of USGS science information products as well as managing the Information Product Data System (IPDS), which tracks development of information products from planning through dissemination and supports FSP compliance. It also ensures adherence to OMB and Departmental information quality and peer review requirements as directed under the Information Quality Act. The reputation for scientific excellence, reliability, integrity, and objectivity is one of the USGS's most important assets and brings authority to data and findings, creates and protects long-term credibility, and ensures the public trust is met.

The evaluation and review of employees and program component of the office administers the evaluation processes for USGS research, development, and senior scientists. It provides monitoring and oversight of internal and external review of USGS science programs and supports implementation of USGS quality and award programs that promote science excellence. The education and development component of the office is devoted to strengthening the Earth and biological sciences through educational outreach, internships, postdoctoral fellowships, scientist emeritus, and youth programs. The Native American scientific and liaison component of the office facilitates USGS science activities with Native American governments, organizations, and people. The USGS recognizes the importance of Native knowledge and living in harmony with nature as it complements the USGS mission to better understand the Earth.

In 2011, the USGS Office of Science Quality and Integrity consolidated into one office the activities described above and implemented them in a Bureau wide context, maximizing the quality, objectivity, utility, and integrity of USGS science and science products. It reviews and revises fragmented policies for employee evaluation and development, improves implementation of OMB and departmental information quality and peer review requirements as directed under the Information Quality Act, and reviews and revises the USGS Scientific Integrity Policy.

The Office of Administration and Enterprise Information (AEI) reports to the Deputy Director and provides Bureau level policy, program direction, and leadership for accounting and fiscal management; general services and office support; security; safety and occupational health; contract negotiation and administration; grant administration; technology transfer; facilities and property management; environmental protection; and business information systems management. The Associate Director for AEI also serves as the USGS Chief Financial Officer, USGS Designated Agency Safety and Health Official, and policy lead for information technology.

Office of Accounting and Financial Management (OAFM) consists of the branches of Accounting Operations, Systems Coordination, and Fiscal Services. The Accounting Operations Branch provides Bureau wide financial management and administrative support for payments, collections, and travel. The Systems Coordination Branch provides technical support, training and management control for users of the Federal Financial System. The Branch of Fiscal Services provides Bureau oversight and monitoring of fiscal programs, financial operating procedures, and allocation management in coordination with field fiscal services staff. Together they provide advice, formulation, and direction of Bureau wide accounting and financial management designed to meet management needs to achieve program objectives and to ensure full compliance with applicable laws and regulations.

Office of Management Services (OMS) provides staff advice, direction, and guidance on space and facilities management, security, property management, environmental protection,

supply management, and other administrative services programs. This office formulates policies and procedures for implementation Bureau wide and provides staff advice and assistance to the Associate Director, AEI. The OMS Chief serves as Bureau facilities program coordinator.

Office of Policy and Analysis (OPA) manages the USGS directives system including the Survey Manual, Handbooks, and Instructional Memoranda. The Office manages the USGS Technology Transfer program, including preparation, review, and approval of Cooperative Research and Development Agreements and Technology Assistance Agreements; evaluation of USGS inventions for patentability and commerciality and preparation of patent applications and non-disclosure agreements; and execution of non-exclusive, exclusive, and partially-exclusive licenses to companies interested in marketing, manufacturing, or using USGS developed technology. The OPA also reviews non-standard cooperative and reimbursable agreements for compliance with statutory and regulatory requirements.

Office of Acquisition and Grants (OAG) has primary responsibility for the effectiveness and integrity of the USGS acquisition and financial assistance functions management of operational acquisition and financial assistance support to headquarters and national programs. Included among its responsibilities are: promulgating acquisition and financial assistance related directives; appointing Contracting Officers and Contracting Officers Representatives; measuring performance and evaluating Bureau acquisition and financial assistance functions; advancing, managing and reporting on the Business Economic Development program, including socio-economic goals; managing the Bureau Charge Card program, including administration of the purchase business line; and managing and providing operational support to acquisition and financial assistance automated systems, including Interior's Financial Business Management System.

Office of Internal Control and Reporting (OICR) evaluates the adequacy of resource internal controls in the USGS, including effectiveness of existing policies and procedures and operational activities. The OICR is responsible for internal and external financial reporting for the Bureau. The OICR develops procedures to ensure USGS compliance with OMB Circular A-123 and manages submission of annual assurance statements for acquisitions, financial assistance, property management, and facility health and safety. In addition, the OICR assists with evaluation of internal practices and policy changes on topics relevant to all USGS operations. The OICR also maintains the integrity of the USGS general ledger, developing reports using cost accounting models, reporting to Treasury and Interior, and producing the USGS contribution to Interior's Agency Financial Report (AFR). The OICR works closely with BPI-PPM in implementing A-123 and contributing to the AFR.

Office of Business Information Systems (OBIS) supports Interior and USGS automated resource management systems and electronic processes. This includes the analysis, design, development, testing, implementation, documentation, user training, operations, maintenance, and user support for financial, personnel, facilities, and property- and vehicle-management systems. The OBIS provides support for all operational aspects of the USGS implementation of Interior's Financial and Business Management System (FBMS). In addition, the OBIS develops and maintains the Budget and Science Information Plus (BASIS+), the standard Bureau wide automated project information system that supports science, project planning, and project budgeting and reporting throughout the USGS. The OBIS also manages interfaces between FBMS and BASIS+, provides Security Point of Contact and liaison duties for the Federal Personnel Payroll System and Quicktime, and develops automated reports and processes. The OBIS is responsible for and performs

required Management Control Reviews, Security Reviews, Privacy Act Information evaluations, Systems Testing and Evaluations, and Certification and Accreditation of administrative business applications.

Office of Human Capital (OHC) provides Bureau level leadership, program direction, and staff support for human capital programs, including ethics, equal employment opportunity, diversity and affirmative employment programs, personnel management policy and operations, employee development, competency management, and technical, managerial and leadership training and development.

Bureau Wide Costs

Bureau sustaining costs are centrally budgeted. The budget is formulated annually based on past actual expenses and an estimate of future need. Certain essential program support costs are not controlled by the USGS and, because of the nature of organization and billing arrangements, are more effectively and efficiently managed centrally (e.g., payments for services provided through Interior's Working Capital Fund for department wide centralized services, payments to Interior's National Business Center (NBC) for administrative systems, and automated data processing services provided through the NBC Working Capital Fund). Other Bureau-level costs include: payments to Interior for Department of Labor unemployment compensation and ongoing injury compensation costs; and USGS administration of six specialized safety (aviation, scuba diving, firearms, large vessel, radiation, watercraft) programs including enhancements to DOI Learn online safety and health training, holding regional collateral duty workshops, and joint Interior–USGS implementation of exposure monitoring and medical surveillance programs.

2012 Performance

Highlights of USGS efforts, including initiatives, Bureau level policy, program direction, and leadership activities in 2010 and 2011, and how these efforts relate to planned program performance in 2012 follow:

Office of Budget, Planning, and Integration – In 2010, the USGS Director began efforts to align the Bureau's management and budget structures with the Science Strategy. The Office of Budget, Planning, and Integration (BPI) led efforts to crosswalk the current budget structure with one that aligns to the themes of the Science Strategy and to receive congressional approval for the management realignment. BPI staff also led the development of the Science Mission in the revision of the Department of the Interior's Strategic Plan. The Science Mission parallels the Bureau's move to align its management and budget structures with the Science Strategy. Performance measures for the Interior Strategic Goal Plan have been revised and in some cases new measures developed by the USGS were created that will provide meaningful information for decision makers and provide greater accountability. Efforts to determine the cost of meeting targets are nearing completion. BPI staff has been actively involved in developing both High Priority Performance Goals and targets to respond to OMB's guidance.

The USGS is proposing a new budget structure be implemented with the 2012 Appropriation. BPI staff will develop the documentation to guide this transition. As the Bureau transitions from a discipline-based approach to a theme-based approach in delivering science, BPI is being asked to assume leadership in assisting the Science Strategy areas in developing science plans which link to the Bureau's strategic plan goals. To assist Bureau leadership in decision making, BPI will begin more detailed management analyses of USGS programs and practices.

Financial Management – The USGS successfully implemented the Financial and Business Management System (FBMS) in November 2010. It is the key to Interior's financial management modernization strategy and meeting future business needs. Implementation of the FBMS allows the USGS to benefit from common processes, a common technology platform, integrated real-time data, and improved operational decision making. In tandem with implementation of the FBMS, the USGS performed a complete review and revision of financial policies, business practices, and Bureau procedures. In 2010 and 2011, the USGS worked to leverage capabilities of FBMS to frontline, cost center, regional, and headquarters managers to provide them the ability to quickly and accurately track and forecast financial status of individual projects, cost centers, and programs. The USGS is included in Interior's consolidated audit process and does not receive a Bureau level independent auditor's report. During 2009, independent auditors identified weaknesses with USGS IT controls, included in Interior's significant deficiency relating to IT controls over financial management systems. In 2010, the USGS implemented additional IT controls, resulting in substantial reductions in audit findings in this area. In 2012, the USGS will continue to improve financial management activities.

Real Property – Improving policy, guidance, and facility planning continues as the mainstay for establishing management processes, tools, concepts, and context for pursuing effective and economic real property asset management. Building on the 2011 alignment of the Bureau Asset Management Plan, updated regional and science center Site Specific Asset Business Plans, and with the most recent departmental guidance, the USGS updated its Strategic Facilities Master Plan. In 2012, pursuit of strategic facility investment opportunities based on integrated science and facility planning will re-examine mission asset priorities, focus on utilization improvement objectives, and target disposal of unneeded assets. A major initiative to improve space usage is examination of the long-term benefits of expanded teleworking and a hoteling strategy that promotes progress on Bureau space and sustainability goals.

Transportation Management – In 2012, the USGS will continue to work toward meeting its transportation management and petroleum goals. Information obtained from the 2010/2011 Fleet Inventory and Utilization Data Validation effort will be analyzed to form recommendations to Cost Center Managers, optimizing placement of vehicles to increase vehicle sharing and the use of alternative fuels. The USGS will work to implement long-term goals of the Fleet Management Strategic Plan. A Fleet Acquisition and Replacement Plan was implemented in 2010, and subsequently expanded as a strategy for acquiring higher fuel economy vehicles and eliminating growth in the USGS fleet; in 2012, it will serve as the template for adding more alternative-fuel and hybrid vehicles.

Energy Efficiency and Environmental Management – In 2012, the USGS will continue to work to achieve the goals of the Energy Independence and Security Act of 2007, and Executive Order No. 13514, of October 5, 2009, *Federal Leadership in Environmental, Energy, and Economic Performance*. The USGS will sustain the current reduction of 26 percent in energy intensity at all facilities compared with the 2003 baseline. This reduction exceeds the percent reduction target established for 2011. Also, the USGS is on track to reduce water intensity by ten percent compared with the 2007 baseline, and to exceed the goal of eight percent for 2011. To the extent practical and technically feasible, the USGS will obtain a minimum of five percent of our electricity from renewable sources, with two-and-a-half percent from new renewable sources. In 2012, the USGS will continue work related to goals established in 2003, using mission-focused Environmental Management System tools that became operational in 2011. Achieving environmental goals outlined in Executive Order No. 13514 remains a high priority. Along these lines, a 2011 greenhouse gas (GHG) emissions inventory established a baseline against which to measure progress to curb emissions for stationary sources like owned facilities

and for Government vehicles, employee commuting, and official travel. A USGS master plan is in place that encourages GHG emission reductions and outreach efforts. The USGS will continue to systematically manage environmental risks while minimizing cost to improve performance and to enhance cooperation with our many stakeholders, partners and the public.

Safety and Health – The Occupational Safety and Health Act of 1970, required establishment of a safety and health program to reduce work-related personnel injuries, illnesses and associated lost production, wages, medical expenses and disability compensation payments. The USGS national program administration for this function is provided by AEI with staff oversight of the specialized safety program, Bureau and region-based policy development, program assessment, compliance inspections, industrial hygiene guidance, and training and educational support services.

In 2012, the USGS will conduct field program assessment and compliance inspections in accordance with OMB Circular A-123 to:

- Reduce significant safety and health findings and deficiencies defined by new DOI Risk Assessment System Risk Assessment Codes and linked to the Five-Year Deferred Maintenance and Capital Improvement Plan;
- Implement Radiation Safety program enhancements;
- Conduct joint Interior–USGS implementation of exposure monitoring and medical surveillance programs;
- Enhance DOI Learn online safety and health training; and
- Hold collateral duty safety officer workshops.

Technology Transfer – The Federal Technology Transfer Act, 15 USC 3710 as amended, requires each Federal laboratory having 200 or more full-time scientific, engineering and related technical positions to establish a research and technology application function. Within the USGS, this function is housed in the Office of Policy and Analysis where staff service USGS Science Centers and offices throughout the country. In 2012, the USGS will continue negotiating and drafting Cooperative Research and Development Agreements (CRADAs), Technical Assistance Agreements, Facility Use Agreements, Material Transfer Agreements, and Patent Licenses. This office also manages the USGS intellectual property and inventions program; markets USGS technology opportunities and assistance to industry, non-profits, academic institutions, and State agencies; and provides training to USGS personnel on technology transfer and intellectual property protection. At the end of 2010, the USGS held 58 current patents. During 2010, the U.S. Patent and Trademark Office accepted filings for three new USGS patent applications and issued four patents to the USGS. The table below page summarizes the number of projects in 2010.

Technology Transfer 2010	Total Number	Private	Non-Profits/ Academic Institutions	Government/ International Entities	Partner Contributions ($000)	USGS/In-Kind Contribution ($000)
CRADAS	6	3	1/0	1/0	663	188
Other Technology Agreements	94	21	14/10	6/9	3,735	150
Patent Licenses	24	19	0/5	0/1	81	0

USGS science and research contributes to a broad range of valuable collaborative projects in the private and academic sector. With expansion of its facility use program, the USGS has increased to 27 the number of specialty analytical laboratory services providing unique capabilities to the United States, foreign partners, and academia. The total number of user agreements executed during 2010 was 180.

Human Capital – The USGS uses a systematic workforce planning approach as the foundation for developing detailed workforce plans at the science center and office level. The Bureau's mission and science strategy define what work needs to be accomplished. The workforce planning process, informed by the Department's strategic plan and the Bureau science strategy, translates USGS strategic goals into future functional requirements of the workforce. The USGS will continue to work with managers in offices, science centers, and regions to conduct workforce analyses and planning. Additionally, the USGS will implement a succession planning strategy to complement the workforce planning model to take a strategic approach to human capital management and planning. The following resources are intended to assist in developing a comprehensive Bureau workforce plan:

Leadership Development – The USGS will continue developing leadership skills and behaviors at all levels of the organization. In 2010, the leadership development program expanded to include a new cadre of leadership, comprised of USGS Leadership program graduates. In addition to internal training focused on leadership skills, the USGS has enhanced its internal supervisory development program. A supervisory mentoring component was successfully implemented in 2010, and in 2011 the USGS continues to offer new supervisors a seasoned mentor to help support them in their supervisory performance. Additionally, work is being done collaboratively among Human Capital Offices within Interior to design a supervisory training and development program for probationary supervisors that could be used by any Bureau within Interior. Part of the program is being piloted in 2011. In 2012, implementation of the program will include distance learning and face-to-face components. In 2010, the Mentoring program expanded to offer continuous and transition mentoring; in 2011, e-mentoring is being piloted.

Competency Management – In 2010, the USGS continued to work with Interior to develop a methodology for conducting competency studies that build models and inform decision making within human resource systems. The USGS initiated development of competency models and conducted baseline assessments on modeled occupations and roles. Currently Interior's Competency Management team is developing models for the Acquisition, HR, IT occupations, and Leadership attributes. Competencies for technical occupations such as Geology and Hydrology will be developed in the next phase. The USGS will continue to work with Interior to identify system requirements to embed competencies in talent management and HR systems. The USGS uses competencies in management of human capital operations.

Workforce Diversity – Improving workforce diversity is a priority for the USGS and part of the workforce planning process. The USGS implements strategies to comply with requirements of the Equal Employment Opportunity Commission's Management Directive (MD)–715, particularly with respect to identifying barriers to diversity and affirmative employment goals. In 2010, the Bureau eliminated two of the three deficiencies identified during the 2009 MD-715 review and analysis process. For 2012, the USGS will continue to implement existing strategies and develop new strategies to comply with requirements of MD-715 and improve diversity of the USGS workforce.

The USGS Office of Equal Opportunity will continue posting workforce demographic information to help HR and line managers identify trends and recruitment opportunities. The USGS will use its Diversity Council to help identify barriers to diversity and recommend solutions to management. The USGS will also direct recruitment efforts and fiscal resources to establish relationships with local colleges and universities with large numbers of minority students and majors related to USGS programs. Finally, the USGS will focus on goals measured by outcomes in recruitment, retention, zero tolerance for illegal discrimination, and accountability.

This page intentionally left blank.

Activity: Administration and Enterprise Information
Subactivity: Security and Technology

2010 Enacted: $26.3 million (89 FTE)
2011 CR: $26.3 million (89 FTE)
2012 Request: $21.1 million (55 FTE)

Budget Realignment

In 2010 and 2011, Security and Technology is a subactivity of the Enterprise Information activity. In 2012, the component is proposed to move to a subactivity in the Administration and Enterprise Information mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Security and Technology subactivity supports advanced scientific computing needs of the USGS and the Department of the Interior information, security, and information technology (IT) programs. The Information Security component ensures compliance with Federal IT mandates and is responsible for electronic security of and access to all USGS data and information assets. The Telecommunications and Computing infrastructure components provide Bureau level centralized management and operation of the USGS telecommunications, including voice, data and radio telecommunications services and management and operation of the Bureau's computing infrastructure (including electronic mail, computer help desks, scientific instruments, directory services, e-authentication, data center management, collaborative tools, applications services). The Information Management component supports federally mandated information activities such as Records Management, Capital Planning, and Privacy, and Freedom of Information Act (FOIA). The USGS DOI Enterprise Services component includes all USGS contributions to the centralized departmental IT working capital funds.

2012 Performance

The Security and Technology program supports advancing modernization and integration through improving information security, telecommunications, and information management.

On December 14, 2010, the Secretary signed Secretarial Order No. 3309, "*Information Technology Management Functions and Establishment of Funding Authorities*." The Secretarial Order fundamentally restructures the information resource management program in Interior, realigning information resources, information technology (IT) programs and infrastructure under the Interior Office of the Chief Information Officer (OCIO). As a result of this change, Bureau-level CIOs have a new designation: Associate Director for Information Resources (ADIR). IT resources and funding within the organization will be realigned in 2011 and 2012 to the Interior OCIO.

To accommodate the $5.2 million reduction in 2012, the Security and Technology program will delay planned technological refresh and implement an assessment model relative to science program utilization of national technology services such as e-mail, Web, storage, bandwidth, directory and IT security services. This new cost model will balance dispersion of cost with service utilization. In support of this action the Security and Technology program will restructure to create a flexible workforce and service offering that can be incrementally mobilized in support

of science program needs. This action will result in a reduction-in-force of an estimated 34 Federal employees and reduced funding for contract and student positions.

Information Security
(2010 Enacted, $6.1 million; 2011 CR, $6.1 million; 2012 Request, $2.9 million)

The Information Security component ensures compliance with Federal Information Security Management Act (FISMA) and other Federal laws directing IT security. The program is responsible for protecting USGS information assets from domestic and foreign threats.

Like other Federal agencies with numerous public-access Web sites, the USGS has experienced a large increase in IT-related threats. Over the past several years computer security incidents in the USGS have increased by more than 400 percent. Network protection devices logged an average of 12 million attacks on the USGS network per month over the past several years. The USGS also experienced an increase in network probes from external entities, including foreign governments, attempting to circumvent security controls to illegally acquire data and potentially infect systems with malicious code.

In 2009, the USGS created a proactive Information Security Strategic Plan (ISSP) using prescribed areas of concern resulting from the 2008 information security program review. The strategic plan contains dynamic tactical objectives for improving information security in the USGS. A Science Advisory Council helps align IT security requirements with science systems to improve information security while minimizing impact to USGS science missions.

In 2012, implementation priorities of the Information Security Strategic Plan (ISSP) include:

- Institutionalizing continuous monitoring;
- Increasing use of common controls; and
- Optimizing technical services to assure operational and technical security controls are implemented according to Federal standards.

IT security control weaknesses will continue to be documented and managed in a POA&M process.

IT Security Certification and Accreditation (C&A) – The Federal Information Management Security Act (FISMA) requires Federal IT systems be reviewed for IT security compliance prior to operation and be reauthorized every three years using the National Institute of Standards and Technology (NIST) guidelines. USGS has 11 systems that meet this requirement. Five of the 11 systems are scheduled for Certification and Accreditation (C&A) activities for reauthorization to operate in 2012. These systems are: Advanced National Seismic System, Enterprise Common Security Controls System, Enterprise Web, National Water Information System, and the Science and Support System-Moderate. The Science and Support System-Moderate is the largest of these C&A activities, which spans more than 400 physical locations. In addition, Security and Technology will validate compliance with continuous monitoring activities for the remaining six systems to ensure risk levels are maintained in accordance with their operational authorization. In 2012, the C&A cost associated with these activities will be assessed to each of the 11 programs.

Common Security Controls – In 2009, the USGS initiated a project to establish common security controls to more efficiently manage risk. In 2010, the USGS completed Phase II of the

Common Security Controls initiative geared toward enhancing both certification and accreditation processes and operational security. As a result, 120 common controls were identified by the USGS that when fully implemented will enhance its performance by:

- Assessing common security controls at the organization level;
- Enhancing efficiency of the security C&A conducted by the organization and significantly reducing security program costs;
- Consistently applying security controls across the organization; and
- Realizing a significant savings in the security C&A process.

In 2011, an estimated 60 of the 120 identified common controls are being integrated across the enterprise to provide cost effective threat management. At the 2012 reduced level of funding, 10 of the remaining 60 additional common controls will be implemented.

Continuous Monitoring and Enhanced Countermeasures – In 2012, the Security Operations Team will maintain and expand security controls to include enhanced vulnerability identification and remediation tools, additional deployment of security controls though enterprise services, and provide support to identify additional USGS common security controls. In 2011 and 2012, enterprise security tools will be streamlined to provide improved deployment of common security controls resulting in additional cost efficiency through enterprise purchases.

POA&M Remediation – In accordance with OMB guidelines, the POA&M report identifies information security weaknesses and document tasks necessary to correct or mitigate those weaknesses. In 2010 and 2011, the USGS made considerable progress closing out 50 percent of the backlogged POA&Ms. In 2012, Security and Technology will continue a POA&M remediation activity to materially reduce the backlog of active POA&Ms. In 2012, POA&M remediation to reduce the backlog will be scaled back from the planned closure of an additional 25 percent to 10 percent as a result of the proposed reduction.

Telecommunications
(2010 Enacted, $8.0 million; 2011 CR, $8.0 million; 2012 Request, $3.7 million)

High speed, reliable voice, video, and radio networks connect USGS science missions. Over the past 15 years, the USGS has experienced a marked increase in demand for Internet bandwidth for data, voice and video services. The USGS science community has taken maximum advantage of integrating complex communications capabilities to proactively—and in real time—monitor scientific sensors across the country. For example, the USGS WaterWatch program monitors thousands of streamflow water sensors remotely and in real-time. The USGS, in cooperation with more than 800 State, local, and other Federal agencies, operates approximately 7,000 continuously active streamflow measurement and data collection sites, called streamgages. Almost 5,000 of the USGS's approximately 7,000 streamgages are equipped with telemetry that transmits a reading of stream depth ("stage") to a district office via satellite or telephone. This "real-time" data is used for a multiplicity of purposes: including flood hazard mitigation by the National Weather Service, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency; and for resource planning, and infrastructure design of reservoirs and dams.

In 2012, the USGS Telecommunication Infrastructure program will focus on integrating new collaboration technologies, optimizing capacity, enabling a virtual workforce, and increasing use of wireless resources. Strategic initiatives described below will focus on increasing efficiencies

in order to meet goals for providing a robust telecommunication infrastructure and improving communication and collaboration resources available to the science mission despite decreased funding.

Radio – The radio program provides guidance and standards for design, construction, operation and maintenance, inspection, acquisition and safety of radio communications systems. The USGS owns and operates approximately 11 percent of all radio equipment within the Department of the Interior. In 2011, and 2012, the radio program will continue to inspect electronic sites including leased, joint tenant, and owned sites to move toward compliance with standards and safety requirements and begin remediation of critical radio assets, as appropriate. As there is no centralized funding to perform these inspections, science program dollars will need to be used to perform this required activity in the field. Additionally, the USGS plans to initiate a small pilot of advanced radio-over-Internet technologies to extend science capabilities to support advanced monitoring of national hazards, water availability, ecosystem and environmental impacts, wildlife and human health impacts. Also, it is likely that the USGS will need to begin an engineering assessment of the impact on science mission-related activities of further radio spectrum reallocation. Existing funding is not available for this activity, nor for any anticipated relocation and would need to be acquired.

Trusted Internet Connection (TIC) – In 2011, the USGS is working toward ensuring that all circuits are in compliance with OMB and DHS's TIC mandate requiring that all Government Internet traffic flow through TIC compliant gateways for security inspection. Work continues on the identification of all circuits and the compilation of a comprehensive inventory. In 2012, the USGS will work to ensure that all locations are brought into compliance or are addressed via POA&Ms. Due to limited resources available for some of the extensive changes that may be needed, particularly where USGS sites are co-located on university campuses, waivers may need to be requested.

Video Communications – The geographically distributed nature of the USGS requires video services to ensure adequate communication among USGS scientists and stakeholders. During 2011, the USGS is integrating streaming and conferencing services into an integrated video infrastructure. In 2012, the program will work to add USGS sites to the streaming video service and work to extend transmission of live video to individual employee desktops. A key limiting factor in the exploitation of this technology to take full advantage of its capabilities continues to be the aging telecommunications infrastructure in place at many field sites. Also, life cycle funding will need to be secured for the new infrastructure.

Wide Area Network Optimization – The scientific and geospatial missions generate terabytes of information on a daily basis that places significant demands on the USGS network. Through this initiative in 2011 and 2012, the USGS will implement state-of-the-art network compression and network acceleration resources to expand capacity of the USGS network without increasing recurring circuit costs. It also is anticipated that the award of the Networx data contract will afford some cost savings, although some increased costs may be experienced in the short term due to the expiration of the FTS 2001 contract prior to the new award.

Voice Optimization – The USGS is modernizing its aging voice infrastructure that supports traditional and mobile voice communication requirements. In 2012, the USGS will expand an integrated voice infrastructure in support of a virtual office to better serve the mobile and teleworking workforce. This will form the basis for a future environment that would allow USGS scientists anywhere in the country to be seamlessly connected to their peers, provided sufficient

funding were available for implementation. Also, continued periodic investment will be needed to ensure support of life cycle costs.

Computing Infrastructure
(2010 Enacted, $12.2 million; 2011 CR, $12.2 million; 2012 Request, $5.1 million)

As a scientific organization, the USGS uses computing resources to support advanced research, monitoring, modeling, mapping, and decision support tools for policy makers, decision makers, resource managers, and the public. Digital delivery of scientific information facilitates rapid dissemination to stakeholders' issues related to natural hazards, water availability, global change, ecosystem impact, and environmental, wildlife and human health impacts. The Computing Infrastructure component provides the USGS with a uniform scientific and office automation infrastructure for mission delivery. Computing Infrastructure provides IT services for over 30,000 scientific and computing resources to more than 13,000 USGS scientists, administration staff, volunteers, and emeritus employees. These services include project management, technology acquisition, technical specifications, standards, directory services, hosting services, office automation tools, software applications, mobile computing devices, computing hardware, directory services, asset management, enterprise license, help desk, electronic mail, backup, business continuity, collaboration services, desktop applications and integration of scientific instruments and computing resources.

Technical Support Teams – Computing Infrastructure manages technical support teams (TST) that facilitate integration and implementation of standards for Microsoft Windows, Macintosh, and Unix operating system environments to meet administration and scientific computing needs. In addition, these teams provide leadership for implementation of IT configurations, security controls, applications, remote access, databases, and Web services to promote excellence in development, implementation, and continuous improvement by establishing "best practice" procedures for deployment.

Collaborative Communications Infrastructure (CCI) – CCI is a suite of software tools that facilitate collaboration and knowledge and data sharing within the USGS and with USGS customers. In 2010 and 2011, staff modernized the infrastructure capabilities to support extended scientific computing needs that create efficiencies and take advantage of Web 2.0 features. In 2012, the CCI will provide integrated, secure, and robust tools that facilitate administration and science delivery.

Enterprise Active Directory (EAD) – EAD is the foundation and source for ensuring integration and interoperability of the complex scientific application, computing devices, and technology resources in the USGS. The EAD provides a consistent technical architecture to assist the USGS in complying with regulatory requirements and help the USGS achieve its vision for an integrated science agency. A common computing environment will help scientists, managers, and researchers share ideas and deliver excellence science.

In 2011, efforts are underway to ensure the EAD program and associated investments are properly maintained and the environment meets current and future Interior initiatives and requirements. Interior standardization efforts are coordinated by the System Change Advisory Board (CAB) and the USGS EAD Change Advisory Board. In 2012, the major focus will be Windows 2008 migration of EAD services and phase II integration of scientific applications into EAD for common authentication and support. Focus will be on projects that extend mobility, virtualization, telework, and integration of EAD services into telecommunication resources.

USGS Service Desk – The USGS Service Desk serves as a single point of contact for support to USGS employees and continually adds services based on customer needs. The Service Desk has primary responsibility for incident resolution, service request tracking, and customer satisfaction. The continuing consolidation of help desk services into the USGS Service Desk creates an integrated environment that improves service excellence and extends the ability to support mobile resources.

Information Management
(2010 Enacted, $0.0 million; 2011 CR, $0.0 million; 2012 Request, $4.9 million)

The Information Management component includes executive management and oversight of USGS IT/Information Resources Management (IRM) activities and a suite of federally mandated activities such as Capital Planning and Investment Control, Project Management, Enterprise Architecture, Records Management, Privacy, and FOIA.

Capital Planning and Investment Control (CPIC) – The CPIC program, in collaboration with the USGS IT Investment Review Board, ensures that IT Investments are managed in accordance with Federal regulations and guidelines. In 2012, the USGS will continue to mature its IT investment management and related CPIC processes and procedures for planning and managing IT investments using the General Accountability Office (GAO) IT Investment Management (ITIM) maturity model. The estimated value of the USGS IT portfolio for 2012 is approximately $103 million. The program will conduct architectural segment reviews, identifying cross-cutting optimization efforts to reduce cost and to ensure planned investments achieve identified performance targets.

Enterprise Architecture (EA) – The USGS, through its EA program office, continues to evaluate and leverage opportunities and best practices to achieve cost efficiencies across the organization and participate in departmental activities to develop modernization blueprints for each of its defined lines of business. As part of the 2012 modernization effort, the USGS EA program seeks to help the USGS become more strategically aligned with Interior and Administration policies and priorities, reduce costs, reduce cycle time, and improve services to citizens. The EA program will focus on the project described below:

> Implement an IT Enterprise Hosting Platform – This initiative will consolidate information delivery into integrated data centers to reduce operating costs and improve service to users. In 2010 and 2011, the USGS consolidated data centers and technology services, achieving resource and life-cycle efficiencies that will save approximately $450,000 in facility modernization costs. In 2012, the USGS will enhance its enterprise hosting capabilities and efficiencies with IT service consolidations, ensuring performance requirements are met, and costs are streamlined. Additionally, the USGS will continue to lead the Interior Geospatial Modernization Blueprint development and chair the Geospatial Blueprint Core Team.

Knowledge Management Through Electronic Records Management – The USGS is the national steward for over 130 years of natural science data and information resources that document observations of natural phenomena, one-of-a-kind research, and impacts on the changing world. A study conducted in the 2006-2007 timeframe revealed that the scientific data acquired by these research efforts will not be repeatable. This information represents observed data that provide a baseline for determining rates of change and for computing the frequency of occurrence of natural hazards such as earthquakes, mudslides, and volcanoes, as well as data on climate change and species migration; and observations that one day may lead to new scientific ideas or concepts in unanticipated ways. Access to much of this information is limited

or it is inaccessible, due to storage condition deterioration or location, for use by scientists, Government Agencies, policy making and decision makers, partners, and the public.

The USGS will further institutionalize its Knowledge Management program in 2012, to ensure preservation of USGS science data and information products for use by future generations. This activity will significantly enhance the Administration's goal of open Government by improving and increasing access to USGS scientific information. This initiative will preserve and provide online access to these valuable and critical assets for current and future generations. Through this effort, the USGS intends to:

- Implement a knowledge management framework for retention of scientific data and information;
- Partner with science centers and collaborators;
- Preserve and make accessible on-line valuable scientific data and information; and
- Take advantage of advanced technologies to digitize USGS paper products and data in old media and formats, and to manage large quantities of information and enhance searching and access structures to allow re-analysis and new understanding of the data.

This initiative builds on current data preservation and digital library efforts. For example, the agency recently completed a project begun in 2009 to rescue and digitize the only existing storehouse of information dating from the 1950s to the 1970s on resources for strategic minerals in 11 States. Mines that were long ago shut down may once again become economically viable due to new technologies and rising prices in mineral commodities.

The anticipated outcome of this activity is a premier, dynamic, online knowledge reservoir of natural science information. In the preceding years, the USGS invested in 40 projects that resulted in the recovery of high-value datasets.

Preserving USGS Science Through Data Rescue – As a component of the Knowledge Management program, the Data Rescue program assists the USGS to identify, assess, preserve, and make accessible critical historical and legacy scientific information and data after a project is completed. Data Rescue projects will make data available to policy makers, resource managers and researchers, and allow data to be re-analyzed by future generations.

For example, the Data Rescue program provided funding to the USGS Spokane Field Office to scan and make accessible 5,036 original dockets dating from 1950 to 1974, stored in approximately 500 boxes covering these 11 States. Their entire collection has now been scanned and converted to PDFs and are available online. This project eliminates storage costs, space costs, and reproduction costs to the USGS and the public.

The agency has identified approximately $65 million in data rescue needs to preserve historical information resources. In 2012, due to proposed funding cuts, USGS reduced the number of Data Rescue projects from the average of ten per year to two per year. This funding cut includes the previous planned partnership with the USGS Digital Library to preserve and make available online eight high-value water, biology, and geology datasets.

Document Production – Over the past few years, there has been an increase in searches, document production, electronic discoveries, litigation-hold requests, preservation obligations, and other legal matters related to USGS records, information, and data. In 2012, the USGS will explore better approaches, new methods, and improved tools to streamline these requests

including working closely with the Interior Solicitor and the Department of Justice attorneys on discovery, disclosure, preservation, and potential access to agency documents, data, and information.

Privacy and FOIA – The USGS Freedom of Information Act (FOIA) program ensures public access to USGS information resources in accordance with the FOIA. The USGS Privacy program ensures that sensitive information the USGS receives is maintained and protected in accordance with the Privacy Act on behalf of employees and the public.

For the past two years, Interior recognized the USGS FOIA program as a “best practice,” indicating that the agency responded to 100 percent of Bureau perfected requests within 40 workdays, and the backlog of perfected requests was between zero and four percent of requests perfected in previous year. As a result of USGS Deepwater preservation activities, USGS FOIA requests increased by 20 percent in both 2010 and 2011. To improve knowledge management capacity and dissemination of information to the public, the USGS is working to make many of these records available to the public through the USGS FOIA reading room. In 2012, the USGS will continue administering the FOIA program according to new governance guidelines delivered by the President in his memorandum dated January 21, 2009, reaffirming the commitment to accountability and transparency.

In 2012, the USGS Privacy program will continue to expand its capability to identify privacy risks and ensure collections of personal information have been reduced, eliminated, or protected by implementing management practices and tools to monitor compliance.

Project Management Office (PMO) – In 2012, the USGS PMO will continue providing collaborative forums and online project management tools for Bureau project managers to share best practices, to peer-mentor and coach, and to exchange project and program tools and technologies. The PMO is committed to help integrate high-quality planning and management processes into the Agency's business practices. The PMO provides “on demand” access to: (1) project management information and methodologies, and (2) documents, checklists, templates, podcasts and System Development Life-Cycle (SDLC) practices. The SDLC methodology is being applied to the eight USGS Major IT investments to ensure that projects are managed in such a way that system retirements are planned sufficiently to ensure that succession planning is formal component of the decision making process of the Investment Review Board (IRB). In 2012, the PMO will work actively with USGS mission areas and offices to maintain the agency's current maturity level under GAO's IT investment management (ITIM) protocols, and in maintaining major system artifacts.

USGS DOI Enterprise Services
(2010 Enacted, $0.0 million; 2011 CR, $0.0 million; 2012 Request, $4.5 million)

The enterprise services component includes USGS contributions to Interior’s centralized working capital fund. The Interior enterprise services cost is the USGS contribution to support the Office of the Chief Information Officer’s information and technology programs. Contributions include funding for program management (including FOIA, Records, Capital Planning, Architecture, and Security and Technology services), project management for strategic projects, and centralized activities provided by Interior.
In support of new OMB requirements, Interior has established several transformation projects directed toward increased security, consolidation and centralization. The projects include consolidation of circuit providers and contract award of Networx; security of internet pathways from Federal locations (Trusted Internet Connections); security of Personally Identifiable

Information, including scanning for that information as well and encrypting that information (Logging Extracts of Data Bases and Encryption/Data at Rest); securing how users connect from outside Federal location to Federal locations using the Interior ID badge (Two-Factor Authentication); and consolidating the radio frequency used in Interior (Radio Consolidation). In addition to the funds provided for consolidated enterprise services, the USGS leverages departmental enterprise contracts and services in support of telecommunications services, hardware purchases, and enterprise licenses.

This page intentionally left blank.

Activity: Administration and Enterprise Information
Subactivity: Information Resources

2010 Enacted: $19.7 million (116 FTE)
2011 CR: $19.7 million (116 FTE)
2012 Request: $15.9 million (81 FTE)

Budget Realignment

In 2010 and 2011, Information Resources is a subactivity of the Enterprise Information activity. In 2012, the component is proposed to move to a subactivity in the Administration and Enterprise Information mission area. Crosswalk details can be found in the Science Strategy Realignment Section.

Overview

The Information Resources subactivity guides and manages Bureau-level systems and activities in science information policy, science information integration and delivery, and science education. The Information Integration and Delivery component provides direction, coordination, and strategic planning of scientific data integration, science publishing, natural science libraries, public science information centers, information product delivery, and management of Web-Internet services. The Information Resource Management component coordinates geographic information system software use in the Bureau and the Department of the Interior, and coordinates enterprise-level science educational activities.

The USGS is increasing efficiency and effectiveness of its scientific information integration and dissemination services through the Natural Science Network of integrated information, science, and knowledge to ensure the latest USGS science data are easily and quickly available to citizens, agencies, academia, and the private sector in accessible formats. The Bureau is optimizing customers' ability to *"find, get, and use"* USGS information and products tailored to their specific requirements.

Information Resources supports advancing modernization and integration through improving information integration and delivery and information resource management.

2012 Performance

Information Resources consists of two components: information integration and delivery, and information resource management.

Information Integration and Delivery
(2010 Enacted, $16.4 million; 2011 CR, $16.4 million; 2012 Request, $14.1 million)

Information Integration and Delivery activities transform existing functions and services to reflect the highly technical nature of USGS science and science products; achieve efficiencies in accessibility, delivery, and integration of USGS information through enterprise-level approaches; employ innovative and cost-effective technologies; and use future skills planning and partnerships to maintain a flexible and balanced workforce.

Information Services, Library, and Product Distribution – This component provides scientific and product information and technical assistance to a wide range of internal and external customers and to the natural science community as a whole. The staff within each of these groups works as an integrated team using a variety of tools and capabilities to provide access to USGS science, and identify sources of scientific information outside the Bureau. Through outreach, education, and public inquiry response, this component connects the public to USGS science and serves as a conduit for feedback between customers of USGS data and information and the USGS scientific and technical community. Significant emphasis is placed on increasing digital content capabilities, including electronic library subscriptions and new technologies that enhance accessibility to research information while acknowledging a significant and valuable collection of historical and archival material. Efforts will continue to convert hard-copy products and historical collections to digital formats in support of electronic distribution and print-on-demand.

In 2010, a new interface for the USGS Publications Warehouse was released; a digital repository framework was initiated; and new capabilities were added to the Ask USGS and Frequently Asked Questions systems that support responses to public inquiries received across the USGS. New tools were developed including a unified telephone system, commercial project tracking toolset, and a workshop registration and abstract submission tool. An abstract submission tool is a capability to submit their abstracts into the Publication Warehouse so that they are available electronically and are attached to the publication Special collections from the USGS Library were cataloged for online discovery alongside USGS publications and scientific data assets.

In 2011, Information Services, Library, and Product Distribution continue to migrate to a digital environment and improve existing systems and services to support scientific research by both USGS staff and the public. Additional partnerships and business strategies are being established to streamline operations and increase efficiencies while reducing overhead costs. Repository and metadata services are being developed to provide long-term durability and stewardship of information products in support of USGS research projects and to improve access to information for internal and external audiences.

In 2012, as a result of the proposed budget decrease, Information Services, Library, and Product Distribution will focus on transition issues related to closing the Biology Libraries at 12 USGS Science Centers. This will result in the loss of access to research material, specialized journals, and research librarian support—on systematic investigations affecting the Nation's ability to understand and manage its biological resources. Remaining Library operating hours will be reduced, resulting in delays in the flow of research information to USGS scientists. In addition, Information Service, Library, and Product Distribution will be significantly impacted in the ability to implement the capability of USGS researchers to integrate data and information with technology and services designed for scientists and research projects—resulting in a loss of much of the previous investment in these areas, such as metadata creation and enhancement through custom forms and active harvesting; search optimization; and data upload and documentation tools.

Enterprise Publishing – Accurate, efficient, effective, and timely reporting of reliable science information are key factors that assure the USGS role as a world leader in natural sciences through scientific excellence and responsiveness to society's needs.

In 2010, the Enterprise Publishing Network (EPN) published about 1,600 scientific information products—many containing high-impact scientific findings, and received five awards from the National Association of Government Communicators.
In 2011, the EPN continues technological development to expand communication and dissemination methods and maintain the USGS reputation for publishing high-quality unbiased science. Specifically, the EPN will implement additional process efficiencies, finalize and disseminate publishing tools and techniques, and develop technical report writing training courses. The EPN manager provides Bureau leadership and management oversight and the office coordinates production support through publishing service centers across the USGS. Many of the 8,700 USGS employees—scientists, managers, and others—use the professional publishing services of the EPN for editorial and visual information support for USGS science series publications and maps, journal articles, external publications, presentation and outreach materials, Web site design and content maintenance. The EPN serves USGS scientists and users of this information by ensuring scientific information is effectively communicated to the intended audience, therefore useful for protection of life and property, resource management decisions, and public use of resources.

In 2012, significant reductions in two sources of funding for the EPN will limit the ability to finish implementation of efficiency practices, including digital processing. The EPN will implement national operating practices on workflow to assist with maintaining efficiency and timeliness given the loss of staff. Planned technical improvements and additional efficiencies for publications that would have resulted from rewritten illustration standards built into templates, including thematic map templates, as well as building animation, three-dimensional graphics, and video into reports, must be postponed until at least 2013.

Enterprise Web (EWeb) – The goal of EWeb is to provide enterprise-level services to USGS scientists. During 2010, the USGS Web Policy Handbook, Interim USGS Social Media Policy, and Interim Guidelines for Data.gov were issued. The Enterprise Web program initiated work to align Web services with the GIO Service Catalog. In 2011, the EWeb program is completing its transition to a service organization with implementation of a Master Service Level Agreement. EWeb services continue to support long-term goals of the USGS Science Strategy and underlying data integration and Interior's initiatives for a transparent and open Government. EWeb also focuses on solutions for the top Bureau Web needs for enterprise search, content management, and governance. In 2012, use of the Service Catalog will promote the breadth of services available to clients internally and externally.

EWeb will continue to support more than 700 USGS Web sites for delivering, managing, and integrating online USGS science information and applications. EWeb will continue to meet all security requirements for maintaining its Certification and Accreditation status. EWeb will continue its partnership with the USGS Office of Communications and Publishing to provide services and establish procedures for effective management of the USGS homepages and the Intranet.

Information Resource Management
(2010 Enacted, $3.3 million; 2011 CR, $3.3 million; 2012 Request, $1.7 million)

Information Resource Management establishes, monitors, and guides efficient use of Geographic Information Systems applications; ensuring compliance with the Bureau's fundamental science practices, peer review and information quality requirements, and coordinating enterprise-level science education activities.

Science Education – The USGS supports a variety of science education activities for a range of age levels. These educational activities are made possible by coordinating student internships, conducting workshops and presentations at science and education meetings, coordinating Earth science events, representing the Bureau and Interior on interagency education and workforce development committees, maintaining and expanding the Bureau's educational Web site, and responding to science education requests from citizens and Bureau partners in professional science societies, schools and academia.

In 2010, the USGS education Web site received a "high satisfaction" score by the new ForeSee Transparency in Government survey model, which was a higher score than those obtained by 14 other Federal agencies participating in the E-Government Transparency Index. In 2011, USGS Education is completing the transition to full-text search functionality for Bureau fact sheets and general information publications. These products, which can now be easily found on the Web, provide the right amount of information and graphics for instructors at all education levels. "Geo-Webinars" on how USGS information can be used to support the new national science standards (planned for release in 2011 by the National Research Council) will also be developed. In 2012, instructional materials on Geographic Information Systems will be updated with a more interactive design of the Web site. USGS Education is a major portal through which educators and the public can find USGS information and content-based, instructional material for K-16 grade levels.

In 2010, the USGS Education program supported the Secretary's Youth Initiative by expanding student internships through integration of education and USGS scientific research. This science center-based activity expands opportunities for youth to work with the USGS scientists and staff in research. In response to legislative and executive calls to engage the Federal science workforce in STEM (Science, Technology, Engineering and Mathematics) education, the USGS is providing effective examples of youth initiative activities in 2011. As the Department of the Interior's representative on the National Science Technology's Subcommittee on Education, USGS Education will work closely with other Federal science agencies in identifying best practices and cost-effective programs for maintaining national science preeminence and meeting future workforce requirements.

The USGS Education program managed all contracts and instructional material development for the Bureau's contribution to Earth Science Week 2010, and its theme of Energy. Similar commitments and responsibilities are anticipated for 2011 and 2012. Now in its 14th year, Earth Science Week provides an unprecedented opportunity to encourage people of all ages and in all locations to explore the natural world and learn about the geosciences.

Activity: Facilities

		2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Rental Payments and Operations and		99,076	99,076	363	-1,454	-4,500	93,485	-5,591
Maintenance ($000)	*FTE*	*52*	*52*	*0*		*0*	*52*	*0*
Deferred Maintenance and Capital		7,321	7,321	-2,500	-14	0	4,807	-2,514
Improvements ($000)	*FTE*	*0*	*0*	*0*		*0*	*0*	*0*
Construction ($000)		0	0	2,500	0	0	2,500	2,500
	FTE	*0*	*0*	*0*		*0*	*0*	*0*
Maintaining America's Heritage ($000)		*[30,989]*	*[30,989]*		*0*		[30,407]	[582[1]]
	FTE							
Total Requirements ($000)		**106,397**	**106,397**	**363**	**-1,468**	**-4,500**	**100,792**	**-5,605**
	Total FTE	***52***	***52***	***0***	***0***	***0***	***52***	***0***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Rental Payments and Operations and Maintenance – Bureau wide Consolidations (Rent & O&M)	-$4,500	0
TOTAL Program Changes	**-$4,500**	**0**

Justification of Program Changes

The 2012 Budget Request for Facilities is $100,792,000 and 52 FTE, a net program change of -$4,500,000 and 0 FTE from the 2010 Enacted/annualized 2011 Continuing Resolution.

Bureau Wide Consolidations (-$4,500,000/0 FTE)

The Rent and Operations and Maintenance subactivity provides the majority of the funding required to support the facilities that house USGS staff. Facilities costs for rent and operations and maintenance are funded primarily by this subactivity and by the facilities component of USGS reimbursable agreements. The remaining cost is funded by the science programs. The USGS relies on General Services Administration owned and leased buildings for nearly 70 percent of the space it occupies. The USGS has no ability to reduce fixed rental rates at these sites, and can only offset the higher facility costs by vacating space. Therefore, the primary emphasis will be on improving space utilization and consolidating operations in GSA-provided offices, laboratories, data centers, and warehouses at major USGS centers in Reston, VA; Denver, CO; and Menlo Park, CA. At these centers, and where it is cost-effective at other science installations, the USGS will implement expanded space-sharing through hoteling and teleworking to reduce space. The onset and extent of these savings are largely dependent on timely up-front expenditures in the first year for modest renovations, equipment, and personnel

relocation; existing computer and telecommunications system moves; workstation reconfiguration; and payments for costs at the vacated site, including expenses for lease termination and environmental clean-up.

Technical Adjustment

Construction Subactivity	**(+$2,500,000/0 FTE)**
Deferred Maintenance and Capital Improvements Subactivity	**(- $2,500,000/0 FTE)**

A technical adjustment is proposed to move $2,500,000 from the Deferred Maintenance and Capital Improvements subactivity to establish a new Construction subactivity within the Facilities activity.

The technical adjustment to establish a Bureau wide Construction subactivity provides the USGS with a mechanism for budgeting and planning for needed facility construction. The establishment of the Construction subactivity provides the USGS with the capacity to modernize its real property assets and replace those that are in a state of disrepair, beyond their useful lives, or otherwise are no longer cost-effective to operate. Establishment would provide recurring funding for asset replacement, including building design and construction, and capital improvements such as building system replacements. The plan provides for much-needed improvements in building envelope (foundation, roof systems, facades, exterior doors, etc.) integrity.

Activity Summary

Assets are property consisting of land, buildings, or other improvements permanently attached to the land or a structure on it. The Department of the Interior defines a facility as an individual building or structure. The USGS defines facilities to include all sites where USGS activities are housed and mission-related work conducted. Facilities typically provide space for offices, laboratories, storage, parking, and shared support for cafeterias, conference rooms, and other common-space uses. The USGS also classifies its eight large (greater than 45 feet in length) research vessels as laboratory facilities. Owned assets are usually part of a campus; for example, the Leetown Science Center includes all associated land, buildings, and other structures.

The Facilities activity comprises three subactivities: Rental Payments and Operations and Maintenance (Rent and O&M); Deferred Maintenance and Capital Improvements (DMCI); and Construction (proposed).

Funds for the facilities activity provide safe, functional workspace and facilities for accomplishing the Bureau's scientific mission. Appropriated funds included in this activity cover approximately 76 percent of recurring USGS facilities costs. Customers, through reimbursable funding, provide approximately 22 percent, and the USGS science programs provide the remaining two percent. This activity supports the Department’s goal of facilities improvement tracking outcomes such as: overall condition of buildings and structures as reported in the Federal Real Property Profile reduction of energy intensity by three percent annually; percentage of square footage that meets E.O. 13514 sustainable building goals, and percent of assets targeted for disposal that were disposed.

The facilities program goal is to meet Bureau science needs while optimizing facilities location, distribution, and use to control or reduce costs. Objectives for meeting this goal include:

- Coordinating facility planning with science planning to provide safe, high-quality workspace aligned with science needs;
- Developing Asset Business Plans to meet asset management goals, continue annual surveys, and cyclic condition assessments;
- Meeting performance targets for improving space utilization, controlling rent and operating costs, and releasing unneeded space;
- Reducing deferred maintenance by renovating and constructing buildings and other facilities to replace assets otherwise no longer cost-effective to operate;
- Establishing an effective maintenance program at each owned facility to meet industry best practices;
- Increasing co-location consistent with science program objectives; and
- Achieving energy performance goals.

The USGS has developed a Five-Year Deferred Maintenance and Capital Improvement Plan, and a Five-Year Construction Plan. Each plan provides the projects of greatest need in priority order, with focus first on critical health and safety and critical resource protection. The Bureau has undertaken an extensive effort to develop these plans in the field, where the urgency of remediation and science program impact are most visible.

For 2012 construction projects, a complete project description is included and a list of all projects between 2012 and 2016 is provided in the justification. For 2012 DMCI projects, a list for 2012 projects is included in the justification along with a list of all projects between 2012 and 2016.

Facility Planning – The Bureau updated its Site-Specific Asset Business Plans (ABPs) to support the Bureau's Asset Management Plan. The ABPs are five- to ten-year plans addressing specific needs of a field unit, campus, or region including all assets reported in the Federal Real Property Profile (FRPP). The USGS ABPs effectively address the life cycle issues and characteristics of a site's real property assets. These plans, prepared by local managers, provide facility and area managers in the organization a micro-level view of these assets. Performance metrics and substantial inventory data included in ABPs are used by local managers to inform daily decision making. They are also used as annual action plans to direct Bureau and area resources where they are most needed to support the USGS mission.

Bureau Systems – In 2012, the USGS will continue deploying the Interior's Financial and Business Management System (FBMS). Two Bureaus will be converting to the FBMS in 2012: NPS and BIA. USGS participation and input will be necessary as the business processes of these Bureaus could impact the current configuration of the Real Estate Module. The USGS is leveraging the FBMS to its fullest for planning and reporting.

Maintaining America's Heritage – As steward of priceless natural and cultural treasures, Interior is committed to preserving and maintaining operational facilities and major equipment. The USGS 2012 budget request includes an estimated $30.4 million for "Maintaining America's Heritage." This includes $4.8 million for Deferred Maintenance and Capital Improvements, including Facilities, Equipment, Maintenance Management, Condition Assessment, and Project Planning. The estimated amount spent from program dollars for facilities and equipment

maintenance needed for Hazards Networks is $4.0 million; $2.5 million for Construction; and $19.1 million for Operations and Maintenance.

Facilities Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
Deferred Maintenance and Capital Improvement							
Overall condition of owned buildings and structures (as measured by the FCI) that are mission critical and mission dependent (as measured by the AEI), with emphasis on improving the condition of assets with critical health and safety needs							
Performance Data	0.134 (68,404/510,141)	0.134 (71,543/532,365)	0.138 (72,956/530,616)	0.078 (41,515/532,365)	0.072 (38,342/532,365)	-0.006	-.018
Comments	Once the $4.5M reduction is made, we expect the out year improvements to decelerate, especially for mission dependent assets.						

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year.
Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

Activity: Facilities
Subactivity: Rental Payments and Operations and Maintenance

2010 Enacted: $99.1 million (52 FTE)
2011 CR: $99.1 million (52 FTE)
2012 Request: $93.5 million (52 FTE)

Overview

The Rental Payments and Operations and Maintenance subactivity provides the USGS with funding needed to meet asset management goals and carry out Executive Orders related to Federal space. The Rental Payments cost component provides rental payments for space occupied by the USGS to GSA, other Federal sources, private lessors, and cooperators. The USGS has unique facility requirements for supporting science functions and relies heavily on GSA to meet needs such as those for modern laboratory space. The USGS occupies a total of 4.2 million square feet of rentable space in about 176 GSA buildings Nation wide, making the USGS one of the largest users of GSA space within Interior. Approximately 83 percent of USGS rental costs are incurred for GSA space holdings, ten percent for space provided through cooperative arrangements, and seven percent for space offered by other Federal agencies and private lessors.

The Operations and Maintenance (O&M) component provides funding for basic facility operations; security costs; facility maintenance in compliance with Federal, State, and local standards; and the provision of a safe working environment for USGS employees, visiting partners and customers.

The USGS owns 33 installations that are comprised of 276 buildings on approximately 1,812 acres. These installations include ten science centers; five field and research stations, the National Center for Earth Resources Observation Science (EROS), ten geomagnetic, seismic and volcano observatories, and seven miscellaneous owned properties such as stream gage stations, warehouses and a storage annex. The USGS also owns eight large research vessels having characteristics, costs, and operations and maintenance features that are comparable to those of a USGS building. These vessels exceed 45 feet in length and perform overnight research to support biological research, water resources investigations, and marine geology research. Five of the vessels operate on the Great Lakes, two operate in California, and one in Alaska.

The goal for this subactivity is to meet science needs while optimizing facilities location, distribution, and utilization to control or reduce costs. Objectives for meeting this goal include:

- Coordinating facility planning with science planning to provide safe, high-quality workspace aligned with science needs;
- Developing Asset Business Plans to meet asset management goals;
- Meeting performance targets by improving space utilization, controlling rent and operating costs, and releasing unneeded space; and
- Increasing co-location consistent with science program objectives.

Funds for this activity provide safe, functional workspace and facilities for accomplishing the USGS scientific mission. In 2010, the USGS spent $130.0 million on Rent and O&M. Of these costs,

76 percent ($99.1 million in 2010) were funded through this subactivity. The remaining costs were funded by reimbursable partners (22 percent) and science programs (two percent). In 2010, the total facilities rent cost was $101.4 million.

Approximately 13 percent of Rent and O&M funds are spent on USGS-owned properties; these assets are the most unique and mission critical in the USGS portfolio. As part of the Strategic Facilities Master Plan, USGS facilities were ranked in terms of their mission dependency using a tool called the Asset Priority Index (API). Although the largest concentrations of employees are in GSA-controlled space in Reston, VA; Denver; CO, and Menlo Park, CA; 15 of the top 20 mission-critical assets are owned assets in other locations. These owned assets have specialized capabilities or are positioned on the landscape to address specific science issues.

For example, the National Wildlife Health Center (NWHC) in Madison, WI, maintains a high-security infectious disease facility that operates at the Biological Safety Level 3 (BSL-3), and is certified by the Centers for Disease Control and Prevention (CDC) to receive and work with "select" disease agents, and approved by the U.S. Department of Agriculture (USDA) to import and export and transport domestic animal infectious agents. In the case of wildlife disease emergencies, the NWHC is the lead for Interior under the Department of Homeland Security's National Response Plan. The 24-acre NWHC tract is surrounded by a seven-foot-high cyclone fence. The entrance to the science center has a high-security-card access gate. Each building has security card readers for entrance and security key pad systems. Twenty-four hour access to restricted areas is limited per CDC Select Agent requirements for BSL-3 laboratories. The Tight Isolation Research Building is further secured by an additional cyclone fence.

Maintenance involves upkeep of USGS-owned facilities and structures and capitalized equipment necessary to maintain the useful life of the asset. This includes preventive maintenance; cyclic maintenance; repairs; rehabilitation; replacement of parts, components, or items of equipment associated with the facility; adjustment, lubrication, and cleaning (non-janitorial) of equipment associated with the facility; periodic inspection; painting; re-roofing; and resurfacing. Also included are special safety inspections and other activities to ensure smooth operation and to prevent breakdowns; scheduled equipment servicing (such as that for heating, ventilation, and air conditioning equipment); and maintenance for owned facility-support equipment such as snowplows and landscape-maintenance vehicles.

Operational costs at USGS-owned and some leased facilities include:

- Electricity, water, and sewage;
- Gasoline, propane, natural gas, diesel, and oil;
- Janitorial services;
- Groundskeeping;
- Waste management and disposal;
- Vehicles operated solely in direct support of operating the facility;
- Annual certification for building systems such as fire systems, fire extinguishers, back-flow preventers, and fume hoods; and
- Upkeep standards necessary to assure the anticipated useful life of the vessels, salaries and benefits of marine professionals operating the vessel, fuel, docking fees, inspections, minor repairs, cyclic maintenance, and at least one vessel haul-out per year.

In addition to maintenance costs, salary costs associated with onsite staff responsible for the day-to-day operations of the facility and for maintaining it in operating order are included in the subactivity.

The USGS Investment Review Board (IRB) makes recommendations to the USGS Director about information technology and major facilities capital investments to create and maintain a Bureau investment portfolio that best supports USGS and Interior mission and strategic goals. IRB membership includes the Deputy Director, and other executives representing science mission and administrative areas, the regions, the centers; and key USGS business activities. For facility investments, the IRB reviews proposed construction projects with a life cycle cost of $2.0 million or more, and all space transactions (occupancy agreements, leases, etc.) with a life-cycle cost of $5.0 million or more.

Program Performance

Space savings are integral to Rent and OM. The USGS realizes its space savings when locations are able to consolidate space or relocate to space with lower costs.

The USGS five-Year Space Management Plan supports the Bureau's Asset Management Plan (AMP) and Site Specific Asset Business Plans and provides a framework, strategic vision, and plan of action for effective Bureau management of GSA-provided space, USGS direct leases, and owned property. It is used by USGS management to implement Bureau space goals, including consolidation, co-location, and disposal. Information contained in the AMP is focused on mission dependency and program requirements for space.

Facility Maintenance Management System (FMMS) is the USGS implementation of the commercial maintenance management software application Maximo™. Interior has mandated that all Bureaus use Maximo™ as the standard maintenance management solution.

The FMMS is used primarily for recording day-to-day maintenance activities and establishing preventive maintenance schedules. It supports efficient operation and maintenance of USGS facilities by providing accurate maintenance information to local, regional, and national facility managers. It includes a mobile work order solution used by maintenance technicians at the centers to document maintenance activities onsite. Use of FMMS supports the USGS's AMP by establishing an inventory and maintenance history on all constructed assets and associated equipment, standardizing maintenance business practices, facilitating maintenance reporting and data analysis, and supporting budgeting and the Five-year deferred maintenance capital improvement and construction planning process.

In 2012, the FMMS will produce the USGS Five-Year Deferred Maintenance and Capital Improvement Plan as well as the USGS deferred maintenance backlog estimate. Additionally, the FMMS will be the database of record for facilities condition assessment deficiency information. Work orders will be used to schedule condition assessment inspections, document findings, and facilitate deferred maintenance accomplishment reporting. By 2012, the FMMS will be expanded to include all Bureau owned and maintained facilities.

The USGS is dedicated to achieving energy and water use reduction and renewable energy consumption goals, set forth in the Energy Independence and Security Act of 2007 and E. O. 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, and has implemented an energy management plan to guide programs toward meeting mandated

goals. The USGS uses a contract for a Web-based system to help capture, store, and analyze utility cost and consumption data.

In 2011, the USGS is working to complete the construction of heating, ventilation, and lighting upgrades under an Energy Savings Performance Contract (ESPC) at the National Wildlife Health Center (NWHC) in Madison, WI. The major energy conservation measures (ECMs) for the project includes two lighting upgrades and the replacement of two exhaust fans, one boiler, three furnaces, four air handlers, and various building control systems. The ECMs are projected to reduce the NWHC's energy consumption by 15 to 20 percent and yield annual savings of about $50,000. The total estimated project cost is approximately $6.3 million and is funded from multiple sources, including American Recovery and Reinvestment Act (ARRA), DMCI, and financing provided by the contractor.

As mandated by the Energy Independence and Security Act of 2007, by 2015, the USGS will achieve a targeted reduction of 30 percent in energy intensity at all facilities from the 2003 baseline. By the end of 2010, the USGS exceeded a target reduction of 15 percent. The USGS will work to obtain a minimum of five percent of our energy from renewable sources and will continue efforts to reduce water consumption by two percent annually compared to the 2007 baseline established in E.O. 13423.

The USGS continues its energy conservation efforts started in 2010. In 2012, the USGS will conduct energy audits and initiate work on new ECMs. Planned ECMs include energy efficient lighting retrofits, heating, ventilation, and air conditioning improvements and replacements, and building envelope enhancements. This funding will support additional improvements in the energy management program and will help further reduce the Bureau's energy consumption.

In 2010, the USGS was awarded a Department of Energy, Federal Energy and Water Management Award in the Individual Contracting Officer category. In less than two years the USGS implemented three Energy Savings Performance Contracts (ESPC) totaling $9.7 million of energy and water efficiency projects, saving 13,080 million British thermal units of energy, 608,000 gallons of water, and $244,500 on utility costs each year, which is used to help offset the operations and maintenance costs at the science centers. The reduction of greenhouse gas emissions attributed to these projects equates to removing the emissions of 471 passenger vehicles or 210 homes (total energy use) from the atmosphere each year.

This subactivity supports the Interior's Strategic Plan goal of facilities improvement tracking outcomes such as reducing energy intensity by three percent and disposing of unneeded assets.

Activity: Facilities
Subactivity: Deferred Maintenance and Capital Improvements

2010 Enacted: $7.3 million (0 FTE)
2011 CR: $7.3 million (0 FTE)
2012 Request: $4.8 million (0 FTE)

Overview

Deferred maintenance is operating or cyclic maintenance that was not performed when it was scheduled. The Deferred Maintenance and Capital Improvement (DMCI) subactivity funds address the highest priority USGS facility and equipment needs according to departmental guidance. The current funding level addresses approximately seven percent of the facilities deferred maintenance and capital improvements backlog of $65.5 million. The condition assessment program includes annual surveys and a cyclic process for comprehensive onsite inspections to document deferred maintenance.

Through the asset management planning process, the USGS can identify real property assets that are candidates for disposition. Any asset that is no longer critical to the mission, in poor condition, or no longer cost-effective to maintain is a candidate for possible disposal.

The USGS is committed to continually improving stewardship of its assets. The primary goal is to provide a safe, comfortable, environment for employees, visitors, and contractors at USGS facilities. Improving maintenance of existing facilities and equipment ensures the health and safety of the public and employees, protects assets, and ensures compliance with building codes and standards. This program tracks the facilities condition, as measured by the Facilities Condition Index (FCI).

Facilities projects reflect comprehensive evaluations conducted by independent architectural and engineering firms. These installation-wide assessments help establish core data on the condition of USGS-constructed assets.

The USGS has stewardship responsibility for unique mission equipment assets such as hazard-warning networks, river cableways, and streamgaging stations, all of which require maintenance and capital investments to preserve their functionality. Projects targeting these assets are included under the Equipment Section of the Five-Year DMCI Plan and are evaluated using the same safety criteria as those governing constructed real property assets.

The USGS prioritizes critical deferred maintenance and capital improvement needs according to the Interior's guidelines. Five-Year Plans are developed and updated on an annual basis using the uniform, department wide process for ranking both deferred maintenance and capital improvement projects that are needed to accomplish management objectives. Plans are subject to adjustments in out-years due to funding changes and revised priorities based on comprehensive facility condition assessments, annual condition surveys, and emergency needs. The goal of the five-year planning process is to focus limited resources on projects that are both mission critical and in the most need of repair or replacement. The ranking equation is designed to accommodate many types and sizes of projects, from simple to complex. It places highest priority on facility-related Critical Health and Safety and Critical Resource Protection deferred maintenance needs in that order. Capital improvement projects that eliminate

substantial amounts of deferred maintenance receive a higher ranking than projects that do not address deferred maintenance needs.

The condition assessment process identifies deferred maintenance needs and determines the current replacement value of constructed assets. Knowing the estimated cost of deferred maintenance and the replacement value of constructed assets allows the USGS to use the industry standard facility condition index as a method of measuring facility condition and condition changes. It is an indicator of the depleted value of capital assets. Funds are also available through the condition assessment process to identify, report, and track any asbestos, environmental, and disposal liability sites on departmental lands according to guidelines issued by Interior's Office of Environmental Policy and Compliance.

This subactivity supports the Bureau's goal of facilities improvement by tracking outcomes such as overall condition of owned buildings and structures and improvement in Bureau FCI. It also tracks the number of Bureau condition assessments completed (within a five-year cycle) and percent of assets target for disposal that were disposed.

Program Performance

Completing routine and cyclic maintenance on schedule is the most direct and effective means of preventing deferred maintenance backlogs. The USGS has started modeling exercises to project the appropriate sustainment level for operations and maintenance funding and to identify voids in critical cyclical and preventive maintenance practices and processes.

For 2012, remediation of the most critical health, safety, and resource-protection deficiencies continues to be the focus of the priority facility projects. In 2012, funding is proposed for 13 facility deferred maintenance projects. The activity's goal is to reduce deferred maintenance and capital improvement backlogs at facilities and establish an effective maintenance program at each USGS owned facility to meet industry's best practices.

The American Recovery Reinvestment Act (ARRA) funding received by the DMCI activity was used to address DMCI projects that were planned for future years in the USGS five-year plan. By doing so, the USGS was able to improve the health and safety of visitors and employees in the remediated facilities, sustain the asset through its remaining useful life, and ensure compliance with building codes and industry standards. ARRA funding supported the advancement of USGS asset management and science programs by reducing deferred maintenance on high priority facilities. Facilities have been decommissioned which will "right-size" the overall portfolio of assets and improve the Bureau's overall FCI. Additionally, the ARRA funding has improved the longevity of seismic networks and the stream gage equipment, and maximized the efficiencies of the real property assets and equipment used to carry out the science mission. ARRA funding will also have provided for the remediation of 1,289 discontinued monitoring sites nationwide that present public safety and health problem and reduces USGS liability for discontinued monitoring.

2012 Deferred Maintenance and Capital Improvement Plan

The following table lists, in priority order, the proposed projects and equipment to be addressed by DMCI in 2012, within available funding.

2012 Facility Projects ($000)

NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING $50	B2010NWHC01 Replace unsafe external fixed facility ladders and add ladder caging and railings.
GREAT LAKES SCIENCE CENTER CHEBOYGAN VESSEL BASE – LAND $114	2010CVB01 Cheboygan Vessel Base Repairs and Improvements
COLUMBIA ENVIRONMENTAL RESEARCH CENTER (A-3 MAIN OFFICE AND LABORATORY BUILDING) $305	B20100004 Replace Fume Hood Exhaust System
NORTHERN PRAIRIE WILDLIFE RESEARCH CENTER (ADMINISTRATIVE AND RIVERSIDE BUILDINGS) $598	B2007001 Install Automatic Fire Sprinkler Systems
COLUMBIA ENVIRONMENTAL RESEARCH CENTER CONFERENCE BUILDING $56	B20100006 Install Building Sprinkler System
NATIONAL WETLANDS RESEARCH CENTER - OFFICE AND LABORATORY BUILDING $65	NWRC-WW-0005 Install Hurricane Security Film on Windows
GREAT LAKES SCIENCE CENTER RESEARCH VESSEL GRAYLING $600	2010RVGRAY01 R/V Grayling Repairs and Improvements
GREAT LAKES SCIENCE CENTER RESEARCH VESSEL STURGEON $250	2010RVSTURG01 R/V Sturgeon Repairs and Improvements
EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING $770	12EROSDM008 Replace Mundt Federal Building Skylight
REDWOOD CITY MARINE FACILITY RESEARCH VESSEL POLARIS $49	W2010NRP001 Safety Renovations to the Research Vessel Polaris Deck
SOLID STATE PHYSICS LABORATORY $120	2010SSB0001 Replace Water Main
NATIONAL WETLANDS RESEARCH CENTER - OFFICE AND LABORATORY BUILDING $152	2008001 Repair and Rebalance Laboratory Fume Hoods
UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - OFFICE AND LABORATORY BUILDING $342 *(Balance of $7,215 to be funded with 2011 Design/Planning Funds.)*	B20100005B Rehabilitate Concrete Ponds & Add Containment

2012 Equipment Projects

600 SITES NATIONWIDE $240	Repair or Replace Cable cars (W1998A10000): 600 cable cars are active and in use nationwide.
NORTHERN CALIFORNIA SEISMIC NETWORK $200	Replace Network Analog and Microwave Stations (G987160001): Replace earthquake network stations that provide seismic monitoring and warning for large metropolitan areas.
CONDITION ASSESSMENTS $210	Condition Assessments/Engineering Support: Complete condition assessments for the identification of maintenance and capital improvement needs. Provide engineering services support for funded facility projects. Conduct surveys to determine asbestos-related cleanup cost or environmental and disposal liabilities.
MAINTENANCE MANAGEMENT SYSTEM $500	Maintenance Management System: Implement and maintain a maintenance management system that meets bureau reporting and oversight requirements.
PROJECT PLANNING $186	Project Planning**:** Contract architectural, engineering and design services for complex projects particularly for developing project requirements and budget estimates.

EXHIBIT 4

USGS FACILITIES
SUMMARY PROJECT DATA SHEET
DEFERRED MAINTENANCE PLAN (or) CAPITAL IMPROVEMENT PLAN

Plan Fund Year	DOI Score	Region /Area	Unit/Facility Name	State	Congressional Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig. Cost Est ($000)	Changes in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	%Odm	% Oci	% DM	%CI		
2012	877/1	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B2010NWHC01	Replace unsafe external fixed facility ladders and add ladder caging and railings.	90	0	0	0	0	10	0	0	0	90	10	$50	$0
2012	792/2	E	GREAT LAKES SCIENCE CENTER CHEBOYGAN VESSEL BASE - LAND	MI	1	2010CVB01	Cheboygan Vessel Base Repairs and Improvements	50	25	0	0	0	25	0	0	0	50	50	$114	($400)
2012	777/3	C	COLUMBIA ENVIRONMENTAL RESEARCH CENTER (A-3 MAIN OFFICE AND LABORATORY BUILDING)	MO	9	B20100004	Replace Fume Hood Exhaust System	50	0	0	0	40	10	0	0	0	50	50	$305	($3,548)
2012	762/4	C	NORTHERN PRAIRIE WILDLIFE RESEARCH CENTER (ADMINISTRATIVE AND RIVERSIDE BUILDINGS)	ND	0	B2007001	Install Automatic Fire Sprinkler Systems	0	80	0	0	0	20	0	0	0	0	100	$598	$1,000
2012	757/5	C	COLUMBIA ENVIRONMENTAL RESEARCH CENTER CONFERENCE BUILDING	MO	0	B20100006	Install Building Sprinkler System	0	70	0	0	0	30	0	0	0	0	100	$56	$485
2012	729/6	C	NATIONAL WETLANDS RESEARCH CENTER - OFFICE AND LABORATORY BUILDING	LA	7	NWRC-WW-0005	Install Hurricane Security Film on Windows	0	50	0	0	50	0	0	0	0	0	100	$65	($4,809)
2012	718/7	E	GREAT LAKES SCIENCE CENTER RESEARCH VESSEL GRAYLING	MI	1	2010RVGRAY01	R/V Grayling Repairs and Improvements	50	0	0	0	0	25	25	0	0	75	25	$600	($7,212)
2012	718/8	E	GREAT LAKES SCIENCE CENTER RESEARCH VESSEL STURGEON	MI	1	2010RVSTURG01	R/V Sturgeon Repairs and Improvements	50	0	0	0	0	25	25	0	0	75	25	$250	($6,695)
2012	704/9	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING	SD	0	12EROSDM008	Replace Mundt Federal Building Skylight	10	0	50	0	0	0	0	40	0	90	10	$770	($3,000)
2012	700/10	W	REDWOOD CITY MARINE FACILITY RESEARCH VESSEL POLARIS	CA	14	W2010NRP001	Safety Renovations to the Research Vessel Polaris Deck	50	0	0	0	0	0	0	50	0	100	0	$49	$0
2012	693/11	HQ	SOLID STATE PHYSICS LABORATORY	VA	11	2010SSB0001	Replace Water Main	50	0	50	0	0	0	0	0	0	100	0	$120	$0
2012	684/12	C	NATIONAL WETLANDS RESEARCH CENTER - OFFICE AND LABORATORY BUILDING	LA	7	2008001	Repair and Rebalance Laboratory Fume Hoods	40	0	0	0	20	0	40	0	0	80	20	$152	($1,461)
2012	669/13	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - OFFICE AND LABORATORY BUILDING	WI	3	B20100005B	Rehabilitate Concrete Ponds & Add Containment	0	0	50	10	25	0	15	0	0	65	35	$342	($2,687)
Total 2012																			**$3,471**	

EXHIBIT 4

USGS FACILITIES
SUMMARY PROJECT DATA SHEET
DEFERRED MAINTENANCE PLAN (or) CAPITAL IMPROVEMENT PLAN

Plan Fund Year	DOI Score	Region /Area	Unit/Facility Name	State	Congressional Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig. Cost Est ($000)	Changes in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	%Odm	% Oci	% DM	%CI		
2013	669/1	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B2010NWHC05	Replace Emergency Generator in Main Building	10	0	0	0	80	0	10	0	0	20	80	$116	($2,687)
2013	668/2	W	MARROWSTONE FIELD STATION PUMP HOUSE	WA	6	B2009MMFSH001	Replace Emergency Generator and Above Grade Fuel Tank	40	0	0	0	0	0	30	30	0	100	0	$275	$0
2013	663/3	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - OFFICE AND LABORATORY BUILDING	WI	3	B20100002B	Rehabilitate/Restore Two Hour Fire Separations	35	0	0	0	0	65	0	0	0	35	65	$98	$0
2013	655/4	W	NEWPORT GEOPHYSICAL OBSERVATORY - LAND	WA	5	G2010CAF102	Create Defensible Space for Fire Protection at Newport Observatory	50	0	0	0	0	0	50	0	0	100	0	$59	($7,215)
2013	655/5	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - GENERATOR BUILDING	SD	0	12EROSDM005	Upgrade Controls and Metering	0	0	0	0	75	0	0	0	25	0	100	$225	($2,500)
2013	653/6	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B2003111102	Necropsy Space Renovation for Histology	0	45	0	0	0	0	45	0	10	45	55	$409	($131,509)
2013	650/7	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - CLAY POND-RES	WI	3	B20100003B	Restore Outdoor Research Ponds-Earthen Lined	0	0	40	0	35	0	25	0	0	65	35	$485	($13,000)
2013	648/8	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - SERVICE BUILDING	SD	0	12EROSDM001	Concrete Side Walk Repairs and ADA Walk at Warehouse Service Building and Concrete Drainage Repairs for the Heavy Equipment Building	25	0	0	0	0	0	0	75	0	100	0	$50	$0
2013	648/9	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - GENERATOR BUILDING	SD	0	12EROSDM002	Insulate Generator Building	0	0	25	0	50	0	0	25	0	50	50	$195	($5,000)
2013	643/10	E	NATIONAL WILDLIFE HEALTH CENTER - TIGHT ISOLATION BUILDING	WI	2	B2010NWHC06	Replace Emergency Generator in Tight Isolation Building	0	0	0	0	90	0	10	0	0	10	90	$179	($8,236)
2013	642/11	W	WESTERN FISHERIES RESEARCH CENTER - DRY LABORATORY BUILDING #415	WA	7	B2009E001	Retrofit Lighting to Energy Efficient Lamps and Ballasts w/ Occupancy Sensors	0	0	0	0	100	0	0	0	0	0	100	$30	($5,461)
2013	633/12	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING	SD	0	12EROSDM003	Replace Mundt Federal Building S1 and S2 Main Entrance	10	0	0	0	20	70	0	0	0	10	90	$350	($3,000)
2013	632/13	W	WESTERN FISHERIES RESEARCH CENTER - WET LABORATORY BUILDING #414	WA	7	B2009I002	Retrofit Lighting to Energy Efficient Lamps and Ballasts w/ Occupancy Sensors	0	0	0	0	100	0	0	0	0	0	100	$31	($2,537)
2013	628/14	W	WESTERN FISHERIES RESEARCH CENTER - ADMINISTRATION BUILDING #416	WA	7	B2009H001	Retrofit Lighting to Energy Efficient Lamps and Ballasts with Occupancy Sensors	0	0	0	0	100	0	0	0	0	0	100	$66	($2,815)
2013	627/15	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - OFFICE AND LABORATORY BUILDING PROPERTY NO. 1	WI	3	B20030003B	Replace Roof Siding and Windows and Remove Overhang on Segment A&B Exterior Corridors (Year 1)	10	0	0	0	60	0	0	30	0	40	60	$903	($26,871)
							Total 2013												**$3,471**	

EXHIBIT 4

USGS FACILITIES
SUMMARY PROJECT DATA SHEET
DEFERRED MAINTENANCE PLAN (or) CAPITAL IMPROVEMENT PLAN

Plan Fund Year	DOI Score	Region /Area	Unit/Facility Name	State	Congressional Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig. Cost Est ($000)	Changes in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	%Odm	% Oci	% DM	%CI		
2014	627/1	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - OFFICE AND LABORATORY BUILDING PROPERTY NO. 1	WI	3	B20030003B	Replace Roof Siding and Windows and Remove Overhang on Segment A&B Exterior Corridors (Year 2)	10	0	0	0	60	0	0	30	0	40	60	$531	($26,871)
2014	627/2	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - LABORATORY/OFFICE	WI	3	B20100004B	Replace Deficient HVAC Variable Frequency Drives	25	0	0	0	10	0	50	15	0	90	10	$73	($12,403)
2014	619/3	C	COLUMBIA ENVIRONMENTAL RESEARCH CENTER (POLLUTION ABATEMENT BUILDING)	MO	9	B20100003	Retrofit Heating, Ventilating, and Air Conditioning (HVAC) System	0	0	0	0	85	15	0	0	0	0	100	$112	($694)
2014	617/4	E	TUNISON FISH HATCHERY LABORATORY - OFFICE LABORATORY AND WEST LABORATORY	NY	25	B20020017G	Window Replacement	0	0	0	0	70	0	0	30	0	30	70	$103	($155)
2014	615/5	W	WESTERN FISHERIES RESEARCH CENTER - WET LABORATORY BUILDING #414	WA	7	B2009I006	Replace Boiler w/ Three Condensing Type Boilers	0	0	0	0	90	5	0	5	0	5	95	$168	($2,537)
2014	613/6	E	GREAT LAKES SCIENCE CENTER RESEARCH VESSEL KAHO LAKE ONTARIO BIOLOGICAL STATION, OSWEGO, NY	NY	13	B2010RVKAHO01	Repair of Dock and Breakwall for Research Vessel Kaho	25	0	0	0	0	0	75	0	0	100	0	$500	$0
2014	608/7	C	COLUMBIA ENVIRONMENTAL RESEARCH CENTER (EAST PARKING LOT)	MO	9	B20100001	Mill and Resurface Asphalt	20	0	0	0	0	0	0	80	0	100	0	$183	$0
2014	604/8	E	GREAT LAKES SCENCE CENTER RESEARCH VESSEL GRAYLING	MI	1	2009GLRV01	Upgrade Current HVAC System	20	0	0	0	0	0	0	80	0	100	0	$50	$0
2014	601/9	C	COLUMBIA ENVIRONMENTAL RESEARCH CENTER (A-3 MAIN OFFICE/LABORATORY)	MO	9	B20080005	Renovate Elevator A3	20	0	0	0	20	10	0	50	0	70	30	$94	$0
2014	597/10	W	STEILACOOM-WAREHOUSE - BLDG 20	WA	6	W2002WA0003	Electrical System Replacement	0	50	0	0	25	0	0	25	0	25	75	$978	$51,595
2014	597/11	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING	SD	0	M2007B11	Replace 1973 Vintage Mechanical Penthouse Walls & Flashing	10	0	0	0	0	0	60	30	0	100	0	$378	($390,400)
2014	595/12	E	TUNISON FISH HATCHERY LABORATORY - RESEARCH AND DEVELOPMENT LABORATORY	NY	25	B2009TL001G	Replace Shingle Roof on Lower Laboratory Building	10	0	0	0	45	0	0	45	0	55	45	$31	$0
2014	594/13	E	S O CONTE ANADROMOUS RESEARCH CENTER - RESEARCH LABORATORY	MA	1	B2009CAF01A	Replace Boiler and Recirculation System Pumps (Year 1)	0	0	0	0	60	0	40	0	0	40	60	$270	($1,752)
							Total 2014												**$3,471**	

EXHIBIT 4

USGS FACILITIES
SUMMARY PROJECT DATA SHEET
DEFERRED MAINTENANCE PLAN (or) CAPITAL IMPROVEMENT PLAN

Plan Fund Year	DOI Score	Region /Area	Unit/Facility Name	State	Congressional Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig. Cost Est ($000)	Changes in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	%Odm	% Oci	% DM	%CI		
2015	594/1	E	S O CONTE ANADROMOUS RESEARCH CENTER - RESEARCH LABORATORY	MA	1	B2009CAF01A	Replace Boiler and Recirculation System Pumps (Year 2)	0	0	0	0	60	0	40	0	0	40	60	$120	($1,752)
2015	590/2	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - GENERATOR BUILDING	SD	0	12EROSDM006	Repair Wall Joints and Clean Rust Stains	0	0	0	25	0	0	0	75	0	75	25	$175	$0
2015	585/3	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B2010NWHC04	Replace Secondary Inefficient Chiller in Main Building with Energy Efficient Chiller	0	0	0	0	60	0	10	30	0	40	60	$320	$3,055
2015	585/4	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B20080007C	Replace Inefficient Chiller in Main Building with Energy Efficient Chiller	0	0	0	0	60	0	10	30	0	40	60	$254	$2,331
2015	581/5	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - HEAVY EQUIPMENT STORAGE	SD	0	12EROSDM004	Solar Heat for the Heavy Equipment Building	0	0	0	0	50	0	0	50	0	50	50	$100	($195)
2015	581/6	E	S O CONTE ANADROMOUS RESEARCH CENTER - RESEARCH LABORATORY	MA	1	B2008CAF05C	Heating and Air Conditioning Air Handling Unit Replacement	0	0	0	0	50	0	50	0	0	50	50	$420	($1,752)
2015	580/7	E	GREAT LAKES SCIENCE CENTER RESEARCH AND DEVELOPMENT LABORATORY	MI	13	B201000002G	Renovate North Laboratory Wing	35	0	0	0	0	35	0	30	0	65	35	$600	$0
2015	578/8	E	UPPER MIDWEST ENVIRONMENTAL SCIENCE CENTER - PAVED ROADS PROPERTY NO. 48	WI	3	B19990005B	Rehabilitate and Repair Roadways	20	0	0	0	0	0	0	80	0	100	0	$408	$0
2015	577/9	W	SITKA MAGNETIC OBSERVATORY GROUNDS	AK	0	G2009CAF108	Replace Pathways to Three Observatory Operations Buildings	30	0	0	0	0	0	0	70	0	100	0	$69	$0
2015	575/10	W	MARROWSTONE - DRY LABORATORY	WA	6	B2009MMFSD003	Repair Air Handling Unit Deficiencies	0	0	0	0	75	0	25	0	0	25	75	$36	($482)
2015	575/11	E	GREAT LAKES SCIENCE CENTER RESEARCH AND DEVELOPMENT BUILDING	MI	1	B19920012G	Repair & Replace Fish Holding Water Distribution System	0	0	25	0	0	0	75	0	0	100	0	$600	$1
2015	575/12	E	GREAT LAKES SCIENCE CENTER RESEARCH AND DEVELOPMENT BUILDING	MI	1	B19900010G	Recondition Wells and Install Softener	0	0	25	0	0	0	75	0	0	100	0	$75	$1
2015	575/13	E	SOUTHEAST ECOLOGICAL SCIENCE CENTER - MAIN R & D BUILDING	FL	6	B19990062F	Upgrade Interior Laboratories	10	0	0	0	10	10	30	40	0	80	20	$262	($563)
2015	572/14	E	LEETOWN SCIENCE CENTER FISH HEALTH LABORATORY	WV	2	B2010FHL0001	Replace Incinerator and Exhaust Stacks at the FHL (Year 1)	0	10	0	0	10	0	80	0	0	80	20	$32	($5,000)
							Total 2015												**$3,471**	

EXHIBIT 4

USGS FACILITIES
SUMMARY PROJECT DATA SHEET
DEFERRED MAINTENANCE PLAN (or) CAPITAL IMPROVEMENT PLAN

Plan Fund Year	DOI Score	Region /Area	Unit/Facility Name	State	Congressional Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig. Cost Est ($000)	Changes in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	%Odm	% Oci	% DM	%CI		
2016	572/1	E	LEETOWN SCIENCE CENTER FISH HEALTH LABORATORY	WV	2	B2010FHL0001	Replace Incinerator and Exhaust Stacks at the FHL (Year 2)	0	10	0	0	10	0	80	0	0	80	20	$68	($5,000)
2016	571/2	E	GREAT LAKES SCIENCE CENTER RESEARCH VESSEL GRAYLING	MI	1	2009GLRV02	Replace Crane	0	25	0	0	0	50	25	0	0	25	75	$84	$0
2016	571/3	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING	SD	0	M2007D27	Replace 200 & 300 ton Chillers	0	0	0	0	80	0	20	0	0	20	80	$878	($393,700)
2016	571/4	C	EARTH RESOURCES OBSERVATION AND SCIENCE CENTER - MUNDT FEDERAL BUILDING	SD	0	M2007B6	1996 Mechanical Penthouse Roof Replacement	0	0	0	0	10	0	0	90	0	90	10	$189	($389,500)
2016	568/5	E	S O CONTE ANADROMOUS RESEARCH CENTER - RESEARCH LABORATORY	MA	1	B2008CAF03C	Miscellaneous concrete and sealant repairs to buildings	10	0	0	0	20	0	50	20	0	80	20	$105	$0
2016	567/6	C	NATIONAL WETLANDS RESEARCH CENTER - OFFICE AND LABORATORY BUILDING	LA	7	NWRC-WW-0006	Replace Greenhouse Heating and Ventilation System	0	0	0	0	50	0	50	0	0	50	50	$76	($1,958)
2016	565/7	E	NATIONAL WILDLIFE HEALTH CENTER - TIGHT ISOLATION BUILDING	WI	2	B2010NWHC08	Replace Autoclaves in TIB	10	0	0	0	0	0	45	45	0	100	0	$234	$0
2016	565/8	E	NATIONAL WILDLIFE HEALTH CENTER - MAIN BUILDING	WI	2	B2010NWHC03	Replace Autoclaves in Main Building	10	0	0	0	0	0	45	45	0	100	0	$328	$0
2016	559/9	E	SAN JUAN - LAND	PR	0	G2009CAF104	Remediate Sidewalk and Landscaping Issues	10	0	20	0	0	0	0	70	0	100	0	$25	$0
2016	559/10	E	LEETOWN SCIENCE CENTER DEGASSER BUILDING (#208)	WV	2	B2010DG0001	Install Roof Hatches in Degasser Building	0	10	0	0	0	0	90	0	0	90	10	$50	$5,000
2016	556/11	E	PATUEXNT - CAPTIVE PROPRAGATION LABORATORY	MD	5	B2001PWRC46	Rehabilitate Captive Propagation Laboratory	0	20	0	0	0	0	80	0	0	80	20	$208	$0
2016	556/12	E	UPPER MIDWEST ENVIRONMENTAL SCIENCES CENTERTR	WI	3	B20030004	Rehabilitate Perimeter Security	0	20	0	0	0	0	0	80	0	80	20	$342	$0
2016	556/13	E	SOUTHEAST ECOLOGICAL SCIENCE CENTER	FL	6	B19990023Fsa	Renovate Walk-in Cooling System	0	0	20	0	5	0	35	30	10	90	10	$135	($1,125)
2016	555/14	E	GREAT LAKES SCIENCE CENTER	NY	1	B2004007VG	Replace Windows, Restore Watertight Integrity, and replace HVAC system	10	0	0	0	0	0	0	90	0	100	0	$60	$0
2016	555/15	E	LEETOWN SCIENCE CENTER FISH HEALTH LABORATORY	WV	2	B19980039D	Renovate Interior Flooring and Carpet	10	0	0	0	0	15	0	75	0	85	15	$460	$0
2016	553/16	E	PATUXENT VETERNARIAN HOSPITAL	MD	5	B2001PWRC42	Rehabilitate Vet Hospital	10	0	0	0	20	10	40	20	0	70	30	$71	$0
2016	552/17	E	LEETOWN SCIENCE CENTER	WV	2	B2001FH0005	Reconstruct Animal Room to Meet Bio Safety Level-2 (BSL-2) Standards	10	0	0	0	0	20	30	40	0	80	20	$158	$343,248
							Total 2016												**$3,471**	

USGS
SUMMARY PROJECT DATA SHEET FOR EQUIPMENT
DEFERRED MAINTENANACE PLAN OR CAPITAL IMPROVEMENT PLAN

Plan Fund FY	DOI Score	Region /Area/ District	Unit/ Facility Name	State	Cong Dist	Project Number	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)*
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	% Odm	% Oci	% DM	% CI		
2012	970	W	113 Sites Nationwide			W1998A10000	**Renovate/Replace Active Cableways** - Cableways at these sites do not meet modern design and load-testing criteria. To ensure that essential scientific data are safely collected, these systems either need to be brought up to modern design and safety standards, or replaced. Approximately 70% of the funding would be used to repair, or renovate, the system with one built to the new safety standards (including replacement of one or more components, cables, supports, anchor blocks, hardware, and cable car). About 30% of the funding would be used to replace installations with either a bank-operated system, or with an alternative measuring system such as an acoustic velocity meter or acoustic doppler velocity meter.	70%	30%								70%	30%	$240	
2012	970	W	Northern California Seismic Network	CA		G987160001	**Replace Network Analog and Microwave Stations** Replace earthquake network stations which provide seismic monitoring/warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment which supports the network may fail during an emergency, which would limit or possibly prevent adequate response to other federal agencies, local governments, the private sector, and public needs.	70%	30%								70%	30%	$200	
2012							**Condition Assessments** - Funding is provided to complete condition assessments for the identification of maintenance and capital improvement needs and help determine future priorities.												$210	
2012							**Maintenance Management System** - Funding is provided to develop, implement, and maintain a maintenance management system that meets bureau reporting and oversight requirements.												$500	
2012							**Project Planning** - Funding will be applied toward architectural and engineering support services for facility projects particularly for developing project requirements and budget estimates for complex projects.												$186	
							Total 2012												**$1,336**	

USGS
SUMMARY PROJECT DATA SHEET FOR EQUIPMENT
DEFERRED MAINTENANACE PLAN OR CAPITAL IMPROVEMENT PLAN

Plan Fund FY	DOI Score	Region /Area/ District	Unit/ Facility Name	State	Cong Dist	Project Number	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)*
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	% Odm	% Oci	% DM	% CI		
2013	970	W	113 Sites Nationwide			W1998A10000	**Renovate/Replace Active Cableways** - Cableways at these sites do not meet modern design and load-testing criteria. To ensure that essential scientific data are safely collected, these systems either need to be brought up to modern design and safety standards, or replaced. Approximately 70% of the funding would be used to repair, or renovate, the system with one built to the new safety standards (including replacement of one or more components, cables, supports, anchor blocks, hardware, and cable car). About 30% of the funding would be used to replace installations with either a bank-operated system, or with an alternative measuring system such as an acoustic velocity meter or acoustic Doppler velocity meter.	70%	30%								70%	30%	$240	
2013	970	W	Northern California Seismic Network	CA		G987160001	**Replace Network Analog and Microwave Stations** Replace earthquake network stations which provide seismic monitoring/warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment which supports the network may fail during an emergency, which would limit or possibly prevent adequate response to other federal agencies, local governments, the private sector, and public needs.	70%	30%								70%	30%	$200	
2013							**Condition Assessments** - Funding is provided to complete condition assessments for the identification of maintenance and capital improvement needs and help determine future priorities.												$210	
2013							**Maintenance Management System** - Funding is provided to develop, implement, and maintain a maintenance management system that meets bureau reporting and oversight requirements.												$500	
2013							**Project Planning** - Funding will be applied toward architectural and engineering support services for facility projects particularly for developing project requirements and budget estimates for complex projects.												$186	
Total 2013																			**$1,336**	

USGS
SUMMARY PROJECT DATA SHEET FOR EQUIPMENT
DEFERRED MAINTENANACE PLAN OR CAPITAL IMPROVEMENT PLAN

Plan Fund FY	DOI Score	Region /Area/ District	Unit/ Facility Name	State	Cong Dist	Project Number	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)*
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	% Odm	% Oci	% DM	% CI		
2014	970	W	113 Sites Nationwide			W1998A10000	**Renovate/Replace Active Cableways** - Cableways at these sites do not meet modern design and load-testing criteria. To ensure that essential scientific data are safely collected, these systems either need to be brought up to modern design and safety standards, or replaced. Approximately 70% of the funding would be used to repair, or renovate, the system with one built to the new safety standards (including replacement of one or more components, cables, supports, anchor blocks, hardware, and cable car). About 30% of the funding would be used to replace installations with either a bank-operated system, or with an alternative measuring system such as an acoustic velocity meter or acoustic doppler velocity meter.	70%	30%								70%	30%	$240	
2014	970	W	Northern California Seismic Network	CA		G987160001	**Replace Network Analog and Microwave Stations** Replace earthquake network stations which provide seismic monitoring/warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment which supports the network may fail during an emergency, which would limit or possibly prevent adequate response to other federal agencies, local governments, the private sector, and public needs.	70%	30%								70%	30%	$200	
2014							**Condition Assessments** - Funding is provided to complete condition assessments for the identification of maintenance and capital improvement needs and help determine future priorities.												$210	
2014							**Maintenance Management System** - Funding is provided to develop, implement, and maintain a maintenance management system that meets bureau reporting and oversight requirements.												$500	
2014							**Project Planning** - Funding will be applied toward architectural and engineering support services for facility projects particularly for developing project requirements and budget estimates for complex projects.												$186	
							Total 2014												**$1,336**	

USGS
SUMMARY PROJECT DATA SHEET FOR EQUIPMENT
DEFERRED MAINTENANACE PLAN OR CAPITAL IMPROVEMENT PLAN

Plan Fund FY	DOI Score	Region /Area/ District	Unit/ Facility Name	State	Cong Dist	Project Number	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)*
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	% Odm	% Oci	% DM	% CI		
2015	970	W	113 Sites Nationwide			W1998A10000	**Renovate/Replace Active Cableways** - Cableways at these sites do not meet modern design and load-testing criteria. To ensure that essential scientific data are safely collected, these systems either need to be brought up to modern design and safety standards, or replaced. Approximately 70% of the funding would be used to repair, or renovate, the system with one built to the new safety standards (including replacement of one or more components, cables, supports, anchor blocks, hardware, and cable car). About 30% of the funding would be used to replace installations with either a bank-operated system, or with an alternative measuring system such as an acoustic velocity meter or acoustic doppler velocity meter.	70%	30%								70%	30%	$240	
2015	970	W	Northern California Seismic Network	CA		G987160001	**Replace Network Analog and Microwave Stations** Replace earthquake network stations which provide seismic monitoring/warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment which supports the network may fail during an emergency, which would limit or possibly prevent adequate response to other federal agencies, local governments, the private sector, and public needs.	70%	30%								70%	30%	$200	
2015							**Condition Assessments** - Funding is provided to complete condition assessments for the identification of maintenance and capital improvement needs and help determine future priorities.												$210	
2015							**Maintenance Management System** - Funding is provided to develop, implement, and maintain a maintenance management system that meets bureau reporting and oversight requirements.												$500	
2015							**Project Planning** - Funding will be applied toward architectural and engineering support services for facility projects particularly for developing project requirements and budget estimates for complex projects.												$186	
							Total 2015												**$1,336**	

USGS
SUMMARY PROJECT DATA SHEET FOR EQUIPMENT
DEFERRED MAINTENANACE PLAN OR CAPITAL IMPROVEMENT PLAN

Plan Fund FY	DOI Score	Region /Area/ District	Unit/ Facility Name	State	Cong Dist	Project Number	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)*
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	%CCci	%CMdm	% Odm	% Oci	% DM	% CI		
2016	970	W	113 Sites Nationwide			W1998A10000	**Renovate/Replace Active Cableways** - Cableways at these sites do not meet modern design and load-testing criteria. To ensure that essential scientific data are safely collected, these systems either need to be brought up to modern design and safety standards, or replaced. Approximately 70% of the funding would be used to repair, or renovate, the system with one built to the new safety standards (including replacement of one or more components, cables, supports, anchor blocks, hardware, and cable car). About 30% of the funding would be used to replace installations with either a bank-operated system, or with an alternative measuring system such as an acoustic velocity meter or acoustic doppler velocity meter.	70%	30%								70%	30%	$240	
2016	970	W	Northern California Seismic Network	CA		G987160001	**Replace Network Analog and Microwave Stations** Replace earthquake network stations which provide seismic monitoring/warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment which supports the network may fail during an emergency, which would limit or possibly prevent adequate response to other federal agencies, local governments, the private sector, and public needs.	70%	30%								70%	30%	$200	
2016							**Condition Assessments** - Funding is provided to complete condition assessments for the identification of maintenance and capital improvement needs and help determine future priorities.												$210	
2016							**Maintenance Management System** - Funding is provided to develop, implement, and maintain a maintenance management system that meets bureau reporting and oversight requirements.												$500	
2016							**Project Planning** - Funding will be applied toward architectural and engineering support services for facility projects particularly for developing project requirements and budget estimates for complex projects.												$186	
							Total 2016												**$1,336**	

Activity: Facilities
Subactivity: Construction

2010 Enacted: $0.0 million (0 FTE)
2011 CR: $0.0 million (0 FTE)
2012 Request: $2.5 million (0 FTE)

Establishment of Construction Subactivity

The 2012 Budget proposes to establish a Construction subactivity by transferring funds from the Deferred Maintenance and Capital Improvement subactivity.

Overview

The Construction subactivity provides the USGS with a way to budget and plan for needed facility construction to meet science needs.

Following Interior guidance, the USGS employs architect/engineer firms to conduct comprehensive condition assessments for about 20 percent of its owned installations each year. The USGS relies on the assessments to identify deficiencies that warrant remediation in three time lines: as high-priority requirements (immediate needs over the next five years), longer-term needs (approximately ten years out), or other requirements (not essential but deserving consideration in ten years or more).

The Construction subactivity provides a mechanism for budgeting and planning to modernize its real property assets and replace those that are in a state of disrepair, beyond their useful life, or otherwise no longer cost-effective to retain. The subactivity funds asset replacement, including building design and construction, and capital improvements such as major building system replacements. This plan includes much-needed improvements in building envelope integrity (foundation, roof system, facades, etc.) as well as the planning and replacement of entire facilities, where extensive deficiencies warrant replacement instead of repair.

The construction of replacement buildings for existing science operations and of new buildings for expanding activities, and investments in capital improvements that extend an asset's useful life are key objectives of the Construction subactivity. These investments typically reduce O&M costs and provide opportunities to include requirements mandated through Executive Orders 13514 and 13423. Project selection is based on a review of the Comprehensive Condition Assessments reports, which revealed the poor condition of these assets.

In 2011, the Construction fund plan targets a series of sustainable roof upgrade projects. The roofing projects replace aging roofs in poor condition with energy efficient roofs incorporating newer technologies. The sustainable roofing project schedule was reflected in the project rankings and was based on the age and condition of the existing roof, the building's condition, and the building's mission dependency. The science operations within the asset determine mission dependency and, as a consequence for this program, indicated the risk to these operations in the event of a failure. An administrative office building is as likely as a laboratory or research and development facility to house mission-critical activities and collections. Five buildings at Geomagnetic Observatories across the country are being replaced in accordance with the guidelines established in Interior and USGS Sustainable Buildings Implementation

Plans, and the heating ventilation and air conditioning systems at the Instrument Buildings in Arizona, Colorado, and Washington is being upgraded.

Investment Review Board (IRB) Oversight

The IRB follows Department of the Interior Capital Planning and Investment Control Guide instructions, which established two thresholds. The IRB reviews all construction projects with a life cycle cost of $2.0 million or more, applying capital investment review principles and employing business case analyses. Major construction projects, which include rehabilitation, remodeling, expansion, or new construction with a cost of $10.0 million or more for any building or other constructed asset, require departmental and Office of Management and Budget approval. The IRB reviews projects as part of the annual facility budget development process.

Program Performance

The USGS 2012-2016 five-year Construction plan includes one project for the Architectural and Engineering design and specifications for construction of a LEED (Leadership in Energy and Environmental Design) certified laboratory building at the Western Fisheries Research Center's Columbia River Research Laboratory (CRRL), in Cook, WA. A LEED certified building is designed and built using strategies intended to improve performance metrics such as those for energy savings, water efficiency, carbon dioxide emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. A new LEED Silver laboratory building would replace an over-utilized facility constructed in 1953. The cost of eliminating its deferred maintenance backlog exceeds its current replacement value. A long list of deferred maintenance, health, and safety issues currently limit the CRRL's ability to fully serve and address USGS science missions. At present, no deferred maintenance and capital improvement activities are planned for CRRL, leaving a backlog of more than $7.4 million in unmet needs.

The facility originally served as a fish nutrition laboratory in support of salmon hatchery programs intended to mitigate impacts from hydro-system operations. At that time, the laboratory's mission was narrowly focused and the building was designed for a work force of 20 FTE. Over the past 30 years, the CRRL science mission has greatly expanded beyond the physical capacity of the facility. Today, 112 FTE are allocated to Cook. The science mission now encompasses regional fisheries and aquatic resource priorities throughout the Columbia River Basin and the Western United States. With less than ten percent of its annual funding coming from the USGS appropriation, the laboratory is primarily funded by reimbursable projects for customers.

A new facility would provide a safe work environment, improve the condition of the workspace, increase efficiency in the use of the workspace, simplify facility management, and provide more control over future facility costs.

The following proposed construction project list the current construction priorities that have been vetted and approved by Bureau and departmental leadership to meet the most urgent programmatic needs for 2012.

U. S. GEOLOGICAL SURVEY (USGS)
SUMMARY PROJECT DATA SHEET
CONSTRUCTION

Plan	DOI	Region	Unit/	State	Cong. Dist.	Project #	Project Title	Ranking Categories									Total DM/CI		Orig Cost Est ($000)	Change in Annual O&M Costs ($s)
								% CHSdm	% CHSci	% CRPdm	% CRPci	% EPHPSBci	% CMdm	%Odm	%OCCci	% Oci	% DM	%CI		
2012	670/1	Western	Columbia River Research Laboratory, Cook	WA	7	Not Established	Architectural and Engineering Design/Specifications for Construction of a LEED Certified Laboratory Building (Year 1)	0	40	0	30	20	0	0	0	10	0	100	$ 2,500	
Total 2012																			**$ 2,500**	
2013	670/1	Western	Columbia River Research Laboratory, Cook	WA	7	Not Established	Architectural and Engineering Design/Specifications for Construction of a LEED Certified Laboratory Building (Year 2)	0	40	0	30	20	0	0	0	10	0	100	$ 2,500	
Total 2013																			**$ 2,500**	
2014	670/1	Western	Columbia River Research Laboratory, Cook	WA	7	Not Established	Architectural and Engineering Design/Specifications for Construction of a LEED Certified Laboratory Building (Year 3)	0	40	0	30	20	0	0	0	10	0	100	$ 25	
2014	500/2	Central	Earth Resources Observation Science Center, Sioux Falls	SD	0	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 1,865	
2014	500/3	Central	Northern Prairie Wildlife Research Center, Jamestown	ND	0	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 317	
2014	500/4	Central	Northern Prairie Wildlife Research Center, Jamestown	ND	0	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 279	
2014	410/5	Western	Geomagnetic Observatories	More Than One	More Than One	Not Established	Architectural and Engineering Design/Specifications to Construct 3 Data Sensor Buildings and 1 Warehouse (Year 1)	0	20	0	0	30	0	0	0	50	0	100	$ 14	
Total 2014																			**$ 2,500**	
2015	410/1	Western	Geomagnetic Observatories	More Than One	More Than One	Not Established	Architectural and Engineering Design/Specifications to Construct 3 Data Sensor Buildings and 1 Warehouse (Year 2)	0	20	0	0	30	0	0	0	50	0	100	$ 269	
2015	500/2	Central	National Wetlands Research Center, Lafayette	LA	7	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 1,292	
2015	500/3	Eastern	Northern Appalachian Research Laboratory, Wellsboro	PA	5	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 729	
2015	500/4	Western	Western Fisheries Research Center, Seattle	WA	7	Not Established	Sustainable Roof Upgrade Project	0	0	0	30	50	0	0	0	20	0	100	$ 210	
Total 2015																			**$ 2,500**	
2016	600/1	Central	Earth Resources Observation Science Center, Sioux Falls	SD	0	Not Established	Install a Ground Souce Heat Pump (Geothermal) System	0	0	0	0	100	0	0	o	o	o	100	$ 2,500	
Total 2016																			**$ 2,500**	

CONSTRUCTION PLAN
FY 2012 - 2016

U.S. Geological Survey PROJECT DATA SHEET	**Project Score/Ranking:**	670/1
	Planned Funding FY:	2012
	Funding Source:	Construction

Project Identification

Project Title: Architectural and Engineering Design/Specifications for Construction of a LEED Certified Laboratory Building

Project No.: Not Established | **Unit/Facility Name:** Columbia River Research Laboratory, Cook

Region/Area/District: Western | **Congressional District:** 25 | **State:** WA

Project Justification

DOI Asset Code:	Real Property Unique Identifier	API:	FCI-Before:	FCI-Projected:
N/A	N/A	0	0	0.00

Project Description:

The WFRC - Columbia River Research Laboratory (WFRC-CRRL) is in need of a new facility. This existing facility is located on Fish and Wildlife property with a backlog of 7.3 million dollars worth of unfunded DMCI projects creating a number of critical health and safety issues (wiring is old and considered a fire hazard, poor air quality, extreme overcrowding and high levels of passenger and industrial traffic making it dangerous for employees to move between buildings). Initial planning for a new facility is complete and has been approved by the Internal Review Board (IRB). Design and review costs were estimated by GSA in the Feasibility Study performed in 2006. Built in 1953, the Cook facility originally served as a fish nutrition laboratory in support of salmon hatchery programs intended to mitigate impacts from hydro-system operations. At that time, the lab's mission was narrowly focused and the building was designed for a work force of 20 FTE. Over the past 30 years, the CRRL science mission has greatly expanded beyond the physical capacity of the facility. Today, 112 FTE are allocated to CRRL. The science mission now encompasses regional fisheries and aquatic resource priorities throughout the Columbia River Basin and the Western Region. The laboratory is essentially self-supporting, receiving less than 10% of its annual funding requirement from the USGS appropriation. The lab is primarily funded by reimbursable projects for customers.

The A/E design will further develop plans to accommodate the WFRC-CRRL site requirements. Total construction cost is estimated at $42.0 million. The Architectural Engineer (A/E) design portion of that cost is estimated to be $5.1 million. The new facility will be approximately 66,000 square feet with state of the art laboratory space to meet the USGS's science mission. The initial funding will complete the Environmental Assessment allowing the A/E firm to complete design up to the 30% phase.

Integrated science requires modern state-of-the-art laboratories. For example, the current wet laboratory at CRRL is a converted vehicle garage which constrains research innovations needed to address emerging science needs (e.g., climate change). The Center estimates approximately $1.0 million in research opportunities have been lost each year due to lack of capacities. Opportunities to lead or participate in a wider range of science endeavors would be increased with modern laboratories. A new facility will provide a safe work environment, improve the condition of the workspace, increase efficiency in the use of the workspace, simplify facility management, and provide more control over future facility costs.

Project Need/Benefit:

40% CHSCI - A new facility is needed to correct numerous health and safety issues inherent in the design and construction of the existing facility. A properly designed facility will correct these deficiencies.

30% CRPCI - A new facility is needed to protect critical resources that are threatened by the poor condition of the existing facility. A properly designed facility will ensure that critical resource protection can be achieved.

20% EPHPSBCI - The current facility contains no features that are in accordance with existing energy policy or the requirements for sustainable buildings. The Architectural and Engineering design and specifications for a LEED certified building will insure that the new building meets or exceeds energy policy and sustainability requirements.

10% OCI - The current facility should be replaced because it is no longer serviceable. Architectural and Engineering design is required as part of the process for the construction of a new facility.

Revision Statement: (provided when submitting changed project data sheet)

N/A

Ranking Categories: Identify the percent of the project that is in the following categories of need.

0	% Critical Health or Safety Deferred Maintenance (10)	20	% Energy Policy, High Performance Sustain Bldg CI (6)
40	% Critical Health or Safety Capital Improvement (9)	0	% Critical Mission Deferred Maintenance (4)
0	% Critical Resource Protection Deferred Maintenance (7)	0	% Code Compliance Capital Improvement (4)
30	% Critical Resource Protection Capital Improvement (6)	0	% Other Deferred Maintenance (3)
		10	% Other Capital Improvement (1)

Capital Asset Planning 300 Analysis Required: N | **Total Project Score**: 670

VE Required: N **Type:** **Scheduled** (YY): **Completed** (YY):

Project Costs and Status

Project Cost Estimate (this PDS):	$'s	%	**Project Funding History (Entire Project):**	$'s
Deferred Maintenance Work:	$ -	0%	Appropriated to Date:	$ -
Capital Improvement Work:	$ 5,025,000	100%	Requested in FY 12 Budget:	$ 2,500,000
Total:	$ 5,025,000	100%	Future Funding to Complete Project:	$ 2,525,000
			Total:	$ 5,025,000

Class of Estimate: D

Estimate Escalated to FY: (yy): 2011

Planning and Design Funds

Planning Funds Received in FY NA

Design Funds Received in FY NA

Dates: Sch'd

Construction Start/Award: (QTR/YY)

Project Complete: (qtr/yy)

Project Data Sheet

Prepared/Last Updated: 05 10 (mm/yy)

DOI Approved: NO

Annual Operation & Maintenance Costs ($s)

Current:	Projected:	Net Change:
$ -	$ -	$ -

Activity: National Land Imaging

	2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)*	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
National Land Imaging ($000)	0	0	52,990	-1,173	48,000	99,817	99,817
FTE	*0*	*0*	*33*		*7*	*40*	*40*
Total Requirements ($000)	**0**	**0**	**52,990**	**-1,173**	**48,000**	**99,817**	**99,817**
Total FTE	***0***	***0***	***33***		***7***	***40***	***40***

* Fixed costs and related changes include technical adjustments, management efficiences, and the Enterprise Publishing Network reduction. Details can be found in the USGS Accounts Section.

Summary of Program Changes

Request Component	($000)	FTE
• Landsat Missions (NLI)	+48,000	+7
TOTAL Program Changes	**+48,000**	**+7**

Justification of Program Changes

The 2012 Budget Request for National Land Imaging is $99,817,000 and 40 FTE, a net change of +$99,817,000 and +40 FTE from the 2010 Enacted / 2011 Continuing Resolution.

Landsats 9 and 10 **(+$48,000,000/+7 FTE)**

The budget includes an increase of $48.0 million to begin planning and development of the next Landsat satellites, in coordination with National Aeronautics and Space Administration (NASA). By establishing a continuous, operational Landsat program, this initial funding will reduce long-term costs of satellite development by purchasing components for both Landsat 9 and 10 together. This program will also ensure data continuity over time, by preparing for a constant presence of Landsat satellites, launched every five years.

Technical Adjustment

Landsats 5 and 7, and
the Landsat Data Continuity Mission (LDCM) **(+$53,500,000/+33FTE)**

The proposed technical adjustment for Landsat missions transfers all enacted funding for Landsat missions and the requested program increase for LDCM from the Land Remote Sensing program under the Survey, Investigations, and Research account to the National Land Imaging account.

Overview

Landsat provides the world's longest, continuously-acquired collection of space-based land remote sensing imagery at a scale revealing both natural and human-induced changes to the landscape. Since 1972, Interior has managed the science data operations and applications development for Landsat satellites and other national land imaging systems from the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Data Center in Sioux Falls, SD. Interior assumed ownership and operation of Landsat 7 in 2000, and Landsat 5 in 2001. Currently, NASA and Interior are developing the LDCM, which is scheduled for launch in December 2012 as Landsat 8.

In June 2010, the President released the National Space Policy that proposed improved Earth observations designed "to gain new insights into our environment and our planet." In acknowledging Interior's leadership of U.S. land management and land science, the President called upon Interior, through the USGS, and NASA to "work together in maintaining a program for operational land remote sensing observations." As a result of this collaboration, the President proposed to formalize the partnership between NASA and the USGS in a way that mirrors the long-standing, successful partnership between NASA and the National Oceanic and Atmospheric Administration (NOAA) for the development of the Nation's operational weather satellite system. Operational satellite systems are distinguished from research or developmental systems by using reliable and proven technologies, by being designed to provide an unbroken stream of data over an extended time period, and by a commitment to replace any satellite that fails during operation. Just as NOAA controls the budget and manages the scientific requirements for weather satellites, the USGS would control the budget and manage the scientific requirements for Landsat satellites. Interior is to assume ownership and responsibility for the transition of Landsat satellites from a series of intermittent research missions to a reliable, continuous source of vital land-observation data for the Nation.
In addition to its ongoing responsibility for Landsat mission operations, Interior is to develop Landsats 9 and 10, with NASA to provide engineering, design, procurement, mission systems integration, and launch services for the sensors and spacecraft in compliance with Interior's mission requirements and funding. Landsat 9 is expected to launch by December 2018 as a replacement for Landsat 8, which will then be one year past its scheduled design life.

Landsat Missions includes the development, launch, operations, and maintenance of the Landsat satellites and ground control and data receiving and processing systems. The activities funded within the Landsat Missions in 2012 would include:

- Operation of Landsats 5 and 7 and follow-on missions, including: flight operations, orbital maintenance, and management of all ground data reception, processing, archiving, and Internet-access capabilities;
- Participation with NASA in LDCM development and lead development of the Landsat 8 ground system; continued adjudication of mission requirements for governmental, academic and private sector users, including international cooperators; and
- Initial development activities for the Landsat 9 and 10 missions, including a focused requirements collection and adjudication across the breadth of the Landsat user community, ground system planning and development, and long-lead development for extending thermal sensor longevity and reliability.

$000	2010 Enacted	2010 Enacted/ 2011 CR	2012 Fixed Costs & Related Changes (+/-)	2012 Administrative Cost Savings (-)	2012 Program Changes (+/-)	2012 Budget Request	Change from 2011 CR (+/-)
Surveys, Investigations, and Research (SIR)							
Land Remote Sensing							
Landsats 5 and 7	16,000	16,000	-16,000	0	0	0	-16,000
Landsat Data Continuity Mission	24,150	24,150	-37,500	0	13,350	0	-24,150
Total SIR	**40,150**	**40,150**	**-53,500**	**0**	**13,350**	**0**	**-40,150**
National Land Imaging (NLI)							
Landsats 5 and 7	0	0	16,000	0	0	16,000	16,000
Landsat Data Continuity Mission	0	0	37,500	0	0	37,500	37,500
Landsat 9 and 10	0	0	0	0	48,000	48,000	48,000
NLI Related Changes	0	0	-510	-1,173	0	-1,683	-1,683
Total NLI	**0**	**0**	**52,990**	**-1,173**	**48,000**	**99,817**	**99,817**

Landsat satellites have provided imagery of the Earth's surface for nearly four decades, making such data the most consistent, reliable documentation of global land-surface change ever assembled. After the USGS opened its global Landsat archive in December 2008 to public access via the Internet, downloads of both current and historical archival data soared to over three million scenes per year.

The LDCM, now well along in development, is designed as a five year mission that will carry enough fuel for up to 10 years of operation. NASA is developing the flight systems including the spacecraft, imaging sensors, mission operations element, mission launch, and coordination of the on-orbit checkout. The USGS is developing the ground system to acquire, process, archive, and disseminate data products to the user community derived from the satellite's Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) imaging sensors. After a December 2012 launch and on-orbit checkout, NASA will transfer ownership of Landsat 8 to the USGS. The USGS will then be responsible for flight operations, orbital maintenance, and data management, as described above.

Landsat 8 will continue and expand the Landsat record of Earth observations from today's daily collection rate of 300 scenes of land-image data per day to 400, increasing support for global land studies. Improved design efficiencies of the ground system will provide for more autonomous operation and contribute to reduced labor costs. Enhanced online access to these data, cross-calibrated with the nearly 40 years of observations in the Landsat archive, will allow scientists to undertake new applications over larger areas and across longer periods of time, at a lower cost than previously available. The enhanced OLI spectral bands offer the potential of a wider range of new applications and improved image quality for traditional remote sensing studies.

The Landsat Science Team (LST) is a 16 member USGS-sponsored group of external independent scientists and engineers (from academia, government, the private sector, and international organizations) who advise the USGS on issues critical to the success of NLI. Membership to the LST is competed on two parallel tracks: one funded and another unfunded. Competition for funded membership is open to academic, non-governmental, and industry scientists and engineers while unfunded membership is open to Federal and international scientists and engineers. The LST recommends strategies for the effective use of archived data from Landsat sensors and investigates requirements for future sensors to meet the needs of Landsat users, including the needs of policy makers at all levels of government.

Program Performance

In 2010 and 2011, the USGS successfully:

- Maintained Landsat 5 and 7 flight operations and ground segment activities;
- Provided over three million Landsat images downloaded free of charge by users throughout the Nation and around the world;
- Supported the NASA/USGS LDCM Development Team in system development, system tests, and the highly successful passing of critical design reviews for the Data Processing and Archive System (DPAS), the Flight Operations Segment, and the Ground System; and
- Focused on scientific issues associated with USGS plans to produce Landsat science products (e.g., surface reflectance and temperature products) and communicate the importance of the overall Landsat mission.

In 2012, the USGS will:

- Maintain Landsat 5 and 7 flight operations and ground segment activities;
- Conduct ground readiness tests for the Landsat 8 ground system, including DPAS operational releases and testing, sensor integration and environmental testing of both the OLI and TIRS sensors, and final launch preparations for all systems;
- Expand availability of science products and prepare for Landsat 8 data utilization;
- Gather requirements for, and begin, in cooperation with NASA, planning and design work for the Landsat 9 and 10 missions;
- Work with NASA to examine and incorporate potential system improvements for Landsat 9, especially in the areas of thermal imaging sensor longevity and reliability; and
- Initiate procurement of Landsat 9 mission sensors.

National Land Imaging Program Performance Change

Measure	2008 Actual	2009 Actual	2010 Actual	2011 Plan	2012 President's Budget	Program Change Accruing in 2012	Program Change Accruing in Out-years
National Land Imaging							
% of critical milestones successfully reached to support the LDCM (Landsat 8) launch schedule (NLI)							
Performance Data	35% (8/23)	52% (12/23)	70% (16/23)	78% (18/23)	83% milestones complete for Landsat 8 (19/23)	+5%	NA
Comments	The achievement of this performance measure in 2011 and 2012 is dependent upon the increase of $13.35 million requested to complete the ground system development of LDCM. If the ground system is not completed, then the USGS will not have the capability to process or distribute data received from the on-orbit satellite, denying users access to the new data for 20 to 24 months.						
% of critical milestones successfully reached to support the Landsat 9 launch schedule (NLI)							
Performance Data	N/A	N/A	N/A	N/A	Planning will commence	N/A	50%
Comments	In 2012, the USGS will begin planning for next Landsat mission which includes: conducting trade studies, gathering requirements, determining contracting needs, and developing preliminary schedules/milestones.						

Note: The 2011 Plan is the performance level based upon the 2010 Enacted/annualized 2011 Continuing Resolution. The 2012 plan and out-year targets build on the 2011 Plan. To the extent Congress enacts an annual 2011 appropriation that is different from the 2011 Continuing Resolution, the 2012 and out-year targets may require revisions.
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Program Change Occurring in Out-Years: Out-year performance beyond 2012 addresses lagging performance - those changes occurring as a result of the program change (not total budget) requested in 2012. It does **not** include the impact of receiving the program change again in a subsequent year. Outyear performance beyond 2011 addresses lagging performance—those changes occurring as a result of the program change (not total budget) requested in 2011. It does not include the impact of receiving the program change again in a subsequent out-year.

This page is intentionally left blank.

Working Capital Fund Overview

The USGS Working Capital Fund (WCF) was established to allow for the efficient financial management of the components listed below. The WCF was made available for expenses necessary for furnishing materials, supplies, equipment, work, and services in support of USGS programs, and as authorized by law (authorization information begins on page 4), to agencies of the Federal Government and others. The WCF consists of four components:

1. The WCF Investment Component provides a mechanism to assist USGS managers in planning for and acquiring goods and services that are too costly to acquire in a single fiscal year or that, due to the nature of services provided must operate in a multi- as opposed to a single-year basis of funding. Investments are supported by documented investment plans that include estimated acquisition/replacement costs, a schedule of deposits, and approval of the plans, deposits and expenditures by designated USGS officials.

- **Telecommunications Investments** are used for telecommunication hardware, software, facilities, and services. Examples include replacement or expansion of automatic exchange systems and computerized network equipment such as switches, routers, and monitoring systems.
- **Equipment Investments** are used for the acquisition, replacement, and expansion of equipment for USGS programs. Equipment may include, but is not limited to, hydrologic, geologic, and cartographic instruments, laboratory equipment, and computer hardware and software.
- **Facilities Investments** support facility and space management investment expenses for USGS real property, including owned and leased space. Authorized investment expenses include nonrecurring and emergency repair, relocation of a facility, and facility modernization. The component does not include annual expenses such as rent, day-to-day operating expenses, recurring maintenance, or utilities. The investment component is not used to fund construction of buildings.
- **Publications Investments** are used for the preparation and production of technical publications reporting on the results of scientific data and research. Research projects typically are three to five years in duration, and planning the medium in which to report results occurs over the life of the project. The Publications Investment Component provides a mechanism for establishing an efficient, effective, and economical means of funding publications costs over the long term.

2. The WCF Fee-for-Service Component provides a continuous cycle of client services for fees established in a rate-setting process and, in some cases, with funding provided by appropriated funds. Fees are predicated upon both direct and indirect costs associated with providing the services, including amortization of equipment required to provide the services.

- **The National Water Quality Laboratory (NWQL)** conducts chemical analyses of water, sediments, and aquatic tissue for all USGS water district offices and other customers, including other USGS mission areas, other Interior Bureaus, and government agencies. The NWQL also does biological classification for these customers. NWQL analysis services are provided on a reimbursable basis, with the price of services calculated to cover direct and indirect costs.
- **The USGS Hydrologic Instrumentation Facility (HIF)** provides **hydrologic** instrumentation on a fee-for-service basis. The facility provides its customers with

hydrologic instruments that can be rented or purchased, maintains a technical expertise on instrumentation, calibrates instruments before they are installed, and tests and evaluates instruments as they become available in the marketplace.

- **Bureau Laboratories –** There are currently three laboratories in Eastern Region Water Research that perform gaseous dissolved chlorofluorocarbon measurements, environmental microbiology analyses and isotope-ratio measurements of water, sediments, rocks, and gases for all Water Resources Mission Area offices, other USGS mission areas, and other Federal agencies.
- **The National Training Center** conducts USGS training programs. These programs include, but are not limited to, specialized training for USGS employees, cooperators, and international participants in many facets of hydrology, hydraulics, and water resources investigations, as well as computer applications, management and leadership seminars, and various workshops.
- **Drilling –** There are currently two drilling units, based in Lakewood, CO and Henderson, NV. The drilling units provide drilling services to conduct exploratory drilling for obtaining geologic samples and cores in difficult hydrogeologic environments and the emplacement of sampling devices and sub-surface sensors for hydrologic investigations.
- **The Reston Supply Service Center (RSSC)** is a nationwide supply support activity which provides the National Center and other USGS offices with a variety of supplies and specialty items on a fee-for-service basis. The activity provides administrative supplies, USGS Visual Identity products, USGS stationery and forms, and other materials determined to be best obtained centrally.

3. GSA Building Delegations Component

- The GSA buildings delegation component is used to manage funds received under the delegated authority for the J.W. Powell Building and Advanced Systems Center in Reston, VA, as provided by 40 U.S.C. 121 (d) and (e) (formerly subsections 205 (d) and (e) of the Federal Property and Administrative Services Act of 1949, as amended, and 40 U.S.C. 486 (d) and (e), respectively). Delegated functions include building operations, maintenance, cleaning, overseeing fire and life safety, maintaining high voltage switchgear and fire alarms, recurring repairs, minor alterations, historic preservation, concessions, and energy management. Because of the size of the Reston buildings and the need to expend the facility funds in a manner corresponding to GSA's no-year funding (Federal Buildings Fund) mechanisms and the GSA National Capital Region long-range capital improvement plan, no-year funding is a prerequisite to administering the delegation. Public Law 104–208, Section 611, provides that, for the fiscal year ending September 30, 1997, and thereafter, any department or agency that has delegated authority shall retain that portion of the GSA rental payment available for operation, maintenance, and repair of the building and the funds shall remain available until expended. This WCF component was established in 2004 to provide USGS with this no-year flexibility.

4. The Enterprise Services Component operates in a businesslike manner, recovering fees for various consolidated services provided to USGS mission areas and other Federal agencies. By leveraging these services through a unified effort, USGS achieves cost and business efficiencies that would otherwise be lost.

- The Enterprise Publishing Network (EPN) operates within the Enterprise Services Component of the WCF. The EPN provides high quality publishing support for science

information products while improving operational effectiveness and efficiencies. The EPN offers a complete range of publishing services to authors of USGS information products and others. Services include consultation, technical editing, illustrating, layout and design, Web services, printing management/distribution, electronic publishing as well as other publishing needs. Direct program funding to the EPN is proposed for reduction in 2012 by $5.5 million. Details can be found in the Key Changes Section.

Appropriation Language and Citations

Permanent authority:

1. Provided further, That, in fiscal year 1986, and thereafter, all amortization fees resulting from the Geological Survey providing telecommunications services shall be deposited in a special fund to be established on the books of the Treasury and be immediately available for payment of replacement or expansion of telecommunications services, to remain available until expended.

   - **43 U.S.C.50a** established the Telecommunications Amortization Fund, which was displayed as part of the Surveys, Investigations and Research appropriation from 1986 through 1990. Beginning in 1991, the Telecommunications Amortization Fund was merged into the WCF described in the next citation.

2. There is hereby established in the Treasury of the United States a working capital fund to assist in the management of certain support activities of the United States Geological Survey (hereafter referred to as the "Survey"), Department of the Interior. The fund shall be available on and after November 5, 1990, without fiscal year limitation for expenses necessary for furnishing materials, supplies, equipment, work, facilities, and services in support of Survey programs, and, as authorized by law, to agencies of the Federal Government and others. Such expenses may include laboratory modernization and equipment replacement, computer operations, maintenance, and telecommunications services; requirements definition, systems analysis, and design services; acquisition or development of software; systems support services such as implementation assistance, training, and maintenance; acquisition and replacement of computer, publications and scientific instrumentation, telecommunications, and related automatic data processing equipment; and, such other activities as may be approved by the Secretary of the Interior.

   There are authorized to be transferred to the fund, at fair and reasonable values at the time of transfer, inventories, equipment, receivables, and other assets, less liabilities, related to the functions to be financed by the fund as determined by the Secretary of the Interior. Provided, That the fund shall be credited with appropriations and other funds of the Survey, and other agencies of the Department of the Interior, other Federal agencies, and other sources, for providing materials, supplies, equipment, work, and other services as authorized by law and such payments may be made in advance or upon performance: Provided further, That charges to users will be at rates approximately equal to the costs of furnishing the materials, supplies, equipment, facilities, and services, including such items as depreciation of equipment and facilities, and accrued annual leave: Provided further, That all existing balances as of November 5, 1990, from amortization fees resulting from the Survey providing telecommunications services and deposited in a special fund established on the books of the Treasury and available for payment of replacement or expansion of telecommunications services as authorized by Public Law 99-190, are hereby transferred to and merged with the working capital fund, to be used for the same purposes as originally authorized. Provided further, That funds that are not necessary to carry out the activities to be financed by the fund, as determined by the Secretary, shall be covered into miscellaneous receipts of the Treasury.

P.L. 101-512 Department of the Interior and Related Agencies Appropriations Act, 1991 This authority established a Working Capital Fund account in 1991. The Telecommunications Amortization Fund was included as part of the WCF and all balances of the Telecommunications Amortization Fund existing at the end of 1990 were transferred to the WCF. These balances were to be used for the same purposes as originally authorized.

P.L. 103-332 Department of the Interior and Related Agencies Appropriations Act, 1995 The amendments that were made in this appropriations act are shown in underline in the second citation shown above. This authority expanded the use of the Working Capital Fund to partially fund laboratory operations and facilities improvements and to acquire and replace publication and scientific instrumentation and laboratory equipment.

United States Geological Survey

Federal Funds

General and special funds:

WORKING CAPITAL FUND

Program and Financing

(In millions of dollars)

Identification Code **14-4556-0-4-306**		**2010 Enacted**	**2011 CR**	**2012 Budget Request**
	Obligations by program activity:			
08.01	Working Capital Fund	86	106	95
	Budgetary resources:			
	Unobligated balance:			
10.00	Unobligated balance carried forward, start of year	96	108	95
10.21	Recoveries of prior year unpaid obligations	3		
10.50	Unobligated balance total	99	108	95
	Budget Authority:			
	Spending Authority from offsetting collections, disc			
17.00	Collected	95	93	78
19.30	Total budgetary resources available	194	201	173
	Memorandum (non-add) entries:			
19.41	Unexpired unobligated balance, end of year	108	95	78
	Change in obligated balances:			
	Obligated balance, start of year:			
30.00	Unpaid obligations, brought forward, Oct 1	19	24	45
30.30	Obligations incurred, unexpired accounts	86	106	95
30.40	Outlays, Gross	-78	-85	-82
30.80	Recoveries of prior year obligations	-3	0	0
	Obligated balance, end of year:			
30.90	Unpaid Obligations, end of year (gross)	24	45	58
	Budget authority and outlays, net:			
	Discretionary			
40.00	Budget authority, gross	95	93	78
	Outlays, gross:			
40.10	Outlays from new discretionary authority	43	42	35
40.11	Outlays from discretionary balances	35	43	47
40.20	Outlays, gross	78	85	82
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
40.30	Federal Sources	-95	-93	-78
40.70	Budget authority, net (discretionary)			
40.80	Outlays, net (discretionary)	-17	-8	4
41.80	Budget authority, net (total)			
41.90	Outlays, net (total)	-17	-8	4

WORKING CAPITAL FUND

Balance Sheet

(In millions of dollars)

Identification Code 14-4556-0-4-306		2009 Actual	2010 Actual
	ASSETS:		
	Federal assets:		
1101	Fund balances with Treasury	115	132
	Investments in U.S. securities:		
1106	Receivables, net		
1803	Other Federal assets: Property, plant and equipment, net	14	18
1999	Total assets	129	150
	LIABILITIES:		
2101	Federal liabilities: Accounts payable		
2201	Non-Federal liabilities: Accounts payable	6	5
2999	Total liabilities	6	5
	NET POSITION:		
3300	Cumulative results of operations	123	145
3999	Total net position	123	145
4999	Total liabilities and net position	129	150

WORKING CAPITAL FUND

Object Classification

(In millions of dollars)

Identification Code 14-4556-0-4-306		2010 Enacted	2011 CR	2012 Budget Request
	Reimbursable obligations:			
	Personnel compensation:			
11.1	Full-time permanent	19	21	18
11.3	Other than full-time permanent	1	1	1
11.5	Other personnel compensation	1	1	1
11.9	Total personnel compensation	21	23	20
12.1	Civilian personnel benefits	5	6	5
21.0	Travel and transportation of persons	1	1	1
22.0	Transportation of things	1	1	1
23.1	Rental payments to GSA	1	1	1
23.2	Rental payments to others	0	1	1
23.3	Communications, utilities, and miscellaneous charges	1	1	1
24.0	Printing and reproduction	0	1	1
25.1	Advisory and Assistance Services	1	2	1
25.2	Other services	9	11	13
25.3	Other purchases of goods and services from Government Accounts	5	8	7
25.4	Operation and maintenance of facilities	7	7	6
25.7	Operation and maintenance of equipment	2	1	1
26.0	Supplies and materials	4	4	4
31.0	Equipment	27	37	31
32.0	Land and structures	1	1	1
99.0	Reimbursable obligations	86	106	95
99.9	Total new obligations	86	106	95

WORKING CAPITAL FUND

Employment Summary

Identification Code 14-4556-0-4-306		2010 Enacted	2011 CR	2012 Budget Request
	Reimbursable:			
2001	Civilian full-time equivalent employment	286	278	234

SURVEYS, INVESTIGATIONS, AND RESEARCH

Summary of Requirements by Object Class

(Millions of Dollars)

Appropriation: Surveys, Investigations, and Research		2010 Enacted		Fixed Costs & Related Changes *		Program Changes		2012 Request	
Object Class		**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
	Personnel compensation								
11.1	Full-time permanent		428		-5		-8		415
11.3	Other than full-time permanent		42		0		-2		40
11.5	Other personnel compensation		14		0		-1		13
	Total personnel compensation	5,432	484	-63	-5	-163	-11	5,206	468
12.1	Civilian personnel benefits		130		-1		0		129
13.0	Benefits for former personnel		1		0		5		6
21.0	Travel and transportation of persons		30		-6		0		24
22.0	Transportation of things		3		-1		0		2
23.1	Rental payment to GSA		54		-1		5		58
23.2	Rental payments to others		5		0		0		5
23.3	Comm., utilities and misc. charges		14		-3		1		12
24.0	Printing and reproduction		1		0		0		1
25.1	Advisory and assistance services		16		-3		0		13
25.2	Other services		133		-38		-4		91
25.3	Other purchases of goods and services from Government accounts		79		-8		-13		58
25.4	Operation and maintenance of Facilities		5		0		0		5
25.7	Operation and maintenance of Equipment		12		0		0		12
26.0	Supplies and materials		21		-6		0		15
31.0	Equipment		38		-3		5		40
32.0	Land and structures		1		0		0		1
41.0	Grants, subsidies, and contributions		85		0		-7		78
	Total requirements		**1,112**		**-75**		**-19**		**1,018**

* The fixed costs and related changes column includes administrative cost savings.

This information is displayed in budget authority (not obligations) by object class.

SURVEYS, INVESTIGATIONS, AND RESEARCH

Summary of Requirements by Object Class

(Millions of Dollars)

Appropriation: Surveys, Investigations, and Research Reimbursable Obligations		2010 Enacted FTE	2010 Enacted Amount	2012 Request FTE	2012 Request Amount	Increase or Decrease FTE	Increase or Decrease Amount
	Personnel compensation						
11.1	Full-time permanent		166		172		6
11.3	Other than full-time permanent		28		29		1
11.5	Other personnel compensation		6		5		-1
	Total personnel compensation	2,836	200	2,836	206	0	6
12.1	Civilian personnel benefits		53		55		2
21.0	Travel and transportation of persons		13		13		0
22.0	Transportation of things		3		3		0
23.1	Rental payments to GSA		17		17		0
23.2	Rental payments to others		2		2		0
23.3	Communications, utilities and miscellaneous Charges		6		6		0
25.1	Advisory and assistance services		2		2		0
25.2	Other services		56		52		-4
25.3	Other purchases of goods and services from Government accounts		55		51		-4
25.4	Operation and maintenance of facilities		2		2		0
25.7	Operation and maintenance of equipment		3		3		0
26.0	Supplies and materials		14		14		0
31.0	Equipment		12		12		0
41.0	Grants, subsidies, and contributions		34		34		0
	Total requirements		**472**		**472**		**0**

United States Geological Survey

Federal Funds

General and special funds:

SURVEYS, INVESTIGATIONS, AND RESEARCH

Program and Financing

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Obligations by program activity:			
00.01	Ecosystems	165	167	166
00.02	Climate and Land Use Change	141	140	107
00.03	Energy, Minerals, and Environmental Health	98	101	89
00.04	Natural Hazards	138	142	135
00.05	Water Resources	214	223	201
00.06	Core Science Systems	124	125	106
00.07	Administration and Enterprise Information	118	119	119
00.08	Facilities	101	113	103
00.09	Recovery Act activities	114	0	0
00.91	Direct program activities, subtotal	1,213	1,130	1,026
08.01	Reimbursable program	456	458	462
08.02	Reimbursable program – EPA Great Lakes	16	10	10
08.99	Total reimbursable obligations	472	468	472
09.00	Total new obligations	1,685	1,598	1,498
	Budgetary resources:			
	Unobligated balance:			
10.00	Unobligated balance brought forward, Oct 1	472	397	379
	Budget authority:			
	Appropriations, discretionary:			
11.00	Appropriation	1,111	1,112	1,018
11.21	Appropriations transferred from other accounts	1	0	0
11.60	Appropriation, discretionary (total)	1,112	1,112	1,018
	Spending authority from offsetting collections, discretionary:			
17.00	Collected	450	468	472
17.01	Change in uncollected payments, Federal sources	55	0	0
17.50	Spending auth from offsetting collections, disc (total)	505	468	472
19.00	Budget authority (total)	1,617	1,580	1,490
19.30	Total budgetary resources available	2,089	1,977	1,869
	Memorandum (non-add) entries:			
19.40	Unobligated balance expiring	-7	0	0
19.41	Unexpired unobligated balance, end of year	397	379	371

SURVEYS, INVESTIGATIONS, AND RESEARCH

Program and Financing cont'd

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Change in obligated balance:			
	Obligated balance, start of year (net)			
30.00	Unpaid obligations, brought forward, Oct 1 (gross)	310	412	476
30.10	Uncollected payments, Fed sources, brought forward, Oct 1	-425	-450	-450
30.20	Obligated balance, start of year (net)	-115	-38	26
30.30	Obligations incurred, unexpired accounts	1,685	1,598	1,498
30.31	Obligations incurred, expired accounts	3	0	0
30.40	Outlays (gross)	-1,580	-1,534	-1,453
30.50	Change in uncollected payments, Fed sources, unexpired	-55	0	0
30.51	Change in uncollected payments, Fed sources, expired	30	0	0
30.81	Recoveries of prior year unpaid obligations, expired	-6	0	0
	Obligated balance, end of year (net)			
30.90	Unpaid obligations, end of year (gross)	412	476	521
30.91	Uncollected payments, Fed sources, end of year	-450	-450	-450
31.00	Obligated balance, end of year (net)	-38	26	71
	Budget authority and outlays, net:			
	Discretionary:			
40.00	Budget authority, gross	1,617	1,580	1,490
	Outlays, gross:			
40.10	Outlays from new discretionary authority	1,097	1,391	1,311
40.11	Outlays from discretionary balances	483	143	142
40.20	Outlays, gross (total)	1,580	1,534	1,453
	Offsets against gross budget authority and outlays:			
	Offsetting collections (collected) from:			
40.30	Federal sources	-267	-262	-264
40.33	Non-Federal sources	-210	-206	-208
40.40	Offsets against gross budget authority and outlays (total)	-477	-468	-472
	Additional offsets against gross budget authority only:			
40.50	Change in uncollected payments, Fed sources, unexpired	-55	0	0
40.52	Offsetting collections credited to expired accounts	27	0	0
40.60	Additional offsets against budget authority only (total)	-28	0	0
40.70	Budget authority, net (discretionary)	1,112	1,112	1,018
40.80	Outlays, net (discretionary)	1,103	1,066	981
41.80	Budget authority, net (total)	1,112	1,112	1,018
41.90	Outlays, net (total)	1,103	1,066	981

SURVEYS, INVESTIGATIONS, AND RESEARCH

Object Classification

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	428	433	415
11.3	Other than full-time permanent	42	42	40
11.5	Other personnel compensation	14	14	13
11.9	Total personnel compensation	484	489	468
12.1	Civilian personnel benefits	130	135	129
13.0	Benefits for former personnel	1	1	6
21.0	Travel and transportation of persons	30	28	24
22.0	Transportation of things	3	3	2
23.1	Rental payments to GSA	54	55	58
23.2	Rental payment to others	5	5	5
23.3	Comm., utilities, and miscellaneous charges	14	12	12
24.0	Printing and reproduction	1	1	1
25.1	Advisory and assistance services	16	15	13
25.2	Other services	165	146	99
25.3	Other purchases of goods and services from Government Accounts	79	78	58
25.4	Operation and maintenance of facilities	11	5	5
25.7	Operation and maintenance of equipment	12	12	12
26.0	Supplies and materials	21	19	15
31.0	Equipment	67	40	40
32.0	Land and structures	18	1	1
41.0	Grants, subsidies, and contributions	102	85	78
99.0	Direct obligations	1,213	1,130	1,026

SURVEYS, INVESTIGATIONS, AND RESEARCH

Object Classification cont'd

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Reimbursable obligations:			
	Personnel compensation:			
11.1	Full-time permanent	166	166	172
11.3	Other than full-time permanent	28	28	29
11.5	Other personnel compensation	6	6	5
11.9	Total personnel compensation	200	200	206
12.1	Civilian personnel benefits	53	53	55
21.0	Travel and transportation of persons	13	13	13
22.0	Transportation of things	3	3	3
23.1	Rental payments to GSA	17	17	17
23.2	Rental payments to others	2	2	2
23.3	Comm., utilities, and miscellaneous charges	6	6	6
25.1	Advisory and assistance services	2	2	2
25.2	Other services	56	54	52
25.3	Other purchases of goods and services from Government accounts	55	53	51
25.4	Operation and maintenance of facilities	2	2	2
25.7	Operation and maintenance of equipment	3	3	3
26.0	Supplies and materials	14	14	14
31.0	Equipment	12	12	12
41.0	Grants, subsidies, and contributions	34	34	34
99.0	Reimbursable obligations	472	468	472
99.9	Total new obligations	1,685	1,598	1,498

SURVEYS, INVESTIGATIONS, AND RESEARCH

Employment Summary

Identification Code 14-0804-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Direct:			
1001	Civilian full-time equivalent employment	5,446	5,432	5,206
	Reimbursable:			
2001	Civilian full-time equivalent employment	2,851	2,836	2,836
	Allocation account:			
3001	Civilian full-time equivalent employment	17	17	17

Note: The 2010 direct FTE includes 14 FTE for Recovery Act activities.

NATIONAL LAND IMAGING

Summary of Requirements by Object Class

(Millions of Dollars)

Appropriation: National Land Imaging		2010 Enacted		Fixed Costs & Related Changes *		Program Changes		2012 Request	
Object Class		FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
	Personnel compensation								
11.1	Full-time permanent		0		5		0		5
	Total personnel compensation	0	0	33	5	7	0	40	5
12.1	Civilian personnel benefits		0		1		1		2
21.0	Travel and transportation of persons		0		0		1		1
25.1	Advisory and assistance services		0		0		2		2
25.2	Other services		0		38		14		52
25.3	Other purchases of goods and services from Government accounts		0		7		29		36
25.7	Operation and maintenance of Equipment		0		0		1		1
31.0	Equipment		0		1		0		1
	Total requirements		**0**		**52**		**48**		**100**

* The fixed costs and related changes column includes administrative cost savings.

This information is displayed in budget authority (not obligations) by object class.

United States Geological Survey

Federal Funds

General and special funds:

NATIONAL LAND IMAGING

Program and Financing

(Millions of Dollars)

Identification Code 14-2630-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Obligations by program activity:			
00.01	National Land Imaging	0	0	95
	Budgetary resources:			
	Budget authority:			
	Appropriations, discretionary:			
11.00	Appropriation	0	0	100
19.30	Total budgetary resources available	0	0	100
	Memorandum (non-add) entries:			
19.41	Unexpired unobligated balance, end of year	0	0	5
	Change in obligated balance:			
30.30	Obligations incurred, unexpired accounts	0	0	95
30.40	Outlays (gross)	0	0	-88
	Obligated balance, end of year (net)			
30.90	Unpaid obligations, end of year (gross)	0	0	7
	Budget authority and outlays, net:			
	Discretionary:			
40.00	Budget authority, gross	0	0	100
	Outlays, gross:			
40.10	Outlays from new discretionary authority	0	0	88
41.80	Budget authority, net (total)	0	0	100
41.90	Outlays, net (total)	0	0	88

NATIONAL LAND IMAGING

Object Classification

(Millions of Dollars)

Identification Code 14-2630-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	0	0	5
11.9	Total personnel compensation	0	0	5
12.1	Civilian personnel benefits	0	0	2
21.0	Travel and transportation of persons	0	0	1
25.1	Advisory and assistance services	0	0	2
25.2	Other services	0	0	48
25.3	Other purchases of goods and services from Government Accounts	0	0	35
25.7	Operation and maintenance of equipment	0	0	1
31.0	Equipment	0	0	1
99.0	Direct obligations	0	0	95
99.9	Total new obligations	0	0	95

NATIONAL LAND IMAGING

Employment Summary

Identification Code 14-2630-0-1-306		2010 Actual	2011 CR	2012 Estimate
	Direct:			
1001	Civilian full-time equivalent employment	0	0	40

Funding of U.S. Geological Survey Programs
(Obligations)
(Thousands of Dollars)

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Ecosystems			
Multi-Year appropriation	164,121	167,097	166,393
No-Year appropriation	37	1	0
Total (appropriation)	**164,158**	**167,098**	**166,393**
Non-Federal (Domestic) sources			
Technology transfer	2,505	2,570	2,636
Miscellaneous	2,136	2,136	2,136
Subtotal (non-Federal domestic sources)	4,641	4,706	4,772
Non-Federal (Foreign) sources			
Miscellaneous	88	90	93
Subtotal (non-Federal foreign sources)	88	90	93
State and local sources			
Unmatched	3,566	3,628	3,693
Subtotal (State and local sources)	3,566	3,628	3,693
Federal sources			
Department of Agriculture	1,228	1,071	1,086
Department of Commerce			
National Oceanic and Atmospheric Administration	1,407	1,236	1,236
Department of Defense			
Corps of Engineers	20,932	18,220	18,341
Other	10,193	8,905	8,992
Department of Energy	1,842	1,631	1,679
Department of Homeland Security			
Federal Emergency Management Agency	50	50	50
Department of the Interior			
Bureau of Land Management	4,194	3,665	3,739
Bureau of Ocean Energy Mgmt, Reg. & Enforcement	1,082	925	941
Bureau of Reclamation	6,408	5,678	5,809
Fish and Wildlife Service	9,305	8,013	8,094
National Park Service	2,110	1,705	1,729
Office of the Secretary	99	99	99
Department of Justice	1	1	1
Department of State	204	204	204
Department of Transportation	419	334	335
Environmental Protection Agency	851	682	684
Health and Human Services	755	669	669
National Aeronautics and Space Administration	29	29	29
Nuclear Regulatory Commission	65	65	65
Miscellaneous	47	48	49
Subtotal (Federal sources)	61,221	53,230	53,831

	2010 Actual	2011 Estimate	2012 Estimate
Total (reimbursable)	**69,516**	**61,654**	**62,389**
Total: Ecosystems	**233,674**	**228,752**	**228,782**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Climate and Land Use Change			
Multi-Year appropriation	101,066	99,226	107,223
No-Year appropriation	40,597	40,794	0
Total (appropriation)	**141,663**	**140,020**	**107,223**
Non-Federal (Domestic) sources			
Miscellaneous	1,434	1,434	1,434
Subtotal (non-Federal domestic sources)	1,434	1,434	1,434
Non-Federal (Foreign) sources			
Landsat International Ground Station Fees	1,316	1,316	1,316
Corporacion Andina de Fomento	128	128	128
Miscellaneous	77	77	77
Subtotal (non-Federal foreign sources)	1,521	1,521	1,521
State and local sources			
Unmatched	75	75	75
Subtotal (State and local sources)	75	75	75
Federal sources			
Agency for International Development	3,333	3,291	3,293
Central Intelligence Agency	1,013	1,000	1,000
Department of Agriculture	313	313	313
Department of Commerce			
National Oceanic and Atmospheric Administration	105	101	101
Department of Defense			
Corps of Engineers	328	319	319
National Geospatial-Intelligence Agency	813	835	858
Other	120	120	121
Department of Energy	20	20	20
Department of Homeland Security			
Federal Emergency Management Agency	119	119	119
Department of the Interior			
Bureau of Indian Affairs	14	14	14
Bureau of Land Management	510	506	511
Bureau of Reclamation	216	212	212
Fish and Wildlife Service	325	325	325
National Park Service	1,019	1,001	1,002
Office of Secretary	3,422	3,368	3,368
Environmental Protection Agency	1,708	1,699	1,713
Federal Aviation Administration	14	14	14
Health and Human Services	95	95	95
National Aeronautics and Space Administration	9,047	8,920	8,920
Remote Sensing Data Purchases	100	103	106
Miscellaneous	15	15	15
Subtotal (Federal sources)	22,649	22,390	22,439

	2010 Actual	2011 Estimate	2012 Estimate
Total (reimbursable)	**25,679**	**25,420**	**25,469**
Total: Climate and Land Use Change	**167,342**	**165,440**	**132,692**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Energy, Minerals, and Environmental Health			
Multi-Year appropriation	98,110	101,024	89,289
Total (appropriation)	**98,110**	**101,024**	**89,289**
Non-Federal (Domestic) sources			
Technology transfer	114	115	117
Miscellaneous	1,467	1,467	1,467
Subtotal (non-Federal domestic sources)	1,581	1,582	1,584
Non-Federal (Foreign) sources			
Miscellaneous	70	70	70
Subtotal (non-Federal foreign sources)	70	70	70
State and local sources			
Unmatched	292	295	301
Subtotal (State and local sources)	292	295	301
Federal sources			
Agency for International Development	128	128	128
Central Intelligence Agency	25	25	25
Department of Agriculture	47	47	47
Department of Commerce			
National Oceanic and Atmospheric Administration	9	9	9
Other	50	0	0
Department of Defense			
Corps of Engineers	301	301	301
National Geospatial-Intelligence Agency	72	72	72
Other	8,064	7,866	7,870
Department of Energy	494	494	494
Department of the Interior			
Bureau of Indian Affairs	38	38	38
Bureau of Land Management	968	951	957
Bureau of Reclamation	356	361	367
Fish and Wildlife Service	677	679	681
National Park Service	216	218	220
Office of Secretary	194	194	194
Environmental Protection Agency	1,108	1,097	1,097
Health and Human Services	50	50	50
National Aeronautics and Space Administration	459	459	459
National Science Foundation	776	742	742
Subtotal (Federal sources)	14,032	13,731	13,751
Total (reimbursable)	**15,975**	**15,678**	**15,706**
Total: Energy, Minerals, and Environmental Health	**114,085**	**116,702**	**104,995**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Natural Hazards			
Multi-Year appropriation	136,461	139,694	134,264
No-Year appropriation	71	628	1,000
Total (appropriation)	**136,532**	**140,322**	**135,264**
Non-Federal (Domestic) sources			
Technology transfer	614	630	648
Miscellaneous	358	365	373
Subtotal (non-Federal domestic sources)	972	995	1,021
Non-Federal (Foreign) sources			
Miscellaneous	44	45	46
Subtotal (non-Federal foreign sources)	44	45	46
State and local sources			
Unmatched	4,249	4,346	4,447
Subtotal (State and local sources)	4,249	4,346	4,447
Federal sources			
Agency for International Development	96	96	96
Department of Agriculture	88	88	89
Department of Commerce			
National Oceanic and Atmospheric Administration	90	92	94
Other	386	386	397
Department of Defense			
Corps of Engineers	5,179	5,174	5,300
National Geospatial-Intelligence Agency	125	125	125
Other	12,621	12,298	12,317
Department of Energy			
Bonneville Power Administration	441	443	456
Other	1,040	1,020	1,035
Department of the Interior			
Bureau of Land Management	25	25	26
Bureau of Ocean Energy Mgmt, Reg. & Enforcement	106	109	112
Bureau of Reclamation	96	98	100
National Park Service	530	507	508
Office of Secretary	6	6	6
Department of Justice	12	12	12
Department of State	1,913	1,900	1,902
Department of Veterans Affairs	1,109	1,115	1,123
Environmental Protection Agency	63	64	66
General Services Administration	9	9	10
National Aeronautics and Space Administration	9,542	9,487	9,587
National Science Foundation	673	673	673
Nuclear Regulatory Commission	1,119	1,109	1,115
Miscellaneous	3	3	3
Subtotal (Federal sources)	35,272	34,839	35,152

	2010 Actual	2011 Estimate	2012 Estimate
Total (reimbursable)	**40,537**	**40,225**	**40,666**
Total: Natural Hazards	**177,069**	**180,547**	**175,930**

* This table does not include obligations for the Spectrum Relocation Fund, since it is a mandatory fund. MAX obligations do include the Spectrum Relocation Fund. The amounts included in MAX are: FY 2010 $1,279; and FY 2011 $1,505.

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Water Resources			
Multi-Year appropriation	213,821	222,784	201,076
No-Year appropriation	0	51	0
Total (appropriation)	**213,821**	**222,785**	**201,076**
Non-Federal (Domestic) sources			
Permittees & licensees of the Fed Energy Regulatory Commission	4,233	4,303	4,376
Technology transfer	1,193	1,207	1,221
Miscellaneous	2,606	2,606	2,606
Subtotal (non-Federal domestic sources)	8,032	8,116	8,203
Non-Federal (Foreign) sources			
National Drilling Company	649	649	649
Miscellaneous	88	88	89
Subtotal (non-Federal foreign sources)	737	737	738
State and local sources			
Matched	65,561	65,561	63,598
Matched (In-Kind Services – NON ADD)	113	113	113
Unmatched	94,965	95,707	98,786
Subtotal (State and local sources)	160,526	161,268	162,384
Federal sources			
Department of Agriculture	2,148	2,267	2,292
Department of Commerce			
National Oceanic and Atmospheric Administration	90	90	90
Department of Defense			
Corps of Engineers	36,512	38,557	38,442
National Geospatial-Intelligence Agency	371	371	371
Other	16,403	15,781	15,920
Department of Energy			
Bonneville Power Administration	537	551	565
Other	7,822	8,230	8,305
Department of Homeland Security			
Federal Emergency Management Agency	559	563	568
Other	60	60	60
Department of the Interior			
Bureau of Indian Affairs	519	530	542
Bureau of Land Management	3,396	3,613	3,690
Bureau of Reclamation	20,126	21,473	22,026
Fish and Wildlife Service	1,778	1,845	1,865
National Park Service	3,348	3,538	3,587
Office of the Secretary	98	99	101
Office of Surface Mining	146	146	146
Department of State	1,114	1,175	1,189
Department of Transportation	124	124	124

	2010 Actual	2011 Estimate	2012 Estimate
Environmental Protection Agency			
Great Lakes Restoration Initiative –Program	16,492	10,282	10,282
Other	2,263	9,256	9,277
Health and Human Services	185	185	185
National Aeronautics and Space Administration	514	517	521
Nuclear Regulatory Commission	523	523	523
Tennessee Valley Authority	430	430	430
Miscellaneous	814	862	862
Subtotal (Federal sources)	116,372	121,068	121,963
Total (reimbursable)	**285,780**	**291,189**	**293,288**
Total: Water Resources	**499,488**	**514,024**	**494,364**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Core Science Systems			
Multi-Year appropriation	124,466	125,014	105,896
Total (appropriation)	**124,466**	**125,014**	**105,896**
Non-Federal (Domestic) sources			
Technology transfer	207	213	219
Miscellaneous	300	300	300
Subtotal (non-Federal domestic sources)	507	513	519
Non-Federal (Foreign) sources			
Miscellaneous	8	8	8
Subtotal (non-Federal foreign sources)	8	8	8
State and local sources			
Unmatched	4,414	4,415	4,416
Subtotal (State and local sources)	4,414	4,415	4,416
Federal sources			
Department of Agriculture	2,172	2,141	2,141
Department of Commerce			
National Oceanic and Atmospheric Administration	156	156	156
Department of Defense			
Corps of Engineers	295	295	295
National Geospatial-Intelligence Agency	6,655	6,557	6,557
Other	1,154	1,150	1,150
Department of Education	15	15	15
Department of Energy	42	42	42
Department of Homeland Security			
Federal Emergency Management Agency	223	219	219
Department of the Interior			
Bureau of Indian Affairs	40	40	40
Bureau of Land Management	562	572	582
Bureau of Ocean Energy Mgmt, Reg. & Enforcement	40	40	40
Bureau of Reclamation	83	83	83
Fish and Wildlife Service	258	258	258
National Park Service	1,354	1,332	1,333
Office of the Secretary	748	748	748
Office of Surface Mining	97	97	97
Department of Justice	62	62	62
Department of State	35	35	35
Department of Transportation	15	15	15
Department of Veterans Affairs	15	15	15
Environmental Protection Agency	42	42	42
General Services Administration	35	35	35
Health and Human Services	35	35	35
Housing and Urban Development	35	35	35
National Aeronautics and Space Administration	15	70	71
National Science Foundation	69	15	15

	2010 Actual	2011 Estimate	2012 Estimate
Miscellaneous	242	238	238
Subtotal (Federal sources)	114,494	14,342	14,354
Total (reimbursable)	**19,423**	**19,278**	**19,297**
Total: Core Science Systems	**143,889**	**144,292**	**125,193**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Administration and Enterprise Information			
Multi-Year appropriation	118,650	119,713	118,827
Total (appropriation)	**118,650**	**119,713**	**118,827**
Non-Federal (Domestic) sources			
Map receipts	2,546	2,546	2,546
Miscellaneous	208	208	208
Subtotal (non-Federal domestic sources)	2,754	2,754	2,754
State and local sources			
Unmatched	8	8	8
Subtotal (State and local sources)	8	8	8
Federal sources			
Department of Agriculture	4	4	4
Department of Defense			
Corps of Engineers	44	44	44
Other	106	110	110
Department of the Interior			
Bureau of Indian Affairs	113	117	117
Bureau of Land Management	18	18	18
Bureau of Ocean Energy Mgmt, Reg. & Enforcement	74	78	78
Fish and Wildlife Service	3	3	3
Office of the Secretary			
National Business Center	73	77	77
Other	8,622	9,004	9,005
Office of Surface Mining	2	2	2
Department of Labor	2	2	2
Environmental Protection Agency	12	12	12
General Services Administration	3	3	3
Sale of maps, photos, reproductions, and digital products	1,232	999	999
Miscellaneous	589	606	606
Subtotal (Federal sources)	10,897	11,079	11,080
Total (reimbursable)	**13,659**	**13,841**	**13,842**
Total: Administration and Enterprise Information	**132,309**	**133,554**	**132,669**

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Facilities			
Multi-Year appropriation	97,221	101,682	93,597
No-Year appropriation	3,964	10,900	9,307
Total (appropriation)	**101,185**	**112,582**	**102,904**
Federal sources			
Central Intelligence Agency	323	323	323
Department of Defense	104	104	104
Department of the Interior			
Office of the Secretary	726	727	727
Subtotal (Federal sources)	1,153	1,154	1,154
Total (reimbursable)	**1,153**	**1,154**	**1,154**
Total: Facilities	**102,338**	**113,736**	**104,058**
Surveys, Investigations, and Research (SIR), Recovery Act			
Recovery Act Activities			
Multi-Year appropriation	114,082	0	0
Total (appropriation)	**114,082**	**0**	**0**
Total: Recovery Act Activities	**114,082**	**0**	**0**
SIR Summary:			
Multi-Year appropriation	1,167,998	1,076,234	1,016,565
No-Year appropriation	44,669	52,374	10,307
Subtotal (appropriation)	1,212,667	1,128,608	1,026,872
Non-Federal sources			
Map receipts	2,546	2,546	2,546
Domestic	17,375	17,554	17,741
Foreign	2,468	2,471	2,476
State and local sources	173,130	174,035	175,324
Federal sources	276,090	271,833	273,724
Subtotal (reimbursable)	471,609	468,439	471,811
Total: SIR *	**1,684,276**	**1,597,047**	**1,498,683**

* This table does not include obligations for the Spectrum Relocation Fund, since it is a mandatory fund. MAX obligations do include the Spectrum Relocation Fund. The amounts included in MAX are: FY 2010 $1,279; and FY 2011 $1,505.

	2010 Actual	2011 Estimate	2012 Estimate
National Land Imaging (NLI) Account			
National Land Imaging			
No-Year appropriation	0	0	99,817
Total (appropriation)	**0**	**0**	**99,817**
Total: National Land Imaging	**0**	**0**	**99,817**
USGS Summary:			
Multi-Year appropriation	1,167,998	1,076,234	1,016,565
No-Year appropriation	44,669	52,374	105,124
Subtotal (appropriation)	1,212,667	1,128,608	1,121,689
Non-Federal sources			
Map receipts	2,546	2,546	2,546
Domestic	17,375	17,554	17,741
Foreign	2,468	2,471	2,476
State and local sources	173,130	174,035	175,324
Federal sources	276,090	271,833	273,724
Subtotal (reimbursable)	471,609	468,439	471,811
Total: USGS	**1,684,276**	**1,597,047**	**1,593,500**

* This table does not include obligations for the Spectrum Relocation Fund, since it is a mandatory fund. MAX obligations do include the Spectrum Relocation Fund. The amounts included in MAX are: FY 2010 $1,279; and FY 2011 $1,505.

	2010 Actual	2011 Estimate	2012 Estimate
Surveys, Investigations, and Research (SIR)			
Contributed Funds:			
Permanent, indefinite appropriation:			
Ecosystems	1,289	1,108	850
Climate and Land Use Change	2	6	0
Energy, Minerals, and Environmental Health	74	72	68
Natural Hazards	45	35	37
Water Resources	167	125	126
Total: Contributed Funds	**1,577**	**1,346**	**1,081**
Operation and Maintenance of Quarters:			
Permanent, indefinite appropriation:			
Ecosystems	20	44	29
Natural Hazards	26	60	60
Total: Operation and Maintenance of Quarters	**46**	**104**	**89**
Working Capital Fund:			
National Water Quality Lab	13,194	14,689	15,777
Hydrologic Instrumentation Facility	21,233	20,642	21,674
Other	51,547	71,218	57,480
Total: Working Capital Fund	**85,974**	**106,549**	**94,931**
Allocations from other Federal Agencies: *			
Department of the Interior: Departmental Offices			
Natural Resource Damage Assessment	3,056	1,500	1,500
Central Hazardous Materials Fund	647	600	600
Total: Allocations	**3,703**	**2,100**	**2,100**

* Allocations are shown in the year they are received, not when they are obligated.

United States Geological Survey

Trust Funds

CONTRIBUTED FUNDS

Special and Trust Fund Receipts

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2010 Actual	2011 Estimate	2012 Estimate
01.00	Balance, start of year	0	0	0
01.99	Balance, start of year	0	0	0
	Receipts:			
02.20	Contributed Funds, Geological Survey	2	1	1
02.99	Total receipts and collections	2	1	1
04.00	Total: Balances and collections	2	1	1
	Appropriations:			
05.00	Contributed Funds	-2	-1	-1
05.99	Total appropriations	-2	-1	-1
07.99	Balance, end of year	0	0	0

Program and Financing

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2010 Actual	2011 Estimate	2012 Estimate
	Obligations by program activity:			
08.01	Donations and contributed funds	2	1	1
09.00	Total new obligations	2	1	1
	Budgetary resources:			
	Unobligated balance:			
10.00	Unobligated balance brought forward, Oct 1	1	1	1
	Budget authority:			
	Appropriation, mandatory:			
12.02	Appropriation (trust fund)	2	1	1
19.30	Total budgetary resources available	3	2	2
	Memorandum (non-add) entries:			
19.41	Unexpired unobligated balance, end of year	1	1	1

CONTRIBUTED FUNDS

Program and Financing cont'd

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2010 Actual	2011 Estimate	2012 Estimate
	Change in obligated balance:			
	Obligated balance, start of year (net):			
30.00	Unpaid obligations, brought forward, Oct 1 (gross)	0	0	0
30.30	Obligations incurred, unexpired accounts	2	1	1
30.40	Outlays (gross)	-2	-1	-1
	Obligated balances, end of year (net):			
30.90	Unpaid obligations, end of year (gross)	0	0	0
	Budget authority and outlays, net:			
	Mandatory:			
40.90	Budget authority, gross	2	1	1
	Outlays, gross:			
41.00	Outlays from new mandatory authority	0	1	1
41.01	Outlays from mandatory balances	2	0	0
41.10	Outlays, gross (total)	2	1	1
41.80	Budget authority, net (total)	2	1	1
41.90	Outlays, net (total)	2	1	1

Object Classification

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2010 Actual	2011 Estimate	2012 Estimate
	Direct obligations:			
99.5	Below reporting threshold	2	1	1
99.9	Total new obligations	2	1	1

Employee Count by Grade
(Total Employment)

	2010 Actual	2011 Estimate	2012 Estimate
Executive Level V	1	1	1
SES	23	24	24
Subtotal	24	25	25
SL – 00	9	9	9
ST – 00	41	41	40
Subtotal	50	50	49
GS/GM -15	567	540	522
GS/GM -14	786	749	723
GS/GM -13	1,297	1,236	1,193
GS -12	1,617	1,541	1,488
GS -11	1,365	1,301	1,256
GS -10	17	16	16
GS – 9	982	936	903
GS – 8	232	221	213
GS -7	709	676	652
GS – 6	267	254	246
GS – 5	439	418	404
GS – 4	317	302	292
GS – 3	199	190	183
GS – 2	78	74	72
GS -1	24	23	22
Subtotal	8,896	8,476	8,185
Other Pay Schedule Systems	243	243	243
Total employment (actual/estimate)	9,213	8,794	8,502

Mandatory Budget and Offsetting Collection Proposals

The USGS does not have any legislative proposals in the 2012 President's budget that impact receipts or mandatory spending levels.

Program/Project Support of Bureau, Department, and Governmentwide Costs

External Administrative Costs

The Department's Working Capital Fund was established pursuant to 43 U.S.C. 1467, to provide common administrative and support services efficiently and economically at cost. The Fund is a revolving fund, whereby capital is expended to provide services for customers who pay for the services. Customers consist of the Department's Bureaus and offices, as well as other Federal agencies. Through the use of centrally provided services, the Department standardized key administrative areas, such as commonly used administrative systems, support services for those located in and around the Main and South Interior building complex, and centrally managed departmental operations that are beneficial to the Bureaus and offices.

Centralized billing is used whenever the product or service being provided is not severable or it is inefficient to bill for the exact amount of product or service being procured. Customers are billed each year using a pre-established basis that is adjusted annually to reflect change over time. The following table provides the actual centralized billing to the USGS for 2010 and estimates for 2011 and 2012.

Working Capital Fund Revenue
Centralized Billing
Geological Survey
($ in thousands)

Activity/Office	2010 Actual	2011 Pres Budget	2012 Estimate
Other OS Activities			
Invasive Species Council	226.7	226.7	220.1
Invasive Species Coordinator	38.5	38.5	39.6
Office of Policy Analysis	265.2	265.2	259.7
Document Management Unit	6.5	6.5	0.0
Office of the Executive Secretariat	6.5	6.5	0.0
Alaska Field Office	12.4	12.4	13.3
Alaska Resources Library and Information Services	166.4	166.4	166.4
Secretary's Immediate Office	178.8	178.8	179.6
Departmental News and Information	97.9	97.9	104.9
Office of Communications	97.9	97.9	104.9
Departmental Museum	216.8	216.8	233.5
Secretary's Immediate Office	216.8	216.8	233.5
Southern Nevada Water Coordinator	32.9	0.0	0.0
Policy, Management and Budget	32.9	0.0	0.0
Asbestos-Related Cleanup Costs Liabilities	0.4	0.4	0.2
FedCenter	2.7	2.7	2.7
Office of Environmental Policy and Compliance	3.1	3.1	2.9
CPIC	22.4	22.4	24.9
Office of Budget	22.4	22.4	24.9
Activity Based Costing/Management	122.1	122.1	129.0
Travel Management Center	25.7	25.7	28.4
e-Gov Travel	110.3	110.3	119.4
Office of Financial Management	258.1	258.1	276.8
Interior Collections Management System	2.5	2.5	2.2
Space Management Initiative	40.2	40.2	43.9
Renewable Energy Certificates	11.4	11.4	3.0
Facility Maintenance Management System	0.6	0.6	3.8
Office of Property and Acquisition Management	54.7	54.7	52.9
SBA Certifications	0.9	0.9	0.0
Small and Disadvantage Business Utilization	0.9	0.9	0.0
Planning and Performance Management	150.9	150.9	148.8
Office of Planning and Performance Management	150.9	150.9	148.8
Alternative Dispute Resolution Training	6.0	6.0	6.4
Collaborative Action and Dispute Resolution	6.0	6.0	6.4
Conservation and Educational Partnerships	31.5	31.5	33.8
Youth, Partnerships and Service	31.5	31.5	33.8
DOI Access	87.7	87.7	146.2
Department-wide OWCP Coordination	29.7	29.7	32.0
Accountability Team	59.7	59.7	62.4
Employee and Labor Relations Tracking System	3.3	3.3	3.5
DOI LEARN	126.7	240.6	214.4
OPM Federal Employment Services	61.6	61.6	53.7

Working Capital Fund Revenue
Centralized Billing
Geological Survey
($ in thousands)

Activity/Office	2010 Actual	2011 Pres Budget	2012 Estimate
Other OS Activities Cont'd			
DOIU Management	0.0	0.0	70.1
DOI Executive Forum	14.4	14.4	15.5
Financial Management Training	33.9	33.9	0.0
SESCDP & Other Leadership Programs	23.5	23.5	21.2
Online Learning	63.7	63.7	67.9
Learning and Performance Center Management	81.7	81.7	52.1
Albuquerque Learning & Performance Center	10.8	10.8	12.1
Anchorage Learning & Performance Center	13.4	13.4	9.8
Denver Learning & Performance Center	45.2	45.2	27.9
Washington Learning & Performance Center	91.0	91.0	67.8
DOI University	377.4	377.4	344.5
EEO Complaints Tracking System	4.2	4.2	1.7
Special Emphasis Program	5.9	5.9	6.2
Accessible Technology Center	38.0	38.0	41.1
Office of Civil Rights	48.0	48.0	49.0
Occupational Health and Safety	180.4	183.9	206.8
Health and Safety Training Initiatives	20.7	17.2	0.0
Safety Management Information System	0.0	0.0	160.3
Office of Occupational Health and Safety	201.1	201.1	367.1
Security (Classified Information Facility)	54.0	54.0	58.1
Law Enforcement Coordination and Training	103.9	103.9	113.0
Security (MIB/SIB Complex)	28.8	28.8	30.1
Victim Witness	0.0	19.2	20.8
Office of Law Enforcement and Security	186.7	205.9	222.0
Interior Operations Center (Watch Office)	232.1	241.5	290.0
Emergency Preparedness	82.8	92.7	121.9
Emergency Response	104.0	132.4	143.1
MIB Health and Safety	0.0	0.0	0.5
Office of Emergency Management	418.8	466.6	555.5
Enterprise Services Network	3,166.3	3,474.9	2,668.3
Federal Relay Service	0.0	0.0	7.0
Web & Internal/External Comm	54.0	54.0	61.7
Unified Messaging	0.0	0.0	200.0
Enterprise Architecture	522.6	550.3	421.8
FOIA Tracking & Reporting System	24.4	27.8	26.4
Threat Management	119.9	119.9	129.4
Frequency Management Support	105.9	105.9	85.1
IT Security	319.4	360.9	284.4
Capital Planning	265.9	265.9	203.4
Privacy (Information Management Support)	33.3	92.8	82.5
Data Resource Management Program	27.7	0.0	0.0
IT Security Certification & Accreditation	430.6	430.6	430.6

Working Capital Fund Revenue
Centralized Billing
Geological Survey
($ in thousands)

Activity/Office	2010 Actual	2011 Pres Budget	2012 Estimate
Other OS Activities Cont'd			
Electronic Records Management	165.2	165.2	100.1
Active Directory	175.5	240.3	353.2
Enterprise Resource Management	61.3	61.3	59.9
e-Authentication	41.5	0.0	0.0
NTIA Spectrum Management	152.0	152.0	152.6
IOS Collaboration	119.3	119.3	104.7
Networx	228.3	0.0	0.0
Trusted Internet Connection	187.7	0.0	0.0
Data-at-Rest	5.0	5.0	7.4
Logging Extracts	44.1	44.1	0.0
OCIO Project Management Office	127.0	127.0	94.7
Radio Program Management Office	106.2	145.0	105.8
IT Asset Management	43.5	43.5	38.2
Two-Factor Authentication	8.6	0.0	0.0
Active Directory Optimization	93.2	0.0	0.0
Office of the Chief Information Officer	6,628.7	6,586.1	5,617.3
Contingency Reserve	18.1	18.1	19.0
Cooperative Ecosystem Study Units	75.2	75.2	56.9
CFO Financial Statement Audit	548.9	548.9	548.9
Glen Canyon Adaptive Management	95.5	95.5	95.5
Enterprise Geospatial Information Management	187.7	187.7	0.0
Department-wide Activities	925.4	925.4	720.2
e-Government Initiatives (WCF Contributions Only)	532.1	532.1	438.4
Volunteer.gov	15.1	15.1	15.1
Office of Planning and Performance Management	547.2	547.2	453.5
Ethics Training	71.5	71.5	75.7
ALLEX Database	3.0	3.0	0.0
FOIA Appeals	15.3	15.3	12.7
Office of the Solicitor	89.7	89.7	88.4
Subtotal Other OS Activities	11,117.3	11,222.6	10,253.9

Working Capital Fund Revenue
Centralized Billing
Geological Survey
($ in thousands)

Activity/Office	2010 Actual	2011 Pres Budget	2012 Estimate
National Business Center			
FPPS/Employee Express - O&M	2,031.1	2,069.6	1,936.5
HRMS (HR LOB W-2 Surcharge)	83.2	83.5	0.0
Drug Testing	9.4	9.4	9.5
NBC Human Resources Directorate	2,123.6	2,162.6	1,946.0
NBC IT Security Improvement Plan	438.5	438.5	373.3
Information Mgmt. - FOIA and Records Management	1.4	1.4	1.4
Safety Management Information Systems	188.0	188.7	0.0
Telecommunication Services	9.5	9.5	9.5
Integrated Digital Voice Communications System	5.0	5.0	2.9
Desktop Services	23.7	23.8	23.8
Audio Visual Services	1.5	1.5	1.5
SIB Cabling O&M	0.3	0.3	0.3
Voice/Data Switching	2.2	2.2	2.1
NBC Information Technology Directorate	670.0	671.0	414.7
Interior Complex Management & Services	5.3	4.5	3.9
Family Support Room	0.1	0.1	0.1
Property Accountability Services	3.0	3.1	2.9
Moving Services	1.1	1.1	1.1
Shipping and Receiving	1.6	1.6	1.5
Safety and Environmental Services	2.3	2.3	2.2
Space Management	1.3	1.3	1.5
Federal Executive Board	34.1	34.3	36.3
Health Unit	1.4	1.4	1.3
Mail and Messenger Services	16.9	17.0	15.0
Mail Policy	42.4	42.6	45.2
Special Events Services	7.6	7.6	7.6
Cultural Resources & Events Management	44.2	37.2	0.0
Partnership Schools & Commemorative Programs	3.9	3.9	0.0
Departmental Library	366.0	380.0	347.5
NBC Administrative Operations Directorate	531.4	538.0	466.1
FBMS Hosting/Applications Management	0.0	693.0	693.0
FBMS Master Data Management	208.3	208.3	299.8
Consolidated Financial Statement Systems	0.0	0.0	174.4
Financial Systems	2,650.7	2,662.1	1,898.5
IDEAS	386.5	388.2	91.8
FBMS Redirect – IDEAS	0.0	0.0	296.7
Quarters Program	1.3	1.0	1.1
FBMS Redirect – FFS	0.0	0.0	379.9
NBC FBMS Conversion	27.4	27.4	30.4
NBC Financial Management Directorate	3,274.2	3,980.1	3,865.5

Working Capital Fund Revenue
Centralized Billing
Geological Survey
($ in thousands)

Activity/Office	2010 Actual	2011 Pres Budget	2012 Estimate
National Business Center Cont'd			
Aviation Management Systems – O&M	0.0	0.0	16.1
Aviation Management	338.8	335.1	306.7
NBC – Aviation Management	338.8	335.1	322.8
Subtotal National Business Center	6,938.1	7,686.8	7,015.1
Total	**18,055.3**	**18,909.4**	**17,268.9**

Working Capital Fund Revenue - Direct Billing
2012 President's Budget
Geological Survey
($ in thousands)

Direct billing is used whenever the product or service provided is again severable, but is sold through a time and materials reimbursable support agreement or similar contractual arrangement. The following tables provide the actual direct and reimbursable collections from USGS for 2010, and estimated billings and collections for 2011 and 2012.

Activity/ Office	2010 Actual	2011 Pres Budget	2012 Estimate
Other OS Activities			
Ocean Coastal Great Lakes Activities	0.0	0.0	52.5
Office of Policy Analysis	0.0	0.0	52.5
Single Audit Clearinghouse	0.6	0.5	0.6
E-Gov Travel	0.0	72.0	0.0
Office of Financial Management	0.6	72.5	0.6
FBMS Change Orders	180.0	180.0	180.0
Financial and Business Management System	180.0	180.0	180.0
Federal Assistance Award Data System	4.0	3.9	4.4
Office of Acquisition and Property Management	4.0	3.9	4.4
DOI Access	342.7	635.6	589.4
Labor and Employee Relations	0.0	14.6	0.0
e OPF	168.1	0.0	181.8
Office of Human Resources	510.8	650.2	771.2
EEO Training	0.0	1.2	1.0
EEO Investigations	0.0	7.9	6.3
Office of Civil Rights	0.0	9.0	7.3
Albuquerque Learning & Performance Center	1.1	0.0	8.8
Anchorage Learning & Performance Center	1.7	4.3	0.7
Denver Learning & Performance Center	5.9	0.0	20.1
Washington Leadership & Performance Center	54.8	2.9	33.3
Online Learning	39.0	16.9	57.5
DOI University	102.5	24.1	120.4
Unified Messaging	0.0	1,626.6	1.626.6
Oracle Licenses and Support	971.1	1,357.8	1,034.3
Enterprise Architecture Services	2,199.7	453.3	920.4
Microsoft Enterprise Licenses	1,487.1	1,486.1	1,487.1
Anti-Virus Software Licenses	149.2	202.5	155.4
Enterprise Services Network	2,487.5	2,558.0	2,136.7
Federal Relay Service	13.8	16.1	0.0
Data-at-Rest Initiative	14.1	0.0	14.2
IOS Collaboration	18.4	0.0	0.0
EID Rack Space	4.0	9.6	75.7
Office of the Chief Information Officer	7,344.8	6,083.4	7,630.5
FY 2011 CFO Audit	0.0	251.6	0.0
FY 2012 CFO Audit	0.0	0.0	165.1
Department-wide Programs	0.0	251.6	165.1

Working Capital Fund Revenue - Direct Billing
2012 President's Budget
Geological Survey
($ in thousands)

Activity/ Office	2010 Actual	2011 Pres Budget	2012 Estimate
Other OS Activities Cont'd			
Federal FSA Program	274.8	271.6	328.1
Colorado School of Mines	15.2	15.2	15.2
Imagery for the Nation	789.9	827.5	750.0
Department-wide Programs	1,079.8	1,114.2	1,093.3
Subtotal Other OS Activities	9,222.7	8,388.9	10,025.3

Working Capital Fund Revenue - Direct Billing
2012 President's Budget
Geological Survey
($ in thousands)

Activity/ Office	2010 Actual	2011 Pres Budget	2012 Estimate
National Business Center			
Creative Communications	21.3	21.6	15.9
Reimbursable Mail Services	6.2	6.6	6.5
NBC Administrative Operations Directorate	27.6	28.2	22.4
Financial Systems	44.2	45.7	0.0
IDEAS	158.0	164.8	138.8
NBC Financial Management Directorate	202.2	210.4	138.8
Client Liaison and Product Development Division	5.9	6.3	5.5
Personnel & Payroll Systems Division	15.7	15.7	13.8
HR Management Systems Division	172.7	109.3	111.4
Quicktime Services	391.9	402.2	428.6
NBC Human Resources Directorate	586.3	533.6	559.4
Enterprise Infrastructure Division	631.1	625.6	0.0
Customer Support services Division	0.7	0.7	0.0
Customer Support Center	34.3	35.5	0.0
NBC Information Technology Directorate	666.1	688.7	0.0
Subtotal National Business Center	1,482.1	1,461.0	720.5
TOTAL	**10,704.7**	**9,849.9**	**10,745.9**

Payments to other Federal agencies include the following:

	2010 Budget	2010 Enacted/ 2011 CR	2012 Fixed Costs Change
Worker's Compensation Payments	+$15	$0	*+$142*
Amount of workers compensation absorbed	*[0]*	*[+$90]*	*[0]*
The adjustment is for actual charges through June 2010 in the costs of compensating injured employees and dependents of employees who suffer accidental deaths while on duty. Costs for 2012 will reimburse the Department of Labor, Federal Employees Compensation Fund, pursuant to 5 U.S.C. 8147(b) as amended by Public Law 94-273.			
Unemployment Compensation Payments	+$43	$0	+$9
Amount of unemployment compensation absorbed	*[0]*	*[+$43]*	*[0]*
The adjustment is for estimated changes in the costs of unemployment compensation claims to be paid to the Department of Labor, Federal Employees Compensation Account, in the Unemployment Trust Fund, pursuant to Public Law 96-499.			
Rental Payments	+$4,166	$0	+$3,336
Amount of rental payments absorbed	*[0]*	*[+$1,080]*	*[0]*
The adjustment is for changes in the costs payable to General Services Administration and others resulting from changes in rates for office and non-office space as estimated by GSA, as well as the rental costs of other currently occupied space. These costs include building security; in the case of GSA space, these are paid to DHS. Costs of mandatory office relocations, i.e., relocations in cases where due to external events there is no alternative but to vacate the currently occupied space, are also included.			

Internal Bureau Overhead Cost Allocation Methodology

The USGS manages overhead costs at two levels—the Bureau and science center. Bureau level costs include headquarters and area executive, managerial, supervisory, administrative, and financial functions and Bureau wide systems. At the Bureau level, funding appropriated to the Administration and Enterprise Information budget activity pays the Bureau wide overhead costs in the same proportion as appropriated funding is to total funding. For this reason, Bureau wide overhead costs collected on reimbursable support agreements are deposited within Administration and Enterprise Information program areas, as well.

The USGS assesses a Bureau overhead rate (12 percent in 2009 and 2010) on reimbursable work from non-Interior customers to recoup their share of Bureau level costs. In some cases, the USGS assesses a special or reduced rate when it can be demonstrated that indirect costs are substantially and consistently less than the norm and the amount collected covers the full costs, such as with pass-through funding where the Survey does not perform any of the actual work. The following table shows the funding available to the Administrative and Enterprise Information program, including the anticipated overhead collections to pay for Bureau wide costs.

(Dollars in Thousands)

Source of Funding	2011 CR	2011 Bureau Overhead Distribution	2011 Total
Administration and Enterprise Information			
Science Support Subactivity	69,225	27,317	98,575
Enterprise Information Subactivity	45,969	7,705	53,674
Total Funding	**115,194**	**35,021**	**150,216**

At the science center-level, because there generally is not an appropriated funding source to pay the local overhead (common services) costs, both the appropriated and reimbursable funding are assessed a percentage to cover their share of science center-level costs. Science center common services costs include center costs that are not directly attributable to a specific activity or project, such as managerial, supervisory, administrative, and financial functions and related systems, as well as costs incidental to providing services and products, such as postage, training, miscellaneous supplies and materials. The cost during 2010, for the local overhead, totaled $184.0 million from both appropriated and reimbursable funds.

In recognition of the USGS role as the science Bureau for the Department of the Interior, the USGS is continuing to give Interior Bureaus and offices a "preferred" customer rate on overhead charges for a significant portion of reimbursable work, to the extent that matching funds are available within the USGS budget. The maximum rate that cost centers may charge other Interior Bureaus for common services and Bureau costs combined remains 15 percent net. In 2012, of the 15 percent, 7.5 percent is applied to Bureau costs, and the remaining 7.5 percent is applied to common services costs. Cost centers must fund the common services costs not recovered (e.g., the difference between the cost center's standard common services costs and the 7.5 percent) from USGS appropriated funds. In this way, the USGS is partnering on the science needs of Interior from both the Bureau and cost centers.

The Chief Financial Officer establishes the USGS Bureau special rate for each fiscal year. The special rate for 2011 is three percent. Cost centers do not charge more than the Bureau special rate for facilities-related costs or their standard common services rate when funding is approved for a Bureau-level special rate. Special rates are applied under the following circumstances:

- When the USGS receives funds from a non-USGS organization and awards a grant to a third-party entity.
- When the USGS receives funds from one or more non-USGS organizations to support, under USGS leadership, a strategic science objective that includes the USGS passing through funds to one or more third-party entities.
- When the USGS receives funds from a non-USGS organization for the purpose of the customer acquiring services through the Cartographic Services or the Remotely Sensed Data Contracts. The special rate helps encourage other Federal agencies to use these contracts for cartographic services and remotely sensed data, rather than establishing and managing their own contracts, and ensures greater data consistency through the use of common service providers.
- When the USGS receives funds from a non-USGS organization for the purpose of passing through the customer's funds to State and local governments for the direct purchase of geospatial data.
- Biology Cooperative Research Units (CRUs) are supported by a three-way partnership including the USGS, a State, and a university. The academic institutions where CRUs are co-located provide significant administrative support. In recognition of the direct services support received from the non-USGS partners, CRUs only recover one-half of the Bureau rate (6 percent) normally recovered from reimbursable customers or partners.

Authorizations

43 U.S.C. 31 et seq. Organic Act of March 3, 1879, as amended, establishes the United States Geological Survey. Provides, among other matters, that the USGS is directed to classify the public lands and examine the geological structure, mineral resources, and products within and outside the national domain. Establishes the Office of the Director of the United States Geological Survey under the Department of the Interior. The Director is appointed by the President by and with the advice and consent of the Senate. P.L. 102–285, Sec. 10(a) establishes the official name as United States Geological Survey.

Title 15 – Commerce and Trade

15 U.S.C. 2901–2908 The National Climate Program Act of 1978. Establishes a national climate program to assist the Nation and the world in understanding and responding to natural and human-induced climate processes and their known and potential effects. The Department of the Interior has a mandated role in this Program.

15 U.S.C. 2921 et seq. The Global Change Research Act of 1990. Establishes the United States Global Change Research Program aimed at understanding and responding to global change, including the cumulative effects of human activities and natural processes on the environment, to promote discussions toward international protocols in global change research, and for other purposes.

15 U.S.C. 5631 et seq. Land Remote Sensing Policy Act of 1992. Enables the United States to maintain leadership in land remote sensing by providing data continuity for the Landsat program. Assigns responsibility for the "National Satellite Land Remote Sensing Data Archive" to the Department of the Interior. Authorizes and encourages the Department of the Interior and other Federal agencies to carry out research and development programs in applications of these data and makes Landsat data available to the public.

Title 16 – Conservation

16 U.S.C. 17 et seq. National Park Service Organic Act of 1916. Parts of Title 16, Conservation, as amended and supplemented, apply to the USGS. Notably, the Outdoor Recreation Act of 1936 authorizes the Secretary of the Interior to sponsor, engage in, and assist in research relating to outdoor recreation, directly or by contract or cooperative agreements, and make payments for such purposes; undertake studies and assemble information concerning outdoor recreation; and cooperate with educational institutions and others to assist in establishing education programs and activities and to encourage public use and benefits from outdoor recreation.

16 U.S.C. 661 et seq. Fish and Wildlife Coordination Act of 1934. Authorizes the Secretary of the Interior to prepare plans to protect wildlife resources, to conduct surveys on public lands, and to accept funds or lands for related purposes; authorizes the investigation and reporting of proposed Federal actions that affect the development, protection, rearing, and stocking of all species of wildlife and their habitat in controlling losses, minimizing damages, and providing recommendations to minimize impacts on fish and wildlife resources. National Wildlife Refuge System Improvement Act of 1997 (P.L. 105–57) amends the National Wildlife Refuge System

Administration Act of 1966 to improve the management of the National Wildlife Refuge System, and for other purposes.

16 U.S.C. 703–712 Migratory Bird Treaty Act of 1918, as amended. Implements four international treaties that individually affect migratory birds common to the United States, Canada, Mexico, Japan, and the former Soviet Union. Establishes Federal responsibility for protection and management of migratory and nongame birds, including the establishment of season length based on scientific information relative to zones of temperature, distribution, abundance, breeding habits and times and lines of migratory flight of migratory birds. Establishes the Secretary of the Interior's responsibility for bag limits and other hunting regulations and issuance of permits to band, possess, or otherwise make use of migratory birds.

16 U.S.C. 715 Migratory Bird Conservation Act of 1900. Establishes the Migratory Bird Conservation Commission; authorizes the Secretary of the Interior to conduct investigations and publish documents related to North American birds.

16 U.S.C. 742(a) et seq. Fish and Wildlife Act of 1956. Authorizes the Secretary of the Interior to conduct investigations, prepare and disseminate information, and make periodic reports to the public regarding the availability and abundance and the biological requirements of fish and wildlife resources; provides a comprehensive national fish and wildlife policy and authorizes the Secretary of the Interior to take steps required for the development, management, advancement, conservation, and protection of fisheries and wildlife resources through research, acquisition of refuge lands, development of existing facilities, and other means.

16 U.S.C. 742(l) Fish and Wildlife Improvement Act of 1978, as amended by P.L. 95–616. Authorizes the Secretary of the Interior to enter into cooperative agreements with colleges and universities, State fish and game agencies, and nonprofit organizations for the purpose of developing adequate, coordinated, cooperative research and training programs for fish and wildlife resources.

16 U.S.C. 797(c) Following language supports Appropriations language "and Federal Energy Regulatory Commission licensees." States that, "To cooperate with the executive departments and other agencies of States or National Governments in such investigations; and for such purposes the several departments and agencies of the National Government are authorized and directed upon the request of the commission, to furnish such records, papers and information in their possession as may be requested by the commission, and temporarily to detail to the commission such officers or experts as may be necessary in such investigations."

16 U.S.C. 931–939 Great Lakes Fishery Act of 1956. Implements the Convention on Great Lakes Fisheries between the United States and Canada; authorizes construction, operation, and maintenance of sea lamprey control works; sets forth procedures for coordination and consultation with States and other Federal agencies; and establishes the Great Lakes Fisheries Commission.

16 U.S.C. 1131 and 1133 Wilderness Act of 1964, as amended. Requires the USGS to assess the mineral resources of each area proposed or established as wilderness. The studies are to be on a planned and recurring basis. The original series of studies has been completed, and no recurring studies have been requested or funded.

16 U.S.C. 1361 et seq. Marine Mammal Protection Act of 1972, as amended. Establishes a responsibility to conserve marine mammals with management authority vested in the Department of the Interior for the sea otter, walrus, polar bear, dugong, and manatee.

16 U.S.C. 1531 et seq. Endangered Species Act of 1973, as amended. Provides for the conservation of threatened and endangered species of fish, wildlife, and plants, and authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants.

16 U.S.C. 1604. Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976. The USGS is a party in an interagency agreement with the Forest Service to assess the mineral resources of National Forests.

16 U.S.C. 2801 et seq. National Aquaculture Act of 1980. Directs the Secretary of the Interior to participate in the development of a National Aquaculture Development Plan and authorizes research, development, and other activities to encourage the development of aquaculture in the United States.

16 U.S.C. 3141 et seq. Alaska National Interest Lands Conservation Act of 1980. Designates certain public lands in Alaska as units of the National Park, National Wildlife Refuge, Wild and Scenic Rivers, National Wilderness Preservation and National Forest Systems, resulting in general expansion of all systems and provided comprehensive management guidance for all public lands in Alaska.

16 U.S.C. 3501 et seq. Coastal Barrier Resources Act of 1982. Designates various underdeveloped coastal barrier islands depicted by specific maps for inclusions in the Coastal Barrier Resource System. **P.L. 106–514** Coastal Barrier Resources Reauthorization Act of 2000. Reauthorizes and amends the Coastal Barrier Resources Act of 1999.

16 U.S.C. 4701 et seq. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. Establishes a Federal program to prevent introduction and control the spread of introduced aquatic nuisance species.

Title 25 – Indians

25 U.S.C. 450 et seq. Tribal Self-Governance Act of 1994. The USGS participates in the Tribal Self-Governance Program by identifying USGS activities that may be available for tribal operation under the Self-Governance Act. The USGS discusses programs and activities with interested tribal governments.

Title 30 – Mineral Lands and Mining

30 U.S.C. 21(a) Mining and Minerals Policy Act of 1970. Emphasizes Department of the Interior responsibility for assessing the mineral resources of the Nation.

30 U.S.C. 201 Federal Coal Leasing Amendments Act of 1976. Provides that no lease sale may be held on Federal lands unless the lands containing the coal deposits have been included in a comprehensive land-use plan. Provides that the Secretary is authorized and directed to conduct a comprehensive exploratory program designed to obtain sufficient data and information to evaluate the extent, location, and potential for developing the known recoverable

coal resources within the coal lands. The USGS provides data and information from coal research and field investigations, which are useful to the BLM to meet the requirements of the coal leasing program. Further, the Secretary, (**Sec. 208–1(b)**) through the USGS, "... is authorized to conduct seismic, geophysical, geochemical, or stratigraphic drilling, or to contract for or purchase the results of such exploratory activities from commercial or other sources which may be needed to implement the ..." exploratory program.

30 U.S.C. 641 Following language supports Appropriations language "administer the minerals exploration program." Provides that, "The Secretary of the Interior is hereby authorized and directed, in order to provide for discovery of additional domestic mineral reserves, to establish and maintain a program for exploration by private industry within the United States, territories and possessions for such minerals, excluding organic fuels, as he shall from time to time designate, and to provide Federal financial assistance on a participating basis for that purpose." (P.L. 85–701.)

30 U.S.C. 1026 Section **6** of the Geothermal Steam Act Amendments of 1988. Requires the Secretary of the Interior to (1) maintain a monitoring program for significant thermal features within units of the National Park System and (2) establish a research program to collect and assess data on the geothermal resources within units of the National Park System with significant thermal features in cooperation with the USGS. Section **8** requires the USGS to conduct a study of the impact of present geothermal development in the vicinity of Yellowstone National Park on the thermal features within the park.

30 U.S.C. 1028 Energy Policy Act of 1992. Directs the Secretary of the Interior, through the USGS and in consultation with the Secretary of Energy, to establish a cooperative government-private sector program with respect to hot dry rock geothermal energy resources on public lands. Supports recurring assessments of the undiscovered oil and gas resources of the United States.

30 U.S.C. 1101, 1121, 1123 Geothermal Energy Research, Development, and Demonstration Act of 1974. Provides that the Department of the Interior is responsible for the evaluation and assessment of the geothermal resource base and the development of exploration technologies. The Chairman, acting through the USGS and other appropriate agencies, shall develop and carry out a plan for the inventorying of all forms of geothermal resources of Federal lands; conduct regional surveys; publish and make available maps, reports, and other documents developed from the surveys; and participate with non-Federal entities in research to develop, improve, and test technologies for the discovery and evaluation of geothermal resources.

30 U.S.C. 1201–1202, 1211 Surface Mining Control and Reclamation Act of 1977, as amended. Establishes the Office of Surface Mining Reclamation and Enforcement (OSM). OSM depends in part upon the USGS for a determination of the probable hydrologic consequences of mining and reclamation operations.

30 U.S.C. 1419 et seq. Deep Seabed Hard Mineral Resources Act of 1980. Provides authorization for conducting a continuing program of ocean research that "shall include the development, acceleration, and expansion, as appropriate, of the studies of the ecological, geological, and physical aspects of the deep seabed in general areas of the ocean where exploration and commercial development are likely to occur …." The USGS, based on expertise developed in regional offshore geologic investigations, provides geological and mineral resource expertise in responding to the requirements of the Act.

30 U.S.C 1601 et seq. National Materials and Minerals Policy, Research and Development Act of 1980. Reemphasizes the responsibility of the Department of the Interior to assess the mineral resources of the Nation.

30 U.S.C. 1901–1902 Methane Hydrate Research and Development Act of 2000. Authorizes appropriations for the establishment of a methane hydrate research and development program within the DOE. The DOE is directed to carry out this program in consultation with the U.S. Navy, USGS, Minerals Management Service, and NSF, through grants, contracts, and cooperative agreements with universities and industrial enterprises. Provides for the study of the use of methane hydrate as a source of energy. Sunsets the methane hydrate research and development program at the end of FY 2005.

Title 33 – Navigation and Navigable Waters

33 U.S.C. 883(a) Great Lakes Shoreline Mapping Act of 1987. Section **3202(a)** requires that the Director of the National Oceanic and Atmospheric Administration "... in consultation with the Director of the United States Geological Survey, shall submit to the Congress a plan for preparing maps of the shoreline of the Great Lakes under section 3203." Section **3203** requires that "... subject to authorization and appropriation of funds, the Director, in consultation with the Director of the United States Geological Survey, shall prepare maps of the shoreline areas of the Great Lakes."

33 U.S.C. 1251–1274, 2901 Federal Water Pollution Control Act Amendments of 1972, Clean Water Act of 1977, and Water Quality Act of 1987, authorize extensive water quality planning, studies, and monitoring under the direction primarily of the EPA.

33 U.S.C. 1271 Water Resources Development Act of 1992. Establishes a National Contaminated Sediment Task Force, with USGS as a member, to conduct a comprehensive national survey of aquatic sediment quality.

33 U.S.C. 2201 et seq. Water Resources Development Act of 1990. Authorizes a program for planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement; cooperative effort and mutual assistance for use, protection, growth, and development of the Upper Mississippi River system; implementation of a long-term resource monitoring program; and implementation of a computerized inventory and analysis systems.

33 U.S.C. 2701, 2761 Oil Pollution Act of 1990. Section **2761** authorizes the establishment of an Interagency Coordinating Committee on Oil Pollution Research, of which the Department of the Interior is a member, to develop a plan for the implementation of the oil pollution research, development, and demonstration program.

Title 42 – The Public Health and Welfare

42 U.S.C. 300(f) et seq. Safe Drinking Water Act Amendments of 1996. Authorizes research "... relating to the causes, ... treatment, ... prevention of ... impairments of man resulting directly or indirectly from contaminants in water, or to the provision of a dependably safe supply of drinking water ...." The USGS and EPA have an interagency agreement covering aquifer studies conducted by the USGS relating to sole source aquifers.

42 U.S.C. 2021(b) et seq. Low-Level Radioactive Waste Policy Act of 1980. Requires intra-State or regional arrangements for disposal of low-level radioactive waste by July 1986.

The USGS provides geohydrologic research and technology to Federal and State agencies developing plans for low-level waste management. The amending Act of 1985 included approval of seven interstate compacts.

42 U.S.C. 2210(b), 2231 Nuclear Regulatory Commission Authorization Act. Requires the Secretary of Energy to monitor and report to the President and Congress on the viability of the domestic uranium industry. Under a Memorandum of Understanding between the Department of Energy and the Department of the Interior, the USGS provides information on domestic uranium resources to the Energy Information Agency.

42 U.S.C. 4321 et seq. National Environmental Policy Act of 1969, as amended. Requires prior-to-action determination that any major Federal action will not have a significantly adverse effect upon the environment. The USGS is called upon to provide technical review or inputs to resource-related actions proposed by other Federal agencies.

42 U.S.C. 5121, 5132 Disaster Relief Act of 1974, Section **202(a).** States that "The President shall ensure that all appropriate Federal agencies are prepared to issue warnings of disasters to State and local officials." In addition, Section **202(b)** states that "The President shall direct appropriate Federal agencies to provide technical assistance to State and local governments to insure that timely and effective disaster warning is provided."

42 U.S.C. 5845(c) Energy Reorganization Act of 1974. Directs all other Federal agencies to "... (2) ... furnish to the (Nuclear Regulatory) Commission ... such research services ... for the performance of its functions; and (3) consult and cooperate with the Commission on research development matters of mutual interest and provide such information and physical access to its facilities as will assist the Commission in acquiring the expertise necessary to perform its licensing and related regulatory functions." The USGS conducts geological mapping in areas where nuclear reactor construction is anticipated and conducts investigations of geologic processes that could imperil the safe operation of the reactors or other critical energy facilities.

42 U.S.C. 6217 Energy Act of 2000. Extends energy conservation programs under the Energy Policy and Conservation Act through FY 2003. Specifically for the USGS, Section **604,** "Scientific Inventory of Oil and Gas Reserves," instructs the Secretary of the Interior, in consultation with the Secretaries of Agriculture and Energy, to conduct and update regularly an inventory of all onshore Federal lands. The inventory will identify (1) USGS reserve estimates of the oil and gas resources underlying these lands, (2) restrictions or impediments to development of such resources, and (3) furnish such inventory data to the House Committee on Resources and the Senate Committee on Energy and Natural Resources. Authorizes appropriations as necessary for implementation.

42 U.S.C. 6901 et seq. Resource Conservation and Recovery Act of 1976 and Hazardous and Solid Waste Amendments of 1984. Requires the EPA to promulgate guidelines and regulations for identification and management of solid waste, including disposal. The expertise of the USGS is a present and potential source of assistance to the EPA in defining and predicting the hydrologic effects of waste disposal.

42 U.S.C. 7418, 7401, 7470. Clean Air Act of 1977, as amended. Requires Federal facilities to comply with air quality standards to the same extent as non-governmental entities. Establishes requirements to prevent significant deterioration of air quality and to preserve air quality in national parks, national wilderness areas, national monuments and national seashores.

42 U.S.C. 7701 et seq. Earthquake Hazards Reduction Act of 1977. Sets as a national goal the reduction in the risks of life and property from future earthquakes in the United States through the establishment and maintenance of a balanced earthquake program encompassing prediction and hazard assessment research, seismic monitoring and information dissemination. Subsequent public laws established a National Earthquake Hazards Reduction Program, of which the USGS is a part. P.L. 96–472 authorizes the establishment of a National Earthquake Prediction Evaluation Council. P.L. 101–614 (National Earthquake Hazards Reduction Program Reauthorization Act), P.L. 105–47, and P.L. 106–503 (Earthquake Hazards Reduction Authorization Act of 2000) reauthorize the 1977 Act, repeal some sections, and add new language in some sections including the establishment of an Advanced National Seismic Research and Monitoring System.

42 U.S.C. 8901 et seq. Acid Precipitation Act of 1980. Authorizes an "Acid Precipitation Program and Carbon Dioxide Study," including the establishment of an Acid Precipitation Task Force (of which the Department of the Interior is a member) and a comprehensive 10-year research program. Title IX of the Clean Air Act Amendments of 1990 (P.L. 101–549) calls for continuation of the National Acid Precipitation Assessment Program (NAPAP) established under the Acid Precipitation Act of 1980. The USGS is an active participant in the research program and coordinates interagency monitoring of precipitation chemistry. The USGS National Coal Resources Data System was named by the EPA as the official database for information on coal quality. The EPA, utility companies, and coal mining industries use the database to estimate the amount of air pollution derived from coal combustion. The USGS is a participant in studies of acid precipitation as a result of prior work in this field.

42 U.S.C. 9601 et seq. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Establishes a Hazardous Substance Superfund (26 U.S.C. 9507) to help finance the massive cleanup programs needed at sites that are heavily contaminated with toxic wastes. The USGS is called upon by the EPA and State agencies to investigate and determine the extent of contamination and remedial measures at some of these sites.

42 U.S.C. 10101 et seq. Nuclear Waste Policy Act of 1982. Defines the DOE as lead agency with responsibility for siting, building, and operating high-level radioactive waste repositories. Requires participation by the USGS in a consultative and review role to the DOE. The Nuclear Waste Policy Amendments Act of 1987 (Title V of the Omnibus Budget Reconciliation Act of 1987) identifies Yucca Mountain, NV, as the first site to be studied to ascertain suitability for disposal of high level nuclear waste. The 1987 Act provides that the DOE conduct a survey of potentially suitable sites for a monitored retrievable storage facility.

42 U.S.C. 10301 et seq. Water Resources Development Act of 1986. Amends the Water Resources Research Act of 1984 (P.L. 98–242) by adding a new Title III, "Ogallala Aquifer Research and Development." P.L. 109–471 amends the act to extend authorization of appropriations through FY 2010. The Water Resources Research Act of 1984, as amended, provides for water resources research, information transfer, and student training in grants and contract programs that will assist the Nation and the States in augmenting their science and technology to discover practical solutions to water shortage and quality deterioration problems. Establishes a Federal-State partnership in water resources research, education, and information transfer through a matching grant program that authorizes State Water Resources Research Institutes at land grant universities across the Nation.

Title 43 – Public Lands

43 U.S.C. 31 et seq. Organic Act of March 3, 1879, as amended, establishes the United States Geological Survey. Provides, among other matters, that the USGS is directed to classify the public lands and examine the geological structure, mineral resources, and products within and outside the national domain. Establishes the Office of the Director of the United States Geological Survey under the Department of the Interior. The Director is appointed by the President by and with the advice and consent of the Senate. P.L. 102–285, Sec. 10(a) establishes the official name as the United States Geological Survey.

Particularly: Section **4** of the Continental Scientific Drilling and Exploration Act of 1988. Requires that "The Secretary of the Department of Energy, the Secretary of the Department of the Interior through the United States Geological Survey, and the Director of the National Science Foundation assure an effective, cooperative effort in furtherance of the Continental Scientific Drilling Program of the United States."

And: 43 U.S.C. **31(a–h).** National Geologic Mapping Act of 1992. Establishes in the USGS a National Cooperative Geologic Mapping Program. States "The objectives of the geologic mapping program shall include (1) determining the Nation's geologic framework through systematic development of geologic maps at scales appropriate to the geologic setting and the perceived applications, such maps to be contributed to the national geologic map database; (2) development of a complementary national geophysical-map database, geochemical-map database, and a geochronologic and paleontologic database that provide value-added descriptive and interpretive information to the geologic-map database; (3) application of cost-effective mapping techniques that assemble, produce, translate and disseminate geologic-map information and that render such information of greater application and benefit to the public; and (4) development of public awareness for the role and application of geologic-map information to the resolution of national issues of land use management." Section **31(g)** requires the Secretary of the Interior to provide biennial reports on the status of the program, progress in developing the national geologic map database, and any recommendations the Secretary may have for legislative or other action to achieve the purposes of the Act to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate. The Act was reauthorized in 1997 (P.L. 105–36) and 1999 (P.L. 106–148). **31(i)** Requires the National Academy of Sciences to review and report on the resource research activities of the USGS. **31(j)** FY 1997 Omnibus Appropriations Act. Requires that, beginning in FY 1998 and once every five years thereafter, the National Academy of Sciences shall review and report on the biological research activity of the USGS.

43 U.S.C. 32 Authorizes the Secretary of the Interior to authorize one of the geologists to act as Director of the USGS in his/her absence.

43 U.S.C. 34 States that the scientific employees of the USGS shall be selected by the Director, subject to the approval of the Secretary of the Interior exclusively for their qualifications as professional experts.

43 U.S.C. 36 Authorizes the purchase of professional and scientific books and periodicals needed for statistical purposes by the scientific divisions of the USGS and that the purchases may be paid for out of appropriations made for the USGS. **36(a)** The Director of the USGS is authorized "… to acquire for the United States, by gift or devise, scientific or technical books, manuscripts, maps, and related materials, and to deposit the same in the library of the United States Geological Survey for reference and use as authorized by law." **36(b)** "The

Secretary of the Interior may, on behalf of the United States and for the use by the United States Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...." Following language supports Administrative Provisions language "acquisition of lands for gauging stations and observation wells;": Provides that, "The Secretary of the Interior may, on behalf of the United States and for the use by the Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...." **36(c)** Acceptance of contributions from public and private sources; cooperation with other agencies in prosecution of projects. States that "In fiscal year 1987 and thereafter the United States Geological Survey is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, or private."

43 U.S.C. 38 Topographic surveys; marking elevations. Provides for the establishment and location of permanent benchmarks used in the making of topographic surveys.

43 U.S.C. 41 Publications and reports; preparation and sale. Provides for the publication of geological and economic maps, illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. Provides for the scientific exchange and sale of such published material.

43 U.S.C. 42 et seq. Distribution of maps and atlases, etc. Authorizes and directs the Director, USGS, upon the approval of the Secretary of the Interior, to distribute topographic and geologic maps and atlases of the United States. The prices and regulations are to be fixed by the Director with the approval of the Secretary. Provides that copies of each map or atlas, not to exceed five hundred, shall be distributed gratuitously among foreign governments, departments of our own Government, literary and scientific associations, and to educational institutions or libraries. States that "In fiscal year 1984 and thereafter, all receipts from the sale of maps sold or stored by the United States Geological Survey shall be available for map printing and distribution to supplement funds otherwise available, to remain available until expended."

43 U.S.C. 43 Copies to Senators, Representatives and Delegates. Provides that one copy of each map and atlas shall be sent to each Senator, Representative, and Delegate in Congress, if published within his term, and that a second copy be placed at the disposal of each.

43 U.S.C. 44 Sale of transfers or copies of data. Provides that the USGS may furnish copies of maps to any person, concern, institution, State, or foreign government.

43 U.S.C. 45 Production and sale of copies of photographs and records; disposition of receipts. Authorizes the USGS to produce and sell on a reimbursable basis, copies of aerial or other photographs, mosaics, and other official records. Discusses disposition of receipts from sales.

43 U.S.C. 49 Extension of cooperative work to Puerto Rico. Authorizes the making of topographic and geological surveys and conducting investigations relating to mineral and water resources in Puerto Rico by the USGS.

43 U.S.C. 50 Provides that the share of the USGS in any topographic mapping or water resources investigations carried on in cooperation with any State or municipality shall not exceed 50 percent of the cost thereof. **50(b)** Recording of obligations against accounts receivable and crediting of amounts received; work involving cooperation with State, Territory, etc. "Before, on, and after October 18, 1986, in carrying out work involving cooperation with any

State, Territory, possession, or political subdivision thereof, the United States Geological Survey may, notwithstanding any other provision of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation." (Note U.S.C. states that "this appropriation" refers to USGS annual appropriation as contained in the Department of the Interior and Related Agencies Appropriations Act.) Following language supports Appropriations language "Provided further, that, heretofore and hereafter, in carrying out work involving cooperation with any State, Territory, possession, or political subdivision thereof, the Geological Survey may, notwithstanding any other provisions of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation." **50(c)** Payment of costs incidental to utilization of services of volunteers. "Appropriations herein and on and after December 22, 1987, made shall be available for paying costs incidental to the utilization of services contributed by individuals who serve without compensation as volunteers in aid of work of the United States Geological Survey, and … Survey officials may authorize either direct procurement of or reimbursement for expenses incidental to the effective use of volunteers such as, but not limited to, training, transportation, lodging, subsistence, equipment, and supplies: Provided further, That provision for such expenses or services is in accord with volunteer or cooperative agreements made with such individuals, private organizations, educational institutions, or State or local government." **50(d)** Services of students or recent graduates. "The United States Geological Survey may on and after November 19, 1999, contract directly with individuals or indirectly with institutions or nonprofit organizations, without regard to section 5 of title 41, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purposes of chapters 57 and 81 of title 5, relating to compensation for travel and work injuries, and chapter 171 of title 28, relating to tort claims, but shall not be considered to be Federal employees for any other purposes."

43 U.S.C. 51 Funds for mapping and investigations considered intragovernmental funds. "Beginning October 1, 1990, and thereafter, funds received from any State, territory, possession, country, international organization, or political subdivision thereof, for topographic, geologic, or water resources mapping or investigations involving cooperation with such an entity shall be considered as intragovernmental funds as defined in the publication titled 'A Glossary of Terms Used in the Federal Budget Process.'"

43 U.S.C. 364 et seq. Board on Geographic Names, 1947. Establishes the Board on Geographic Names to provide for uniformity in geographic nomenclature and orthography throughout the Federal Government and to promulgate in the name of the Board decisions with respect to geographic names and principles of geographic nomenclature and orthography.

43 U.S.C. 371 Reclamation Projects Authorization and Adjustment Act of 1992. Public Law 104–46 amends the 1992 law to add Section **3001,** "Western Water Policy Review Act of 1992." Directs the President to undertake a comprehensive review of Federal activities in the 19 western States that directly or indirectly affect the allocation and use of resources, whether surface or subsurface. The Secretary of the Interior, "... given … responsibilities for … investigations and reviews into ground water resources through the Geologic Survey (now United States Geological Survey) ..." and the Secretary of the Army "have the resources to assist in a comprehensive review ...."

43 U.S.C. 1334 et seq. Outer Continental Shelf (OCS) Lands Act. Authorizes the Secretary of the Interior to prescribe rules and regulations to provide for the prevention of waste and conservation of the natural resources of the OCS; to conduct geological and geophysical explorations of the OCS; directs the Secretary of the Interior to conduct a study of any region in

any gas and oil lease sale to obtain information necessary for assessment and management of environmental impacts on human, marine and coastal areas which may be affected by oil and gas development on such areas.

43 U.S.C. 1801 et seq. OCS Lands Act Amendments of 1978. Provides for management of oil and natural gas in the Outer Continental Shelf and for other purposes. The Minerals Management Service is responsible for carrying out all functions in direct support of management of the OCS program. The USGS provides indirect support to the Department's management activities through the basic mission to examine the geological structure, mineral resources, and products of the national domain, which, offshore, includes the EEZ.

Title 50, Appendix – War and National Defense

50 U.S.C. 98 Strategic and Critical Materials Stock Piling Act of 1946 as amended by the Revision Act of 1979. Supports the USGS programs for assessment of domestic minerals, especially for strategic and critical minerals, to complement the Federal mineral stockpile program. Section **98(g)** following language supports Appropriations language "and to conduct inquiries into the economic conditions affecting mining and materials processing industries ... and related purposes as authorized by law and to publish and disseminate data …." Provides for scientific, technologic, and economic investigations concerning the development, mining, preparation, treatment, and utilization of ore and other mineral substances.

Public Laws

P.L. 81–82, P.L. 82–231 Arkansas River Compact and Yellowstone River Compact, respectively.

P.L. 93–322 Special Energy Research and Development Appropriation Act of 1975

P.L. 106–291 FY 2001 Interior and Related Agencies Appropriations Act.

P.L. 106–498 Klamath Basin Water Supply Enhancement Act of 2000.

P.L. 106–541 Water Resources Development Act of 2000.

P.L. 107–63 FY 2002 Interior and Related Agencies Appropriations Act.

P.L. 108–7 FY 2003 Interior and Related Agencies Appropriations Act. Consolidated Appropriations Resolution, 2003.

P.L. 108–108 FY 2004 Interior and Related Agencies Appropriations Act.

P.L. 108–360 Earthquake Hazards Reduction Authorization Act of 2004.

P.L. 108–447 FY 2005 Consolidated Appropriations Act. Division E

P.L. 109–54 Department of the Interior, Environment, and Related Agencies Appropriations Act, 2006.

P.L. 109-58 Energy Policy Act of 2005.

P.L. 109-471 Water Resources Research Act Amendments of 2006

P.L. 110-5 Revised Consolidated Appropriations Resolution, 2007

P.L. 110-114 Water Resources Development Act of 2007.

P.L. 110-161 Consolidated Appropriations Act, 2008

P.L. 110–140 Renewable Fuels, Consumer Protection, and Energy Efficiency Act of 2007 – Title I: Biofuels for Energy Security and Transportation - Biofuels for Energy Security and Transportation Act of 2007 - Subtitle A: Renewable Fuel Standard - (Sec. 111)

P.L. 111-8 Omnibus Appropriations Act, 2009

P.L. 111-11, 123 Stat. 991 Omnibus Public Land Management Act of 2009.

P.L. 111-88 Interior Department and Further Continuing Appropriations, Fiscal Year 2010

Additional information related to authorizations of the U. S. Geological Survey can be found at the following website: *http://www.usgs.gov/budget/resources_tools.asp*