

# 1998-99 Activity Report

## Civil Applications Committee



### Civil Applications Committee

Department of the Interior • Department of Agriculture • Department of Commerce • Department of Transportation • Department of Energy • Environmental Protection Agency • Federal Emergency Management Agency • National Aeronautics and Space Administration • National Science Foundation • U.S. Army Corps of Engineers

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1998-99 Activities Report  
Civil Applications Committee

Chairman's Comments

The Civil Applications Committee (CAC) has a long history of supporting applications of imagery from unique sources for Federal civilian agency programs. Over the years, the committee's role has evolved from essentially a technical working group to an advocacy body and, finally, to a strong voice on matters of policy and strategic direction. From an early emphasis on mapping and land management issues, the work of the members has grown to encompass environmental monitoring and analysis, and planning for and responding to emergencies and disasters, including fires, hurricanes, floods, mudslides and landslides, earthquakes, and volcanoes. The missions of the agencies have shifted the focus of the work from being only on the United States to monitoring and analyzing events on a global basis.

The changes in the role of the CAC reflect the changing character of events in the world and the need to obtain information more rapidly, more completely, and in a more useful format. Evolving technology combined with the growing experience of CAC members contributes to the continued success of the committee.

As remote sensing technology continues to evolve and new satellites carrying even more sophisticated sensors are launched, the volume of data flowing from these national systems will increase dramatically. New sources of data will provide the CAC with expanded opportunities to provide critical, timely information to scientists and decision makers for the analysis and solution of environmental problems and for crisis and disaster warning and mitigation. The broad application of these data has the potential to benefit a wide range of congressionally mandated Federal civil agency missions and to help stakeholders and collaborators make informed decisions.

The work of the Committee is demanding and requires the participation of senior-level people from all the Departments. They come with a broad knowledge of the needs involving all the programs of those they represent. These are people with busy schedules who make a commitment to support the work of the CAC. All the representatives are to be commended for their efforts and their willingness to engage in the dialog that builds more effective programs for the future.

Dr. K. Eric Anderson  
Chairman, 1990-1999  
Ms. Karen A. Irby  
Chairman, 2000-

## **The Civil Applications Committee 1998-99 Activities Report**

### **Overview**

During 1998 and 1999, the CAC and its member organizations increased the number and diversity of applications of advanced remote sensing technology, developed and issued information guidelines for more efficient operations, and developed an extensive program to brief CAC members on current and future technological developments. CAC participation in the technology community of advanced remote sensing also provided a mechanism for identifying CAC agency needs in the evolution of future national systems.

### **National Policy Background**

The CAC is a civilian interagency committee established in 1975 to facilitate the appropriate use of classified advanced remote sensing technology and data by Federal civil agencies in support of their missions and programs. The CAC provides a forum through which the civil agencies coordinate requirements, applications, and research pertaining to the use of these assets for their mission-related responsibilities. For civil agencies, the CAC provides the communication channels and the procedures for interaction with the military and intelligence communities on issues pertaining to the use of classified remote sensing data.<sup>1</sup>

### **Responsibilities and Functions**

The CAC's major responsibilities are to provide oversight on the use of classified remote sensing data (hereafter referred to as national systems data), facilitate the acquisition and use of these data, and provide a forum for the exchange of information.

CAC meetings are held once each month at the U.S. Geological Survey (USGS) Advanced Systems Center (ASC) in Reston, Va., to provide informational briefings and conduct routine business. CAC working groups are established to address specific CAC programs and issues and meet on an as-needed basis.

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<sup>1</sup> Additional information on the history and national policy background of the CAC was provided in the 1997 annual report.

## **Membership**

The CAC is made up of representatives from the U.S. Departments of the Interior, Agriculture, Commerce, Transportation, and Energy; the Environmental Protection Agency (EPA); the Federal Emergency Management Agency (FEMA); the National Aeronautics and Space Administration; the National Science Foundation (NSF); and the U.S. Army Corps of Engineers (USACE). A representative of the Director of Central Intelligence (DCI) serves as a member to provide liaison with the intelligence community. Associate members to the CAC include the National Reconnaissance Office, the DCI Environmental Center, the National Imagery and Mapping Agency (NIMA), and the State Department. By direction of the Secretary of the Interior, the Chair of the CAC is assigned to the USGS.

## **Working Group Activity Reports**

Working groups are established under the CAC to deal with specific CAC-related programs and issues. Currently established working groups are concerned with the following subjects: imagery derived products, global fiducials, security, and emergency response. At the present time, consideration is being given to reestablishing the Requirements Working Group to assist the CAC in carrying out its responsibility for reviewing and approving the increasing number and diversity of requirements.

### **Imagery Derived Products Working Group**

Imagery derived products (IDP), which are the literal (image) and nonliteral (maps and other graphics) products generated from national systems data, play an important role in the scientific and environmental applications of CAC member agencies. The 1997 work of the CAC IDP Task Force culminated in CAC approval in February 1998 of the formal charter for the Imagery Derived Products Working Group (IDPWG). The IDPWG began its regularly scheduled monthly meetings in April 1998. Since its inception, the IDPWG has been a forum in which IDP policy issues are discussed, CAC IDP use requests are previewed and critiqued, and the latest information on IDP's is provided to CAC members. The IDPWG facilitates the coordination of IDP issues and CAC IDP projects with NIMA through NIMA's attendance and presentations at IDPWG meetings. Accomplishments include (1) the establishment of CAC procedures for submitting IDP approval requests, (2) the establishment of a tracking system for CAC IDP use requests, (3) beta testing of the IDP Toolkit<sup>2</sup> at several CAC agency facilities, and (4) the creation of an IDP information fact sheet and documentation on IDP approval processes. This group meets on a regular basis. (See attachment A).

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<sup>2</sup> The IDP Toolkit is a software package that allows the automated production of IDP's using NIMA-approved product generation techniques.

### **Security Working Group**

In 1998 and 1999, the Security Working Group worked extensively with various agency security representatives and offices, including the Security Policy Board established by the President, to collect the information required for inclusion in specific security guidelines for the CAC security program. The procedures and guidance being developed outline the policies and regulations as they pertain to the storage, protection, use, and security of classified information and material. These policies and regulations are being designed to provide uniform standards and instruction for constructing, modifying, or renovating a secure room, installing and operating security hardware, implementing access and protection standards, and obtaining departmental certification for subsequent endorsement by the CAC. These guidelines will be issued in 2000. This group meets on an ad hoc basis.

### **Emergency Response Working Group**

The Emergency Response Working Group coordinates the civil agency response to emergency situations by identifying the data needs of the various departments and agencies, establishing communication channels for requesting and disseminating information before, during, and after an emergency situation, and providing an arena where competing needs can be discussed and relative priorities identified. This group meets on an ad hoc basis.

### **Global Fiducials Working Group**

The Global Fiducials Program provides for the establishment of a library of classified remotely sensed data collected on a regular basis for selected sites. These sites, chosen for their significance in long-term studies on environmental processes and change, are sponsored by the CAC agencies. More than 500 sites have been nominated and the site validation process is under way. Fiducial sites are used to study environmental topics within five major disciplines: (1) atmosphere, (2) geology, (3) land use and land cover, (4) oceans, and (5) polar regions. Agency representatives are refining site descriptions, tasking parameters, and requirements. Strategies for managing the data acquisition process are being developed. In September 1999, after a 15-month development period, the library system was declared operational and the first images were loaded. These activities will continue and the working group will gradually increase the number of sites and agencies for which data are being collected. System enhancements will include the electronic receipt of imagery and the establishment of remote access for scientists, who will then be able to query metadata, view browse imagery, and place orders directly. The Global Fiducials Working Group coordinates civil community input to the Global Fiducials Program. This group meets on an ad hoc basis.

## Department and Agency Activity Reports

This section of the annual report highlights the activities of the individual CAC organizations. Additional details which are filed, are available with relevant classified background information for reference through the office of the CAC Executive Secretariat.

### Department of Agriculture

In 1998, U.S. Department of Agriculture (USDA) missions and mandates benefited by the use of national systems data for emergency response, natural resource inventory and monitoring, mapping, development of conservation measures, and land management support.

Fires: Although the U.S. wildland fire season was relatively mild compared to those of recent years, it had major impacts [REDACTED]

[REDACTED] and other commercially available information.

In 1998, the well-known El Niño phenomenon affected burning conditions throughout the world. Large fires occurred in Florida and Mexico [REDACTED]

[REDACTED] The maps were delivered over the Internet from the Forest Service home page and used for fire suppression tactical support by the Department of Defense (DoD), FEMA, and the USFS. These maps were also used to support efforts in damage assessment and ecosystem restoration activities.

National Resource Inventory: The Natural Resource Conservation Service (NRCS) conducts the National Resource Inventory to monitor agricultural production and natural resource conditions across the United States. Once again in 1998, national systems data were used to support this inventory effort to determine changes in agricultural production practices. National systems data augmented commercial aerial photograph sources.

Ice Storm in New England: National systems data were requested by the USDA Forest Service, Northeastern Area State and Private Forestry, to support the recovery and restoration of urban and rural forests damaged by the unprecedented Northern Forests Ice Storm of January 1998. Research on the application of national systems data by the Forest Service Remote Sensing Applications Center and the Northeastern Area Forest Health Protection specialist helped minimize the negative economic, social, and ecological impacts on the region.

Hurricane Georges: IDP's were produced to delineate damage to property and infrastructure in the Caribbean National Forests. These IDP's expedited recovery

measures by identifying landslides and trees blown down over roads. They were also used in subsequent ecosystem management operations.

Fires: In 1999, there were numerous large wildland fires in the western United States. California and Nevada were particularly hard hit in areas where a combination of dry temperatures and high winds resulted in large fires that consumed thousands of acres.

[REDACTED] in these two States, and further advances were made in the [REDACTED]

There was also better coordination [REDACTED]

[REDACTED] Suppression of the northern Nevada fires was [REDACTED]

[REDACTED] In northern California, [REDACTED]

[REDACTED] and in southern [REDACTED]

California, to the [REDACTED]

[REDACTED] incidents. [REDACTED]

[REDACTED] was refined during this period, and workable solutions resulted.

Disaster Assessment: National systems data were also used to aid disaster assessment related to a July 4, 1999, high-wind event at the Superior National Forest in northeastern Minnesota. Initially, the data were used to provide mapped polygons of damaged areas because aerial survey and photo overflights were grounded owing to poor weather. Because the priority for aerial photographs was in populated areas, very little information was available for the interior lands of the Boundary Waters Canoe Area Wilderness, where there was significant tree damage. National systems data were used to supplement field reports within the wilderness area. Additional imagery was acquired to assist in mapping fuel loads within the wilderness. This information will be used by the USFS for an Environmental Impact Statement.

### **Department of Commerce**

The National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce has been a participating member of the CAC since its inception. From the beginning, NOAA's National Ocean Service (NOS) has used national systems data in support of its coastal mapping program, but the past several years have seen increased use for various applications by other NOAA offices.

#### *National Ocean Service*

The Remote Sensing Division of NOAA's NOS National Geodetic Survey (NGS) continued to use national systems data for charting and geodetic purposes during 1998. These data were used for revising shorelines, updating nautical charts, and determining the mean low-water and mean high-water shorelines in southern Alaska.

During 1999, the NGS used national systems data for shoreline compilation in support of the coastal mapping program in Lake Montauk, N.Y. and Columbia Glacier, Harris Bay, and Ketchikan, in Alaska. In addition, new positions were charted of the faces of seven receding glaciers in Glacier Bay National Park, Alaska, and data were used to evaluate the need for chart revision in New York Harbor, N.Y., Boston Harbor, Mass., Houston-Galveston Harbors, Texas, and Charleston Harbor, S.C.

In 1998, the Coastal Services Center (CSC) used archived national systems data in analyzing land use/land cover in Maine and Massachusetts for the Coastal Change Analysis Program (C-CAP).

In 1999, the CSC requested archived data to develop IDP's consisting of vector coverage diagrams, literal images, digital elevation models, and spreadsheets. The IDP's depict land cover and land use and its change over time, intertidal habitat, shoreline, elevation, and recreational boat activity in the areas of Gray's Reef National Marine Sanctuary (NMS), Ga., Florida Keys NMS, Fla., Tillamook County, Oreg., Delaware National Estuarine Research Reserve (NERR), Del., Weeks Bay NERR, Alaska, Old Woman Creek NERR, Ohio, Elkhorn Slough NERR, Calif., Wells NERR, Maine, Kachemak Bay NERR, Alaska, Ace Basin NERR, S.C., Penobscot Bay, Maine, coastal North Carolina, and coastal Maine.

The NOS began using national systems data in conjunction with its coral reef mapping and monitoring efforts under Executive Order 13089, "Coral Reef Protection", signed by President Clinton on June 11, 1998.

#### *National Environmental Satellite Data and Information Service*

NOAA's National Environmental Satellite Data and Information Service is in the process of using national systems data to assist the Federal Aviation Administration (FAA) in locating abandoned beacon sites. These beacon sites, established in the 1930's and decommissioned in the 1950's, consist of a beacon, concrete slab, building, and, in most cases, an underground fuel tank. The locations of many of these sites are no longer known, and the FAA needs to locate them so that any remaining environmental hazards can be removed.

#### *National Marine Fisheries Service*

The National Marine Fisheries Service (NMFS) is using archival and 1999 imagery to study chinook salmon habitat along the Sacramento River between Sacramento and Redding, California (Keswick Dam). The information is being used to (1) develop a baseline for essential fish habitat consultations and management, (2) understand changes in the river system over time, and (3) assist in developing and carrying out species recovery and habitat conservation plans that will protect the salmon and help their populations recover.

Five Federal agencies and the State of Louisiana are joined in a task force to implement a comprehensive approach to restore and prevent the loss of coastal wetlands in Louisiana.

In September 1998, a massive dredging project was completed in the Atchafalaya River delta creating new wetland habitat in coastal Louisiana. In an ongoing effort, the NMFS is obtaining imagery for the years 1997 (preconstruction) and 1999-2001 (postconstruction) in order to observe the change in created land masses and the period needed for full vegetation to cover the newly created areas.

### **Department of Energy**

The Department of Energy (DOE) Office on Nonproliferations and National Security, through its Office of Research and Development, is conducting an electro-optical sensor system development program aimed at determining the capabilities and limitations of new systems for remotely detecting and characterizing certain chemicals in the atmosphere or on surfaces. The systems cover a range of area and spectral resolutions. Although these systems are being optimized to perform specific objectives, they will be able to serve other purposes as well.

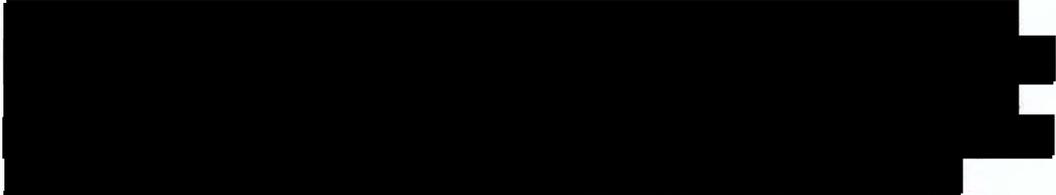
The DOE has offered to share data from these systems with other Federal agencies represented on the CAC after the systems have been put through their testing and evaluation stages. There may be agencies that would like to do exploratory work on an application concept where proof of principle requires access to data of the type produced by these systems. It may even be possible for other agencies to effect minor changes in some of the systems or to task them in the testing deployments. Such changes or tasking would, of necessity, be limited and considered on a case-by-case basis. In any event, this may be an opportunity to have access to data that are not otherwise available and that may be necessary in feasibility analysis of potential new systems or perhaps for other purposes.

### **Department of the Interior**

#### *Bureau of Land Management*

The BLM has used national systems data since 1994. The first national systems data project was the Alaska Wetlands and Hydrography project. This was a collaborative effort among several Federal agencies, including the intelligence community's Environmental Intelligence Applications Program (EIAP), the BLM, and the U.S. Fish and Wildlife Service (FWS). The project developed procedures to use national systems data for inventorying wetlands, documenting wetland trends (losses and gains), and identifying the boundaries for hydrographic features.

This initial effort of using national systems data was very successful, and the BLM has continued to use national systems data for these purposes. Since that initial success, the BLM has employed national systems data to support other activities and has continued to implement an infrastructure to support field use of these unique data. Below is a summary of the 1998 and 1999 activities that involved national systems data:

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The BLM also began a project to evaluate national systems data to map fire fuels, using sampling, for analysis with multispectral commercial satellite data.
- Grand Staircase-Escalante National Monument: This project supported the initial planning for the BLM's new national monument in southern Utah. The EIAP process was used to support environmental studies of the area. Delivery of national systems data products progressed slowly in 1998. However, several were produced, including a detailed map of coal fire vents. In addition, the volume of data associated with this effort has led the BLM to develop a "data mining" tool to support spatial queries of both national systems data and other data sets.
- Bering Glacier: The objective of these national systems data activities include (1) delineating and monitoring forelands and ice margins, (2) monitoring beach side and ice erosion, (3) identifying and assessing existing and potential anadromous fish habitat, (4) identifying dusky Canadian Goose habitat, and (5) assessing hazards for recreation and transportation. Control panels were established in 1998 to monitor long-term changes in the forelands area. Initial results seem to verify the potential to accurately monitor movement and subtle changes in that environment. Additional control panels of improved design were deployed in 1999 in both the Bering Glacier forelands area and the Berg Lake area on the west flank of the Bering Glacier.
- National Petroleum Reserve – Alaska: This project began in 1999 as a test of using national systems data to detect subtle environmental changes caused by oil and gas development. State-of-the-art technologies are used to minimize environmental impacts in this area; however, with the use of national systems data, the BLM hopes to accurately assess even minor changes in the extremely sensitive arctic ecosystem.
- Hydrography/Riparian/Wetlands: National systems data were used by the USGS, FWS, National Park Service (NPS), and BLM in a multiagency agreement to revise and automate all hydrographic features in Alaska. The value of national systems data was also tested in monitoring the condition of riparian areas and updating wetlands inventories in Wyoming.
- Alaska Land Transfer: National systems data were used to map meander hydrography for two cadastral survey groups.

- Alaska Digital Orthophoto Quadrangles (DOQ): In 1997 and 1998, national systems data were used to produce DOQ's of the National Petroleum Reserve-Alaska in an expedited effort to support planning for oil and gas development. There were plans for additional DOQ coverage in Alaska to support other priorities. However, 1998 saw agencies back away from the national systems data DOQ products for two main reasons. First, the products were not of optimal quality. They were made from the best existing coverage, which included images with snow cover and other detracting conditions. The production process included film media that were originally intended only for map revision in which scratches and dust specks were tolerated. And second, the restrictions on use that NIMA policy placed on literal IDP's proved too limiting for effective field use. If the use restrictions can be overcome, the BLM staff are confident that national systems data, properly processed, could make an excellent DOQ for natural resource use.

Despite some difficulties, the BLM believes that national systems data can meet many mission-related information requirements. The BLM will continue to use national systems data when and where appropriate. Although technical and policy restrictions limit the utility of this data, the BLM is convinced of its value and continues to explore new applications.

#### *Bureau of Reclamation*

**Snowpack Measurement:** The Bureau of Reclamation used national systems data in a test to measure snowpack volume in areas where no monitoring exists (wilderness areas, high elevation area). Before 1998, data were collected on several sites in Colorado and Washington with good results. In 1998, an attempt was made to collect data in areas of Wyoming and Washington. The algorithms developed in the first effort will be applied to a larger, basinwide approach. It is hoped that this approach will provide another data set of snow volume that can be used in operational models of these areas.

In 1999, national systems data were received on a Yuma Soil Moisture monitoring program. The data will be correlated with ground data.

#### *National Park Service*

The NPS is charged with managing about 378 park units across the United States and has recently begun using national systems data for mapping areas in Alaska and Hawaii, monitoring critical park areas for changes and trends, and developing new mapping products to find solutions to park management problems.

The Global Fiducials Library (GFL) will ultimately provide a consistent, multiyear image data set for 63 sites in about 14 national parks. These sites compose a temporal view representative of ecosystems across the NPS. These data will be critical in establishing long-term monitoring protocols and resource management strategies for these ecosystems. In the fall of 1999, GFL-derived products were produced as a standard set

for a select subset of sites to test their usefulness for park managers and scientific researchers in other agencies and universities. The GFL data are augmented by other commercially available data, such as aerial photographs, airborne visible infrared imaging Spectrometer data, and Landsat images.

In Yellowstone National Park, general land use and specific weed location maps were produced. After weed-potential maps for dalmatian toadflax were field verified, it was determined that the structural nature of the weed, soil types, and reflectances did not permit accurate mapping of the toadflax. The NPS is attempting to determine if other weeds, such as white clover can be mapped and studied owing to differences in structure and density of plant biomass and ground distribution. Weed locations were known for only 2 percent of the park's 2.2 million acres. The ecological role of white clover is important to understand because it is a food source for Yellowstone bears as well as a weed. Landsat 7 imagery was acquired in the summer of 1999 and is helping to plan for weed management for 100 percent of the park. Invasive and noxious weeds are a growing threat to native species, habitat, and the Greater Yellowstone Ecosystem.

#### *U.S. Geological Survey*

The USGS provides the CAC chairmanship, the CAC secretariat staff, and numerous other resources to help operate the CAC. USGS resources are responsible for organizing monthly CAC meetings, participating in CAC working groups, representing civil agencies at CAC-related meetings, and conducting and participating in other briefings, training sessions, and conferences that take place with increasing frequency in the civil and intelligence communities. In addition to performing these support services, the USGS provides resources at the ASC to process all CAC civil agency requests for national systems data. USGS facilities and systems for data exploitation are made available to all CAC member agencies.

#### National Mapping Program

##### *USGS Mapping Applications Center*

The USGS Mapping Applications Center (MAC), located in Reston, Va., used the Rapid Exploitation System (REx) in the following projects:

- DOQ-to-CIB – This is a cooperative project with NIMA to use existing 1:12,000-scale DOQ's to make 1-degree x 1-degree controlled image base (CIB) products for areas within the United States. Two test areas in Georgia and Florida were used to merge as many as 128 DOQ files, to reduce the pixel spacing from 1 meter to 5 meters, and then format the data file as a NIMA CIB. Initial software was supplied by NIMA - St. Louis. Both panchromatic and color-infrared aerial photographs were tested. Although the process was successful, there was a problem with image balance between adjacent photographs.

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- EIAP River Inundation -- An EIAP study was done with the USGS Water Resources Division (WRD) and National Mapping Program on the use of national systems data for flood inundation mapping. The study was conducted on a flood of the San Joaquin-Tuolumne Rivers in California. It was initially believed that debris on the ground would provide the best indicators of the high-water mark. However, very little debris was left in this area of the river, and soil saturation marks were eventually used to mark the flood extent. A report and map were sent to the Central Intelligence Agency (CIA).
- Shenandoah River Seeps -- Another opportunity was presented in the fall of 1998 to map ground water seeps in the Shenandoah River near Ft. Royal, Va. Unfortunately, because of a summer drought in 1998, the river level was very low and no evidence of a seep was located. Late fall is seen as the best time of year to acquire data because of the stability of the flow and the lack of tree leaves on the banks. Another attempt was made in 1999.
- Wetlands Status and Trends -- A cooperative project with the U.S. Fish and Wildlife Service to map wetland changes in over 3,600 sites in the United States. Changes in the 2-mile x 2-mile Status and Trends plots will be compiled for the year 2000 report to Congress. Ten States were selected to use national systems data where commercial aerial photographs are unavailable.
- Lycoming Creek Elevations -- This is a USGS WRD project maps detailed topography in selected sites along the Lycoming Creek in Pennsylvania. Stereoimages are used in a softcopy photogrammetry program to create orthoimages and triangulated irregular network elevation values. The elevations will be used in a flow model to help predict flooding.
- Dry Valleys, Antarctica -- This is a USGS National Mapping Program project to map hydrographic features in the Dry Valley region of Antarctica.
- Gulf Coast Mosquitoes - A joint Human Health Initiative project with the Center for Disease Control is studying potential habitat for disease-borne mosquitoes. This project identified flooded areas from storms or hurricanes using national systems data, as well as commercial data. Output products will be field maps of potential habitats to locate mosquito traps.
- Surface Heat Budget of the Arctic Ocean (SHEBA) IDP's -- Fifty-seven literal products of the Arctic Ocean were processed for public release. The images document the conditions around an icebreaker locked in the arctic ice and used as a platform for scientists to study ice and atmospheric conditions. The products were prepared jointly between the USGS and Earthsat Corporation for the NSF.
- Disaster Support to Volcanic Eruptions -- This USGS Volcano Hazards Program project provided timely information to USGS scientists in Quito regarding the conditions of the Tungurahua and Guagua Pichincha volcanoes in Ecuador. The

two volcanoes have been periodically erupting since the summer of 1999. Sketches of the craters, in addition to locally derived data, are giving scientists a more complete picture of events.

- Disaster Support to Earthquakes – Locational information was provided to teams of scientists going to the sites of earthquakes in Turkey and California. Information regarding the condition of a landslide after the Taiwan earthquake was given to the Office of Foreign Disaster.

*USGS Rocky Mountain Mapping Center*

At the USGS Rocky Mountain Mapping Center (RMMC), located in Denver, Colo., REX system capabilities have increased over 1997 levels with additional personnel, equipment, and software to support a wide range of applications in the western United States. In 1999, the RMMC increased the functionality of the REX by adding both more capacity and more capability. Socet Set software was installed and used on several projects. Two workstations – one UNIX, one NT – were added. Environment for Visualizing Images software was acquired and installed to provide hyperspectral data analysis tools.

The following projects were under way at RMMC during 1998 and 1999:

- SHEBA: The RMMC provided technical support for data exploitation of the NSF project known as SHEBA. RMMC developed image analysis and land characterization techniques with the project's principal investigator to distinguish melt ponds, used to index the overall arctic heat budget. The techniques were later used by outside contractors and other agencies to produce 59 IDP's for release to the scientific community. Some nonliteral IDP's were produced at RMMC as well. Scientists from the National Snow and Ice Data Center continue to use USGS facilities for this effort.
- Sea Ice Melt Study – NSF: With the completion of RMMC's role in the SHEBA project, the principal investigator is continuing the Sea Ice Melt study using image analysis techniques derived from the SHEBA project.
- Middle Rio Grande, N. Mex.: The USGS Geologic Division (GD) is refining geologic maps for the Middle Rio Grande Basin area of New Mexico. The GD is exploring methodologies to more quickly produce, digitize, and update existing geologic maps. The RMMC developed techniques using Landsat and other sources for producing and updating geologic maps. Technique approval was granted by NIMA, and work is continuing on the Mesita Negra quadrangle and the surrounding area.
- Abandoned Mine Lands Initiative: This USGS project is part of an ongoing multi-year initiative studying abandoned mine areas in Colorado and Montana. The focus is on the collection and integration of base cartographic data and scientific information into GIS formats. For Colorado, the RMMC has nearly completed the

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extraction of roads, railroads, and hydrography vector layers from various data sources for the watershed study area. Existing mine data were incorporated into data collected by the RMMC. For Montana, vector layers for hydrography, roads, and railroads were extracted using multiple data sources. The final products were completed and prepared for delivery to the project's principal investigator.

- Front Range Infrastructure Resources Project, Colorado: Digital cartographic production (DCP) IDP's were made for the Front Range project. This project is generating information on natural resources critical for infrastructure needed by growing urban areas and is developing methodology to help in the planning process. RMMC's role is to develop a temporally consistent database framework on which all other data layers generated by the project will be placed. A Jefferson County, Colo., wildfire response pilot project emerged from this project. USGS data were merged with all available Colorado Department of Transportation and Jefferson County data and then formatted to fit on a CD-ROM to be used as a demonstration product by local fire districts.
- Global Fiducials Program- NPS: The RMMC developed techniques for importing overhead data to create literal IDP's for select GFL sites. The NPS was granted permission from NIMA to release literal IDP's for 11 sites for a limited time. Twelve literal IDP's were released to the NPS, and work is continuing on others. Nonliteral IDP's in the form of elevation models were requested by the NPS for glacier GFL study areas, Glacier National Park (NP), Mt. Rainier NP, Denali NP, and North Cascades NP.
- Yellowstone (Bison) Wildlife Study: The USGS Biological Resources Division (BRD) is studying bison herd movement within Yellowstone NP. The RMMC collected data over the area, developed methods to catalog bison movement patterns, and trained BRD scientists in these methods.
- In its role as the chair of the CAC's Western Users Group, the RMMC also worked on numerous projects for the BLM, NPS, USGS/BRD, USGS/WRD, and USGS/GD. Data were gathered to update maps, generate techniques for drainage basins, identify fire fuel types, quantify glacier movement, and identify the encroachment of nonnative weed species. In addition to producing one-of-a-kind products for various REx users, the RMMC also provided scanning support and software training sessions.

*USGS Mid-Continent Mapping Center*

The following activities took place at the USGS Mid-Continent Mapping Center (MCMC) in Rolla, Mo.:

REx capability was implemented at the MCMC Special Applications Center (SAC). The first exploitation with the system involved the production of high-resolution elevation data using the Socet Set software. Data were collected to investigate and develop

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techniques to create elevation data and imagery. The MCMC has had initial success in producing these data from softcopy stereo imagery and is working to improve the production and editing processes. Additionally, investigations continued with scanned hardcopy data on the REx system, which is designed for softcopy input. Most archived classified data are in hardcopy format. A concurrent investigation is being conducted using REx and Socet Set to generate elevation data from scanned National Aerial Photography Program (NAPP) imagery. The results of these investigations will help MCMC's elevation team extract elevation data from commercial sources for fusion with national systems data in support of Bureau partnerships.

National systems data were used to support St. Charles, Mo., in hazard and disaster mitigation scenarios. Work focused on extracting the flood plain infrastructure, defining the terrain surface (enhanced) to support water modeling, delineating flood hazards, and defining hydro-geomorphologic structure.

National systems data are being sought to validate applicability in support of the Mississippi Delta Initiative for a 10-year study of natural resource issues. These issues include investigations of subsidence and sea-level rise, restoration of wetlands, aquifer yields, and water quality, and a host of other resource management needs. The projects that concern subsidence and the delineation of a land/water interface will be collaborative projects with personnel from the USGS GD, Center of Coastal Geology, in St. Petersburg, Fla.

National systems data of the Springfield, Mo., area are being used to support a WRD project to study how stormflows from Wilsons and Pearson Creeks affect the water quality for the James River system; this information will be used as input for determining the total maximum daily load.

Global Fiducials Program- The first validation image for the Big Muddy National Fish and Wildlife Refuge was received at MCMC. The image will be used to verify that the characteristics of the data are appropriate for the proposed investigations. A poster was generated showing all of the GFL sites in the MCMC's area of responsibility. The outreach effort will begin with Department of the Interior (DOI)/USGS investigators and expand to other CAC member agencies. In conjunction with this effort, the SAC has proposed to validate national systems data for all GFL sites in the central United States.

### *USGS Western Mapping Center*

The USGS Western Mapping Center is establishing a 3,000-square-foot combined Collateral Facility and Sensitive Compartmented Information Facility. Construction is scheduled for completion in March 2000.

### DIGITAL CARTOGRAPHIC PRODUCTION SYSTEM

The DCP system generates orthorectified images from Mapping, Charting, and Geodesy (MC&G), the NAPP, or National High Altitude Program imagery. This system operates

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at the MAC, MCMC, and RMMC. The DCP system is used to produce USGS DOQ products for control extension and to scan hardcopy to produce digital data.

The USGS generated a large number of DOQ's using the DCP system. System capabilities supplemented the conventional USGS DOQ program in Alaska and Hawaii, where adverse weather conditions and remoteness of the areas precluded the use of commercial imagery. The following are the special programs for which DOQ's were produced using national systems data in 1998 and 1999:

- DOI-Alaska High-Priority Lands Initiative: DOQ's in Alaska are used for various analyses and assessment needs by Federal agencies such as the BLM, FWS, NPS, and USFS. DOQ's in Alaska are in a quarter-quadrangle format that is based on the 1:63,360-scale quadrangles at a 1.5-meter resolution, and it should be noted that a quarter-quadrangle in Alaska is equivalent in area to a full 7.5-minute quadrangle in the continental United States. In 1998, approximately 1,900 DOQ's were generated, and another 1,100 in 1999. That is in addition to the approximately 3,500 DOQ's made during the previous year and a half. Approval has been received to release these as unclassified IDP's for U.S. Government Use Only. Over 3,000 Alaska DOQ's have been released as IDP's, to support the revision of DLG hydrography layers for the Alaska Hydrography Revision Program (revision done by MCMC, RMMC, and contractors) and to support other agencies in accomplishing their missions. Starting in 1997, tasking was requested for summer collection only.
- National Petroleum Reserve, Alaska: DOQ's were made for the BLM over the Harrison Bay, Umiat, Teshekpuk, and Ikpikpuk Rivers. This project began in 1997 and was completed in early 1998. Approximately 210 of these DOQ's were authorized as IDP's.
- State of Hawaii: In this NIMA-sponsored project, the USGS completed production of about 500 DOQ's in Hawaii in 1999. The DOQ's were generated to facilitate the map revision done at RMMC, MCMC, and MAC. Full sets of CD-ROM's of the islands were produced and delivered to the USGS, NPS, FWS, USDA, and the Pacific Disaster Center. All DOQ's produced were released as IDP's.
- There were also DOQ's produced over the continental United States in support of the Raster Graphics Revision Program and other directives. Where NAPP DOQ's do not meet the currency required for revision, DCP DOQ's have been used as substitutes. More than 200 quarter-quadrangle DOQ's were generated in 1998 and 500 in 1999. Nearly 600 were released as IDP's.
- In addition to the production of DOQ's, the DCP system continued to generate suitable control for the USFS in support of their standard National Digital Orthophoto Program (NDOP) in these remote and inaccessible areas: Coconino National Forest, Ariz., Manti National Forest, Utah, and Clearwater National Forest, Idaho.



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Storm Hermione passed through these areas in September 1998. The data were used to determine the extent of damage to shipping channels/waterways and the displacement of aids to navigation.

- [REDACTED] involved in a joint study with [REDACTED] and the [REDACTED]. This study was performed to satisfy congressionally mandated requirements. The study was conducted in conjunction with a similar test using commercial remote sensing systems being carried out by the Jet Propulsion Laboratory.
- The ICC, in response to a request from the Coast Guard Directorate of Operations, is conducting a year-long study on the number of maritime vessels transiting two different areas off the East Coast of the United States on a daily basis. Upon the completion of this study, the ICC will provide summarized data to support a policy decision on whether to modify the shipping lanes to protect the northern right whale (on the endangered species list). The original tasking request for this study came from the [REDACTED].

**Environmental Protection Agency**

The mission of the EPA is to protect human health and to safeguard the natural environment (air, water, and land) upon which life depends. The EPA's purpose is to ensure (1) that all Americans are protected from significant risks to human health and the environment where they live, learn, and work, (2) that national efforts to reduce environmental risk are based on the best available scientific information, and (3) that Federal laws protecting human health and the environment are enforced fairly and effectively. The EPA's work is always undertaken with the realization that the United States plays a leadership role in working with other nations to protect the global environment and that the global environment affects the United States. The EPA works with the CAC to ensure that the proper EPA decision makers have access to all relevant, available, and appropriate information.

For more than 20 years, EPA's Environmental Photographic Information Center has worked with the CAC and with national systems data. In recent years, the EPA has developed secure facilities that permit the use of these data at many of its locations around the United States. The EPA has used national systems data for research on habitat evaluation, environmental remediation, land use change, global climate change, and pollutant distribution and impacts. Through the Environmental Working Group of the U.S.-Russian Joint Commission on Economic and Technological Cooperation, the EPA cooperates in research using national systems data for risk assessment involving energy development in extreme environments and for studies of global change. In addition, the EPA has worked on the development of the GFL and is sponsoring several global fiducial sites. Finally, the EPA uses unclassified IDP's to fulfill its broad responsibilities regarding disaster and emergency response.

The EPA recognizes that environmental protection contributes to making our communities and ecosystems diverse, sustainable, and economically productive. Accordingly, it must ensure that environmental protection is an integral consideration in U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade, and these factors are similarly considered in establishing environmental policy. The EPA must also ensure that all parts of society (communities, individuals, businesses, and state, local, and tribal governments) have access to enough accurate information to effectively participate in managing human health and environmental risks.

#### **Federal Emergency Management Agency**

During 1998, the FEMA submitted 16 requirements to the CAC for evaluation and approval. Four requirements supported the monitoring of smoke from fires in Central America, the acquisition of Alaska baselining information, a California levee-mapping project, and a South Pacific damage assessment comparison study. The other 12 disaster-related requirements were submitted to support Federal response to ice storms, typhoons, hurricanes, tropical storms, flooding, and wildland fires.

During 1999, the FEMA submitted eight domestic imagery requirements (DIR) to the CAC for evaluation and approval. All of the DIR's were for Federal response and recovery missions in support of actual or projected Presidential disaster declarations. Each mission directly supported damage and impact assessment activities for areas adversely affected by tornadoes, flooding, and(or) hurricanes.

#### **U.S. Army Corps of Engineers**

The Topographic Engineering Center (TEC) represents the U.S. Army Corps of Engineers on the CAC and participates in the activities of the IDP Working Group and the Emergency Response Working Group.

During 1998-99, the TEC received approval for six IDP use requests, including two crisis-oriented blanket approvals and three research-oriented IDP's. The USACE was granted blanket approval to produce both literal and nonliteral products under crisis response situations. IDP products were created primarily in response to hurricane-related crisis events. In addition, Corps officials are now authorized to share this IDP information with State and local officials similarly engaged. Research requests that were approved include the identification of landmines in Bosnia, the development of special weapons, and the use of national systems data by military land managers.

During 1998-99, the TEC requested and received approval for nine DIR's. These included two long-term USACE projects: the ongoing Baseline Imagery Collection of U.S. Floodprone Areas, and the collection of imagery for the GFL sites. Other approvals included tornado and hurricane damage assessments, northeast U.S. flooding, and a research effort to determine the feasibility of using national systems data to track ocean-going surface vessels.

In addition, during this reporting period, the USACE requested imagery collected through 13 FEMA-requested DIR's, primarily in response to U.S. flooding, hurricanes, and tropical storms.

### **National Science Foundation**

Because of the interest, assistance, and commitment of the CAC and intelligence community, the scientific research community now has access to unique and otherwise unavailable data from national systems. The processes are in place to support scientific interests while maintaining appropriate oversight of national security interests.

SHEBA – Global circulation models that are used to predict the environmental effects of global climate change suffer from a lack of information about the climate feedback caused by fluctuations in snow and ice cover in the Arctic. Research on the key processes that determine ice-albedo and cloud-radiation feedback in the Arctic Ocean has been severely limited by the lack of comprehensive, accurate measurements that document the time evolution of the coupled upper ocean/sea-ice/lower atmosphere system over a full annual cycle. Accordingly, a coordinated research program called SHEBA was formulated to study the interaction of surface energy balance, atmospheric radiation, and cloud radiation feedback processes. SHEBA is a key element of the Global Change Research Program. Both climate feedback mechanisms are controlled by surface properties of the drifting ice pack, which vary greatly over the annual cycle owing to changes in surface reflectivity and cloud formation caused by surface melt, open leads exposing the ocean, and fresh snow cover. The national systems data are being used to determine the relative amounts of surface features with differing reflectivity and serve as a critical source of information that could not be collected on the same scale and resolution by commercially available means. The CAC played a major role in enabling the release of derived and declassified imagery taken at the SHEBA site in the Beaufort Sea during 1997-98. The release was announced by Vice President Gore in a White House press release and during a press event attended by the Vice President.

LC-130 Landing Site Evaluation – The NSF has responsibility for activities in the Antarctic. One major project was to determine if and how national systems data can be used to evaluate potential landing sites for LC-130 aircraft (ski-equipped C-130 heavy-lift aircraft) operated by the USAF/ANG for the NSF U.S. Antarctic Program. Only one nonliteral IDP has been released For Government Use Only (FGUO). This project shows that there is considerable promise for exploiting national systems data in support of safer air operations in the Antarctic. Literal and nonliteral IDP's may be required FGUO.

Cape Roberts Project Sea-Ice Assessment – Beginning in June 1997, national systems data were available to augment commercial imagery for an internationally collaborative geological drilling project named the Cape Roberts Project. The drilling phase is complete, and now the project is in the last major segment of the core analysis phase. The seasonal sea ice, about 150 kilometers north of McMurdo Station, was used as a drilling platform. Successful drilling required adequate development of sea ice through

the austral winter and spring, so monitoring sea ice development was a key operational activity.

**Penguin Rookery Changes Near Palmer Station** – The NSF is involved in several projects to study the extent, distribution, and change of penguin rookeries. National systems data were used to aid in the control required for making digital elevation models and orthophoto quadrangles from conventional aerial photographs for several islands near Palmer Station; this was part of a particular study of changes in the extent of penguin rookeries.

**Jornada (New Mexico) Long-Term Ecological Research (LTER) Program** – The Jornada LTER Program is using national systems data to conduct respective analysis of desertification of grasslands in the desert Southwest. Desertification has resulted from the invasion of grasslands by woody vegetation and the conversion of productive grasslands to low-production woodlands with high patch distribution of soil resources. The Jornada LTER program is using retrospective analysis to assess the rate of shrub invasion in these desert grasslands. This information will be combined with ongoing empirical and experimental studies at Jornada to determine the mechanisms leading to desertification and the consequences of these changes on the ecosystem function.

**Dry Valleys Region Declassified Images** – Efforts of the NSF and CIA resulted in the release of a literal IDP of the Dry Valleys in September 1999, and efforts continue to release a second image. The images are from obsolete national systems, and the data were acquired in the 1970's and early 1980's. The release was announced by the President during a speech in New Zealand and was the subject of related press releases by the White House, the NSF, and the CIA. Once processed, the data will be very useful to researchers working in the McMurdo Dry Valleys LTER site. The wide coverage of each image provides information about lake levels and other physiographic features at a single instant in time. In contrast, the aerial photographic archives do not cover the entire area at once, and often several years lapse between coverage in adjacent areas. Also, aerial photographic coverage in the 1970's was sparse, and commercial satellite imagery was not of sufficient resolution to be useful for LTER and other ground-based science activities.

## **Collection Management**

The Source Management Section (SMS) at the USGS ASC handles national system data requests by CAC member agencies. This team, made up of Government and contractor personnel, is responsible for coordinating and planning an agency's source requirements, submitting data requests to the appropriate DoD authorities, and distributing and archiving the acquired data. The SMS also conducts archive searches and assesses the quality of the data.

During 1998 and 1999, the SMS continued to process an increased number of requirements for the ad hoc and MC&G data. In 1998, data requests and collection for ad hoc requirements, unique data considerations that usually have a short-term duration with

a specific beginning and ending date, increased by almost 13 percent over 1997. Distribution of digital data increased by 37 percent over 1997, and distribution of hardcopy data increased 36 percent over 1997. In 1999, data requests and collection for ad hoc requirements showed a modest decrease of 8.5 percent compared to 1998. Distribution of digital data increased by 39 percent over 1998, and distribution of hardcopy data decreased by 23 percent. The decrease in hardcopy data was a result of better management of the number of hardcopy orders for distribution and the use of more digital data by project customers.

MC&G requirements, which are suitable for general mapping purposes, showed a significant increase over 1997 activities. In 1998, a total of 1,017,025 square miles was searched for MC&G data. Data for 334,803 square miles were delivered to customers, and new data were ordered for another 192,000 square miles. Of all the searches submitted, 28 percent resulted in the ordering of archived data, and 23 percent resulted in new tasking to NIMA. The SMS was able to satisfy 45 percent of the searches with our in-house archived inventory. In 1999, MC&G requirements showed a modest increase over 1998 activities. The SMS searched 1,047,052 square miles. Data for 251,006 square miles were delivered to customers, and new data were ordered for another 885,483 square miles. Of all the searches submitted, 42 percent resulted in SMS ordering archived source and 30 percent for tasking NIMA. The SMS was able to satisfy 21 percent of the searches with in-house archived inventory.

Other related activities that occurred included the approval by DoD for the SMS to establish a Departmental Requirements Office (DRO) at the mission ground station. The SMS now maintains a DRO onsite at this facility on a daily basis during normal business hours. This has resulted in better planning, coordination, and processing of the CAC ad hoc collection requirements and also has established an improved relationship between the civil and intelligence communities. (See attachment B).

### **Major Accomplishments and Future Challenges**

Applications of advanced remote sensing technology in the CAC and its member organizations increased in number and diversity during 1998 and 1999. These increases resulted in a higher level of requirements for both archived and new data. The growth of regional CAC centers continued and provided increased opportunities for all-source work in secure, decentralized locations. New facilities in Denver, Colo., Reston, Va., and Anchorage, Alaska, increased the number of facilities with production capabilities.

CAC meetings continue to be held the first Wednesday of each month at the USGS ASC. Once a year, the CAC meeting is held at another site. In 1998, the June meeting was held at the USACE TEC site. In 1999, the December meeting was held in Denver, Colo., at the USGS RMMC site. The monthly status reports and working group reports showed an increase in the number of environmental applications projects, such as support for Hurricane Mitch, Yellowstone National Park Vegetation, and the Wildfire Suppression Network. More information was received on commercial satellite imagery and commercial developments in the multispectral/hyperspectral/ultraspectral arena are being

closely followed. The increased requirements for and use of national systems data were linked with an increased number of IDP's. The IDP program has presented many challenges to the civil and intelligence communities that will continue in the coming years. Growing awareness of the long-term potential for national systems data in monitoring the environment has spurred increased participation by CAC member agencies in the Global Fiducials Program. All of these programs support the civil community and we look forward to their growth.

**Contacts**

For more information about the CAC, contact:

CAC Secretariat  
USGS Advanced Systems Center, MS 562  
12201 Sunrise Valley Drive  
Reston, VA 20192  
Phone: [REDACTED]  
Fax: [REDACTED]  
E-mail: [REDACTED]

For more information about the collection of national systems data, contact:

Source Management Section  
USGS Advanced Systems Center, MS 562  
12201 Sunrise Valley Drive  
Reston, VA 20192  
Phone: [REDACTED]  
Fax: [REDACTED]

CAC Representatives:

Karen A. Irby (USGS) Chair – [REDACTED]  
Denise Perreca (USGS) Executive Secretary – [REDACTED]

Department of the Interior:  
Ed Harne (BLM) – [REDACTED]

Department of Agriculture:  
Chuck Dull (FS) – [REDACTED]

Department of Commerce:  
Anne Miglarese (NOAA/CSC) – [REDACTED]

Department of Energy:  
Brant Jones – [REDACTED]

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Department of Transportation:

Kevin Miller (USCG) - [REDACTED]

Federal Emergency Management Agency:

Bruce Price - [REDACTED]

National Aeronautics & Space Administration:

Richard Baldwin - [REDACTED]

U.S. Army Corps of Engineers:

Regis Orsinger (TEC) - [REDACTED]

U.S. Environmental Protection Agency:

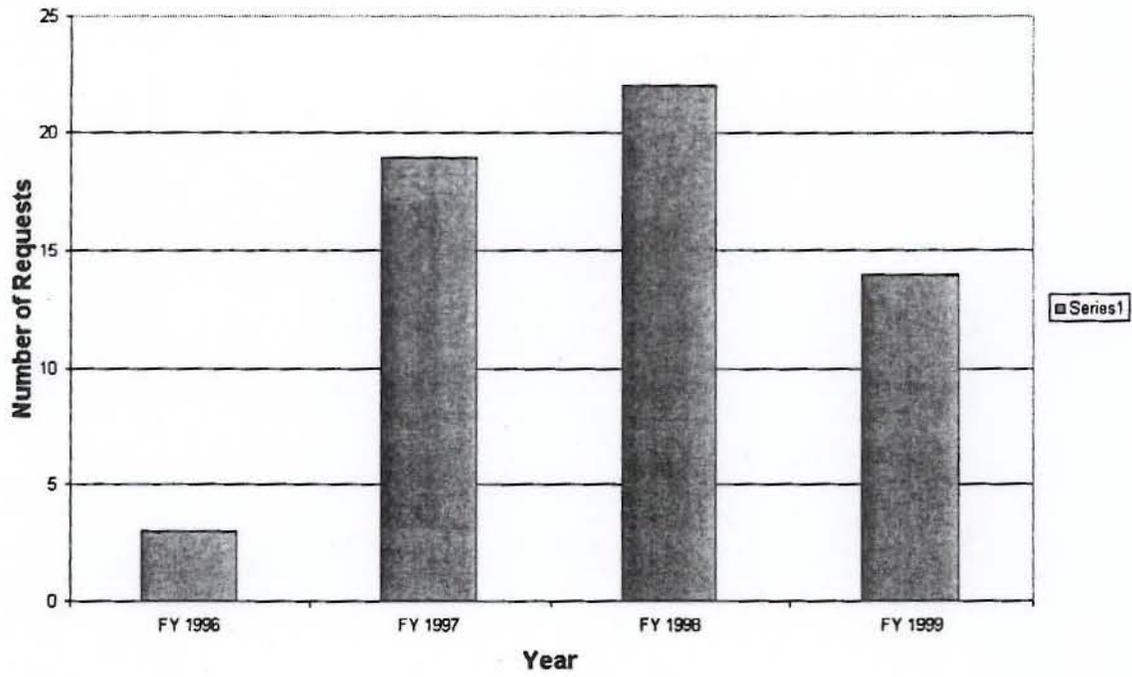
Dr. Peter Jutro - [REDACTED]

National Science Foundation:

Dr. Karl Erb - [REDACTED]

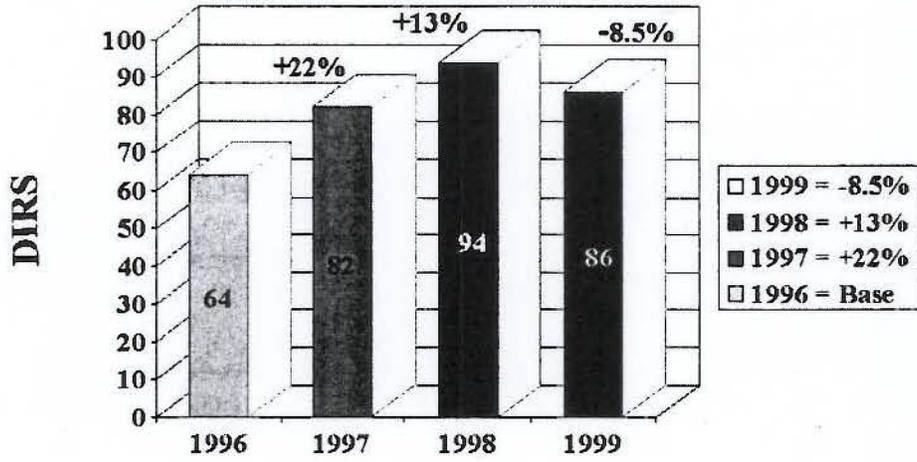
Attachment A

IDP Declassification Approval Requests

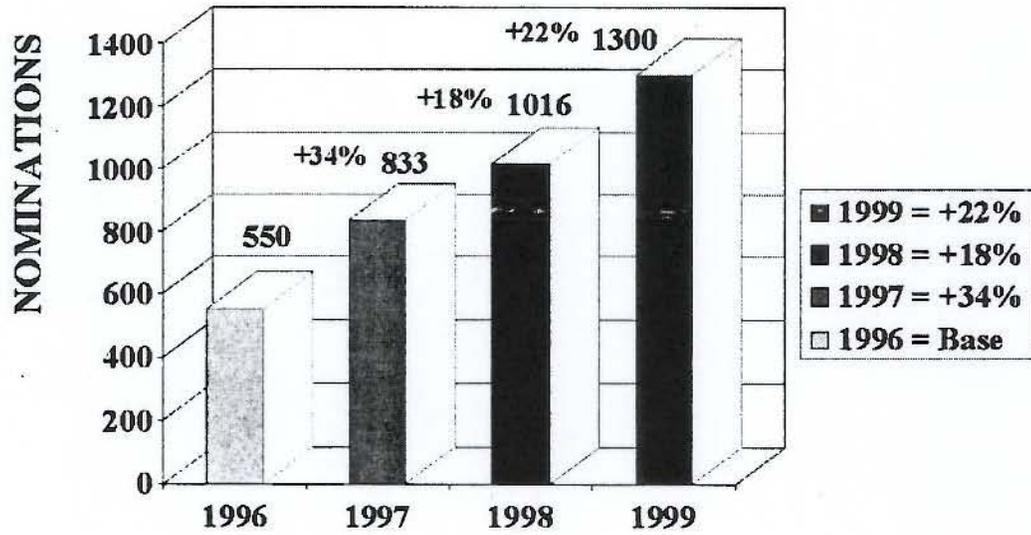


Attachment B

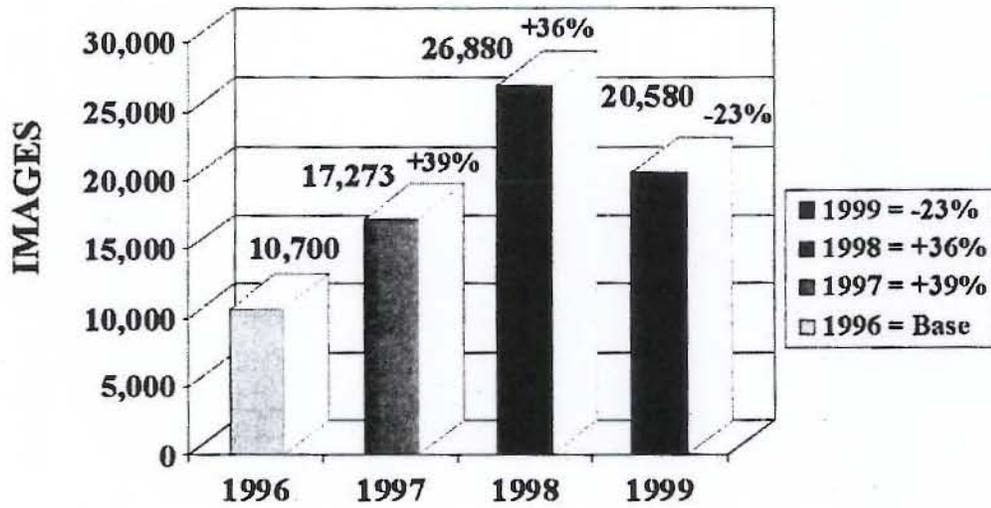
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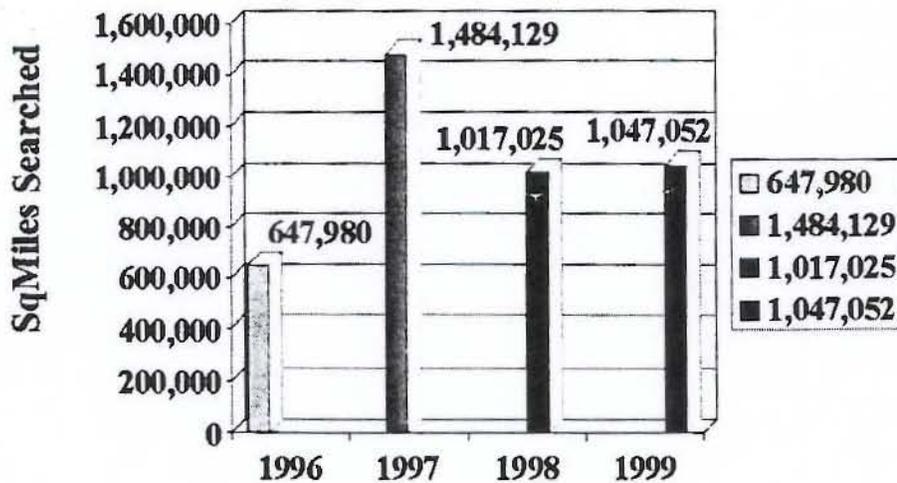
### NOMINATIONS ON RMS



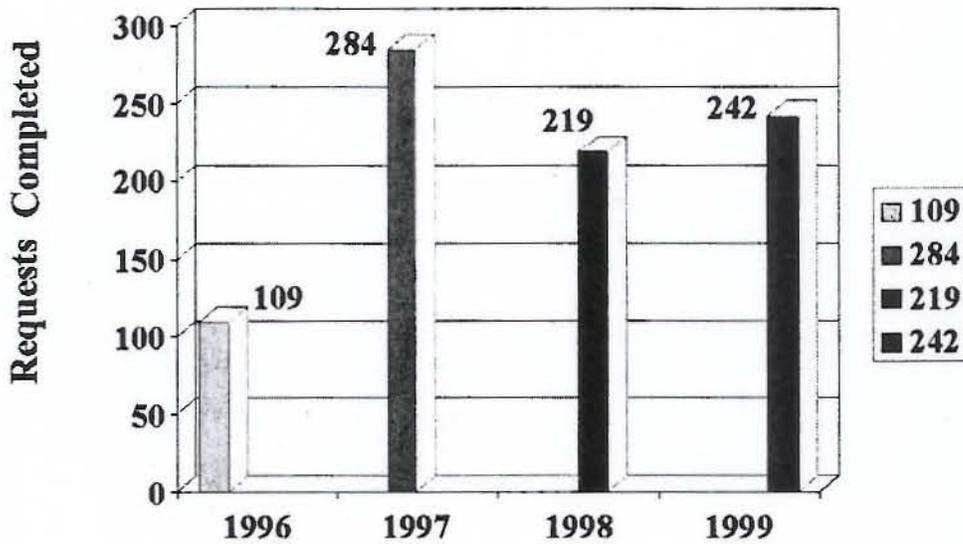
### AD HOC IMAGES RECEIVED



### MC&G SQUARE MILES SEARCHED

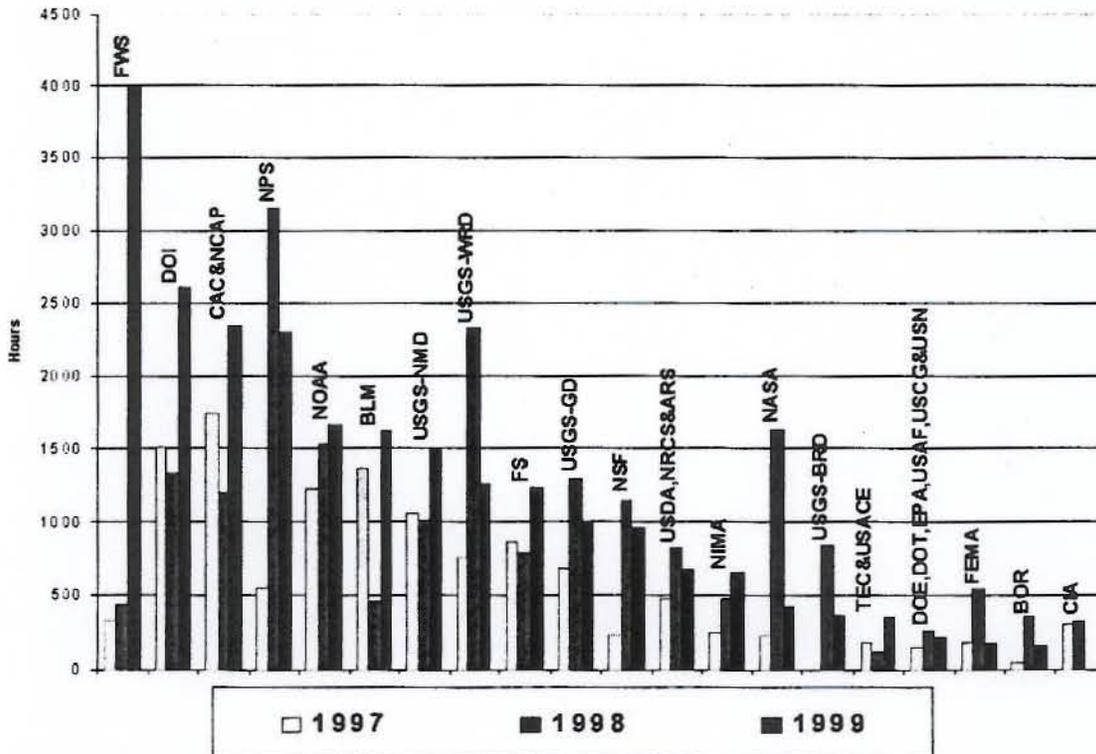


## MC&G REQUESTS COMPLETED



## Advanced Systems Center - Source Management Section

Time Spent Searching & Obtaining Source Over the Last Three Calendar Years



## UNCLASSIFIED

[REDACTED] BY AGENCY FOR CALENDAR  
 YEARS 1996 - 1999

AGENCY	1996	1997	1998	1999
BLM	6	4	3	8
BRD	-	-	-	5
DOI	-	-	1	1
DOT	1	3	-	-
EPA	-	2	-	1
FEMA	11	12	18	8
FS	5	9	8	8
GD	8	6	6	1
NASA	-	2	2	1
NMD	1	1	2	1
NOAA	6	6	12	6
NPS	2	4	5	3
NRL	-	-	1	-
NSF	-	3	4	3
TEC	1	4	3	2
USACE	-	-	1	2
USCG	1	1	4	2
USDA	1	1	1	2
USFWS	3	2	1	2
USGS	12	16	16	23
WRD	6	6	6	7
<b>TOTAL</b>	<b>64</b>	<b>82</b>	<b>94</b>	<b>86</b>

UNCLASSIFIED