

Federal-State Cooperative Water Program Subactivity

Program	FY 2000 Estimate	Uncontrol. & Related Changes	Program Changes	FY 2001 Budget Request	Change from FY 2000
Federal-State Cooperative Water Program	60,553	+2,326	0	62,879	+2,326
Total Requirements \$000	60,553	+2,326	0	62,879	+2,326

Current Program Highlights

A vital cornerstone of the USGS mission is the continuous assessment of the Nation's water resources. This is a huge and expensive task. Throughout its history, the Federal-State Cooperative Water Program (Coop Program) has enabled the USGS to partner with State and local water resource agencies in carrying out this important part of its mission. The Coop Program also provides technical assistance to State and local water management agencies (including Indian Tribes) in seeking solutions to water-resource issues of national concern through a matched funding arrangement. The cooperating agencies provide at least half the funding; USGS does most of the work. These provisions result in an effective cost sharing arrangement and ensure that data collection, archiving, and analysis are conducted with consistent techniques that allow a truly national resource assessment.

The Coop Program has been highly successful for several reasons. From a Federal perspective, the Coop Program combines Federal and non-Federal resources in addressing many of the Nation's most pressing water resource issues. Coop studies are conducted in each of 50 States; the knowledge gained from these studies contributes significantly to understanding the hydrology in all parts of the country. By bringing together and synthesizing the results of studies on common topics in various hydrogeologic and climatic settings, the Coop Program enables the USGS to form a national picture of important water-resource issues and potential solutions at great cost savings to the Federal Government.

From a State and local perspective, having an objective Federal science agency provide high-quality data and information on issues of importance to them is a vital service for which they are willing to share the cost. By using standardized methods of data collection and analysis across the country, the USGS ensures that its information and results are comparable from one State to another. Rivers and aquifers cross jurisdictional lines; studies and data collected in one county or State have great value to adjoining counties and States. Therefore, water managers at all levels appreciate that information developed by the USGS is provided to all potential users, public and private, on an equal basis. Also, cooperators understand that USGS staff have ready access to a wide variety of expertise across the country in such areas as database management, quality assurance, and research in all areas of hydrology.

Within the Coop Program, about half of the funds are used to support Data-Collection Activities; the remaining funds are used for Interpretive Studies. In an effort to maximize the usefulness of hydrologic data and the results of interpretive studies, the USGS continues to compile and analyze information resulting from these activities in various States into Regional and National Synthesis products using modest amounts of funding from other USGS programs.

Data-Collection Activities

Cooperatively funded hydrologic data collection activities are underway in every State, Guam, Puerto Rico, and the U.S. Virgin Islands. Over the past few years the Coop Program has provide sole support or partial support for well over half of the sites where USGS collects data on surface-water levels and flow, ground-water levels, and ground-water quality. In addition, the Coop Program supports collection of data on surface-water quality, which is becoming increasingly important to the States as they monitor total maximum daily loads (TMDLs), in order to comply with the requirements of the Clean Water Act. All these data provide resource managers with the information they need to determine the suitability of water for various uses, identify trends in water quality, and evaluate the effects of stresses on the Nation's ground-water and surface-water resources. Much of the data collected at USGS monitoring sites is provided free of charge on the World Wide Web to all interested parties. This includes historical data, as well as real-time data which are generally less than 4 hours old. The real-time data are used routinely by emergency management agencies, State and municipal agencies, businesses, and recreational boaters and fishers.

In addition to providing information responsive to State or local needs, the Coop Program provides information that satisfies the needs of many Federal agencies. Some of these needs are:

- Forecasting floods
- Managing surface-water supplies
- Monitoring hydroelectric power production
- Setting waste disposal limitations
- Regulating industrial discharges
- Designing highway structures
- Measuring the downstream transport of pollutants or nutrients
- Determining total maximum daily loads
- Evaluating mine permits
- Planning and evaluating land reclamation
- Evaluating fish habitat
- Quantifying Indian water rights
- Quantifying Federal reserved water rights

Most of the USGS data-collection stations serve multiple purposes and many are funded, wholly or in part, through cooperative agreements. Normally these stations, though funded by various organizations, are operated as part of an integrated network rather than as stand-alone entities. For this reason cooperating organizations are billed on the basis of AVERAGE station cost, rather than ACTUAL cost, which rarely can be precisely known. For instance, the annual cost of a streamflow gaging station usually is the same for all such stations operated by a particular USGS office. This procedure benefits these organizations and the USGS in at least two ways. Administrative costs are reduced because financial transactions are simplified, and definitive cost information is available to all parties for planning purposes at the beginning of the fiscal year. This arrangement also assures that data collection in remote areas or which may be otherwise problematic during a given period of time (vandals, extreme flooding, lightning strikes, etc.) do not become prohibitively expensive and as a result exclude these important hydrologic stations from the network.

Interpretive Studies

In addition to data collection activities, the Coop Program supports about 500 hydrologic studies and investigations each year. Water resource appraisals define, characterize, and evaluate the extent, quality, and availability of water resources. Since the early 1970's these investigations have increasingly emphasized water-quality issues, such as aquifer contamination, land application and injection of reclaimed water, river quality, storm-runoff quality, and the effects of acid rain, urbanization, mining, and agricultural chemicals and practices on water resources. The results of these investigations are published and provided to State agencies, who use them as the basis for managing the water resources for which they are responsible. Also, these

investigations provide information that can be synthesized and applied to a variety of hydrogeologic and climatic settings across the country, greatly expanding the usefulness and transferability of USGS study results nationwide.

External Review of the Coop Program

During FY 1999, the Coop Program had an extensive review by stakeholders external to the USGS--the first such review in the program's history. The External Review Committee comprised representatives from cooperating agencies and Tribes, Federal agencies, national water resources organizations, and the private sector. The Review Committee, under the aegis of the Advisory Committee on Water Data (established under FACA guidelines) was charged with evaluating the program in four major areas: mission, prioritization and funding of work, conduct of work, and products.

The Review Committee provided many insightful observations and recommendations about the program that will maintain the program's core strengths while leading to significant improvements. In accordance with FACA guidelines, the Committee's report is now available for public comment. An excerpt from the Committee's report follows:

"The Cooperative Water Program is critical to improving the management of the Nation's water resources. It is important to the Nation in that it acknowledges the keen shared-interest of Federal, State, Tribal, and other government agencies in appraising the Nation's water resources and seeking solutions to water-related problems. In today's climate of growing demands on, and increasing competition for, the Nation's water resources, there can only be an increased need for all types of water-related data and analyses in the future. The Cooperative Water Program offers the highest level of scientific knowledge, objectivity, and technical expertise. The Cooperative Water Program is integral to providing long-term data collection and analysis of water quantity, quality, and use on a national basis. Without the Cooperative Water Program, the nation would not have information vital to the routine management of the nation's water resources and critical in the management of water-related emergencies."

Recent Accomplishments

Innovations in Water Data Collection -- The USGS developed an unmanned platform used to make river discharge measurements with an acoustic Doppler current profiler. This work is described in a paper which was presented to the Institute of Electrical and Electronic Engineers Sixth Working Conference on Current Measurement in San Diego, in March 1999. The paper, titled "Overview of Hydro-acoustic applications by the U.S. Geological Survey in Indiana," presents an overview of the work, including in-situ applications and mobile applications. For in-situ applications, hydro-acoustic instrumentation is installed and operated at streamflow-gaging stations to produce accurate records of river discharge. Such applications are particularly well suited to presenting data in real-time on the Internet. The paper explains the benefits in precision, efficiency, and safety obtained by the use of hydro-acoustic instruments in the streamflow-gaging program.

Flood Tracking Chart -- The USGS Mississippi and Louisiana Districts recently completed a year-long effort to develop a flood tracking system for the Pearl River Basin in Mississippi and Louisiana. The flood tracking system includes two components, a printed report, "The Flood Tracking Chart for the Pearl River Basin," and the Flood Tracking Web Page. The report, released as USGS Open-File Report 99-53, is a color poster that shows a map of the Pearl

River Basin, the location of real-time streamgaging stations in the basin, and the five highest recorded peak stages at selected stations. The Flood Tracking Web Page (<http://ms.water.usgs.gov>) provides an interactive version of the Flood Tracking Chart that allows users to simultaneously monitor data at several streamgaging stations. The information shown for each selected site includes a plot of the river stage for the previous 3 days and, where available, the National Weather Service (NWS) river stage forecast for the next 3 days. In addition, during flood conditions, the information shown for each site may include the NWS flood-crest forecast and, for comparison purposes, the recorded crests of five previous floods.

InSAR to Monitor Land Subsidence -- The Santa Clara Valley of California was the first area in the U.S. where land subsidence due to ground-water withdrawal was recognized. It is also the first area where organized remedial action was undertaken, and subsidence was effectively halted by about 1969, through a combination of reduced ground-water pumpage and extensive recharge of imported surface water. With the recovery of water levels in the valley, the Santa Clara Valley Water District has proposed to increase ground-water withdrawals during periods of drought, to reduce the extreme reliance on expensive imported water. They set a concurrent goal, however, to limit land subsidence to 0.3 centimeters per year. USGS cooperated with the Santa Clara Valley Water District to test the viability of using InSAR (Interferometric Synthetic Aperture Radar) as a tool to monitor surface displacements associated with land subsidence. InSAR images were produced by USGS from satellite-borne radar data for a short (8 month) period and a longer (5 year) period. Subsidence of about 3 cm was noted for the January to August period in an area centered around San Jose. For the 5-year period between 1992-97, however, the land surface in Santa Clara Valley as a whole rebounded about 3 cm. InSAR has been proven to be an excellent tool for evaluation of land-surface subsidence, with applications to many areas and many problems.

Snyderville/Park City Hydrology -- The Snyderville basin-Park City area, located east of Salt Lake City in the Wasatch Range, is one of the fastest growing residential and recreational areas in Utah. A major constraint to planned development in the area is the availability of water. Water resources of the area are considered to be fully appropriated and the Utah Division of Water Rights needed to know the effects of exchanging existing surface-water rights for ground-water rights to meet future municipal and residential needs. The USGS conducted a study to define the geometry and character of the principal sources for ground-water development, define the principal mechanisms and processes within the hydrologic system, assess the existing quality of water and the potential for degradation, and provide data and analyses from which the effects of future water development could be estimated. The Utah Division of Water Rights has used the conclusions of this study as a basis to form the policy for future ground-water development.

Urban Hazards Initiative -- This USGS multi-divisional program has resulted in development of geographic information system (GIS) methods to efficiently map areas of flood inundation in flood plains. The GIS methods, although not quite as accurate as traditional "on-the-ground" methods, are much less expensive and faster, and produce results that more accurately reflect current conditions than do many existing flood-plain maps, that are outdated due to better estimates of the 100-year flood level. Thus, in the trade off between method accuracy and 100-year flood-level accuracy, the new method finds utility. This new flood-plain mapping method is currently being further developed to allow real-time inundation mapping based on predicted flooding conditions. This real-time method requires coupling the GIS technique with a two-dimensional surface water model, which is being refined and documented under the Urban Hazards Initiative.

Drinking Water Sources in Kansas -- In partnership with the City of Wichita and the Bureau of Reclamation, the USGS is conducting two studies to describe nearly all of the source-water supplies for 350,000 customers in the City of Wichita, Kansas. Current supplies are completely allocated, and the City has adopted a water-supply plan for recharging these sources with excess streamflow from the Little Arkansas River to meet future water demand. The primary role of the USGS study focuses on describing the current water-quality and quantity conditions in the Little Arkansas River and adjacent aquifer, quantifying the effects of demonstration-scale recharge activities, evaluating the effects of agricultural chemicals and sediment on Cheney Reservoir, and providing a baseline of current water-quality conditions to measure the effectiveness of any implemented land-management strategies to maintain future reservoir water quality. Results from these studies help the City to ensure their future water-quantity and quality needs and provide agricultural producers with information about preserving water resources for the future. The recharge demonstration project has received nationwide recognition from water-supply communities, and the watershed study will have national relevance for relating water-quality constituent concentrations and transport to land-use, climatic, hydrologic, or geologic characteristics.

New Bridge-Scour Prediction Equations Improve Estimates of Scour Depths -- Scour is the hole left behind when sediment (sand and rocks) is washed away from the bottom of a river. Although scour may occur at any time, scour action is especially strong during floods, and can pose a threat to the stability and safety of highway bridges, culverts, and other structures that span or are adjacent to rivers and streams. Until recently, the mathematical equations used to predict the scour at bridges overestimated scour depths when compared to actual field observations. Further complicating this issue was the lack of guidelines or supportive field data by which an engineer could modify the theoretical values of scour. As a result, the USGS and the South Carolina Department of Transportation collected both clear-water abutment and contraction scour data at nearly 130 bridges throughout the State. When the field-collected data were analyzed and compared with theoretical scour depths, scientists were able to derive new scour-prediction equations from regression analyses and envelope curves that delineated maximum-observed scour depths at South Carolina bridges. The concepts and tools developed in the South Carolina study may be applicable for use at bridges across the United States. Scientists are planning to take the study one step further by developing a flow model to predict the acceleration of flood flows around bridge abutments.