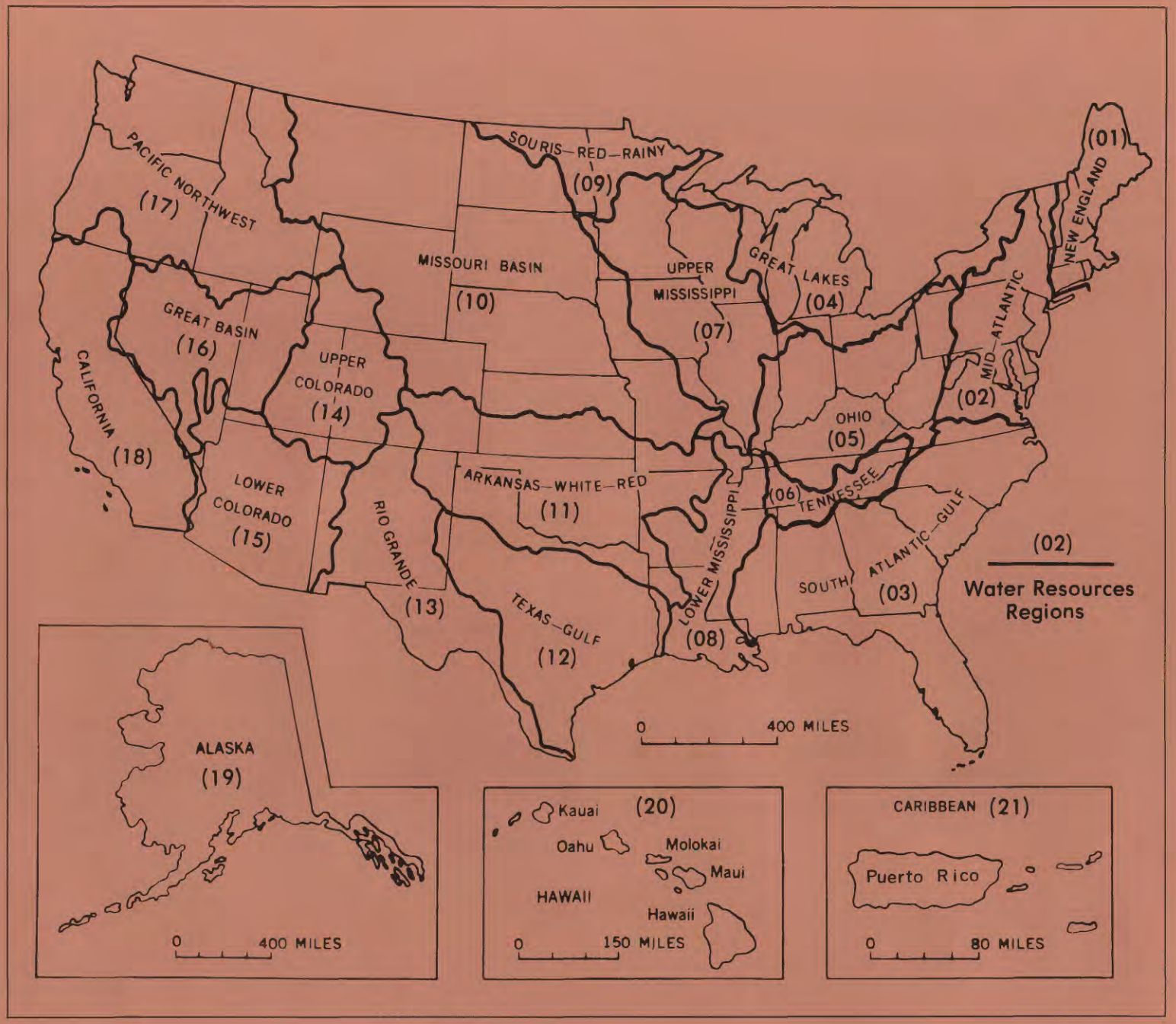
INTERAGENCY ADVISORY COMMITTEE ON WATER DATA

NOTES ON SEDIMENTATION ACTIVITIES CALENDAR YEAR 1984

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
Office of Water Data Coordination
417 National Center
Reston, Virginia 22092



Water Resources Regions of the United States

NOTES ON SEDIMENTATION ACTIVITIES CALENDAR YEAR 1984

the
Subcommittee on Sedimentation
of the
INTERAGENCY ADVISORY COMMITTEE ON WATER DATA

U.S. DEPARTMENT OF THE INTERIOR
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417 National Center
Reston, Virginia 22092

September 1985

PREFACE

This report is a digest of information furnished by Federal agencies conducting sedimentation investigations. The decision to publish the report was made in 1946, from a proposal by the Chairman of the Federal Interagency River Basin Committee, Subcommittee on Ground Water. The Subcommittee approved the proposal and agreed to issue this report as a means of effecting better coordination of the work of various Federal agencies in the field of sedimentation. From 1946 to 1947 the report was issued on a quarterly basis, from 1948 to 1953 reports were issued every 6 months, and from 1954 to the present the report has been issued annually.

Descriptions of work in progress or planned are included in the report, as well as important findings, new methods, new publications, information relating to laboratory and research activities, and other pertinent information. The material is organized by major drainage regions in the conterminous United States, Alaska, Hawaii, and the Caribbean.

Until 1979, each issue of this publication contained a list of stations where sediment data are collected, giving the station location, drainage area, and other related information. Because the station list did not change significantly from year to year, it was eventually deleted from the publication. Also, because most users of the station list were only interested in the stations in a certain geographic area, it was felt that their needs could be served more efficiently by acquiring the necessary information through the National Water Data Exchange (NAWDEX). Therefore, locations and addresses of NAWDEX assistance centers are included in this report.

Information for "Notes on Sedimentation Activities, Calendar Year 1984" was contributed by the representatives of participating Federal agencies. Suggestions for improving the report are welcome.

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SERVICE CHARGES

Charges for NAWDEX services are assessed at the option of the organization providing the requested data or data service. Search assistance services are provided free by NAWDEX to the greatest extent possible. Charges are assessed, however, for those requests requiring computer services, extensive personnel time, duplicating services, or service costs accrued by NAWDEX from other sources in the course of providing services. In all cases, charges assessed by NAWDEX Assistance Centers will not exceed the direct costs incurred in responding to the data request. Estimates of cost are provided by NAWDEX upon request and in all cases where costs are anticipated to be substantial.

ADDITIONAL INFORMATION

For additional information concerning the NAWDEX program or its services, contact:

Program Office
National Water Data Exchange (NAWDEX)
U.S. Geological Survey
421 National Center
12201 Sunrise Valley Drive
Reston, VA 22092

Telephone: (703) 860-6031
FTS 928-6031

NEW ENGLAND REGION

GEOLOGICAL SURVEY

St. John Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Aroostook River at Caribou, ME, and bimonthly at St. John River near Van Buren, ME, as a part of the National Stream Quality Accounting Network (NASQAN).

Penobscot Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Penobscot River at Eddington, ME, as a part of NASQAN.

Kennebec Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Kennebec River near North Sidney, ME, as a part of NASQAN.

Androscoggin Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Androscoggin River at Brunswick, ME, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Wild River at Gilead, ME, as a part of the National Hydrologic Benchmark Network.

Maine Coastal Subregion

1. Suspended-sediment data are being collected on a quarterly basis at St. Croix River at Milltown, ME, and bimonthly at Narraguagus River at Cherryfield, ME, as a part of NASQAN.

Saco Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Saco River at Cornish, ME, and at Presumpscot River near West Falmouth, ME, as a part of NASQAN.

Merrimack Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Merrimack River above Lowell, MA, as a part of NASQAN.

Connecticut Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Connecticut River at Wells River, VT, and at Connecticut River at North Walpole, NH, and at Connecticut River at Thompsonville, CT, as a part of NASQAN.

2. Suspended-sediment data are being collected on approximately a daily basis at Stony Brook near Suffield, CT, Salmon River near East Hampton, CT, and Coginchaug River at Rockfall, CT, to determine daily sediment loads. The data collection is being done in cooperation with the State of Connecticut Department of Environmental Protection.

Massachusetts-Rhode Island Coastal Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Charles River at Dover, MA, at Blackstone River at Millville, MA, and at Pawcatuck River at Westerly, RI, as a part of NASQAN.

Connecticut Coastal Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Housatonic River at Stevenson, CT, and quarterly at Shetucket River at South Windham, CT, and at Quinebaug River at Jewett City, CT, as a part of NASQAN.

St. Francois Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Black River at Coventry, VT, as part of NASQAN.

Special Studies

1. Daily sediment samples were collected through June 1984 at Bald Mountain Brook near Bald Mountain, ME, and at Bishop Mountain Brook near Bald Mountain, ME, in the St. John Subregion, as part of a study to evaluate the impact of a proposed open pit copper mine. The study was conducted in cooperation with the State of Maine Department of Environmental Protection.

2. Intermittent sediment data were collected through June 1984 at Johnson Brook near South Albion, ME, in the Kennebec Subregion, to define storm hydrograph characteristics and to estimate phosphorus yields from the watershed. The study was conducted in cooperation with the State of Maine Department of Environmental Protection.

For additional information about Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
150 Causeway Street, Suite 1309
Boston, MA 02114

NEW ENGLAND REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for work plans in the following watersheds:

   a. Public Law 534.

Major Drainage	Watershed	Stream	County	State
Narragansett Bay	Aquidneck Is.	various	Newport	RI
Connecticut	Quabog River	Quabog River	Worcester	MASS.
Thames	Mill Horse	Mill Horse Brook	Windham/ New London	CONN.

   c. River Basin Investigations.

Major Basin	Basin Reported	State
Narragansett Bay	Maskerchigg River/Dark Entry Brook	RI

2. Reservoir Sedimentation Surveys.

   A reservoir sedimentation survey was made in the following reservoirs:

Reservoir	County	State
Lawton Valley Reservoir	Newport	RI
Sisson Pond	Newport	RI
St. Mary's Pond	Newport	RI
Green End Pond (North Easton Pond)	Newport	RI
Easton Pond	Newport	RI
Nelson Pond (Paradise Pond)	Newport	RI
Gardiner Pond	Newport	RI

3. Special Studies.

   a. Rhode Island - Two sediment samples were collected from each of the seven water supply reservoirs on Aquidneck Island for chemical (nutrient, metal, pesticide) analyses.

   b. Massachusetts - Gully inventory study was conducted in the Connecticut River Valley.

   c. Maine - Gully erosion, yield, and damage study was conducted in a portion of the St. Johns River Basin, Aroostook County.

   d. Vermont - Have completed the first year of a five year inventory and study of over 70 ephemeral gully erosion sites.

MID ATLANTIC REGION

CORPS OF ENGINEERS

North Atlantic Division

Baltimore District

Sedimentation Surveys - Reservoir

1. Alvin R. Bush Dam. In April 1983, 13 sediment ranges were resurveyed upstream of Bush Dam with the intention of determining the amount of deposition since the initial survey was taken in October 1961. These cross sections were located by coordinates calculated from the original survey notes.

Most of the original monuments, set in 1961, were not found. The old monuments that were found are not located at the points described by the original survey. Therefore, the original ranges were impossible to locate. New monuments were set for the sediment ranges, and topographic data was obtained.

With properly monumented and surveyed sediment ranges established, future surveys may be performed and compared to the 1983 base data. Sediment deposition is not believed to be a major problem in this project.

2. Tioga, Hammond, and Cowanesque Lakes. Initial monumentation and surveys were done in 1983. The survey data is on file in the district office.

3. Bloomington Lake. In 1973, a detailed study to determine the magnitude and distribution of sediment accumulation in the reservoir was performed. HEC computer program, Deposit of Suspended Sediment in Reservoirs was used in the calculation process. Based on the computations, it was found that a 100 year storage for sediment of 2,065 acre-feet was required. Bloomington Lake was completed in July 1981 and began full scale operation in May 1982. A crude reconnaissance survey of the reservoir area was performed in November 1984. The purpose of the survey was to estimate the amount of sediment that has been deposited in the reservoir over a two year period.

Sediment depths were measured at predetermined cross sections in the upstream section of the reservoir and were used to compute sediment volume. Sediment volume for the remainder of the lake was estimated using a linear decrease in sediment depth from the last measured cross section to the dam.

The total amount of sediment deposited over a two year period is estimated to be 270 acre-feet or 135 acre-feet per year. This estimate may be low, because the bulk of any sediment accumulation in a reservoir is generally delivered during major storm events and none has occurred at this site in the two year period prior to this survey. At a rate of 135 acre-feet/year, the sediment storage set aside for the project (2,065 acre-feet) would be depleted in 15 years.

Additional and more detail studies will have to be made to better quantity the problem.

Sediment Removal.

Project	Stream	Removal Location	Amount Removed cu. yds.
Almond Lake	Canacadea Creek	NY 21 Bridge	11,430
Arkport Dam	Canisteo River	Intake Channel	7,247
Binghamton, N.Y.	Pierce Creek	Upper Paved Channel	1,085
		Belden Street Bucket	10
Canisteo, N.Y.	Purdy Creek	Check Dam	6,127
		Below Check Dam	2,656
		Confluence of Bennett and Purdy Creeks	2,738
Corning, N.Y.	Cutler Creek	Outlet of Twin Conduits to Lower Weir at Confluence with Chemung River	1,566
		Upper Channel and Drop Structure	3,234
Hornell, N.Y.	Canacadea Creek	Check Dam	581
	Chauncey Run	Check Dam	1,837
	Crosby Creek	Check Dam	11,698
Whitney Point Lake	Willet Creek	Channel	3,000
Whitney Point Village	Tioughnioga River	Channel	4,070
		TOTAL	57,279

Sedimentation Studies. Canisteo River, Chauncey Run, Crosby Creek, and Canacadea Creek, Hornell, NY. The hydraulic and sedimentation study was completed and a report was forwarded to the Baltimore District in 1984. The report provided information on the sources and amounts of sediment entering the project and indicated several methods with which to alleviate the

situation. These methods, as well as the study itself, are under intensive review at the present time.

New York District

The District conducted sediment tests at the following locations:

Project Name & #	Grain Size	Bulk Sed.	Elut-riate	Bio-assay	Bio-accum ulation	Micro bio-logical
Westchester Crk. - 7	X	X	X	X	X	
Bronx River - 8	X	X	X	X	X	
Jones Inlet - 28	X	X	X	X	X	
S. Bros. Is. Ch. - 37	X	X	X	X	X	
Dutch Kills - 39	X	X	X	X	X	
Newton Crk. - 39	X	X	X	X	X	
Huds. Riv - Haverstraw Rch - 48	X	X	X	X	X	
Main Ship Ch. - 62	X	X	X	X	X	
N. Shooter Is. - Ch. - 63	X	X	X	X	X	
Raritan Bay Rch. - 63	X	X	X	X	X	
Winds Point Bend - 63	X	X	X	X	X	
Port Newark - 64	X	X	X	X	X	
Atlantic Highlands - 79	X	X	X	X	X	
Navesink - 80	X	X	X	X	X	
Shrewsbury River - 80	X	X	X	X	X	
Hudson River - 48						
- Castleton Rch.	X	X	X	X	X	
- N. Germanton Rch.	X	X	X	X	X	
- Stuyvesant Rch.	X	X	X	X	X	
Mud Dump Site	X	X				X

Project Name & #	Grain Size	Bulk Sed.	Elut-riate	Bio-assay	Bio-accum ulation	Micro bio-logical
Port Chester - 1						Y
Eastchester - 6						Y
Milton Harbor - 85						Y
West Long Island Sound - Site III						Y

Philadelphia District

Sedimentation Surveys.

1. Beltzville Lake, Carbon and Monroe Counties, PA
   Purpose - Initial sedimentation survey
   Type - Range
   Elements Measured - Bottom elevation
   Equipment Used - Leadline and level and rod
   Scope - Selected ranges upstream and downstream of dam
   Results - Sections plotted

2. Blue Marsh Lake, Berks County, PA
   Purpose - Initial sedimentation survey
   Type - Range
   Elements Measured - Bottom elevation
   Equipment Used - Acoustic depth sounder and level and rod
   Scope - Selected ranges upstream and downstream of dam
   Results - Sections plotted

3. Prompton Reservoir, Wayne County, PA
   Purpose - Update sedimentation survey
   Type - Range
   Elements Measured - Bottom elevation
   Equipment Used - Leadline and level and rod
   Scope - Selected ranges upstream and downstream of dam
   Results - Sections plotted over previously surveyed sections

4. Jadwin Reservoir, Wayne County, PA
   Purpose - Update sedimentation survey
   Type - Range
   Elements Measured - Bottom elevation
   Equipment Used - Level and rod only (dry dam)
   Scope - Selected ranges upstream and downstream of dam
   Results - Sections plotted over previously surveyed sections

Sediment Load Measurements.

1. Delaware River at Trenton, N.J.
   Sampling Frequency - Daily
   Period of Record - September 1949 through September 1984
   (measurements discontinued effective 1 October 1984)

2. Schuylkill River at Manayunk, Philadelphia, PA
   Sampling Frequency - Daily
   Period of Record - November 1947 to present.

MID-ATLANTIC REGION

GEOLOGICAL SURVEY

Richelieu Subregion

1. Suspended-sediment data are being collected on a periodic basis at Richelieu River (Lake Champlain) at Rouses Point, NY, as a part of the National Stream Quality Accounting Network (NASQAN).

Upper Hudson Subregion

1. Suspended-sediment data are being collected on a daily basis at Hudson River at Stillwater, NY, and Hudson River at Waterford, NY, in cooperation with the New York State Department of Environmental Conservation. Suspended-sediment data are being collected on a periodic basis at Hudson River at Rogers Island at Fort Edward, NY, and Hudson River at Schuylerville, NY.

2. Suspended-sediment data are being collected on a periodic basis at Hudson River at Green Island, NY, as a part of NASQAN.

3. Suspended-sediment are being collected on a periodic basis at Esopus Creek at Shandaken, NY, as a part of the National Hydrologic Benchmark Network.

Lower Hudson-Long Island Subregion

1. Suspended-sediment data are being collected on a bimonthly basic at Passaic River at Little Falls, NJ, and quarterly at Raritan River at Queens Bridge at South Bound Brook, NJ, as a part of NASQAN.

Delaware Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Maurice River at Norma, NJ, and West Branch Wading River at Maxwell, NJ, and on a quarterly basis at Delaware River at Trenton, NJ, and Toms River near Toms River, NJ, as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at Delaware River at Trenton, NJ, in cooperation with the U.S. Army Corps of Engineers (COE).

3. Suspended-sediment data are being collected on a monthly basis at McDonalds Branch in Lebonon State Forest, NJ, as a part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a daily basis at Schuylkill River at Philadelphia (Manayunk), PA. The data will be anaylzed by the COE to evaluate the Delaware River dredging programs.

Susquehanna Subregion

1. Suspended-sediment data are being collected at Juniata River at Newport, PA, as a Federal sediment index station.

2. Suspended-sediment data are being collected on a bimonthly basis at Susquehanna River at Conowingo, MD, as a part of NASQAN and on a daily basis, beginning July 1984, as part of a Fall-Line Monitoring project.

Upper Chesapeake Subregion

1. Suspended-sediment data are being collected on a daily basis at Choptank River near Greensboro, MD, as part of the Federal CBR program, fall-line monitoring project, and as a part of NASQAN.

2. Suspended-sediment data are being collected on a bimonthly basis at Patuxent River near Bowie, MD, as a part of NASQAN and on a daily basis, beginning October 1984, as part of a fall-line monitoring project.

Potomac Subregion

1. Suspended-sediment data are being collected on a daily basis at Monacacy River at Reichs Ford Bridge near Frederick, MD, in cooperation with the Maryland Geological Survey.

2. Suspended-sediment data are being collected on a daily basis at Potomac River at Point of Rocks, MD, as a part of the Federal CBR program.

3. Suspended-sediment data are being collected on a bimonthly basis at Potomac River at Shepherdstown, WV, Potomac River at Chain Bridge, Washington, D.C., and Shenandoah River at Millville, WV, as a part of NASQAN.

Lower Chesapeake Subregion

1. Suspended-sediment data are being collected on a daily basis on Rappahanock River at Remington, VA, as a Federal sediment index station.

2. Suspended-sediment data are being collected monthly at Rappahannock River near Fredericksburg, VA, Mattaponi River near Beulahville, VA, Pamunkey River near Hanover, VA, and James River at Cartersville, VA, as part of NASQAN and a fall-line monitoring program of the Chesapeake Bay.

3. Suspended-sediment data are being collected quarterly at Holiday Creek near Andersonville, VA, as part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a bimonthly basis at Appomattox River at Matoaca, VA, as part of NASQAN.

Special Studies

1. A study of agricultural best management practices was started in the Conestoga River basin in Lancaster County, PA, during 1982. Suspended-sediment, nutrient, and pesticide data were collected during 1984 from the Little Conestoga Creek near Morgantown and near Churchtown, from a 25-acre corn and alfalfa field and from a 50-acre corn field that were selected for conservation treatment with best management practices. Automatic samplers are used at each of the sites.

2. Suspended-sediment data were collected from the Swatara Creek at Pine Grove and from the Lower Little Swatara Creek near Pine Grove, PA, with automatic samplers. The sediment data were collected as part of a project to determine sediment deposition rates in a proposed reservoir.

3. A study to help the National Park Service develop best management practices for Prince William Forest Park in Prince William County, VA, was begun in 1983. Suspended-sediment data are being collected every other day by local observers and during storms by automatic samplers at three sites on the South Fork Quantico Creek and at one site on the Quantico Creek. Suspended-sediment data are also being collected on a monthly basis at eight other sites and on a semiannual basis at nine other sites.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
208 Carroll Building
8600 LaSalle Road
Towson, MD 21204

District Chief, WRD
U.S. Geological Survey
P.O. Box 1669
Albany, NY 12201

District Chief, WRD
U.S. Geological Survey
Room 409, Federal Building
402 East State Street
Trenton, NJ 08608

District Chief, WRD
U.S. Geological Survey
603 Morris Street
Charleston, WV 25301

District Chief, WRD
U.S. Geological Survey
P.O. Box 1107
Harrisburg, PA 17108

MID-ATLANTIC REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for work plans in the following watersheds:

   a. Public Law 534.

Major Drainage	Watershed	Stream	County	State
Potomac	Moffett Creek	Moffett Creek	Augusta	Virginia

   b. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Susquehanna	Buffalo Creek	Buffalo	Union	Pennsylvania
Susquehanna	Cedar Run	Cedar Run	Clinton	Pennsylvania
James River	Looney-Mill Creek	Looney-Mill Creek	Botetourt	Virginia
Lake Champlain Richelieu	Lower Missiquoi River	Lower Missiquoi River	Franklin	Vermont

   c. River Basin Investigations.

Major Basin	Basin Reported	State
Rappahannock, York, and Potomac	Mobjack Bay	Virginia
	Pamunkey River	Virginia
	Hawksbill Creek	Virginia
	Linville Creek	Virginia
	Upper Rapidan River	Virginia
	Mountain Run East	Virginia

2. Reservoir Sedimentation Surveys.

   A reservoir sedimentation survey was made in the following reservoirs:

Reservoir	County	State
Little Deer Creek	Harford	MD
Tridelphia	Montgomery	MD

3. Special Studies.

a. Vermont - LaPlatte River Watershed Comprehensive Water Quality Monitoring and Evaluation Project is continuing. St. Albans Bay Watershed CM&E Project (water quality) is continuing. Completed the first year of a five year inventory of over 70 ephemeral erosion sites.

b. New Jersey - Report completed for Statewide Erosion Sediment and Agricultural Waste (SESAW) Inventory. First year of a multi-year ephemeral gully study of cropland in 5 counties of Southern New Jersey.

c. Maryland - Periodic suspended sediment samples and turbidity measurements taken on the Choptank and Marshy Hope Watershed projects to monitor the effects of channel modification works of improvement.

d. Pennsylvania - First year is underway of a four year program to study ephemeral gullies on 46,000 acres of cropland in the Rock Creek Watershed, Adams County.

e. New York - First year study of a four year study of cropland gully erosion completed on the Saratoga Watershed.

CORPS OF ENGINEERS

South Atlantic Division

Charleston District

Coastal Shoreline Monitoring. Monitoring of coastal shoreline changes for the newly-constructed jetty system at Little River Inlet, South Carolina, continued through 1984. The initial five-year monitoring program for the recently-constructed weir jetty system at Murrells Inlet, South Carolina, was completed in October 1982. The anticipated report date for the Murrells Inlet Monitoring Program is May 1985. A reduced monitoring effort for the second five-year period was continued during 1984 for Murrells Inlet. The monitoring of the projects is being performed to determine the effect that a weir jetty system has on littoral transport processes and adjacent shorelines. Data being gathered for monitoring these projects include:

a. controlled aerial photography,
b. beach profiles upcoast and downcoast for the jetties,
c. wave data,
d. hydrographic surveys of the inlet area, and
e. structural performance.

The data, which is gathered on a regular basis, is forwarded to the Coastal Engineering Research Center at U. S. Army Engineers Waterways Experiment Station in Vicksburg, Mississippi, for analysis and report preparation.

Charleston Harbor Section 111 Study. A Section 111 study is currently being conducted for the Charleston Harbor jetties at Charleston, South Carolina. An evaluation of the changes in the rate of beach erosion in the vicinity of the jetties is being made on the basis of historical data extracted in large from USC&GS surveys and charts. Due to the age of the jetties and various man-made alterations affecting Charleston Harbor, the following time frames have been selected for determining any changes in the rate of erosion:

a. 1851-1857 (Before construction of Charleston Harbor jetties)
b. 1860-1869 (During construction of Charleston Harbor jetties)
c. 1900-1910 (Post construction of Charleston Harbor jetties)
d. 1921 (Post construction of Charleston Harbor jetties)
e. 1963-1965 (Post construction of Charleston Harbor jetties)

The Coastal Engineering Research Center at the U. S. Army Engineers Waterways Experiment Station in Vicksburg, Mississippi, was contracted to furnish support to the District in analyzing the historical data in a three-phase program. Phase I, completed in October 1984, was to digitize the survey sheets for the five time periods to create a digital data base. Phase II, expected to be completed in May 1985, will use the new National Ocean Service Cooperative Shoreline Movement maps to verify and adjust the vertical datum

changes in the Charleston Harbor area to a common reference elevation and locate backshore topographic data for incorporation into the data base. Also, during Phase II, Charleston District will obtain a current set of beach profiles at 2,000 foot intervals and oceanward to the 30-foot contour for incorporation into the data base. Phase III will involve assessing the relationships between the acts of nature and men and the rates of volumetric change with a view towards identifying culpability of the Federal Government, should it exist. The anticipated report date for this project is September 1985.

Cooper River Rediversion Project. Construction of the Cooper River Rediversion Project, which will reduce shoaling and restore to some degree the historic saline regiment to Cooper River and Charleston Harbor, is approaching completion. The project consists of a canal about 11.7 miles in length. Beginning at the northeast corner of Lake Moultrie, the canal proceeds generally eastward to a 84,000 kw hydropower plant near St. Stephen, South Carolina, and thence to its confluence with the Santee River at Mattassee Lake. The post construction monitoring of the entrance, intake, and tailrace canals includes the establishment of a monumented baseline and cross sections. The cross sections in the entrance and intake canals will be located approximately every 1,000 feet, while those in the tailrace canal will be 500 feet apart initially to insure detection and quantification of potential erosion and bank sloughing. Additional cross sections will be taken at all canal transitions and bridge crossings for a total of 114 cross sections. Seven cross sections will also be taken in the Santee River to monitor the effects of the project on the river. These sections are to be surveyed annually for the first three years, then again in the fifth year of operation and thereafter at five-year intervals unless conditions warrant otherwise. The first set of cross sections will be taken in January 1985.

Bank-to-bank cross sections are also being taken at 1,000-foot intervals in the Charleston Harbor (Cooper River) from Fort Sumter to Snow Point. These sections will be used to monitor sediment movement in the harbor as a result of the reduced fresh water releases into the river from Lake Moultrie. These cross sections will reveal any sloughing of navigation channel banks and will aid in determining effects on sediment deposits outside of these channels. These cross sections are to be taken annually for a five-year period. The first set of cross sections were taken in December 1984 and January 1985.

Suspended Sediment Sampling. Suspended sediment data is being collected by USGS on a monthly basis at three locations on the Santee River in the vicinity of St. Stephens, South Carolina where the tailrace canal of the Cooper River Rediversion project enters the Santee River.

Mobile District

Sedimentation Range Network Monitoring.

1. The sedimentation range networks in Demopolis, Gainesville, Aliceville and Columbus Lakes were resurveyed during the year. These lakes are located on the Tombigbee River and are part of the Tennessee-Tombigbee Waterway.

2. A network of ranges was installed and surveyed in Aberdeen Lake on the Tennessee-Tombigbee Waterway.

3. A resurvey of selected ranges in Allatoona Lake on the Etowah River was completed during the year.

Sedimentation Studies.

1. The sedimentation studies of the Alabama, Apalachicola, Pascagoula and Tombigbee Rivers and Tibbee Creek will continue through 1985.

2. The sedimentation study of the proposed Shoccoe Dam project on the Pearl River near Canton, Mississippi was completed during the year.

Suspended Sediment Investigations.

1. Suspended sediment samples were periodically collected under a cooperative agreement by the U. S. Geological Survey Districts as follows:

Alabama	Alabama River at Montgomery, AL Black Warrior River near Northport, AL Tombigbee River at Gainesville, AL
Florida	Apalachicola River at Chattahoochee, FL
Georgia	Chattahoochee River near Whitesburg, GA Chattahoochee River at West Point, GA Flint River at Newton, GA Oostanaula River at Resaca, GA Etowah River near Kingston, GA
Mississippi	Noxubee River at Maco, MS Town Creek near Nettleton, MS

2. The collection of suspended sediment samples on a daily basis was continued on the Tombigbee River at Columbus, Aberdeen and Amory, Mississippi. On a periodically basis, samplings were done on the Tombigbee River at four bendway cutoff locations; on the Chuquatonchee Creek at West Point, Mississippi; on the Weaver Creek at Amory, Mississippi; on the Okatibbee Creek at Meridian and Arundel, Mississippi and at Okatibbee Dam; on the Apalachicola River at Blountstown and Wewahitchka, Florida.

Savannah District

1. Have performed weekly surveys of Tybee Beach since October 1984 to monitor erosion and accretion in the vicinity of the seawall.

2. Total deposition at our three reservoir projects on the Savannah River was computed.

3. Wet and dry bed load samples were taken on Oates Creek near Augusta, Georgia in the vicinity of a proposed flood control project. These data are being used to determine stability of our final channel design.

Wilmington District

In calendar year 1982, a system of 52 sedimentation and two retrogression ranges were established at Falls Lake project. A report describing the ranges, resurvey plans, and sedimentation characteristics of the project area was scheduled to be completed in 1984, but is rescheduled for 1985.

SOUTH ATLANTIC-GULF REGION

GEOLOGICAL SURVEY

Chowan-Roanoke Subregion

1. Suspended-sediment data are collected bimonthly at Dan River at Paces, VA, and quarterly at Nottoway River near Sebrell, VA, Meherrin River at Emporia, VA, and Blackwater River near Franklin, VA, as a part of NASQAN.

2. Suspended-sediment data are collected bimonthly at Roanoke River at Roanoke Rapids, NC, as part of the National Stream Quality Accounting Network (NASQAN).

Neuse-Pamlico Subregion

1. Suspended-sediment data are being collected on a daily basis at the main station on the Chicod Creek and on a monthly basis at three sites in the Chicod Creek watershed near Grimesland, NC, in cooperation with the U.S. Department of Agriculture, Soil Conservation Service. These data will be used to determine changes caused by channelization which was completed in 1981.

2. Suspended-sediment data are collected bimonthly at Neuse River at Kinston, Tar River at Tarboro, and Contentnea Creek at Hookerton, NC, as a part of NASQAN.

3. Suspended-sediment data are being collected monthly at six headwater stations on the Neuse River to determine the quality of inflow into the new 12,500-acre Falls Reservoir. This effort is part of a cooperative program with the U.S. Army Corps of Engineers (COE). Monthly sediment samples are collected below Falls Reservoir on the Neuse River in cooperation with the North Carolina Department of Natural Resources and Community Development.

4. Suspended-sediment data are collected monthly and during floods at three sites in the eastern Piedmont province for defining the effects of various land uses on sediment and biological characteristics.

Cape Fear Subregion

1. Suspended-sediment data are being collected on a monthly basis at Haw River near Bynum, and Haw River near Moncure, NC, in cooperation with the North Carolina Department of Natural Resources and Community Development.

2. Suspended-sediment data are collected bimonthly on the Cape Fear River at Lock 1 near Kelly, NC, as part of the NASQAN program.

3. Suspended-sediment data are collected monthly at three headwater stations to determine the quality of inflow into the new 13,900-acre Jordan Lake in cooperation with the COE.

4. Suspended-sediment data are being collected on a monthly basis at five sites in the Grove Creek basin, near Kenansville, NC, to define effects of channel modifications, in cooperation with the North Carolina Department of Human Resources.

Pee Dee Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Scape Ore Swamp near Bishopville, SC, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a bimonthly basis at Lynches River at Effingham, SC, Black River at Kingstree, SC, Pee Dee River near Rockingham, NC, and at Pee Dee River at Pee Dee, SC, as a part of NASQAN.

3. Suspended-sediment data are being collected daily and more frequently during flood events at the Yadkin River at Yadkin College, NC, as part of the Federal CBR program.

Santee-Edisto Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Lakes Marion-Moultrie Diversion Canal near Pineville, SC, and at Edisto River near Givhans, SC, and quarterly at Coosawhatchie River near Hampton, SC, as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Crawl Creek near Pineville, SC, Santee River below St. Stephens, SC. This is being done in cooperation with the COE.

Ogeechee-Savannah Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Upper Three Runs near New Ellenton, SC, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a quarterly basis at Savannah River near Clyo, GA, and at Ogeechee River near Eden, GA, as a part of NASQAN.

Altamaha-St. Marys Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Falling Creek near Juliette, GA, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a bimonthly basis at Altamaha River near Everett City, GA, and quarterly at Satilla River at Atkinson, GA, and bimonthly at St. Mary's River near Macclenny, FL, as a part of NASQAN.

St. Johns Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at three sites in Florida as a part of NASQAN.

Southern Florida Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at seven sites in Florida as a part of NASQAN.

Peace-Tampa Bay Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at five sites in Florida as a part of NASQAN.

Suwannee Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at four sites in Florida as a part of NASQAN.

Ochlockonee Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at two sites in Florida as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at one site in Florida as a part of the National Hydrologic Benchmark Network.

Apalachicola Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at three sites in Florida as a part of NASQAN. Suspended-sediment data are being collected periodically at 16 sites in the Apalachicola River basin in cooperation with the COE.

2. Suspended-sediment data are being collected on a bimonthly basis at Flint River at Newton, GA, and Chattahoochee River near Columbia, AL, as part of NASQAN.

Choctawhatchee-Escambia Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at four sites in Florida as a part of NASQAN.

Alabama Subregion

1. Suspended-sediment data are being collected on a periodic basis at Coosawatee River near Ellijay, GA, and Holly Creek near Chatsworth, GA, in cooperation with the Georgia Geologic Survey.

2. Suspended-sediment data are being collected 10 times per year and quarterly at Alabama River near Montgomery, AL, in cooperation with the COE, as a part of NASQAN, respectively, and bimonthly at Alabama River at Claiborne, AL, as a part of NASQAN.

Mobile-Tombigbee Subregion

1. Suspended-sediment data are being collected 10 times per year at Tombigbee River at Gainesville, AL, and at Black Warrior River at Northport, AL, in cooperation with the COE, bimonthly at Tombigbee River at Gainesville and Black Warrior River below Warrior Dam near Eutaw, AL, and quarterly at Tombigbee River at Coffeeville lock and dam, AL, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Sipsey Fork near Grayson, AL, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on about a 6-week basis at Town Creek at Nettletown, MS, and at Noxubee River at Macon, MS, in cooperation with the COE.

Pascagoula Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Pascagoula River near Benndale, MS, and quarterly at Wolf Creek near Landon, MS, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Cypress Creek near Janice, MS, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a quarterly basis at Escatawpa River near Agricola, MS, as part of NASQAN.

Pearl Subregion

1. Suspended-sediment data are being collected on a daily basis at Pearl River near Bogulusa, LA, as a part of the Federal CBR program.

2. Suspended-sediment data are being collected on a bimonthly basis at Bogue Chitto River near Bush, LA, as a part of NASQAN.

Special Studies

1. Suspended-sediment and bed-material data are being collected periodically and during two storm events per year at five sites in order to gage sediment deposition in certain Georgia reservoirs as part of a cooperative program with the COE.

2. Suspended-sediment data are being collected every 6 hours at Congaree River at U.S. 601 near Fort Motte, SC, and the Wateree River below Wateree, SC, and on a weekly basis at Lakes Marion-Moultrie diversion canal near Pineville, SC, Lake Pineville tailrace canal near Moncks Corner, SC, and Santee River near Pineville, SC. Bottom-sediment data are being collected once annually at both high and low flow at all locations. Core data are being collected at various locations in Lakes Marion and Moultrie, and the bathymetry of the lakes are being mapped. This is part of a program to determine the rates of sedimentation in Lakes Marion and Moultrie, conducted in cooperation with the South Carolina Department of Health and Environmental Control and the South Carolina Public Service Authority.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
520 19th Avenue
Tuscaloosa, AL 35401

District Chief, WRD
U.S. Geological Survey
227 N. Bronough Street, Suite 3015
Tallahassee, FL 32301

District Chief, WRD
U.S. Geological Survey
6481 Peachtree Industrial Blvd.
Suite B
Doraville, GA 30360

District Chief, WRD
U.S. Geological Survey
P.O. Box 66492
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
Suite 710, Federal Building
100 West Capitol Street
Jackson, MS 39269

District Chief, WRD
U.S. Geological Survey
P.O. Box 2857
Raleigh, NC 27602

District Chief, WRD
U.S. Geological Survey
1835 Assembly Street, Suite 658
Columbia, SC 29201

District Chief, WRD
U.S. Geological Survey
200 West Grace Street, Room 304
Richmond, VA 23220

2. Reservoir Sedimentation Surveys.

a. Reservoir sedimentation surveys were made on the following reservoirs:

Reservoir	County(s)	State
Potato Creek No. 56	Upson	Georgia

3. Special Studies.

a. Flood Plain Damage Assessment.

Project Name	Counties	State
TVA Area in Georgia	13 (2.6 million acres)	Georgia
Southeast Georgia Land and Water Resource Cooperative Study (continued)	28 (6.8 million acres)	Georgia
Bainbridge Emergency Watershed Protection Project (216)	Decatur	Georgia

4. Special Studies.

a. Virginia - Completed the first year of a five year study to monitor ephemeral gully erosion on cropland in the Brightleaf Tobacco Region of Southern Virginia.

SOUTH ATLANTIC - GULF REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for work plans in the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Choctawhatchee	Upper Choctawhatchee 03140201	Kelly Creek W/S No. 040	Dale	Alabama
Appalachicola	Shoal Creek (continuation)	Shoal Creek	Marion	Georgia
Savannah	Cason Branch-Duhart Creek	Cason Branch-Duhart Creek	Jefferson	Georgia
Roanoke	Double-Big Creeks	Double-Big Creeks	Stokes	NC
Pee Dee	Lanes Creek	Lanes Creek	Union, Anson	NC

   b. River Basin Investigations.

Major Basins	Study Area	State
Savannah Ogeechee Altamaha Suwannee	Southeast Georgia Land and Water Resource Cooperative Study - 28 Counties (continuation)	Georgia
Chattahoochee	Upper Chattahoochee River (prelim.)	Georgia
Coosa	Upper Etowah River (prelim.)	Georgia
Cape Fear	Haw River	NC
Cape Fear	Deep River	NC

GREAT LAKES REGION

CORPS OF ENGINEERS

North Central Division

Buffalo District

Emergency Streambank Protection Projects in Ohio.

1. Mayfield Road Section 14*, Chagrin River, Gates Mills Ohio. The Chagrin River flows generally in a northerly direction through Gates Mills, Ohio with its mouth at Lake Erie. Mayfield Road crosses the river on an outside meander bend where streambank erosion poses a threat to the road. A field investigation was conducted to assess the bank erosion and areas of deposition in the vicinity of the project. The purpose of this study was to determine the limits of protection and to investigate the potential for using existing gravel bars for granular fill. Results of this investigation were used in developing the plans and specifications.

2. Cuyahoga River Sewer Outfall Section 14*. The Cuyahoga River flows through Akron, Ohio in a northerly direction. An above ground sewer line for the city of Akron runs adjacent to the river. The study area includes three sites where the river is encroaching the sewer line. A field reconnaissance was conducted along the study area to evaluate the accessibility to each site, assess the feasibility of using channel and/or bar sediment for granular fill and to determine the limits of protection for each site. The results of this study were used in developing the design document.

3. Cuyahoga River at Cuyahoga Street Section 14*, Akron, Ohio. The Cuyahoga River flows in a westerly direction at the project site before it makes a sharp bend to begin its generally northward flow. Cuyahoga Street crosses the river at an eroding meander bend. A sewer lift station, located along the river was also threatened by erosion. A field investigation was conducted to identify the characteristics of the bank material and to identify areas of erosion and deposition. The purpose of this study was to define the limits of protection and to assess the potential affect of the proposed project on the downstream reaches of the river. The results of this study were used to develop the plans and specifications.

4. East Branch Chagrin River Section 14*, Kirkland, Ohio. The East Branch Chagrin River is a tributary to the Chagrin River. The problem area investigated is located along the East Branch Chagrin River at Chillico Road where streambank erosion is threatening to breach the road. A field investigation was conducted for the initial appraisal of the area of interest. Site conditions such as areas of erosion and deposition were determined to develop the design document.

*Section 14 projects - Streambank and Shoreline Protection for Public Facilities

Huron Harbor, Ohio Section 107*. The Huron Harbor Project lies within the Eastern Lake Section of the central lowlands physiographic province. The proposed project alternative requires deepening the turning basin by 2 feet. A sediment analysis was conducted to determine if this alternative would cause an increase in deposition and possibly increase required dredging.

The turning basin of Huron Harbor is in the upper reaches of the harbor where fluvial processes have the greatest impact. Dredging records and available boring information indicate the sediment within the turning basin varies in thickness from 5 feet at the center to 20 feet along the west bank.

In 1978, the harbor was deepened by 2 feet. Since the deepening, dredging has been conducted every 2 years yielding less sediment than prior to the deepening.

Based upon the dredging records and the affect of the 1978 harbor deepening, it was verified that the depth of the harbor does not control the volume of sediment that enters the harbor. By deepening the harbor, a basin is produced with the potential to accumulate larger volumes of sediment. However, urless the input of sediment is also increased, the volume of sediment will not be affected.

*Section 107 projects - Small Navigation Projects

Limestone Creek Flood Control Project at Fayetteville, NY. Limestone Creek flows over the Appalachian Plateau in the project area at Fayetteville, NY. The floodplain in the vicinity of Fayetteville has been populated by various commercial and residential developments. Frequent flooding in the past resulted in the construction of a levee along the left bank of the channel. Near the downstream limit of the project is a dam.

A field reconnaissance was conducted in June 1983. Generally the existing channel banks appeared well vegetated and stable. Velocities through the project reach a maximum of 9 FPS. The apparent affect of the dam is to cause the sediment to accumulate immediately upstream. The existing conditions indicate that sediment accumulates only immediately upstream of the dam. The construction of levees along the channel (i.e., raising the banks) will not change the areas of accumulation because the new channel morphology will not result in a loss of competency. The net affect of the proposed project is to contain higher flows within the various reaches of the channel. One of the concerns that was considered for this analysis was whether these increased flows would produce scouring in the channel bottom.

For this analysis, the stability of the channel bottom for the 100-year plan of improvement was assessed to determine the necessity for protecting the bed. Based upon the assumption that the channel bottom is presently stable and if the velocities with improved conditions do not significantly change, then the channel bottom will remain stable. The DuBoys equation for boundary shear was used to consider competence of the stream. This was compared to the competence of the existing conditions to determine if scour would occur.

Based upon the results of this analysis, it was determined that channel bottom protection would be required in scouring reaches where existing structures are endangered.

Environmental Analyses of Harbor Sediments for O&M Program. In 1984, sediment samples were obtained from the following list of project locations within the Buffalo District. Sediment sampling consisting of bulk chemical, elutriate and bioassay testing was completed at Ashtabula, Cuyahoga, Oak Orchard and Port Clinton/West Huron Harbor. Additional testing consisted of dredged overflow at Buffalo Harbor.

The purpose of the testing is to evaluate the sediments for suitability for a particular type of disposal following maintenance dredging of the Federal Navigation Channels.

Project Location	:	Types of Tests
Astabula	:	Bulk Chemical, Elutriate, Bioassay
Cuyahoga	:	Bulk Chemical, Elutriate, Bioassay
Oak Orchard	:	Bulk Chemical, Elutriate, Bioassay
Port Clinton/West Huron	:	Bulk Chemical, Elutriate, Bioassay
Buffalo	:	Dredge Overflow

Chicago District

Indiana Harbor Ship Canal. Bottom sediments from the Indiana Harbor Canal in East Chicago, Indiana were collected by the District in October 1984. These sediments will be used for a number of physical, chemical, and biological analyses conducted by the Corps' Waterways Experiment Station. The purpose of this study will be to examine alternate disposal methods for highly contaminated dredged materials.

Waukegan Outer Harbor, Waukegan, Illinois. A sediment sampling program was conducted outside the entrance to Waukegan Harbor during June 1984 in relation to emergency maintenance dredging of the entrance. Sediment grab samples were taken at two locations south of the North breakwater in the channel entrance area. The sediment samples were analyzed for PCB's. The results were presented in a report dated 5 July 1984 and are available in the Chicago District files.

Detroit District

A sediment quantity study was made from the period December 1983 thru June of 1984 on the rivers and creeks in the Shiawassee Flats Area, Saginaw, Michigan

by the U.S.G.S for the District. Seven locations at bridges were sampled at high and low flow conditions. The data and results of the study will be published in the General Design Memorandum for the Shiawassee Flood Control Project.

Also during C.Y. 1984, monitoring of beach nourishment material was made at the Holland, Michigan Harbor. Twelve Lines were sampled by a Peterson Sampler from the shore line to the thirty (30') contour. A report of the monitoring will be filed in the GL H&H Branch of the Engineering Division of the District.

GREAT LAKES REGION

GEOLOGICAL SURVEY

Western Lake Superior Subregion

1. Suspended-sediment data are being collected on a periodic and storm-event basis at Nemadji River near South Superior, WI, and at Bad River near Odanah, WI, on a quarterly basis at Baptism River near Beaver Bay, MN, and on a bimonthly basis at St. Louis River at Scanlon, MN, as a part of the National Stream Quality Accounting Network (NASQAN).

Southern Lake Superior-Lake Superior Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Washington Creek at Windigo (Isle Royale), MI, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a quarterly basis at Ontonagon River near Rockland, MI, Sturgeon River near Chassell, MI, and at Tahquamenon River near Tahquamenon, MI, as a part of NASQAN.

Northwestern Lake Michigan Subregion

1. Suspended-sediment data are being collected on an intermittant basis at Popple River near Fence, WI, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a periodic and storm-event basis at Fox River at Wrightstown, WI, and on a bimonthly basis at Escanaba River at Cornell, MI, on a quarterly basis at Menominee River near McAllister, WI, as a part of NASQAN.

Southwestern Lake Michigan Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Milwaukee River at Milwaukee, WI, and at Manitowac River at Manitowac, WI, as a part of NASQAN.

2. Suspended-sediment data are being collected as a part of a study of Milwaukee Harbor, in cooperation with the Southeastern Wisconsin Regional Planning Commission. Data are being collected on a periodic and storm-event basis at the following sites:

Menomonee River at Menomonee Falls, WI
Milwaukee River at Milwaukee, WI
Milwaukee River at North Avenue Dam at Milwaukee, WI
Menomonee River at 70th Street at Wauwatosa, WI
Menomonee River at Falk Corp. at Milwaukee, WI
Milwaukee River near Cedarburg, WI
Kinnickinnic River at Milwaukee, WI

Data are being collected on an intermittent basis at 11 other sites on these rivers in the Milwaukee area.

3. Suspended-sediment data was collected on a weekly basis at Little Calumet River at Munster, IN, in cooperation with the U.S. Army Corps of Engineers (COE).

Southeastern Lake Michigan Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Grand River at Eastmanville, MI, St. Joseph River at Niles, MI, and on a quarterly basis at Kalamazoo River at Saugatuck, MI, as a part of NASQAN.

Northeastern Lake Michigan-Lake Michigan Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Manistique River above Manistique, MI, and at Manistee River at Manistee, MI, and on a quarterly basis at Muskegon River near Bridgeton, MI, as a part of NASQAN.

2. Suspended-sediment data are being collected in cooperation with Grand Traverse County and the Michigan Department of Natural Resources on a 4- to 6-week interval at the following sites:

Anderson Creek near Buckley, MI
Green Lake Inlet near Interlochen, MI
Boardman River above Brown Bridge Pond near Mayfield, MI
East Creek near Mayfield, MI
Boardman River near Mayfield, MI
Swainston Creek at Mayfield, MI
Boardman River near Traverse City, MI
Boardman River at Traverse City, MI
Hospital Creek at Traverse City, MI
Mitchell Creek at Traverse City, MI
Acme Creek at Acme, MI
Yuba Creek near Acme, MI
Tobeco Creek near Elk Rapids, MI
Battle Creek near Williamsburg, MI
Williamsburg Creek near Williamsburg, MI

On a quarterly basis at the following sites:

Fife Lake Outlet near Fife Lake, MI
Mason Creek near Grawn, MI
Duck Lake Outlet near Interlochen, MI
Betsie River near Karlin, MI
South Br. Boardman River near South Boardman, MI
North Br. Boardman River near South Boardman, MI
Jackson Creek near Kingsley, MI
Jaxon Creek near Mayfield, MI

Northwestern Lake Huron Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Cheboygan River at Cheboygan, MI, Thunder Bay River at Alpena, MI, and Au Sable River near Au Sable, MI, as a part of NASQAN.

Southwestern Lake Huron-Lake Huron Subregion

1. Suspended-sediment data are being collectd on a bimonthly basis at Pigeon River near Caseville, Mich., Thunder Bay River at Alpena, Mich., Rifle River near Sterling, MI, and at Saginaw River at Saginaw, MI, as a part of NASQAN.

St. Clair-Detroit River Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Clinton River at Mount Clemons, MI, as a part of NASQAN.

2. Suspended-sediment data are being collected in cooperation with the Huron-Clinton Metropolitan Authority on a monthly basis at the following sites:

Huron River at Milford, MI
Huron River near New Hudson, MI

Western Lake Erie Subregion

1. Suspended-sediment data are being collected on a daily basis at Maumee River at Waterville, OH, in cooperation with the COE, and at Sandusky River near Fremont, OH, in cooperation with the Ohio Department of Natural Resources.

2. Suspended-sediment data are being collected on a quarterly basis at River Raisin near Monroe, MI, as part of NASQAN.

Southern Lake Erie Subregion

1. Suspended-sediment data are being collected on a daily basis at Cuyahoga River at Independence, OH, in cooperation with the COE, Buffalo District.

2. Suspended-sediment data are being collected on a daily basis at Grand River at Painseville, OH, in cooperation with the Ohio Department of Natural Resources.

Eastern Lake Erie-Lake Erie Subregion

1. Suspended-sediment data are being collected on a periodic basis at Cattaraugas Creek at Gowanda, NY, Niagara River (Lake Ontario) at Fort Niagara, NY, and Tonawanda Creek at Batavia, NY, as a part of NASQAN.

Southwestern Lake Ontario Subregion

1. Suspended-sediment data are being collected on a periodic basis at Genesee River at Charlotte Docks at Rochester, NY, as a part of NASQAN.

Southeastern Lake Ontario Subregion

1. Suspended-sediment data are being collected on a periodic basis at Oswego River at Lock 7 at Oswego, NY, and at Sandy Creek at Adams, NY, as a part of NASQAN.

Northeastern Lake Ontario-Lake Ontario-St. Lawrence Subregion

1. Suspended-sediment data are being collected on a periodic basis at Black River at Watertown, NY, Raquette River at Raymondville, NY, St. Regis River at Brasher Center, NY, St. Lawrence River at Cornwall, Ontario, near Massena, NY, and at Oswegatchie River at Heuvelton, NY, as a part of NASQAN.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Champaign County Bank Plaza
102 East Main St., 4th Floor
Urbana, IL 61801

District Chief, WRD
U.S. Geological Survey
6520 Mercantile Way, Suite 5
Lansing, MI 48910

District Chief, WRD
U.S. Geological Survey
702 Post Office Building
St. Paul, MN 55101

District Chief, WRD
U.S. Geological Survey
P.O. Box 1669
Albany, NY 12201

District Chief, WRD
U.S. Geological Survey
975 West Third Avenue
Columbus, OH 43212

District Chief, WRD
U. S. Geological Survey
1815 University Avenue
Madison, WI 53705-4042

District Chief, WRD
U.S. Geological Survey
6023 Guion Road
Suite 201
Indianapolis, IN 46254

GREAT LAKES REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made in the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Lake Michigan	Bear River	Bear River	Emmett Charlevois	Michigan

2. Special Studies.

   a. New York--A streambank erosion study was made of the Virgil Creek Watershed, Thompkin and Courtland Counties. The study was set up to provide approximately a 10 percent sample of the stream system in the watershed. The lengths of the main stem and all the major tributaries were measured, along with the small unnamed feeder stream.

OHIO REGION

CORPS OF ENGINEERS

Ohio River Division

Report on sedimentation activities in the Ohio River Division is as follows:

Sedimentation Surveys.

1. Sedimentation investigations of reconnaissance scope were conducted in 1984 at Pleasant Hill Lake, Clear Fork of the Mohican River, Ohio; Piedmort Lake, Stillwater Creek, Ohio; Tappan Lake, Little Stillwater Creek, Ohio and Senecaville Lake, Seneca Fork of Wills creek, Ohio. Letter reports on these investigations are scheduled for submission in 1985. Letter reports on the sedimentation reconnaissance scope investigations conducted in 1984 at Sutton Lake, Elk River, Licking River, Ohio; Tom Jenkins Lake, East Branch of Sunday Creek, Ohio and Delaware Lake, Olentangy River, Ohio are scheduled for submission in 1986.

2. Letter reports on the sedimentation investigations of reconnaissance scope conducted in 1983 at J. W. Flannagan Lake, Pound River, Virginia; Charles Mill Lake, Black Fork of the Mohican River, Ohio; Clendening Lake, Stillwater Creek, Ohio and North Branch of Kokosing Lake, North Branch of Kokosing River, Ohio were submitted to and approved by the Ohio River Division in 1984.

3. Fishtrap Lake, Levisa Fork, Kentucky: A resurvey of 26 existing sediment ranges at Fishtrap Lake was conducted in 1984. Current ground profiles were obtained for 22 sediment ranges upstream of the dam and for four sediment ranges downstream of the dam. A report on the resurvey is scheduled for completion in 1985.

4. Beach City Lake, Sugar Creek, Ohio: The sediment range network at Beach City Lake was increased from 10 to 37 sediment ranges in 1984. The original 10 sediment ranges were located within the limits of the normal pool area. The sediment range network of 37 sediment ranges covers the flood control pool. A report on the resurvey is scheduled for completion in 1985.

5. R. D. Bailey Lake, Guyandot River, West Virginia: A resurvey of 17 existing sediment ranges at R. D. Bailey Lake was conducted in 1984. Fourteen of the sediment ranges were located upstream of the dam and three sediment ranges were downstream of the dam. A report on the resurvey is scheduled for completion in 1986.

6. Dewey Lake, Johns Creek, Kentucky: A resurvey of 22 existing sediment ranges at Dewey Lake was conducted in 1984. Nineteen of the sediment ranges were upstream of the dam and three sediment ranges were downstream of the dam. A report on the resurvey is scheduled for completion in 1985.

7. Paint Creek Lake, Paint Creek, Ohio: The report on the 1979 sedimentation survey was submitted to and approved by the Ohio River Division in 1984. The rate of deposition was determined to be 0.40 acre-feet per year per squar mile of contributing drainage area. The time of deposition was taken as the 5.4 year period between the time that storage began in April 1974 and the date of resurvey in August 1979. Although this rate of sedimentation does not appear to be detrimental to the effective operation and management of the project, it exceeds the design sedimentation rate of 0.15 acre-feet per year per square mile. A resurvey of all sedimentation ranges in the seasonal pool area will be conducted in 1986 to verify the rate of sedimentation.

8. Bluestone Lake, New River, West Virginia: The report on the 1983 sedimentation survey was submitted to and approved by the Ohio River Division in 1984. The rate of sedimentation for the 33.7 year period between July 1949 and March 1983 was 0.12 acre-feet per year per square mile of contributing drainage area. This rate of sedimentation is not considered to be excessive or detrimental to the operation of the project. Some boating activities have been restricted by sediment deposits in the upper reaches of the pool area. A reconnaissance scope survey will be conducted in 1988 unless a major flood or increased sediment producing activities in the drainage basin require a resurvey at an earlier date.

9. Piedmont Lake, Stillwater Creek, Ohio: The report on the 1979 sedimentation survey was submitted to and approved by the Ohio River Division in 1984. The rate of sedimentation for the 36.1 year period from the time of the original sediment range survey in April 1938 to the time of the first resurvey, May 1974, was 0.67 acre-feet per square mile of contributing drainage area. Nine sedimentation ranges in the seasonal pool area were resurveyed in 1979. The rate of sedimentation for the 5.2 year period between May 1974 and the July 1979 surveys was found to be 0.63 acre-feet per year per square mile of contributing drainage area. The rate of sedimentation indicated by the latest survey is not excessive and does not appear to be detrimental to operation of the project. Because of an increase in surface mining activities in the basin since the 1979 survey, a reconnaissance level survey was conducted in 1984. Results of this survey will be available in early 1985.

10. Wolf Creek Dam, Lake Cumberland, Cumberland River, Kentucky: The Wolf Creek project report "Sediment Resurvey of August 1979" recommended establishment of 15 additional ranges since conclusive reservoir sedimentation volumes were not attainable with the ranges existing during the resurvey. Fifteen sediment ranges were established during the summer and fall of 1983. After the resurvey in 1983, a report, "Supplement to Sediment Resurvey of August 1979", was prepared and forwarded to the Ohio River Division in August 1984. The rate of sedimentation for the 16.2 year period between the previous survey of June 1963 and the August 1979 survey was 0.18 acre-feet per year per square mile of contributing drainage area. This rate of deposition is for the main body of the lake and does not include tributary deposition. This rate of sedimentation is not excessive and is not detrimental to operation of the project. A reconnaissance survey will be conducted in 1988.

11. Center Hill Lake, Caney Fork, Tennessee: The study of the sediment range resurvey in August 1983 and August 1984 is complete and will be submitted to the Ohio River Division in early 1985. Sediment deposition is greater than the design rate but depletion of the conservation pool would occur in 1005 years at the current rate.

12. Barkley Reservoir, Cumberland River, Tennessee: Sediment ranges in the Barkley Reservoir were resurveyed in April and August 1984. The report of the resurvey will be submitted to the Ohio River Division in 1985.

13. Martins Fork Lake, Martins Fork, Kentucky: A resurvey of sediment ranges was conducted in June 1984. The study is complete and will be submitted to the Ohio River Division for review and approval in March 1985. A sediment monitor has been recommended for Martins Fork upstream of the reservoir to measure sediment inflow. Installations is planned during the spring of 1985.

14. Salamonie Lake, Salamonie River, Illinois: The report of the 1984 Salamonie Lake sedimentation resurvey will be submitted to the Ohio River Division in February 1985. This survey consisted of resurveying existing ranges plus establishment of some new ranges. Twenty-one ranges surveyed both in 1972 and 1984 were available for comparison. Preliminary results indicate an annual sedimentation rate of 0.51 acre-ft/square mile which compares with the design rate established for the project.

15. Crooked Creek Lake, Crooked Creek, Pennsylvania: A report on the October 1984 sedimentation survey (selected range) was submitted to the Ohio River Division.

16. Mahoning Creek Reservoir, Mahoning Creek, Pennsylvania: A selected range sedimentation survey was completed at Mahoning Creek Reservoir in October 1984. A report will be submitted to the Ohio River Division in the 2nd Quarter of FY 1985.

17. Tennessee-Tombigbee Waterway: In March 1984, the three remaining proposed sediment ranges for the Divide Cut were established. The Divide Cut sediment monitoring network has 13 sediment ranges. Also during March, horizontal and vertical control was revised for the Bay Springs reservoir sediment range network. All sediment data was transferred to the Mobile District as a part of the agreement for Mobile to operate and maintain the waterway after construction.

18. Coal Creek, Lake City, Tennessee, Local Protection Project: During the period, August through October 1984, with financial assistance from the State, the City of Lake City, Tennessee removed 50,000 cubic yards of sediment from the channel of Coal Creek. Lake City is a local protection project consisting of 3.5 miles of improved channel and a bend cutoff. This work was the first major maintenance effort by the city since the channel was constructed by the Nashville District in 1962. The work partially restores the channel capacity for about 2.0 miles of the project.

Sediment Load Measurements.

1. Fishtrap Lake, Levisa Fork, Kentucky: Suspended sediment data were collected by the Huntington District at the Levisa Fork at Big Rock, Virginia, gaging station and at gaging stations on five tributary streams in the Fishtrap Lake Drainage Basin during 1984.

2. Dewey Lake, Johns Creek, Kentucky: Suspended sediment data were collected by the Huntington District at the Johns Creek at Meta, Kentucky, monitoring station and at gaging stations on two tributary streams in the Dewey Lake Drainage Basin during 1984. Data collection at the gaging station on Raccoon Creek was discontinued due to flood damage in May 1984.

3. R. D. Bailey Lake, Guyandot River, West Virginia: Suspended sediment data were collected by the Huntington District at the Clear Fork and the Baileysville monitoring stations throughout 1984.

4. Yatesville Lake, Blaine Creek, Kentucky: Suspended sediment data were collected by the Huntington District at the Blaine Creek at Blaine, Kentucky monitoring station throughout 1984.

5. Upper Cumberland River Basin, Kentucky: The U. S. Geological Survey continued sediment sampling (grab samples) from five stations at Harlan, Pineville, Middlesboro, and Barbourville, Kentucky in anticipation of sedimentation studies and construction necessary for Section 202 (Public Law 96-367) work. Additional samples were taken from a second site near Harlan during January through June 1984 to aid in sediment analyses necessary for flood control alternative studies for Harlan.

OHIO REGION

GEOLOGICAL SURVEY

Upper Ohio Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Ohio River at Benwood, near Wheeling, WV, and at Little Kanawha River at Palestine, WV, as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data are being collected on a daily basis at East Branch Shade River near Tuppers Plains, OH, West Branch Shade River near Harrisonville, OH, and West Branch Shade River near Burlingham, OH, in cooperation with Ohio Department of Natural Resources.

3. Suspended-sediment data are being collected on a daily basis at Wheeling Creek near Blaine, OH, in cooperation with the Ohio Department of Natural Resources.

Muskingum Subregion

1. Suspended-sediment data are being collected on a daily basis at Muskingum River at McConnelsville, OH, in cooperation with the Ohio Department of Natural Resources.

Kanawha Subregion

1. Suspended-sediment data are being collected on a near quarterly basis at Kanawha River at Winfield, WV, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily and storm-event basis at Elk River at Sutton, WV, Elk River at Queen Shoals, WV, and at Elk River at Blue Creek, WV. Also, suspended-sediment data are being collected on a periodic basis and during selected storm events at Buffalo Creek at Clay, WV, Big Sandy Creek near Clendenin, WV, Little Sandy Creek near Elkview, WV, and Blue Creek near Quick, WV, in cooperation with the West Virginia Department of Natural Resources, Water Resources Division.

3. Suspended-sediment data were collected on an event basis at Soak Creek at Sophia, WV, in cooperation with the U.S. Soil Convervation Service.

4. Suspended-sediment data are being collected on a bimonthly basis as part of NASQAN on the New River at Glen Lyn, VA.

Raccoon Subregion

1. Suspended-sediment data are being collected on a daily basis in cooperation with the Ohio Department of Natural Resources at the following stations:

Raccoon Creek ner New Plymouth, OH
Lt. Raccoon Creek at Vinton, OH
Lt. Raccoon Creek near Ewington, OH
Raccoon Creek at Bolin Mills, OH
Raccoon Creek near Adamsville, OH

Big Sandy-Guyandotte Subregion

1. Suspended-sediment data were collected on a periodic basis and during selected storm events at the following stations (discontinued September 30, 1984):

Barton Fork near Council, VA
Grisson Creek near Council, VA
Russell Fork near Birchleaf, VA
Russell Fork near Council, VA

2. Suspended-sediment data are being collected on a near bimonthly basis at Guyandotte River at Branchland, WV, as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis and during selected storm events, in cooperation with the U.S. Army Corps of Engineers (COE), Huntington District, at the following stations:

Tug Fork at Glenhayes, WV
Tug Fork near Kermit, WV
Tug Fork at Fort Gay, WV

4. Suspended-sediment data are being collected on a bimonthly basis at Big Sandy River at Louisa, KY, as part of NASQAN.

5. Suspended-sediment data are being collected on a daily basis at the following station as a part of the coal hydrology project:

Dicks Fork at Phyllis, KY (discontinued September 30, 1984)

6. Suspended-sediment data are being collected on a bimonthly basis in cooperation with the COE, Huntington District, at the following stations:

Levisa Fork at Pikeville, KY
Levisa Fork at Paintsvill, KY
Levisa Fork at Louisa, KY
Big Sandy River near Burnaugh, KY

Great Miami Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Whitewater River at Brookville, IN, as a part of NASQAN.

Middle Ohio Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Upper Twin Creek at McGaw, OH, and at South Hogan Creek near Dillsboro, IN, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a daily basis at Little Miami River at Milford, OH, in cooperation with the Ohio Department of Natural Resources.

3. Suspended-sediment data are being collected on a quarterly basis at Ohio River at Greenup Dam, KY, and Ohio River at Markland Dam, KY, as a part of NASQAN.

Kentucky-Licking Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Licking River at Butler, KY, and on a bimonthly basis at Kentucky River at Lock 2 at Lockport, KY, as a part of NASQAN.

Green Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Green River near Beech Grove, KY, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Green River at Munfordville, KY, as a part of the Federal Sediment Index Network.

Wabash Subregion

1. Suspended-sediment data were collected quarterly at White River at Hazelton, IN, as part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Wabash River at New Harmony, IN, and at Little Wabash River at Main Street at Carmi, IL, as a part of NASQAN.

Cumberland Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Cumberland River at Carthage, TN, and at Cumberland River near Grand Rivers, KY, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily and storm-event basis in cooperation with the COE, Nashville District, at the following stations:

Clover Fork at Harlan, KY
Yellow Creek near Middlesboro, KY
Cumberland River at Barbourville, KY
Cumberland River near Pineville, KY
Cumberland River at Cumberland Falls, KY
Cumberland River at Williamsburg, KY

Lower Ohio Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Rolling Fork near Lebanon Junction, KY, and Ohio River at Cannelton Dam, KY, and on a bimonthly basis at Ohio River at Lock and Dam 53 near Grand Chain, IL, and Salt River at Shepherdsville, KY, as part of NASQAN.

Special Studies

1. Suspended-sediment data were collected with an automatic sampler at Enlow Fork near West Finley, PA. These data were collected as part of a study to evaluate the effects of mining on streams in Washington County.

2. Suspended-sediment data are being collected at two sites draining small basins (less than 2 mi^2) in Buchanan County, VA. The data will serve as input to the Geological Survey Precipitation-Runoff Model.

3. Suspended-sediment data were collected on a daily and event basis at Little Creek near Chelyan, WV (discontinued September 30, 1984), as part of a rainfall-runoff sediment transport modeling study in coal areas of West Virginia.

4. Suspended-sediment data were collected with automatic samplers at two sites in the Big Sandy Creek basin in Fayette County Pennsylvania during 1984. The data were collected as part of a study to evaluate the effects of surface mining on the Big Sandy Creek basin of southwestern Pennsylvania.

5. A study of course material movement and channel adjustment in the South Fork Cumerland River Basin, TN, is being conducted in cooperation with the Tennessee Division of Surface Mining and Reclamation.

6. In cooperation with the COE, four suspended sediment discharge stations are being operated; New River at New River, TN, Clear Fork near Rubbins, TN, South Fork Cumberland River at Leatherwood Ford, TN, and South Fork Cumberland River near Stearns, KY. These stations monitor daily and storm-event loads. These data will be used to define current water-quality conditions within the Big South National River and Recreation Area, TN.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Champaign County Bank Plaza
102 East Main Street, 4th Floor
Urbana, IL 61801

District Chief, WRD
U.S. Geological Survey
6023 Guion Road
Suite 201
Indianapolis, IN 46254

District Chief, WRD
U. S. Geological Survey
208 Carroll Building
8600 La Salle Road
Towson, MD 21204

District Chief, WRD
U.S. Geological Survey
P.O. Box 1107
Harrisburg, PA 17108

District Chief, WRD
U.S. Geological Survey
A-413 Federal Building
U.S. Courthouse
Nashville, TN 37203

District Chief, WRD
U.S. Geological Survey
200 West Grace Street
Room 304
Richmond, VA 23220

District Chief, WRD
U.S. Geological Survey
Room 572, Federal Building
600 Federal Place
Louisville, KY 40202

District Chief, WRD
U.S. Geological Survey
603 Morris Street
Charleston, WV 25301

District Chief, WRD
U.S. Geological Survey
975 West Third Avenue
Columbus, OH 43212

OHIO REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and/or determinations of sediment yields were made for the following watersheds.

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Kentucky River	Pigeon Roost	Indian Creek	Jackson	Kentucky
Greenbrier River	Howard Creek	Dry Creek	Greenbrier	West VA
Miami River	Upper Mad River	Mad River	Logan	OH
Miami River	Kings Creek	Kings Creek	Champaign	OH
Portage River	Rocky Ford Creek	Rocky Ford Creek	Hancock	OH

   b. River Basin Investigations.

Major Basin	Basin Reported	Watershed	State
Ohio River	Central Ohio	----	OH
Wabash River	Little Wabash River	Elliott Creek	ILL
Ohio River	Assessment and Treatment of Areas in Ohio Impacted by Abandoned Mines		

2. Reservoir sedimentation Surveys.

Reservoir	County	State
Polk Creek #6	Lewis	West VA
Campbellsville	Taylor	KY

3. Kentucky - The primary purpose of this study was to evaluate the effectiveness of Landsat MSS and TM sensors in fulfilling the SCS obligations for inventorying and monitoring, as assigned under PL-95-192 for future resource inventories. Specifically, the MSS (80 meter resolution) was tested against the TM (30 meter resolution) in Fulton and McCrackon Counties, Kentucky, to determine their utility in providing an accurate county database. Various tabular data sets and map products were also included as part of the study.

TENNESSEE REGION

GEOLOGICAL SURVEY

Upper Tennessee Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at French Broad River at Marshall, NC, French Broad River near Knoxville, TN, and at Clinch River at Melton Hill Dam, TN, and at Holston River near Knoxville, TN, as part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data are collected on a bimonthly basis at Cataloochee Creek near Cataloochee, NC, as a part of the National Hydrologic Benchmark program.

Middle Tennessee-Hiwassee Subregion

1. Suspended-sediment data are being collected on a monthly basis at Tennessee River at Watts Bar Dam, TN, as part of NASQAN.

2. Suspended-sediment data are being collected in the Tennessee River basin in Georgia at 3 sites on a monthly basis and at 13 sites on a semiannual basis as part of the OSM Coal Hydrology program.

Tennessee-Elk Subregion

1. Suspended-sediment data are being collected on a monthly basis at Tennessee River at South Pittsburg, TN, as a part of NASQAN.

2. Suspended-sediment data are being collected by an automatic PS-69 sampler at Tennessee-Tombigbee Waterway at Cross Roads, MS, in cooperation with the U.S. Army Corps of Engineers (COE).

Lower Tennessee Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Tennessee River at Pickwick Landing Dam, TN, and at Tennessee River at Highway 60 near Paducah, KY, as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at Buffalo River near Flat Woods, TN, as part of the National Hydrologic Benchmark Network.

Special Studies

1. All available suspended-sediment data for the Tennessee River basin are being compiled, entered into the WATSTORE system, and analyzed in cooperation with Tennessee Tech University.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
6481 Peachtree Industrial Blvd.
Suite B
Doraville, GA 30360

District Chief, WRD
U.S. Geological Survey
Suite 710, Federal Building
100 West Capitol Street
Jackson, MS 39269

District Chief, WRD
U.S. Geological Survey
Room 436, Century Postal Station
300 Fayetteville Street Mall
Raleigh, NC 27602

District Chief, WRD
U.S. Geological Survey
A-413 Federal Building
U.S. Courthouse
Nashville, TN 37203

District Chief, WRD
U.S. Geological Survey
Room 572, Federal Building
600 Federal Place
Louisville, KY 40202

District Chief, WRD
U.S. Geological Survey
200 West Grace St., Rm. 304
Richmond, VA 23220

TENNESSEE REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for work plans in the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Clinch River	Copper Creek	Copper Creek	Scott/ Russell	Virginia

UPPER MISSISSIPPI REGION

CORPS OF ENGINEERS

North Central Division

Chicago District

Chicago River, North Branch. A sediment sampling program was conducted on the North Branch of the Chicago River during June 1984 in relation to proposed bank stabilization. Sediment grab samples were taken at two locations on the river at the Niles Park District Tam Golf Course, Niles, Illinois. The samples were analyzed for polychlorinated biphenyls (PCB's). The results were presented in a report dated July 1984, and are available in the District Files.

Suspended sediment sampling, funded by the District, is performed by a U.S.G.S. observer in conjunction with operation of U.S.G.S. discharge gage station number 05536000 on the North Branch Chicago River at Niles, Illinois. Sampling was begun in November 1984.

Little Calumet River at Munster, Indiana. Weelky suspended sediment sampling, funded by the District, is performed by a U.S.G.S. observe in conjuntion with operation of U.S.G.S. discharge gage station number 05536195. Sediment parameters analyzed are Total Suspended Solids and Volatile Suspended Solids. Data is available in the District files beginning February 1984.

Rock Island District

Suspended Sediment Sampling - Suspended load sampling is being conducted at 27 stations; 3 located on the Mississippi River and 24 on its tributaries including 3 on the Illinois River and its tributaries. Eighteen long-term stations are operated and maintained directly by the District. Sampling on the Turkey River at Garber, Iowa began in the spring of 1984. Nine stations which began in conjunction with the GREAT II program are now being operated and maintained under a cooperative program with the U. S. Geological Survey.

Bedload Sampling - Bedload sampling is being conducted at 5 stations located on tributaries of the Mississippi River. Samples are collected during three peak flows for the year using the Helley Smith bedload sampler. All statiors at which bedload samples are collected are operated and maintained in cooperation with the U.S.G.S. Records for the bedlaod stations are also maintained by the U.S.G.S.

Sedimentation Surveys - The survey of sedimentation ranges in Saylorville Lake, Coralville Reservoir, and Bear Creek Reservoir at Hannibal, Missouri, was completed during 1984. Reports detailing the results of these surveys will be made available during claendar year 1985. The survey of sedimentation ranges in Lake Red Rock is approximately 24 percent complete.

St. Paul District

Sediment load measurements continued at 6 stations by the U. S. Geological Survey under the District's sponsorship. Measurements made at these stations are published by the U.S.G.S. in the Water Resources Data. Staions are at Anoka, MN on Mississippi River; near Big Stone City, SD on Whetstone River; near Odessa, MN on Yellow Bank River; at Mankato, MN on Minnesota River; at Winona, MN on Mississippi River and at McGregor, IA on Mississippi River.

UPPER MISSISSIPPI REGION

GEOLOGICAL SURVEY

Mississippi Headwaters Subregion

1. Suspended-sediment data are being collected on a daily basis at Mississippi River near Anoka, MN, in cooperation with the U.S. Army Corps of Engineers (COE).

2. Suspended-sediment data are being collected on a bimonthly basis at Mississippi River near Royalton, MN, and on a quarterly basis at Mississippi River at Nininger, MN, as a part of the National Stream Quality Accounting Network (NASQAN).

Minnesota Subregion

1. Suspended-sediment data are being collected on a daily basis at Minnesota River at Mankato, MN, and on a daily basis March through August at Whetstone River near Big Stone City, SD, and at Yellow Bank River near Odessa, MN, in cooperation with the COE.

2. Suspended-sediment data are being collected on a bimonthly basis at Minnesota River near Jordon, MN, as a part of NASQAN.

3. Suspended-sediment measurements were made for a specific study at the following sites:

Tributary to North Branch Yellow Medicine River above Dillon Syltie Impoundment near Porter, MN
Dillon Syltie Impoundment Outlet near Porter, MN
Tributary to South Fork Yellow Bank River above LaBolt Impoundment at LaBolt, SD
LaBolt Impoundment Outlet at LaBolt, SD
Tributary to Plum Creek above Lake Laura at North Inlet near Walnut Grove, MN
Tributary to Plum Creek above Lake Laura at South Inlet near Walnut Grove, MN
Lake Laura Impoundment Outlet near Walnut Grove, MN
Florida Creek near Burr, MN
Lac Qui Parle River near Canby, MN
West Branch Lac Qui Parle River at Gary, MN
Dry Creek near Jeffers, MN

St. Croix Subregion

1. Suspended-sediment data are being collected on a monthly basis at St. Croix River at St. Croix Falls, WI, as a part of NASQAN.

Upper Mississippi-Black-Root Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at North Fork Whitewater River near Elba, MN, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a daily basis at Mississippi River at Winona, MN, in cooperation with the COE.

3. Suspended- and bed-material data are being collected on an intermittent basis for the COE, at Chippewa River at Durand, WI, and at the Chippawa River near Pepin, WI.

4. Suspended-sediment data are being collected on a bimonthly basis at Durand and Black River at Galesville, WI, as a part of NASQAN.

5. Suspended-sediment data are being collected on a weekly and runoff-event basis at Garvin Brook near Minnesota City and Stockron Valley Creek at Stockton, MN.

Upper Mississippi-Maquoketa-Plum Subregion

1. Suspended-sediment data are being collected on a daily basis at Mississippi River at McGregor, IA, in cooperation with the COE, St. Paul District.

2. Suspended-sediment data are being collected on a periodic and storm-event basis to determine monthly suspended-sediment loads for the COE at the Grant River at Burton, WI.

Wisconsin Subregion

1. Suspended-sediment and bed-material data are being collected on a bimonthly basis as part of NASQAN and storm-event basis for the COE at Wisconsin River at Muscoda, WI.

Upper Mississippi-Iowa-Skunk-Wapsipinicon Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Mississippi River at Clinton, IA, and at Mississippi River at Keokuk, IA, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at the following in cooperation with the Iowa Geological Survey:

Iowa River at Iowa City, IA
Ralston Creek at Iowa City, IA
Skunk River at Augusta, IA

3. Suspended-sediment data are also being collected on a bimonthly basis at Skunk River at Augusta, IA, as part of NASQAN.

4. Suspended-sediment data are being collected on a daily basis at Iowa River at Wapello, IA, in cooperation with COE, Rock Island District. Suspended-sediment data are also being collected on a monthly basis as part of NASQAN.

Rock Subregion

1. Suspended-sediment data are being collected on a periodic and storm-event basis to determine monthly suspended-sediment loads for the COE, Rock Island District, at Sugar River near Brodhead, WI.

2. Suspended-sediment data are being collected on a storm-event basis in cooperation with Dane County, WI, at:

Pheasant Branch Creek at Middleton, WI, at U.S. Highway 12
Spring Harbor Storm Sewer at Madison, WI

3. Suspended-sediment data are being collected on a quarterly basis at Rock River near Joslin, IL, as part of NASQAN.

Des Moines Subregion

1. Suspended-sediment data are being collected on a daily basis at Des Moines River near Saylorville, IA, in cooperation with the COE, Rock Island District.

2. Suspended-sediment data are being collected on a daily basis at Des Moines River at St. Francisville, MO, in cooperation with the COE, Rock Island District, and bimonthly as part of NASQAN.

3. Suspended-sediment data are being collected on a daily basis at Middle Fork Raccoon River at Bayard, IA, and Middle Fork Raccoon River at Panora, IA. This study is a cooperative undertaking with the Engineering Research Institute, Iowa State University at Ames, IA.

Upper Mississippi-Salt-Subregion

1. Suspended-sediment data are being collected on a daily basis at Middle Fabius River near Monticello, MO, in cooperation with the COE, Rock Island District.

2. Suspended-sediment data are being collected on a daily basis and partical-size data collected on a intermittent basis in cooperation with the COE:

North Fork Salt River near Hunnewell, MO
Middle Fork Salt River at Paris, MO

3. Suspended-sediment data are being collected on a daily basis at Salt River near New London, MO, and Mississippi River below Alton, IL, in cooperation with the COE, St. Louis District. Suspended-sediment data also are being collected on a quarterly basis at New London and a bimonthly basis at Alton as part of NASQAN.

Upper Illinois Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Illinois River at Marseilles, IL, as a part of NASQAN.

Lower Illinois Subregion

1. Suspended-sediment data are being collected every other day, and more frequently during high flows, in cooperation with the Rock Island and St. Louis Districts, the COE, at Illinois River at Valley City, IL, Mackinaw River below Congerville, Sangamon River near Oakford, IL, and Illinois River at Henry, IL. Additional samples are collected on a bimonthly basis at

Sangamon River near Oakford and on a quarterly basis at Illinois River at Valley City, IL, as part of the NASQAN program.

Upper Mississippi-Kaskaskia-Meramec Subregion

1. Suspended-sediment data are being collected every other day, and more often during high flows, in cooperation with the St. Louis District of the COE, at the following sites:

Kaskaskia River at Cooks Mills, IL
Kaskaskia River at Venedy Station, IL
Big Muddy River at Murphysboro, IL

Suspended-sediment samples are also collected on a bimonthly basis at the Kaskaskia River at Venedy Station, IL, and Big Muddy River at Murphysboro, IL, as part of the NASQAN program.

2. Suspended-sediment data are being collected on a daily basis at Mississippi River at St. Louis, MO, in cooperation with the COE, St. Louis District.

3. Suspended-sediment data are being collected on a daily basis at Meramec River near Eureka, MO, and at Mississsippi River at Thebes, IL, in cooperation with the COE, St. Louis District. Suspended-sediment data also are being collected on a bimonthly basis at these two stations as a part of NASQAN.

4. Suspended-data are being collected on a daily basis at Mississippi River at Chester, IL, in cooperation with the COE, St. Louis District.

Special Studies

1. Five stations were established in the Rochester area in cooperation with the COE, St. Paul District, to determine changes in sediment yield from channelization. The stations Bear Creek on Belt Line, MN, Cascade Creek at Rochester, MN, Silver Creek at Rochester, MN, South Fork Zumbro River on Belt Line, MN, and South Fork Zumbro River near Rochester, MN, are sampled during three storm events per year.

2. Suspended-sediment data are being collected every other day, and more frequently during high flows at Big Creek near Bryant, IL, in cooperation with the Metropolitan Sanitary District of Greater Chicago. The sediment data collected are used to monitor changes in sediment transport during the reclamation of a strip-mined area by irrigating with digested sludge from sewage treatment facilities.

3. Suspended-sediment samples are being collected at several locations in the low-level radioactive-waste disposal site at Sheffield, IL. The data will be used to determine the relation of sediment discharge to runoff for the site; the types and rates of geomorphic change; the potential for erosion and slumping; and to establish a data base to which changes caused by changing practices on the site can be compared.

4. Water-Resources Investigations Report 82-4073 entitled "Runoff, Sediment Transport, and Water Quality in a Northern Illinois Agricultural Watershed Before Urban Development" by H. E. Allen, Jr., and J. R. Gray was published.

5. Water-Resources Investigations Report 84-4003 entitled "Estimates of Long-Term Sediment Yields for Bay Creek at Nebo, Illinois" by T. R. Lazaro, K. K. Fitzgerald, and L. R. Frost was published.

Laboratory Activities

The Geological Survey laboratory in Iowa City, IA, analyzed suspended-sediment samples collected by the COE at:

Mississippi River at Hannibal, MO
Bay Creek at Nebo, IL
Wapsipinicon River at DeWitt, IA
Iowa River at Marengo, IA
Iowa River at Coralville Dam, IA
Mississippi River at Burlington, IA
Mississippi River at Keokuk, IA
Des Moines River near Stratford, IA
Raccoon River at Van Meter, IA
North River near Norwalk, IA
Middle River near Indianola, IA
South River near Ackworth, IA
Des Moines River near Tracy, IA
Des Moines River at Kedsauqua, IA
White Breast Creek near Dallas, IA
Mississippi River at East Dubuque, IL

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Champaign County Bank Plaza
102 East Main Street, 4th floor
Urbana, IL 61801

District Chief, WRD
U.S. Geological Survey
6023 Guion Road, Suite 201
Indianapolis, IN 46254

District Chief, WRD
U.S. Geological Survey
P.O. Box 1230
Iowa City, IA 52244

District Chief, WRD
U.S. Geological Survey
702 Post Office Building
St. Paul, MN 55101

District Chief, WRD
U.S. Geological Survey
1400 Independence Road
Mail Stop 200
Rolla, MO 65401

District Chief, WRD
U.S. Geological Survey
1815 University Avenue
Madison, WI 53705

UPPER MISSISSIPPI REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and/or determinations of sediment yields were made for the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Mississippi River	Middle Fork of Salt River	Middle Fork of Salt River	Macon Monroe Randolf Shelby	Missouri
Mississippi River	Crooked Creek	Crooked Creek	Monroe Shelby	Missouri
Mississippi River	Otter Creek	Otter Creek	Macon Monroe Shelby	Missouri
Kaskaskia River	Vandalia Lake	Bear Creek	Fayette	Illinois
Sangamon River	Lake Taylorville	South Fork	Christian	Illinois
Des Plaines River	Tinley Creek	Calumet Sag	Cook	Illinois
Des Plaines River	Upper Salt Creek #2	Upper Salt Creek	Cook	Illinois
Des Plaines River	Soap Creek	Soap Creek	Davis Wapello Allamakee Warren	Iowa

   b. River Basin Investigations.

Major Basin	Basin Reported	Watershed	State
Rush-Vermillion	N. Mississippi Valley Loess Hills	Isabelle Creek	Wisconsin
Grant-Little Maquoketa	N. Mississippi Valley Loess Hills	Rattlesnake Creek	Wisconsin
Mississippi River	Waukarusa	Waukarusa Creek	Illinois

Major Basin	Basin Reported	Watershed	State
Illinois River	Waverly Lake	Apple Creek	Illinois
Minnesota River	S. Minnesota	Yellow Bank River	Minnesota South Dakota
Illinois River	Indian Creek	Indian Creek	Illinois
Illinois River	Sangamon River	Lick Creek	Illinois
Mississippi River	Pope Creek	N. Pope Creek	Illinois

c. Resource Conservation and Development.

Project Name	County	State
North Cedar	Clayton	Iowa
Whiskey Hollow	Louisa	Iowa

2. Reservoir Sedimentation Surveys.

a. Reservoir sedimentation surveys were completed in the following:

Reservoir	County	State
Plain Honey Creek #4	Sauk	Wisconsin
Ernest Schusters	Washington	Minnesota
James Valley	Scott	Minnesota

LOWER MISSISSIPPI REGION

CORPS OF ENGINEERS

Lower Mississippi Valley Division

Memphis District

Five sediment sampling stations in the St. Francis River Basin were discontinued. These stations were located on the St. Francis River near Powe, Missouri, and on the following tributaries: Locust Creek, Big Slough, Eight Mile Creek and Straight Slough. Two stations in the L'Anguille River Basin were discontinued. These stations were located near Palestine, Arkansas and Cherry Valley, Arkansas. The type of records maintained at the sediment station on the St. Francis near St. Francis, Arkansas, was altered to include daily observations and monthly measurements during the entire year. Sediment sampling continued at the 15 remaining stations in the St. Francis Basin and the station previously established near Colt, Arkansas, in the L'Anguille River Basin. Suspended sediment samplers DH76TM, DH78, D74 ALTM and bed sampler BMH60 were used. Types of records maintained are: discharge, observed suspended and bed sediment grain size distributions, observed suspended sediment concentrations, computed suspended sediment load and temperature.

New Orleans District

Sediment Load Measurements.

1. Suspended sedimentation and bed material samplings were continued at the following six ranges: Mississippi River at Coochie, LA, semimonthly; Mississippi River at Tarbert Landing, LA, semimonthly; Atchafalaya River at Simmesport, LA, semimonthly; Wax Lake Outlet at Calumet, LA, monthly; and Lower Atchafalaya River at Morgan City, LA, monthly.

2. Suspended sediment samples were taken with a U. S. P-46, or U. S. P-61 sampler. Bed material samples were taken with a BM-54 sampler or drag bucket-type sampler. Daily suspended sediment samples were taken with a trap-type sampler.

Office Investigations.

For District, WES is performing an investigation of the Atchafalaya Bay, incorporating both physical and mathematical models to study the bay hydrodynamics and the effects the Atchafalaya River will have in the future. Two sediment models are being used to forecast long-term evolution of the delta, HAD-1 and STUDH. HAD-1 is a pseudo two-dimensional sediment computation program using steady state hydraulics. STUDH is sediment transport program using unsteady two-dimensional flow in the horizontal plane.

District is continuing development of a Flow Sediment Model of the Mississippi River throughout the District.

A computer Data Base System is being used to store hydrographic data for the period of record in the District.

A computer Data Base System is being used to analyze, store, and retrieve sediment data.

District has a contract with Louisiana State University to study the Atchafalaya Delta. The task involves updating information on the historical growth of the delta, conducting a field data collection and monitoring program to compute flow and sediment budgets and correlate suspended sediment concentrations with LANDSAT digital data in the area, and performing grain size analyses on suspended sediment and bed-material samples of the delta.

St. Louis District

A resurvey of upstream sediment and downstream retrogression ranges at Lake Shelbyville was completed. The data analysis will be completed and submitted in late 1985.

A resurvey for the upstream sediment ranges at Carlyle Lake was completed in 1984. These data will be analyzed and submitted in 1985.

The data from the initial survey of the upstream sediment ranges at Mark Twain Lake will be submitted in late 1985 or 1986.

Vicksburg District

Sedimentation Surveys.

Channel geometry data, such as cross sections and profiles, were made on many streams within the District during the year. This data, which is to be used in various hydrologic and hydraulic studies, was collected by surveying existing and new permanent ranges, temporary ranges, and fathometer spot surveys.

Sediment Load Measurements.

1. Both bed sample and suspended sample measurements are being made weekly at three locations on the Mississippi River. These locations are Natchez, Mississippi; Vicksburg, Mississippi; and Arkansas City, Arkansas. Bed material samples are gathered using a BM-54 bed material sampler, and suspended material samples are collected using a P-61 suspended materials sampler.

2. An ongoing program in which the suspended material sample, bed material sample, temperature, discharge, and stage data are collected and computerized for many stations within the District has been continued. Sedimentaiton data was collected at approximately 80 stations during 1984. Bed samples are collected using either BM-54, BMH-60, or drag bucket bed

material samplers, while suspended samples are collected using either D-48, D-57, D-61, or D-74 suspended material samplers.

Office Investigations.

1. The Mississippi River sediment data has been analyzed to determine sediment discharge curves at each of the three stations.

2. A comprehensive data collection program was continued for Goodwin Creek. This data collection program is being continued by the Agricultural Research Service at no cost to the District.

3. A sediment investigation to determine the deposition rate of the approach channel to Lock and Dam 1 on the Red River was initiated in 1984.

Southwestern Division

Little Rock District

Sediment sampling continued at Dam No. 2, Lock and Dam No. 3, Lock and Dam No. 4, Lock and Dam No. 5 and David D. Terry Lock and Dam on the Arkansas River. Samples were taken intermittently with USD-49 and the concentration in terms of the percent of weight were maintained.

LOWER MISSISSIPPI REGION

GEOLOGICAL SURVEY

Lower Mississippi - Hatchie Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Mississippi River at Memphis, TN, and on a monthly basis at Obion River at Obion, TN, and at Hatchie River at Bolivar, TN, as a part of NASQAN.

Lower Mississippi - St. Francis Subregion

1. Suspended-sediment data are being collected on a quarterly basis at St. Francis River at Parkin, AK, and bimonthly at St. Francis Bay at Riverfront, AK, as a part of NASQAN.

Lower Mississippi - Lower White Subregion

1. Suspended-sediment data are being collected on a quarterly basis at White River at Clarendon, AK, as a part of NASQAN.

Lower Mississippi - Lower Arkansas Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Arkansas River at Dam 2 near Gillett, AK, as part of NASQAN.

Lower Mississippi - Yazoo Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Yazoo River at Redwood, MS, and on a quarterly basis at Mississippi River near Arkansas City, AK, and Yazoo River near Shell Bluff, MS, as a part of NASQAN.

2. Suspended-sediment data are being collected by a automatic PS-69 sampler at North Fork Tillatoba Creek near Teasdale, MS, in cooperation with the U.S. Soil Conservation Service.

Lower Red - Ouachita Subregion

1. Suspended-sediment data are being collected on a monthly basis at Ouachita River at Columbia, LA, at Red River near Simmesport, LA, and on a quarterly basis at Ouachita River at Camden, AK, as a part of NASQAN. Sediment data are being collected on a quarterly basis at Big Creek at Pollock, LA, as a part of the National Hydrologic Benchmark Network.

Boeuf - Tensas Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Tensas River at Tendal, LA, and bimonthly at Boeuf River at Fort Necessity, LA, as a part of NASQAN.

Lower Mississippi - Big Black Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Big Black River at Bovina, MS, and quarterly at Homochitto Creek at Rosetta, MS, and Mississippi River at Vicksburg, MS, as part of NASQAN.

Lower Mississippi - Lake Maurepas Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Amite River at 4-H Camp near Denham Springs, LA, Tangipahoa River at Robert, LA, Lower Grand River at Bayou Sorrel, LA, and at Tchefuncta River near Covington, LA, as a part of NASQAN.

Louisiana Coastal Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Bayou Teche at Keystone Lock and Dam below St. Martinville, LA, Mermentau River at Mermentau, LA, and at Calcasieu River near Kinder, LA, and monthly at Atchafalaya River near Melville, LA, as a part of NASQAN and in cooperation with the COE.

2. Suspended-sediment data are being collected on a bimonthly basis at the following sites as a part of NASQAN.

Mississippi River at Belle Chasse, LA
Mississippi River near St. Francisville, LA

3. Suspended-sediment and bed-material data are collected at the following sites on a monthly basis in cooperation with the U.S. Army Corps of Engineers (COE):

Lower Atchafalaya River at Morgan City, LA
Wax Lake Outlet at Calumet, LA

Special Studies

1. Suspended-sediment data are being collected at 22 stations on the St. Francis River and selected tributaries for the COE. Eight sites are collected on a monthly basis and the remaining 14 sites are collected on a monthly basis from November through June. Monitoring is expected to continue from year to year as the need exists.

2. An interagency study is being conducted to quantify sediment transport to Reelfoot Lake. Four stations have been equipped with automatic samplers and five stations are sampled manually.

3. In cooperation with the Tennessee Department of Transportation, a study of man-induced channel adjustments in the fluvial channels of western Tennessee is being conducted.

Laboratory Activities

The Geological Survey sediment laboratory located in Baton Rouge, LA, analyzed suspended-sediment and bed-material samples collected by the COE at the following locations:

Old River Outflow near Knox Landing
Red River above Old River Outflow
Mississippi River at Coochie
Mississippi River at Tarbert Landing
Atchafalaya River at Simmesport
Bayou Chene above Bayou Crook Chene
East Access Channel above Lake Chicot
Lake Long below Bayou LaRompe
Little Tensas below Blind Tensas Cut

For additional information about U.S. Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Federal Office Building
Room 2301
700 West Capitol Avenue
Little Rock, AR 72201

District Chief, WRD
U.S. Geological Survey
P.O. Box 66492
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
Suite 710, Federal Bldg.
100 West Capitol Street
Jackson, MS 39269

District Chief, WRD
U.S. Geological Survey
A-413 Federal Building
U.S. Courthouse
Nashville, TN 37203

LOWER MISSISSIPPI REGION

SOIL CONSERVATION SERVICE

1. Studies of erosion rates and images were made for justification of accelerated land treatment for a watershed protection plan in the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Big Black River	Fourteen Mile-Bakers	Fourteen Mile-Bakers	Hinds	Mississippi
Mississippi River	Bayou Pierre	Bayou Pierre	Copiah, Lincoln	Mississippi

2. Special Studies.

   Mississippi--Erosion rates by land use and land capability subclass for the state were determined and published in a report.

CORPS OF ENGINEERS

North Central Division

St. Paul District

Sediment loads were measured by the U. S. Geological Survey at two river stations (near Kindred, ND on Sheyenne River and at Walhalla, ND on Pembina River) under the District sponsorship.

SOURIS-RED-RAINY REGION

GEOLOGICAL SURVEY

Souris Subregion

1. Suspended-sediment data are being collected on a periodic basis at Souris River near Westhope, ND, as part of the National Stream Quality Accounting Network (NASQAN). Additional periodic suspended-sediment data were collected at Souris River near Verendrye, ND.

Red Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Sheyenne River at Kindred, ND, and Red River at the north at Halstad, MN, as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at Beaver Creek near Finley, ND, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a bimonthly basis at the Red Lake River at Crookston, MN, and at Roseau River below State Ditch 51 near Caribou, MN, as a part of NASQAN.

Rainy Subregion

1. Suspended-sediment data were collected on a quarterly basis at Little Fork River at Littlefork, MN, and at Kawishiwi River near Ely, MN, and on a bimonthly basis at Rainy River at Manitou Rapids, MN, as part of NASQAN.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
702 Post Office Building
St. Paul, MN 55101

District Chief, WRD
U.S. Geological Survey
821 East Interstate Avenue
Bismarck, ND 58501

SOURIS-RED-RAINY REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for the following watersheds:

   a. Resource Conservation and Development.

Project Name	County	State
Grand Forks County Legal Drain No. #4	Grand Forks	North Dakota

MISSOURI REGION

BUREAU OF LAND MANAGEMENT

Montana

Monitoring of sediment production was conducted on a limited basis in response to specific land management activities. The majority of monitoring activities were in response to timber harvesting and livestock grazing. Periodic suspended sediment data are collected and analyzed to indicate overall watershed condition and changes in condition. Suspended sediment data collected at Geological Survey stream gages provide either daily or event-related sediment information for critical watershed areas such as the Willow Creek watershed in northeastern Montana.

Wyoming

A watershed activity plan was completed for Bates Hole Creek which addresses the overall watershed problem of accelerated erosion and recommends specific actions necessary to reduce the erosion. Implementation schedules will be dependent upon program funding levels.

Efforts continued on Fifteenmile Creek addressing the stabilization of ephemeral stream channels and acceptable levels of livestock use. These efforts are cooperative with the University of Wyoming and the State Department of Environmental Quality.

Watershed activity planning is underway for Muddy Creek and will include installation of small structures, planting of grasses and willows, and fencing of small enclosed areas. This watershed conservation effort is in conjunction with ongoing work by the University of Wyoming and Wyoming Department of Environmental Quality.

MISSOURI REGION

Bureau of Reclamation

A report was published on the 1978 sedimentation survey of Fresno Reservoir on the Milk River. This was the first survey of the reservoir since its completion in 1939. During the 38.7 years of reservoir operation, a total of 25,665 acre-feet of sediment had deposited below the top of the joint use pool and a total of 32,912 acre-feet was deposited below the maximum water surface. This accumulation equates to a sediment yield rate of 0.275 acre-feet per square mile per year for the 3,096 square mile contributing drainage area.

A study of the sediment transport capability and regime channel characteristics was initiated for the Platte River in central Nebraska.

CORPS OF ENGINEERS

Missouri River Division

Kansas City District

Sediment Load Measurements. The measurements of suspended sediment were continued at 15 stations through the water year. At the end of the water year, 2 previous stations were reactivated. These stations are located at Ellsworth, Kansas, on the Smoky Hill River, an inflow station to Kanopolis Lake, and at the outlet of Kanopolis Lake. Currently in operation are 3 main stem Missouri River stations and 14 tributary stations. The Missouri office of the U. S. Geological Survey collects monthly points, depth integrated, and bed material samples under the cooperative stream gaging program on the main stem of the Missouri River. The remaining stations are operated by contact observers or project personnel.

Lake and Reservoir Sediment Activities.

1. Melvern. The initial resurvey of this lake was preformed during this reporting period. A newly acquired "Odom" Offshore Range-Azimuth Hydrographic system was utilized for the underwater survey. Conventional land surveying techniques were used to complete the dry portion of the reservoir. The interfaced range-azimuth instrumentation of this system is programed to automatically compute State-plane coordinates as the hydrographic soundings are being performed. Thus, the need for maintaining complete range monumentation is no longer necessary. The coordinates can be reentered and the exact range line can be resounded. Utilizing this capability, several supplemental aggradation ranges were set up and sounded for both future resurveys and for contouring the bottom of the reservoir. Location of these supplemental ranges was selected at key locations predicated by the valley geometry. Volume computations utilizing the additional sections are more easily performed, increase the accuracy, and increase confidence in the results. In order to aid in defining the bottom contouring, longitudinal soundings were also made. These longitudinal lines were made on local reaches as well as spanning the length of the water portion of the reservoir. After a heavy spring inflow which raised the pool some 4 plus feet, the cross sections in the delta area were resounded. This was performed primarily because navigation depths during the sounding survey were insufficient to maintain accurate horizontal control. Secondarily, the higher pool soundings indicated the magnitude of inflows contained insufficient energy to resuspend or scour any portion of the delta deposits. The original capacity of the reservoir was reconstituted by using the installed aggradation ranges. Several volume computations were performed, using the original ranges only, and also with the supplemental ranges added. It is anticipated that the supplemental aggradation ranges will improve future computations and decrease future computational time requirements. Although the total study has not been completed, the preliminary differences between the original capacity and the present capacity

using the 1984 resurvey data indicate a total storage loss of 1,223 acre-feet has occurred. The distribution between the multipurpose pool and the flood control pool is approximately 84 percent and 16 percent respectively. Core samples were collected at the original aggradation ranges and were analyzed for density and gradations. At the time of core sample collection, wire weight measurements were also made to verify the hydrographic soundings. Eight of the degradation ranges were also resurveyed. This is the first resurvey of these ranges since the project became operational in 1975. Bed over bank samples were collected at these ranges and gradation analysis were performed on the materials.

2. Wilson. The initial resurvey of Wilson was completed during 1984. This is the first resurvey since closure of the dam in 1963. This survey was run immediately after the survey was conducted at Melvern and the instrumentation, methodology, supplemental ranges, etc., were essentially the same. The area capacity computations have been completed, documented, and the results were given to the forecast unit for incorporation into the Water Control data base. The total loss of storage was 5,785 acre-feet. The multipurpose pool had accumulated 92 percent of the inflowing sediment, while 8 percent was found deposited in the flood pool. The average annual inflow was approximately 275 acre-feet, whereas the allocated loss in storage was initially estimated to be 400 acre-feet per year. The allocated estimate appears to be conservative; however, considering that the first major inflow did not occur until 1973, when multipurpose pool was initially reached, some 10 years after closure, the allocation may be more accurate than the numbers may indicate. This difference will be more thoroughly investigated during the sedimentation study. To complete degradation ranges, bed and banks, were sampled. The materials were analyzed for density and mechanical gradations.

Special Studies.

1. Harry S. Truman. The monitoring program below the Harry S. Truman project, in the head waters of the Lake of the Ozarks, is being continued. This program is monitoring the effects on degradation, deposition, bank line changes, suspended solids, recreational velocities, core entrances, coves, boat docks, and/or any other related physical phenomena which may be attributed to hydropower generation. The reach being monitored is approximately 30 miles below the Harry S. Truman Damsite. Erosion sites were located downstream at locations considered to be most vulnerable to attack. These sites are surveyed approximately on a monthly schedule. Four suspended sediment contractor stations are sampled at least once daily as a minimum, and upon demand. Intensive thalweg-timed depth integrated sediment samples and point velocity distributions at several sites have been collected for each increase in the incremental step up of power generation. Data collected for CY 1982 and CY 1983 were published. Data collected for CY 1984 are in preparation.

2. Kansas River. The study performed by Simons, Li & Associates, Inc., Fort Collins, Colorado, which included investigating the bed degradation and channel enlargement in the lower Kansas River, has been completed. The study

report has been published as a document in the MRD sediment series. A second and special study is being awarded to Simons. This will be an intensive management study concerning effects upon the bed and banks of newly permitted or proposed sites of commercial dredging.

Omaha District

Sediment Load Measurements. The Omaha District operated five suspended sampling stations during the year. One is a Missouri River station and four are major tributary stations. The U. S. Geological Survey operates the station under a cooperative stream gaging program and includes computation and publication of sediment load records. In addition, with the Corps' assistance, they collect suspended sediment samples, bed material samples, and flow velocity data in the Missouri River at Nebraska City, Nebraska; Omaha, Nebraska; and Sioux City, Iowa. Data collected include point-integrated samples and a bed sample at five vertical locations in the cross section. Samples are obtained from a boat at each station at about six-week intervals during the open water season. This data will be used to document the bed material load being transported by the Missouri River.

2. Missouri River Bed Material Samples. In conjunction with the Kansas City District, samples of the bed material were taken in the Missouri River from Ponca, Nebraska, about twenty miles upstream of Sioux City, Iowa, to the mouth. Samples were collected at five or six vertical locations in the cross section, with at least three from the navigation channel of the river. The sections were taken every five miles, using navigation mile markers for location. Additional samples were taken at some crossings and at known trouble spots for a total of 160 sections in the 750 miles of river. A total of 711 samples were collected and are being analyzed by the Missouri River Division laboratory. The results of the data will be compared to samples collected at the same cross sections in 1979.

Ground Water Measurements.

1. Niobrara River. Five observation wells were installed and read weekly to monitor ground water changes associated with lake headwater aggradation effects. Both the delta at the mouth of the Niobrara and the proposed Gavins Point pool raise may cause ground water levels to rise in this area.

2. Niobrara Townsite and Ft. Randall Project. Twelve wells at the old Niobrara townsite are read monthly, and four wells upstream on the Missouri River are read weekly. Data from these wells was used to predict the ground water impact of the proposed Gavins Point pool raise.

3. Pierre, South Dakota. Nine observation wells were installed in response to local complaints of high ground water levels. These wells are read bi-weekly.

4. Bismarck, North Dakota. Twelve observation wells are read monthly to monitor the effect of Missouri River stage increases on local ground water levels.

5. Garrison Project. Seventeen wells immediately downstream of Garrison Dam are read monthly. Data will be used for the Garrison Additional Hydropower Study.

6. Buford-Treton Irrigation District. Fourteen wells are read monthly, quarterly or bi-weekly to monitor the effect of Missouri River stage increases on local ground water levels.

7. Fort Peck Project. Twenty-two wells immediately downstream of Fort Peck Dam are read monthly. Data from these wells was used for the Fort Peck Additional Hydropower Study.

Reservoir Sediment Activities

1. Fort Peck Project. A reconnaissance survey was made of the Fort Peck degradation reach from the dam to Williston, North Dakota. Sediment range monuments were located and marked with a steel post with a two-foot by six-inch with steel plate bolted to it. Bed material samples were gathered at three of four verticals at each range and water surface elevation was obtained at approximately five-mile intervals in the reach.

2. Big Bend Project. A reconnaissance survey was made on a ten-mile reach of Lake Sharpe between the Pierre railroad bridge and Antelope Creek. Uncontrolled cross-section soundings were made at all sediment ranges as well as at about 500-foot intervals between the ranges using land features for location. A bed map of the reach was developed in an effort to determine if sediment had accumulated in locations that would be undetected with established sediment range resurveys. It was found that sediment range placement was adequate to monitor the Lake Sharpe delta growth. Water surface elevations were obtained from Oahe Dam to Antelope creek during periods of steady releases from Oahe Powerhouse in April and June 1984.

3. Fort Randall Project. The White River, located in the upstream reach of the reservoir, is the major source of sediment inflow into the lake, and most of this sediment is depoisted near the mouth of the White River during the spring and early summer. In an effort to identify the amount and location of the deposition and the redistribution of the sediment during lake drawdown, the sediment ranges between the White river and Platte Creek, about a fifty-mile reach, were scheduled for resurvey in July and again in November. The July survey was completed as scheduled; however, due to the weather and insufficient water at the boat ramps in the downstream reach, only the upstream twenty-five miles were resurveyed in November. It is hoped that a resurvey of the ranges in the lower reach, when the lake is free of ice in 1985, will identify the redistribution pattern.

4. Gavins Point Project. The Missouri River Basin experienced above-normal inflow into the mainstem reservoirs during the 1984 season. Above normal releases from Fort Randall Dam, for most of the summer, resulted in some lowland flooding near the mouth of the Niobrara River. Monitoring of the stage recorder gages in the reach indicated that for a release of 44,000 c.f.s. in 1984, the stage was about the same as that recorded in 1975 when 60,000 c.f.s. was released from Fort Randall Dam for several months. All of the sediment ranges for a twenty-mile reach from Choteau Creek to Springfield, South Dakota were resurveyed to determine if this high stage was the result of stream bed aggradation, channel narrowing, or a combination of both.

5. Bowman-Haley Project. A resurvey was made on Bowman-Haley Reservoir. All sediment range cross sections were surveyed in order to update the area capacity table scheduled to be completed during 1985.

6. Salt Creek Reservoirs. A resurvey was made on Bluestem Reservoir. All sediment ranges were surveyed in order to update the area capacity tables. Holmes Lake was not scheduled for a resurvey until 1988: however, due to heavy rains most of the sediment ranges were sounded to identify the amount of sediment inflow.

Special Studies.

1. Aggradation Assessment. Gavins Point Pool Raise. A study on the effects of a proposed pool raise in Lewis and Clark Lake has been completed. The study dealt with the effects of changed aggradation patterns on surface and ground water levels in the area between Gavins Point and Fort Randall dams. The effect on bank erosion around Lewis and Clark Lake was also considered.

2. Lake Sakakawea Shoreline Erosion Study. Conducted a study under contract with Dr. John Reid of the University of North Dakota to develop an improved methodology for predicting the potential of a slope to erode and to reach a non-eroding equilibrium state. Approximately twenty erosion stations have been set up and monitored to determine the relative importance of different factors in the erosion process. Factors under consideration include geology (lithology and structure), bank slope, height, orientation, soil moisture, precipitation, frost depth, freeze-thaw cycles, and wind speed and direction. Phase I of the two-phase study was completed this year; the study will be continued in 1985 with additional data collection and analysis, including the measurement of offshore profiles and the sediment size distribution for both beach and offshore materials. The ultimate goal of this study is to come up with a method of predicting shoreline erosion that can be applied to the other mainstem reservoirs.

3. Gavins Point Pool Raise Ground Water Study. A study was completed to determine the impact of the proposed pool raise upon ground water levels in the Missouri River valley above the old Niobrara townsite. The results of the aggradation assessment were used to predict what lands would be waterlogged by

pool raises of zero, six, and ten feet using a one-dimensional ground water model calibrated to the available well data.

4. Fort Peck Dam Additional Hydropower Ground Water Investigation. An assessment of present ground water conditions below Fort Peck Dam was made. This assessment also made use of the one-dimensional ground water model applied in the Gavins Point Pool Raise Study. The report included maps of ground water contours and depth to water.

5. Pierre Ice-Affected Flooding. A preliminary study was completed to address the ice-related flooding situation in Pierre and Fort Pierre reach of the Missouri River at the head end of Lake Sharpe. The flooding occurs when cold weather combines with high power output from Oahe Dam. The study included aggradation surveys of the headwater delta, water surface profiles under sustained flow, and assessments of ice-affected stages. Preliminary findings indicate that a structral solution may not be economically feasible based on power revenue foregone data available at the time of the study. In addition to this study, an ongoing winter data collection program has been initiated. Air temperature, water temperatures at both Oahe Dam and Pierre, and the location of the head of ice are being monitored daily.

6. White River Ice Jam Study. Additional studies are being completed to provide data for a litigation report for Edward Byre vs. United States. This action has been brought against the United States for damages resulting from the alleged taking of flow easements by spring break-up ice jams across three separate ownerships in South Dakota. The Omaha District is working in conjunction with expert witnesses hired by the Corps and the Justice Department.

7. Sequential Bed Profile Analysis. Completed a study under contract with Dr. Khalid Mahmood of George Washington University to analyze sequential bed profile data obtained from a 4,000-foot-long straight study reach of Missouri River near Omaha, Nebraska. Data obtained from these profiles was then used to measure the length, height and width of bed forms as well as the bed load associated with the migration of dune bed forms. The study revealed that (a) an appropriately designed middle crossing scheme is the best available technique to analyze bed form dimensions; (b) graphical and cross-spectral techniques used to measure bed forms will yield similar results; (c) the width/length ratio of the bed forms in the Missouri is about 2.0 (which implies that a two-dimensional analysis can be applied to mid-channel flow); (d) the average bed load associated with the downstream migration of bed forms is closely approximated by Einstein's bed load function; and (e) the bed load in alluvial rivers is not uniformly distributed across the channel width, but meanders laterally, both in space and time.

8. Channel Bed Armoring Processes. Completed a study under contract with Dr. H. W. Shen of Colorado State University to analyze the development of the part of the study, it was found that the sediment transport rate calculated using Einstein's (1950) bed load function, with the replacement of the hiding curve by Pemberton's (1972) calibrated hiding curve, is very close to the

"true total bed material load", if the effect of the segregation parameter on the shifting of the hiding curve is considered. The "true total bed materal load" is assumed to be the calculated total bed material load, using Shen and Wang's (1979) sediment transport relationship, which was developed based on the data collected at Yankton (within the degradation study reach), Omaha, Sioux City and Nebraska City.

9. IALLUVIAL. A contract was initiated to the University of Iowa to further refine IALLUVIAL, the computer-based flow- and sediment-routing model being developed jointly by the Omaha District and the Unviersity of Iowa. This contract calls for the reformulation of the sediment continuity equation to yield conservation of sediment by size fraction, performance of necessary additions and modifications to the computer coding, and verification using the Missouri River, Sioux City to Rulo reach. Documentation of the investigaitons and resluts will be presented in final report form.

MISSOURI REGION

GEOLOGICAL SURVEY

Saskatchewan Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at St. Mary's River at Montana, USA-Alberta, Canada, border, as a part of the National Stream Quality Accounting Network (NASQAN).

Missouri-Marias Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Missouri River at Tostom, MT, and bimonthly at Missouri River at Fort Benton, MT, and at Marias River near Chester, MT, as a part of NASQAN.

Missouri-Musselshell Subregion

1. Suspended-sediment data are being collected on a daily basis at Missouri River near Landusky, MT, and at Musselshell River at Mosby, MT, in cooperation with the U.S. Army Corps of Engineers (COE).

2. Suspended-sediment data are being collected on a bimonthly basis at the following as a part of NASQAN:

Missouri River at Vingelle, MT
Missouri River below Fort Peck Dam, MT

3. Suspended-sediment data are being collected on a quarterly basis at Halfbreed Creek near Klein, MT, as part of the Federal CBR program.

Milk Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Milk River at Nashua, MT, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Little Peoples Creek near Hays, MT, as part of the Federal CBR program.

3. Suspended-sediment data are being collected on a quarterly basis at Rock Creek below Horse Creek at the international boundary, as a part of the National Hydrologic Benchmark Network.

Missouri-Poplar Subregion

1. Suspended-sediment data are being collected on a quartely basis at Redwater River at Circle, MT, and Redwater River near Vida, and monthly at Redwater Creek near Richey, MT, as a part of the Federal CBR program.

2. Suspended-sediment data are being collected on a monthly basis at the following sites to define water-quality characteristics of the Poplar River basin:

Poplar River at international boundary
East Poplar River at international boundary
East Fork Poplar River near Scobey, MT

3. Suspended-sediment data are being collected on a monthly basis at West Fork Poplar River near Baedette, MT, in cooperation with the Bureau of Indian Affairs.

4. Suspended-sediment data are being collected on a bimonthly basis at Missouri River near Culbertson, MT, as a part of NASQAN.

5. Suspended-sediment data are being collected on a monthly basis at Big Muddy Creek near Antelope, MT, and on a quarterly basis at Beaver Creek at international boundary as part of the Federal CBR program and the Water Ways Treaty Program.

Upper Yellowstone Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Yellowstone River near Livingston, MT, and quarterly at Yellowstone River at Billings, MT, as part of NASQAN.

Big Horn Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Bighorn River at Bighorn, MT, as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly and storm-event basis at East Fork Wind River near Dubois, WY, as part of the Missouri River basin program.

3. Suspended-sediment data are being collected on a daily basis at Fifteenmile Creek near Worland, WY, in cooperation with the Wyoming Department of Environmental Quality.

4. Suspended-sediment data are being collected on a monthly and storm-event basis at Bighorn River at Kane, WY, as a part of the Missouri River basin program.

5. Suspended-sediment data are being collected on a monthly basis at Fivemile Creek and Muddy Creek near Shoshoni, WY, as a part of the Missouri River basin program.

6. Suspended-sediment data are being collected on a bimonthly and storm-event basis at Wind River below Boysen Reservoir, WY, as part of NASQAN.

Powder-Tongue Subregion

1. Suspended-sediment data are being collected on a daily basis at Tongue River at Miles City, MT, in cooperation with the Montana Department of State Lands.

2. Suspended-sediment data are being collected March through September at Powder River at Moorhead, MT, at Powder River at Broadus, MT, and at Power River at Locate, MT, as part of the Federal CBR program.

3. Suspended-sediment data are being collected on a monthly basis in cooperation with the Bureau of Land Management (BLM) at Otter Creek near Otter, MT, and East Fork Otter Creek near Ashland, MT. and quarterly at Mizpah Creek near Mizpah, MT.

4. Suspended-sediment data are being collected in cooperation with the Montana Department of State Lands at the following stations:

Squirrel Creek near Decker, MT (monthly)
Hanging Woman below Horse Creek, near Birney, MT (bimonthly)
Otter Creek at Ashland, MT (monthly)
Otter Creek below Fifteen Mile Creek, near Otter, MT (monthly)
Pumpkin Creek near Miles City, MT (quarterly)

5. Suspended-sediment data are being collected on a monthly basis as part of the Federal CBR program at the following stations:

Tongue River at Tongue River Dam near Decker, MT
Tongue River at Birney Day School near Birney, MT

6. Suspended-sediment data are being collected on a daily basis at South Fork Powder River near Kayee, WY, at Powder River at Sussex, WY, and at Powder River at Arvada, WY, and on a monthly and storm-event basis at Salt Creek near Sussex, WY, in cooperation with the BLM.

Lower Yellowstone Subregion

1. Suspended-sediment data are being collected on a daily basis at Yellowstone River near Sidney, MT, in cooperation with the COE.

2. Suspended-sediment data are being collected on a monthly basis at East Fork Armelles Creek near Colstrip, MT, and Cow Creek near Colstrip, MT, and quarterly at Rosebud Creek near Colstrip, MT, in cooperation with the Montana Department of State Lands.

3. Suspended-sediment data are being collected on a quarterly basis at Rosebud Creek at mouth near Rosebud, MT, and Burns Creek near Sevege, MT, in cooperation with the BLM.

4. Suspended-sediment data are being collected on a monthly basis at the following sites as part of the Federal CBR program:

Sarpy Creek near Hysham, MT
O'Fallon Creek near Ismay, MT
Yellowstone River near Miles City, MT
Beaver Creek at Wibaux, MT

5. Suspended-sediment data are being collected on a quarterly basis at Rosebud Creek at Reservation Boundary, near Kirby, MT, in cooperation with the Bureau of Indian Affairs.

6. Suspended-sediment data are being collected on a monthly basis at Armells Creek near Forsyth, MT, in cooperation with the Montana Department of Natural Resources.

Missouri-Little Missouri Subregion

1. Suspended-sediment data are being collected on a periodic basis at Bear Den Creek near Mandaree, ND, as part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a periodic basis at Little Missouri River near Watford City, ND, as part of NASQAN.

3. Suspended-sediment data are being collected on a quarterly basis at the following sites as part of the coal hydrology program:

Deep Creek near Amidon, ND (discontinued September 30, 1983)

Missouri-Oahe Subregion

1. Suspended-sediment data are being collected on a periodic basis at Knife River at Hazen, ND, at Heart River near Mandan, ND, and at Cannonball River at Breien, ND, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Grand River at Little Eagle, SD, as a part of NASQAN.

3. Suspended-sediment data are being collected on a bimonthly basis at Moreau River near Whitehorse, SD, as a part of NASQAN.

Cheyenne Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Belle Fourche River near Elm Springs, SD, and on a quarterly basis at Cheyenne River at Cherry Creek, SD, as a part of NASQAN.

2. Suspended-sediment data are being collected on a storm-event basis in cooperation with the South Dakota Department of Water and Natural Resources at the following sites (discontinued September 30, 1984):

Cheyenne River near Wasta, SD
Belle Fourche River near Fruitdale, SD
Belle Fourche River above mouth of Whitewood Creek, SD
Whitewood Creek above Lead, SD
Whitewood Creek above Whitewood, SD
Whitewood Creek near Whitewood, SD
Whitewood Creek above Vale, SD
Belle Fourche River at Vale, SD
Belle Fourche River near Sturgis, SD
Belle Fourche River near Elm Springs, SD
Cheyenne River near Plainview, SD
Cheyenne River at Cherry Creek, SD

3. Suspended-sediment data are being collected on a quarterly basis at Castle Creek above Deerfield Dam, near Hill City, SD, as a part of the National Hydrologic Benchmark Network.

Missouri- White Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Missouri River at Pierre, SD, and at Missouri River below Fort Randall Dam, SD, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Bad River near Fort Pierre, SD, in cooperation with the COE.

3. Suspended-sediment data are being collected on a daily basis at White River near Ocoma, SD, in cooperation with the COE.

Niobrara Subregion

1. Suspended-sediment data are being collected on approximately a bimonthly basis at Niobrara River near Verdel, NE, as a part of NASQAN.

James Subregion

1. Suspended-seiment data are being collected on a periodic basis at James River at LaMoure, ND, James River at Pingree, ND, James River at Jamestown, ND, and James River near Ludden, ND, as part of the Missouri River program.

2. Suspended-sediment data are being collected on a bimonthly basis at James River near Columbia, SD, as a part of NASQAN.

3. Suspended-sediment data are being collected on a quarterly basis at James River near Scotland, SD, as part of NASQAN.

Missouri - Big Sioux Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Big Sioux River at Akron, IA, as a part of NASQAN.

North Platte Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at North Platte River near Lisco, NE, as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Encampment River above Hog Park Creek near Encampment, WY, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a daily basis with an automatic pumping sampler during periods of flow at Stinking Creek above Lawn Creek near Alcova, WY, and at North Platte River above Poison Spider Creek near Goose Egg, WY, in cooperation with the BLM.

4. Suspended-sediment data are being collected on a monthly and storm-event basis at North Platte River at Alcova, WY, as part of NASQAN.

South Platte Subregion

1. Suspended-sediment data are being collected on a quarterly basis at South Platte River at Julesburg, CO, as a part of NASQAN.

Platte Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Platte River near Duncan, NE, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Platte River at Louisville, NE, as a part of NASQAN.

Loup Subregion

1. Suspended-sediment data are being collected once during winter months and twice during spring high-flow periods at Loup River near Genoa, NE, as a part of NASQAN.

2. Suspended-sediment data are being collected on a bimonthly basis at the diversion to the Loup River Power Canal near Genoa, NE, as part of NASQAN.

3. Suspended-sediment data are being collected on a quarterly basis at Dismal River near Thedford, NE, as part of the National Hydrologic Benchmark Network.

Elkhorn Subregion

1. Suspended-sediment data are being collected at Elkhorn River at Waterloo, NE, on a bimonthly basis as a part of NASQAN.

Missouri-Little Sioux Subregion

1. Suspended-sediment data which includes bed material, suspended-sediment samples, and velocities at several points in a vertical are being collected at the following stations in cooperation with the COE, Omaha District:

Missouri River at Sioux City, IA
Missouri River at Omaha, NE
Missouri River at Nebraska City, NE

2. Suspended-sediment data are being collected at Missouri River at Sioux City, IA, and Missouri River at Omaha, NE, as a part of NASQAN.

Missouri-Nishnabotna Subregion

1. Suspended-sediment data are being collected on a daily basis at Nodaway River at Clarinda, IA, in cooperation with the Iowa Geological Survey.

2. Suspended-sediment data are being collected on a quarterly basis at Nishnabotna River above Hamburg, IA, as a part of NASQAN.

3. Suspended-sediment data are being collected on a quarterly basis at Platte River at Sharps Station, MO, and bimonthly at Missouri River at St. Joseph, MO, as a part of NASQAN.

Republican Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Beaver Creek at Cedar Bluffs, KS, South Fork Sappa Creek near Brewster, Prairie Dog Creek above Keith Sebelius Lake, and White Rock Creek near Burr Oak, KS, in cooperation with the Kansas Water Office.

2. Suspended-sediment data are being collected on a 6-week basis at Republician River near Clay Center, KS, as part of NASQAN.

Smoky Hill Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Smoky Hill River at Enterprise, KS, Saline River at Tescott, KS, North Fork Smoky Hill River near McAllaster, KS, Big Creek near Hays, KS, North Fork Big Creek near Victoria, KS, Saline River near Russell, KS, North Fork Solomon River at Glade, KS, and South Fork Solomon River above Webster Reservoir, KS, in cooperation with the Kansas Water Office.

2. Suspended-sediment data are being collected on a 6-week basis at Solomon River at Niles, KS, in cooperation with Kansas Department of Health and Environment.

Kansas Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Kansas River at Wamego, KS, Little Blue River near Barnes, KS, and Stranger Creek near Tonganoxie, KS, in cooperation with the Kansas Water Office, and at Big Blue River near Manhattan, KS, as part of NASQAN.

2. Suspended-sediment data are being colected on a 6-week basis at Kings Creek near Manhattan, KS, as part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a 6-week basis at Kansas River at DeSoto, KS, as part of NASQAN.

Chariton-Grand Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Elk Creek near Decatur City, IA, as part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a quarterly basis at Grand River near Summer, MO, and at Chariton River near Prairie Hill, MO, as a part of NASQAN.

Gasconade-Osage Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Dragoon Creek near Burlingame, KS, and Pottawatomie Creek near Garnett, KS, in cooperation with the Kansas Water Office.

2. Suspended-sediment data are being collected on a bimonthly basis at Osage River below St. Thomas, MO, and at Gasconade River above Jerome, MO, as a part of NASQAN.

3. Suspended-sediment data are being collected on a bimonthly basis at Osage River near Schell City, MO, as a part of NASQAN.

Lower Missouri Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Missouri River at Hermann, MO, as a part of NASQAN.

2. Suspended-sediment data are being collected on a bimonthly basis at Lamine River near Blackwater, MO, as part of NASQAN.

Special Studies

1. PS-69 pumping sediment samplers are operating at Lower Hay Creek Tributary near Wilbaux, MT, discontinued September 30, 1981, and at West Branch Antelope Creek Tributary No. 4 near Zap, ND, as part of EMERIA studies. Sediment data are collected at these and several other sites in the study basins.

2. A project which will investigate methods to estimate sediment production for a storm-runoff event was started in Wyoming. Sediment data which is on file will be used in the analysis.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Bldg. 53, Denver Federal Center
Mail Stop 415, Box 25046
Lakewood, CO 80225

District Chief, WRD
U.S. Geological Survey
1950 Constant Ave., Campus West
Lawrence, KS 66046

District Chief, WRD
U.S. Geological Survey
Federal Building, Room 428
301 South Park Ave., Drawer 10076
Helena, MT 59626

District Chief, WRD
U.S. Geological Survey
821 East Interstate Avenue
Bismarck, ND 58501

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
Cheyenne, WY 82003

District Chief, WRD
U.S. Geological Survey
P.O. Box 1230
Iowa City, IA 52244

District Chief, WRD
U.S. Geological Survey
1400 Independence Road
Mail Stop 200
Rolla, MO 65401

District Chief, WRD
U.S. Geological Survey
Room 406, Federal Building
100 Centennial Mall, North
Lincoln, NE 68508

District Chief, WRD
U.S. Geological Survey
Federal Building, Room 317
200 4th Street, S.W.
Huron, SD 57350

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and/or determinations of sediment yields were made for the following watersheds.

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Missouri River	Locust Creek	Locust Creek	Appanoose Wayne Putnam Sullivan	Iowa Missouri
Heart River	Belfield	Heart River	Stark Billings	North Dakota
Nishnabotna River	Turkey Creek	Turkey Creek	Cass	Iowa
Boyer River	Mill-Picayune	Mill Creek	Shelby	Iowa
Thompson River	Twelve Mile Creek	Twelve Mile Creek	Union	Iowa
Nishnabotna River	Troublesome Creek	Troublesome Creek	Audubon	Iowa
Little Nemaha River	South Branch	Little Nemaha River	Johnson Lancaster Otoe	Nebraska
Little Nemaha River	Wilson Creek	Wilson Creek	Cass Otoe	Nebraska
Nemaha River	Middle Big Nemaha	Nemaha River	Johnson	Nebraska
Platte River	Gering Valley	Gering Drain	Scotts Bluff	Nebraska
Missouri River	Winnebago-Bean	Bean Creek & Winnebago Creek	Richardson	Nebraska
Missouri River	Papillion	Papillion Creek	Washington Douglas Sarpy	Nebraska

Major Drainage	Watershed	Stream	County	State
Elkhorn River	East-West-Dry Maple Creeks	Maple Creek	Stanton Colfax Cumming Dodge Platte	Nebraska
Big Blue River	Soap Creek	Soap Creek	Gage	Nebraska

b. Public Law 534.

Major Drainage	Watershed	Stream	County	State
Little Sioux River	West Wolf	West Wolf Creek	Woodbury	Iowa
Little Sioux River	Big Coon	Big Creek	Woodbury	Iowa
Little Sioux River	Barber Hollow	Barber Creek	Monona	Iowa
Little Sioux River	Reed	Unnamed	Monona	Iowa

c. River Basin Investigations.

Major Basin	Basin Reported	Watershed	State
Platte River	Sand Hills Cooperative Study	---	Nebraska

d. Resource Conservation and Development.

Project Name	County	State
Massena Lake	Cass	Iowa
Western Irrigation	Deuel	Nebraska
Red Willow	Morrill	Nebraska
Long Pine	Brown	Nebraska

e. Studies of sediment damages.

(1) Conservation Operations - PL-46.

River Basin	Major Drainage	Watershed	County	State
1. Missouri	Tongue River	Stoops Draw	Sheridan	Wyoming
2. Missouri	North Platte	Dry creek	Carbon	Wyoming
3. Missouri	North Platte	Rock Creek (off channel)	Carbon	Wyoming

2. Reservoir Sedimentation Surveys.

a. Reservoir sedimentation surveys were completed in the following:

Reservoir	County	State
White Clay, Brewery, Whiskey #14	Atchison	Kansas
Walnut Creek #W-2	Brown	Kansas
Lower Salt Creek #1	Ottawa	Kansas
Kiowa Creek B-9	Elbert	Colorado
Kiowa Creek J-33	El Paso	Colorado
Kiowa Creek K-41	El Paso	Colorado
Kiowa Creek Q-51	Elbert	Colorado
Kiowa Creek R-3	Elbert	Colorado

3. Special Studies.

A cooperative agreement between the State of Montana Department of Natural Resources and Conservation and the Soil Conservation Service was completed. This agreement was relative to a sedimentation study of Petrolia Reservoir and upper drainage area. This reservoir, in Petroleum County, in Sections 24,25 and 36, Township 14N, R28E, is at the junction of Yellow Water and Flat Willow Creeks. The purpose of the study is to determine increased sediment yield due to extensive amount of rangeland plowout in the Petrolia drainage area. The survey is to be completed by 1986.

Erosion maps on 1/50,000 scale were prepared for Kit Carson County, Colorado.

Inventories of sheet, gully, and streambank erosion, including mapping on 1/24,000 scale maps, were made for the upper portions of West Bijou Creek in Elbert and El Paso Counties, Colorado.

ARKANSAS-WHITE-RED REGION

BUREAU OF LAND MANAGEMENT

Colorado

Several agencies are cooperatively involved with identification, study, and control of accelerated erosion in the Badger Creek watershed. Other agencies working with the Bureau include the Colorado Division of Wildlife, Colorado State Land Board and Forest Service, U.S. Forest Service, Soil Conservation Service, Sangre de Cristo Resource Conservation and Development Area, and other local governments. The watershed has been monitored for 5 years, and sediment data are used in determining location and types of control activities. Sediment sampling stations are maintained by the Geological Survey, with BLM providing partial funding.

Bureau of Reclamation

A study was made to assess the existing sedimentation and to project future delta conditions in the Ute Reservoir on the Canadian River. Original (1963) sediment range data and the results of the 1975 resurvey were used to define the deltas on the Canadian River and Ute Creek arms of the reservoir. These delta profiles and the original sediment inflow estimates were then used to estimate the delta configurations in the year 2035.

CORPS OF ENGINEERS

Southwestern Division

Reservoir Sediment Data Summaries (Form 1787) for Eufaula and Heyburn Lakes were approved by the Division.

Albuquerque District

Sediment Load Measurements. Suspended sediment measurements were made daily (more frequent when sediment content varies noticeably) at two stations (Arkansas River below John Martin Reservoir and Purgatoire River below Trinidad Lake near Trinidad) in this region.

Other Investigations

1. Trinidad and John Martin Dams continued to be operated to control sediment in the Arkansas River Basin.

2. In December of 1983, a survey was initiated to re-establish damaged or missing range mounments at Conchas Dam. The work was completed by March 1984.

3. The Hydrologic Engineering Center under contract with the District undertook a sediment investigation on the Arkansas River between Pueblo, Colorado and John Martin Dam. The study is primarily to analyze the future performance of various flood control alternatives in the vicinity of La Junta, Colorado with regard to channel stability, sediment movement and project maintenance. A draft report has been completed and is being reviewed at the District level. The final report will be completed 1985 (CY) after the final project design has been evaluated.

Little Rock District

Sedimentation Surveys. Sediment ranges in Ozark Lake, Dardanelle Lake, the Entrance Channel, and Pools 3, 4, 5, 8, and 9 were resurveyed with Motorola automated hydrographic survey equipment.

Sediment Load Meausrements. Measurements continued at 34 stations during the year on Arkansas River, Mulberry, Spadra Creek, Little Piney creek, Piney Creek, Petit Jean, Fourche La Fave, White River, Taylor Bay, James River, Bryant Creek, North Fork, Current River, Black River, Piney Fork, Strawberry River and Little Red River. 115 sediment measurements were obtained and the concentration in percent of weight records maintained.

Tulsa District

Sedimentation Surveys. The pole monument installation contract for Fall River and Toronto Lakes, Kansas were completed in April 1984. A reconnaissance

survey was conducted at Fall River Lake after completion of the pole monument installation contract. Detailed resurveys of Elk City Lake, Kansas, Pat Mayse Lake, Texas and Lake Texoma, Oklahoma and Texas were initiated and completed except for Lake Texoma which is to be completed in late February 1985. The original survey of Skiatook Lake was completed. A detailed hydrographic resurvey of Lake Abiquiu, New Mexico for Alburquerque District was completed in September. Hydrographic surveys were performed in conjunction with Fort Worth District, Lower Colorado River Authority and the University of Texas at Austin at Lake Travis, Lake Lyndon Johnson, Lake Marble Falls, Roy Inks Lake and Lake Buchanan, Texas.

Sediment Load Measurements. The suspended sampling program consists of 45 stations. Presently there are 37 operational stations in the arkansas River Basin and 8 operational stations in the Red River Basin. Samplers DY 48 and DH 49 were used.

Other Investigations. Reservoir sediment Data Summaries (ENG Form 1787) for Eufaula, Heyburn and Marion Lakes have been prepared and submitted for approval and as of 31 December 1984, the Marion Lake Summary has not been approved. Software developments have been made to computerize the processing of the Reservoir Sediment Data Summary, ENG Form 1787.

ARKANSAS-WHITE-RED REGION

GEOLOGICAL SURVEY

Upper White Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at North Sylamore Creek near Fifty Six, AR, as part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a bimonthly basis at White River at Newport, AR, as a part of the National Stream Quality Accounting Network (NASQAN).

3. Suspended-sediment data are being collected on a daily basis at the following stations in cooperation with the Soil Conservation Service:

Little Black River near Grandin, MO
Little Black River below Fairdealing, MO
Logan Creek at Oxly, MO
Little Black River at Success, AR

4. Suspended-sediment data are being collected periodically at Little Black River ditch 2 near Sinsabaugh, MO, in cooperation with the Soil Conservation Service.

Upper Arkansas Subregion

1. Suspended-sediment data are being collected on a monthly basis at Badger Creek, Upper station near Howard, CO, and Badger Creek, Lower station near Howard, CO, in cooperation with the U.S. Bureau of Land Management.

2. Suspended-sediment data are being collected on a bimonthly basis at Arkansas River at Portland, CO, in cooperation with the U.S. Bureau of Reclamation (USBR), Lower Missouri River Basin Region.

3. Suspended-sediment data are being collected on a bimonthly basis at Halfmoon Creek near Malta, CO, as a part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a daily basis at the following stations, in cooperation with the U.S. Army Corps of Engineers (COE):

Purgatoire River near Thatcher, CO
Taylor Arroyo blw. Rock Crossing near Thatcher, CO
Chacauco Creek at mouth near Timpas, CO
Bent Canyon Creek at mouth near Timpas, CO
Purgatoire River at Rock Crossing near Timpas, CO
Burke Arroyto Trib near Thatcher, CO
Luning Arroyo Trib near Model, CO
Big Arroyo near Thatcher, CO

Middle Arkansas Subregion

1. Suspended-sediment data are being collected on a 6-week basis at the following sites in cooperation with the Kansas Water Office:

Arkansas River at Syracuse, KS
Whitewoman Creek near Leoti, KS
Mulberry Creek near Dodge City, KS
Arkansas River near Kinsley, KS
Pawnee River near Larned, KS
Walnut Creek at Albert, KS
Rattlesnake Creek near Macksville, KS
Cow Creek near Claflin, KS
Cow Creek near Lyons, KS
Arkansas River near Hutchinson, KS
Little Arkansas River at Alta Mills, KS
North Fork Ninnescah River above Cheney Reservoir, KS
South Fork Ninnescah River near Pratt, KS
South Fork Ninnescah River near Murdock, KS
Ninnescah River near Peck, KS
Slate Creek at Wellington, KS
Whitewater River at Towanda, KS
Arkansas River at Arkansas City, KS
Walnut River at Winfield, KS

2. Suspended-sediment data are being collected on a 6-week basis at Arkansas River near Coolidge, KS, as part of NASQAN.

3. Suspended-sediment data are being collected on a 6-week basis at Little Arkansas River at Valley Center, KS, in cooperation with the COE.

Upper Cimarron Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Bear Creek near Johnson, KS, Cavalry Creek at Coldwater, KS, North Fork Cimarron River at Richfield, KS, and Crooked Creek near Nye, KS, in cooperation with the Kansas Water Office.

2. Suspended-sediment data are being collected at Cimarron River near Englewood, KS, in cooperation with the USBR.

Lower Cimarron Subregion

1. Suspended-sediment data are being collected at Cimarron River near Buffalo, OK, as a part of NASQAN.

2. Suspended-sediment data are being collected at Cimarron River at Perkins, OK, in cooperation with the COE and Oklahoma Conservation Commission, and as a part of NASQAN.

3. Suspended-sediment data are being collected at Cottonwood Creek near Navina, OK, in cooperation with the USBR.

Arkansas-Keystone Subregion

1. Suspended-sediment data are being collected at Arkansas River near Ponca City, OK, Salt Fork Arkansas River Near Jet, OK, and Salt Fork Arkansas River at Alva, OK, in cooperation with the COE.

2. Suspended-sediment data are being collected at Arkansas River at Ralston, OK, as a part of NASQAN, and in cooperation with the COE and the Oklahoma Conservation Commission.

Neosho-Verdigris Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Lightning Creek near McCune, KS, and at Neosho River near Parsons, KS, in cooperation with the Kansas Water Office.

2. Suspended-sediment data are being collected on a 6-week or periodic basis at the following sites in cooperation with the COE:

Otter Creek at Climax, KS
Elk River at Elk Falls, KS
Big Hill Creek near Cherryvale, KS
Neosho River at Council Grove, KS
Neosho River near Americus, KS
Cottonwood River below Marion Lake, KS
Cottonwood River near Plymouth, KS

3. Suspended-sediment data are being collected at Newt Graham Lock and Dam (Verdigris River) near Inola, OK, and at Neosho River below Fort Gibson Lake near Fort Gibson, OK, as a part of NASQAN.

4. Suspended-sediment data are being collected at Neosho River near Commerce, OK, in cooperation with the COE.

5. Suspended-sediment data are being collected at Tar Creek at Miami, OK, as part of a study of water discharging abandoned zinc mines in Northeastern Oklahoma.

Upper Canadian Subregion

1. Suspended-sediment data are being collected at the following stations at this indicated frequency in cooperation with the New Mexico Interstate Stream Commission:

Una de Gato Creek near Raton, NM (semiannual)
Vermejo River near Dawson, NM (bimonthly)
Cimmaron River below Eagle Nest, NM (annual)
Cimmaron River near Cimmaron, NM (semiannual)
Ponil Creek near Cimmaron, NM (bimonthly)
Rayado Creek near Cimmaron, NM (bimonthly)
Mora River at La Cueva, NM (bimonthly)
Ute Reservoir near Logan, NM (annual)
Revuelto Creek near Logan, NM (bimonthly)

2. Suspended-Sediment data are being collected on a bimonthly basis at the Canadian River near Sanchez, NM, in conjunction with the Water Quality Surveillance Program in cooperation with NMISC.

3. Suspended-sediment data are being collected on a bimonthly basis at the Canadian River above New Mexico - Texas State line as a part of NASQAN.

4. Reservoir sedimentation survey was made on UTR Reservoir in Quay County, NM, in cooperation with NMISC.

Lower Canadian Subregion

1. Suspended-sediment data are being collected at Canadian River near Whitefield, OK, and at Canadian River near Canadian, TX, as part of NASQAN.

2. Suspended-sediment data are being collected at Little River near Bowlegs, OK, in cooperation with the USBR.

3. Suspended-sediment are being collected at Canadian River at Calvin, OK, as a part of NASQAN and in cooperation with the COE and the Oklahoma Conservation Commission.

4. Suspended-sediment data are being collected at Canadian River at Bridgeport, OK, in cooperation with the Oklahoma Water Resources Board.

North Canadian Subregion

1. Suspended-sediment data are being collected at North Canadian River at Woodward, OK, and at Beaver River at Beaver, OK, as a part of NASQAN.

2. Suspended-sediment data are being collected at North Canadian River near Wetumka, Ok, in cooperation with the Oklahoma Conservation Commission and as a part of NASQAN.

3. Suspended-sediment data are being collected at the following sites in cooperation with the COE:

Beaver River near Guymon, OK
Beaver River near Hardesty, OK
North Canadian River near Seiling, OK
North Canadian River below Lake Overholser near Oklahoma City, OK
Deep Fork near Arcadia, OK
Deep Fork near Warwick, OK

4. Suspended-sediment data are being collected at Deep Fork near Beggs, OK, for NASQAN and in cooperation with the COE and the Oklahoma Conservation Commission.

5. Suspended-sediment data are being collected at North Canadian River near Harrah, OK, in cooperation with the Oklahoma Water Resources Board.

Lower Arkansas Subregion

1. Suspended-sediment data are being collected on a monthly basis at Arkansas River at Tulsa, OK, and on a bimonthly basis at Arkansas River at Dam 13 near Van Buren, AR, and at Arkansas River at David D. Terry Lock and Dam below Little Rock, AR, as a part of NASQAN.

Red Headwaters Subregions

1. Suspended-sediment data are being collected periodically at North Fork Red River near Headrick, OK, at Salt Fork Red River near Elmer, OK, at Prairie Dog Town Red River near Wayside, TX, and at Prairie Dog Town Fork Red River near Childress, TX, as a part of NASQAN.

Red-Washita Subregion

1. Suspended-sediment data are being collected periodically at Red River near Burkburnett, TX, at Red River at Denison Dam near Denison, TX, and at Red River near Gainesville, TX, as a part of NASQAN.

2. Suspended-sediment data are being collected at Washita River near Dickson, OK, in cooperation with the COE and Oklahoma Conservation Commission, and as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis at the following sites in cooperation with the COE:

Red River near Quanah, TX
North Wichita River near Truscott, TX
Red River near DeKalb, TX

4. Suspended-sediment data are being collected at Blue Beaver Creek near Cache, OK, as part of the National Hydrologic Benchmark Network.

Red-Sulphur Subregion

1. Suspended-sediment data are being collected at Kiamichi River near Big Cedar, OK, as a part of the National Hydrologic Benchmark Network and in cooperation with the COE.

2. Suspended-sediment data are being collected on a quarterly basis at Little River at Millwood Dam, near Ashdown, AR, and at Sulphur River south of Texarkana, AR, and bimonthly at Red River at Index, AR, as a part of NASQAN.

3. Suspended-sediment data are being collected on a quarterly basis at Twelvemile Bayou near Dixie, LA, and Red River at Alexandria, LA, as a part of NASQAN.

4. Suspended-sediment data are being collected on a daily basis at Bayou Pierre near Lake End and on a monthly basis at Grand Bayou near Coushatta, LA, as a part of a lignite study for the Louisiana Office of Public Works.

For additional information about U.S. Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Federal Office Building
Room 2301
700 West Capitol Avenue
Little Rock, AR 72201

District Chief, WRD
U.S. Geological Survey
P.O. Box 66492
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
215 Dean A. McGee Avenue
Room 621
Oklahoma City, OK 73102

District Chief, WRD
U.S. Geological Survey
Bldg. 53, Denver Federal Center
Mail Stop 415, Box 25046
Lakewood, CO 80225

District Chief, WRD
U.S. Geological Survey
1950 Constant Avenue - Campus West
Lawrence, KS 66046

District Chief, WRD
U.S. Geological Survey
505 Marquette NW, Room 720
Western Bank Building
Albuquerque, NM 87102

District Chief, WRD
U. S. Geological Survey
649 Federal Building
300 East 8th Street
Austin, TX 78701

ARKANSAS - WHITE - RED REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for work plans in the following watersheds:

   a. Public Law 566.

Major Drainage	Watershed	Stream	County	State
Cimarron River	Wild Horse Creek	Wild Horse	Payne	OK
Cimarron River	Fairview FPM Stdy	Sand Creek	Major	OK
Red River	Waterfall-Gilford	Waterfall-Gilford	McCurtain	OK
Red River	Lower Bayou	Simon Walnut Bayou	Carter Love	OK
Arkansas River	Sans Bois Bois d'Arc-Cowskin South Canadian	Sans Bois Boise d'Arc-Cowskin Buckhead	Haskell Kay Cleveland	OK OK
Grand River	Upper & Lower Big Cabin	Big and Little Cabin Frazier Branch West Fork Thompson White Oak Cool	Craig	OK

2. Reservoir Sedimentation Surveys.

   Reservoir sedimentation surveys were made on the following reservoirs:

Reservoir	County(s)	State
Rock Creek, Site No. 6	Murray	OK
Rush Creek, Site No. 2	Grady	OK
Tramperos Creek, Site No. 2	Union	New Mexico

3. Special Studies.

   An inventory of erosion including mapping on 1/24,000 scale maps, was made for planning purposes on the Wolf Creek Highlands Watershed, Prowers County, Colorado.

Bureau of Reclamation

A sediment study was prepared for the proposed Shaw's Bend Reservoir on the Colorado River. The study was based upon a flow duration, sediment rating curve analysis for the Colorado River at Columbus, Texas gaging station. The estimated 50- and 100-year sediment accumulations in the reservoir are 44,300 acre-feet and 83,800 acre-feet for a reservoir normal water surface at elevation 225 feet. The corresponding figures for a normal water surface elevation of 220 feet are 40,600 acre-feet and 77,000 acre-feet. The average sediment yield rate was computed to be 527 tons per square mile per year.

CORPS OF ENGINEERS

Southwestern Division

The SWD Laboratory received 2132 bottled samples for determination of percent of sediment. There were 37 bed load material samples received for testing.

Galveston District

A total of 187 inplace samples were obtained from eight navigation projects. These samples were analyzed to determine the quality of the sediment relative to chemical constituents which would be resuspended during dredging, disposal activities and construction. The projects sampled and number of samples taken are as follows:

Navigation Project	Number of Samples
Gulf Intracoastal Waterway	62
Miscellaneous	32
Sabine-Neches Waterway	29
Houston Ship Channel	27
Freeport Harbor	13
Galveston Harbor	10
Trinity River	5
Texas City Channel	5
Matagorda Ship Channel	4
Total	187

TEXAS-GULF REGION

GEOLOGICAL SURVEY

Sabine Subregion

1. Suspended-sediment data are being collected at Sabine River near Ruliff, TX, as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data are being collected on a daily basis at Bayou Grand Cane near Stanley, LA, Bayou Castor near Logansport, TX, and Bayou San Patricio near Benson, LA, as a part of a lignite study for the Louisana Office of Public Works. Suspended-sediment data is also being collected at Bayou Grand Cane near Stanley, LA, and Bayou Castor near Logansport, TX, on an event basis with a PS-69.

3. Suspended-sediment data are being collected on a daily basis at Big Sandy Creek near Big Sandy, TX, in cooperation with the U.S. Bureau of Reclamation (USBR) beginning October 1, 1984.

Neches Subregion

1. Suspended-sediment data are being collected on a periodic basis at Neches River at Evadale, TX, as a part of NASQAN.

Trinity Subregion

1. Suspended-sediment data are being collected on a periodic basis at Mountain Creek near Cedar Hill, TX, Duck Creek near Garland, TX, and at Kings Creek near Kaufman, TX, as a part of the Federal CBR program (discontinued September 30, 1982).

2. Suspended-sediment data are being collected on a periodic basis at Trinity River at Trinidad, TX, as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis at Trinity River at Romayor, TX, and at Chocolate Bayou near Alvin, TX, as a part of NASQAN.

4. Suspended-sediment data are being collected on a daily basis at Bedias Creek near Madisonville, TX, in cooperation with the USBR.

Galveston Bay - San Jacinto Subregion

1. Suspended-sediment data are being collected on a periodic basis at West Fork San Jacinto River near Conroe, TX, and at Buffalo Bayou at West Belt Dr., Houston, TX, as part of NASQAN.

Middle Brazos Subregion

1. Suspended-sediment data are being collected on a periodic basis at Salt Fork Brazos River near Aspermont, TX, Double Mountain Fork Brazos River near Aspermont, TX, Brazos River near Highbank, TX, and at Brazos River near South Bend, TX, as a part of NASQAN.

Lower Brazos Subregion

1. Suspended-sediment data are being collected on a daily basis at Brazos River at Richmond, TX, as part of the Federal CBR program and also as part of NASQAN.

2. Suspended-sediment data are being collected four times a year at South Fork Rocky Creek near Briggs, TX, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a periodic basis at Little River near Cameron, TX, as a part of NASQAN.

Upper Colorado Subregion

1. Suspended-sediment data were being collected on a periodic basis at Colorado River above Silver, TX, as a part of NASQAN.

Lower Colorado-San Bernard Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Colorado River at Austin, TX, Colorado River at Wharton, TX, Colorado River near San Saba, TX, and at San Bernard River near Boling, TX, as a part of NASQAN. The collection of suspended-sediment data at Llano River at Llano, TX, began April 1, 1979, as part of NASQAN.

2. Suspended-sediment data for total-load determination is being collected on a periodic basis at Colorado River above Columbus, TX, in cooperation with the Lower Colorado River Authority beginning October 1, 1982.

Central Texas Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Guadalupe River at Victoria, TX, San Antonio River at Goliad, TX, Lavaca River near Edna, TX, and at Mission River at Refugio, TX, as a part of NASQAN.

Nueces-Southwestern Texas Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Nueces River near Three Rivers, TX, as a part of NASQAN.

For additional information about U.S. Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
649 Federal Building
300 East 8th Street
Austin, TX 78701

RIO GRANDE REGION

BUREAU OF LAND MANAGEMENT

Colorado

The objective of the San Luis Valley study is to evaluate the watershed responses, as measured by runoff and sediment yield associated with changes in grazing intensities. Automatic sediment samplers are operated on San Luis Creek by the Geological Survey. This is an ongoing monitoring study that has been in process for several years.

Also in process is the construction of checks dams, contours, and diversions in the San Luis Resource Area. These water control structures are a part of a plan to stabilize 350 acres of public land. These lands are presently producing excessive runoff and erosion.

New Mexico

Bureau of Land Management continued the funding of basic sediment data collection at three continuous-record stations in the Rio Puerco drainage basin, a major sediment producer to the Rio Grande. The study objective is to evaluate the impacts of intensive grazing management on runoff and sediment yield in the Rio Puerco drainage and was initiated in the summer of 1981. Small watersheds were instrumented with rainfall-runoff gages and Manning automatic water samplers. This study is being conducted in cooperation with the Geological Survey and the Forest Service.

Bureau of Reclamation

Hydrographic surveys were completed for El Vado and Heron Reservoirs in northern New Mexico. Heron Reservoir is located on Willow Creek and El Vado Reservoir is on the Rio Chama. Because much of the data from previous surveys of El Vado Reservoir could not be located, it was decided to obtain sufficient underwater survey data so that new underwater topography could be developed. Heron Reservoir was surveyed using the more conventional range line method.

CORPS OF ENGINEERS

Southwestern Division

Albuquerque District

Sedimentation Surveys.

1. A hydrographic survey of the sediment ranges at Abiquiu Reservoir was conducted in July 1984. Abiquiu Reservoir was also resurveyed by aerial methods in December 1984. The purpose of the survey is to determine changes in overall reservoir storage. The letter report describing and analyzing the reservoir sedimentation resurvey at Abiquiu Reservoir is scheduled for completion in calendar year 1985.

2. Two new area-capacity tables will be adopted on 1 January 1985, for Jemez Canyon Reservoir and Galisteo Reservoir. Two letter reports describing and analyzing the reservoir sedimentation surveys at Jemez canyon Reservoir and Galisteo Reservoir were completed. The Jemez Canyon Reservoir Report is under review at the Division and the Galisteo Reservoir Report is presently being reviewed at the District level.

Sediment Load Measurements. Suspended sediment measurements were made at five stations. These stations are located on Rio Chama above Abiquiu Dam, below Abiquiu Dam, near Chamita, NM; on Rio Grande below Cochiti Lake; and on Jemez River below Jemez Canyon Dam. All samples are secured by the DH-48, DH-59, or DH-49 samplers according to flow conditions.

Other Investigations.

1. Abiquiu, Cochiti, Galisteo, and Jemez Canyon Dams continued to be operated to control sediment flow in the Rio Grande.

2. In July 1984, a survey was initiated to re-establish damaged or missing range mounments at Abiquiu Reservoir. Also, new intermediate range monuments were added to facilitate re-surveys with the authorized storage of 200,000 acre-feet of San Juan water. The work was completed in July 1984.

RIO GRANDE REGION

GEOLOGICAL SURVEY

Rio Grande Headwaters Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Rio Grande near Lobatos, CO, as a part of the National Stream Quality Accounting Network (NASQAN).

Rio Grande-Elephant Butte Subregion

1. Suspended-sediment data are being collected on a semiannually basis at Red River below Fish Hatchery near Questa, NM, and Embudo Creek at Dixon, NM, in cooperation with the New Mexico Interstate Streams Commission (NMISC) and the U.S. Bureau of Land Management (BLM).

2. Suspended-sediment data are being collected on a bimonthly basis at Rio Chama above Abiquiu Reservoir, NM, Rio Chama below Abiquiu Dam, NM, and at Rio Chama near Chamita, NM, in cooperation with the U.S. Army Corps of Engineers (COE).

3. Suspended-sediment data are being collected on a daily basis at Rio Grande at Otowi Bridge near San Ildefonso, NM, and at Rio Grande near Albuquerque, NM, as a part of the Federal CBR program.

4. Suspended-sediment data are being collected on a daily basis at Rio Grande below Cochiti Dam, NM, in cooperation with the COE.

5. Suspended-sediment data are being collected on a daily basis at Arroyo Chico near Guadalupe, NM, at Rio Puerco above Arroyo Chico near Gaudalupe, NM, and at Rio Puerco near Bernardo, NM, in cooperation with the BLM, NMISC, and COE.

6. Suspended-sediment data are being collected on a bimonthly basis at Rio Grande at San Felipe, NM, and at Rio Grande at Isleta, NM, in conjunction with the Water Quality Surveillance Program and financed cooperatively by NMISC.

7. Suspended-sediment data are being collected at Santa Fe River above Cochiti Dam, NM (quarterly), Cochiti Lake, NM (semiannually), and Jemez River near Jemez, NM (semiannually), in cooperation with the NMISC.

8. Suspended-sediment data are being collected on a daily basis at Rio Grande near Bernardo, NM, at Rio Grande at San Acacia, NM, and at Rio Grande at San Marcial, NM, in cooperation with NMISC.

9. Suspended-sediment data for total-load determinations are being collected on a monthly basis at Rio Grande at Albuquerque, NM, at Rio Grande near Bernardo, NM, at Rio Grande at San Acacia, NM, and Rio Grande at San Marcial, NM, in cooperation with NMISC.

10. Suspended-sediment data are being collected on an intermittent basis at Rio Salado near San Acacia, NM, in cooperation with NMISC.

11. Suspended-sediment data are being collected on a quarterly and storm-event basis at Rio Mora near Terrero, NM, as a part of the National Hydrologic Benchmark Network.

12. Suspended-sediment data are being collected on a bimonthly basis at Pecos River above Santa Rosa Lake, NM, and Pecos River near Acme, NM, in cooperation with NMISC.

13. Suspended-sediment data are being collected on a bimonthly and intermittent basis at Pecos River below Sumner Dam, NM (formerly called Alamagordo Dam), in cooperation with NMISC, and as a part of NASQAN.

14. Suspended-sediment data are being collected on a daily basis at Pecos River at Santa Rosa, NM, and at Pecos River near Artesia, NM, as part of the Federal CBR program.

15. Suspended-sediment data were collected on a bimonthly basis at Pecos River near Puerto de Luna, NM, in conjunction with the Water Quality Surveillance Program and in cooperation with NMISC.

16. Suspended-sediment data are being collected on a bimonthly basis at Pecos River at Red Bluff, NM, at Rio Grande at El Paso, TX, and at Rio Grande at Fort Quitman, TX, as a part of NASQAN.

Rio Grande-Amistad Subregion

1. Suspended-sediment data are being collected on a periodic basis at Rio Grande at Foster Ranch, near Langtry, TX, and at Devils River at Pafford Crossing, near Comstock, TX, as a part of NASQAN.

Rio Grande Closed Basins Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Rio Tularosa near Bent, NM, and at Mimbres River near Mimbres, NM, as a part of NASQAN.

Lower Pecos Subregion

1. Suspended-sediment data are being collected on a periodic basis at Pecos River near Langtry, TX, as a part of NASQAN.

Rio Grande-Falcon Subregion

1. Suspended-sediment data are being collected on a periodic basis at Rio Grande at Laredo, TX, as a part of NASQAN.

Lower Rio Grande Subregion

1. Suspended-sediment data are being collected on a periodic basis at Rio Grande River near Brownsville, TX, as part of the Federal CBR program as part of NASQAN (daily sampling discontinued September 30, 1983).

2. Suspended-sediment data are being collected on a weekly or more frequent basis at North Floodway near Sebastion, TX, and at Arroyo Colorado Floodway at El Fuste Siphon, south of Mercedes, TX, as part of the Federal CBR program (discontinued September 30, 1983).

Special Studies

A water-quality monitoring plan for the Rio Grande and Red River in Taos County, NM, was initiated in October 1978 by the BLM. The study objectives are to monitor long-term changes in water quality (chemical and sediment) at 12 selected sampling sites. BLM personnel collect monthly samples and the Geological Survey analyzes the samples and publishes the data.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Bldg. 53, Denver Federal Center
Mail Stop 415, Box 25046
Lakewood, CO 80225

District Chief, WRD
U.S. Geological Survey
505 Marquette, N.W., Room 720
Western Bank Building
Albuquerque, NM 87102

District Chief, WRD
U.S. Geological Survey
649 Federal Building
300 East 8th Street
Austin, TX 78701

RIO GRANDE REGION

SOIL CONSERVATION SERVICE

1. Reservoir Sedimentation Surveys.

   a. Reservoir sedimentation surveys were made on the following reservoirs.

Reservoir	County(s)	State
Santa Cruz, Site #3A	Rio Arriba	New Mexico

UPPER COLORADO REGION

BUREAU OF LAND MANAGEMENT

Colorado

Sediment control, as it relates to salinity reductions, is a major objective on public lands in the Basin Control activities including watershed treatments on 200 acres and installation of 50 instream structures. Sediment and water quality data were collected at Salt Creek in Sinbad Valley, Colorado, as part of the Sinbad Valley Salinity Control Project.

Wyoming

Continued implementation of the Red Creek Watershed Activity Plan included repair of an existing reservoir correction of road drainage problems and fencing to develop a rotation livestock pasture system. Monitoring of improvements to watershed condition is part of ongoing implementation.

The Bureau is developing a watershed activity plan to address the severe erosion problems in Sage and Current Creeks and the related impacts on Flaming George Reservoir. Some work was done by the Bureau's Wildlife Program utilizing beaver in rehabilitating riparian areas along streams.

Bureau of Reclamation

Completed a topographic map of the Glen Canyon Dam tailrace area based upon the October 1983 bathymetric survey. The map was computer generated and shows the scour holes created by the spillway and outlet discharges of 1983.

The comprehensive analysis of the effects of Glen Canyon Dam powerplant operations on the sediment transport and beach erosion of the Colorado River through the Grand Canyon continued throughout 1984. Suspended sediment, hydraulic measurements, and bed material data were collected at five river stations and three tributaries in 1983. the sediment samples collected in 1983 were analyzed in the USBR and USGS laboratories and a data management system was developed for the central computer. Total sediment loads were computed for each of the main river and tributary sampling locations. Predictive sediment transport equations were tested to determine those most applicable to future modeling efforts. Additional data will be collected once the Colorado River system returns to a peaking power operation.

UPPER COLORADO REGION

GEOLOGICAL SURVEY

Colorado Headwaters Subregion

1. Suspended-sediment data are being collected on a daily basis at East Middle Fork Parachute Creek near Rio Blanco, CO, and East Fort Parachute Creek near Rulison, CO, in cooperation with the U.S. Navy.

2. Suspended-sediment data are being collected on a once-a-week basis at Colorado River near Cameo, CO, in cooperation with the Colorado River Water Conservation District.

3. Suspended-sediment data are being collected on a monthly basis at Colorado River near Colorado-Utah State line as a part of the National Stream Quality Accounting Network (NASQAN).

Gunnison Subregion

1. Suspended-sediment data are being collected on a monthly basis at Gunnison River near Grand Junction, CO, as a part of NASQAN.

Upper Colorado-Dolores Subregion

1. Suspended-sediment data are being collected on a comprehensive level at Colorado River near Cisco, UT.

2. Suspended-sediment data are being collected on a bimonthly basis at Dolores River near Cisco, UT, as a part of NASQAN

Great Divide-Upper Green Subregion

1. Suspended-sediment data are being collected on a daily basis at Green River near Green River, WY, as a part of the Federal CBR program.

2. Suspended-sediment data are being collected on a monthly basis at Green River near Greendale, UT, as a part of NASQAN.

White-Yampa Subregion

1. Suspended-sediment data were obtained on a quarterly basis at Yampa River near Maybell, CO, and at Little Snake River near Lily, CO, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Yampa River near Maybell, CO, and on a weekly basis at Little Snake River near Lily, CO, in cooperation with the Colorado River Water Conservation District.

3. Suspended-sediment data are being collected at several sites in the coal mining region of the Yampa River basin. At the following stations samples are collected eight times per year:

Middle Creek near Oak Creek, CO
Foidel Creek near Oak Creek, CO
Foidel Creek at mouth near Oak Creek, CO

These stations are operated in cooperation with the U.S. Bureau of Land Management (BLM).

4. Suspended-sediment data are being collected at several stations in the Piceance Creek basin to monitor the potential impact of the oil shale development project.

Box Elden Gulch near Rangely, CO (annually)
Piceance Creek below Rio Blanco, CO (daily)
Stewart Gulch above West Fork, CO (peaks)
Piceance Creek tributary near Rio Blanco, CO (peaks)
Willow Creek near Rio Blanco, CO (peaks)
Piceance Creek above Hunter Creek, CO (daily)
Piceance Creek below Ryan Gulch, CO (daily)
Piceance Creek at White River, CO (daily)
Corral Gulch below Water Gulch, CO (peaks)
Corral Gulch near Rangely, CO (daily)

These stations are operated in cooperation with Rio Blanco County.

5. Suspended-sediment data are being collected on a comprehensive level at White River near Colorado-Utah State line in cooperation with the Utah Department of Natural Resources.

6. Suspended-sediment data are being collected on a bimonthly basis at White River near Ouray, UT, as part of NASQAN.

7. Suspended-sediment and bedload data are being collected on a comprehensive level at White River below Boise Creek near Rangely, CO, in cooperation with Colorado River Water Conservation District.

8. Suspended-sediment data are being collected quarterly at the following stations in cooperation with the Upper Yampa Conservancy District:

White River below Meeker, CO
Fish Creek at upper station near Steamboat, CO
Walton Creek near Steamboat, CO

9. Suspended-sediment data are being collected on a comprehensive level at Yampa River near Oak Creek, CO, in cooperation with the Upper Yampa Conservancy District.

Lower Green Subregion

1. Suspended-sediment data are being collected on a monthly basis at San Rafael River near Green River, UT, in cooperation with the U.S. Bureau of Reclamation.

2. Suspended-sediment data are being collected on a monthly basis at Price River near Woodside, UT, in cooperation with the U.S. Bureau of Reclamation.

3. Suspended-sediment data are being collected on a comprehensive level at Green River at Green River, UT.

Upper Colorado-Dirty Devil Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Colorado River at Lees Ferry, AZ, as part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Muddy Creek at Delta Mine, near Hanksville, UT, in cooperation with the BLM.

San Juan Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Vallecito Creek near Bayfield, CO, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a daily basis at Animas River at Farmington, NM, as a part of NASQAN.

3. Suspended-sediment data are being collected on a intermittent basis at Chaco River near Waterflow, NM, and on a daily basis at San Juan River at Shiprock, NM, as a part of the U.S. Geological Survey Coal Hydrology Program.

4. Suspended-sediment data are being collected on a monthly basis at La Plata Creek at Colorado-Utah State line and a McElmo Creek at Colorado-Utah State line as a part of the U.S. Geological Survey Coal Hydrology Program.

5. Suspended-sediment data are being collected on a quarterly basis at San Juan River near Bluff, UT, as part of NASQAN.

Special Studies

1. An energy project "Hydrologic Surveillance of Coal Lease Areas in Northwestern New Mexico" was continued. Sediment stations were established throughout the coal lease areas and are financed by Federal CBR and BLM funds.

2. A project which will investigate methods to estimate sediment production for a storm-runoff event was started in Wyoming. Sediment data which is on file will be used in the analysis.

3. As part of the Federal program for determining baseline conditions in the areas of potential oil-shale development in the White River basin, UT, suspended-sediment data are being obtained on a comprehensive level at 4 sites and monthly at 12 sites.

For additional information about Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Federal Building, FB-44
300 West Congress
Tucson, AZ 85701

District Chief, WRD
U.S. Geological Survey
Bldg. 53, Denver Federal Center
Mail Stop 415, Box 25046
Lakewood, CO 80225

District Chief, WRD
U.S. Geological Survey
505 Marquette, N.W., Room 720
Western Bank Building
Albuquerque, NM 87102

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
Cheyenne, WY 82003

District Chief, WRD
U.S. Geological Survey
Room 1016 Administration Building
1745 West 1700 South
Salt Lake City, UT 84104

UPPER COLORADO REGION

SOIL CONSERVATION SERVICE

Upper Colorado Region

1. A reservoir sedimentation survey was made on the following reservoirs:

Reservoir	County(s)	State
Roatcap Wash	Montrose	Colorado

2. Special Studies.

An inventory of erosion in the drainage basins and computations of sediment storage requirements were made for two proposed flood control reservoirs in the Shavano Valley Watershed Project in the Montrose County, Colorado.

Bureau of Reclamation

A feasibility grade sedimentation study was prepared for the proposed Conner Reservoir on the Gila River resulting in 50- and 100-year sediment accumulations of 11,850 acre-feet and 23,700 acre-feet, respectively. The computed sediment yield rate for the Conner Reservoir drainage area was 0.084 acre-feet per square mile per year. A degradation analysis indicated streambed degradation would be limited to 1 foot downstream of the dam.

The cross drainage scour potential was analyzed for the discharge line of the Red Rock Pumping Plant on the Tucson Aqueduct. The 100-year frequency flood peak was estimated to have an associated scour depth of 3.5 feet.

Sedimentation estimates were made for several ponding areas against the Tucson Aqueduct-Reach 3. The 50-year sediment accumulations according to canal stationing are:

30+00 to 286+00	439 acre-feet
286+00 to 451+00	225 acre-feet
451+000 to end of reach	1,371 acre-feet

The 100-year frequency scour depth for the Santa Cruz River siphon of the Tucson Aqueduct-Reach 4 was estimated to be 9 feet.

By contract with the firm of Simons, Li, and Associates an analysis was made of the impact of the proposed Santa Margarita Project on beach sand replenishment from the Santa Margarita River. It was concluded that under existing conditions the Santa Margarita is a relatively insignificant contributor of beach sand to the Oceanside littoral cell (about 15,000 yd^3 per year or about 9 percent of the total). Under full reservoir pool conditions, the contribution with the project in place would be about the same. However, under worst case conditions, i.e., during periods of long reservoir drawdown, the average annual contribution would be about 2,000 yd^3.

LOWER COLORADO REGION

GEOLOGICAL SURVEY

Lower Colorado-Lake Mead Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at the following sites as part of the National Stream Quality Accounting Network (NASQAN):

Virgin River above Halfway Wash near Riverside, NV
Muddy River above Lake Mead near Overton, NV

2. Suspended-sediment data are being collected on a monthly basis at the following sites in cooperation with the U.S. Bureau of Land Management.

Las Vegas Wash near Henderson, NV
Las Vegas Wash near Boulder City, NV

3. Suspended-sediment data are being collected at North Fork Virgin River above Zion Narrows, near Glendale, UT, in cooperation with the Utah Department of Natural Resources.

Little Colorado Subregion

1. Suspended-sediment data are being collected on a daily basis in cooperation with Navago County at Cottonwood Wash near Snowflace, AZ, from October 1981 to May 31, 1984.

2. Suspended-sediment data are being collected on a daily basis in cooperation with the U.S. Corps of Engineers (COE) at Little Colorado River near Joseph City, AZ.

3. Suspended-sediment data are being collected on a flow-event basis at Leroux Wash near Holbrook, AZ, in cooperation with the COE.

4. Suspended-sediment data are being collected on a bimonthly basis at Little Colorado River at Cameron, AZ, as a part of NASQAN.

5. Suspended-sediment data are being collect on a monthly basis at Zuni River above Black Rock Res., NM, in cooperation with the USBR and at Rio Puerco at Gallup, NM, on a semi-annual basis in cooperation with the New Mexico Interstate Stream Commission (NMISC).

Lower Colorado Subregion

1. Suspended-sediment data are being collected on a bimonthly basis as part of NASQAN at:

Colorado River below Hoover Dam, AZ
Bill Williams River near Planet, AZ

Upper Gila Subregion

1. Suspended-sediment data are being collected on a quarterly and storm-event basis at Mongollon Creek near Cliff, NM, as a part of the National Hydrologic Benchwork Network.

2. Suspended-sediment data are being collected on a bimonthly basis at Gila River near Redrock, NM, as part of NASQAN, and at San Francisco River near Glenwood, NM, in cooperation with NMISC.

3. Suspended-sediment data are being collected on a bimonthly basis at Gila River at Calva, AZ, as a part of NASQAN.

Middle Gila Subregion

1. Suspended-sediment data are being collected on a bimonthly basis as a part of NASQAN at the San Pedro River below Aravaipa Creek, near Mammoth, AZ.

2. Suspended-sediment data are being collected on a monthly basis at Gila River at Kelvin, AZ, and San Pedro River below Aravaipa Creek, near Mammoth, AZ, in cooperation with the USBR.

Salt Subregion

1. Suspended-sediment data are being collected on a monthly basis at Wet Bottom Creek near Childs, AZ, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a bimonthly basis as a part of NASQAN at:

Gila River above diversions, at Gillespie Dam, AZ
Gila River near mouth, near Yuma, AZ

Sonora Subregion

1. Suspended-sediment data are being collected on a monthly basis as a part of NASQAN at the Vamori Wash at Kom Vo, AZ.

Special Studies

1. A long-term, ongoing statewide program in Nevada of investigations of sediment and debris transported by flash floods continued during 1984. Flash flooding was extensive and frequent throughout Nevada during 1984, particularly in southern Nevada. Las Vegas had three major floods within a 1-week period. These floods transported inordinate amounts of sediment in numerous ephemeral drainages.

For additional information about U.S. Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
Federal Building
301 West Congress Street, FB-44
Tucson, AZ 85701

Nevada State Office Chief
Idaho-Nevada District
U.S. Geological Survey
Federal Building, R. 227
705 North Plaza Street
Carson City, NV 89701

District Chief, WRD
U.S. Geological Survey
505 Marquette NW, Room 720
Western Bank Bldg.
Albuquerque, NM 87102

District Chief, WRD
U.S. Geological Survey
Room 1016 Administration Building
1745 West 1700 South
Salt Lake City, UT 84104

SOIL CONSERVATION SERVICE

1. Reservoir Sedimentation Surveys.

   a. Reservoir sedimentation surveys were made on the following reservoirs:

Reservoir	County(s)	State
Upper Gila Valley Arroyos Watershed #1, Site #3	Grant	New Mexico
Lyman Lake	Apache	Arizona

GREAT BASIN REGION

BUREAU OF LAND MANAGEMENT

Nevada

The Saval Ranch Research Project is a cooperative effort between the BLM, the Department of Agriculture, Agricultural Research Service (ARS), and the University of Nevada, Reno. The objectives of this project include: development of a climatic data base for use in interpreting other results; monitoring streamflow, sediment yield, and erosion from four small watersheds; and describing and documenting changes in stream geomorphology and subsurface flow in riparian areas.

GREAT BASIN REGION

GEOLOGICAL SURVEY

Bear Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Bear River near Corinne, UT, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis (May to September) at Chicken Creek and Thief Creek near Evanston, WY, as part of a cooperative program with the Wyoming Department of Environmental Quality.

Great Salt Lake Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Red Butte Creek at Fort Douglas, near Salt Lake City, UT, as part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a quarterly basis at Weber River near Plain City, UT, and at Jordan River at Salt Lake City, UT, as a part of NASQAN.

Escalante - Sevier Lake Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Sevier River near Lynndyl, UT, and at Beaver River at Adamsville, UT, as a part of NASQAN.

Black Rock Desert-Humboldt Subregion

1. Suspended-sediment data are being collected bimonthly at the following sites as part of NASQAN:

Humboldt River near Carlin, NV
Humboldt River near Imlay, NV
Humboldt River near Rye Patch, NV
Quinn River near McDermitt, NV

2. Suspended-sediment data are collected periodically at Mahala Creek near Tuscarora, NV, and Gance Creek near Tuscarora, NV, as part of a cooperative program with U.S. Bureau of Land Management.

Central Lahontan Subregion

1. Suspended-sediment data are being collected at the following sites as part of NASQAN:

Walker River near Wabuska, NV (bimonthly)
Carson River near Fort Churchill, NV (quarterly)
Truckee River near Nixon, NV (quarterly)

2. Suspended-sediment data are being collected twice-yearly at the following sites in cooperation with the U.S. Army Corps of Engineers:

Martis Creek at Highway 267 near Truckee, CA
Martis Creek Lake near Truckee, CA
Martis Creek near Truckee, CA

Central Nevada Desert Basins Subregion

1. Suspended-sediment data are being collected quarterly at Steptoe Creek near Ely, NV, and South Twin River near Round Mountain, NV, as part of the National Hydrologic Benchmark Network.

Special Studies

1. A long-term, ongoing statewide program of investigations of sediment and debris transport by flash floods continued during 1984. An intense flood on Ophir Creek near Carson City (Western Nevada) occurred on May 30, 1983. Sediment transport was probably the outstanding hydrologic characteristic of this flood. An interpretative report of this event is being prepared.

A long-term investigation of sediment and debris hazards related to flooding is in the third investigative year at the Nevada Test Site. The test site was hard hit by flash floods in July and August of 1984.

Several additional flash floods in Nevada were investigated, and data on sediment transport were obtained.

For additional information about U.S. Geological Survey activities within this region, contact the following offices:

Nevada Office Chief
Idaho - Nevada District
U.S. Geological Survey
Federal Building, Room 224
705 N. Plaza Street
Carson City, NV 89701

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
Cheyenne, WY 82003

District Chief, WRD
U.S. Geological Survey
1016 Administration Building
1745 West 1700 South
Salt Lake City, UT 84104

GREAT BASIN REGION

SOIL CONSERVATION SERVICE

Reservoir Sedimentation Surveys.

A reservoir sedimentation survey was made in the following reservoirs:

Reservoir	Watershed	County	State
Debris Basin #28	Blue Creek-Howell	Box Elder	Utah

PACIFIC NORTHWEST REGION

BUREAU OF LAND MANAGEMENT

Idaho

The Bureau's Reynold's Creek project activity centers on technology transfer of past and ongoing watershed research by the ARS, including range production models (ERHYM, SPUR), water movement in landfills (HELP Model), use of soil survey data in modeling and USLE adaptation for rangelands. This project provides a valuable link between BLM and ARS.

PACIFIC NORTHWEST REGION

CORPS OF ENGINEERS

North Pacific Division

Portland District

Sedimentation Surveys.

1. Reservoir Surveys. There were no reports on reservoir surveys or re-surveys completed in 1984. There are five reports in progress or planned.

a. Surveys. Two reservoir sedimentation range and investigation design memoranda, for Lost Creek and Applegate projects, are expected to be completed during 1985.

b. Re-surveys. Three re-surveys for reservoir sedimentation are planned. Umatilla and Willow Creek Lakes will be re-surveyed by reconnaissance methods and Fern Ridge Lake will be re-surveyed by photogrammetric techniques and echo sounding of sediment ranges. These reports should be completed in 1985 or early 1986.

2. Channel Surveys. Extensive sedimentation surveys, studies, and reports have been made on the river channels below the Mount St. Helens volcano. This Mount St. Helens work, is in response to the sediment-caused flooding danger resulting from the erosion of the debris avalanche left by the 1980 volcanic eruption. Several previous reports on this subject were noted in last year's report.

a. Reports--completed. Two reports were completed in 1984.

(1) Mount St. Helens, Cowlitz and Toutle Rivers, Sedimentation Study/1984.....Sep 84

(2) Mount St. Helens, WA., Feasibility Report.....Oct 84

b. Reports--planned. One report on Mount St. Helens sedimentation, which updates the continuing study, will be completed about September 1985.

c. Scope. The studies are very comprehensive in that many organizations and analysis methods were utilized. The Vancouver office of the U. S. Geological Survey, Orgeon State University, the Waterways Experiment Station at Vicksburg, and a Technical Advisory Group comprised of special sedimentation consultants are cooperating in and/or contributing to the studies. A large volume of data was gathered and analyzed by the Portland District Sedimentation Section to support the studies.

(1) About 650 River or stream bed material samples were obtained between the mouth of the Columbia River and the volcano.

(2) More than 150 suspended sediment samples were taken.

(3) More than 40 river discharge measurements were made to define sample points.

(4) In the upper Toutle River basin, 13 cross-sections were surveyed at unique loactions to monitor the effects of the planned Spirit Lake drawdown.

(5) During the Spring of 1984, 133 sixty-pound sacks and 23 cubic yards of bulk-type samples were obtained from pits dug in the sediment source areas.

(6) At 12 points on the Cowlitz River from the mouth to River Mile (RM) 20, 27 water-surface profiles were surveyed.

(7) A maximum of 54 cross-sections were surveyed six times in the Cowlitz River from the mouth to RM 22.

(8) Up to 18 cross-sections were surveyed five times in the Toutle River from the mouth to RM 4.

(9) Nearly 200 photogrammetric cross-sections were produced between the mouth of the Toutle River and Spirit Lake.

(10) Numerous computer model simulations for sediment transport and water surfaces for periods varying up to 10 years were conducted.

d. Equipment. Most sediment sampling has been done using standard equipment available from St. Anthony Falls or other manufacturers. The notable exceptions are the use of a backhoe to obtain bulk-type samples and the utilization of a new type of core sampler for a few bed material samples.

3. Harbor Surveys. Harbor and navigation channel hydrographic surveys are continued the year round on the Columbia River harbors and/or navigation channel and 11 boat harbors along Oregon's Pacific Ocean coast. Formal study reports are issued from time to time.

a. Reports--completed. No study reports were completed in 1984.

b. Reports--planned. Two reports by A-E contractors on the Columbia River navigation channel/harbor are planned to be completed in 1985.

(1) A dredging management study report covering RMs 10 to 76 should be completed in January 1985.

(2) A study report of sedimentation effects on the proposed coal channel deepening project between RMs -2 and 18 should be completed in March 1985.

c. Scope. Surveys of the harbors and navigation channels are continuous and are used for year-round maintenance dredging.

(1) The Columbia River between RMs 4 and 192 was surveyed 217 times.

(2) A total of 103 surveys were done on the 11 coastal harbors/channels.

d. Equipment. The harbor and navigation channel surveys are made by special survey boats equipped with electronic fathometers (echo-sounders). The surveys are then displayed on aerial photographs at various scales. During 1985, a "vibracore" sampler will be used to obtain samples below the surface of the harbor or navigation channel bed.

e. Summation. The routine maintenance of the Columbia River navigation channels has been modified by the addition of sediment from the Mount St. Helens volcanic debris. The impact of this is under evaluation.

Sediment Load Measurements. One station is operated by this District for the Mount St. Helens studies. This station, on the Cowlitz River at Kelso, Washington, is used to gather information during high-water periods. The District supports the U. S. Geological Survey for sediment records at several other locations in the Mount St. Helens area and near other operating projects.

Other Investigations. New Equipment/Research. The District has tested, to a minor degree, two items which may be considered new in the field of sedimentation.

1. Core Sampler. A new type of core sampler furnished by St. Anthony Falls, was used on several occasions to obtain sand samples in shallow water (1 foot or less). The sampler acquired satisfactory samples.

2. Scour Pins. Several 2-inch PVC pipes of varied lengths surrounded by a metal collar, to record the depth to which scour occurs during high water, were installed at four sites in the upper Toutle River. No significant high water has occurred since the installation.

Seattle District

Reservoir sedimentation report was completed on Howard A. Hanson Dam in June 1984 for the resurvey done in 1979. The sediment deposition during the 18-year period (1961 to 1979) was minor, and only about 1 percent of the project capacity has been depleted.

Walla Walla District

Sedimentaiton Surveys.

1. Lower Granite Lock and Dam. Soundings to determine bed elevation were made at the 75 existing sediment ranges. Twenty-four additional (new) ranges

were established, monumented, and measured. River soundings were made and a topographic map of the reservoir bed was developed in the area near the confluence of Clearwater and Snake Rivers.

2. Lower Monumental Lock and Dam. Sediment ranges at the mouth of the Palouse River were measured to determine depth of water. Three new sediment ranges were established, monumented, and measured on the Snake River just downstream of the Palouse River confluence.

3. McNary Lock and Dam. Sediment ranges at the mouth of Walla Walla River were measured to determine depth of water.

Sediment Load Measurements. A few suspended sediment measurements were made by the U. S. Geological Survey on Salmon River near Salmon, Idaho, to determine concentration and gradation.

Other Investigations. A reconnaissance study was initiated to determine the most effective method of maintaining adequate freeboard at Lewiston Levees. Studies show that sediment deposition in Lower Granite Reservoir will raise flood levels above those used for project design. the study is scheduled for completion in 1985.

PACIFIC NORTHWEST REGION

GEOLOGICAL SURVEY

Kootenai-Pend Oreille-Spokane Subregion

1. Suspended-sediment data are being collected on a periodic basis from Pend Orielle River at international boundary and at Spokane River at Long Lake, WA, as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data are being collected on a daily basis by a PS-69 at Kootenai River at Porthill, ID, as part of the U.S. Geological Survey waterways-treaty program.

3. Suspended-sediment data are being collected on a quarterly basis at Hayden Creek below North Fork, near Hayden Lake, ID, as part of the National Hydrologic Benchmark Network.

Upper Columbia Subregion

1. Suspended-sediment data are being collected on a bimonthly basis in cooperation with the Bureau of Indian Affairs at the following stations:

Teepee Creek near Polson, MT
Mill Creek above Gassco Creek near Niarada, MT
Cromwell Creek near Niarada, MT
South Fork Crow Creek near Ronan, MT
Mission Creek above Reservoir near St. Ignatius, MT
South Fork Jocloo River near Arlee, MT
Big Knife Creek near Arlee, MT
Valley Creek near Arlee, MT
Revais Creek below West Fork near Dixon, MT
Camas Creek near Hot Springs, MT
Flathead River near Perma, MT

2. Suspended-sediment data are being collected on a periodic basis at Columbia River at Northport, WA, at Columbia River at Vernita Bridge, near Priest Rapids Dam, WA, and at Okanogan River at Malott, WA, as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis at Andrews Creek near Mazama, WA, as a part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected at the following sites as part of NASQAN:

Clark Fork below Missoula, MT (bimonthly)
Flathead River at Flathead, British Columbia, Canada (quarterly)
Flathead River at Columbia Falls, MT (quarterly)

5. Suspended-sediment data are being collected on a quarterly basis at Columbia River at Richland, WA, in cooperation with the U.S. Department of Energy.

6. Suspended-sediment data are being collected monthly at Clark Fork near Cabinet, ID, in cooperation with the Idaho State Department of Health and Welfare.

Yakima Subregion

1. Suspended-sediment data are being collected periodically at Yakima River near Union Gap, WA, and at Yakima River at Kiona, WA, as part of NASQAN.

Upper Snake Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Cache Creek near Jackson, WY, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a daily basis by a PS-69 sampler and bedload data collected during spring run-off at Little Granite Creek near Bondurant, WY, as part of a special study for the Forest Service.

3. Suspended-sediment data are being collected on a bimonthly basis at Snake River near Heise, ID, as a part of NASQAN.

Middle Snake Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Snake River at King Hill, ID, and Snake River at Weiser, ID, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at Big Jacks Creek near Bruneau, ID, as a part of the National Hydrologic Benchmark Network.

Lower Snake Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Salmon River near White Bird, ID, and Clearwater River at Spalding, ID, as part of NASQAN.

2. Suspended-sediment data are being collected at Snake River at Burbank, WA, as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis from Miram River at Minam, OR, as a part of the National Hydrologic Benchmark Network, and from Owyhee River near Owyhee, OR, as part of NASQAN.

Middle Columbia Subregion

1. Suspended-sediment samples are being collected on a periodic basis at John Day River near McDonald Ferry, OR, and at Deschutes River near Biggs, OR, and bimonthly at Klickitat River near Pitt, WA, as a part of NASQAN.

Lower Columbia Subregion

1. Suspended-sediment data are being collected on a periodic basis at Columbia River at Warrendale, OR, Lewis River at Ariel, WA, and Cowlitz River at Kelso, WA, as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Bull Run River near Multnomah Falls, OR, South Fork Bull Run River near Bull Run, OR, North Fork Bull Run River near Multnomah Falls, OR, and at Fir Creek near Brightwood, OR, in cooperation with the city of Portland, OR, to provide needed information to define the effects of activities in the basin.

Willamette Subregion

1. Suspended-sediment data are being collected on a periodic basis from Tualatin River at West Linn, OR, and at Willamette River at Portland, OR, as a part of NASQAN.

Oregon-Washington Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Rogue River near Agress, OR, Umpqua River near Elkton, OR, Siuslaw River near Mapleton, OR, Alsea River near Tidewater, OR, Nehalam River near Foss, OR, Chehalis River at Porter, WA, Willapa River near Willapa, WA, and at Queets River near Clearwater, WA, as a part of NASQAN.

2. Suspended-sediment data are being collected on a quarterly basis at North Fork Quinault River near Amanda Park, WA, as part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a biweekly basis from Applegate River near Copper, OR, in cooperation with the U.S. Army Corps of Engineers.

Puget Sound Subregion

1. Suspended-sediment data are being collected on a periodic basis at Elwha River at McDonald Bridge near Port Angeles, WA, Skagit River near Mount Vernon, WA, Snohomish River near Monroe, WA, and at Puyallup River at Puyallup, WA, as a part of NASQAN.

Oregon Closed Basins Subregion

1. Suspended-sediment data are being collected on a periodic basis at Donner and Blitzen River near Frenchglen, OR, as a part of NASQAN.

Special Studies

1. Collection of suspended-sediment data in streams near Mount St. Helens has continued since May 1980. Sediment data are presently collected at six sites in the Toutle River Basin, three in the Lewis River Basin, and one in the Cowlitz River, with the goal of quantifying and understanding the sediment system of many streams impacted by the 1980 eruption of Mount St. Helens. A network of automatic pumping sediment samplers has been installed at most sites along with conventional sampling equipment. Standard sampling techniques, equipment, and data analysis are being augmented by research to develop new methodology. These data compliment channel geometry data from 30 sites which are collected in support of ongoing research on erosional processes and evolution of drainage systems.

2. Suspended-sediment and streambed materials were collected in March 1984 at seven transects along a 5-mile reach of the Cowlitz River during the peak and recession of a moderate-high flow. The objective of this data set and a similar data set collected in 1983 is definition of the Manning roughness coefficient during flood flows along the sediment-filled channel of the Cowlitz River, but there were no flows of flood magnitude in either year. The extent of continuously changing sediment deposits in a 24-mile reach of the Cowlitz and lower Toutle Rivers was surveyed twice by USGS and four times by the COE during calendar year 1984.

3. Work continued in the sediment-transport modeling project on the long-term goal of developing suitable computer models. In calendar year 1984, a hypothetical outburst of Spirit Lake was investigated by such a mathematical model. A one-dimensional program written by Danny Freud of the National Weather Service was implemented on the PRIME computer in the Tacoma office for the study. The application to the Spirit Lake outburst detailed the predicted dynamic formation of a large sediment plug in the Columbia River at the mouth of the Cowlitz River. The subsequent blockage of the Columbia River would then cause flooding upstream at least as far as Portland, OR. These results are given in Water-Resources Investigations Report 85-4054, "Impact on the Columbia River of an Outburst of Spirit Lake," by W. G. Sikonia.

For additional information about U.S. Geological Survey activities within this region, contact the following offices:

District Chief, WRD
U.S. Geological Survey
230 Collins Road
Boise, ID 83702

District Office, WRD
U.S. Geological Survey
847 NE 19th Avenue
Suite 300
Portland, OR 97232

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
Cheyenne, WY 82003

District Chief, WRD
U.S. Geological Survey
Federal Building, Room 428
301 So. Park Avenue, Drawer 10076
Helena, MT 59626-0076

District Chief, WRD
U.S. Geological Survey
1201 Pacific Avenue, Suite 600
Tacoma, WA 98402

SOIL CONSERVATION SERVICE

1. Erosion and Non-Point Pollution Studies.

a.

Subregion	County	State
Mid-Columbia	Gilliam, Morrow	Oregon

Sediment delivery ratios were developed for the Dry Fork watershed land treatment project.

b.

Subregion	County	State
Mid-Columbia	Wasco, Sherman Gilliam, Morrow, Umatilla	Oregon

Case studies comparing erosion rates on conventionally tilled fields to rates on field with conservation tillage are being carried out in the 5-county wheat-fallow targeted areas.

c.

Subregion	County	State
1. Central Snake	Baker	Oregon
2. Lower Snake	Union, Wallowa	Oregon
3. Mid-Columbia	Jefferson	Oregon
4. Willamette	Washington	Oregon

Case studies are being carried out comparing erosion rates on conventionally-tilled fields to rates on no-till fields.

d.

Subregion	County	State
1. Willamette	Clackamas, Yamhill, Polk, Benton, Multnomah	Oregon
2. Coastal	Coos	Oregon

All counties, except Polk, carried out studies comparing erosion rates from fields with differing varieties and amounts of residue or cover. Several different crops were studied including small grains, corn, nursery stock, vineyards, Christmas trees, and lily bulbs.

Polk County measured erosion rates comparing grain fields having subsurface drainage to undrained grain fields.

e. The Area Forester in Area 1 has established over 30 plots in cut-over woodland to measure erosion rates using the erosion bridge method.

2. Studies of Sediment Damages.

Water Resource Council Region 17040201-030 (Idaho)

Upper Sand Creek Land Treatment completed. Sheet and gully erosion analysis and delivery.

Water Resource Council Region 17040290-010 (Idaho)

Big Canyon East Fork Land Treatment Watershed completed. Sheet and gully erosion analysis and delivery.

Water Resource Council Region 17060108-051 (Idaho)

Thorn Creek Land Treatment Watershed completed. Sheet and gully erosion analysis and delivery.

Water Resource Council Region 17060306-100 (Idaho)

Mission Lapwai River Basin study. Sheet and gully erosion analysis and delivery.

3. Special studies.

Sedimentation rate studies were made in Grant and Adams Counties, Washington for the East High River Basin Project Study. Sediment catchment devices were installed on ten sites using sprinkler irrigation systems and seven sites using furrow irrigation. Each site is represented by three replications. Studies were confined to potato and wheat lands.

Studies are scheduled to continue for the 1985 irrigation season.

A new method for determining soil losses was tested during this study. It involved using filter fabric material to trap sediment as it is being transported to any specific point. The filter fabric is a heavy pile, knitted material formed as a sediment collection container. This sediment collection device has provided high sediment trap efficiencies.

CALIFORNIA REGION

BUREAU OF LAND MANAGEMENT

A report was prepared which provides watershed management guidance designed to address the erosion and sedimentation problems within the Clear Creek Management Area in the Bakersfield District. These practices will be applied to existing and proposed uses of the area to mitigate and improve the erosion in the area. Monitoring of the natural accelerated erosion was also continued in the Clear Creek Area.

Two activity plans were completed in the Bodie Hills area which address control of erosion and sedimentation as well as rehabilitation of wetland and riparian areas and management of livestock grazing.

Within the Susanville District, installation of erosion control structures was completed in Upper Sheep Valley to control gully development. Work was started on channel work to control bank erosion of the Susan River along the Biz Johnson Trail. Two reservoirs were cleared of sediment and inlet channels were redesigned and reconstructed.

Monitoring of approximately 60 USLE transects and 25 watersheds took place during the year. Survey and design was initiated on the Delera erosion control project. Work was started on High Rock Watershed Management Plan for erosion and flood control and riparian management.

Roads and trails which had disturbed about 75 acres were closed and revegetated to decrease erosion in the Cow Mt. area of the Ukiah District. Roads which were left open were improved with culverts and resloping to decrease erosion which normally reaches local streams and the Russian River affecting the fisheries and other water uses.

California Desert District motorcycle hill climb areas rehabilitation project began in 1983 and continued this year. Prescribed burning was continued in McCain Valley to reduce the probability of wildfires and severe erosion and to improve wildlife habitat and range forage.

CALIFORNIA REGION

Bureau of Reclamation

A comprehensive study of the sediment production from the Grass Valley Creek Basin, a tributary of the Trinity River, was undertaken. Results of suspended sediment sampling and channel hydraulic measurements are being used to compute total sediment loading from the upper part of the basin. These computed loads will be used with measured physical and land use factors to calibrate sediment production from various parts of the basin and the basin as a whole.

CALIFORNIA REGION

CORPS OF ENGINEERS

South Pacific Division

Los Angeles District

Cooperative Stream Gaging Program. The following sediment sampling stations are operated by the U. S. Geological Survey and supported by the District: Mill Creek near Yucapia, CA; Santa Ana River at Mentone, CA; Santa Ana River at South of San Bernadino, CA; Little Colorado River near Joseph City and Holbrook, AZ; Mission Creek near Barbara Mission, CA (this station was added in October 1984). San Jose Creek at Goleta, CA is funded by contract with the USGS.

Reservoir Sedimentation. "Sediment Data Summary" sheets (ENG FORM 1787) for big Tujunga, Hansen, Pacoima, Santa Anita, Santa Fe, Sepulveda, and Thompson Creek flood control basins; and for Aliso, Brace, Bradbury, Cassara, Halls, Hillcrest, Kinneloa, Kinneloa-West, Las Flores, La Tuna, Limekiln, Little Dalton, Mullally, Pickens, Rubio, Sawpit, Sierra Madre Villa, Snover, Spinks, Sunset (Upper), Turnbull, Wildwood, and Wilson debris basins were completed.

Office Activities.

1. The Los Angeles District (SPL) completed final sedimentation design studies for the Arizona Canal Diversion Channel (ACDC) sediment basins. A previous sediment transport study for the ACDC project indicated that sediment basins would be necessary on two tributaries, namely Cave Creek and Cudia City Wash, to exclude materials from the ACDC. The sedimentation design of the basins was accomplished by use of criteria involving concepts of ideal settling of sediment particles, short circuiting of flows, basin length-to-width ratios, and permissible flow-through velocities.

2. SPL completed the Agua Fria River, Arisona, sedimentation study in support of the New River, Skunk Creek, and Aqua Fria River General Design Memorandum. The sedimentation study was conducted to analyze sediment-transport characteristics of the proposed floodway for the 100-year flood over the life of the project. Three levels of analysis were utilized to assess the flood control plan: (1) qualitative geomorphic analysis; (2) quantitative geomorphic analysis; and (3) a mathematical model simulation.

3. SPL completed the Little Colorado River (LCR) near Holbrook, Arizona, sedimentation study. The study was conducted to analyze the sediment transport characteristics of the existing project on the LCR, where severe deposition was occurring; and to estimate future trends of sedimentation for proposed improvements to the project for the design flood as well as long-term flows. In addition, an analysis was also conducted to estimate sediment yield for the Holbrook interior flood control storage pond.

4. SPL completed an update study of sediment yield for the proposed upper Santa Ana River damsites, San Bernardino County, California. The sediment yield was estimated from data from other reservoirs near the study area with similar drainage-basin charcateristics.

5. Currently in progress is development of the SPL Plan of Study for sedimentation analysis in support of the coast of California Storm and Tidal Wave Study. This year the study consists of a literature inventory and data search for sediment information on rivers or streams entering the littoral cells along the Coast of California between Ragged Point (San Luis Obispo county) and the Mexican Border. Portions of the study were contracted to DMA Consulting Engineers.

6. Currently in progress is an SPL sediment-transport analysis of Calleguas Creek, Ventura County, California. The purpose of the study is to analyze the existing sediment problems which will help determine the necessity for developing plans for flood control works. The analysis will use a sediment-budget approach and results from a recently completed watershed sediment-yield study.

7. Currently in progress is a sediment-transport analysis for the lower Santa Ana River, California, as part of the SPL Santa Ana River Phase II GDM. The purpose of this study is to analyze the hydraulic design of proposed improvements to ensure that the project will function properly under sediment loads imposed by a variety of flow conditions. The studies consist of a sediment-yield analysis of the canyon watershed, a qualitative and quantitative assessment of the river, and a detailed sediment routing study.

8. SPL initiated a sedimentation analysis for the New River - Skunk Creek, Arizona. The objectives and method of analysis of this study are similar to those conducted for Agua Fria River in paragraph 2. The study was contracted to Simons, Li & Associates.

9. Sediment development work in support of general hydrologic studies, will be initiated by SPL in an attempt to generalize and update sediment-yield methodologies in the light of data accumulted during recent years.

Sacramento District

Suspended Sediment Sampling. Routine samples of lake outflows were collected and analyzed for suspended sediment at Black Butte, Pine Flat, Kaweah, Success and Isabella Lakes. On Cottonwood Creek at Cottonwood, California total sediment-load samples were collected. Total sediment load was also sampled on three sites on the Russian River, and turbidity at two of these sites: data from the above-mentioned samples may be obtained from the Sacramento District. A sediment survey was conducted at Black Butte Lake in 1984, but the results are not yet compiled; the results will be reported as soon as they become available.

Sediment Studies.

1. Cache Creek Basin, CA. - C,P&E Study. The proposed project involves enlarging the outlet channel of Clear Lake in the upper part of the basin and enlarging the existing sediment basin in the lower basin. A Sediment Engineering (S.E.) Investigation is ongoing to evaluate project impacts on the Creek's channel morphology through Capay Valley, downstream of Clear Lake. A sediment monitoring program initiated in October 1983 is continuing and includes streamflow and total load sediment gages at the upstream and downstream boundaries of Capy Valley.

2. Cottonwood Creek, California. - Phase I Studies. S.E. activity includes continuing collection of periodic total load sediment data on Cottonwood Creek at Cottonwood. This activity is a continuation of monitoring of sediment inflows (particularly fish spawning size gravels) into the Sacramento River from Cottonwood Creek under "preproject" (before closure of the proposed dams) conditions.

3. Dry Creek (Sonoma County), California. - Construction. Activity included initiation of an S.E. investigation of Dry Creek, between the (recently closed) Warm Springs Dam and its confluence with the Russian River. This reach has a history of bank erosion (and other sediment transport related) problems. Before dam closure, some bank and bed stabilization works were authorized and constructed. The purpose of the S.E. Investigation is to determine project impacts on the sediment transport and channel morphology of the study reach and how best to proceed with future (if necessary) bank and/or bed stabilization works. The investigation is taking a multidisciplinary approach to analysis of Dry Creek problems, including consideration of the hydraulic, hydrologic, sediment transport and geomorphic aspects of the creek and its contributing watershed. A data collection program in the basin is continuing, including collection of streamflow and total load sediment data at three stations and resurveying of established sediment survey ranges along the Creek (last surveyed in 1981).

4. Morrison Creek, California. - Phase I/II GDM. An S.E. Investigation of the Morrison Creek Stream Group was completed and found that hte proposed flood control channels in the Stream Group would have minimal impact on the channel morphology and sediment transport in the project area. Stable channel design analyses showed that the project channels would not have any major aggradation or degradation problems due to the nature of the soils in the area which are highly cohesive and appear to be nonerosive.

5. Sacramento River and Tributaries Bank Protection and Erosion Control Investigation. - G.I. The report on the Sediment Transport studies of the General Investigation was finalized. The report discusses the potential effects on sediment transport that might be induced by the implementation of a comprehensive channel stabilization plan between Colusa (R.M. 143) and Red Bluff (R.M. 243) on the Sacramento River.

6. Sacramento River Deep Water Ship Channel. - Construction. An S.E. Investigation to determine the impacts on sediment transport and on shoaling in the ship channel of deepening of the channel was completed. The investigation found that deepening of the ship channel from 30 to 35 feet would not cause any increase in the present average annual maintenance dredging volume. Although deepening may increase rates of shoaling, it may reduce the total length of channel requiring frequent maintenance dredging by isolating the deposits to a shorter length of channel. This investigation was conducted by the U. S. Army's Hydrologic Engineering Center at the request of the Sacramento District.

7. Sacramento River Deep Water Ship channel (Sediment Trap). - Construction. An S.E. Investigation was initiated to evaluate the engineering and economic feasibility of constructing a sediment trap in the ship channel. Such a trap could, if properly designed, capture sediments in a very localized area, thus reducing annual ship channel maintenance dredging costs by reducing the aerial extent of dredging. This investigation is being conducted by the U. S. Army's Hydrologic Engineering Center at the request of the Sacramento District.

8. Wildcat/San Pablo Creeks (Contra Costa County), California. - G.D.M. An S.E. Investigation was initiated to determine the impacts that proposed flood control channels would have on the channel morphology and sediment transport in the project area, and determine if any modifications are necessary to alleviate potential problems.

San Francisco District

As a result of a reorganization within the South Pacific Division, all reservoir and related streamgaging sedimentation activities were transferred to the Sacramento District during calendar year 1983. No new similar sedimentation activities were initiated in claendar year 1984.

Sedimentation activities that were conducted within the District's boundaries during calendar year 1984 consisted primarily of on-going dredging and related hydrographic surveys for purposes of maintaining Federal harbors and channels free of sedimentation. Unusual sedimentation activities related to the Alcatraz dredge material disposal site are described below in next paragraph.

In 1982, it was discovered that a mound had formed at the Alcatraz disposal site, and had reached an elevation of -24 feet, MLLW datum. This accumulation of material had gone unnoticed until a ship picked up the mound on its depth sounder. Dumping was restricted to the half of the desposal area which still had deep water. Later, a dredging contract was let and the mound was removed down to -45 feet, MLLW. Subsequently, the studies and analyses described in the following paragraphs have been, or are being, conducted.

Studies using a 'dump' model at WES, which gave an indication of the capacity of the site over one tidal cycle, have been completed. The study indicated that between 100,000 and 500,000 cubic yards of sand and/or silt can safely be

placed per tidal cycle, depending on the tide and the Delta outflow; however, as little as 30% clumps in the material to be disposed will reduce the rate at which material can be placed at the site, with no accumulation of material, to 4,000 cubic yards per tidal cycle.

Testing was conducted at the Bay Model to determine current velocities at the disposal site under different tidal conditions (neap, spring, and 19-year mean), high and low delta outflow, and with and without the mound.

On-going prototype studies are being conducted at the disposal site and at two other sites. In addition to current velocities and direction, biological samples are being collected and studied. Samples have been gathered during neap tide conditions, and will be gathered during spring tide conditions.

Monthly bathymetric surveys are being made at the site to assure that there is not further build-up of material at the site.

A very useful study, if funds become available, would involve use of the TABS II model by WES. This model will follow the particles through the Bay from the time the material is dumped until the material settles. This will provide information relative to where the material is going, how much is leaving the Bay, etc.

CALIFORNIA REGION

GEOLOGICAL SURVEY

North Coastal Subregion

1. Suspended-sediment and bedload data are being collected in Redwood National Park to evaluate the sediment transport rates caused by both natural processes and logging activities within the park. Data collection began in 1973 in cooperation with the National Park Service. The Park Service is using this data to develop management practices that will reduce erosion rates. The current sampling network includes the following stations:

Redwood Creek near Blue Lake	(daily)
Lacks Creek near Orick	(monthly)
Redwood Creek above Panther Creek	(monthly)
Panther Creek near Orick	(monthly)
Coyote Creek near Orick	(monthly)
Redwood Creek above Harry Weir Creek*	(storm-event)
Redwood Creek near Orick*	(storm-event)
Redwood Creek at Orick	(daily)

*(Discontinued April 30, 1984)

2. Suspended-sediment data are being collected on the Hoopa Indian Reservation to determine the variation in sediment transport rates within the reservation and to use as a data base for comparison of transport rates with the forest areas adjacent to the reservation. The transport comparisons will be used by the Bureau of Indian Affairs to evaluate the impact of the timber harvesting and management practices within the reservation on the local fisheries. Estimates of bedload discharge are included in this study. Data collection began in the 1982 water year and includes the following stations:

Supply Creek at Hoopa	(daily)
Supply Creek near Hoopa	(storm-event)
Mill Creek at Hoopa	(storm-event)
Mill Creek near Hoopa	(storm-event)
Soctish Creek at Hoopa	(storm-event)
Pine Creek near Weitchtec	(storm-event)

3. Suspended-sediment data are being collect on a daily basis and bedload data on a periodic basis at Grass Valley Creek at Fawn Lodge near Lewiston and at Trinity River below Limekiln Gulch near Douglas City, in cooperation with Califronia Department of Water Resources and the Bureau of Reclamation, respectively.

4. Suspended-sediment data are being collected on a quarterly basis at Elder Creek near Branscomb, as part of the National Hydrologic Benchmark Network, and at Smith River near Crescent City, as part of NASQAN.

5. Suspended-sediment data are being collected on a bimonthly basis at Klamath River near Klamath and at Eel River at Scotia, as part of NASQAN.

Sacramento Basin Subregion

1. Suspended-sediment data are being collected on a daily basis and bedload data on a periodic basis at Cache Creek near Brookes and Cache Creek above Rumsey, in cooperation with the U.S. Army Corps of Engineers (COE).

2. Suspended-sediment data are being collected on a daily basis at Feather River near Gridley, in cooperation with California Department of Water Resources, and at Sacramento River at Freeport, in cooperation with the COE.

3. Suspended-sediment data are being collected on a periodic basis at Cottonwood Creek near Cottonwood, in cooperation with the AOE.

4. Suspended-sediment data are being collected on a bimonthly basis at Sacramento River at Keswick, as part of NASQAN.

North Lahontan Subregion

1. As part of the Tahoe Monitoring Program, suspended-sediment data are being collected from seven streams that drain into Lake Tahoe. The relation of sediment discharge to algae growth in the lake is being studied by the University of California at Davis. The sediment data collection program is in cooperation with the California Department of Water Resources and the University of California at Davis, and includes the following daily sediment stations:

Upper Truckee River at South Lake Tahoe
General Creek near Meeks Bay
Blackwood Creek near Tahoe City
Ward Creek at Highway 89
Snow Creek at Tahoe Vista
Third Creek near Crystal Bay, NV
Trout Creek near Tahoe Valley

2. Suspended-sediment data are being collected on a daily basis and bedload data on a periodic basis at Edgewood Creek near Stateline and Logan House Creek near Glenbrook, as part of a sediment budget study in the Lake Tahoe Basin in cooperation with the Tahoe Regional Planning Agency.

3. Suspended-sediment data is being collected on a periodic basis at Martis Creek at Highway 267 near Truckee, Martis Creek Lake near Truckee and Martis Creek near Truckee, in cooperation with the COE; and at Sagehen Creek near Truckee, in cooperation with the University of California at Davis.

4. Suspended-sediment data is being collected on a bimonthly basis at Susan River at Susanville, as part of NASQAN.

San Francisco Bay Subregion

1. Suspended-sediment and bedload data are being collected in the Cull Creek and San Lorenzo Creek Basins to document sediment transported into Cull Creek and Don Castro Reservoirs, respectively, and to test erosion control procedures. Data collection began in the 1979 water year, in cooperation with Alameda Country Flood Control and Water Conservation District, and includes the following stations:

San Lorenzo Creek above Don Castro Reservoir near Castro Valley	(daily)
Cull Creek above Cull Creek Reservoir near Castro Valley	(daily)
Cull Creek Tributary No. 4 above CC Reservoir	(storm-event)

2. Suspended-sediment data is being collected on a daily basis and bedload data on a periodic basis at Pena Creek near Geyserville and Dry Creek near Geyserville, in cooperation with the COE.

3. Suspended-sediment data are being collected on a daily basis at Russian River near Guerneville, in cooperation with the COE.

4. Suspended-sediment data are being collected on a bimonthly basis at Napa River near Napa, as part of NASQAN.

San Joaquin Basin Subregion

1. Suspended-sediment data are being collected on a daily basis at San Joaquin River at Vernalis, in cooperation with the California Department of Water Resources.

2. Suspended-sediment data are being collected on a quarterly basis at Mokelumne River at Woodbridge, as part of NASQAN, and at Merced River at Happy Isles Bridge near Yosemite, as part of the National Hydrologic Benchmark Network.

Central Coastal Subregion

1. A resurvey of Loch Lomond Reservoir in the San Lorenzo River Basin in Santa Cruz County was completed in August 1982. The survey was undertaken following landslides and sediment deposition related to the January 1982 storm events. Results of the survey and bed core samples that were taken during the survey will be published in 1985.

2. Suspended-sediment data are being collected on a daily basis at Arroyo Seco near Greenfield, in cooperation with Monterey County Flood Control and Water Conservation District (discontinued September 30, 1984), and at San Jose Creek at Goleta, in cooperation with the COE. Monthly estimates of bedload discharge are also made at San Jose Creek.

3. Suspended-sediment and bedload data are being collected on a periodic basis at San Antonio River near Lockwood, in cooperation with Monterey County Flood Control and Water Conservation District.

4. Suspended-sediment data are being collected on a periodic basis at Nacimiento River near Bryson, in cooperation with Monterey County Flood Control and Water Conservation District.

5. Suspended-sediment data are being collected on a bimonthly basis at Salinas River near Chular and on a quarterly basis at Pajaro River at Chittenden, as part of NASQAN.

Tulare Basin and South Lahontan Subregions

1. Suspended-sediment data are being collected on a bimonthly basis at Kings River below NF near Trimmer and Kern River at Kernville, and on a quarterly basis at Owens River near Big Pine, as part of NASQAN.

South Coastal Subregion

1. Previously existing sediment data are being used to estimate long-term sediment discharge in the Ventura River Basin. The role which major flood events play in determining the magnitude and frequency of sediment transport in this basin is of particular interest to the California Department of Boating and Waterways, who are cooperators on this project. This project is expected to be completed in 1984.

2. Suspended-sediment data are being collected on a daily basis at San Diego Creek at Culver Drive near Irvine, San Diego Creek at Campus Drive near Irvine and at Peters Canyon Wash near Irvine to test the trap efficiency of two siltation basins located in the lower reaches of San Diego Creek Basin. Estimates of bedload discharge at the San Diego Creek at Campus Drive and Peters Canyon Wash stations and periodic surveys of the siltation basins are included in this study. The sediment discharge and survey data along with an assessment of factors controlling sediment yield within the basin will be used by the cooperator, City of Newport Beach, to effectively manage factors which may have detrimental impacts on the physical and biological habitat of Newport Bay. Data collection began in the 1983 water year.

3. Suspended-sediment data are being collected on a daily basis and monthly estimates of bedload discharge are made at Santa Clara River at Montalvo, in cooperation with Ventura County PWA and California Department of Boating and Waterways, and at Santa Ana River at Santa Ana, in cooperation with Orange County Environmental Management Agency.

4. Suspended-sediment data are being collected on a daily basis at San Juan Creek at San Juan Capistrano, in cooperation with Orange County Environmental Management Agency, and at Santa ana River near Mentone and Santa Ana River near San Bernardino, in cooperation with the COE.

5. Suspended-sediment data are being collected on a daily basis and bedload on a periodic basis, in cooperation with the California Department of Boating and Waterways and the COE, at the following stations:

Arroyo Trabuco at San Juan Capistrano
San Luis Rey River at Oceanside
San Diequito River near Del Mar
San Mateo Creek at San Onofre
San Diego River at San Diego (discontinued)

6. Suspended-sediment data are being collected on a bimonthly and storm event basis at Mill creek near Yucaipa, in cooperation with the COE (discontinued September 30, 1984) and at Santa Ana River below Prado Dam, in cooperation with Orange County Environmental Management Agency.

7. Suspended-sediment data are being collected on a periodic basis at Ventura River near Ventura, in cooperation with California Department of Boating and Waterways.

8. Suspended-sediment are being collected on a quarterly basis at Los Angeles River at Long Beach and Santa Clara River at Los Angeles-Ventura County Line, as part of NASQAN.

Colorado Desert Subregion

1. Suspended-sediment data are being collected on a quarterly basis at Alamo River near Calipatria and on a bimonthly basis at New River near Calexico, as part of NASQAN.

For additional information about U.S. Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
2800 Cottage Way
Sacramento, CA 95825

SOIL CONSERVATION SERVICE

1. Special Studies.

Tomki Creek - Mendocino County and Long Valley Creek - Lake County, California.

As part of stream analyses in small, ungaged watersheds, the sediment yield and transport capacity of the streams were calculated for various storm sizes. Results of the calculations were compared to historic changes in the streams in an attempt to locate control structures, identify causes of meandering, and determine typical gravel supply amounts to specific sites.

ALASKA REGION

CORPS OF ENGINEERS

North Pacific Division

Alaska District

The Alaska district had no formal sediment data collected during FY 84. There were a few single collections of suspended sediment data to support EIS studies associated with small boat harbors.

ALASKA REGION

GEOLOGICAL SURVEY

Arctic Slope Subregion

1. Suspended-sediment data are being collected on a periodic basis at the Kuparuk River near Deadhorse, AK, as part of the National Stream Quality Accounting Network (NASQAN).

Yukon Subregion

1. A cooperative study with the Alaska Department of Natural Resources and the U.S. National Park Service was initiated in 1983 and continued in 1984. The objectives of the study are to document the hydraulics of flow, channel-bed composition, and channel morphology downstream from placer-mined areas.

Data were collected on several streams in the Kantishna Hills area of Denali (formerly Mt. McKinley) National Park and Preserve and on Birch Creek near Fairbanks.

2. Suspended-sediment data are being collected on a periodic basis at the Yukon River at Pilot Station, AK, as a part of NASQAN.

3. Suspended-sediment data are being collected periodically at the Tanana River at Nenana, AK, as part of NASQAN.

Southwest Subregion

1. Suspended-sediment data are being collected on a periodic basis at Nushagak River at Ekwok, AK, and at Kuskokwim River at Crooked Creek, AK, as part of NASQAN.

South-Central Region

1. A suspended-sediment data program funded by Alaska Power Authority, as part of their evaluation of the proposed Watana and Devil's Canyon hydroelectric power sites, was continued through 1984. Suspended-sediment data are being collected on a periodic basis at Chulitna River near Talkeetna, AK, Susitna River near Denali, AK, Susitna River near Gold Creek, AK, Susitna River near Talkeetna, Susitna River near Cantwell, AK, and at Susitna River at Sunshine, AK. Bedload data were obtained at various sites on the Chulitna, Susitna, and Talkeetna Rivers near Talkeetna, Susitna River at Sunshine, and the Yentna River near Susitna Station.

2. A cooperative study with the Municipality of Anchorage was initiated in 1983 to determine annual suspended-sediment inflow and outflow of Potter Marsh. Suspended-sediment data were obtained at three sites during the 1984 water year.

3. Suspended-sediment data are being collected on a periodic basis at Talkeetna River near Talkeetna, AK, as part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a periodic basis at Susitna River at Susitna Station, AK, and at Copper River near Chitina, AK, as a part of NASQAN.

5. Suspended-sediment data are being collected on a miscellaneous basis at the following sites:

Willow Creek near Willow, AK
Deception Creek near Willow, AK
Yentna River near Susitna Station, AK
Indian River near Gold Creek, AK
Portage Creek near Gold Creek, AK

Southeast Subregion

1. As part of the cooperative program with the U.S. Forest Service, suspended-sediment data are being collected on a periodic basis at the following sites:

Hamilton Creek near Kake, AK
Rocky Pass Creek near Point Baker, AK
Greens Creek near Juneau, AK
Kadashan River above Hook Creek near Tanakee, AK

2. Suspended-sediment data are being collected on a periodic basis at the Stikine River near Wrangell, AK, and at Skagway River at Skagway, as part of NASQAN.

3. A cooperative program with the City and Borough of Juneau, to obtain suspended-sediment samples at Gold Creek near Juneau, was initiated in 1984.

For additional information about U.S. Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
4230 University Drive, Suite 201
Anchorage, AK 99508-4664

HAWAII REGION

GEOLOGICAL SURVEY

Hawaii Subregion

1. Suspended-sediment data are being collected on a bimonthly at Honolii Stream near Papaikou, Hawaii, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected bimonthly at Wailuku River at Hilo, Hawaii, as a part of NASQAN.

Maui Subregion

1. Suspended-sediment data are being collected on a bimonthly at Kahakuloa Stream near Honokohau, Maui, as a part of NASQAN.

Molokai Subregion

1. Suspended-sediment data are being collected bimonthly basis at Halawa Stream near Halawa, Molokai, as a part of NASQAN.

Oahu Subregion

1. Suspended-sediment data are being collected at the following sites:

   Waikele Stream, Waipahu, Oahu, on a daily basis as part of the Federal CBR program.

   Kalihi Stream, at Kalihi, Oahu, quarterly as a part of NASQAN.

   Kamooalii Stream near Kaneohe, Oahu, on a daily basis in cooperation with the U.S. Corps of Enginners.

   Moanalua Stream near Aiea, Oahu, on a periodic basis in cooperation with the City and County of Honolulu, Department of Public Works.

2. In cooperation with Hawaii State Department of Transportation, daily suspended-sediment data are being collected at the following stations on Oahu:

   North Halawa Stream near Honolulu
   Right Branch Kamooalii Stream near Kaneohe
   South Fork Kapunahala Stream at Kaneohe
   Haiku Stream near Heeia

Kauai Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Waimea River at Waimea, Hawaii, as a part of NASQAN.

Special Studies

1. A cooperative study with Hawaii State Department of Health was initiated to study the effects of cell-grazing method on soil loss and water quality on Hawaii Island. Erosion and suspended-sediment data are being collected at two cattle-grazing sites near Kamuela on Hawaii Island.

For additional information about U.S. Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
P.O. Box 50166
Honolulu, HI 96850

CARIBBEAN REGION

GEOLOGICAL SURVEY

Puerto Rico Subregion

1. Suspended-sediment data are being collected on a bimonthly basis when flow is above normal at 59 sites in cooperation with the Puerto Rico Environmental Quality Board (PREQB).

2. Suspended-sediment data are being collected on a bimonthly basis at the following sites as a part of NASQAN:

Río de la Plata at Toa Alta, PR
Río Grande de Manatí near Manatí, PR
Río Grande de Añasco near San Sebastián, PR
Río Grande de Patillas near Patillas, PR

3. Suspended-sediment data are being collected on a weekly basis and during high flows at Río Tanamá near Utuado, PR, in cooperation with PREQB.

4. Suspended-sediment data are being collected on a daily basis at Río Fajardo near Fajardo, PR, in cooperation with the U.S. Army Corps of Engineeers (COE).

Special Studies

1. Suspended-sediment data are being collected on a weekly basis and during high flows at the following sites in cooperation with PREQB, COE, Puerto Rico Department of Natural Resources (PRDNR), and Puerto Rico Aqueduct and Sewer Authority (PRASA) to determine the sediment load from those small basins to Lago Loíza, a water supply reservoir:

Quebrada Blanca at Jagual, PR
Quebrade Salvatierra near San Lorenzo, PR
Quebrade Caimito near Juncos, PR
Quebrada Maney near Guarbo, PR
Río Turabo Borinquen, PR

2. Suspended-sediment data are being collected on a daily basis at the following sites in cooperation with PREQB, PRASA, PRDNR, and COE as part of a project to determine the sediment load at these three proposed dam sites:

Río Cayaguas at Cerro Gordo, PR
Río Valenciano near San Lorenzo, PR
Río Grande de Loíza at Quebrada Arenas, PR

3. Suspended-sediment data are being collected daily at the following sites in cooperation with PREQB, PRDNR, PRASA, and COE to determine total sediment input from Río Grande de Loíza Basin to Lago Loí reservoir:

Río Grande de Loí at Caguas, PR
Río Gurabo at Gurabo, PR

4. Bed material samples will be collected twice a year at the following sites in cooperation of PREQB, PRDNR, PRASA, and COE as part of a project to determine the total bed material discharge from these sub-basins to Lago Loíza:

Río Grande de Loíza at Quebrada Arenas, PR
Quebrada Blanca at Jagual, PR
Quebrada Salvatierra near San Lorenzo, PR
Río Cayaguas at Cerro Gordo, PR
Río Turabo at Borinquen, PR
Río Grande de Loíza at Caguas, PR
Quebrada Caimito near Juncos, PR
Río Valenciano near Juncos, PR
Quebrada Mamey near Gurabo, PR
Río Gurabo at Gurabo, PR

For additional information about U.S. Geological Survey activities within this region, contact the following office:

District Chief, WRD
U.S. Geological Survey
G. P. O. Box 4424
San Juan, PR 00936

LABORATORY AND OTHER RESEARCH ACTIVITIES

ARIZONA

Research activities at the Southwest Rangeland Watershed Research Center in Tucson, Arizona include the following:

1. Rainfall simulator studies were continued on 24 plots on the Walnut Gulch Experimental Watershed near Tombstone, Arizona, and on 12 plots near Mercury, Nevada. The 3 X 10 m plots are replicated and subjected to three treatments: cleared or bare soil where vegetation is clipped at the ground surface, and gravel mulch or erosion pavement is removed; clipped or erosion pavement plots where the vegetation is clipped, but the gravel is undisturbed; and natural or control plots. Simulated rainfall is applied at a rate of 60 mm/h for 60 min, the same rate for 30 min 24 h later, and the same rate for 30 min 1/2 h after the second application. This storm sequence of "dry," "wet," and "very wet" produces a range of initial soil moisture for the simulations. Data collected include rainfall and runoff rates and total amounts, sediment concentration during runoff, and total sediment yield. Data have been collected twice yearly (spring and fall) for 4 years in Arizona, and 3 years in Nevada. These data form an extensive set of measurements useful in infiltration, overland flow, and erosion studies on semiarid rangelands.

2. Infiltration, overland flow, erosion, and sediment yield models are being developed and evaluated using data from the rainfall simulator plots. These models include the Philip infiltration equation, the kinematic wave equations, the Universal Soil Loss Equation, a coupled unsteady flow-rill and interrill erosion model, and the KINEROS kinematic cascade model. In addition, data from small watersheds on the Walnut Gulch Experimental Watershed, near Tombstone, Arizona, and on the Santa Rita Experimental Range, near Tucson, Arizona, were used in a verification/validation study of the sediment yield component of the SPUR range resource model. These model evaluation and development activities are being used to determine parameters (under rangeland conditions) for existing models, and to extend our knowledge of processes controlling erosion and seidment yield on semiarid rangelands.

For additional information, contact Keneneth G. Renard, Research Leader, USDA-ARS, 2000 East Allen Road, Tucson, AZ 85719.

GEORGIA

Research activities at the Southern Piedmont Conservation Research Center, Watkinsville, Georgia include the following:

1. Ephemeral gully erosion is a significant problem in the agricultural area of the southeastern United States. Photogrammetric techniques for monitoring erosion and sedimentation from ephemeral gullies in agricultural fields have been developed by the University of Georgia Geography Department, Agricultural Research Service at Watkinsville, Georgia, and Soil Conservation Service in Athens, Georgia. Seven test sites have been established in north Georgia and aerial photographs obtained at critical times throughout the year. Large scale contour maps (1:360, contour interval=30 cm) have been produced for dates corresponding to tillage, planting, and harvesting operations. Maps from different dates have been registered to one another, the areas of change digitized, and the volume differences between dates computed. A detailed soil survey has been developed to determine the distribution of soil types in the fields. These data in association with information on topography, slope, rainfall, and tillage, and planting practices have been incorporated into a Geographic Information System for analyses of the interrelationships between factors. It is anticipated that these efforts will produce data and methodologies which will lead to a more complete understanding of the processes and effects of ephemeral gully erosion.

2. Long term rainfall data (98 years) were used in conjunction with 11 years of observed hydrologic and soil loss data to develop soil loss probabilities for the upland Southern Piedmont. The watershed variables were four tillage-cropping systems for each of three watersheds. Probability distributions for the initial monocropped conventional tillage systems suggest that soil loss will exceed the T-value frequently on these Typic Hapludult soils. With the same management system, soil losses associated with soybeans were 2-fold greater than those with corn. Probability distributions associated with the three multi-crop conservation tillage systems suggest remote chances of soil losses exceeding 10% of T on slopes $\leq$10%.

For additional information contact Adrian W. Thomas, Research Leader, USDA-ARS, Southern Piedmont Conservation Research Center, P. O. Box 555, Watkinsville, GA 30677.

GEORGIA

Research activities at the Southeast Watershed Research Laboratory, Tifton, Georgia, include the following:

1. Probability distributions of annual sediment yield from agricultural fields in the Southern Piedmont under several different cropping and tillage practices have been computed. These distributions, which provide probabilities of sediment available for downstream transport, were obtained by coupling data from short-term field experiments with long-term rainfall records through the use of a recursive computer procedure. Comparison of the probability distributions for different cropping-tillage systems showed a definite reduction in sediment production risk for conservation tillage systems as compared to conventional tillage systems. A carry-over effect was also noted for the conservation tillage systems in that sediment production risk was reduced for successive conservation tillage systems and for conventional tillage systems following conservation tillage systems.

2. Estimates of century-long sediment deposition were made for the riparian (streamside) zone of Watershed K, a subwatershed of the Little River. Two techniques were used to estimate long-term sediment deposition: 1) to estimate gross upland erosion using the Universal Soil Loss Equation and to apply a modern-day sediment delivery ratio to this estimate; and 2) to measure changes in depth to the argillic horizon along transects leading from fields to the stream channel. Estimates from the two methods ranged from 35 to 52 Mg $ha^{-1}yr^{-1}$. These deposition estimates are being verified using 137-Cs dating in cooperation with the Watershed Research Laboratory in Durant, OK.

3. Experiments continued to evaluate several USLE parameters typical to the Georgia Coastal Plain. These parameters include the soil erodibility factor, the cover factor for crops previously not included in the USLE handbook, the effect of raised bed planting systems, and soil crusting. Utilizing a rotating-boom rainfall simulator and 12' x 35' USLE test plots, 72 plot runs were conducted. The collected erosion, runoff, and plot characteristic data have been tabulated and entered into the locations computed. Initial data analysis indicates an approximate factor of three increases in soil erosion due to the raised bed planting system.

4. Concentrations of suspended and dissolved sediment in Little River Watershed Streamflow were measured at three watershed scales. Samples were collected weekly at gaging stations K, F, and B, which are 16.66, 114.87, and 334.33 km, respectively. In addition to weekly sampling, streamflow was intensively sampled during the highflow events of February-April 1984. Suction filtration using 0.45 m millipore filters was used to separate the suspended and dissolved sediment fractions. Data analyses indicate that dissolved solids concentrations generally exceed suspended solids concentrations in the stream systems.

5. A study to evaluate sediment yields from field scale watersheds of the Coastal Plain continued. Initiated in 1981, this study is designed to evaluate the effects of conservation tillage on sediment and water yields. Rainfall depths runoff rates and sediment concentrations are being measured for five fields ranging in size from 0.60 to 1.77 ha. Crop

rotations consists of corn, peanuts, and soybeans in both conventional and minimum tillage systems. The collected data have been tabulated, entered into the computer, data analysis is in progress.

For additional information contact L. E. Asmussen, Laboratory Director, USDA-ARS, Southeast Watershed Research Laboratory, P. O. Box 946, Tifton, GA 31793.

IDAHO

Research activities at the Northwest Watershed Research Center, Boise, Idaho, include the following:

1. 1984 water year runoff was the greatest of record and about twice the average at the Reynolds Creek Watershed Outlet station. The yearly sediment yield was about 110 percent of average and the peak streamflow rate was about 1/2 of average at the station. Long-term records such as this are needed to determine sedimentation rates during droughts, floods, and to establish normal conditions.

2. Sediment yield analysis by the Modified Universal Soil Loss Equation (MUSLE) was re-evaluated on four Reynolds Creek watersheds using soil erodibility and cover-management factors from recent soil surveys, vegetation cover measurements, and rainfall simulation studies. Results show relative contributions of sediment from rainfall and snowmelt associated events on these rangeland watersheds.

3. Rainfall simulation studies in southwest Idaho and north-central Nevada have contributed to more reliable application of the Universal Soil Loss Equation (USLE) on rangelands. Studies are continuing on effects of plant canopy, rock and vegetation ground cover, roots, and surface roughness on soil loss from sagebrush rangelands.

4. Channel cross-section surveys, automatic suspended sediment pumping samplers, bedload sediment catchments, and periodic sediment transport measurements have been installed or established on the Upper Sheep Creek Watershed in conjuction with an intensive groundwater flow study. Storm and snowmelt events will be analyzed as the study progresses.

For additional information contact Clifton W. Johnson, Hydraulic Engineer, USDA-ARS, 270 South Orchard, Boise ID 83705

INDIANA

Research activities at the National Soil Erosion Laboratory, West Lafayette, Indiana include the following:

1. A rainfall simulator was used to collect soil erosion data on the ARS-Purdue University Integrated Pest Management study. The purpose of the 1984 study was to evaluate the effects of a developing soybean canopy on variables such as soil loss, and infiltration. Two row-width treatments (10 and 30 inches) were compared to gauge the possible value of row width in reducing soil erosion from soybeans during the growing season. Simulated rainfall was applied to each plot during canopy development starting when the canopy was at about 10 percent cover and continuing to full canopy. A range of canopies from 8 percent to 99 percent were tested. The progression of canopy development was recorded by taking photographs from above the plots. Percent canopy cover was calculated using an image analyzer, and correlated to dependent variables. The average cover throughout the season for the 30-inch row was about 10 percent less than the 10-inch row plots. In the regression of soil loss on percent canopy, a 30 percent decrease was observed in soil loss attributed to the increasing canopy cover for the 30-inch rows, while a 48 percent decrease was found for 10-inch rows. Canopy cover was found to have no effect on infiltration during the dry run.

2. An assessment of the use of soil mechanical properties to predict soil detachment by single waterdrop impact was made. Soil mechanical properties were measured on four soils with a triaxial consolidated-undrained compression test and a Swedish fall-cone device. The weight of soil detached by a single raindrop was measured for 5.7-mm diameter drops falling a distance of 13 m. The results indicated that strength and pre-failure deformational properties, as measured by the triaxial test alone were not linearly related to splash. As previously reported, soil splash weight was a linear function of the ratio of waterdrop kinetic energy to fall-cone strength on a per soil basis, but the slope of the line differed among soils. Slopes were greater for soils with greater consolidated, undrained friction angles as determined in the triaxial compression test and expressed in terms of total stresses. Therefore, fall-cone strength was multiplied by the triaxial friction angle. Detachment versus raindrop kinetic energy divided by the corrected fall-cone strength term was linear with constant slope for all soils.

3. Laboratory tests were completed on a study of sediment transport and deposition by shallow flow. Data analysis has shown that raindrop impact greatly increases the transport capacity of shallow flow. Size, density, and shape are major factors in the transport of sediment by shallow flow, and deposition and selectivity of particles during deposition is strongly influenced by sediment nonuniformity. Classical streamflow sediment transport theories do not apply to this transport. New theory is needed to advance technology for predicting sediment yield from field-sized areas. Although little sediment may leave surface irrigated fields, high erosion rates can occur at the upper ends of the fields where water is introduced. Field and analytical research is being conducted to better understand these erosion processes, to develop ways of estimating this erosion, and to develop improved control

methods. Research also continued on erosion, sediment transport, and deposition by flow confined in row furrows as a function of channel grade, discharge rate, soil conditions, and erosion rate on adjacent areas.

3. A project was initiated to develop a procedure by which yields and other data could be collected by field people and processed at a central location. This would give the opportunity for people such as Soil Conservation Service technicians to collect data from a large number of sites across the U.S. The data base so developed could then be used to verify models assessing the effect of erosion on soil productivity. Data were collected during the years of 1981, 1982, 1983, and 1984. Individual differences of the effect of erosion on corn yield were 40 bushels in several cases. Soybean yield differences are more on the order of 7 or 8 bushels. This is occurring on some of the best corn and soybean soils in the Corn Belt. Surprisingly, differences were greatest in years with very favorable growing conditions. It was previously thought that the highest differences would be in years of high moisture stress. Data from 1981-83 are essentially analyzed. They will be reported in a Ph.D. thesis. Two manuscripts have been prepared and presented. The experiment will be continued through 1985 in cooperation with the Soil Conservation Service.

4. Pore-size distributions measured with image analysis on soil thin sections and by Hg-porosimetry were compared for three soils. Image analysis was performed on thin sections to measure the area of pores from 10-4000μm diameter using optical transmission microscopy (OTM). Pores 0.17-200μm were measured volumetrically by intrusion with Hg. Direct areal measurements from image analysis of thin sections did not correspond favorably to Hg intrusion measurements of pores 10-200μm diameter for two of the soils. Deviations occurred in all soils in the pore sizes less than 100μm diameter and were greater for soils with lower bulk densities. Pore collapse during Hg intrusion was found to be the cause for the deviation. Shape analysis performed during image analysis placed pores into rounded, vughy or planar classes, but did little to explain discrepancies in the data between the two techniques.

5. The principle expected result from the project, Improved Technology for Predicting Soil Erosion by Water, which began in 1984, will be an erosion prediction method to replace the Universal Soil Loss Equation (USLE), which is widely used but is now more than two decades old. The replacement will be fundamentally based in that it will use relationships for the fundamental erosion processes of detachment, sediment transport, and deposition as these processes are driven separately by the erosive agents rainfall and runoff in contrast to the USLE which lumps the processes. The research will develop new governing relationships and parameter values rather than adapt existing ones from the USLE. The new parameters will be functions of measurable properties of climate, topography, soil, cover, and management. The replacement will be more powerful than the USLE, more accurate, more broadly applicable, and easier to use. The replacement will be implemented on a portable computer that can be taken to the field. A workshop was held to plan details of the research. Work is underway on updating the USLE and revision of Agric. Handbook 537, the main guideline manual for the USLE. The update will incorporate recent information on erosion reduction by conservation tillage, erosion processes on rangelands and forestlands, and on deposition by terraces. Also, data on slope length and steepness are

being reanalyzed and adjustments are being made in the USLE topographic factors. 20 ARS and university scientists are involved.

For additional information contact H. L. Barrows, Director, USDA-ARS, National Soil Erosion Laboratory, Purdue University, Bldg. SOIL, W. Lafayette, IN 47907.

MARYLAND

Research activities at the Hydrology Laboratory in Beltsville, Maryland include:

The determination of sediment accumulation rates is important in understanding how these materials are affecting lakes and reservoirs ecosystems. In this study three methods were used to estimate sediment accumulation rates in the impounded backwater lakes behind Lock and Dam Nos. 8 and 9 on the upper Mississippi River. The three methods were: 1) a "spud" survey, 2) a survey of bottom contours, and 3) the use of fallout cesium-137. The field use of these three methods of determining sediment accumulation and the potential errors and merits involved in each method are discussed. The results from the field study in backwater areas along the upper Mississippi River showed the survey of bottom contour method gave the lowest rate of sediment deposition and the ^{137}Cs method gave the highest rates. Sediment accumulation rates from 0 to 7.8 cm per year were measured in the study area. All three methods are useful and have unique characteristics for determining rates and patterns of sediment accumulation. Thus the choice of a method to be used in a sediment survey is dependent on the type of information needed and the time available.

For additional information contact Albert Rango, Research Leader, USDA-ARS-FA, Hydrology Laboratory, Room 139, Building 007, Beltsville, MD 20705

MINNESOTA

Research activities at the North Central Soil Conservation Research Laboratory at Morris, Minnesota include the following:

1. Evidence suggests that soil aggregate stability is altered following most oilseed crops when grown in normal rotation. In 1982, field plots with four replicates each of corn-soybean and wheat-sunflower rotations were established to study the effect of microbial activity and soil organic matter on soil aggregate stability and soil and nutrient losses. Sampling and analyses were initiated during the 1983 growing season. Simulated rainfall has been used to induce soil loss and runoff. Sediment size distributions have been measured and stability of in situ aggregates and eroded aggregates have been determined in the laboratory using a drop tower procedure. Residue bags were placed at depths of 0, 4, and 8 inches for biweekly retrieval for 6 months to study rate of residue decomposition and weekly soil samples have been collected for total organic matter, water soluble organic matter, and microbial respiration rate measurements. Qualitative and quantitative determinations of total and water soluble polysaccharides from soils on these plots are also being made. When soil respiration rates were measured in the field, generally the rates of respiration for the soils with decomposing oilseed residue (from the previous year) were lower than for the grain crop. Measurement of respiration for one soil in the laboratory (air-dried, passed through a 2-mm sieve) with soybean and corn residue confirmed this observation. The addition of both residues increased respiration as compared to unamended soil, but the rate of respiration was highest for the soil with corn residue added. The addition of NH_4^+-N to the corn residue decreased the rate of respiration, indicating the rate of respiration depends on the C/N ratio. These results, combined with observations that microbially produced polysaccharides contribute to aggregate stability and decreased erosion, suggest that both residue management and N fertilization may exert an effect on soil erodibility.

2. Detailed analyses of sediment particle sizes and densities continue to be done as an integral part of all erosion studies. This data, accumulated from several different soil, tillage, and cropping conditions, is being correlated and analyzed to refine the relationships between sediment particle size and type and amount of vegetative cover, topography, and soil type which are currently being used in sediment transport models.

3. Properties of tilled soil as affected by rainfall kinetic energy continue to be quantified. The kinetic energy of 335 cm of rainfall decreases random roughness to about 0.4 of original, whereas that amount of rainfall without energy causes a decrease to about 0.9 of original. Bulk density values in the tilled layer responded similarly with and without energy applied but a dense surface seal formed with energy added.

4. In colder climates, it is known that during the period of spring thaw, soil is extremely susceptible to erosion from snowmelt and rainfall. Most current erosion models do not include erodibility relationships for this unique condition. Consequently, the effects of freezing and thawing of soil aggregates at different moisture contents on subsequent aggregate stability are being measured in a drop tower.

5. Soils from Minnesota, Indiana, and Mississippi were eroded using simulated rainfall. Soil loss, runoff, sediment size, and plant nutrient data were measured. Soil losses from similar rainstorms and soil conditions were highest in Mississippi and least in Minnesota. Greatest losses of plant nutrients and organic matter occurred in Minnesota and the least in Mississippi. Data show that even though the Minnesota soil had the least amount of soil loss, it suffered the greatest loss of those elements important to plant growth, while just the opposite was true in Mississippi. It is clear from these results that current equations predicting soil loss do not adequately predict losses in soil productivity.

6. Two simplified hydrologic models, a large scale model and a small scale model have been developed to analyze nonpoint source pollution from agricultural watersheds in Minnesota. They are based on single storm events defined in terms of frequency and duration and are intended for use on watersheds ranging in size from 200 to 12,000 ha for the large scale and 1 to 200 ha for the small scale model. The models use geographic cells of data units at a resolution of 1 to 16 ha. They simulate the transport of sediment, nutrients, and flow from the headwaters of a watershed to the outlet in a stepwise manner so that the flow at any point within a watershed can be examined. The nutrients examined by the models are N, P, and COD. Watershed data is currently being collected from instrumented watersheds for testing and verifying the accuracy of the models.

For additional information contact Charles A. Onstad, Director, USDA-ARS-NCR, North Central Soil Conservation Research Laboratory, North Iowa Avenue, Morris, MN 56267.

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

MISSISSIPPI

Research activities at the USDA Sedimentation Laboratory at Oxford, Mississippi include the following:

1. A Technology Applications Project (TAP) was formed at the USDA Sedimentation Laboratory in support of the Yazoo Basin Demonstration Erosion Control Project, a joint effort between the Soil Conservation Service and the Vicksburg District Corps of Engineers. The purpose of the ARS Technology Applications Project is to cause rapid and complete transformation of existing and new scientific findings to more innovative and useful soil and water conservation and flood control methods. The Demonstration Erosion Control Project (DEC) is controlled by an Interagency Task Force Committee comprised of personnel from ARS, SCS, COE and the Corps of Engineers Waterways Experiment Station (WES). ARS and WES support the Task Force Committee by performing needed inventories, monitoring, and evaluating installed remedial measures. The DEC project is responsible for six watersheds in the Yazoo Basin. These are Hickahala, Hotophia, Long, Otoucalofa, Batupan Bogue and Black Creeks.

2. Insecticides foliar-persistence data are needed to develop and refine predictive models concerning pesticide loss from agricultural ecosystems. The disappearance (volatility and degradation) of toxaphene, methyl parathion, and fenvalerate from cotton plants was measured under field conditions in northern Mississippi. Insecticide loads on the plants decreased hyperbolically with time over a 146-hr period. Calculated 50% disappearance times for toxaphene, methyl parathion, and fenvalerate were 17.6, 2.4, and 79.4 hr, respectively. In general, these values are somewhat shorter than reported half-lives. The range of reported persistence times for an individual pesticide in different geographical areas demonstrates the influence of site specific factors, especially weather variables, on pesticide disappearance, and indicates the need for broad-based information on the effect of weather variables on pesticide disappearance.

3. No statistical difference in sediment size distribution from 0.2% slope could be found due to time during the storm, plot length, or dry and wet rainulator runs. Enrichment ratios of sediments ranged from 1.4 for clay to 0.1 for sand. Over 60% of the sediment clay was transported in aggregates; D_{50} sizes of the non-dispersed sediment were 2 to 3 times as large as D_{50} of the dispersed sediment.

4. Sediment yield from a flatland watershed (16 ha) in Mississippi has been surprisingly high. Annual losses were as high as 29 t/ha with an average annual loss of 16 t/ha from cotton on 0.2% slopes. However, when the sediment detention effects of a small pond below the experimental area were included, sediment yield was reduced to 6 t/ha. This amount was a little larger than the 5.2 t/ha measured from a 259-ha flatland watershed.

5. Sediment losses from the ends of bedded cropland rows were measured for row furrow gradients ranging from 0.5 to 6.5% at several row lengths and rain intensities. Losses doubled between 0.5 and 2.0% gradient, increased

only slightly from 2.0 to 5.0%, and increased rapidly from 5.0 to 6.5%. Part of the soil eroded by rainfall from the row sideslopes deposited in the furrows at 0.5% gradient, but all was lost at 2.0% and steeper. Beginning at about 5.0%, additional erosion resulted from serious furrow scour due to concentrated runoff. More of the lost sediment originated from the row sideslopes than from the furrows for all conditions except the long, steep rows. The size of the lost sediment became coarser as the furrow gradient steepened.

6. Soil losses from crop row sideslopes were measured for a wide range of soils during rainstorms of various intensities. Relative erodibilities varied as much as 10:1 among soils for a dry, tilled condition and by 4:1 for succeeding storms. Poorly aggregated high-silt soils were most erodible, and high-clay soils were least erodible. Loam and sandy loam soils were intermediate. Erosion was best correlated with soil clay percentage, 1500 kPa water, exchangeable calcium, sum of exchangeable bases, cation exchange capacity, or organic matter content, all negatively. The more erodible soils generally produced the finer, more easily transported sediment.

7. The effect of rainfall on soil surface roughness was studied for three tillage systems: chisel only, chisel plus disking, and chisel plus disking plus do-all. Rainstorms were applied at 50 mm/hr for 6 durations from 15 minutes to 6 hours. The resulting roughness changes, expressed in terms of a parameter R, could be described by an exponential decay function, $R = a + b \exp(-c \cdot r)$, where r is the cumulative rainfall and a, b and c are constants.

8. The development of ephemeral gullies as a consequence of normal farming practices is being intensively studied on two field sites, each about 4 acres in size, in the Goodwin Creek Experimental Watershed, northern Mississippi. Discharge at each site is being measured with twin 0.46-meter (1.5-foot) H flumes with continuous stage recorders. Sediment concentration samples are being collected by 0.91-meter (3-foot) diameter N-3 Coshocton wheels below the outfall of each H flume. The ephemeral gully distributions and sizes are being documented by ground surveys at these two intensively studied sites and at ten monitoring sites representing a variety of topographic, soil, and management conditions.

9. Fine and sand fractions of the sediment load passing through critical flow structures on Goodwin Creek near Batesville, Mississipi, are being measured by manual and automatic methods. The manual samples are being obtained by traversing a DH-48 sampler over the flow depth with a sampling boom. The automatic samples are obtained by pumping samplers with intakes fixed on the sloping surface of the concrete structures about one foot above the lowest point. The concentration from individual samples exhibit appreciable scatter; however, average concentrations for quarter-foot increments of stage exhibit consistent relationships with stage or flow discharge. Simple power functions give good representations of the sediment ratings. The automatic samples have been found to overestimate the sand concentrations from the manual samples by factors ranging from about 3 to 40 with representations of the fine sediment concentrations.

For additional information contact Neil L. Coleman, Director, P. O. Box 1157, Oxford, Mississippi 38655; telephone 601-234-4121.

U. S. DEPARTMENT OF AGRICULTURE-ARS

MISSOURI

Research activities at the Watershed Research Unit in Columbia, Missouri, include the following:

1. Reservoir water quality was improved by the use of the automatic bottom withdrawal spillway on three small reservoirs in this study. The water stored in these reservoirs had 2 to 3 times less sediment than that discharged through the spillway. Similarly, 1.3 to 3.6 times more ortho-phosphorus and 2 to 6 times more ammonium were discharged. The deepest reservoir with the deepest withdrawal depth showed the most benefit from the bottom withdrawal. Trap efficiency on the one reservoir that was studied five years prior to being converted to a bottom withdrawal dropped from an average of 80% to 74%. This drop will increase the useful life of this reservoir 20%. Since the trap efficiency of the larger storms on this reservoir is usually 50 to 60%, the average TE is expected to drop further and the benefits be greater yet. However, the greatest benefit from this spillway may not be longer life but a reservoir full of cleaner water throughout its life.

2. Runoff and soil loss from 40 essentially uniform experimental plots were monitored for 25 naturally occurring rainfall events over a six-month period. Plots had been maintained uniformly for the prior three years and were kept fallow with periodic cultivation during the study period. Except for events with low runoff and soil loss, event coefficients of variation were relatively constant at about 20% for both runoff and soil loss. Differences in runoff and soil loss among plots varied with event. Only minor amounts of observed variability could be attributed to any of several measured plot properties and plot differences expressed during the period of record did not appear to persist for prior or subsequent observations. The relatively large amount of variability shows that several replications of treatments are needed to confidently estimate mean runoff and soil loss for comparison purposes and that factors having minor effects on runoff and soil loss may be difficult to detect experimentally. The fact that most variability is unexplained indicates an important effect of factors or processes that are not currently understood.

3. A 37-year history of soil loss from a Mexico silt loam claypan soil in north central Missouri was summarized for corn following corn with conventional tillage. The USLE cover and management C factors defined in Agricultural Handbook 537 were calculated from the measured data. Results showed C factors have decreased for natural rainfall soil loss plots as nitrogen fertilizer use has increased, with a concomitant increase in plant populations and grain yield. Because most of the data used to calculate tabulated AH 537 C factors were collected before the mid-1950's, some reduction of the C factors is warranted to better represent soil losses from modern corn management.

4. Soil loss data from a 24-year period for corn tillage treatments of conventional and conservation tillage were summarized by cropstage and tillage year periods. The average tillage year soil loss of conservation tillage was about one-half that of conventional tillage. Except for cropstage F (spring tillage to planting), soil loss for conservation tillage was less than that for conventional tillage in each cropstage. The similarity of soil loss for both tillage treatments in cropstage F was attributed to similar infiltration capacities of both tillage treatments due to different causes. Conventional tillage of moldboard plowing may have increased soil porosity and infiltration capacity compared to conservation tillage of field cultivation. However, surface residues from conservation tillage were greater than that from conventional tillage. Surface residues tend to attenuate runoff and enhance infiltration.

For additional information contact Allen T. Hjelmfelt, Jr., Research Leader, USDA-ARS, Central Plains Area, Watershed Research Unit, 207 Business Loop 70 East, Columbia, MO 65203.

U. S. DEPARTMENT OF AGRICULTURE-ARS

IOWA

Research activities at the Watershed Research Unit in Treynor, Iowa, include the following:

1. Soil loss was determined along a steeply sloping hillside using photogrammetric techniques and by measuring residual Cesium 137 (^{137}Cs) levels. These soil loss values and measured sediment yields were used to establish sediment accounting and delivery values for the research watersheds in the Missouri Valley deep loess soils of western Iowa. Hillside net soil movement was about 25 Mg/ha/y and sediment delivery was 60 and 58 percent for ^{137}Cs and photogrammetric procedures, respectively.

2. Concentrated flow erosion was investigated on a conventionally tilled watershed and a conservation tilled watershed. During a severe runoff period in May and June of 1984, concentrated flow erosion was estimated to be 17 Mg/ha from a conventionally tilled watershed and 1.8 Mg/ha from a conservation tilled watershed. Conservation tilled reduced concentrated flow erosion 8-fold compared to conventional tillage. One storm in 1985 yielded an estimated 7.4 Mg/ha. Estimates were made using channel cross sections, channel lengths and total number of channels.

For additional information contact Allen T. Hjelmfelt, Jr., Research Leader, USDA-ARS, Central Plains Area, Watershed Research Unit, 207 Business Loop 70 East, Columbia, MO 65203.

NEBRASKA

Research activities of the Soil and Water Conservation Research Unit at Lincoln, Nebraska, include the following:

1. Equations describing overland flow depth, rainfall induced soil detachment and sediment transport capacity on interrill areas were identified. The Darcy-Weisbach equation which included a parameter for predicting flow resistance caused by rainfall was used to calculate depth of overland flow. Soil detachment was determined from an equation incorporating raindrop induced, impact pressure estimates. The product of a soil transport factor, bottom shear stress and flow velocity was used to calculate sediment transport capacity. Nondimensional forms of the model equations were evaluated using existing experimental data.

2. Laboratory measurements were made of interrill erosion as affected by varying overland flow discharge and slope steepness. Soil detachment and sediment transport capacity relations were then evaluated using experimentally obtained information. The model equations were utilized to further characterize interrill soil erosion. The overland flow region over which the model equations are applicable for a disturbed Nunn clay loam soil was determined from laboratory tests and critical shear stress analyses. The influence of slope length on interrill erosion was also examined.

For additional information, contact James F. Power, Research Leader, USDA-ARS, University of Nebraska, Room 122 Keim Hall, Lincoln, NE 68583-0915.

OKLAHOMA

Research activities at the Water Quality and Watershed Research Laboratory in Durant, Oklahoma included the following:

1. Flocculation of clay and growth of algae were studied simultaneously after fertilizing turbid pond water. Fertilizer stimulated algal growth and photosynthesis, and increased the settling rate of clay for several weeks after fertilization. Algae responding to fertilization were mainly Chlorella or Chlamydomonas sp. There was no increased settling of clay when the ponds were darkened to prevent algal growth. The results show that in this case clarification was due to biological flocculation, not chemical flocculation of the clay. The nutritional state of algae may effect their ability to flocculate clay.

2. A sedimentation survey was made of Reelfoot Lake in Tennessee using cesium dating techniques. The average annual rate of sedimentation decreased from 2.2 cm/yr in 1954-1965 to 0.7 cm/yr in 1965-1983. Measurements of particle size distribution showed that the rate of water flow increased in Upper Buck Basin during the period 1965-1983 in comparison to the flow during 1954-1964. The estimate of the period of time that Upper Buck Basin will remain a useable lake was 100 to 300 years.

3. Cesium-137, a radionuclide that was added to soils by fallout from nuclear tests was used to trace sediment movement in small watersheds. The cesium-137 measurements on a small native grass watershed showed considerable spacial variability, but the variability was random and was not correlated with changes in slope. On the other hand cesium-137 concentrations measured on a 10 m grid in an adjacent small watershed that had been cultivated for seven years showed significant diffences at different slope positions. The cesium content in the cultivated watershed was significantly less than in the uncultivated watershed even though sediment yield measurements showed that only small amounts of sediment left the watershed. These data show that cesium-137 can be used to measure low erosion rates if enough samples are collected.

4. Measurements of cesium-137 concentrations in uneroded soils across the southern U. S. indicated that the cesium-137 input was proportional to the average annual rainfall. The vertical distribution of cesium-137 within the soil profile was related to soil properties rather than to rainfall. Similar concentration profiles of cesium-137 in forest and adjacent clear-cut areas in Southeastern Oklahoma indicated little soil disturbance or sediment loss due to harvesting. Comparisons of cesium-137 activities in a peanut field and a nearby forest in the Coastal Plain area of Georgia showed extensive loss of clay from the field and considerable sediment deposition at the field edge.

5. Amounts of sediment per runoff event from agricultural watersheds in the Texas Blackland Prairie, Southern High Plains, Central Rolling Red Prairies, and Central Rolling Red Plains land resource areas of Oklahoma and Texas were predicted using the modified Universal Soil Loss Equation (MUSLE). In this equation, $Y = 11.8 (Qq_p)^{0.56} KCPSL$, where Y = sediment yield in metric tons, Q = runoff volume in m^3, q_p = peak runoff rate in m^3/sec, K = soil erodibility factor, C = crop management factor, P =

erosion control-practice factor, and SL = slope length, gradient factor. Periods of study were 3 to 5 years and included treatments involving grazing density, fertilization, cultivation, and burning. Over the range of watersheds, average measured sediment yield varied from less than 10 to more than 800 kg/ha/event. In most cases, the predicted values compared favorably to the field measured values.

6. The effects of longterm erosion-depositions and soil formation in a small watershed (Udertic Paleustoll soils, 3-4%) are evaluated by an analysis of two-dimensional spatial trends, correlation structure of variability, and interrelationship for some selected topsoil properties and grain sorghum yield. The measurements were made in a 10-m, two-dimensional, grid of 108 points. These were supplemented by a more detailed measurement of both topsoil and subsoil properties on a 21-point line transect along the main slope. The topsoil properties measured on the grid were the texture (percent sand, silt and clay), bulk density, and soil water storage after a rainfall at one time during the rapid growth stage of sorghum. The soil profile properties measured on the line transect were the texture, bulk density, macroporosity, organic matter, volumetric soil water storage at different suctions, pH and available phosphorus. The coefficient of variation of grain sorghum yield was much greater that those of the soil properties, especially in the dry year of 1983. There were significant 2-dimensional, curvilinear, trends for all properties, which were represented by least-square parabolic surfaces. Sand content decreased while the silt and clay contents increased downslope. Grain sorghum dry matter yield in both years increased along the main slope, but was also higher on the sides than in the middle of the field. A semivariogram was calculated for each property after the data were detrended using the parabolic fits. All variograms had a large nugget effect. The variograms for texture components showed a weak correlation structure, with a range between 30 and 40 m. In both years, the semivariograms for soil bulk density and water storage did not clearly indicate a structure. There was also apparently no structure for dry matter yield, plant stand or yield per plant in the 1983 variograms, while a weak structure was present in the 1984 variograms with range nearly the same as that for the soil texture components (30-40 m). The soil physical properties of texture, macroporosity, water storage, available water and bulk density in the topsoil and subsoil explained a very large percentage of the variation and increase of grain sorghum yield along the slope. A multiple regression containing only 4 or 5 variables explained between 64 to 75% of the variation yield. The topsoil properties were relatively more important for yield under suboptimal growing conditions (in a dry year), while the subsoil was a limiting factor for yield under normal conditions.

7. The enrichment of several P forms (Bray I, labile, inorganic, and organic), N, C, and K in runoff sediment was investigated for 6 soils of varying physical and chemical composition, using simulated rainfall (60 and 120 mm hr^{-1}). Differing enrichment ratio (ER) for C, N, and organic P (2.00, 1.61, and 1.47 averaged for the 6 soils) indicate that erosion may reduce the C:N:organic P ratio of the remaining surface soil. Average ER's for Bray I (2.45) and labile P (2.89) were significantly greater than for the other P forms (1.48). This was attributed to less aggregation of sediment compared to source soil for the major proportion

(70%) of the runoff events studied. Phosphorus desorption-sorption characteristics, buffer capacity (1.49), sorption index (1.56), and equilibrium P concentration (1.80) and exchangeable K (2.46) were also enriched in runoff sediment compared to source soil. The logarithm of ER for each P form, N, C, and K was related to the logarithm of soil loss, which ranged from 10 to 800 kg ha^{-1}. Statistically significant differences between regression equations for each nutrient indicate that more than one equation is needed to estimate different nutrient ER's. Nutrient ER was related to clay and specific surface area ER of the sediment. This is to be expected as the nutrients described are chemically associated with clay-sized particles. The relationship between soil loss and nutrient ratio will be of use in estimating the effect of erosion on soil fertility.

8. Accurate predictions of sediment and associated nutrient transport are important from land use, management, and environmental standpoints. To predict sediment yield for individual runoff events the Modified Universal Soil Loss Equation (MUSLE) was employed for 23 grassed and cropped watersheds in the Southern Plains over study periods of 3 to 5 years. Use of MUSLE involved both measured and computed runoff energy factors. Corresponding losses of soluble P were predicted using a soil P desorption equation, and particulate P and N losses were predicted using a relationship between enrichment ratio (nutrient content of sediment/source soil) and soil loss. In general, the results indicate that MUSLE and the nutrient equations provided realistic estimates of sediment and nutrient transport in runoff.

9. The relative amounts and distribution of P forms in virgin soil profiles are compared with those of similar soils that had been cultivated and fertilized for at least 15 years. Eight agriclturally important soil series, representative of different U. S. cropping areas, are included. The effect of sheet erosion of the surface 15 cm of soil on the content of P, N, and C forms, was estimated by comparing the nutrient contents of 0-75 cm (uneroded) and 15-90 cm (eroded) depths. Such erosion would reduce the inorganic P, available P, mineralizable N, and organic C contents of the soil profile while increasing P sorption index. In general, simulated erosion wille affect soil P status less than N status.

For additional information contact Frank R. Schiebe, Director, USDA-ARS, Southern Plains Area, P. O. Box 1430, Durant, Oklahoma, 74702.

PENNSYLVANIA

Research activities at the Northeast Watershed Research Center at University Park, Pennsylvania include the following:

1. A model was developed to predict the effect of standing vegetation on sediment yield. The model is based on the relationship between local scour around standing vegetation and the role of plant population density in deposition. The model utilizes a spacing hydraulic radius to define the characteristic length applicable to the calculation of Reynold's and Froude's number. These numbers, indicative of a flow regime, are then used in conjunction with sediment transport parameters for determination of net erosion or deposition.

2. Comparisons were made between amounts of soil eroded or deposited at a point using metal erosion pins, gross sediment yield and numerical model predictions. Spatial structure of soil loss distribution was evaluated. Discrepancies between values observed at the pins and values expected based on model results and sediment yield sampling were explained by increases in turbulence and the amount of rain near the pins. Implications with regard to vegetation in the form of stalks were suggested.

3. Mathematical simulation of erosion on upland areas was described. The erosion process was divided into rill and interrill components according to the source of eroded sediment. The model provided estimates of sediment yield, predicted patterns of flow, delineated partial contributing areas and shows principal zones of deposition. Predicted values of sediment yield for individual storms over a 10 year period agreed well with experimental data for two agricultural watersheds. No concurrent data exist to verify the extent of deposition, or rill scour also predicted by the model.

4. An erosion-deposition model, originally developed for a mainframe computer, was adapted for an Apple IIe. With minimal adjustment it can also be used on other personal microcomputers. The model is user oriented and utilizes readily available data. It predicts distribution of erosion and deposition on a watershed and provides information for selecting optimal management practices. Its application is illustrated using rainfall, topography, and soil data from a mined and reclaimed watershed in Pennsylvania. The model satisfactorily predicted sediment load at the outlet of the watershed and at the holding ponds. The simulation package can be used to plan location of detention basins, in channel design studies, and in land use planning.

For additional information contact Andrew S. Rogowski, Soil Scientist, USDA-ARS, Northeast Watershed Research Center, 110 Research Building A, University Park, PA 16802.

TEXAS

USDA, AGRICULTURAL RESEARCH SERVICE

Research activities at the Grassland, Soil and Water Research Laboratory in Temple, Texas include the following:

1. The EPIC model was tested extensively as part of the RCA validation process. Several hundred long-term simulations were conducted for hypothetical sites throughout the U.S. Simulation results were carefully examined by SCS personnel familiar with the test sites. The EPIC model was modified on several occasions to overcome deficiencies identified in the RCA validation process. Besides the RCA validation process, tests with research data were continued. Resulting modifications to EPIC included (1) the addition of an erosion factor to account for the effect of surface rocks and other coarse fragments; (2) equations for estimating wilting point and field capacity soil water contents; (3) an improved method for distributing soil evaporation with depth; (4) an initial attempt at simulating a water table and its effect on plant growth.

2. Some initial phases of ALMANAC development were accomplished. The crop parameter table was expanded to include an infinite number of crops. To save computer storage, however, the model only considers the user-specified crops for each simulation. A new crop indexing system was developed to place crops into categories for special treatment like N fixation for legumes, continuous growth without planting perennials, etc. A component was developed to allow construction and destruction of furrow dikes. These operations along with appropriate modifications to the runoff model provide a means for evaluating furrow diking systems. An initial attempt was made to adapt the general crop model to tree growth applications. The first version of ALMANAC for use in real time simulation were designed.

3. Work continued on testing the SWRRB model. A mathematical description of transmission losses was developed for SWRRB based on travel time, soil water content and effective hydraulic conductivity. Improvements were made in return flow, crack flow, and sediment routing. A general crop growth model and tillage operations were added to SWRRB. SWRRB was validated on 12 large (9-538 km^2) watersheds from 8 ARS locations from throughout the U.S. Measured and predicted sediment yields were compared and SWRRB provided reasonable results considering the wide range in climate, soils, topography, land use, and management. The model was used extensively by a consultant to determine sediment yields for the entire U.S. east coast. SWRRB was modified to run with the SCS Soils-5 data base while Soils-5 was condensed and made readily available to users.

For additional information contact Jeffrey G. Arnold or Jimmy R. Williams, USDA-ARS, Grassland, Soil and Water Research Laboratory, P. O. Box 748, Temple, TX 76503.

AGRICULTURAL RESEARCH SERVICE

WASHINGTON

The following research is being conducted by the Land Management and Water Conservation Research Unit at Pullman, Washington:

1. Runoff plots have been installed on fields in eastern Washington on various crop treatments including conventionally tilled, conservation tilled, and direct stubble seeded winter wheat, and various primary tillages of wheat stubble. The purposes are (1) to determine the effect of crop treatments on (a) runoff, (b) soil loss, and (c) nitrogen and phosphorous in runoff water; (2) determine the effect of slope length on relative magnitudes of sheet and rill erosion; (3) determine the effect of certain conservation practices on runoff and erosion; and (4) determine potential for residue harvesting for biomass conversion processes. Instrumentation includes frost depth gages to determine the effect of crop treatment on frost depth and subsequent runoff and erosion following periods of frozen soil.

2. A subfactor method of estimating crop management factors (C factor in the USLE) has been developed and output is being used by SCS in Idaho, Oregon, and Washington. Seven years of runoff and erosion plot data from the Palouse Conservation Field Station at Pullman have been collected to substantiate and improve the method. Work is continuing to improve the consistency of the data and to apply the method to additional crop rotations.

3. Results of investigations into the effect of soil freezing and thawing on soil shear strength indicate very low surface shear strength during the thawing process. Results of this study will be used with soil freezing and thawing models to improve winter erosion prediction with the USLE and runoff/erosion models.

4. Analysis of short-term precipitation records from gages near Corvallis, Oregon, has indicated that relationships can be developed between 15-minute and hourly intensities, and between EI calculated from 15-minute and from hourly precipitation data. Thus, hourly precipitation data can be used to estimate the EI values that would be calculated from break-point data. Such calculations offer the promise of vast improvements in estimating EI values for much of the western United States where break-point precipitation data are sparse.

For additional information, contact Donald K. McCool, USDA-ARS, Agricultural Engineering Department, 219 Smith Engineering Building, Washington State University, Pullman, Washington 99164-6120.

LABORATORY AND OTHER RESEARCH ACTIVITIES

BUREAU OF LAND MANAGEMENT

The BLM's Service Center in Denver, Colorado, is involved in technology developments and transfer projects, technical assistance, and training in sedimentation issues.

Universal Soil Loss Equation on Rangelands. A project to modify USLE for application on arid and semiarid rangelands. Product of this study will be a BLM Technical Note, Hydrology and the Universal Soil Loss Equation = Applications to Rangelands.

A low-cost system to monitor runoffs and soil loss from rangelands. This project required installation and instrumentation of paired runoff plots to quantify effects of livestock grazing on annual runoff and soil loss. Products of this effort include: runoff counter device which was developed and manufactured; 16 runoff plots constructed in four BLM Districts; four project reports developed for each site; and a BLM Technical Note will be written.

Gully erosion. A project to review the state-of-the-art in gully erosion analysis. A BLM Technical Note 366: "Gully Erosion" was written.

Bureau of Reclamation

Testing and revision of the water-sediment routing model developed under contract with Colorado State University continued. The first production use of the model will be the analysis of sediment transport and channel changes in the Grand Canyon as a part of the beach erosion study.

In a contract with Colorado State University, a field study was made of the response of the Fall River to the extreme sediment supply resulting from the failure of Lawn Lake Dam near Estes Park, Colorado. Data were collected on the streamflow, suspended and bed sediment movement, and the change in channel cross sections. Changes in channel meander pattern were also monitored. The rate of sediment influx to Lake Estes was also monitored.

The Hydrologic Engineering Center

The Hydrologic Engineering Center has been very actively providing technical assistance to Corps District offices who are dealing with sediment problems. The HEC participated in approximately a dozen different sediment-related District studies. Several special projects reports, technical documents and other publications were published in 1984 documenting HEC's technical assistance activities. These studies included work for six District offices, four Divisions, and OCE, The Federal Highway Administration (Transportation Research Board), U. S. Forest Service, Bureau of Reclamation and The East-West Center in Honolulu, Hawaii.

Several sediment investigations, initiated in 1984, are continuing into 1985. They include studies to evaluate possible project-related sediment problems on the Arkansas River in Colorado, the Santa Ana, Sacramento, and San Joaquin Rivers in California, and numerous creeks and smaller watercourses in California, Nevada, Utah, Arizona, and Washington.

The HEC is investigating debris flows and mud flooding problems in the Wasatch Mountains in Utah. The purpose of this study is to develop methods for predicting occurrences of mud/debris flows and for estimating their impacts on local flooding for flood insurance purposes. HEC is also assisting the Portland District with their analysis of mud flow problems along the Toutle River.

Work at HEC continues to focus on the maintenance and improvement of the mathematical model HEC-6, "Scour and Deposition in Rivers and Reservoirs." HEC is also developing task-specific utility routines designed to help Corps personnel to evaluate sediment and hydraulic problems.

Conceptual design of a new one-dimensional fluvial hydraulics numerical model is continuing and specific software engineering tasks have been initialized.

CORPS OF ENGINEERS

Waterways Experiment Station

Title of Study:

Storm Erosion Study

Conducted for:

U. S. Army Corps of Engineers

Water Resources Region:

All coastlines

Location:

Field Research Facility, Duck, NC

Summary of Accomplishments:

The purpose of this study is to develop an improved understanding of how beaches change during storms and other natural processes and to predict storm-induce beach changes. Initial efforts concentrated on use of historic CERC beach profile data collected from 1962 to 1978. These have been compiled and combined with the WES Phase II hindcast wave data and used to evaluate a Dutch method for predicting storm erosion.

Since the historic data cover only the beach above mean sea level, a new field study, begun in 1981, seeks to investigate nearshore changes. Two profile lines located at CERC's Field Research Facility are being surveyed bi-weekly and after storms out to a depth of about 10 meters using the Coastal Research Amphibious Buggy (CRAB). These data indicate that beach changes are small relative to offshore changes with most changes occurring in water depths less than 6 meters. Most of the observed profile changes result from the exchange of sediment from the beach to the nearshore bar and on/offshore oscillations of the bar.

During 1984, a report discussing use of the Dutch method for estimating storm erosion was drafted along with a data report presenting the historical storm erosion data. A user's guide to the computer program used to process the CRAB data was published and a paper discussing the first three years of nearshore surveys was presented at the International Coastal Engineering Conference.

Title of Study:

Nearshore Surveys at Assateague Island, Maryland

Conducted for:

U. S. Army Engineer District, Baltimore, MD

Water Resources Region:

North Atlantic

Location:

Assateague Island, Maryland

Objective: To collect and analyze survey and sediment data from 20 profile lines within the northern 8 miles of Assateague Island, MD, extending from the bay shoreline, across the island, and seaward to the -30 ft water depth. The data will be used by the District for planning future coastal projects, and by the National Park Service and Rutgers University for a regional coastal processes study.

Summary of Accomplishments: Surveys were conducted in September and October 1984. Survey data were analyzed, and profile plots were produced for the 1984 data set and for profiles previously obtained in 1965 and 1979. Sediment samples are being analyzed to determine the size distribution within the nearshore study area.

Title of Study:

Barrier Island Sedimentation Study

Conducted for:

U. S. Army Corps of Engineers

Water Resources Region:

All barrier coastlines

Location:

All barrier coastlines

Summary of Accomplishments:

Field data collection efforts for New Jersey and the Virginia Barrier Islands were completed. Laboratory analysis of the data has begun. Data collectior and reduction were completed for the sediment source study conducted at St. Lucie Inlet, Florida. Initial drafts of two reports on sediment sources have been completed. Final drafts of two technical reports, Cape Formation Along Straight Barrier Shorelines and The Holocene Depositional History and Predicted Morphological Changes of the Virginia Barrier Islands and Back Barrier Regions, have been completed and are ready for publication. A set of 16 shoreline change maps for the Delmarva Peninsula has been published. The shoreline change data have been reduced for analysis. Technical papers were presented by invitation at the American Meteorological Society conference, the Assateague Shelf and Shore Workshop, and the SEPM W. Armstrong Price Symposium on Sea Level Rise. A contributed paper on nearshore profile changes was presented at the ICCE. A sediment sampling and analysis program was initiated in cooperation with the FRF to document changes in sediment characteristics related to nearshore morphological variations. Back-barrier sediment sampling is planned.

Title of Study:

Preliminary Assessment of Soil Erosion in the U. S. Virgin Islands

Conducted for:

U. S. Army Engineer District, Jacksonville

Water Resources Region:

Caribbean

Location:

U. S. Virgin Islands

Summary of Accomplishments:

The U. S. Virgin Islands (USVI) are experiencing significant soil erosion attributable to commercial and residential development. The U. S. Army Engineer District, Jacksonville requested that the U. S. Army Engineer Waterways Experiment Station (WES) conduct a preliminary assessment of the extent of erosion in the Islands. This study will serve as a basis to develop erosion-control measures for the Territorial Government.

During 1984, the WES completed a literature survey of published USVI studies dealing with soil loss and related physical parameters (e.g., geology, climatology, surface water, etc.). In addition, a WES team made an inspection visit to the Islands to evaluate the area extent of erosion and to coordinate the effort with knowledgeable local persons. Based on the results of the literature survey and the inspection visit, WES is preparing a draft report describing the development of a first generation automated soil loss estimate methodology for construction and undistrubed sites in the Islands. Further, the impact of increased siltation and optical turbidity on near-shore marine ecosystems is discussed in the draft.

Title of Study:

Improved Dredging Methods

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

The Improved Dredging Methods project is a portion of the Improvement of Operations and Maintenance techniques (IOMT) program, funded by the Office, Chief of Engineers. The objective of the project is to investigate potential improvements in existing maintenance dredging methods in support of COE Civil Works missions. The project was begun in October 1982. Accomplishments during calendar year 1984 include:

a. Completed laboratory investigation of high density polyethylene (HDPE) dredge pipe. Flow properties and wear characteristics were determined for HDPE and steel. In both cases HDPE gave the superior performance.

b. Published the results of the HDPE tests at the ASCE specialty conference on Dredging in Clearwater Beach, Florida.

Future work will include evaluations of HDPE in field applications, performance of dredge production meters, and development of methods for measuring sediment volumes in hopper dredges, and input to ER 1130-2-307, Dredging Policies and Practices.

Title of Study:

Advance Maintenance for Entrance Channels

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

The Advance Maintenance for Entrance channels study is a unit of the Improvement of Operations and Maintenance techniques (IOMT) program, funded by the Office, Chief of Engineers. The objective of the study is to develop rational criteria for the use of advance maintenance dredging, i.e., over width and/or over depth dredging, for entrance channels by evaluating the effect of depth and width on dredging frequency. A literature survey to determine the state of the art was conducted. Corps-dredged entrance channels have been identified, and those to which advance maintenance is applied have been so designated. Specific projects have been analyzed to determine the effect of channel depth and width on dredging frequency and volume. The analysis was conducted using an empirical technique based on historical dredging records. The analysis of selected advance maintenance projects in the Portland District was completed.

Accomplishments during 1984 include the following: (a) The analyses of Sisulaw River, Coquille River, Coos Bay, and Wilmington Harbor Entrance Channels were completed. (b) The analyses of additional selected projects in the Wilmington, Norfolk, Portland, Savannah, and Mobile Districts were continued. (c) Work was underway on an ETL Engineer Technical letter draft describing a new empirical technique for predicting the effect of advance maintenance on dredging requirements developed from this study. (d) Preparation of a technical report describing the evaluation of advance maintenance effectiveness for specific entrance projects continued.

Future work includes completion of the analysis of advance maintenance entrance projects, particularly over width projects, publication of the ETL describing an empirical approach to the prediction of advance maintenance effectiveness, and publication of the technical report describing the results of the evaluation of specific advance maintenance projects.

Title of Study:

Principles of Channel Alignment on Navigable Alluvial Rivers Phase I

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

This study is the first phase of a broad-based, long-range, state-of-art study to determine the principles of natural stream tendencies with regard to channel alignment. The study is divided into phases with the exact scope of each phase based on the results of preceding phases. Phase I includes (a) review of published literature, (b) analysis of prototype data, and (c) development and checking of hypotheses for natural channel alignment for varying conditions. Phase II will involve laboratory investigations to validate hypotheses developed in Phase I. This research is necessary to develop criteria to ensure the most economical and stable alignment for navigation channels.

Based on several papers presented at the Rivers '83 conference in October 1983, Mississippi River data for the 1880's and 1973-1975 are being analyzed to determine various channel characteristics and relationships. The analysis includes digitizing the prototype data for computations of relationships of radius of curvature to width ratios, spacing of crossing and point bars, and top bank controls. Luna Leopold's original work on radius to width ratio is also being reanalyzed. Results of the first phase of this study are expected to be included in Chapter 9 of Navigation Channel Stabilization EM in FY 86.

Title of Study:

Sedimentation Engineer Manual

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

A revised draft of the complete engineer manual was assembled and editing initiated. The revised draft reflects consideration of comments received from CE review of the first draft of the major technical chapters.

Title of Study:

Stable Flood Control Channel Design (Improvements)

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

Guidance for the design of stable flood control channels to be used by design offices of the Corps of Engineers (CE) is being developed. Planning was completed to conduct a nationwide inventory of CE flood control projects. The purpose of the inventory is to identify Corps design criteria needs and to establish priority of research effort.

Title of Study:

Improved Numerical Procedures for Deep Draft Channels

Conducted for:

Office, Chief of Engineers

Summary of Accomplishments:

Work to produce a 2-D system of computer programs for water and sediment movement was completed.

This TABS-2 numerical modeling system was used extensively at WES, was enhanced substantially, and was released in draft form to Corps of Engineers offices in February 1984. The final system and a user's manual will be issued in May 1985.

Work is now underway on TABS-3, a 3-D system of numerical models for open channel flows and transport processes.

Title of Study:

Fine-Grained shoaling in Navigation Channels

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

a. Further flume tests were made to investigate the relationships between bed shear and settling velocity.

b. Settling tests were performed on Corpus Christi sediments. Previously-developed methods of analysis for turbulent suspension ard consolidation behavior were checked.

c. Two papers were presented at Cohesive Sediments Workshop, Tampa FL, sponsored by NSF.

d. Long flume experiments were conducted to investigate density-driven sediment flows.

Future Work:

a. Flume tests on dense suspension will be carried out to investigate rheological properties and friction in unsteady, open-channel flows.

b. Laboratory experiments will also be conducted to investigate the effect of shear on hindered-settling consolidation, age hardening, and aggregate formation.

c. Field demonstration will be arranged for determination of bed density and comparisons made to acoustic detection of the "bed."

d. Deposition tests will be conducted in the recirculating flume to investigate particle population behavior.

ENVIRONMENTAL PROTECTION AGENCY

REGION IV, ATLANTA, GEORGIA

Florida's Sediment Control Program

Through some grant funds provided by EPA under Sections 208 and 205(j) of the Clean Water Act, the State of Florida's Department of Environmental Regulation (FDER) has planned and is implementing a program to control sediment and other nonpoint source pollutants through its "Stormwater Rule". The Rule is five years old, and is a legislative regulatory approach to the control of all categories of nonpoint source pollutants. Agricultural NPS pollutants are controlled in that farmers are exempt if they are implementing an approved Conservation Plan. If not, the Rule applies. Silvicultural activities are handled in a similar manner: Comply with the Florida Silvicultural BMP Manual or the Rule.

For additional information, contact Eric Livingston, FDER, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida, 32301-8241. Telephone (904) 487-1779 or William J. Patton, EPA Region IV, 345 Courtland Street, N.E., Atlanta, Georgia 30365. Telephone FTS 257-4289.

U.S. ENVIRONMENTAL PROTECTION AGENCY
GREAT LAKES NATIONAL PROGRAM OFFICE

CHICAGO, ILLINOIS

The Great Lakes National Program Office, located in Chicago, Illinois has conducted monitoring of sediment contaminants, has sponsored research on the bioaccumulation of contaminants from sediments, and has sponsored demonstration projects on sediment and erosion control through conservation tillage practices.

1. Extensive surveys of bottom sediments were conducted in the St. Lawrence River. Over seventy samples were collected in the Massena, New York/ Cornwall Ontario area, and fourteen samples were collected in the Ogdensburg, New York/Maitland, Ontario in the vicinity of known or suspected sources of toxic substances discharges.

   For additional information contact Anthony Kizlauskas, GLNPO, Chicago, Illinois 60605, Telephone (312) 353-3576 - FTS: 353-3576.

2. Working under an Interagency Agreement with the Great Lakes National Program Office, the Great Lakes Fishery Laboratory (Ann Arbor, Michigan) of the U.S. Fish and Wildlife Service, developed a laboratory flow-through bioassay for evaluating bioaccumulation of toxic substances from sediments. The Great Lakes Fishery laboratory then conducted a field exposure of caged test species to contaminated sediments in Green Bay, Wisconsin for comparison with the results of the laboratory flow-through bioassay to evaluate the applicability of the laboratory test procedure.

   For additional information contact Anthony Kizlauskas, (312) 353-3576, FTS: 353-3576.

3. Section 108(a) of the Clean Water Act provides for Great Lakes basin projects to demonstrate new and innovative methods to reduce, eliminate or remove pollutants from any part of the drainage basin. Presently this program is funding thirty-three Soil and Water Conservation Districts (SWCD) to demonstrate the no-till farming practices. The objective of the projects are to reduce soil erosion and phosphorus loads to the Great Lakes. SWCD's participating are two (2) in New York on Lake Ontario, three (3) in Michigan, six (6) in Indiana and twenty-two (22) in Northwest Ohio on Lake Erie. In addition to this tillage effort fertilizer and pesticides management are stressed.

   For additional information contact Ralph G. Christensen, GLNPO, Region V USEPA, Chicago, Illinois 60605 Telephone (312) 353-3545 - FTS: 353-3545.

ENVIRONMENTAL PROTECTION AGENCY

REGION V WATER DIVISION

Sediment Delivery Ratio

Highland Silver Lake Watershed Project is one of five comprehensive monitoring and evaluation projects in the Rural Clean Water Program (RCWP). One of the primary technical needs of the Highland Silver Lake Watershed Project was the determination of sediment delivery ratios for sites where implementation has occurred, so as to ascertain the off-site impacts of resource management system (RMS) implementation. A study was intitiated to examine various predictive sediment delivery ratio estimation techniques and determine which technique should be utilized to determine the impact of the erosion control efforts on sediment yield for the Highland Silver Lake Rural Clean Water project. It was determined that site specific sediment delivery ratios based on sediment transport factors were more representative of the actual delivery process than area-based techniques or techniques that encompass a combination of area-based and sediment transport factors. Results from the study indicated the need for a distance to stream correction factor to be applied to fields not directly adjacent to the stream network. The "Pete" method was selected to determine sediment delivery ratios on all sites where RMS implementation occurs as part of the RCWP.

For additional information contact Thomas E. Davenport, USEPA, (WQS-TUB-8), 230 South Dearborn Street, Chicago, Illinois 60604.

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION V - WATER DIVISION

Illinois Agricultural Watershed Monitoring and Evaluation Project

The project was financed in part with funds from the U.S. Environmental Protection Agency (USEPA), Region V office, Chicago, Illinois under provisions of Section 208 of the Clean Water Act (P.L. 95-217). The Blue Creek Watershed encompasses 2839 hectares. Land use in the Blue Creek is predominately agricultural. The terrain is hilly, and it has a high soil loss potential due to its steep slopes, fine-textured soils and agricultural land use management practices. The three-year comprehensive monitoring and evaluation project was completed in 1984 with the publication of three summary reports. These reports are available from NTIS.

For additional information contact Toby Frevent, IEPA, 2200 Churchill Road, Springfield, Illinois 62706.

LARGE LAKES RESEARCH STATION
GROSSE ILE, MICHIGAN 48138

The Large Lakes Research Station, Grosse Ile, Michigan has conducted research during 1983 and 1984 on the fate and effects of toxic substances in Monroe Harbor, Michigan. A study was designed and implemented to address the issues of transport, exposure and effects of contaminants in the tributary and nearshore areas of the Great Lakes. A component of this study included the analysis of surficial sediments for physical characteristics, polychlorinated biphenyls (PCBs), selected organochlorine pesticides, zinc, chromium, and copper. Preliminary data indicate relatively high levels of PCBs at numerous points along the river bottom, especially in the area of a freighter turning basin located 1.5 miles (2.4 km) upstream of the river's mouth and just downstream of the turning basin. In addition to surficial sediment samples, sediment cores were collected at selected stations in the river and sliced at 2 cm increments from the surface to as deep as 18 cm in some cores. Each slice was analyzed for PCBs and selected organochlorine pesticides and the data currently are being analyzed and interpreted. Preliminary data indicates an increase in PCB concentration with depth at some stations and a decrease in PCB concentration with depth at other stations.

In-situ bioaccumulation studies conducted in 1984 used caged clams, fathead minnows and channel catfish to compare differences in contaminant uptake between species. Replicate cages were suspended in the water column and placed on the bottom to compare different exposure regimes. The data from this study presently are being analyzed and results are not yet available.

As part of the Monroe Harbor study, investigations of sediment resuspension events and the effects of different sheer stresses on sediment resuspension were conducted to predict the frequency and the magnitude of resuspension events. The data from these studies still are being analyzed and interpreted.

The Large Lakes Research Station, as part of the Upper Great Lakes Connecting Channel study, will be initiating a 3-year research program in the summer of 1985 to understand the exposure and biological effects of in-place pollutants. The intent of this three-year program is to relate toxicity and other biological effects directly to resuspension and diffusion of in-place pollutants or indirectly from environmental factors affecting exposure concentration of classes of compounds. This will allow prediction of biological effects from easily measured parameters such as the physical characteristics of sediments, and the concentration of contaminants in the sediment.

For additional information contact William Richardson, LLRS, FTS 226-7811.

ENVIRONMENTAL RESEARCH LABORATORY
DULUTH, MINNESOTA 55804

The Toxic Substances Research Branch, Dioxin study, has conducted research on reverse phase liquid chromatography-mass spectrometry evaluated for the prediction of log P oct/wat of organic molecules in aqueous samples and organic extracts of sediment samples. This technique provided log P values within 0.5 log units of accepted literature values. Mass spectrometry detection is used as a very sensitive universal detector not restricted to limitations of conventional detectors. Post column flow extraction using a membrane to enhance high log P chemicals is being developed, along with organics enrichment techniques for organics on sediment samples.

Specialized extraction and isolation techniques are being developed for the isolation of dioxin isostereomers such as tetrachloro-dibenzofurans, carbazoles and biphenylenes. These techniques involve modifications of the carbon/silica gel chromatography techniques used in the National Dioxin Study. Standards for some of these analyses have been synthesized at ERL-D.

For additional information contact Doug Kuehl, ERL-D, FTS 783-9559.

ENVIRONMENTAL RESEARCH LABORATORY

NARRAGANSETT, RI

The Environmental Research Laboratory, located in Narragansett, Rhode Island, with its Field Station in Newport, Oregon, is the Agency's center for marine, coastal, and estuarine water quality research. The Laboratory is responsible for conducting research on marine disposal and discharge of contaminated sediments, sludges, and complex wastes as well as quality criteria for marine water and sediment.

Significance of Bioavailability and Bioaccumulation

The objective of this project is to develop or revise physical, chemical and biological screening procedures for predicting the bioavailability and potential bioaccumulation of organic contaminants from sediments. EPA's ocean disposal program requires techniques to evaluate the bioavailability and bioaccumulation potential of contaminants in the wastes. The research strategy integrates laboratory experiments, field assessment, and computer simulations. Kinetics of contaminant uptake, depuration and metabolism are being examined as well as the properties of sediments, contaminants and organisms that control bioaccumulation processes. Thermodynamic and kinetic models are being developed to predict accumulation potentials of contaminants. Controlled laboratory experiments will be conducted with pure compounds using field and laboratoryreared animals and with field-obtained contaminated sediments. Field experiments employing caged and native populations are conducted in conjunction with laboratory exposures.

Field Verification Program

ERL-Narragansett is conducting research on the bioaccumulation of contaminants associated with the disposal of dredged materials in coastal marine and estuarine waters. Black Rock Harbor, Bridgeport, Conn., dredged materials, typical of East Coast polluted harbor sediments, has been shown to be contaminated with polynuclear aromatic hydrocarbons, polychlorinated biphenyls, an unexpected pesticide Ethylan, and trace metals. Furthermore, these contaminants are biologically available to a filter-feeding bivalve, Mytilus edulis, the blue mussel. Of the 6800 ng/g PCB's in the sediment, mussels accumulated 3000 ng/g. Mussels also accumulated up to 28% of the PAH's that were present in individual concentrations of up to 9800 ng/g. Of the trace metals present, the mussels seemed to accumulate Cu, Cr, Pb, Ni, and Cd, although some of these may be due to entrained sediment.

In acute solid phase toxicity tests, the sediment was lethal to only one of the eleven species tested, Ampelisca abdita, although behavioral changes were observed in two additional species, both infaunal species. No effect was noted with epibenthic or water column species in either solid phase or in combination with suspended particulate phase.

CRITERIA AND STANDARDS DIVISION, WASHINGTON, D.C.

Sediment Quality Criteria

The U.S. Environmental Protection Agency has been exploring technical approaches available to establish numerical sediment quality criteria. The presence of toxic contaminants in the bottom sediments of the Nation's lakes, rivers, and coastal waters creates the potential for continued environmental degradation even though control of effluent discharges may allow compliance with established water quality criteria.

During the year a variety of activities have been undertaken in the effort to develop sediment criteria. A list of the major activities and a brief description of each is as follows:

(1) Review of Methodologies - A variety of approaches are available that have a potential for use in the development of sediment criteria. The pros and cons of each approach were identified and evaluated with respect to EPA needs.

(2) National Perspective - Using STORET data for 48 contaminants suspected of being in concentration of concern in the environment, an assessment was conducted to determine the scope of the contaminated sediment problem and which contaminants are of primary concern.

A final detailed document is to be developed and distributed in May, 1985 entitled, "National Perspective on the Contaminated Sediment Prolem".

(3) Criteria Development Workshop - A workshop was convened in November, 1984, in which experts selected and tailored two approaches (one for metals and one for non-polar organics) to fulfill EPA criterion needs.

(4) Workplan Development - Based on the findings of the Criteria Development Workshop, an integrated workplan was developed which identifies specific activities, priorities and time frames involved in implementing the criteria development effort.

Because the Agency wished to avail itself of the knowledge and technical expertise gained from previous research, a three-day workshop was convened in Alexandria, Virginia, in November 1984 to bring together experts from around the country familiar with the various facets of the sediment quality criterion development process. These experts consisted of a diverse group of biologists, chemists, and engineers from within and outside EPA. These individuals were broadly representative of varying technical outlook and organizational perspective.

Participants of the Sediment Quality Criteria (SQCD) Workshop provided a cohesive set of recommendations to EPA on the development of numerical sediment quality criteria. Contaminents of potential concern were divided into three groups--non polar organic compounds, metals, and polar organic compounds--based on the status of bulk sediment concentration normalizatior

theory. This approach can be used to ensure that all sediment locations can be compared on an equivalent basis. the use of existing field data was emphasized as was the validation of all theoretical criteria calculations by laboratory bioassay where practical and technically feasible.

For the non-polar organic compounds, normalization to organic carbon content is well established such that recommendations emphased the practical development of the criteria rather than theory. Separate approaches were specified for toxicity limited concentrations and body-burden limited concentrations. The former makes considerable use of field data to compute a conservative probable no-effects level while the latter ideally works backward from specific limits. Lack of water quality criteria and other appropriate action limits constraints the development of sediment quality criteria.

For the metals, an equilibrium partitioning approach was recommended. Because the normalization theory is as not well established for metals as it is for non-polar organics, the recommendations include some examination of the validity of iron oxide, manganese oxide, and total organic carbon content as normalization factors. The body-burden limited approach recommended was similar to that for the non-polar organics.

The criterion development process for polar organic compounds is the least well developed of the three groups. The recommendations emphasized the determination of appropriate normalization factors and the development of priority lists of compounds of environmental significance.

In conclusion, the SQCD workshop served to provide a direction for EPA's future efforts to develop sediment quality criteria. Tractable progress in criterion establishment can be expected for non-polar organic compounds and metals, but the theoretical basis for polar organic compound criteria is generally less well understood at this time.

For additional information contact Chris Zarba, EPA, Criteria and Standards Division, Washington, D.C. 20460. Telephone FTS- 472-3400.

FEDERAL HIGHWAY ADMINISTRATION

The Federal Highway Administration (FHWA) concentrated its activities on five major areas: evaluation of embankment stability subject to flood overtopping, control of culvert outlet erosion, control of stream instability at highway crossings, control of sediment produced by highway construction, and control of highway water quality. Major efforts were carried out by staff and contract research, and by the various studies in the Highway Planning and Research Program (HPR) and in the National Cooperative Highway Research Program (NCHRP).

Evaluation of Embankment Stability Subject to Flood Overtopping - The objectives of these studies are to evaluate stability of embankments subject to flood overtopping and to determine expected rates of erosion when damages do occur. Various types of embankment materials and various types of protective measures are considered for these studies. In the overall design framework for highway stream crossings, these studies provide guidelines for risk analysis and lowest total expected cost design.

A. Simons, Li and Associates (SLA) is currently conducting a study sponsored jointly by FHWA and the U.S. Forest Service under contract DTFH61-82-C-00104 "Embankment Damage Due to Flood Overtopping." This is a large scale outdoor lab study to measure rates of embankment damage under various overtopping conditions. Two different embankment soil types are used, tests are conducted with and without grass covers and with and without a paved roadway on the top of the embankment. The U.S. Forest Service tests include a few select protective measures to stabilize the embankment. This study is scheduled for completion in 1986.

B. FHWA sponsored three small contracts with USGS and State highway agencies to document field data after specific flood events to augment the large scale lab data collected by SLA in item A above. The studies include: (1) P.O. 83-Y-10018 "Documentation of December 1982 Flood Characteristics and Damages at Three Missouri Sites." A letter report by the Missouri District of USGS dated September 19, 1983 is on file by FHWA (Structures Division, HNR-10, McLean, VA 22101). (2) P.O. 83-Y-10017 "Documentation of Flood Damage December 1982 Overtopping of Highway Embankments at Seven Locations Within Arkansas." This study was conducted jointly by the Arkansas USGS district and by the Arkansas State Highway and Transportation Department. A report dated January 1984 prepared by the Hydraulics section of the Arkansas State Highway and Transportation Department is on file by FHWA. (3) P.O. DTFH61-84-Y-10009 "Flood Damage and Highway Damage at Five Arizona Sites." A report by H. W. Hjalmarson, USGS, Arizona District dated September 1984 is on file by FHWA. All three of these reports were made available to SLA and the field data points are to be included in the final report by SLA.

C. A small scale centrifuge experiment was conducted by the University of Colorado at Boulder, Colorado, and was sponsored jointly by FHWA and the Waterways Experiment Station at Vicksburg, Mississippi. This study was an exploratory effort to determine if a centrifuge apparatus, rigged to handle water, could be a model for the large scale experiments. A draft report for this study was prepared and reviewed. It will be published soon.

D. A large scale study of protective measure for embankments subject to overtopping was being planned as a followup to the overtopping damage study in item A above. This study is expected to be co-sponsored by FHWA and the U.S. Bureau of Reclamation and will be initiated in 1985.

Control of Culvert Outlet Erosion - The objectives of these studies are to investigate the various flow conditions and the forces involved at the outlet area, the material necessary to resist the erosion, and the special design of energy dissipators and stilling basins to control the erosion.

A. The University of Akron completed the study, sponsored under the HP&R program by the Ohio Department of Transportation, on "Internal Energy Dissipators for Culverts" which is a continuation of earlier work on this topic. The work included a laboratory investigation of staggered halves of roughness ring energy dissipators and resulted in a table of design coefficients for "standard" internal energy dissipator chambers. The draft final report was prepared and reviewed; it will be published soon.

Control of Stream Instability at Highway Crossings - The objectives of these studies are to evaluate the significance of natural stream adjustments on the structural integrity of highway crossings, to provide techniques for resolving the impact of these changes, then to provide guidelines for measures to mitigate stream instability at highway stream crossings.

A. As a result of the "Countermeasures" study completed in 1978, protective measures were identified that could benefit from additional evaluation and laboratory testing. One of these protective measures was spur or dike constructed along stream banklines. Although spurs and dikes have been applied nationwide there was no general guideline for their construction in application to protection of highway right-of-way. The Sutron Corporation in cooperation with the Pennsylvania State University completed the FHWA study entitled "Flow Control Structures for Highway Stream Crossings." The research evaluated present application of spur and conducted laboratory flume studies to refine design guidelines for use by highway engineers. The draft final report was prepared and reviewed; it will be published soon.

B. The USGS completed the FHWA sponsored study on "Roughness Coefficients in Vegetated Flood Plains." The study took advantage of data collected by completed HP&R studies in the Gulf Coast States of Louisiana, Mississippi, and Alabama. Detailed data were used to field validate methods of roughness coefficient estimation which had been developed theoretically and only laboratory tested. The final report, FHWA-TS-84-204, "Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains" was published in April 1984.

C. Sponsored by FHWA, the USGS continued a study on "Evaluation of Design Practices for Riprap Used in Protection of Highway Crossings." The study will determine, using field evaluation and collection of hydraulic data, the applicability of available riprap design procedures and provide guidelines for comprehensive design methods. Of special interest is the function of riprap in bends or when tested against impinging flow.

D. The FHWA continued the study of flexible linings in Drainage Ditches with the U.S. Geological Survey for a series of tests at their Gulf Coast Hydroscience Center in Bay St. Louis, Mississippi to evaluate the failure criteria and hydraulic resistance characteristics of some of the newer flexible lining materials as well as some traditional linings that have incomplete data. Materials being tested include: excelsior mat, single and double fiberglass roving, jute netting with straw and asphalt spray, jute netting with and without straw, Holdgro, Enka mat (lightweight), Erosionet with straw and asphalt spray, D_{50} 1-inch gravel (dumped and spread), and D_{50} 1-inch gravel rolled into soil.

Control of Sediment Produced by Highway Construction - This problem consists of two stages: during construction and just after construction.

A. The USGS Hawaii District, through the sponsorship of Hawaii Department of Transportation, continued the study on Rainfall-Runoff and Rainfall-Sedimentation Discharge Relations in Hawaii-type Watersheds. The objective of this study is to determine the effects of highway construction on the rainfall-runoff and rainfall-sedimentation discharge relations of a watershed on Moanalua Valley, Oahu, considering all significant basin characteristics. The results obtained will be used as a basis for deriving similar relations for other basins in Hawaii. Data collection and analysis were completed in 1980. The draft final report was prepared and reviewed; it will be published soon.

B. It is equally important that upon completion of highway construction, immediate and adequate protection against erosion be provided for slopes and other roadside areas affected by grading. In most regions of the country this has been accomplished with the establishment of proper management of vegetative cover. In 1983, nine States were conducting studies designed to improve vegetation establishment techniques and subsequent management practices. The participating States were Alabama, California, Georgia, Indiana, Maryland, Michigan, North Carolina, Oklahoma and Rhode Island. No reports were published in 1984.

Control of Highway Water Qualilty - The objectives of these studies are to monitor the highway water pollution parameters and to devise cost effective means to control them.

A. The FHWA research study on "Sources and Migration of Highway Runoff Pollutants," was completed by the Environmental Research Center of Rexnord, Milwaukee, Wisconsin 53214. Monitoring was completed in Milwaukee, Wisconsin; Sacramento, California; Harrisburg, Pennsylvania; and Effland, North Carolina. The final report will be published in 1985.

B. The third phase of FHWA's research runoff quality to determine the impact of highway runoff on receiving waters was completed with the Engineering Research Center of Rexnord, Milwaukee, Wisconsin 53214. The final report will be published in 1985.

C. An interagency agreement with the U.S. Geological Survey is underway to do a study on "Procedure to Predict the Impact of Hydrologic Modifications by Highways on Wetlands." Its objective is to develop guidelines and procedures to utilize wetland hydrodynamics in the evaluation, analysis, and design of highway crossings in flood plains and wetlands. This work shall utilize the U.S. Geological Survey SIMSYS2D modeling system as the basic tool in accomplishing the above objectives. An access system shall be made available to State highway agencies which will permit highway agencies or their consultants to access SIMSYS2D through the U.S. Geological Survey's National Water Data Exchange (NAWDEX) on an AMDAHL 470 Computer or load modules, as appropriate. The tool developed shall have the capability for dealing with estuarine wetland systems. The study will also develop a training program and supporting materials to allow State highway agencies to develop capability and proficiency for use of hydrodynamics in the location, assessment and systems and in operation and utilization of SIMSYS2D.

D. The California Department of Transportation continued another HP&R study on "Mitigation of Highway Related Chemical Water Quality Pollutants."

E. The Alaska Department of Transportation and Public Facilities continued the HP&R study to evaluate the effectiveness of roadway drainage structures for fish passage.

F. The FHWA administrative contract to identify effective alternatives for mitigating highway stormwater runoff pollution was completed. The final report will be published in 1985.

G. The Florida Department of Transportation completed an HP&R study to analyze the heavy metal input to receiving waters from highway stormwater runoff and determining any metal species change which occurs in the receiving water. The research also evaluated the environmental consequences. The final report will be published in 1985.

H. An FHWA Region 15 Demonstration Project to illustrate techniques and equipment for sampling and analysis of highway stormwater runoff is now available. Demonstrations were completed this year. The final report will be published in 1985.

I. In response to the serious problems encountered with conventional deicing chemicals, sodium and calcium chloride, FHWA continued the development of an effective alternative material. Research identified Calcium Magnesium Acetate (CMA) as a promising alternative. Studies are now underway to develop a commercial source for CMA. Before extensive commitments for CMA

are made, it is important to insure the environmental suitability of CMA. Research was completed with the Transportation Laboratory of CALTRANS to investigate CMA's compatibility with the environment and identify any potential problems. The report will be published in 1985. A followup study was underway at the University of Washington.

J. The FHWA administrative contract to investigate highway maintenance activities, identify potential hazards to water quality, and develop guidelines for effective mitigation alternatives was completed. The final report will be published in 1985.

K. In order to draw together the results of all the research on characterization of highway stormwater runoff, FHWA contracted with Woodward Clyde Consultants to develop a "Design Procedure to Estimate Pollutant Loading from Highway Stormwater Runoff." This study will develop a computer model to estimate pollutant loading and will include a procedure to evaluate the potential impact to water resources.

L. To transfer the technology to highway agency users, a "Highway Runoff/Water Quality Training Course" is being developed for FHWA. The course will include results from research on runoff characterization, water quality impact, environmental evaluation, best management practices and mitigation alternatives. Training courses will begin in 1985.

If more information is desired about these research studies, inquiries should be addressed to the sponsoring agencies.

CORPS OF ENGINEERS, GEOLOGICAL SURVEY, FOREST SERVICE, BUREAU OF RECLIMATION, AGRICULTURAL RESEARCH SERVICE, FEDERAL HIGHWAY ADMINISTRATION, AND BUREAU OF LAND MANAGEMENT

Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
Minneapolis, Minnesota

An experimental sediment-concentration gage worked reasonably well in field tests conducted at a site on Willow Creek near Madison, Wisconsin. Lack of rainfall hampered the data collection program; only a few storms occurred and these produced sediment concentrations that seldom rose above the instrument's threshold of detection (about 100 mg/L). During one period that lasted only a couple of minutes, the concentration rose from a few hundred mg/L to about 5,000 mg/L and then immediately dropped back to its former value. The gage registered the peak; however, it logged about 3,000 mg/L for the peak. The project plans to lab check the instrument's response to rapid changes in concentration and then, with help from the Madison Geological Survey office, resume field tests during 1985.

A new sediment-concentration gage was designed and partially constructed during 1984. This instrument is designed to hang from a cable so the gage can be lowered from a bridge. Laboratory testing will commence in 1985.

A P-61 suspended-sediment sampler and a Delft-bottle sampler were tested at two sites on the Colorado River near Blythe, California. Discharge-weighted concentrations (DWC) computed from the Delft-bottle samples were somewhat higher than DWC values computed from P-61 samples. A comparative test run in the Mississippi River near Vicksburg showed the opposite relationship: DWC computed from Delft-bottle samples were lower than DWC values computed from P-61 samples. At both sites, data from pumped samples agreed with data from the P-61. Personnel from the Sedimentation Project and the Delft Laboratories are reviewing the data with hopes of explaining the discrepancies.

Another study, based on a computer program, showed that sampling errors are created by sampler drift and that the errors are highly dependent on sampling technique. Drift refers to the motion of a sampler shifting downstream under the influence of drag forces acting on the sampler and its suspension cable. The program charts a sampler's path and also tabulates the quantity of sediment and water entering the sampling nozzle. Details of the theoretical analysis will be available in 1985.

Several techniques were studied for mapping scour holes around bridge piers. The study, described in an administrative report, shows a remote-controlled boat has serious drawbacks stemming from the weight of its propulsion system. A tethered craft fitted with a fathometer and a remote-controlled rudder is more promising. Compared to three-dimensional mapping of the holes, monitoring at a fixed point is a simpler task. A temperature-sensitive rod implanted in the river bed shows potential for future development.

An ASTM standard guide for sampling suspended sediment was finished and will be published in 1985. The draft of a guide for sampling deposited sediment was prepared and will be available for review in 1985.

Two core samplers fitted with core catchers were designed and shipped to the Corps of Engineers for field testing. One sampler is for use in wadeable streams; the other is for small reservoirs.

The surface area of suspended-sediment particles can be estimated from the attenuation of an infra-red light beam. Limitations of the technique and details regarding computations and equipment are explained in a report entitled "Measuring the surface area of sediment particles."

All equipment developed by the project is first reviewed by the technical committee and then submitted to the Corps of Engineers contract and purchasing division. Manufacturing contracts are awarded through a competitive bid process and then the equipment items are delivered to the project for inspection and calibration. The project maintains a stock of replacement parts and also repairs damaged sampling equipment. Each year the project supplies sediment samplers and analyzers to about 300 field offices. All items are pictured and described in a catalog that, upon request, will be supplied free of charge.

The following table lists only the major pieces of equipment that the project supplies to government and educational institutions:

	Instrument	Sold 1983	Sold 1984	Inventory, Dec. 1984
DH-48	Hand sampler	36	19	210
DH-75P	Hand sampler	0	14	7
DH-75Q	Hand sampler	6	4	3
DH-59	Hand-line sediment sampler	24	3	23
DH-76	Hand-line sediment sampler	2	4	29
D-74	Depth-integrating sampler	15	18	11
D-74AL	Depth-integrating sampler	6	5	1
P-61	Point-integrating sampler	3	4	11
P-63	Point-integrating sampler	1	4	2
P-72	Point-integrating sampler	5	1	5
BMH-53	Bed-material hand sampler	6	3	59
BMH-60	Bed-material hand sampler	18	8	32
BM-54	Bed-material sampler	18	5	8
SA	Particle-size analyzer	3	4	4
PS-69	Pumping sampler	4	4	0
	Total	147	100	

For additional information and copies of published reports readers are invited to call FTS 787-3352 or Comm. 612 349-3352 or write to:

Project Leader
Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
Hennepin Island & Third Avenue S.E.
Minneapolis, Minnesota 55414

GEOLOGICAL SURVEY

IL82-055 Evaluation of Shift-Control Method of Estimating Sediment Discharge in Illinois Streams

WRD Project No.: IL82-055

Project Chief: Frost, Leonard R., Jr.

Headquarters Office: Urbana, Illinois

Field Location: Illinois, Statewide

Problem: Water-resource planning and water-quality assessment require a base level of information on sediment concentration and discharges in streams. Conventionally this information is obtained by collecting water-sediment samples, once daily and more often during storms, and computing the sediment discharge on daily basis. A shift-control method that requires that some daily records be available to define the sediment transport curve may prove feasible to compute sediment discharge from sediment-transport curves and infrequent periodic samples. Records for periods succeeding the available records would be estimated using water-discharge records and the sediment-transport curve to compute a sediment-discharge hydrograph which is then shifted based on the intermittent sample record. The shift-control method needs to be evaluated for its applicability of Illinois streams.

Objectives: To evaluate the shift-control method of estimating sediment discharge in Illinois streams using a minimum number of samples.

Approach: Records at 12 stations will be used to evaluate the shift-control method of estimating sediment discharge in Illinois streams. The selection will provide areal coverage of drainage basins statewide that range in drainage area from 2.44 to 5,150 square miles.

Sediment transport curves relating daily mean discharge to daily sediment discharge will be prepared from the most recent 2 years of daily records for each station.

Equations that define these curves, and daily water discharge, will be used to compute daily sediment discharge by the following procedures: (1) unadjusted values directly from the sediment transport curve, and (2) adjusted by the shift-control method by using samples at 4-, 2-, and 1-week intervals as control samples (simulates monthly, biweekly, and weekly sampling).

The values for monthly and annual sediment discharge obtained by each of the above procedures will be compared to the published values obtained by daily sampling to evaluate the feasibility of using periodic samples to estimate sediment discharge.

FY-1984 Progress: Report completed and published. Frost, L. R., Jr., and Mansue, L. J., Evaluation of a hydrograph-shifting method for estimating suspended-sediment loads in Illinois streams: U.S. Geological Survey Water-Resources Investigations Report 84-4037, 37 p.

GEOLOGICAL SURVEY

Headquarters Office: Iowa City, Iowa

Field Location: Iowa, Statewide

The Iowa District has, in conjunction with the Hydrologic Instrumentation Facility, compared the pipet and SediGraph methods of particle-size analysis. The comparison was made using the results from replicate runs of reference sediment samples prepared by the U.S. Geological Survey.

Tests were designed to supply information on the operational characteristics of the SediGraph, including training needed, time elasped during a complete analysis, and reproducibility under varying conditions.

The Iowa District, in cooperation with the University of Iowa Hygienic Laboratory, has begun an evaluation of the sediment and dissolved partitioning of synthetic organic compounds in the Cedar River. Monthly samples were taken at six stations for suspended sediment size analysis as well as total suspended sediment chemical and dissolved chemical analysis. One bed sample cross section was obtained at each station for size and chemical analysis. The information collected is expected to be useful in documenting the amount and timing of agricultural chemicals transported through a major agricultural drainage basin.

GEOLOGICAL SURVEY

WRD Project No.:	4384-10700
Project Title:	Geomorphic and botanical impacts of sediment due to natural and unnatural land disturbance
Project Chief:	Osterkamp, Waite R.
Headquarters Office:	Reston, Virginia
Field Locations:	various sites in Virginia, Tennessee, Texas, Colorado, and California

Problem:

Increased sediment yield from mine spoils, reclaimed and urban areas, and agricultural lands is one of the largest problems being addressed by agencies such as the Office of Surface Mining and Soil Conservation Service. The acquisition and meaningful interpretation of sediment data is one of the most deficient areas that must be considered by these agencies. The impacts on the geomorphology and botany that are caused by induced sediment movement are sometimes intense, and knowledge of these impacts is beneficial for understanding the effects of naturally-occurring sediment movement.

Objectives:

1) To predict movement of sediment from naturally and unnaturally disturbed areas.
2) To assess existing techniques for the prediction of sediment movement and develop new ones based on geomorphic, botanical, and statistical principles as aids in improving interpretive capabilities.
3) To evaluate geomorphic, botanical, and hydrologic changes by sediment movement from disturbed areas.

Approaches:

1) Develop the technology for determining amounts and rates of movement of sediment by size class from disturbed areas based on factors such as land use, runoff, basin and landform morphology, and botanical indicators.
2) Conduct research on the effects of sediment movement on landforms and vegetation using vegetation age, damage, and patterns of occurrence as indicators of the magnitude, frequency, and time of occurrence of distructive hydrologic events.
3) Investigate the influence that ground-water movement exerts on sediment transport and on changes in landforms by analyzing near-surface subsurface rates of water and sediment movement (including piping, sapping, and seepage erosion) in dynamic hydrologic systems.
4) Determine from available information the sediment yields and trends in sediment yields from watersheds draining the coalfields in the eastern United States.
5) In conjunction and close coordination with other research and district personnel, conduct research on the interactions between hydrology, water chemistry, and geochemistry as determinants of sediment movement through a hydrologic system.

CR74-098 Sediment Transport Phenomena

Project Title: Measurement and Prediction of Sediment Transport Phenomena
WRD Project No.: CR74-098
Project Chief: Hubbell, David W.
Headquarters Office: Lakewood, Colorado
Field Location: Topical Research

Problem: In alluvial streams, for every different hydrologic condition, the bed configuration, sediment transport, and hydraulic characteristics mutually change to achieve a quasi-equilibrium. The changes affect the ability of the stream to convey given quantities of water, accommodate navigation, transport and dilute solid and solute wastes, support aquatic biota, and perform a variety of other similar functions. As yet, the relationships between pertinent hydraulic and sedimentologic variables are not completely understood, hence the extent to which important variables, particularly bed-form roughness and sediment transport, will change in response to natural or man-induced alterations to the flow regime can not be predicted with reliability. As a result, optimum utilization and management of a waterway usually is not assured and, often, modifications intended to enhance the utility of a waterway are ineffective or have adverse effects. Lack of understanding is due in part to inadequate instrumentation for measuring the bedload transport. This problem is particularly acute in areas where resources are being mined for energy development.

Objective: To provide a more complete understanding of sedimentation phenomena in alluvial streams and the response of such streams to imposed changes through the use of improved instrumentation and better understanding of the relationships between hydraulic and sedimentologic variables, particularly (1) the relationships between the factors that most influence the formation and alteration of bed forms and the transport of bedload and bed-material load and (2) the interrelationships between bed-form characteristics and the transport of bedload and bed-material load.

Approach: Initially, existing data will be analyzed to related bed-form characteristics and hydraulic and sedimentologic variables, and one or more bedload samplers will be developed to permit accurate measurements of bedload transport. The development of bedload samplers will be accomplished through a comprehensive testing and calibration program with prototype samplers in a specifically designed laboratory facility capable of continuously measuring the discharge of bedload particles from 2 to 64 mm in diameter under different flow conditions. Later, data on bed-form characteristics, sediment transport, and other pertinent variables will be collected as required, to meet specific needs; acoustic instrumentation, including side-scan sonar, will be employed to measure bed configuration and movement, and suitable bedload samplers, as well as suspended-load samplers, will be used to define transport rates. Tracer techniques also may be applied. Finally, data will be analyzed to define criteria for predicting bed form and to provide a better understanding of sediment transport phenomena. Both sand-bed and gravel-bed streams will be studied.

FY-1984 Progress: Data from all runs made with four different bed materials were used to develop final calibration curves for the 1.4 to 4.0 mm, 4.0 to 8.0 mm, and 11.3 to 32.0 mm size ranges for six versions of the Helley-Smith sampler and standard versions of the VUV (Hungarian) and Arnhem (Dutch) bedload samplers. Basic data from the study were compiled in final form. The compilation includes hydraulic and sedimentologic data for all runs and bed materials and extensive information on streambed morphology. The data set is one of the broadest and most definitive of its kind on the transport of particles from 1.0 to 32.0 mm under controlled conditions in a large laboratory flume.

FY-1985 Plans: A comprehensive report on the results from the calibration study will be started and specialized studies on the accuracy of various sampling procedures will be investigated. Techniques for reducing sampling requirements and effort will be studied using information collected during the calibration study at SAFHL. Participation in OWDC and ASCE committees will be continued, and activity on the Federal Interagency Sedimentation Committee will be initiated.

Completed Reports:

Hubbell, D. W., 1984, Discussion of remodified Einstein procedure for sediment load: Journal of Hydraulic Engineering, Proceedings American Society of Civil Engineers, v. 110, no. 4, p. 556-559.

CR75-187: Bedload Transport Research

WRD Project No: CR75-187
Project Chief: Emmett, William W.
Headquarters Office: Lakewood, Colorado
Field Location: Topical Research

Problem: Of all processes operating in river channels, and especially of those of practical concern to engineers and others interested in river channel behavior, perhaps the least knowledge is available regarding the hydraulics and mechanics of bedload transport. Before continuing advances in river channel behavior can be made, some understanding of the behavior of bedload sediment must be made.

Objective: (1) Define spatial and temporal variations in bedload transport rate for a single stage of flow; (2) define change in average magnitude of transport rate over a range in hydraulics of flow; (3) define change in average magnitude of transport rate over a range in channel geometry; and (4) analyze the data to evaluate the applicability of available bedload equations, suggest new coefficients for the existing equations, or propose new relations for predicting rates of bedload transport.

Approach: To use the conveyor-belt bedload-transport facility on the East Fork River near Pinedale, Wyoming, as a control to evaluate variability factors in bedload transport and to field calibrate the Helley-Smith bedload sampler; to use the calibrated Helley-Smith sampler in the systematic collection of bedload samples, along with the concurrent measurements of streamflow hydraulics, from a variety of sand- and gravel-bed streams, and, within the laws of general physics, stochastically develop empirical relations of bedload transport and interpret the physical significance of the developed relations.

Initiate at the conveyor-belt bedload-trap research facility a tracer study utilizing fluorescent particles to evaluate (1) residence time of sediment, (2) average speed of particles, (3) depth of bed material involved in transport, (4) dispersion of bed material, (5) short-term channel changes accompanying sediment transport, (6) influence of availability of sediment on transport rate, and other related aspects of sediment transport.

Progress: Collection of field data on the East Fork River as related to the calibration of the Helley-Smith bedload sampler and the fluorescent-tracer study has been completed. The bedload sampler has a near-perfect sampling efficiency for sediment particles in the size range of 0.5 to 16.0 mm. Daily bedload measurements at frequently spaced sections along a reach of the river demonstrate significantly different relations of bedload-transport rate to discharge from one section to another. Field data relating to the fluorescent-tracer study (1979-80) have been compiled and released in a series of open-file reports.

GEOLOGICAL SURVEY

WRD Project No.: CR 287

Project Title: Fluvial paleohydrology and paleohydraulics

Project Chief: Costa, John E.

Headquarters Office: Lakewood, Colorado

Field Location: Nationwide

Problem: Fundamental flow characterisitics of small watersheds are extremely difficult to resolve because events occur quickly and so little direct instrumentation is available, or capable, of recording the flows. It is difficult at present to differentiate different flow types (water, hyperconcentrated, debris flows) in small basins. Fundamental geomorphic theories on frequency and magnitude of flow events, developed from data on large streams, do not apply in small watersheds.

Objectives: (1) To provide geomorphic and stratigraphic-based estimates of magnitude and frequency of large flows events in small basins. (2) To compile existing information on landscape modifications and recovery rates and processes following large flows. (3) To identify discharge thresholds instigating major channel, flood plain, and hillslope changes.

Approach: The process, magnitude, and frequency of different kinds of flow events in small basins will be interpreted from the stratigraphic (sediment) and geomorphic (landforms) remains of modern flow events. Moment analysis of sediment deposits, and techniques of hydrodynamic stratigraphic interpretation will be developed to differentiate process. Where an appropriate sediment record exists, frequency of flow events will be estimated by using various Quaternary dating techniques. Using existing data from small basins that experienced large flows in historic times, photographic and planimetric information will be used to identify the rates and processes by which basins "heal" following large events.

FY-1984 Progress: (1) A technique for estimating the magnitude of prehistoric flash floods using boulder deposits has been developed and verified. (2) The hydraulic, geomorphic, and sedimentologic effects of a catastrophic flood from a dam failure have been documented, and a new type of sediment-gravity flow verified. (3) A report on the long-term landform evolution of the Piedmont Province has produced new insights and interpretations of landforces based on scale and time frames. (4) The hydraulic and geomorphic characteristics of the largest rainfall-runoff floods ever measured have been interpreted for paleohydraulic reconstructions.

GEOLOGICAL SURVEY

Instrumentation for automatically monitoring sediment concentration and size

WRD Project No.: WD154
Project Title : Instrumentation for automatically monitoring sediment concentration and size
Project Chief : Ficken, James H.
Headquarters Office : Instrument Development Lab., NSTL, Mississippi

Problem: There is a long standing need to rapidly measure the concentration of suspended sediment in rivers and streams. Normally, streams are manually sampled daily and during peak flows by observers or automatic sampling eqeuipment. These grab samples are then transported to a laboratory and analyzed for concentration and size distribution by techniques and methodologies that are cumbersome, time consuming, and labor-intensive. Daily sediment loads are then estimated based on sample analysis and a knowledge of stream discharge and other characteristics. Other means of detecting and measuring concentrations of suspended sediment both at the stream and in the laboratory should be investigated, especially those employing the latest technologies.

Objectives:

1. To evaluate recently developed instrumentation for applicability to measure at the stream or in the laboratory, the concentration and/or size of suspended sediment.

2. To determine the benefits associated with labor savings, increased accuracy, and quality of measurements that the use of such instrumentation might offer.

3. To suggest what future development would be needed to improve such instrumentation for use by the Water Resources Division.

Approach:

1. Continuous determination of sediment concentration at the streamside.

   A. Vibrating U-Tube Densiometer - Provide instrumentation, equipment and funding to the Wisconsin District to operate a system at a stream site. Technical design and assistance provided by the Interagency Sedimentation Project.

   B. Ultrasonic Solids Meters - Provide instrumentation and equipment and funding to the New Mexico and Washington Districts to operate ultrasonic solids meters on streams having concentrations of suspended sediment ranging from 5,000 to 100,000 mg/l.

   C. Optical Solids Meter - Provide instrumentation and equipment and funding to the New Mexico and Kentucky Districts to operate battery-powered optical solids meters on selected streams.

2. Determination of sediment size.

   A. Continue to support activities in the Iowa District associated with evaluation of Sedigraph to determine sediment particle size distribution. A Sedigraph utilizing x-rays to determine the settling rates was originally furnished to the District to compare with results from the pipet method of size determination.

3. Samplers

   A. A PS-82 pumping sediment sampler, developed by the Interagency Sedimentation Project, has been provided to the New Mexico District for field test and evaluation along side the ultrasonic solids meter.

GEOLOGICAL SURVEY

Prototype P-61 & BP-76 Sediment Sampler

WRD Project No.: WD-141
Project Chief : Futrell II, James C.
Project Title : Prototype P-61 & BP-76 Sediment Sampler
Headquarters
Office : Instrument Development Laboratory, NSTL, Mississippi

Problem: The P-61 Sediment Sampler is a point-intergrating sampler that is used to determine the mean sediment concentration at selected points beneath the surface of a stream. The trace metal version of the P-61 is used to collect trace metal samples. The P-61 is used in conjunction with a BP-76 control unit. When fired, this battery-operated unit sends 48 volts DC via the sounding cable to a solenoid in the P-61 to hold the valve open during a sampling cycle. This valve closes when the voltage is removed.

The problems with the existing P-61-TM Sediment Sampler are as follows:

1. The path of the water sample through the valve exposes the sample to stainless steel.
2. The single valve in the head of the sampler is held open by a LEDEX solenoid ,during sampling, using 48 volts DC. Therefore, the sounding cable may fail if over-heated and the batteries in the BP-76 control unit often do not last for a days sampling work.
3. The recharge time for the BP-76 is slow. This often requires two units to be used alternately.
4. Sample timing is normally measured by counting or by use of a mechanical stop-watch. These methods of timing can be inaccurate.
5. The BP-76 case is not water-proof. This fault may cause the unit to malfunction when used in rainfall.
6. The holes in the valve may not be aligned properly to permit an unrestricted flow path for the water sample through the nozzle of the P-61 and the valve wipers. This improper adjustment usually occurs during cleaning and may invalidate the rating of the sampler.

Objectives: To develop a prototype unit that resolves as many of the aforementioned problems as possible.

Approach: In the prototype P-61, the path of the water sample is entirely Ultra-High Molecular Weight Polyethelene (UHMW-PE). This material has a lower dynamic coefficient of friction than the previous materials used and is self-lubricating, non-corrosive, chemically inert, high impact and superior in abrasion resistance. A second solenoid has been added to the head of the sampler. This allows the sampler to be latched open by one short burst of voltage and then unlatched by a reverse polarity voltage. Therefore, the previous 48 volts, at 1.5 amps, is applied to the light wire in the sounding line for only a fraction of a second instead of the entire sampling period. A 12X0.190 inch rod is supplied with the prototype sampler to align the flow path through the valve after cleaning. This rod is

inserted through the entire assembly prior to locking the solenoid in place. By this proceedure, absolute alignment is assured after each cleaning and the laboratory rating should be easily maintained.
The prototype BP-76 is fitted with a 12V/4.5 AH rechargeable gel-cell battery. The unit may be operated by direct connection to external 12 volts DC or 115 volts AC, with the power cords supplied. This battery will operate for an estimated 2000 cycles on one charge. Sample timing is set by a pushbutton circuit that regulates the sampling cycle.Settings are shown on an LCD. The time between samples may be as short as 3 seconds and the sample time ranges from 3-99 seconds. The unit remembers the previously set sample timing and will repeat this cycle as many times as desired in the automatic mode. A manual mode also exists for operator use. The case is waterproof and supporting equipment is contained in a false lid inside the removeable hinged cover.

FY-1984 Progress and Results: The prototype equipment was calibrated in the Gulf Coast Hydroscience Center Laboratory (GCHC). Seven sampling runs were performed and the percentage difference between theoretical and measured volumes ranged from -7% at 1.5 ft/s to +16% at 6.5 ft/s. The variation in differences indicates that a sampler should be calibrated at multiple velocities and that a calibration curve should be furnished with each sediment sampler.

A one year field test was conducted by Al Onions of the Vancouver Subdistrict Office, Washington. Both the standard and prototype samplers were pressure tested to a depth of 130 feet and compared equally. The prototype BP-76 was re-sealed with silicone rubber caulking to make it truly waterproof. When the sample bottle was overfilled during periods of high sediment concentration, the main valve tended to jam similar to the standard P-61. The parts within the P-61 head assembly experienced very little wear even though exposed to high sediment concentrations and repeated diassembly for cleaning.

Recommendations from this field test included: easier access to internal parts, brighter lights, more rugged overall and sealing the head assembly to prevent sediment from entering the cavity of the sampler.

FY-1985 Plans: Further testing of this prototype sampler will be performed at the St. Anthony Falls Hydrologic Laboratories. A check will be made of the P-61 calibration in turbulent flow to determine if there are any systematic differences that are created by the lack of free-stream turbulence. The calibration at the GCHC was performed in still water in a towing tank.

The prototype equipment that was tested contained wire-wrapped electronics. The final model, to be supplied to the field, will require further development into a solid state electronics unit.

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