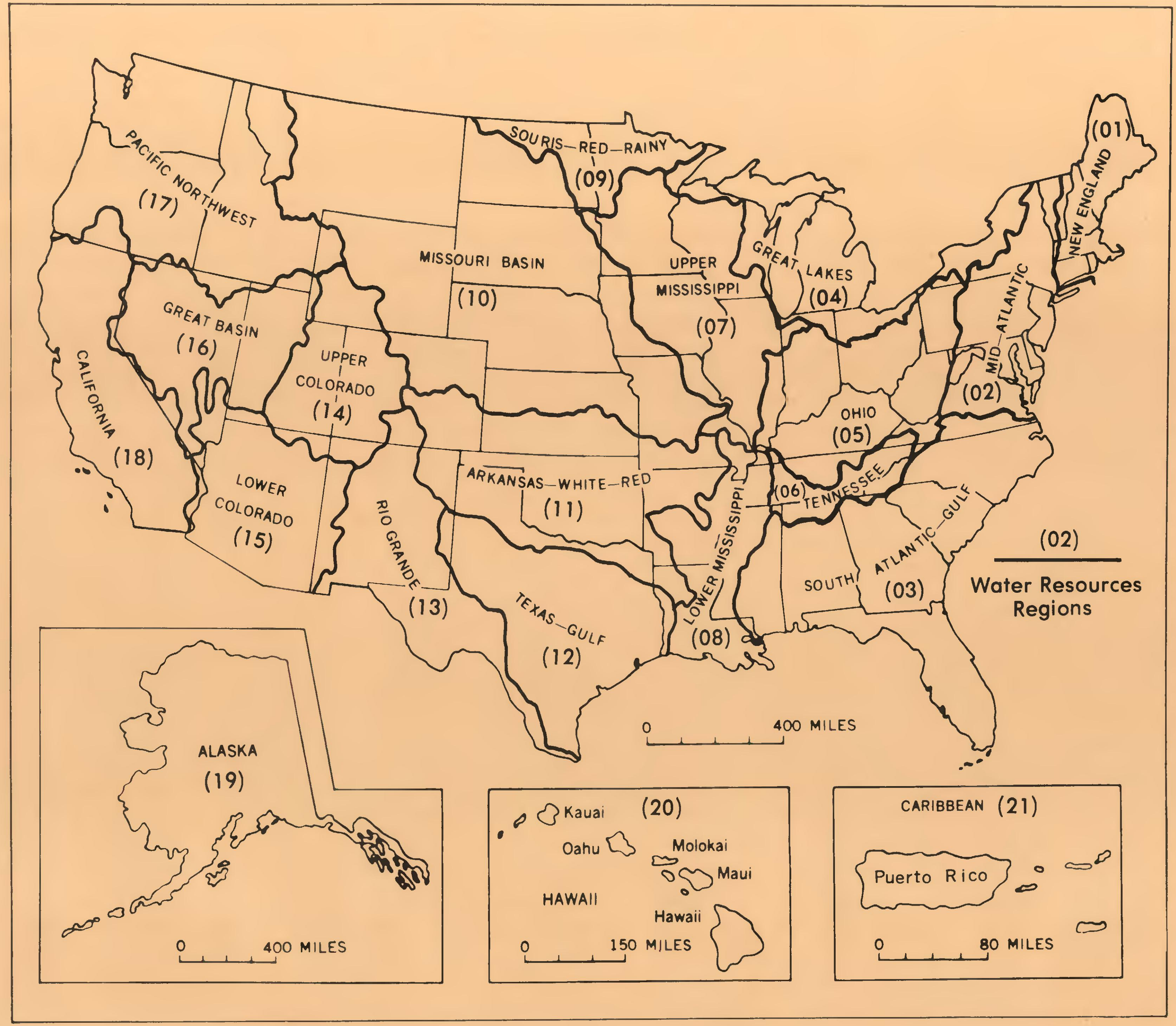
INTERAGENCY ADVISORY COMMITTEE ON WATER DATA

NOTES ON SEDIMENTATION ACTIVITIES CALENDAR YEAR 1981

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
OFFICE OF WATER DATA COORDINATION
RESTON, VIRGINIA 22092



Water Resources Regions of the United States

NOTES ON SEDIMENTATION ACTIVITIES
CALENDAR YEAR 1981

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

U. S. DEPARTMENT OF THE INTERIOR
Geological Survey
Office of Water Data Coordination
Reston, Virginia 22092

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NOTES ON SEDIMENTATION ACTIVITIES CALENDAR YEAR 1981

Preface

A proposal to disseminate current information on activities in the field of sedimentation was made by the Chairman of the Federal Interagency River Basin Committee's Subcommittee on Sedimentation shortly after the subcommittee was formed in May 1946. At the fifth meeting of the subcommittee on September 17, 1946, the members approved this proposal and agreed to the issuance of the quarterly report as one means of effecting better coordination of the work of various Federal agencies in the field of sedimentation.

Quarterly reports were issued during the period of July 1, 1946, through June 30, 1947, when the reporting period was changed to a 6-month period, and semiannual reports were issued through 1953. Starting in 1954 and continuing through the present, these reports have been made annually and cover the activities of the Federal agencies in the field of sedimentation on the calendar year basis.

This report is a digest of information furnished by those Federal agencies conducting sedimentation investigations. It includes descriptions of work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent information. The material has been organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and foreign. There is also a section on Research and Other Activities.

Until 1979, each issue of "Notes on Sedimentation Activities" contained a list of stations at which sediment data have been obtained giving the station location, drainage area, and other related information. Because the station list did not change significantly from year to year, the decision was made to include the listings only every other year in the interest of economizing. After further consideration, however, it was decided to completely discontinue publication of the station list. The Committee felt that most users of the station list were only interested in the stations located in a particular geographic area and their needs could be served more efficiently by acquiring the information desired through the National Water Data Exchange (NAWDEX). Locations and addresses of NAWDEX assistance centers follow.

Information for "Notes on Sedimentation Activities" for calendar year 1981 was contributed by the representatives of participating Federal agencies. Suggestions for improving the report, both in content and in format, 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:

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12201 Sunrise Valley Drive
Reston, Virginia 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 bimonthly basis at Aroostook River at Caribou, Maine, and at St. John River near Van Buren, Maine, as a part of the National Stream Quality Accounting Network (NASQAN).

Penobscot Subregion

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

Kennebec Subregion

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

Androscoggin Subregion

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

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

Maine Coastal Subregion

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

Saco Subregion

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

Merrimack Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Merrimack River above Lowell, Mass., and at Merrimack River at Concord , N. H. as a part of NASQAN.

Connecticut Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Connecticut River at Wells River, Vt., and at Connecticut River at North Walpole, N.H., and at Connecticut River at Thompsonville, Conn., as a part of NASQAN.

2. Suspended-sediment data are being collected on approximately a daily basis at Stony Brook near Suffield, Conn., Salmon River near East Hampton, Conn., and Coginchaug River at Rockfall, Conn., 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 bimonthly basis at Charles River at Dover, Mass., at Blackstone River at Millville, Mass., and at Pawcatuck River at Westerly, R.I., as a part of NASQAN.

Connecticut Coastal Subregion

1. Suspended-sediment data are being collected on a monthly basis at Housatonic River at Stevenson, Conn., Shetucket River at South Windham, Conn., and at Quinebaug River at Jewett City, Conn. 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. Sediment data are being collected on a daily basis at Muddy Brook at Childs Hill Road near Woodstock, Conn., to determine daily sediment loads, as part of a study to determine the effects of agricultural management practices being implemented in the Little River watershed. The study is being done in cooperation with the Northeastern Connecticut Regional Planning Agency.

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

3. Intermittent sediment data were collected at Johnson Brook near South Albion, Maine, in the Kennebec Subregion, to define storm hydrograph characteristics and to estimate phosphorus yields from the watershed. The study is 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 offices:

District Chief, WRD
U.S. Geological Survey
150 Causeway Street, Suite 1001
Boston, MA 02114

NEW ENGLAND REGION

SOIL CONSERVATION SERVICE

1. Studies of erosion and sediment yield for work plans were made in the following watersheds:

a. Public Law 566

Major Drainage	Watershed	Stream	County	State
Aroostook River	Parkhurst Siding	Unnamed	Aroostook	Maine
Kennebec	Sebasticook Lake	Tributaries to Sebasticook Lake	Penobscot and Somerset	Maine
St. Francois	Black River	Black River	Orleans	Vermont

b. River Basin Investigations

Major Basin	Basin Reported	State
Housatonic	Town Brook	Massachusetts
Saco	Saco	Maine, New Hamp.
Connecticut R.	Harvey Pond	Vermont
St. Francois	Barton R.	Vermont
St. Francois	Clyde R.	Vermont

c. Resource Conservation and Development

Project Name	County	State
Nemasket River	Plymouth	Massachusetts

2. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
North Branch of Park River #3A	Hartford	Connecticut
Souhegan #10A	Hillsborough	New Hampshire

3. Special Studies

a. SCS-Maine continued to assist the St. John-Aroostook RC&D Steering Committee and the St. John Valley, Central Aroostook, and Southern Aroostook SWCD's in the Field Appraisal of Resource Management Systems (FARMS) study. FARMS is a three-year program with the objective of showing how conservation practices, management practices, and crop quality and quantity relate to soil erosion rates and other variables.

Field data was collected on the second one-third of the 2,400 sample points in 1981. Computer analysis of data is underway but not yet complete. The final 800 points will be sampled in the 1982 field season.

b. Sediment yields on the Town Brook Watershed, Massachusetts, have been developed using the SEDEL program. Periodic storm flows were sampled for suspended sediment.

MID ATLANTIC REGION

CORPS OF ENGINEERS

North Atlantic Division

Baltimore District

Sedimentation Surveys

1. Initial Surveys -- The following projects have had sedimentation monumentation installed and cross sections surveys to evaluate future sediment build up: Bloomington Lake, Maryland, Tioga-Hammond Lakes, Pennsylvania, Cowanesque Lake, Pennsylvania.

2. Annual Reconnaissance Surveys -- No serious sediment problems were observed in the District's reservoirs in 1981. Some sediment was observed near the inflow to Raystown Lake but was not believed to pose a serious problem to the impoundment. The following quantities of sediment were removed from various flood control projects in the District:

Project Location	Stream	Sediment Removal	Sediment Removed During 1981 (CU YDS)
Almond Lake	Canacadea Creek	Rt 21 bridge u/s of lake	4,000
Avoca, N.Y.	Cohocton River	Channel	15,375
Binghamton, N.Y.	Pierce Creek	Channel	200
Canisteo, N.Y.	Purdy Creek	Check dam and confluence of Purdy and Bennett Creeks	6,960
Corning, N.Y.	Cutler Creek	Intake of Twin Conduits	176
Hornell, N.Y.	Canisteo River	Channel	1,486
	Chauncey Run	Upper Check Dam	540
	Crosby Creek	Check dam	4,748
Lisle, N.Y.	Dudley Creek & Tioughnioga River	Confluence	2,688
Stillwater Lake	Lackawanna River	Outlet Channel	424

Project Location	Stream	Sediment Removal	Sediment Removed During 1981 (CU YDS)
Whitney Point, Village, N.Y.	Tioughnioga River	Channel	572
		Total Sediment Removal	37,169

New York District

The District conducted sediment tests at the following locations:

Location (State) and Waterway	Sampling Equipment and Sample Types	Dates Sampled
New York State		
	Smith-MacIntyre	
Gowanus Creek Channel	Surface Grab	9/79
Westchester Creek	" "	8/79
Newtown Creek	" "	9/79
Mamaroneck Harbor	" "	8/79
Bronx River	" "	8/79
Dutch Kills	" "	9/79
N. Shooter's Island	" "	8/79
Red Hook Anchorage	" "	8/80
State of New Jersey		
Newark Bay	" "	10/80
Passaic River	" "	10/80
Edgewater-Weehawken	" "	8/79
Raritan River North & South	" "	9/79
Raritan Bay	" "	9/79
Raritan River Cut-Off	" "	9/79
Sandy Hook Bay	" "	9/79
Sandy Hook Leonardo	" "	9/79
New York/New Jersey State		
Kill Van Kull	" "	5/79

Note: Sampling was only done once for each location over 1978 and 1979 in compliance with Section 103 of the Marine Protection Research and Sanctuaries Act. Types of records maintained - Grain size, Bioassay and Bioaccumulation

Philadelphia District

Sedimentation Survey - F. E. Walter Reservoir

Survey Purpose: Determine sedimentation rates for periods 1960 to 1971 and 1971 to 1981, within confines of the F. E. Walter Reservoir. Then use these rates to determine the amount of reservoir storage required for sediment accumulation for project over 100 year life for proposed modification project.

Type of Survey: Range

Elements Measured: Reservoir bottom elevations across 13 ranges.

Equipment Used: 1960, 1971: lead line
1981: recording fathometer

Survey Scopes: Five range lines are within the bounds of normal pool elevation. The other eight are upstream of normal pool on three tributary streams.

Results: To be completed in FY 82 (not later than September 1982)

Sediment Load Measurement

1. Delaware River at Trenton
   Sampling Frequency - Daily
   Period of Record - September 1949 to Present

2. Schuylkill River at Berne, PA (Dropped 1 Nov 1981)
   Sampling Frequency - Daily
   Period of Record - October 1947 to 1 November 1981

3. Schuylkill River at Manayunk, Philadelphia, PA (Dropped 31 Dec 1981)
   Sampling Frequency - Daily
   Period of Record - November 1947 to 31 December 1981

4. Delaware River Below Tocks Island, NJ (Dropped 1 Nov 1981)
   Sampling Frequency - Daily, October 1965 to September 1976
   Partial, October 1976 to 1 November 1981
   Period of Record - October 1965 to 1 November 1981

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

Forest Service

MID-ATLANTIC REGION

George Washington National Forest

Thirty-six acres of severely eroding lands were rehabilitated resulting in a reduction of 1,800 tons of sediment annually. Emergency funding under Section 403 of the Agriculture Act of 1978 was provided by SCS in restoring a 3-acre massive landslide.

The National Forest personnel monitored turbidity on two projects. The monitoring data are stored in "Storet."

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, N.Y., as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data was collected on a daily basis at West Brook at Lake George and English Brook at Lake George, N.Y., in cooperation with New York State Department of Environmental Conservation (discontinued March 15, 1981).

Upper Hudson Subregion

1. Suspended-sediment data are being collected on a daily basis at Hudson River at Stillwater, N.Y., and Hudson River at Waterford, N.Y., 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 Ft. Edward, N.Y., and Hudson River at Schuylerville, N.Y.

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

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

4. Suspended-sediment data was collected on a periodic basis at Hudson River at Castleton-on-Hudson, N.Y., Hudson River at Catskill, N.Y., Hudson River at Staatsburg, N.Y., and Hudson River at Clinton Point near New Hamburg, N.Y., in cooperation with New York Department of Environmental Conservation (discontinued September 1981).

Lower Hudson-Long Island Subregion

1. Suspended-sediment data are being collected at Passaic River at Little Falls, N.J., Raritan River near South Bound Brook, N.J. (discontinued September 30, 1981) Raritan River at Queens Bridge at South Bound Brook, N.J. (initiated October 1, 1981), Nissequoque River near Smithtown, N.Y., and at Carmans River at Yaphank, N.Y., as a part of NASQAN.

Delaware Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Toms River near Toms River, N.J. (monthly January through September 1981), Maurice River at Norma, N.J., and West Branch Wading River at Maxwell, N.J., and on a daily basis at Delaware River at Trenton, N.J., as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Delaware River at Trenton, N.J., in cooperation with the U.S. Army Corps of Engineers.

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

4. Suspended-sediment data are being collected on a daily basis at two sites on the Schuylkill River, Berne and Philadelphia, (Manayunk) Pa. The data will be anaylzed by the U. S. Corps of Engineers to evaluate the Delaware River dredging programs.

Susquehanna Subregion

1. Suspended-sediment data are being collected using an automatic pumping sampler on a monthly and storm-event basis at Young Womens Creek near Renovo, Penn., as part of the National Hydrologic Benchmark Network and the Coal Hydrology Program.

2. Suspended-sediment data are being collected at Juniata River at Newport, Penn., as a Federal sediment index station, and at Susquehanna River at Harrisburg, Penn., in cooperation with the EPA.

3. Suspended-sediment data are being collected on a daily basis at Tioga River at Lindley, N.Y., in cooperation with the U.S. Corps of Engineers (discontinued September 30, 1981).

4. Suspended-sediment data are being collected on a bimonthly basis at Susquehanna River at Conowingo, Md., as a part of NASQAN.

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 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.

Potomac Subregion

1. Suspended-sediment data are being collected on a daily basis at Crabtee Creek near Swanton, Md., as a part of the hydrologic assessment of the Eastern Coal Provinece.

2. Suspended-sediment data are being collected on a daily basis at North Branch Potomac River near Cumberland, MD., and at Monacacy River at Reichs Ford Bridge near Frederick, Md., in cooperation with the Maryland Geological Survey.

3. 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.

4. Suspended-sediment data are being collected on a bimonthly basis at Potomac River at Shepherdstown, W.Va., and Shenandoah River at Millville, W.Va., as a part of NASQAN.

5. Suspended-sediment data are being collected on a bimonthly basis at Potomac River at Chain Bridge, Washington, D.C., as 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 bimonthly at Rappahannock River near Fredericksburg, VA, Appomattox River at Matoaca, VA, and Mattaponi River near Beulahville, VA, and monthly at Pamunkey River near Hanover, VA, as part of NASQAN

3. Suspended-sediment data were collected daily at James River at Cartersville, VA, until May 31, 1981, as part of EPA's Chesapeake Bay Program. Thereafter, monthly samples are being collected as part of NASQAN.

4. Suspended-sediment data are being collected monthly at James River at Richmond, VA, as part of NWQSS (discontinued September 1981).

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

Special Studies

1. A study of non-point sources of sediment, nutrients, and pesticides was started during the 1977 water year in the Pequea Creek Basin in Lancaster County, Pennsylvania. Data collection which ended in June, 1981, included the operation of six automatic suspended-sediment samplers, one at Pequea Creek at Martic Forge, Penn., and on five small single land-use sites in the basin. The study was in cooperation with the Susquehanna River Basin Commission, and had the support of the Chesapeake Bay Program.

2. Sediment data were collected during the 1981 water years at three sites in Northern Pennsylvania. The data were collected as part of a study to evaluate the effects of surface mining on sediment yields.

3. Suspended-sediment data were collected at 8 sites in the Raritan River basin in Hunterdon and Somerset Counties, N.J., and 2 sites in the Manasquan River basin in Monmouth County, N.J. Sampling was discontinued as of June 30, 1981. The study was in cooperation with the New Jersey Department of Environmental Protection to investigate sediment transport during storm events in two basins with highly erodible soils.

MID-ATLANTIC REGION

SOIL CONSERVATION SERVICE

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

a. Public Law 566

Major Drainage	Watershed	Stream	County	State
Atlantic Coastal	Murderkill	Murderkill	Kent	Delaware
Upper Chesapeake Bay	Upper Chester	Chester R.	Kent and New Castle	Delaware
			Kent and Queen Anne	Maryland
Lake Champlain (Otter Ck)	Lemon Fair	Lemon Fair	Addison	Vermont
Lake Champlain	L. Winooski	Winooski R.	Chittendon	Vermont

b. River Basin Investigations

Major Basin	Basin Reported	State
Chesapeak Bay	Pocomoke	Maryland Delaware Virginia
Hudson	Normanskill	New York
Susquehanna	Lancaster County	Pennsylvania
Richelieu-Lake Champlain	Black Creek	Vermont
"	Browns R.	"
"	Lewis Creek	"
"	Little Otter Creek	"
"	Lower Lake Champlain	"
"	Lower Winooski	"
"	Malletts Bay	"
"	Mettawee Bay	"
"	Mid Otter Creek	"
"	New Haven River	"
"	Rock River & Pike Creek	"
"	Shelbourn Pond	"
"	Trout River	"
"	Tyler Br.	"

2. Reservoir Sedimentation Survey

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
Fleetwood Pond	Sussex	Delaware
Herns Pond	Susex	Delaware
Noxontown Pond	New Castle	Delaware
Silver Lake	New Castle	Delaware
Shallcross Lake	New Castle	Delaware
Lake Frank (Rock Creek #1)	Montgomery	Maryland
Cannonsville	Delaware	New York
South River #4	Augusta	Virginia
Mountain Run #11	Augusta	Virginia
Beautiful Run #4	Madison	Virginia
Potomac Creek #2	Strafford	Virginia
South Fork #15	Pendleton	West Virginia

3. Special Studies

a. Bouquet River, Essex County, NY - A streambank erosion study was carried out in cooperation with DEC. The purpose was to identify and prioritize streambanks which could be stablized to preserve quality and quanlity and quantity of spawning areas for newly expanded salmon fishery on the Bouquet River. Twenty six miles of stream were inventoried following a helicopter flight to pinpoint major erosion areas.

b. New Jersey - Approximately 4,200 sample areas have been studied as part of a Statewide Erosion Sediment and Agricultural Waste (SESAW) Inventory. Each sample area is approximately 100 acres in size and the total represents about 10% of the rural-agricultural area of New Jersey. Compilation of data will be completed this year.

c. Maryland - Periodic suspended sediment samples and turbidity measurements are being taken on the Choptank and Marshyhope watershed projects to monitor the effects of channel modification works of improvement.

d. Daily suspended sediment samples are being gathered on the La Platte PL-566 Watershed, Chittendon County, Vermont, to monitor the effects of land treatment measures being installed. A similar study is being carried out on the St. Alban's Bay Watershed Rural Clean Water Project, Frnaklin County, Vermont. Both watersheds drain into Lake Champlain.

SOUTH ATLANTIC-GULF REGION

CORPS OF ENGINEERS

South Atlantic Division

Charleston District

Monitoring of coastal shorelines changes for newly constructed weir jetty systems at Murrells Inlet, South Carolina and Little River Inlet, South Carolina are underway. 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 of the jetties,
c. wave data, and
d. hydrographic surveys of the inlet area.

The data which is gathered on a regular basis is being forwarded to the Coastal Engineering Research Center at Fort Belvoir, Virginia for analysis.

Mobile District

Sedimentation Range Network Monitoring

1. The sedimentation range networks in the Demopolis, Gainesville, and Aliceville Projects were resurveyed during the year. The original survey of the Columbus Project sedimentation range network was initiated in 1981. These projects are located on the Tombigbee River and are a part of the Tennessee-Tombigbee Waterway.

2. Resurveys of the projects are made annually and twelve selected ranges were resurveyed at the six-month interval.

3. A network of ranges was installed and surveyed on the Tombigbee and Mobile Rivers between Coffeeville, AL and Mobile, AL.

4. Resurveys of selected ranges in Buford, George W. Andrews, and Walter F. George Reservoirs on the Chattahoochee River and Allatoona Reservoir on the Etowah River were also completed during the year.

Sedimentation Studies

1. The sedimentation studies of the Alabama, Pascagoula, Apalachicola, and lower Tombigbee Rivers will continue through 1982.

2. Sedimentation studies were initiated during the year and are expected to continue through 1982 on the Coosa River pertinent to the Coosa River Navigation Project (Montgomery to Gadsden) and on the Apalachicola River.

3. The sedimentation study for the Tibbee River and its tributaries will continue in 1982.

Suspended Sediment Investigations

1. During the year suspended sediment samples were collected on a daily basis from locations on the Tombigbee River at Columbus, Aberdeen, Amory, and Fulton, Mississippi. Additionally, suspended sediment samples for various studies were obtained from streams located through the District.

2. The permanent suspended sediment sample monitors that were damaged by high water were not installed at alternate locations during the year. Various sediment sampling methods are being considered in lieu of the permanent samplers.

3. The discontinuance of sampling stations in the Tombigbee River tributaries was the result of sufficient data being collected for planning and design. The addition of stations in the Tombigbee, Pascagoula, and Apalachicola River Basins was required for planning, design and operational studies.

Savannah District

The District conducted annual controlling depth surveys and periodic examination surveys for all dredging work to determine the location and extent of shoaling in the District's navigation projects. Efforts were centered on Savannah Harbor and Brunswick Harbor. These surveys were performed using an integrated hydrographic survey system including radio location equipment, a high-resolution echo-sounder, an analog-to-digital converter to process the location and depth data, and a computer and automatic plotter for survey plotting and yardage calculations.

Wilmington District

Two suspended sediment sampling stations (at Randolph, VA on Roanoke River and at Paces, VA on Dan River) upstream from John H. Kerr Reservoir were operated through September 1981 at which time they were discontinued.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

Forest Service

SOUTH ATLANTIC-GULF REGION

National Forests in Alabama

Sixteen severely eroding acres contributing an estimated 80 tons of sediment annually were rehabilitated. The National Forest personnel monitored turbidity on two projects and suspended sediment on one. The monitoring results are stored in "Storet."

Chattahoochee-Oconee National Forest

The National Forest personnel rehabilitated 20 acres of severely eroding land which resulted in an estimated sediment reduction of 1,100 tons annually. Turbidity was monitored on two projects. The monitoring results are stored in "Storet."

National Forests in Florida

The National Forest personnel monitored turbidity using automated ISCO samplers on two projects. The monitoring data are stored in "Storet."

Francis Marion and Sumter National Forests

The National Forest personnel rehabilitated 208 acres in the South Carolina Piedmont. This resulted in an estimated sediment reduction of over 10,000 tons annually. The treated acres included 77 acres that were rehabilitated following a severe wildfire.

Turbidity was monitored at 12 water quality monitoring stations. The data are on "Storet."

National Forests in Mississippi

The National Forest personnel rehabilitated 15 acres of severely eroding lands. This resulted in a reduction of approximately 750 tons of sediment annually.

National Forests in North Carolina

Eight acres of severely eroding lands were restored resulting in a sediment reduction of approximately 400 tons annually. Turbidity was monitored at seven stations. These data are in "Storet."

SOUTH ATLANTIC-GULF REGION

GEOLOGICAL SURVEY

Chowan-Roanoke Subregion

1. Suspended-sediment data are being collected daily during flood events and at 7-day intervals for periods of medium to low flows at Dan River at Paces, Va., and at Roanoke River at Randolph, Va., in cooperation with the U.S. Corps of Engineers (discontinued September 30, 1981).

2. Suspended-sediment data are collected bimonthly at Nottaway River near Sebrell, Va., Dan River at Paces, Va., and Meherrin River at Emporia, Va., and on a monthly basis at Blackwater River near Franklin, Va., as a part of NASQAN.

3. Suspended-sediment data are collected monthly at Roanoke River at Roanoke Rapids, N.C., 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, N.C., in cooperation with the U.S. Department of Agriculture, Soil Conservation Service. These data will be used to determine changes caused by channelization. Samples collected by automatic sediment samplers at two in-stream sediment traps were used to determine settling characteristics of the traps. Cross-sectional surveys of the traps were made immediately following major storms to determine the amounts of sediment deposited by high flows.

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

Cape Fear Subregion

1. Suspended-sediment data are being collected on a monthly basis at Deep River at Moncure, 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 monthly on the Cape Fear River at Lock 1 near Kelly, N.C. as part of the NASQAN program.

Pee Dee Subregion

1. Suspended-sediment data are being collected on a monthly basis at Scape Ore Swamp near Bishopville, S.C., 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, S.C., Black River at Kingstree, S.C., Pee Dee River near Rockingham, N.C., and at Pee Dee River at Pee Dee, S.C., as a part of NASQAN.

3. Suspended-sediment data are being collected daily at the Yadkin River at Yadkin College, N.C., as a Federal Sediment Index Station.

Santee-Edisto Subregion

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

2. Suspended-sediment data are being collected on a monthly basis at Crawl Creek near Pineville, S.C., Santee River below St. Stephens, S.C. This is being done in cooperation with the U.S. Corps of Engineers.

Ogeechee-Savannah Subregion

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

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

3. Suspended-sediment data are being collected on a periodic basis at Brier Creek near Wagesboro, Ga., in cooperation with the Georgia Geologic Survey.

Altamaha-St. Marys Subregion

1. Suspended-sediment data are being collected on a monthly 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 monthly basis at Altamaha River near Everett City, Ga., and at Satilla River at Atkinson, Ga., and bimonthly at St. Mary's River near Macclenny, Fla. as a part of NASQAN.

3. Suspended-sediment data are being collected at South River near McDonough, Ga., at Yellow River near Covington, Ga., at Pates Creek near Flippin, Ga., Ohoope River near Reidsville, Ga., Penholoway Creek near Jessup, Ga., and at Little Satilla River near Offerman, Ga., in cooperation with the Georgia Geologic Survey Division.

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 U.S. Corps of Engineers, Mobile District.

2. Suspended-sediment data are being collected on a periodic basis at Chattahoochee River near Cornelia, Ga., at Sweetwater Creek near Austell, Ga., at Upatoi Creek near Columbus, Ga., in cooperation with the Georgia Geologic Survey.

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., Holly Creek near Chatsworth, Ga., and West Armuchee Creek near Subligna, Ga., in cooperation with the Georgia Geologic Survey.

2. Suspended-sediment data are being collected 10 times per year at Alabama

River at Montgomery, Ala., incooperation with the Corps of Engineers and bimonthly at Alabama River at Claiborne, Ala., as a part of NASQAN.

Mobile-Tombigbee Subregion

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

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

3. Suspended-sediment data are being collected by an automatic pumping sampler at Mackeys Creek below Bay Springs Lock and Dam, Miss., in cooperation with the U.S. Corps of Engineers, to estimate the impact of sediment loads on the Tennessee-Tombigbee Waterway.

4. Suspended-sediment data are being collected on a 6-week basis at Town Creek at Nettletown, Miss., and at Noxubee River at Macon, Miss.

Pascagoula Subregion

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

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

3. Suspended-sediment data are being collected on a bimonthly basis at Escatawpa River near Agricola, Miss., 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.

3. Suspended-sediment data are being collected on a 6-week basis at Pearl River at Jackson, Miss.

Special Studies

1. Suspended-sediment sampling by an automatic sampler was continued on Blue Creek near Oakman, Ala., at Trinity Creek near Carbon Hill, Ala., and

at Bear Creek near Samantha, Ala., as part of a study of coal-mine hydrology in cooperation with the Bureau of Land Management. Samples were collected monthly and during flood events at Yellow Creek near Northport, Ala., and Turkey Creek (Tuscaloosa County) near Tuscaloosa, Ala.

2. Suspended-sediment sampling during storm events was continued in two agricultural basins in southwest Georgia in conjunction with an ongoing study of the effects of agricultural runoff on receiving waters.

3. Suspended-sediment sampling by automatic pumping sampler continued at Dorsey Creek near Arkadelphia, Ala. until September 30, 1981.

4. Suspended-sediment and bed material data is being collected periodically and during 3 storm events per year at 5 sites in order to gage sediment deposition in certain Georgia reservoirs as part of a cooperative program with the U.S. Army Corps of Engineers.

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

District Chief, WRD
U.S. Geological Survey
P.O. Box V
Oil and Gas Board Building
Room 202
University, AL 35486

District Chief, WRD
U.S. Geological Survey
325 John Knox Road, Suite F-240
Tallahassee, FL 32303

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 66492
6554 Florida Boulevard
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
100 W. Capitol St., Suite 710
Jackson, MS 39269

District Chief, WRD
U.S. Geological Survey
P.O. Box 2857,
Century Station Post Office Building
Room 436
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

SOUTH ATLANTIC - GULF REGION

SOIL CONSERVATION SERVICE

1. Studies of sediment damages and determinations of sediment yields were made for watershed plans in the following watersheds during 1981:

a. Public Law 566

Major Drainage	Watershed	Stream	County	States
Pee Dee River	Cartwheel Community	Honey Camp Branch Hinson's Bay Cedar Creek	Horry	South Carolina
Lynches River	Salem Community	Camp Branch Two Mile Branch Sandy Run Branch	Florence	South Carolina
Apalachicola	Beaver Creek	Beaver Creek	Macon	Georgia

b. River Basin Investigations

Major Basin	Basin Reported	State
Chowan-Roanoke	Albermarle-Chowan	North Carolina, Virginia
Southwest Georgia Land and Water Resource Cooperative Study - 32 Counties	Apalachicola Altamaha Suwannee Ochlocknee	Georgia

c. Resource Conservation and Development

Project Name	County	State
Limestone Valley	Fannin	Georgia

2. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
E. Fork Falling R. #7 and #15	Appomattox and Campbell	Virginia
Bridge Creek-Ochlocknee River, Site No. 8	Colquitt	Georgia

3. Special Studies:

An erosion map was completed for the Upper Tar River Basin in portions of Person, Granville, Vance, and Franklin Counties, North Carolina during CY 1981.

The evaluation of sediment deposition in Beaverdam Creek, Site 4, Oconee County, South Carolina, begun during 1980 was deferred until a later date.

Sediment yield studies on several selected existing reservoirs were begun during 1981 in conjunction with a State Wide Cooperative River Basin Study of South Carolina.

GREAT LAKES REGION

CORPS OF ENGINEERS

North Central Division

Buffalo District

LAKE ERIE WASTEWATER MANAGEMENT STUDY. The Water Quality Section supported water sample collection and analysis at six stations during CY 81. Continuous automatic samplers were operated at:

1. Honey Creek at New Washington, OH
2. Honey Creek at Melmore, OH
3. Bean Creek at Powers, OH
4. Ottawa River at Allentown, OH
5. West Branch Rocky River at Valley City, OH
6. South Branch Cattaraugus Creek at Cattaraugus, NY

Samples collected at the stations above were analyzed for:

1. pH
2. Suspended Solids
3. Conductivity
4. Dissolved Orthophosphorus
5. Nitrate-Nitrite Nitrogen
6. Ammonia Nitrogen
7. Dissolved Silica
8. Total Phosphorus
9. Chloride
10. Sulfate
11. Alachlor (Lasso)
12. Cyanazine (Bladex)
13. 2, 4-D
14. Carbofuran (Furodan)
15. Butylate (Sutan)
16. Metribuzin (Lexone)
17. Atrazine
18. Fonofos (Dyfonate)
19. Terbufos
20. Phorate (Timet)

Lorain Harbor, OH, Erosion and Sedimentation Study. In conjunction with the above study, a support agreement was entered into with the U.S. Geological Survey to conduct a 1-year sediment sampling program in the Black River, OH, Watershed. Sediment sampling was performed at various locations in the Black River basin from 14 June 1980 through 30 June 1981. The purpose of the program was to provide sediment yield data at various locations on the river in order to identify the prolific source areas of sediment within the basin.

The sampling network consisted of water discharge and daily sediment load measurements at the permanent gage on the main stem, Black River at Elyria, OH, as well as one additional continuous record gage and two partial record gages established upstream on the east and west branches. Suspended sediment loads were measured at the two continuous record stations by both automatic and manual methods. Suspended sediment and discharge data was collected periodically at the two partial record stations. In addition, between 13-16 April 1981, a series of discharge measurements and sediment cross-sections were made on the Black River about 1/2 mile upstream of Lake Erie (at Lorain Harbor) following a single run-off event. Bed material samples were collected at all the stations.

Results of the 1-year sediment sampling program will be incorporated in the Final Feasibility Report on Lorain Harbor, OH. The report, scheduled for completion in 1982, will identify the primary sources of sediment requiring annual maintenance dredging from the navigation channel at Lorain Harbor.

Cuyahoga and Maumee River Suspended Sediment Sampling. The Cuyahoga and Maumee Rivers are the major contributors of suspended sediment to Cleveland and Toledo, OH, harbors, respectively. During 1981 the U.S. Geological Survey, under a support agreement with the U.S. Army Corps of Engineers, Buffalo District, collected suspended samples on the Cuyahoga River at Independence, OH, and the Maumee River at Waterville, OH. The daily sediment discharge data collected at these two stations has proved valuable in determining:

1. the amount of sediment to be dredged, relative to previous years, and

2. the validity of dredging claims against the Buffalo District.

Cuyahoga River Restoration Study. The District published the Cuyahoga River, OH, Restoration Study Third Interim Report on Erosion and Sedimentation in 1981. The purposes of this study, the major portion of which was conducted by the Soil Conservation Service of USDA, were to determine the prolific sources of sediment throughout the basin (from land and streambank erosion) and identify methods of controlling erosion and sedimentation through structural and/or nonstructural means.

The results of the study were that upland (sheet and rill) erosion contributes significantly (approximately 50 percent) to the Cuyahoga River sediment load (including Cleveland Harbor) while streambank erosion is a minor contributor (approximately 5 percent). The study also indicated that streambank erosion control plans were not economically justified and recommended that no further consideration be given to streambank erosion control plans at this time. In addition, the report recommended that local interests implement upland erosion control practices (Best Management Practices) on critically eroding areas in the watershed.

Sedimentation Report on Lakeview Park, OH. Lakeview Park is located 1 mile west of Lorain Harbor on the south shore of Lake Erie. In the summer of 1977, three detached offshore breakwaters plus 100,000 cubic yards of beach fill were placed as a cooperative beach erosion control project for Lakeview Park. An additional 9,000 cubic yards of beach fill has been placed at the west end of the park as part of the periodic replenishment program, 6,000 cubic yards in July 1980 and 3,000 cubic yards in September 1981. All beach fill used was obtained from commercial offshore sources.

The Buffalo District in cooperation with CERC is involved in a 5-year monitoring program (1977-1982) to document the effectiveness of these offshore breakwaters in retaining the fill and controlling beach erosion.

Hydrographic and topographic surveys were made along 32 profile lines in April 1981 and September 1981. The surveys extend 2,000 feet west and 4,500 feet east of the project. In addition, 72 sediment samples were collected along a 100-foot increment sampling grid during the September survey. The offshore samples were collected with a Peterson sampler. Samples were evaluated for grain-size distribution. Quantities of sediment transport in the project area were computed from the survey data.

Sedimentation Report on Presque Isle State Park, PA. Presque Isle is a large recurved sand spit which completely shelters the harbor for Erie, PA, and functions as a very popular State park. Since 1975, the Buffalo District, in cooperation with the Commonwealth, conducts an annual replenishment program. In 1981, 236,000 tons of medium sand was obtained from various land sources located within a 20-mile radius of Erie, PA, and placed on the beach.

In 1978, three prototype rubblemound offshore breakwaters were constructed at Beach 10. The performance of these breakwaters and the associated beach has been monitored through semiannual surveys. Fifteen stations were bathymetrically and topographically surveyed in April 1981 and September 1981. In addition, during the September survey, 41 sediment samples were collected at established offset locations along a 100-foot increment sampling grid. Samples were evaluated for grain-size distribution.

Sedimentation Report on Maumee Bay State Park. Maumee Bay State Park, located on the south shore of Lake Erie approximately 5 miles east of Toledo, OH, is a 1,855 acre Ohio Department of Natural Resources facility with a 11,000 foot long shoreline. Severe shore erosion is a major threat to this development and possible solutions are being addressed through a joint ODNR and Corps of Engineers Beach Restoration Study. Paradoxically, although the Maumee Bay State Park shore exhibits one of the highest erosion rates on Lake Erie, it also experiences one of the gentlest wave climates. Local wave data and sediment transport information is absent and the lack of native sand deposits in the nearshore prohibits a reasonable qualitative evaluation. In order to identify the potential stability of an unprotected medium sand beach, and predict nourishment and back passing quantities for a breakwater alternative, a sand transport test was initiated in October 1981 and will continue through the spring of 1982. This test consists of the placement of 50 cubic yards of a natural tracer sand as an elongated sand "groin" which is then periodically surveyed and sampled along with the surrounding shore to determine direction, quantity, and rate of transport.

Environmental Analyses of Harbor Sediments for O&M Program. In 1981, sediment samples were obtained from the Federal navigation channels from the following list of harbors within the Buffalo District. The sediment samples were subjected to bulk chemical analysis, elutriate chemical analysis, mechanical analysis (particle size), and/or bioassay testing. The purpose of the testing was to evaluate the sediments for suitability for a particular type of disposal following maintenance dredging of the Federal navigation channels.

Harbor	Project Type	Test Type
Buffalo, NY	O&M	Bulk Elutriate Mechanical
Fairport, OH	O&M	Bulk Elutriate Mechanical
Great Sodus Bay, NY/ Little Sodus Bay	O&M	Bulk Elutriate Mechanical Bioassay
Ogdensburg, NY	O&M	Bulk Elutriate Mechanical Bioassay
Olcott, NY	O&M	Bulk Elutriate Mechanical Bioassay
Oswego, NY	O&M	Bulk Elutriate Mechanical Bioassay
Rocky River, OH	O&M	Bulk Elutriate Mechanical
Toledo, OH	O&M	Bulk Elutriate Bioassay
Vermilion, OH	O&M	Bulk Elutriate Mechanical
Wilson, NY	O&M	Bulk Elutriate Mechanical Bioassay

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

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, Wisc., and at Bad River near Odanah, Wis., and on a monthly basis at Baptism River near Beaver Bay, Minn., and at St. Louis River at Scanlon, Minn., as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data were collected on a daily basis by an automatic sampler at Deer Creek near Holyoke, Minn., in cooperation with the Minnesota Department of Natural Resources, Division of Waters (discontinued September 30, 1981).

Southern Lake Superior-Lake Superior Subregion

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

2. Suspended-sediment data are being collected on a bimonthly basis at Ontonagon River near Rockland, Mich., Sturgeon River near Chassell, Mich., and at Tahquamenon River near Tahquamenon, Mich., 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, Wis., 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, Wis., and on a bimonthly basis at Ford River near Hyde, Mich., Escanaba River at Cornell, Mich., and at Menominee River near McAllister, Wis., as a part of NASQAN.

Southwestern Lake Michigan Subregion

1. Suspended-sediment data are being collected on a periodic and storm-event basis at Milwaukee River at Milwaukee, Wis., and at Manitowac River at Manitowac, Wis., as a part of NASQAN.

2. Suspended-sediment data are being collected on a bimonthly basis at Trail Creek at Michigan City, Ind., as part of NASQAN

Southeastern Lake Michigan Subregion

1. Suspended-sediment data are being collected on an intermitant basis at Pigeon Creek near Angola, Ind., and at North Branch Elkhart River at Cosperville, Ind., in cooperation with the Indiana Department of Natural Resources.

2. Suspended-sediment data are being collected on a bimonthly basis at Grand

River at Eastmanville, Mich., St. Joseph River at Niles, Mich., and at Kalamazoo River at Saugatuck, Mich., as a part of NASQAN.

3. Suspended-sediment data are being collected in cooperation with the Michigan Departments of Natural Resources and Agriculture and Van Bureu County on a daily basis as part of the Van Buren County study at the following sites:

Paw Paw River near Paw Paw, Mich.
Paw Paw River near Hartford, Mich.
Black River near Bangor, Mich.

On monthly basis at the following sites:

Dowagiac Drain near Decatur, Mich.
Lake of the Woods Drain near Decatur, Mich.
South Branch Paw Paw River near Paw Paw, Mich.
East Branch Paw Paw River at Lawton, Mich.
East Branch Paw Paw River at Paw Paw, Mich.
South Branch Paw Paw River near Paw Paw, Mich.
North Branch Paw Paw River near Paw Paw, Mich.
Unnamed Tributary to North Branch Paw Paw River near Paw Paw, Mich.
Brandywine Creek near Paw Paw, Mich.
Bush Creek at Lawrence, Mich.
Brandywine Creek near Covert, Mich.
Deerlick Creek near South Haven, Mich.
Black River Drain near Bangor, Mich.
Haven & Max Lake Drain near Bangor, Mich.
Black River at Bangor, Mich.
Cedar Creek near South Haven, Mich.
Black River near South Haven, Mich.

On a periodic basis at the following sites:

Dowagiac Drain at Decatur, Mich.
Obsorne Drain near Keeler, Mich.
Eagle Lake Drain near Lawton, Mich.
Gates Drain near Lawton, Mich.
East Branch Paw Paw River near Lawton, Mich.
Cook Drain near Mattawan, Mich.
Brandywine Creek near Gobels, Mich.
North Extension Drain near Gobels, Mich.
Brush Creek near Lawrence, Mich.
Red Creek near Lawrence, Mich.
Pine Creek near Hartford, Mich.
Paw Paw River at Riverside, Mich.
Haven & Max Lake Drain at Bloomingdale, Mich.
Haven & Max Lake Drain near Bloomingdale, Mich.
Middle Fork Black Lake near Bloomingdale, Mich.
Melvin Creek near Bloomingdale, Mich.
Barber Creek near Grand Junction, Mich.
Pine Creek near Gobles, Mich.

Northeastern Lake Michigan-Lake Michigan Subregion

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

Northwestern Lake Huron Subregion

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

St. Clair-Detroit River Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Clinton River at Mt. Clemons, Mich., Detroit River at Detroit, Mich., and at River Raisin near Monroe, Mich., as a part of NASQAN.

Western Lake Erie Subregion

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

2. Suspended-sediment data are being collected on an about-monthly basis at Cedar Creek near Cedarville, Ind., in cooperation with the Indiana Department of Natural Resources.

Southern Lake Erie Subregion

1. Suspended-sediment data are being collected on a daily basis at Rocky River near Berea, Ohio, and at Chagrin River at Willoughby, Ohio, for the Northeast Ohio Areawide Co-ordinating Agency, and at Cuyahoga River at Old Portage, Ohio, in cooperation with the Cuyahoga County Sanitary Engineering Department.

2. Suspended-sediment data are being collected on a daily basis at Cuyahoga River at Independence, Ohio, in cooperation with the U.S. Corps of Engineers, Buffalo District.

3. Suspended-sediment data are being collected on a daily basis at Grand River at Painseville, Ohio, 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, N.Y., Niagara River (Lake Ontario) at Ft. Niagara, N.Y., and Tonawanda Creek at Batavia, N.Y., 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, N.Y., as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic and storm-event basis in cooperation with Monroe County Health Department at the following sites:

Irondequoit Creek at Thornell Rd. near Pittsford, N.Y.
Barge Canal tributary at Cranston Rd. near East Rochester, N.Y. (discontinued September 30, 1981)
White Brook tributary at Southgate Rd. near Pittsford, N.Y. (discontinued September 30, 1981)
Thomas Creek At BOCES at Fairport, N.Y.
Irondequoit Creek tributary (Storm Sewer) at East Rochester, N.Y. (discontinued September 30, 1981)
Irondequoit Creek at Linden Ave. at East Rochester, N.Y.
Irondequoit Creek at Blossom Rd. near Rochester, N.Y.
Irondequoit Creek at Wetland Narrows at Rochester, N.Y.
Irondequoit Creek at Empire Blvd. at Rochester, N.Y. (discontinued September 30, 1981)

Southeastern Lake Ontario Subregion

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

2. Collection of suspended-sediment data on a periodic and storm-event basis was begun in September 1981 in cooperation with Onondaga County at the following sites:

Spafford Creek at Bromley Rd. near Spafford, N.Y.
Spafford Creek at Sawmill Rd. near Spafford, N.Y.
Rice Brook at Rice Grove, N.Y.
Willow Brook at Lader Point, N.Y.
Amber Brook at Amber, N.Y.
Van Benthuysen Brook at Amber, N.Y.
Ninemile Creek near Marietta, N.Y.

Northeastern Lake Ontario-Lake Ontario-St. Lawrence Subregion

1. Suspended-sediment data are being collected on a periodic basis at Black River at Watertown, N.Y., Raquette River at Raymondville, N.Y., St. Regis River at Brasher Center, N.Y., St. Lawrence River at Cornwall, Ontario, near Massena, N.Y., and at Oswegatchie River at Heuvelton, N.Y., 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 E. 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
Post Office Building, Room 702
St. Paul, MN 55101

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

District Chief, WRD
U.S. Geological Survey
6023 Guion Road
Indiana, IN 46254

District Chief, WRD
U.S. Geological Survey
P.O. Box 1350
U.S. Post Office and
Courthouse Building
Albany, NY 12201

District Chief, WRD
U. S. Geological Survey
1815 University Avenue, Room 200
Madison, WI 53706

GREAT LAKES REGION

SOIL CONSERVATION SERVICE

1. Analysis of sedimentation for pond or lake improvement was made as follows:

Major Drainage	Pond	Stream	County	State
Fox River	Lake Emery	Laing (OX)	Marquette	WI

2. Reservoir Sedimentation Surveys

A reservoir sedimentation survey was made on Edwin Hanson - G2 pond in Lake County, Minnesota.

OHIO REGION

BUREAU OF LAND MANAGEMENT

Ohio

Suspended sediment data is being collected as part of a BLM funded study of the impact of abandoned mine land reclamation on the water quality in the Yost II area of the Wayne National Forest. Flow data, water quality (chemical and biological), and sediment data are being collected prior to, during, and following reclamation activities. Prior to reclamation, water quality and sediment samples will be collected during several runoff events to establish pre-reclamation highflow conditions. During and following reclamation, water samples will be collected and analyzed for selected chemical constituents. Sediment samples will be collected during runoff events by means of a manning sampler and will also be collected manually to establish a rating factor. This study is being conducted in cooperation with the U.S. Geological Survey and Forest Service.

OHIO REGION

CORPS OF ENGINEERS

Ohio River Division

Report on sedimentation activities in the Ohio River Division for calendar year 1981 is as follows:

Sedimentation Resurveys.

1. Old Hickory. The sediment range resurvey of Old Hickory Reservoir was completed in September 1980. Data analysis has been completed and the anticipated report completion date is April 1982. Standard land procedures were used for above-ground portions of the ranges while underwater sections were sounded using an electronic echo-depth sounding device and a reel and tag line. The purpose of the resurvey was to determine changes in surface elevations along each range in the reservoir since the previous survey, which occurred in June 1965. Resurvey results show largest accumulations of sediment depositions in the middle reaches of the reservoir where several major tributary creeks enter. Preliminary results show a low sediment rate. A resurvey of some ranges and bridges will be made every five years. The survey data will be reviewed to determine if a more detailed survey of the range system is needed.

2. Martins Fork. A resurvey of all 31 sediment ranges was completed in July 1981. The survey was conducted to determine the changes in surface elevations along each range since the previous resurvey of July 1980. Surveying procedures used for above-ground and underwater sections are described in paragraph 1 above. Analysis of the survey data shows excessive deposition in the Martins Fork Reservoir with the resulting decrease in storage capacity. Before extensive measures such as monitoring sources of sediment or construction are taken, an additional resurvey in the summer of 1982 will be made. A report detailing the 1981 and 1982 resurveys is scheduled for completion in August 1982.

3. Dale Hollow Reservoir. The Dale Hollow Reservoir sediment range resurvey was completed in August 1980. Surveying procedures described in paragraph 1 above were used. Twenty-six ranges were surveyed to determine changes in surface elevations since the previous resurvey of June 1960. Preliminary results show the deposition to be insignificant. Check surveys of parts of the sediment range system will be made every five years to determine if a detailed range system resurvey is needed.

4. A reconnaissance sedimentation survey was completed at Conemaugh River Lake during 1981. Five range sections were surveyed and sedimentation samples were taken and analyzed for grain-size distribution. Depending on the significance of sediment accumulation, either a brief letter report will be prepared or a more detailed evaluation will be initiated in 1982 by the District.

5. The detailed sedimentation report for the 1973 Tygart Lake project survey will be completed and submitted in 1982. The project is scheduled to be resurveyed in 1982 along with the Berlin Lake project. Either brief letter reports will be prepared or more detailed evaluations will be initiated in 1983 by the District, depending on the degree of sediment accumulation at the respective projects.

6. An investigation of sedimentation in the Turtle Creek Flood Protection Project was accomplished in 1981. Initiated in 1975, the sediment monitoring program in the lower reach of Turtle Creek local flood protection project is an effort to determine the rate of sediment accumulation in the channel, to determine the scouring effect of various flows on the sediment configuration and the effect of sedimentation on the design flow of the channel. Slackwater from the Monongahela River nagivation dam (L&D #2), located just downstream from the mouth of Turtle Creek, extends about 8,800 feet upstream from the mouth. To date, seven annual complete surveys of the channel, from the mouth to project station 88+00 have been completed. Each survey included thirty-eight cross sections of the channel which were plotted on the "as built" channel template. The elements measured were volumes of sediment, sediment deposit depth and scour depth. A few sediment samplings and gradations were also carried out. Standard survey equipment was used including transit, rod, mapping, boat, sampling cylinder, and a standard laboratory gradation technique. Gradations of the sediment samples varied significantly and included both cohesive and non-cohesive materials. An unsuccessful effort was made to produce a predictive model for scour and deposition using Corps' computer program HEC-6. Other attempts at predicting future scour assuming cohesive material have shown some promise but have not been tested by a large flood.

7. Sedimentation reconnaissance surveys were conducted in 1981 at three lakes in the Muskingum River Basin: Beach City Lake, Sugar Creek, Ohio, Leesville Lake, McGuire Creek, Ohio and Wills Creek Lake, Wills Creek, Ohio and at one lake in the Scioto River Basin: Deer Creek Lake, Deer Creek, Ohio. Reports on these reconnaissance investigations are scheduled for completion in 1982.

8. Summersville Lake, Gauley River, West Virginia. A survey to obtain current profiles along the 39 existing sediment ranges at Summersville Lake was conducted in 1981. A design memorandum to present the sediment range network is scheduled for completion in 1983.

9. Reports on the 1980 resurveys at East Lynn Lake, Twelvepole Creek, West Virginia and at R. D. Bailey Lake, Guyandot River, West Virginia are in progress and are scheduled for completion by the Huntington District in 1982.

10. A Report of Sedimentation Survey at Barren River Lake is in progress and near completion.

Initial Range Surveys and Range Layouts.

1. Atwood Lake, Indian Fork of Conotton Creek, Ohio. Twelve new sediment ranges were surveyed during 1981 in the seasonal pool area to establish a sediment range network. A design memorandum to present the sediment range network is scheduled for completion in 1983.

2. Initial survey of the sedimentation ranges at Taylorsville Lake is approximately 70% complete at this time.

3. Tennessee-Tombigbee Waterway. The sediment range design memorandum for Bay Springs Reservoir, Design Memorandum No. N-16, Sedimentation Ranges, was submitted to the Ohio River Division and the South Atlantic Division, Corps of Engineers and was approved subject to satisfaction of minor comments.

Sediment Load Measurements.

1. Fishtrap Lake, Levisa Fork, Kentucky, and Dewey Lake, Johns Creek, Kentucky. The Huntington District collected suspended sediment data at the Johns Creek at Meta, Kentucky, monitoring station through 30 September 1981. After that date, the U.S. Geological Survey collected suspended sediment data at this station as part of a cooperative agreement with the Huntington District. Suspended sediment were collected by the U.S. Geological Survey at Levisa Fork at the Big Rock, Virginia gaging station through 13 November 1981. After that date, the U.S. Geological Survey collected the suspended sediment data with participation by the Huntington District. The Huntington District collected suspended sediment data on four tributary streams in the Fishtrap Lake Drainage Basin and on three tributary streams in the Dewey Lake Drainage Basin throughout 1981.

2. R. D. Bailey Lake, Guyandot River, West Virginia. Suspended sediment data were collected by the Huntington District at the Clear Fork, Indian Creek, and the Baileysville monitoring stations during 1981. The Indian Creek monitoring station was discontinued in September 1981.

3. Data collection is continuing on the pilot study of the sediment control dam on Defeated Creek, a tributary of Carr Fork Lake. A final report is in progress.

4. Establishment of four monitoring stations at the Litt Carr Sediment Dam at Carr Fork Lake is nearly complete and should be operational by the summer of 1982. Equipment at each site consists of automatic USGS PS-69 point-type bottling sampler in conjunction with a Stevens A-75 strip chart recorder. Records to be maintained at each station consist of suspended sediment and flow.

5. Upper Cumberland River Basin.

(a) Sediment sampling (grab samples) by the US Geological Survey at Harlan, Pineville, Middlesboro, and Barbourville in Kentucky is continuing in anticipation of sedimentation studies necessary for implementation of Section 202 (PL 96-367) work.

(b) The sediment monitoring station at Cumberland Falls, Kentucky has become operational. This station is monitoring sediment inflow from the Upper Cumberland River Basin into Wolf Creek Reservoir (Lake Cumberland).

6. Ohio River, Louisville, Kentucky. The full-section sediment measuring station is being operated for the third consecutive year by USGS at Louisville with financial support from the Louisville District. During FY 1982 the bottom sampling activities will be increased, and an attempt will be made to estimate the bed load.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

OHIO REGION

Jefferson National Forest

Seventeen severely eroding acres were rehabilitated. This resulted in an estimated sediment reduction of over 800 tons annually. Turbidity was monitored on three projects. These results are stored in "Storet."

Daniel Boone National Forest

The National Forest personnel rehabilitated 90 acres of severely eroding lands. This resulted in a reduction of about 4,500 tons of stream sediment annually.

OHIO REGION

GEOLOGICAL SURVEY

Monongahela Subregion

1. Suspended-sediment data are being collected on a an event basis at Taylor Run at Bowden, W. Va., as part of the Shavers Fork Basin Cooperative Program with the West Virginia Department of Highways.

2. Suspended-sediment data were being collected on a daily basis and with automated samplers at Huff Run at Lindentree, Ohio, and Sugartree Fork near Birmingham, Ohio, as part of the USGS's Coal Hydrology Monitoring project. (Huff Run and Sugartree Fk discontinued October, 1981).

Upper Ohio Subregion

1. Suspended-sediment data are being collected by automatic samplers at Brokenstraw Creek at Youngsville, Pa. and Redbank Creek at St. Charles, Pa., as part of the Coal Hydrology program.

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

3. Suspended-sediment data are being collected on a monthly basis at Little Grave Creek near Moundsville, W. Va., at Par Run near mouth near Moundsville, W. Va., and at Middle Grave Creek near Moundsville, W. Va., in cooperation with the U.S. Soil Conservation Services.

4. Suspended-sediment data are being collected on a daily basis at Hocking River below Athens, Ohio, in cooperation with the Ohio Department of Natural Resources.

5. Suspended-sediment data were collected on a daily basis at Consol Run near Bloomingdale, Ohio, in cooperation with the U.S. Environmental Protection Agency (EPA).

6. Suspended-sediment data were collected on a daily basis and with automated samplers at Short Creek near Dillonvale, Ohio, East Branch Shade River near Tuppers Plains, Ohio, as part of the USGS's Coal Hydrology Monitoring project (discontinued October, 1981).

7. Suspended-sediment data are being collected on a storm event basis at Yost Run near Nelsonville, Ohio, in cooperation with BLM.

Muskingum Subregion

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

2. Suspended-sediment data are being collected on a daily basis at Sand Fork near Wakatomika, Ohio, in cooperation with the U.S. EPA.

3. Suspended-sediment data were collected on a near-monthly and storm-event basis at Clear Fork tributary near Hanover, Ohio, and at Opossum Run tributary near Wakatomika, Ohio, in cooperation with the U.S. EPA.

4. Suspended-sediment data were collected on a daily basis and with automated samplers at Mud Run at Tuiscarawas, Ohio, and Moxahala Creek near Crooksville, Ohio, as part of the USGS'S Coal Hydrology Monitoring project (both discontinued October, 1981).

5. Suspended-sediment data were being collected on a daily basis and with automated samplers at Huff Run at Lindentree, Ohio, and Sugartree Fork near Birmingham, Ohio, as part of the USGS's Coal Hydrology Monitoring project. (both discontinued October, 1981).

Kanawha Subregion

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

2. Suspended-sediment data are being collected on a daily basis at Little Coal River at Danville, W. Va., Little Coal River at Julian, W. Va., Big Coal River near Alum Creek, W. Va., Coal River at Alum Creek, W. Va., Coal River at Tornado, W. Va., Rock Creek at Danville, W. Va., Rock Creek at Rock Creek, W. Va., Trace Fork at Ruth, W. Va., and Trace Fork Downstream Dryden Hollow at Ruth, W. Va. (starting July 1980) in cooperation with the West Virginia Department of Highways.

3. Suspended-sediment data were collected about monthly at Cranbery Creek at Beckley, W. Va., Little Whitestick Creek at Beckley, W. Va., and Soak Creek at Sophia, W. Va.

4. Suspended-sediment data are being collected on a event basis at Peters Creek at Lockwood, W. Va., as part of the Gauley River basin project in cooperation with the West Virginia Geological and Economic Survey.

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

Scioto Subregion

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

2. Suspended-sediment data are being collected on a daily and storm-event basis at the following locations in cooperation with the Ohio Department of Transportation:

    Olentangy River near Worthington, Ohio
    Rush Run at Worthington, Ohio
    Linworth Road Creek at Columbus, Ohio

Bethel Road Creek at Columbus, Ohio
Unnamed Tributary to Olentangy River at 315 Expressway at Columbus, Ohio
Olentangy River at Henderson Road at Columbus, Ohio

Big Sandy-Guyandotte Subregion

1. As part of the Coal Monitoring program in southwestern Virginia, suspended-sediment samples were collected at 31 stations. Bottom-material samples for coal-separation and trace-metals analysis were collected at 31 sites in the Big Sandy River basin (discontinued September 30, 1981).

2. Suspended-sediment data were collected on a daily basis at Levisa Fork at Big Rock, VA as part of the Coal Hydrology Program (discontinued September 30, 1981).

3. Suspended-sediment data are being collected, on a near monthly basis at Guyandotte River at Branchland, W. Va., as a part of NASQAN.

4. In cooperation with the U. S. Bureau of Mines and the Office of Surface Mining, Reclamation and Enforcement, suspended-sediment data were collected on a event basis and with automatic samplers at the following sites as part of a study of the effects of land-use changes on the magnitude and frequency of flood-peak flows and on sediment characteristics of the Tug Fork in Kentucky, Virgina, and West Virginia:

Right Fork Hurricane Creek near Stopover, Ky.
Puncheoncamp Branch at Leckie, W. Va.
Left Fork Sandlick Creek at Elbert, W. Va.
Pumpkin Branch near Hurley, Va.
Camp Creek near Argo, Ky.
Elkfoot Branch near Nigh, Ky.
Elkhorn Creek Tributary at Welch, W. Va.
Freemans Branch near Skygusty, W. Va.
Right Fork Sandlick Creek near Gary, W. Va.
Crane Creek near Panther, W. Va.

5. Suspended-sediment data collection was begun on a twice-weekly plus storm-event basis in October 1980 at the following sites in the Tug River basin:

Pumpking Branch near Hurley, Va.
Camp Creek near Argo, Ky.
Rt. Fork Hurricane Creek near Stopover, Ky.

and at Elkfoot Branch near Nigh, Ky., in the Levisa Fork basin. All four of these stations were established to provide information to assist in investigation of flooding in the Tug Fork basin of Virgina, Kentucky, and West Virginia.

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

7. Suspended-sediment data are being collected on a daily basis at Johns Creek near Meta, Ky., to monitor sediment discharge into Dewey Lake. The work is being done in cooperation with the U.S. Corps of Engineers, (COE), Huntington District.

8. Suspended-sediment data are being collected on a quarterly basis at Dicks

Fork at Phyllis, Ky., as a part of the Coal Hydrology project.

9. Suspended-sediment data are being collected on a weekly and storm-event basis at Russell Fork at Elkhorn City, Ky., Levisa Fork at Pikeville, Ky., and Johns Creek near Van Lear, Ky., as part of the Coal Hydrology program (discontinued September 30, 1981).

10. Suspended-sediment data are being collected on a quarterly basis at 41 other locations as part of the Coal Hydrology program (discontinued September 30, 1981).

Great Miami Subregion

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

Middle Ohio Subregion

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

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

3. Suspended-sediment data are being collected daily at Big Four Hollow Creek near Lake Hope, Ohio, in cooperation with the Ohio Department of Natural Resources.

4. Suspended-sediment data are being collected on a bimonthly basis at Ohio River at Greenup Dam, Ky., and Ohio River at Markland Dam, Ky., as a part of NASQAN.

5. Suspended-sediment data are being collected on a weekly and storm-event basis at Tygarts Creek near Greenup, Ky., and Little Sandy River at Grayson, Ky., as part of the Federally funded Coal Hydrology network (discontinued September 30, 1981).

6. Suspended-sediment data are being collected on a quarterly basis at 10 locations in Kentucky, as part of the Federally funded Coal Hydrology network (discontinued September 30, 1981).

7. Suspended-sediment data are being collected on an intermittant basis at Blue River at White Cloud, Ind. in cooperation with the Indiana Department of Natural Resources.

Kentucky-Licking Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Licking River at Butler, Ky., and at Kentucky River at Lock 2 at Lockport, Ky.,

as a part of NASQAN.

2. Suspended-sediment data are being collected on a 5-week frequency at the following stations to define sediment yields by physiographic province in Kentucky (all discontinued September 30, 1981):

North Fork Triplett Creek near Morehead, Ky.
North Fork Licking River near Lewisburg, Ky.
Goose Creek at Manchester, Ky.
Red River near Hazel Green, Ky.
Elkhorn Creek near Frankfort, Ky.

This work was done in cooperation with the Kentucky Geological Survey. The Goose Creek and Red River stations was also part of the Coal Hydrology program.

3. Suspended-sediment data are being collected on a daily basis at Middle Fork Kentucky River near Hyden, Ky., in cooperation with the U.S. Corps of Engineers, Louisville District, and as part of the Coal Hydrology program (discontinued September 30, 1981).

4. Suspended-sediment data are being collected on a weekly and storm-event basis at (all discontinued September 30, 1981):

North Fork Kentucky River at Hazard, Ky.
North Fork Kentucky River at Jackson, Ky.
Middle Fork Kentucky River at Tallega, Ky.
South Fork Kentucky River at Booneville, Ky.

5. Suspended-sediment data are being collected on a quarterly basis at 54 locations in Kentucky as part of the Coal Hydrology program (discontinued September 30, 1981).

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.

3. Suspended-sediment data are being collected on a 5-week frequency at the following stations in cooperation with the Kentucky Geological Survey (all discontinued September 30, 1981):

Russell Creek near Columbia, Ky.
Nolin River near White Mills, Ky.
South Fork Panther Creek near Whitesville, Ky.
Bacon Creek near Priceville, Ky. (started Oct. 1, 1978)

4. Suspended-sediment data are being collected on a weekly and storm-event basis as part of the Coal Hydrology program at (all discontinued September 30, 1981).

Rough River at Dundee, Ky.
Pond River near Apex, Ky.
Pond River near Vandetta, Ky.
Green River at Rockport, Ky.
Cypress Creek near Calhoun, Ky.

Panther Creek near Owensboro, Ky.
Green River at Lock 2 at Calhoun, Ky.

5. Suspended-sediment data are being collected on a quarterly basis at 47 locations in Kentucky as part of the Coal Hydrology program (discontinued September 30, 1981).

Wabash Subregion

1. Suspended-sediment data are being collected on a daily basis at East Fork White River at Seymour, Ind., in cooperation with the Indiana Department of Natural Resources, and at Big Blue River at Carthage, Ind., for the C.O.E.

2. Suspended-sediment data were collected monthly during steady-flow conditions and during flood events at six sites in Indiana as part of the Federal Coal Hydrology program.

3. Suspended-sediment data were collected during flood events at two sites in Indiana using automatic sediment samplers as part of the Federal Coal Hydrology program.

4. Suspended-sediment data were collected monthly at White River at Hazelton, Ind., as part of NASQAN.

5. Suspended-sediment data are being collected on an intermittant basis at the following sites in cooperation with the Indiana Department of Natural Resources:
Buck Creek near Muncie, Ind.
Stoney Creek near Nobleville, Ind.
White Lick Creek near Mooresville, Ind.
Beanblossom Creek at Beanblossom, Ind.
Big Walnut Creek near Reelsville, Ind.
Flatrock River at St. Paul, Ind.
Stephens Creek near Bloomington, Ind.

6. Suspended-sediment data are being collected on an intermittant basis from Wabash River at Linn Grove, Ind., Missisinewa River near Ridgeville, Ind., Wildcat Creek at Jerome, Ind., Wabash River at Lafayette, Ind., Busserou Creek near Sullivan, Ind., and Big Creek near Wedesville, Ind., in cooperation with the Indiana Department of Natural Resources.

7. Suspended-sediment data are being collected on a monthly basis at Wabash River at New Harmony, Ind., and at Little Wabash River at Carmi, Ill., as a part of NASQAN.

8. Suspended-sediment data are being collected daily and bed-material data are being collected seasonally at Little Wabash River at Louisville, Ill., (discontinued September, 1981) and at Embarras River near Oakland, Ill., in cooperation with the C.O.E., Louisville District.

Cumberland Subregion

1. As part of the Coal Hydrology program, a suspended-sediment discharge

station is being operated at Smoky Creek near Hembree, Tenn., in the New River basin. This station monitors daily and storm loads. Also in conjunction with this same program, miscellaneous suspended-sediment discharge measurements are being made at 50 other sites in this Subregion within the State of Tennessee.

2. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a six-week frequency at 11 sites in this Subregion within the State of Tennessee.

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

4. Suspended-sediment data are being collected on a 5-week frequency at the following stations in cooperation with the Kentucky Geological Survey:
Buck Creek near Shopville, Ky. (discontinued September 30, 1981)
Little River near Cadiz, Ky. (discontinued September 30, 1981)

5. Suspended-sediment data are being collected on a daily and storm-event basis in cooperation with the U.S. Army Corps of Engineers, Nashville District at the following stations:
Clover Fork near Harlan, Ky.
Yellow Creek near Middlesboro, Ky.
Cumberland River at Barbourville, Ky.
Cumberland River near Pineville, Ky.
Cumberland River at Cumberland Falls, Ky. (started April 1, 1981)

6. Suspended-sediment data are being collected on a weekly and storm-event basis as part of the Coal Hydrology program at (all discontinued September 30, 1981):
Clear Fork near Saxton, Ky.
Rockcastle River near Billows, Ky.
Cumberland River at Williamsburg, Ky.

7. Suspended-sediment data are being collected on a quarterly basis at 29 miscellaneous stations of the Coal Hydrology program (discontinued September 30, 1981).

Lower Ohio Subregion

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

2. Suspended-sediment data are being collected on an intermittent basis at Indian-Kentucky Creek near Canaan, Ind., on a highflow only basis at Middle Fork Anderson River at Bristow, Ind., and on a daily basis at West Fork Blue River at Salem, Ind., in cooperation with the Indiana Department of Natural Resources.

3. Suspended-sediment data are being collected on a once-weekly and storm-

event basis at Ohio River at Louisville, Ky., in cooperation with the C.O.E., Louisville District.

4. Suspended-sediment data are being collected on a weekly and storm-event basis at Tradewater River at Sullivan, Ky., as part of the Coal Hydrology program (discontinued September 30, 1981).

5. Suspended-sediment data are collected on a quarterly basis at 13 locations in Kentucky as part of the Coal Hydrology program (discontinued September 30, 1981).

6. Suspended-sediment data are collected on a 5-week and storm-event basis at Massac Creek near Paducah, Ky., in cooperation with the Kentucky Geological Survey (discontinued September 30, 1981).

Special Studies

1. Suspended-sediment data were collected with automatic samplers at three sites in Greene County, Penn., during 1979-81,--Castile Run at Clarksville, Penn., Whitely Creek near Kirby, Penn., and Enlow Fork of Wheeling Creek, near West Finley, Pennsylvania. These data were collected as part of a study to evaluate the effects of mining on streams in Greene County.

2. Suspended-sediment data were collected from June 1979 to October 1981 with automatic samplers at two sites in the East Branch Mahanoy Creek basin, Penn., as part of a study to evaluate the effects of surface mining on the stream. The study is in cooperation with the Pennsylvania Department of Environmental Resources, Office of Surface Mine Reclamation.

3. Suspended-sediment data were collected at two sites below a surface mine in Western Clearfield County, Pennsylvania. An automatic sampler collects samples from the inflow and outflow of a sediment control pond. The study is designed to collect data to calibrate a sediment yield-surface mining model.

4. A 4-year study began in 1978 to evaluate surface mining influences on sedimentation characteristics of basins in the Allegheny and Monogahela geologic series in Ohio.

5. Suspended-sediment data were collected at selected sites in the coal mining region of Ohio during storm-events, once in 1979 and 1980, as part of the USGS's Coal Hydrology Monitoring project (discontinued October 30, 1980).

6. A 4-year study began in 1978 to evaluate and quantify any impact that highway construction has on sediment loads to neighboring streams at the construction site of Ohio State Route 315 in Columbus, Ohio.

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

8. The project report by Joel E. Dysart is in review stage on the Federally-funded project, "Downstream effects of coal mining on Levisa Fork of the Big Sandy River, Kentucky-Virginia."

9. Suspended-sediment data were collected with automatic samplers at five sites in the Big Sandy Creek basin in Pennsylvania during 1980. Two of these sites are below a surface mine which is in the process of being reclaimed. 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.

10. In cooperation with the Tennessee Department of Transportation, the problem of scour at highway bridges is being investigated at known and potential problem sites across Tennessee. Reports documenting data and research findings are in preparation.

11. A 5-year study was initiated in 1980 to model the cumulative downstream effects of coal mining in the Smoky Creek basin, Tennessee. In conjunction with this study automatic suspended-sediment samplers are operating at 5 sites.

12. In cooperation with the U.S. Army Corps of Engineers, three suspended-sediment discharge stations are being operated; Clear Fork near Robbins, Tenn., New River at New River, Tenn., and Big South Fork Cumberland River near Stearns, Kentucky. 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, Tennessee.

13. Professional paper 427D by John A. McCabe, a report on the 1974 phase of sediment studies at Cane Branch near Parkers Lake, Ky., is in review stage. This work was done in cooperation with a number of Federal and state agencies.

14. Suspended-sediment data were collected at all synoptic sites in the coal mining region of Ohio during high-water -- once in 1980 and 1981, as part of the USGS's Coal Hydrology Monitoring project (discontinued October, 1981).

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 E. Main St., 4th Floor
Urbana, IL 61820

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

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 1107
Federal Building, Fourth Floor
228 Walnut Street
Harrisburg, PA 17108

District Chief, WRD
U.S. Geological Survey
Federal Building and
U.S. Courthouse, Room A-413
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
Rm. 572, Federal Building
600 Federal Place
Louisville, KY 40202

District Chief, WRD
U.S. Geological Survey
Federal Building and U.S. Courthouse
Room 3017
500 Quarrier Street
East 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 determinations of sediment yields were made for a work plan in the following watershed:

a. Public Law-566

Major Drainage	Watershed	Stream	County	State
Muskingum River	Killbuck Creek	Apple Creek	Wayne	Ohio

b. River Basin Investigations

River Basin	Basin Reported	State
Ohio River	Central Ohio	Ohio

2. Reservoir Sediment Surveys

Reservoir sedimentation surveys were made in the following:

Reservoir	County	State
Upper Wabash Site No. 1	Darke, Preble	Ohio
Upper Hocking Site No. 1	Fairfield	Ohio
Upper Hocking Site No. 2	Fairfield	Ohio
Bruce Lake1/	Fulton, Pulaski	Indiana
Heritage Lake1/	Putnam	Indiana
Ryerson Station State Park Lake	Greene	Pennsylvania
Mamoth Park Lake	Westmoreland	Pennsylvania
Jumping Branch #1	Summers	West Virginia
Marlin Run #1	Pocohantas	West Virginia
Freeman Lake (Valley Creek #4)	Hardin	Kentucky
Lake Reba	Madison	Kentucky

1/ Limited survey

3. Special Studies

County Reliable Natural Resource Inventories, including erosion, were made for selected areas within the entire state of Ohio.

Forest Service

TENNESSEE REGION

National Forests in North Carolina

The forest personnel rehabilitated 18 severely eroding aures. This resulted in an annual stream sediment reduction of about 900 tons.

Turbidity was monitored at seven stations. The data are stored in "Storet."

Chattahoochee-Oconee National Forest

The Chattahoochee-Oconee National Forest personnel rehabilitated 10 acres of severely eroding lands. This resulted in a reduction of about 500 tons of sediment annually.

The National Forest personnel monitored turbidity on two projects. The data are stored in "Storet."

Cherokee National Forest

Four acres of severely eroding lands were rehabilitated. This resulted in an annual sediment reduction of about 200 tons. Stream turbidity was monitored on two projects. These data are in "Storet."

Jefferson National Forest

Rehabilitation was completed on 8 acres of severely eroding lands resulting in a decrease of approximately 400 tons of stream sediment annually.

Water quality monitoring included two projects where turbidity was monitored. These results are in "Storet."

TENNESSEE REGION

GEOLOGICAL SURVEY

Upper Tennessee Subregion

1. As part of the Coal Hydrology program in southwestern Virginia, suspended-sediment samples were collected at 19 stations. Bottom-material samples for coal-separation and trace-metals analysis were collected at 19 sites in the Clinch and Powell River basins (discontinued September 30, 1981).

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

3. Suspended-sediment data are collected on a monthly basis at Cataloochee Creek near Cataloochee, N.C., as a part of the National Hydrologic Benchmark program.

4. In conjunction with the Coal Hydrology program, miscellaneous suspended-sediment discharge measurements are being made at 17 sites within the State of Tennessee.

5. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a 6-week frequency at eight sites within the State of Tennessee.

6. In cooperation with the North Carolina Department of Natural Resources and Community Development, suspended-sediment samples are collected about monthly at Pigeon River near Hepco, N.C.

Middle Tennessee-Hiwassee Subregion

1. In conjunction with the Coal Hydrology program, miscellaneous suspended-sediment discharge measurements are being made at 13 sites within the State of Tennessee.

2. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a 6-week frequency at Oostanaula Creek near Sanford, Tennessee.

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

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

Tennessee-Elk Subregion

1. In conjunction with the Coal Hydrology program, miscellaneous suspended-sediment discharge measurements are being made at six sites within the State of Tennessee.

2. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a 6-week frequency at Shoal Creek near Iron City, Tenn.

3. Suspended-sediment data are being collected on a monthly basis at Tennessee River at South Pittsburg, Tenn., as a part of NASQAN. This site is also in a national pesticide monitoring network which requires periodic streambed sediment sampling.

4. Suspended-sediment data are being collected by an automatic sampler at Tennessee-Tombigbee Waterway at Cross Roads, Miss., in cooperation with the U.S. Corps of Engineers.

Lower Tennessee Subregion

1. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a 6-week frequency at three sites within the State of Tennessee.

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

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

4. Suspended-sediment data are being collected on a 5 week-frequency at West Fork Clarks River near Brewers Creek, Ky., in cooperation with the Kentucky Geological Survey (discontinued September 30, 1981).

5. Suspended-sediment data are being collected on a periodic basis at Toccoa River near Dial, Ga., in cooperation with the Georgia Geological Survey.

Special Studies

In cooperation with the Tennessee Department of Transportation, the problem of scour at highway bridges is being investigated at known and potential problem sites across Tennessee. Reports documenting data and research findings are in preparation.

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

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 2857, Century Station
Post Office Building, Room 436
Raleigh, NC 27602

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

District Chief, WRD
U.S. Geological Survey
100 W. Capitol St., Suite 710
Jackson, MS 39269

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

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

TENNESSEE VALLEY AUTHORITY
TENNESSEE RIVER BASIN

Notes on Sedimentation Activities in 1981

Douglas Reservoir

Thirty-three ranges were sounded in the fall of 1981. This was the fifth survey since the reservoir was completed in 1943. Other investigations were made in 1949, 1955, 1960, and 1967.

LaFollette Water Supply Reservoir (Upper Ollis Creek Reservoir)

This thirty-five-acre reservoir, which was filled in 1964, was surveyed for the tenth time since the forty-six sediment ranges were established, sounded, and probed in 1970. Deposited sediment accumulations are being monitored to ascertain the effects of strip mining and subsequent reclamation work in the watershed.

Tellico Reservoir

Original areas and volumes were measured and calculated from topographic maps and the forty-eight sediment ranges established and sounded in 1980.

Sediment Sampling

Core samples were obtained from Douglas and Tellico Reservoirs to determine particle size and sediment oxygen demand.

CUMBERLAND RIVER TRIBUTARY

Great Falls Reservoir

Forty-two sediment ranges were sounded in the spring of 1981. The reservoir was filled in 1916 but sediment ranges were not established until 1935 when the U.S. Army Corps of Engineers established eighty-four ranges. TVA made sediment surveys in 1947, 1954, 1960, and 1969.

Sediment Sampling

Sediment samples were obtained from the Cumberland River in the vicinity of the Hartsville Nuclear Plant project to determine wet particle size distribution.

UPPER MISSISSIPPI REGION

CORPS OF ENGINEERS

North Central Division

Chicago District

Two investigations of the pollutional characteristics of sediments from Waukegan Harbor, Illinois, were conducted by the Chicago District during 1981 in relation to proposed dredging activities. In May 1981, core samples were collected from a shoaled area, just east of the harbor entrance. Results of physical, chemical, and elutriate analysis were presented in a report, "Waukegan Outer Harbor Sediment Analysis," June 1981. Sediment samples were predominantly fine grained sand with concentrations of polychlorinated biphenyls (PCB's) of less than 1 ppm (mg/kg dry weight).

In October 1981, grab and core sediment samples were collected from the outer harbor, entrance channel, and turning basin of Waukegan Harbor. Core samples were analyzed for bulk chemistry, particle size distribution (sieve analysis), and standard elutriate tests. Bulk chemical parameters analyzed are: moisture, volatile solids, chemical oxygen demand, total Kjeldahl nitrogen, ammonia - nitrogen, total phosphorus, nitrite and nitrate, oil and grease, aluminum, antimony, arsenic, barium, berylium, cadmium, calcium, chronium, copper, cyanide, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, thallium, zinc, and PCB's. Grab sediment samples were used for sediment bioassays, which were designed to show the 'worst case' effect of sediments suspended during dredging/disposal on indiginous aquatic organisms. The results of the October sampling program will be presented in a report by the Chicago District in February 1982.

The Chicago District conducted two sampling programs at Burns Waterway and Burns Ditch, Indiana, during 1981 in relation to proposed dredging operations. In a preliminary program, grab sediment samples were collected from five locations at the mouth of Burns Waterway at Lake Michigan and two from the Waterway itself. Samples were analyzed for bulk chemistry, particle size distribution, and standard elutriate tests. Bulk chemical parameters tested include: COD, volatile solids, ammonia-nitrogen, nitrates and nitrites, TKN, total phosphorus, oil and grease, lead, mercury, cadmium, chromium, nickel, selenium, silver, copper, and PCB's. The results of this sampling program were presented in "Sampling Report on Sediment Sampling Program at Burns Ditch, Indiana," August 1981. These sediment samples were predominantly medium to fine grained sand, with non-polluted levels of heavy metals, organics, and PCB's according to the USEPA Region V "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments," 1977.

The Chicago District collected core sediment samples from two locations on Burns Ditch, Indiana and one site at the mouth of Burns Waterway in September, 1981 for bulk chemical and elutriate analysis. Samples were analyzed for the bulk chemical parameters as mentioned in second paragraph above, and also for priority pesticides. The report of this sediment investigation will be presented in February 1982.

During September and October 1981, core sediment samples were collected from Burns Ditch, Burns Waterway and adjacent Lake Michigan for physical analysis in relation to proposed channel modifications and breakwater construction. Corings were made at twenty locations along Burns Waterway and on Burns Ditch extending about 1 1/2 miles west from the junction with the East Arm Little Calumet River.

Core samples were analyzed for sieve analysis, hydrometer analysis, Atterberg limits and visual classification. Core samples from 4 locations in Lake Michigan near the mouth of Burns Waterway were analyzed for sieve analysis, hydrometer analysis, specific gravity, moisture, Atterberg limits, unconfined compression, consolidation and visual classification. Results of laboratory analysis will be included in the "Burns Ditch Small Boat Harbor Detailed Project Report" in March 1982.

Grab sediment samples were collected from the Federal Navigation channels in the Chicago River and Harbor and the Calumet River and Harbor in 1981. Samples were used to perform EP-toxicity and standard elutriate tests, in order to project the quality of the leachate from these sediments following dredging and disposal. The results of analyses were presented in two reports "Summary Report on Sediment Sampling Program, Chicago River and Harbor and Calumet River and Harbor," March 1981, and August 1981.

During September and October 1981, core sediment samples were collected at the site of a proposed confined disposal facility at Calumet Harbor, Illinois. The samples were collected for foundation design analysis purposes. Eight borings and seven probings were made at Calumet Harbor. Samples were tested for percent fly ash, hydrometer analysis, sieve analysis, Atterberg limits, permeability and visual classification. Results of physical testing was presented in "Chicago Area CDF, Calumet Harbor, Design Analysis - Appendix H."

During November 1981, a Phase II investigation of sediments from the Little Calumet River in Illinois was completed. Core samples were collected from eight locations on the river between its mouth at the Cal-Sag channel and the Illinois-Indiana stateline. Samples were analyzed for bulk chemistry, particle size distribution, and standard elutriate test. Bulk chemical parameters are as those mentioned in second paragraph above. The results of this investigation will be presented in a report in February 1982.

During 1981, the Chicago District funded two USGS suspended sediment discharge stations. These stations are located on the Kankakee River near Wilmington, Illinois, and on the Des Plaines River at Riverside, Illinois. Suspended sediment load is recorded daily at these stations. Data is available through the WATSTORE data storage and retrieval system.

Rock Island District

Suspended Sediment Sampling. Suspended load sampling is being conducted at 35 stations; 4 located on the Mississippi River and 31 on its tributaries. Seventeen long-term stations are operated and maintained directly by the Rock

Island District. Eighteen 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 19 stations located on tributaries of the Mississippi River. At 15 of these stations suspended sediment samples are also collected. At the remaining four stations, The Turkey River at Garber, Iowa; Skunk River at Augusta, Iowa; Rock River at Jefferson, Wisconsin; and the Rock River at Afton, Wisconsin, only bedload samples are collected. Bedload samples are collected during the three peak flows for the year using the Helley Smith bedload sampler. All stations at which bedload samples are collected are operated and maintained in cooperation with the USGS. Records for the bedload stations are also maintained by the USGS.

St. Paul District

Sediment load measurements were made at 28 stations (reduced to 21 stations on 1 October) sponsored by the St. Paul District. There were 21 stations (now 14) in the Upper Mississippi River basin and 7 in the Souris-Red-Rainy River basin. All sediment load measurements are being conducted by the U.S. Geological Survey under St. Paul District sponsorship.

Included in the sediment measurement stations referenced above are five stations in Rochester, Minnesota, to provide data for the Sediment Transport Study for the Rochester, Minnesota Flood Control Project being accomplished under contract by WES.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

UPPER MISSISSIPPI REGION

GEOLOGICAL SURVEY

Mississippi Headwaters Subregion

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

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

3. Suspended-sediment data were collected on a periodic basis at Crow River at Rockford, Minn., and at Elk River near Big Lake, Minn., in cooperation with the Minnesota Department of Natural Resources, Division of Waters (discontinued September 30, 1981).

4. Suspended-sediment measurements were made as part of special studies at the following site:

St. Francis River at Santiago, Minn.
St. Francis River near Orrock, Minn.
St. Francis River near Zimmerman, Minn.

Minnesota Subregion

1. Suspended-sediment data are being collected on a daily basis at Minnesota River at Mankato, Minn., at Whetstone River near Big Stone City, S. Dak. (discontinued September 30, 1981), and at Yellow Bank River near Odessa, Minn. (discontinued September 30, 1981), in cooperation with the U.S. Corps of Engineers.

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

3. Suspended-sediment data were collected on a periodic basis at Watonwan River near Garden City, Minn., Chippewa River near Milan, Minn., and at Yellow Medicine River near Granite Falls, Minn., in cooperation with the Minnesota Department of Natural Resources, Division of Waters (discontinued September 30, 1981).

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

Trib. to N. Br. Yellow Medicine River above Dillion Syltie Impoundment near Porter, Minn.
Dillion Syltie Impoundment Outlet near Porter, Minn.
Trib to S. Fk. Yellow Bank River above LaBolt Impoundment at LaBolt, S. Dak.

St. Croix Subregion

1. Suspended-sediment data are being collected on a periodic basis at the following sites:

St. Croix River at CTH "T" near Dairyland, Wis.
Namekagon River at Hayward, Wis.

Namekagon River at Trego, Wis.
St. Croix River near Danbury, Wis.
Yellow River at Danbury, Wis.
Clam River at ice house bridge near Webster, Wis.
Kettle River near Cloverdale, Minn.
Snake River near Pine City, Minn.
Apple River near Somerset, Wis.

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

Upper Mississippi-Black-Root Subregion

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

2. Suspended-sediment data are being collected on a daily basis at Zumbro River at Kellogg, Minn. (discontinued October, 1981), at Whitewater River near Beaver, Minn. (discontinued October, 1981), at Mississippi River at Winona, Minn., at Root River near Houston, Minn. (discontinued October, 1981), and at South Fork Root River near Houston, Minn. (discontinued October, 1981), in cooperation with the U.S. Corps of Engineers.

3. Suspended- and bed-material data are being collected on a periodic and storm-event basis for the U.S. Corps of Engineers, at Chippewa River at Durand, Wis., and at Black River at Galesville, Wis.

4. Suspended- sediment and bed material data are being collected on an intermittent basis for the U.S. Corps of Engineers, at Chippewa River near Caryville, Wis., and at Chippewa River near Pepin, Wis.

Upper Mississippi-Maquoketa-Plum Subregion

1. Suspended-sediment data are being collected on a daily basis at Upper Iowa River near Dorchester, Iowa, and at Mississippi River at McGregor, Iowa, as a part of the Great River Environmental study in cooperation with U.S. Corps of Engineers, St. Paul District.

2. Suspended-sediment data are being collected on a periodic and storm-event basis to determine daily suspended-sediment loads for the U.S. Corps of Engineers at the Grant River at Burton, Wis.

3. Suspended-sediment data are being collected on a periodic and storm-event basis to determine daily loads in cooperation with the Wisconsin Department of Natural Resources at the following sites:
Pats Creek near Belmont, Wis.
Madden Branch Tributary near Belmont, Wis.
Madden Branch near Meckers Grove, Wis.
Apple River near Shullsburg, Wis.

4. Suspended-sediment data are being collected at Maquoketa River near Maquoketa, Ia., as a part of the Great II River Environmental study in cooperation with the U.S. Corps of Engineers, Rock Island District.

5. Suspended-sediment data were collected on a periodic basis at Cedar River near Austin, Minn., in cooperation with the Minnesota Department of National Resources, Division of Waters (discontinued September 30, 1981).

6. Suspended-sediment data are being collected on a storm-event basis at Turkey River at Garber, Iowa, as part of Great II study in cooperation with the U.S. Corps of Engineers, Rock Island District.

Wisconsin Subregion

1. Suspended-sediment and bed-material data are being collected on a periodic and storm-event basis for the U.S. Corps of Engineers at Wisconsin River at Muscoda, Wis.

Upper Mississippi-Iowa-Skunk-Wapsipinicon Subregion

1. Suspended-sediment data are being collected on a monthly basis at Mississippi River at Clinton, Iowa, and at Mississippi River at Keokuk, Iowa, 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, Iowa
Ralston Creek at Iowa City, Iowa
Skunk River at Augusta, Iowa

3. Suspended-sediment data are being collected on a daily basis at Crow Creek at Bettendorf, Iowa as part of the Great II River Environmental study in cooperation with U.S. Corps of Engineers, Rock Island District.

4. Suspended-sediment data are being collected on a storm-event basis at Wapsipinicon River at De Witt, Iowa, as part of Great II study in cooperation with the U.S. Crops of Engineers, Rock Island District.

5. Suspended-sediment data are being collected on a daily basis and bedload-sediment data are being collected on a storm-event basis at Iowa River at Wapello, Iowa, in cooperation with U.S. Corps of Engineers, Rock Island District, Great II study. Suspended-sediment data are also being collected on a monthly basis as a part of NASQAN.

6. Bed load-sediment data are being collected on a storm-event basis at Skunk River at Augusta, Iowa, in cooperation with U.S. Corps of Engineers, Rock Island District, Great II study.

Rock Subregion

1. Suspended-sediment data are being collected on a storm-event basis in cooperation with Dane County, Wis., on Willow Creek at Madison, Wis.

2. Suspended-sediment data are being collected on a periodic and storm-event basis to determine daily suspended-sediment loads for the U.S. Corps of Engineers, Rock Island District at:

Crawfish River at Milford, Wis.
Turtle Creek near Clinton, Wis.

Sugar River near Brodhead, Wis.
Pecotonica River at Martintown, Wis.

3. Suspended-sediment data are being collected on a weekly and storm-event basis in cooperation with the U.S. Corps of Engineers and the City of Middleton, Wis., at
Pheasant Branch Creek at Middleton, Wis., at U.S. Highway 12
Pheasant Branch at Century Avenue at Middleton, Wis.
Tributary to Pheasant Branch at Hwy. 14 at Middleton, Wis.
Tributary to Pheasant Branch at Airport Road at Middleton, Wis.
Pheasant Branch at Middleton, Wis., at CTH "M"

4. Suspended-sediment data are being collected on an intermittent and storm-event basis in cooperation with Dane County, Wis., at Sixmile Creek near Waunakee, Wis.

5. In cooperation with the Rock Island District, U.S. Army Corps of Enginners, daily suspended-sediment data, approximately seasonal bed-material data and following large discharge events suspended-sediment samples, bed-material and bedload samples are collected at the Rock River near Joslin, Ill., Kishwaukee River near Perryville, Ill. (discontinued September 30, 1981), South Branch Kishwaukee River at DeKalb, Ill. (discontinued September 30, 1981), and the Green River near Geneseo, Ill. (discontinued September 30, 1981)

Des Moines Subregion

1. Suspended-sediment data are being collected on a daily basis at Des Moines River near Saylorville, Iowa, in cooperation with the Iowa Geological Survey.

2. Suspended-sediment data are being collected on a daily basis at Des Moines River at St. Francisville, Mo., in cooperation with the U.S. Corps of Engineers, Rock Island District and monthly as part of NASQAN.

3. Suspended-sediment data were collected on a periodic basis at Des Moines River at Jackson, Minn., in cooperation with the Minnesota Department of Natural Resources, Division of Waters (discontinued September 30, 1981).

4. Suspended-sediment data are being collected on a daily basis at Middle Fork Raccoon River at Bayard, Iowa, and Middle Fork Raccoon River at Panora, Iowa. In conjunction with the operation of these stations, a sediment reservoir sedimentation study is being conducted at Lake Panorama at Panora, Iowa. This study is a cooperative undertaking with the Engineering Research Institute, Iowa State University at Ames, Iowa.

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 U.S. Corps of Engineers, Rock Island Districts.

2. Suspended-sediment data are being collected on a daily basis and partical-size data collected on a intermittent basis in cooperation with the Missouri Division of Geology and Land Survey at the following sites:
North Fork Salt River near Hunnewell, Mo.
South Fork Salt River at Santa Fe, Mo.

Youngs Creek near Mexico, Mo.
Middle Fork Salt River at Duncans Bridge, Mo.
Middle Fork Salt River at Paris, Mo.
Elk Fork Salt River near 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, Ill., as part of the GREAT III study in cooperation with the U. S. Army Corps of Engineers, St. Louis District. Suspended-sediment data also are being collected on a monthly basis at these two stations as part of NASQAN.

Upper Illinois Subregion

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

2. Suspended-sediment data are being collected on an intermittent basis at Kaskakee River near North Liberty, Ind., and at Singleton Ditch at Schneider, Ind., in cooperation with the Indiana Department of Natural Resources.

3. Suspended-sediment data are being collected on a daily basis at Yellow River at Plymouth, Ind., in cooperation with the Indiana Department of Natural Resources.

4. In cooperation with the Chicago District, U.S. Army Corps of Enginners, and the Illinois Department of Transportation, Water Resources Division, suspended-sediment data are being collected on a daily basis and bed-material samples on an approximately seasonal basis at:

Des Plaines River at Riverside, Ill.
Kankakee River at Momence, Ill. (discontinued September 30, 1981)
Kankakee River near Wilmington, Ill.
Iroquois River near Chebanse, Ill. (discontinued September 30, 1981)

Upper Mississippi-Kaskaskia-Meramec Subregion

1. Suspended-sediment data are being collected on a daily basis and bed-material samples are collected on an approximately seasonal basis at the Kaskaskia River at Cooks Mills, Ill, in cooperation with the St. Louis Distrcit, U.S. Army Corps of Engineers.

2. Suspended-sediment data are being collected on a daily basis at Mississippi River at St. Louis, Mo., in cooperation with the U.S. Army Corps of Engineers, St. Louis District.

3. Suspended-sediment data are being collected on daily basis at Meramec River near Eureka, Mo., and at Mississsippi River at Thebes, Ill., as part of the GREAT III study in cooperation with the U.S, Army Corps of Engineers, St. Louis District. Suspended-sediment data also are being collected on a monthly 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, Ill., and Saline Creek near Minnith, Mo., as part of the GREAT III study in cooperation with the U.S. Army Corps of Engineers, St. Louis District.

5. In cooperation with the Rock Island District, U.S. Army Corps of Engineers, daily suspended-sediment data, seasonal bed-material data, and following high discharge events suspended-sediment samples, bedload and bed-material samples are collected at Henderson Creek near Oquawka, Ill. (discontinued September 30, 1981), Edwards River near New Boston, Ill. (discontinued September 30, 1981), Spoon River at Seville, Ill. (discontinued September 30, 1981), LaMoine River at Ripley, Ill. (discontinued September 30, 1981), Vermilion River near Leonore, Ill. (discontinued September 30, 1981), and the Sangamon River near Oakford, Ill.

Special Studies

1. Five stations were established in the Rochester area in cooperation with the St. Paul District, U.S. Army Corps of Engineers, to determine changes in sediment yield from channelization. The periodic stations include Bear Creek on Belt Line, Minn., Cascade Creek at Rochester, Minn., Silver Creek at Rockester, Minn., and S.F.K. Zumbro River on Belt Line, Minn. S.F.K. Zumbro River near Rochester, Minn. is a daily station. In addition, all stations are sampled during three storm events per year.

2. Suspended-sediment data are being collected on a daily basis at Big Creek near Bryant, IL in cooperation with the Metropolitan Sanitary District of Greater Chicago. 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. Annually, several particle-size analyses are run on suspended sediment and bed material from this station.

3. Suspended-sediment data are being collected on a daily basis, bed-material samples are collected on an approximately seasonal basis and during high discharge events, suspended-sediment samples, bedload and bed-material samples are collected in cooperation with the St. Louis District, U.S Army Corps of Engineers and for use by the Erosion and Sediment Work Group of the GREAT III Mississippi River Basin Study at the Illinois River at Valley City, Ill., the Kaskaskia River at Venedy Station, Ill., and the Big Muddy River at Murphysboro, Ill.

4. In cooperation with the Illinois Department of Transportation, Division of Water Resources, sediment data was collected on a daily basis at three sites from August 1979 to July 1981 to determine the changes in sedimentation characteristics of a stream caused by urban construction activities. Spring Creek at McFarland Road near Rockford, Ill., was established upstream of the proposed construction; Spring Creek at Rock Valley College at Rockford, Ill., is downstream of the proposed activities; and Spring Creek Tributary near Rockford, Ill., is immediately downstream of the activities. Automatic pumping samplers monitor the rapid rises along these streams and numerous particle-size analyses of suspended-sediment as well as bed-material are completed.

5. Seven stations were established and daily suspended-sediment sampling started for Water Monitoring in Coal Mining Areas (P.L. 95-87), in order to monitor the general hydrologic conditions of Illinois in locations where significant areas are to be affected by active and potential coal-mining operations. Three stations were established on streams draining natural areas. These are Lusk Creek near Eddyville, Ill., Grindstone Creek near Industry, Ill., and White Walnut Creek near Pinckneyville, Ill. Indian Creek near Wyoming, Ill., Grindstone Creek near Birmingham, Ill, South Fork Saline River near Carrier

Mills, Ill., and Brushy Creek near Harco, Ill., are sites on streams which drain active surface mining areas. In addition, a synoptic-sampling network of 10[illegible] periodic sampling stations was established and one high-flow sediment sample collected at each and analyzed for sand/fine concentration (all sampling discontinued September 30, 1981).

6. Storm related suspended-sediment data are being collected in cooperation with the Northeastern Illinois Planning Commission to determine the effect of detention ponds on water quality. At Lake Ellyn an 11 acre (4.5 hectare) detention facility servicing a 535 arce (217 hectare) drainage area in Glen Ellyn, Ill., three automatic pumping sampler stations have been established. One sampler was installed to monitor the flow in the main inlet to the facility and the other two samplers monitor the flow in the two outlets (discontinued September 30, 1981).

Laboratory Activities

The Geological Survey laboratory in Iowa City, Iowa, analyzed suspended-sediment samples collected by the Corps of Engineers at:

- Mississippi River at Hannibal, Mo.
- Hadley Creek at Kinderhook, Ill.
- Bay Creek at Nebo, Ill.
- Wapsipinicon River at DeWitt, Iowa
- Iowa River at Marengo, Iowa
- Iowa River at Coralville Dam, Iowa
- Mississippi River at Burlington, Iowa
- Mississippi River at Keokuk, Iowa
- Des Moines River near Stratford, Iowa
- Raccoon River at Van Meter, Iowa
- North River near Norwalk, Iowa
- Middle River near Indianola, Iowa
- South River near Ackworth, Iowa
- Des Moines River near Tracy, Iowa
- White Breast Creek near Dallas, Iowa
- Mississippi River at East Dubuque, Ill.

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 E. Main St., 4th floor
Urbana, IL 61801

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 1230
Federal Building, Room 269
400 South Clinton Street
Iowa City, IA 52244

District Chief, WRD
U.S. Geological Survey
Post Office Building
Room 702
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
Room 200
Madison, WI 53706

UPPER MISSISSIPPI REGION

SOIL CONSERVATION SERVICE

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

a. Public Law-566

Major Drainage	Watershed	Stream	County	State
Mississippi	Cahokia Canal	Canteen Creek Judy's Branch Burdick Branch Schoolhouse Branch	Madison St. Clair	Illinois
Illinois	Springlake	Spring Creek	McDonough	Illinois

b. River Basin Investigations

River Basin	Basin Reported	State
Pecatonica	Upper West Branch Pecatonica	Wisconsin
Pecatonica	Richland Creek	Wisconsin Illinois

2. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made on the following:

Reservoir	County	State
Coal & Crane No. 5	Schuyler	Illinois
Durgens Creek No. 7	Lewis	Missouri
Lost Creek No. 1	Lincoln	Missouri
Russell Hanson	Pope	Minnesota
Kill	Stevens	Minnesota
Van Horn	Stevens	Minnesota
Hilgrenberg	Scott	Minnesota
Jackel-Filenworth	Redwood	Minnesota

A watershed study was conducted in the drainage area of Structure No. 4, Plain Honey Creek watershed, Sauk County, Wisconsin as part of a reservoir sedimentation survey scheduled for completion in 1982.

LOWER MISSISSIPPI REGION

CORPS OF ENGINEERS

Lower Mississippi Valley Division

Memphis District

Four sediment sampling stations in the St. Francis River Basin were discontinued. These stations were located on the following tributaries: Thompson Creek, Big Bay Ditch, Locust Creek, and Varney River. Sediment sampling continued at the 20 remaining stations in the St. Francis River Basin. In addition, three sediment sampling stations were established in the L'Anguille River Basin. These stations are located near Palestine, Arkansas; Colt, Arkansas; and Cherry Valley, Arkansas. Suspended samplers DH76TM, DH78, D74ALTM 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. Samples were collected on a monthly basis.

New Orleans District

Sediment Load Measurements.

1. Suspended sediment and bed material sampling was continued at the following 14 ranges: Mississippi River at Coochie, LA, semimonthly; Mississippi River at Tarbert Landing, LA, semimonthly; Old River Outflow Channel near Knox Landing, LA, semimonthly; Atchafalaya River at Simmesport, LA, semimonthly; Wax Lake Outlet at Calumet, LA, monthly; Lower Atchafalaya River at Morgan City, LA, monthly; Red River at Fulton, AR, semimonthly; Red River at Shreveport, LA, semimonthly; Red River at Alexandria, LA, semimonthly; Red River above Old River Outflow Channel, semimonthly; Atchafalaya Basin, Bayou Chene below Bayou Crook Chene, weekly; Atchafalaya Basin, Lake Long below Bayou La Rompe, weekly; Atchafalaya Basin, Little Tensas below Blind Tensas Cut, weekly; Atchafalaya Basin, East Access Channel above Chicot Pass, weekly.

2. Daily suspended sediment samples were taken on the Red River at Colfax, LA.

3. A cooperative program with the US Geological Survey for collection and analysis of suspended sediment samples was in effect for stations located on the Mississippi River at St. Francisville, Plaquemine, Union, Luling Ferry, Violet, and Venice, LA. Samples were taken on the Red River at Boyce and Moncla, LA. The sampling frequency was monthly and the data will be published by USGS in its annual publication.

4. 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 undertaking a predictive 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 computations program using steady state hydraulics. STUDH is sediment transport program using unsteady two-dimensional flows 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 hydrograph data for the period of record in the district.

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

As part of the LMVD Potamology Program (P-1), WES has compiled a report on the characterization of the suspended-sediment regime and the bed material composition of the Mississippi River. The study is being printed. The following is a summary of the report. Land-use management practices, the completion of the Old River Control Structure and its operation beginning in 1963, and the placement of sediment-retention structures and streambank protection works throughout the Mississippi River Basin have helped the current characteristics of the suspended-sediment regime. There has been a decrease in the amount of suspended sediment available for transport to the Gulf of Mexico from an average of 434 million tons per year (prior to 1963) to 255 million tons per year. In the reach of the Upper Mississippi River mainstem upstream of the confluence of the Missouri River, the bed gradation has essentially remained the same over the past fifty years, with the major component of the bed being fine to medium sand. Downstream of the confluence, the mainstem is influenced by the coarse bed material input from the Missouri River. The bed-material gradation of the Lower Mississippi River immediately downstream of Cairo, IL, is influenced by the coarse to fine sand input from the Upper Mississippi and the coarse input from the Ohio River. The gravel/sand/silt fractions have remained relatively constant from Arkansas City, AR, downstream to Tarbert Landing, MS, since 1932. The bed material has tended to become more uniformly graded throughout this reach. The long term trend in bed-material gradation fron Donaldsonville, LA, to the Gulf of Mexico shows a pronounced shift in bed composition from the sand to silt fraction.

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 programs 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

Sedimentation Surveys. Resurveys of upstream sediment and downstream retrogression ranges for Rend Lake and Shelbyville Reservoirs were conducted during the preceding calendar years (1980-1981). The data analysis has been completed and the results are being prepared.

The 1974 and 1980 resurveys for Rend Lake and Shelbyville were analyzed to determine the distribution of sediment depletion of storage in the reservoir and trap efficiency of the reservoir. Sediment range resurveys were conducted by direct leveling and use of a recording depth sounder.

Sediment Load Measurements. Twelve new sedimentation/retrogression ranges have been established on the Salt River below the Clarence Cannon Dam. These ranges are in addition to the 6 sedimentation/retrogression ranges located in the re-regulation pool and the 3 sedimentation/retrogression ranges below the re-regulation dam. All 21 of these ranges were surveyed twice in 1981 (before and after July flood). It is anticipated that these ranges will be surveyed at least once a year for future comparative analysis and to determine reservoir regulation cause/effect relationships. Bed samples and suspended samples will be obtained in 1982 at several of the sedimentation/retrogression ranges.

There are a total of 35 sediment stations within the District. The numbers of stations added and dropped from the program during the calendar year were 22 and 3, respectively.

Vicksburg District

Sedimentation Surveys.

1. 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 and temporary ranges, and fathometer spot surveys.

2. Arkabutla Lake silt ranges were selectively resurveyed during the latter part of the year to determine the sediment filling characteristics of the reservoir and its tributaries. Analyzation of this data should be completed in 1982.

3. Some Yazoo River channel monitor sections were resurveyed after completion of specific phases of the Upper Yazoo projects channel excavation work in order to determine the effects of channel dredging operations on the downstream channel conveyance. Visual inspection of the survey data indicates significant sediment deposition has not occurred to date.

Sediment Load Measurements.

1. Both bed sample and suspended sample measurements are being made weekly at three locations on the Mississippi River, these locations being 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 material sampler.

2. An ongoing program in which suspended material sample, bed material sample, temperature, discharge, and stage data are collected and computerized for many stations within the District has been continued. Sediment data was collected at approximately 21 stations during 1981. Bed samples are collected using either BM-54, BMH-60, or drag bucket bed material samplers while suspended samplers are collected using either D-47, D-48, D-74, or P-61 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 study has been continued by the District to determine the effects of the Ouachita River Navigation Project. This study is to determine the individual and cumulative effects of channel dredging, bend widening, and cutoffs on the sediment regime of the river between Monroe, Louisiana, and Felsenthal Lock and Dam.

3. Preliminary sediment studies were conducted on the Boeuf River project alternatives to determine project effects on sediment inflows and methods of minimizing sediment depositions.

4. A study which was initiated in 1979 by the District and Colorado State University to determine possible alternatives for reducing sediment inflow into the main stem Yazoo-Tallahatchie-Coldwater River system from its hill tributaries and to determine design of structural measures to reduce sediment problems is continuing. This study should be completed in October 1982.

5. A comprehensive data collection program was continued as part of the Yazoo Basin streambank erosion control evaluation and demonstration program. This data collection program has been contracted with the Agricultural Research Service and includes detailed water, sediment, and the geology data collection, analysis, and evaluation of selected hill tributaries in the Yazoo Basin.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

LOWER MISSISSIPPI REGION

National Forests in Mississippi

Forest personnel rehabilitated 32 acres of severely eroding lands. This resulted in a sediment reduction of about 1,600 tons annually.

Kisatchie National Forest

Sixteen acres of severely eroding lands were rehabilitated resulting in annual sediment reduction of about 800 tons.

Ouachita National Forest

Forest personnel rehabilitated 6 acres of severely eroding lands resulting in an annual sediment reduction of about 300 tons. Turbidity was monitored at 12 stations. These data are in "Storet."

LOWER MISSISSIPPI REGION

GEOLOGICAL SURVEY

Lower Mississippi - Hatchie Subregion

1. In cooperation with the Tennessee Department of Public Health, Division of Water Quality Control, suspended-sediment discharge measurements are being made on a 6-week frequency at seven sites within the State of Tennessee.

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

Lower Mississippi - St. Francis Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at St. Francis River at Parkin, Ark., St. Francis Bay at Riverfront, Ark., Arkansas River at Dam 2 near Gillette, Ark., and at White River at Clarendon, Ark., as a part of NASQAN.

Lower Mississippi - Yazoo Subregion

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

Lower Red - Ouachita Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Ouachita River at Columbia, La., at Red River near Simmesport, La., and at Ouachita River at Camden, Ark., as a part of NASQAN. Sediment data are being collected on a monthly 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 bimonthly basis at Tensas River at Tendal, La., and 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 monthly basis at Mississippi River at Vicksburg, Miss., Big Black River at Bovina, Miss., and at Homochitto Creek at Rosetta, Miss., as part of NASQAN.

Lower Mississippi - Lake Maurepas Subregion

1. Suspended-sediment data are being collected on a bimonthly 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 Mississippi River near St. Francisville, La., as a part of NASQAN.

Louisiana Coastal Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Bayou Teche at Keystone Lock and Dam below St. Martinville, La., Mermentau River at Mermentau, La., Atchafalaya River near Melville, La., and at Calcasieu River near Kinder, La., as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at the following sites as a part of NASQAN.
   - Mississippi River at Belle Chasse, La.
   - Tchefuncte River near Covington, La.

3. Suspended sediment and bed material data are collected at the following sites on a monthly basis in cooperation with the U.S. Corps of Engineers:
   - Lower Atchafalaya River at Morgan City, LA.
   - Wax Lake Outlet at Calumet, LA.

Special Studies

1. In cooperation with the Tennessee Department of Transportation, the problem of scour at highway bridges is being investigated at known and potential problem sites across Tennessee. Reports documenting data and research findings are in preparation.

2. Monthly collection was begun at 23 stations on the St. Francis River and selected tributaries in October 1977 for the Corps of Engineers. Monitoring is expected to continue for five years. Following the 5-year period, the existing network may be reduced to a few stations that would be monitored more intensively.

3. Suspended-sediment data are collected on a weekly basis and for selected storm events on Tillatoba Creek below Oakland, Miss., and South Fork Tillatoba Creek near Charleston, Miss. This information is collected in cooperation with the U.S.Soil Conservation Service in order to estimate the sediment loads of Tillatoba Creek during periods of high discharge.

4. Suspended-sediment samples are collected on a monthly basis and selected storm events on Coldwater Creek and David Bayou near Sledge, Mississippi. The samples are collected as part of a lignite hydrology project.

Laboratory Activities

The Geological Survey sediment laboratory located in Baton Rouge, La., analyzed suspended-sediment and bed-material samples collected by the U.S. Corps of Engineers at the following locations:
- Red River at Alexandria
- 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 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
6554 Florida Boulevard
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
100 W. Capitol St., Suite 710
Jackson, MS 39269

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

LOWER MISSISSIPPI 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
Lower Mississippi	Larkin Creek	Larkin Creek	Lee and St. Francis	Arkansas

3. Special Studies

Sedimentation activity in Louisiana during 1981 has consisted of recomputing erosion and sedimentation amounts for the West Franklin Watershed in the Ouachita Basin of the Lower Mississippi River Water Resources Region.

SOURIS - RED - RAINY REGION

CORPS OF ENGINEERS

North Central Division

St. Paul District

Sediment loads were measured by the U.S. Geological Survey at seven river stations (Wild Rice, two at Sheyenee, two at Pembina, Souris, and Little South Pembina Rivers) under the St. Paul District sponsorship.

SOURIS-RED-RAINY REGION

GEOLOGICAL SURVEY

Souris Subregion

1. Suspended-sediment data are being collected on a daily basis at Souris River near Sherwood, N. Dak., as part of the Waterways Treaty program with the U.S. Department of State (discontinued September 30, 1981).

2. Suspended-sediment data are being collected on a monthly basis at Souris River near Westhope, N. Dak., as part of the National Stream Quality Accounting Network (NASQAN).

3. Suspended-sediment data are being collected on a monthly basis at Souris River near Verendrye, N. Dak., as part of the Missouri River Basin program.

4. Suspended-sediment data are being collected on a monthly basis at West Branch Short Creek near Columbus, N. Dak., as part of the Coal Hydrology Program (discontinued September 30, 1981).

Red Subregion

1. Suspended-sediment data are being collected on a bi-monthly basis at Sheyenne River at Kindred, N. Dak., as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Wild Rice River near Abercrombie, N. Dak., and at Red River of the North at Hickson, N. Dak., as part of the Missouri River Basin program (discontinued September 30, 1981).

3. Suspended-sediment data are being collected on a monthly basis at Beaver Creek near Finley, N. Dak., as a part of the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a monthly basis at Red River of the North at Halstad, Minn., and at Red River of the North at Emerson, Manitoba, Canada, at the Red Lake River at Crookston, Minn., and at Roseau River below State Ditch 51 near Caribou, Minn., as a part of NASQAN.

5. Suspended-sediment data were collected on a periodic basis at Buffalo River near Dilworth, Minn., in cooperation with the Minnesota Department of Natural Resources, Division of Waters (discontinued September 30, 1981)

Rainy Subregion

1. Suspended-sediment data were collected on a monthly basis at Little Fork River at Littlefork, Minn., and at Rainy River at Manitou Rapids, Minn., as part of NASQAN.

Special Studies

Suspended-sediment data are being collected during periods of high flow at several sites in the Turtle River basin, N. Dak., in cooperation with the U.S. Soil Conservation Service.

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

District Chief, WRD	District Chief, WRD
U.S. Geological Survey	U.S. Geological Survey
Post Office Building, Room 702	821 East Interstate Avenue
St. Paul, MN 55101	Bismarck, ND 58501

SOURIS-RED-RAINY REGION

SOIL CONSERVATION SERVICE

1. Determination of sediment yield was made for a work plan in the following watershed:

a. Public Law-566

Major Drainage	Watershed	Stream	County	State
Red River of the North	English Coulee	English Coulee	Grand Forks	North Dakota

2. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made on the following:

Reservoir	County	State
Erie	Cass	North Dakota
Mt. Carmel	Cavalier	North Dakota
John Baird	Polk	Minnesota
Gene Magnum	Lake of the Woods	Minnesota
Upper Sunny Hill	Norman	Minnesota

3. Special Studies

Suspended sediment information is being collected in the Turtle River Basin, North Dakota, in cooperation with the U. S. Geological Survey.

MISSOURI REGION

Bureau of Land Management

Colorado

Infiltration, Runoff, and Sediment Production: The study was established in 1980 under a BLM-USGS Interagency Agreement to determine the transferability of data from small plots to larger watersheds. Four stations have been instrumented to determine runoff and sediment yield from tributaries of a 7.0 square mile watershed. Rainfall simulation data will be used in a rainfall-runoff model being developed by USGS. Runoff and sediment data are provided in the basic data reports of the Colorado District, USGS, WRD. This study will be completed in 1982.

Further Information: Gregg C. Lusby, Project Chief
U. S. Geological Survey
Water Resources Division (Mail Stop 420)
Denver Federal Center, Bldg. 56
Denver, CO 80225

MISSOURI REGION

BUREAU OF LAND MANAGEMENT

Montana

Sediment yield studies are being conducted on native rangeland in central and eastern Montana. Measurement of long term deposition in small reservoirs is being used to characterize average annual yield by geologic/soil type and surface resource management.

Suspended sediment data is being acquired in connection with coal hydrology studies in eastern Montana and western North Dakota. These studies, being conducted cooperatively with USGS, are being used to define baseline hydrologic characteristics and forecast probable impacts of surface coal mining.

Data collection is underway in preparation for development of a watershed management plan for the Willow Creek Watershed. Sediment yield problems are chief among the concerns that will be addressed in the plan.

Bureau of Land Management

Wyoming

Stratton Sagebrush Hydrology Study: The study was begun in 1967 as a cooperative effort with the Rocky Mountain Forest and Range Experiment Station, Laramie, Wyoming. Objectives are (1) to provide hydrologic information, including sedimentation, for big sagebrush lands where snow relocation has major significance, and (2) to determine hydrologic effects of various sagebrush management practices. The project will be completed and a final report submitted in 1982.

New Publications: Sturges, David L. and Ronald D. Tabler. 1981. Management of blowing snow on sagebrush lands. J. Soil and Water Cons. 36(5): 287-292.

Further Information: Ronnie D. Clark, Natural Resource Specialist
Bureau of Land Management (D-470)
Denver Federal Center, Bldg. 50
Denver, CO 80225

or

David L. Sturges, Research Forester
Rocky Mtn. For. and Range Exp. Stn.
222 South 22nd Street
Laramie, Wyoming 82070

North Platte River--Area encompasses approximately 600 square miles. Continuing data collection and monitoring in order to identify and quantify severe sediment source areas. Investigations will result in formulating a watershed management plan.

Powder River Basin--Basic data collection including water quality, sediment, and discharge is being initiated on selected ephermeral and perennial drainages.

South Bighorn Mountains--Monitoring of changes in water quality, sediment, and discharge in response to timber management activities is continuing.

MISSOURI BASIN REGION

Bureau of Reclamation

The geomorphic history, channel patterns , channel width studies, ice effects on the channel, and sediment transport analyses aspects of the "Niobrara River Whooping Crane Habitat Study" by ERT Inc., January 1981 were reviewed. The study provided a good evaluation of the possible releases from the Norden Dam for maintaining a whooping crane habitat. The river modeling studies gave a predicted maximum degradation immediately below a dam of 11.6 meter (38 feet) that would extend downstream about 21 kilometers (13 miles).

New area-capacity tables were published for Keyhole Reservoir based on the 1978 sediment survey. The original storage capacity of 792.09 x 10^6 m^3 (642,160 acre-feet) at elevation 1258.5 meters (4129 feet) has been reduced by 9.28 x 10^6 m^3 (7,520 acre-feet) due to sediment deposition. The associated basin sediment yield rate is 69.53 m^3/km^2/year (0.146 acre-feet /mi^2/year).

A hydrographic resurvey of Guernsey Reservoir was completed. Fourteen established sediment ranges were surveyed using sonar to obtain depth and either an automated positioning system or calibrated cable to determine position of the sounding boat. The underwater data will be combined with above water data obtained in 1980 by aerial photogrammetry in order to complete analysis of the present storage capacity and the success of the silt runs during periods of extreme drawdowns.

A resurvey was completed of Harry Strunk Lake on Medicine Creek, tributary to the Republican River, in Nebraska. A total of 31 sediment ranges were surveyed, 6 ranges by hydrographic methods using a Motorola Mini-Ranger III system with a Raytheon depth sounder, and 25 ranges using conventional land surveying methods.

Two members of the Sedimentation Section participated in a meeting with personnel from the Upper Missouri Regional Office and the USGS on the feasibility level degradation study of the Missouri River near Fort Benton, Montana. Aspects of the river hydrology and hydraulics were discussed emphasizing data collection methods. Recommendations for collecting additional hydraulic and bed material size data were developed by Gar Williams of the USGS and a representative of the Sedimentation Section. An additional cross section should be surveyed at about every river mile, for a 5-mile reach below the proposed damsite. In deep water, bed material samples should be taken at the 1/4 points across the sections using a bracket type "jaw" sampler. For shallow water or exposed bed areas, the grid or straight line "pebble count" method should be used.

A study was completed on the sediment inflow for the Calamus River upstream from the cofferdam and diversion channel during construction of Calamus Dam. The sediment inflow for a 2-year construction period of about 0.16 x 10^6 m^3 (130 acre-feet) would fill less than 10 percent of

Bureau of Reclamation

the available reservoir capacity of about 2.10 x 10^6 m^3 (1,630 acre-feet) below the intake structure sill at elevation 666 meters (2185 feet).

New area-capacity tables were developed and printed for Angostura Reservoir based upon the 1979 sediment survey.

MISSOURI BASIN REGION

CORPS OF ENGINEERS

Missouri River Division

Kansas City District

Sediment Surveys. The initial reports for resurveys at Perry Lake, Kansas, Milford Lake, Kansas, and Rathbun Lake, Iowa, will be completed early in calendar year 1982. The following are brief summaries on these projects.

1. Milford Lake.

(a) The survey was made to determine the loss in usable storage in the lake since filling the lake to the multipurpose pool level in 1967. Also, to determine the volume and distribution of the sedimentation as compared to the estimates used for the initial design storage allocation of storage for sedimentation over the life of the project. All of the ranges were surveyed and intensive sampling of the lake deposits was conducted. Samples collected were analyzed to determine densities and mechanical gradations. Preliminary results of these surveys indicate that the sediment distribution during this period has been about 8% in the flood control pool and 92% in the multipurpose pool rather than the 25-75 percent distribution used in the design storage allocations for the project. Calculations indicate that an average annual volume of 2,045 acre-feet of sediment has been deposited in the lake during the 1967-1980 period, which is 445 acre-feet higher than the design estimate of 1,600 acre-feet per year. The densities determined from the survey data indicate the deposits to be 37.6 pounds per cubic feet (lb/cf). It is estimated that with time, the deposits will approach 52-55 lb/cf due to consolidation. Should this be the case, the measured 2,045 acre-feet deposited in the lake would be 1,600 acre-feet after consolidation and indicate little change in the sediment production in the watershed since 1949.

(b) The outlet channel has been resurveyed numerous times since operation began and the findings are that some local scour or degradation has occurred but is contained in a short reach downstream of the dam. The outlet channel banks are protected by riprap for the anticipated degradation and expected velocities during operation of the project. The riprap design was modeled prior to installation and has been field checked for performance several times. To date, it has performed as well or better than expected.

2. Perry Lake.

(a) A survey of Perry Lake was made in 1979 which is the first sedimentation survey since the multipurpose pool was filled at Perry Lake in June of 1970. The average annual volume has been found to be about 1,900 acre-feet for the initial 10 years of operation as compared to the average annual rate of 1,400 acre-feet used in establishing the design storage allocation for the project. Also, the sediment has been found to be distributed in the lake with about 20 percent in the flood control pool and 80 percent in the multipurpose pool as compared to the 33 percent and 67 percent used for the flood control and multipurpose pools respectively in the design storage allocation. Considering the difference in the survey gross density of 47 lb/cf, and the 100-year consolidation density as calculated and used for design of 65 lb/cf, the average annual sediment volume would be reduced to 1,460+ acre-feet. If consolidation does occur as expected, storage allocation is adequate as originally estimated. The distribution found in the multipurpose and flood control pool indicates a larger percentage deposited in the multipurpose and if it continues, some adjustment in the storage allocation may be necessary.

(b) The outlet channel has shown to have a somewhat migrant history. Disregarding the unstable history, comparison of 1967 and 1979 channel cross sections indicate some minor widening, some degradation, and some bank steepening. No significant problems have been observed or measured at this time.

3. Rathbun Lake.

(a) Rathbun Lake was surveyed in 1980 which is the first sedimentation survey since the multipurpose pool was filled in October 1970. The original lake capacity was reconstituted utilizing the original surveyed cross sections to within about 1.0 percent deviation from the original capacity curve. Then, using the resurveyed cross sections, differences were determined for all elevations. These computations indicate an overall volume of 6,050 acre-feet has been deposited in the lake with 92 percent of the material located in the multipurpose pool. Comparing the changes in the ranges no classical delta has formed and the material has been fairly uniformly deposited throughout the lake. Somewhat thicker layers are observed down-lake near the dam. The initial sediment storage allocation was based on an average 240 acre-feet per annum, but the 11 year resurvey data indicates an average volume of 550 acre-feet per year. This change may be explained due to differences in the densities found in the lake and assumed for the original storage allocation of the project.

(b) Downstream degradation ranges were resurveyed at the same time but at present no analytical results are available. A preliminary review of the downstream channel cross sections indicates very little change has occurred since the initial surveys were made.

4. Osage River (downstream of Harry S. Truman Dam). The degradation ranges downstream of the Harry S. Truman Dam are being closely monitored to detect any bank or channel erosion which could be attributed to power releases. Ranges within about 4.1 miles below the dam have been resurveyed with greater degree of accuracy in order to define the bank lines so that even a small amount of erosion can be detected. Erosion to date has been local and minor and it is doubtful if it will become extensive; however, because of the interest which has surfaced over erosion below power projects, local residents are highly concerned that the banks will recede or erosion will increase several-fold as the project nears completion and full powerplant releases are begun.

5. Kansas River. In 1977, 52 ranges were established in the lower Kansas River. These ranges are located from the confluence of the Missouri River to about mile 31 at DeSoto, Kansas. Several commercial dredgers operate in a short reach between near Bonner Springs, mile 22, and about mile 11. The dredging

operations in this reach are extracting bed material at a faster rate than the river can resupply the material. Nine ranges were resurveyed between mile 9.5 and 31.0 to determine any changes or extent of degradation in the reach of the river. The most extensive degradation and widening since 1977 occurred just above the reach where the dredging operations are active. Some slight lowering in the dredging reach was observed and some lowering was ascertained 9 miles above the upstream most dredging site.

Sediment Load Measurements. The Kansas City District operated 25 suspended sediment stations during this calendar year. On 1 October 1981, three stations were closed on the Kansas River, Ft. Riley, Lawrence, and Eudora, Kansas. The station at Eudora, Kansas, on the Wakarusa River was also closed because of bridge removal and construction. The inflow station to Melvern Lake at Reading, Kansas, was also closed.

1. Missouri River. Three long-term stations exist on the Missouri River, St. Joseph, Kansas City, and Hermann, Missouri. Depth integrated samples (DI) were scheduled each week and a full set of point samples was scheduled each month of the year. A minimum of five verticals was measured at the cross section. Bed material samples were collected at each vertical. Beginning with the 1982 water year, the weekly DI sampling at each location was reduced to monthly sampling taken in conjunction with the point samples due to fiscal constraints. Point and DI samples are collected utilizing a P-61 suspended sediment sampler. The bed materials are collected with a BM-54 bed material sampler. The samples are collected by the Missouri US Geological Survey and shipped to the Missouri River Division Laboratory. Samples are analyzed for grain size and total suspended sediment concentrations.

2. Kansas River. On the main stem of the Kansas River, seven stations were operated. All of the stations had observers collecting a periodic DI sampling with frequency dependent on discharge. Three stations, Wamego, Lecompton, and DeSoto are long-term stations with different agencies having collected data with one or two year gaps between periods of continuous sampling. The US Geological Survey is collecting points, DI's, and bed material samples periodically. Samples are collected by the Kansas US Geological Survey using a P-61 for point and DI samples and a BM-54 for the bed materials. Samples collected by observers are taken using a D-49 sampler. All samples are analyzed by the Kansas US Geological Survey laboratory for grain size, distribution, and total suspended concentrations.

3. Osage River Basin (Osage River arm of the Lake of the Ozarks below Harry S. Truman Dam).

(a) Four sampling stations are maintained below the project in order to calculate trap efficiency of the project and to monitor any increase in concentrations which may be due to erosion as a result of imposed flow regime changes. The first station is located in the outlet area and the second is located about 2.5± miles below the project at Lake of the Ozarks mile LOZ 90.5 near Warsaw, Missouri. The third and fourth stations are located at LOZ mile 81 and LOZ mile 70. Because of the local circumstances, only the site at Warsaw, Missouri, LOZ mile 90.5 is collected utilizing an approved sediment sampler (D-49). Because of access and site location facilities, the sampling techniques were changed at these locations. The samples collected at these sites are essentially surface or dipped samples. Several correlations were performed using the Warsaw, Missouri, site and locations on the Sac River regarding the clay materials being transported. It was determined from these correlations that the suspended sediment was fairly homogeneous from top to bottom and that the dipped samples would give reasonable results regarding the suspended material at those sites. The samples are collected by observers as required by the Corps of Engineers. The stations at Warsaw and at the dam are sampled on a discharge-stage basis or a minimum of two samples weekly. Analysis of the samples is made for total concentration, sand-silt break point, and turbidity.

(b) Inflow Stations to Harry S. Truman. Sampling stations are operated by local observers utilizing D-49 samplers at Schell City, Missouri, on the Osage River arm and on the South Grand arm at Clinton, Missouri. Frequency of sampling is based on stage with a minimum of two samples weekly. Initially, samples were analyzed for grain size, distribution, concentration, and turbidity; however, at the present time, only concentrations and turbidity are being analyzed due to fiscal constraints.

4. Marais des Cygnes River. A cooperative sampling station with the Kansas US Geological Survey has been established at the State line. The Corps collects the sediment data utilizing a local observer with a D-43 sampler. Initially, D-49 samplers were used at this site; however, continued vandalism has forced the use of older and less expensive samplers. The US Geological Survey is collecting samples for various water quality parameters to monitor coal strip mining activities in the upper Osage River basin. The collection frequency is based on stage criteria with at least two samples per week as a minimum.

Other Investigations.

1. Harry S. Truman Water Quality Weir. Velocity measurements were taken upstream, over, and downstream of the water quality weir during high flood control releases. The purpose was to determine withdrawal zones in relation to both depth and lateral extent. These data will give an indication of the future effectiveness at the skimming weir. Due to very high pool levels, velocities were very low with their accuracy believed to be somewhat questionable, but indications were that the primary source of withdrawal was directly in front of the outflow gates and drawn primarily from the elevation at the weir and above the minimal lower elevation water being withdrawn. Since the amount of outflow, extent of stratification, and elevation of the pool will affect these results, further measurements are planned, especially after the powerplant becomes operational.

2. Atchison Tunnel. Surface bed samples were collected inside the sediment filled tunnel in an attempt to determine the erodibility of the sediment deposits. There is presently some doubt that design discharges will scour the deposits before upstream flooding occurs. It was decided that core testing and further study were needed in order to better evaluate the problem.

Omaha District

Sediment Load Measurements. The Omaha District operated eight suspended sampling stations during the calendar year. Of these, two are Missouri River stations, four are major tributary stations and two are minor tributary stations. The US Geological Survey operates the two Missouri River and the four major tributary stations under a cooperative stream gaging program which includes computation and publication of sediment load records. In addition, with the Corps assistance, they collect suspended sediment samples, bed material samples and flow velocities in the Missouri River at Nebraska City, Nebraska; Omaha, Nebraska; Sioux City, Iowa; Ponca, Nebraska; Maskell, Nebraska; and Gayville, South Dakota. Data collected include five to seven point integrated samples per stream vertical at five vertical locations in the cross-section as well as one bed sample at each vertical using a BM-54 sampler. The samples, including the velocity measurements, 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.

The Corps also operates PS-69 automatic samplers at the two minor tributary stations in the Omaha Metropolitan Area.

Reservoir Sediment Activities.

1. Fort Randall Project. A complete sedimentation resurvey was made of the Fort Randall aggradation reach including the White River arm. Observations included profiling all ranges by A-E contract and collection of bed surface samples by Corps personnel to determine reservoir volume change and define location and rate of growth of the White River delta. Because of above normal inflow from the White River experienced during July 1981, special cross-section and profile soundings, turbidity measurements, suspended sediment samples and new sediment deposit samples were gathered to monitor the volume density and dispersion of the sediment inflow.

2. Salt Creek Reservoirs. A resurvey was made of Branched Oak and Pawnee Reservoirs. All range cross-sections were sounded in order to update the area capacity tables scheduled to be completed in 1982 and 1983.

3. Chatfield Reservoir. The first resurvey was made of Chatfield Reservoir by A-E contract and included soundings of all sediment range cross-sections. The results will be used to update water volume and sediment accumulation during the above normal inflow experienced in 1979.

Special Studies.

1. Fort Randall Project. A draft report on the sedimentation aspects of the potential Gregory County pumped back storage facility was completed. The study was initiated under A-E contract in 1980. Interesting elements of the study included samples of large quantities of sediment, primarily montmorillonite clay, from the lake bed in the vicinity of the project; conducting many specialized

tests to determine the erodibility of the material; and estimating the amount of erosion which might occur under various operating conditions of the Gregory County project. The study disclosed several potential problems which may require further investigation.

2. Oahe Project. A preliminary assessment of the Lake Oahe delta has been completed. The assessment included development of sedimentation trends based upon historic sedimentation and hydrographic survey data, and reconstitution of water surface profiles using the Corps HEC-2 model. The objectives of the study was to determine possible impact to lands near Bismarck, North Dakota, above the current project boundary as a result of aggradation and back water effects from Lake Oahe. Detailed mapping of these floodplain lands is currently being developed and should be completed in the 2nd Quarter of FY 82. The overall study is expected to be completed in the 1st Quarter of FY 85.

3. Recreation Master Plans. A bank line erosion assessment and sediment deposition potential was made for all recreation sites on Lake Oahe, Lake Sharpe, and Lewis and Clark Lake, and included in the Recreation Master Plans.

4. Lewis and Clark Project. A report was published by the Sutron Corporation entitled "Missouri River Study of the Lateral and Longitudinal Mixing Characteristics of the Missouri River in Lewis and Clark Lake." The objectives of the study were to determine (1) the travel time and travel path through the reservoir; (2) the rate and nature of lateral mixing within the lake; (3) the ability to use a mathematical model to investigate sediment deposition and dispersion in the lake.

5. Fort Peck Project. A reconnaissance survey was made at Fort Peck Lake including uncontrolled soundings of 11 mainstem and 21 tributary ranges. Also included was a water surface profile of the backwater reach upstream to the Robinson Bridge. In the past, complete resurveys have been scheduled for the large reservoirs in the Omaha District at intervals of every 8 to 10 years. Data gathered in the reconnaissance survey will be used to determine if and/or when a complete resurvey is needed.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

MISSOURI REGION

GEOLOGICAL SURVEY

Saskatchewan Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at St. Mary's River at Montana, U.S.A.--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 daily basis at two sites on Muddy Creek near Vaughn, Mont., to monitor irrigation practices.

2. Suspended-sediment data are being collected on a bi-monthly basis at Missouri River at Toston, Mont., and at Marias River near Chester, Mont., as a part of NASQAN.

3. Suspended-sediment data are being collected on a monthly basis at the following sites in cooperation with the U. S. Bureau of Reclamation:
   - Belt Creek near Portage, Mont.
   - Highwood Creek near Portage, Mont.
   - Missouri River at Fort Benton, Mont.

Missouri - Musselshell Subregion

1. Suspended-sediment data are being collected on a daily basis at Missouri River near Landusky, Mont., in cooperation with the U.S. Corps of Engineers.

2. Suspended-sediment data are being collected on a bimonthly basis at the following as a part of NASQAN:
   - Missouri River at Virgelle, Mont.
   - Musselshell River at Mosby, Mont.
   - Missouri River below Fort Peck Dam, Mont.

3. Suspended-sediment data was collected on a monthly basis at the following sites in cooperation with the Bureau of Land Management (discontinued September 30, 1981):
   - Rehder Coulee near Klein, Mont.
   - Half Breek Creek near Klein, Mont.
   - Musselshell River near Roundup, Mont.
   - East Parrot Creek near Roundup, Mont.
   - West Parrot Creek near Roundup, Mont.
   - Fatteg Creek near Delphia, Mont.

Milk Subregion

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

2. Suspended-sediment data are being collected on a quarterly basis at Little Peoples Creek near Hays, Mont., and Boxelder Creek near Rocky Boy, Mont.

(discontinued September 30, 1981) as part of the Federal CBR program.

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

2. Suspended-sediment data are being collected on a bimonthly basis at East Poplar River at international boundary in cooperation with the Department of State (International Joint Commission).

3. Suspended-sediment data are being collected on a monthly basis at the following sites to define water quality characteristics of the Poplar River Basin as part of the Federal CBR program:

    Poplar River at international boundary
    East Fork Poplar River near Scobey, Mont.
    Poplar River above West Fork near Bredette, Mont. (discontinued September 30, 1981)
    West Fork Poplar River near Bredette, Mont.
    Poplar River near Poplar, Mont. (discontinued September 30, 1981)

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

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

6. Suspended-sediment data are being collected on a monthly basis at Hardscrabble Creek near Culbertson, Mont., in cooperation with the Montana Department of State Lands.

Upper Yellowstone Subregion

1. Suspended-sediment data were collected on a daily basis until September 30, 1981 at Yellowstone River at Billings, Mont., as a part of the Federal CBR program and are now being collected on a bimonthly basis as part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Yellowstone River at Huntley, Mont., in cooperation with the Environmental Protection Agency (discontinued September 30, 1981)

3. Suspended-sediment data are being collected on a monthly and storm-event basis from March to October at Big Sand Coulee at Montana-Wyoming State Line, in cooperation with the U.S. Bureau of Land Management. (discontinued September 30, 1981)

4. Suspended-sediment data are being collected on a bi-monthly basis at Yellowstone

River near Livingston, Mont., as part of NASQAN.

Big Horn Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Bighorn River at Bighorn, Mont., 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, Wyo, as part of the Missouri River basin Program.

3. Suspended-sediment data are being collected on a monthly and storm-event basis at Wind River near Crowheart, Wyo., at Nowood River near Tensleep, Wyo., and at Shoshone River near Lovell, Wyo., in cooperation with the Wyoming State Engineer.

4. Suspended-sediment data are being collected on a daily basis at the following sites, in cooperation with the U.S. Bureau of Land Management:
Dry Creek near Bonneville, Wyo.
East Fork Nowater Creek near Colter, Wyo.
Fifteenmile Creek near Worland, Wyo.

5. Suspended-sediment data are being collected on a monthly basis at Bighorn River at Kane, Wyo., as a part of the Missouri River Basin Program.

6. Suspended-sediment data are being collected on a weekly basis during irrigation season at Wyoming Canal near Lenore, Wyo., and at Wyoming Canal below Pilot Wasteway near Morton, Wyo., in cooperation with the U.S. Bureau of Reclamation, Upper Missouri Region.

7. Suspended-sediment data are being collected on a quarterly basis at Middle Fork Fifteenmile Creek near Worland, Wyo., and Dry Creek near Gray Bull,, Wyo., in cooperation with the Bureau of Land Management.

8. Suspended-sediment data are being collected on a monthly and storm-evert basis at Fivemile Creek near Shoshoni, Wyo., as a part of the Missouri River Basin program.

9. Suspended-sediment data are being collected on a monthly and storm-evert basis at Wind River below Boysen Reservoir, Wyo., as part of the Federal CBR program.

10. Suspended-sediment data are being collected on a montly and storm-evert basis at Shoshone River above Willwood Dam near Willwood, Wyo., in cooperation with USBR, Upper Missouri Region.

11. Suspend-sediment data are being collected on a monthly basis (from April to September) at Cottonwood Drain near Shoshoni, Wyo., in cooperation with USBR, Upper Missouri Region.

12. Suspended-sedment data are being collected on a weekly basis during the irrigation season at Willwood Canal near Willwood, Wyo., and Shoshone River below Willwood Dam, Wyo., in cooperation with WAPRS, Upper Missiouri Region.

13. Suspended-sediment data are being collected on a monthly and storm-event

basis at Ocean Drain near Midvale, Wyo., in cooperation with the USBR, Upper Missouri Region.

Powder-Tongue Subregion

1. Suspended-sediment data are being collected on a daily basis at Tongue River at Brandenberg Bridge, Mont. (discontinued September 30, 1981), at Tongue River at Miles City, Mont., and at Powder River at Locate, Mont.

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

3. Suspended-sediment data are being collected on a monthly basis at Tongue River at Birney Day School Bridge near Birney, Mont., as part of the Federal CBR program.

4. Suspended-sediment data are being collected on a monthly storm-event basis at the following sites in cooperation with the Wyoming State Engineer:

Goose Creek below Sheridan, Wyo.
Little Powder River above Dry Creek, near Weston, Wyo.

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

Salt Creek near Sussex, Wyo.
Powder River near Sussex, Wyo.
Crazy Woman Creek at upper station, near Arvada, Wyo.
Clear Creek below Rock Creek, near Buffalo, Wyo.
Clear Creek at Ucross, Wyo.
Clear Creek near Arvada, Wyo.
Little Powder River below Corrall Creek, near Weston, Wyo.
Little Powder River near Weston, Wyo.

6. Suspended-sediment data are being collected on a monthly basis in cooperation with the Montana Department of State Lands:

Spring Creek near Decker, Mont.
Hanging Woman Creek at state line, near Otter, Mont.
Waddle Creek near Otter, Mont.
Trail Creek near Otter, Mont.
Corral Creek near Otter, Mont.
Horse Creek near Birney, Mont.
Hanging Woman below Horse Creek, near Birney, Mont.
Otter Creek near Otter, Mont.
Otter Creek below Fifteen Mile Creek, near Otter, Mont.
Home Creek near Ashland, Mont.
Locate Creek near Ismay, Mont.

7. Suspended-sediment data are being collected on 2 monthly basis at Tongue River at Tongue River Dam near Declear, Mont. and Pumpkin Creek near Miles City, Mont. in cooperation with the Bureau of Land Management.

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

Tongue River at state line near Declear, Mont.

Hanging Woman Creek near Birney, Mont.
Otter Creek at Ashland, Mont.
Mizpah Creek near Mizpah, Mont.

Lower Yellowstone Subregion

1. Suspended-sediment data are being collected on a daily basis at Yellowstone River near Sidney, Mont., in cooperation with the U.S. Corps of Engineers (discontinued September 30, 1981)

2. Suspended-sediment data are being collected on a daily basis at Yellowstone River at Forsyth, Mont. as part of the Federal CBR program. (discontinued September 30, 1981)

3. Suspended-sediment data are being collected on a monthly basis at the following sites in cooperation with the Montana Department of State Lands:
East Fork Sarpy Creek near Colstrip, Mont.
East Fork Armelles Creek near Colstrip, Mont.
Cow Creek near Colstrip, Mont.
Fox Creek near Lambert, Mont.
Beaver Creek near Wibaux, Mont.
Lone Tree Creek near Wilbaux, Mont.

4. Suspended-sediment data are being collected on a monthly basis at Yellowstone River near Miles City, Mont., as part of the Federal CBR program.

5. Suspended-sediment data are being collected on a monthly basis at the following sites in cooperation with the U.S. Bureau of Land Management:
Armolles Creek near Forsyth, Mont.
Rosebud Creek near Colstrap, Mont.
Rosebud Creek at mouth, near Rosebud, Mont.
Snyder Creek near Brandonberg, Mont. (discontinued September 30, 1981)
Cherry Creek near Terry, Mont. (discontinued September 30, 1981)
Glendive Creek near Glendive, Mont. (discontinued September 30, 1981)
Cottonwood Creek near Intake, Mont. (discontinued September 30, 1981)

6. Suspended-sediment data are being collected on a monthly basis at the following sites as part of the Federal CBR program:
Sarpy Creek near Hyshem, Mont.
Rosebud Creek at reservation boundary near Kirby, Mont.
O'Fallon Creek near Ismay, Mont.
Yellowstone River near Terry, Mont.

Missouri-Little Missouri Subregion

1. Suspended-sediment data are being collected on a monthly basis at Missouri River near Williston, N. Dak., in cooperation with the Environmental Protection Agency.

2. Suspended-sediment data are being collected on a monthly basis at Bear Den Creek near Mandaree, N. Dak., as part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a monthly basis at Little

Missouri River near Watford City, N. Dak., as part of NASQAN.

4. Suspended-sediment data are being collected on a monthly basis and quartly after September 30, 1981, at the following sites as part of the Coal Hydrology program:

Stony Creek near Williston, N. Dak. (discontinued September 30, 1981)
Beaver Creek near Ray, N. Dak.
Deep Creek near Amidon, N. Dak.
Beaver Creek near Trotters, N. Dak.

Cheyenne Subregion

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

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

3. Suspended-sediment data are being collected on a monthly and storm-event basis at Red Water Creek at Wyoming - South Dakota State line in cooperation with the Wyoming State Engineer.

4. Suspended-sediment data are being collected on a monthly and storm-event basis at Cheyenne River near Dull Center, Wyo., as a part of the Federal Energy program.

5. Suspended-sediment data are being collected on a monthly and storm-event basis at Dry Fork Cheyenne River near Bill, Wyo., at Belle Fourche River below Moorcraft, Wyo., and at Lance Creek near Riverview (formerly known as near Spencer, Wyo.), Wyo., in cooperation with the U.S. Bureau of Land Management.

6. Suspended-sediment data are being collected on a daily basis at Belle Fourche River below Rattlesnake Creek, near Piney, Wyo., and at Belle Fourche River above Dry Creek, near Piney, Wyo., and at Coal Creek near Piney, Wyo., as part of the Federal Energy program.

7. Suspended-sediment data are being collected on a monthly storm-event basis at the following sites as part of the Federal Energy program:

Antelope Creek near Teckla, Wyo.
Lodgepole Creek near Hampshire, Wyo.
Little Thunder Creek near Hampshire, Wyo.
Black Thunder Creek near Hampshire, Wyo.
Caballo Creek at mouth, near Piney, Wyo.
Raven Creek near Moorcraft, Wyo.
Donkey Creek near Moorcraft, Wyo.

8. Suspended-sediment data are being collected at Rapid Creek above Canyon Lake near Rapid City, S. Dak., Rapid Creek above Water Treatment Plant at Rapid City, S. Dak., Rapid Creek at Rapid City, S. Dak., Rapid Creek at East Main Street at Rapid City, S. Dak., and Meade Street Drain at Rapid City, S. Dak. as part of the National Urban Hydrology Program.

Missouri-Oahe Subregion

1. Suspended-sediment data are being collected on a monthly basis at Spring Creek near Zap, N. Dak., in cooperation with the U.S. Environmental Protection Agency (discontinued September 30, 1981).

2. Suspended-sediment data are being collected on a monthly basis at Knife River at Hazen, N. Dak., at Heart River near Mandan, N. Dak., (bimonthly) and at Cannonball River at Breien, N. Dak., as a part of NASQAN.

3. Suspended-sediment data are being collected at Missouri River at Bismarck, N. Dak., in cooperation with the U.S. Corps of Engineers (discontinued September 30, 1981).

4. Suspended-sediment data are being collected on a monthly basis at Apple Creek near Menoken, N. Dak., as part of the Missouri River Basin program (discontinued September 30, 1981).

5. Suspended-sediment data are being collected on a monthly basis and quartly after September 30, 1981 during periods of flow at the following sites as part of the Coal Hydrology program:

Knife River at Manning, N. Dak.
Stray Creek near Manning, N. Dak. (discontinued September 30, 1981)
Knife River at Marshall, N. Dak. (discontinued September 30, 1981)
Elm Creek near Golden Valley, N. Dak. (discontinued September 30, 1981)
Coyote Creek near Zap, N. Dak.
Brush Creek near Beulah, N. Dak.
Spring Creek below Lake Ilo at Dunn Center, N. Dak. (discontinued September 30, 1981)
Spring Creek near Halliday, N. Dak. (discontinued September 30, 1981)
Antelope Creek above Hazen, N. Dak.
Antelope Creek Tributary near Hazen, N. Dak.
Coal Creek near Stanton, N. Dak. (discontinued September 30, 1981)
Alderin Creek near Fort Clark, N. Dak.
Missouri River Tributary 2 near Hensler, N. Dak. (discontinued September 30, 1981)
Coal Lake Cl near Hensler, N. Dak.
Buffalo Creek near Washburn, N. Dak.
Square Butte Creek near Hannover, N. Dak. (discontinued September 30, 1981)
Square Butte Creek above Nelson Lake near Center, N. Dak.
Hagel Creek near Center, N. Dak.
Norwegian Creek near Belfield, N. Dak. (discontinued September 30, 1981)
S Branch Heart River near South Heart, N. Dak.
North Creek near South Heart, N. Dak. (discontinued September 30, 1981)
Heart River near South Heart, N. Dak.
Green River near New Hradec, N. Dak.
Cannonball River at New England, N. Dak. (discontinued September 30, 1981)
Coal Bank Creek near Havelock, N. Dak.
Cannonball River at Regent, N. Dak. (discontinued September 30, 1981)
Timber Creek near Bentley, N. Dak. (discontinued September 30, 1981)
Buffalo Creek Tributary near Gascoyne, N. Dak.

6. Suspended-sediment data are being collected on a bimonthly basis at Grand River at Little Eagle, S. Dak., as a part of NASQAN.

7. Suspended-sediment data are being collected on a bi-monthly basis at Moreau River near Whitehorse, S. Dak., as a part of NASQAN

Missouri- White Subregion

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

2. Suspended-sediment data are being collected on a daily basis at Bad River near Ft. Pierre, S. Dak., in cooperation with the U.S. Corps of Engineers.

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

Niobrara Subregion

1. Suspended-sediment data were collected on a daily basis through September, 1981 at Niobrara River near Verdel, Nebr., in cooperation with the U.S. Corps of Engineers, and are being collected on a bimonthly basis as part of NASQAN.

James Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at James River near Scotland, S. Dak., and at James River near Columbia, S. Dak. as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at James River at LaMoure, N. Dak., as part of the Missouri River Basin program

Missouri - Big Sioux Subregion

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

2. Suspended-sediment data are being collected on a monthly basis at Big Sioux River near Dell Rapids, S. Dak.

3. Suspended-sediment data are being collected six times a year on the Missouri River near Maskell, Nebr. and Missouri River near Ponca, Nebr., in cooperation with the U.S. Corps of Engineers.

North Platte Subregion

1. Suspended-sediment data are being collected on a daily basis at Canadian River near Lindland, Colo., and at Canadian River near Brownlee, Colo., in cooperation with the U. S. Bureau of Land Management.

2. Suspended-sediment data were collected on a monthly basis through September, 1981 and are being collected on a bimonthly basis at North Platte River near Lisco, Nebr., as part of NASQAN.

3. Suspended-sediment data are being collected on a monthly basis at Encampment River above Hog Park Creek, near Encampment, Wyo, as a part of

the National Hydrologic Benchmark Network.

4. Suspended-sediment data are being collected on a monthly and storm-event basis at the following stations in cooperation with the Wyoming State Engineer:

Little Medicine Bow River near Medicine Bow, Wyo.
Medicine Bow River above Seminoe Reservoir, near Hanna, Wyo.
Sweetwater River near Alcova, Wyo.
North Platte River at Casper, Wyo.
North Platte River at Orin, Wyo.
Laramie River near Fort Laramie, Wyo.
North Platte River at Wyoming - Nebraska State line

5. Suspended-sediment data are being collected on a monthly and storm-event basis at the following stations in cooperation with the U.S. Bureau of Land Management:

Sage Creek near Saratoga, Wyo.
Big Ditch near Coyote Springs, Wyo.
North Ditch near Coyote Springs, Wyo.
Hannah Draw near Hanna, Wyo.

6. Suspended-sediment data are being collected on an infrequent basis at Sand Creek near Glenrock, Wyo., as part of the Federal CBR program.

7. Suspended-sediment data are being collected on a monthly and storm-event basis at North Platte River at Alcova, Wyo., as part of the Federal CBR program.

South Platte Subregion

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

Platte Subregion

1. Suspended-sediment data were collected on a monthly basis through September 1981 and are being collected on a bimonthly basis at Platte River near Duncan, Nebr., as part of NASQAN.

2. Suspended-sediment data were collected on a miscellaneous basis at Mill Creek at Louisville, Nebr., and Cedar Creek near Louisville, Nebr., and at Four-mile Creek near Plattsmouth, Neb., in cooperation with the Nebraska Department of Water Resources (discontinued September 30, 1981)

3. Suspended-sediment data were collected on a daily basis at Platte River at Louisville, Nebr., in cooperation with the U.S. Corps of Engineers, Omaha District, (discontinued October, 1981) and are being collected on a bimonthly basis and as part of NASQAN.

4. Suspended-sediment data were being collected through Sept. 30, 1981, on an intermittant basis at Rock Creek near Ceresco, Nebr., in cooperation with the Nebraska Department of Environmental Control.

5. Suspended-sediment data are being collected on a miscellaneous basis at Platte River at North Bend, Nebr., in cooperation with the Nebraska Natural Resources Commission and the Nebraska Department of Enviromental Control.

Loup Subregion

1. Suspended-sediment data are being collected on a bimonthly basis at Loup River near Genoa, Nebr., as part of NASQAN.

Elkhorn Subregion

1. Suspended-sediment are being collected at Elkhorn River at Waterloo, Nebr., on a bimonthly basis as part of NASQAN and on a miscellaneous basis in cooperation with the Nebraska Department of Enviromental Control.

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 Corps of Engineers, Omaha District:

Missouri River at Sioux City, Iowa
Missouri River at Omaha, Nebr.
Missouri River at Nebraska City, Nebr.

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

Missouri - Nishnabotna - Subregion

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

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

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

4. Suspended-sediment data were collected on a miscellaneous basis at Weeping Water Creek at Weeping Water, Nebr., South Branch Weeping Water Creek near Union, Nebr., and Weeping Water Creek near Union, Nebr., in cooperation with the Nebraska Department of Water Resources (discontinued September 30, 1981).

Republican Subregion

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

Smoky Hill Subregion

1. Suspended-sediment data are being collected on a 6-week basis at Smoky Hill River at Enterprise, Kans., Saline River at Tescott, Kans., North Fork Smoky Hill River near McAllaster, Kans., Big Creek near Hays, Kans., North Fork Big Creek near Victoria, Kans., Saline River near

Russell, Kans., North Fork Solomon River at Glade, Kans., Deer Creek near Phillipsburg, Kans. (discontinued September 30, 1981), South Fork Solomon River above Webster Reservoir, Kans., and Kill Creek near Bloomington, Kans. (discontinued September 30, 1981), in cooperation with the Kansas Water Office.

Kansas Subregion

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

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

3. Suspended-sediment data are being collected on a periodic basis at Kansas River at Lecompton, Kans. (discontinued September 30, 1981), and Kansas River at DeSoto, Kans., in cooperation with the U.S. Corps of Engineers prior to September 30, 1981, and as part of NASQAN thereafter.

4. Suspended-sediment data are being collected on a miscellaneous basis at Big Blue River at Beatrice, Nebr., and at Little Blue River at Hollenberg, Kans., in cooperation with the Nebraska Natural Resources Commission and the Nebraska Department of Environmental Control.

5. Suspend-sediment data are being collected on a monthly basis on at West Fork Big Blue River near Dorchester, Nebr., in cooperation with the Nebraska Department of Environmental Control.

Chariton-Grand Subregion

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

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

3. Suspended-sediment data are being collected on a periodic basis as part of the Coal Hydrology program at the following sites:

Shoal Creek near Mendota, Mo.
Shoal Creek near Glendale, Mo.
Unnamed Creek at Ardmore, Mo.
South Fork Claybank Creek near College Mound, Mo.
East Fork Little Chariton River near Macon, Mo.
East Fork Little Chariton River near Huntsville, Mo.
Blackbird Creek near Sidney, Mo.
North Blackbird Creek near Martinstown, Mo.
Sinking Creek near Huntsville, Mo.
Middle Fork Little Chariton River near Callao, Mo.
Middle Fork Little Chariton River near Thomas Hill, Mo.
Ash pond outflow near Thomas Hill, Mo.

Middle Fork Little Chariton River near Prairie Hill, Mo.
Muncas Creek near Thomas Hill, Mo.

Gasconade-Osage Subregion

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

2. Suspended-sediment data are being collected on a monthly 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 monthly basis at Osage River near Schell City, Mo. , as a part of NASQAN.

4. Suspended-sediment are being collected on a periodic basis as part of the Coal Hydrology program at the following sites:
Mulberry Creek at Mulberry, Mo.
Unnamed tributary to Mulberry Creek near Amoret, Mo.
Mulberry Creek near Amoret, Mo.
Walnut Creek near Foster, Mo.
Dry Wood Creek near Oskloosa, Mo.
Dry Wood Creek near Deefield, Mo.

Lower Missouri Subregion

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

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

3. Suspended-sediment data are being collected on a periodic basis as part of the Coal Hydrology prograam at the following site:
Moniteau Creek near Higbee, Mo.
Moniteua Creek near Harrisburg, Mo.
Cedar Creek near Hallsville, Mo.
Cedar Creek near Columbia, Mo.

Special Studies

1. A study by the Kansas District to find relations between channel bed and bank material, gradient, discharge, and channel geometry for streams throughout the Missouri River basin has been completed and the final report was published a U.S. Geological Survey Professional Paper 1242.

2. Sediment data are being collected at several sites in the Rock Creek-Clear Creek drainage basin to relate suspended-sediment discharge to water discharge. The purpose is to detect changes in the sediment discharge characteristics of the stream as it heads in the mountains, flows through a municipal area, through an agricultural area, and finally through a badlands, semiarid region.

3. PS-69 pumping sediment samplers are operating at Lower Hay Creek Trib. near Wilbaux, Mont., discontinued September 30, 1981, and at West Branch Antelope

Creek Trib. No. 4 near Zap, N. Dak., as part of EMERIA studies. Sediment data are collected at these and several other sites in the study basins.

4. A project which will relate sediment yield to rainfall and runoff to determine if surface mining has any significant effect on quantity and which will also determine the relative importance of channel erosion and slope wash as sediment sources, was begun in 1981 on Dugout Creek Tributary near Midwest, Wyoming.

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

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 1230
Federal Building, Room 269
400 South Clinton St.
Iowa City, IA 52244

District Chief, WRD
U.S. Geological Survey
1950 Avenue A-Campus West
University of Kansas
Lawrence, KS 66045

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

District Chief, WRD
U.S. Geological Survey
301 South Park Avenue
Federal Building, Room 428
Drawer 10076
Helena, MT 59601

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

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

District Chief, WRD
U.S. Geological Survey
200 Fourth Street, SW
Federal Building, Room 308
Huron, SD 57350

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
J.C. O'Mahoney Federal Center
Room 5017
2120 Capitol Avenue
Cheyenne, WY 82001

MISSOURI REGION

SOIL CONSERVATION SERVICE

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

a. Public Law-566

Major Drainage	Watershed	Stream	County	State
Elkhorn River	Maple Creek (Middle Fork)	Maple Creek	Stanton Colfax	Nebraska
Platte River	Camp Creek	Camp Creek Salt Creek	Lancaster	Nebraska
Platte River	Gering Valley	Gering Drain	Scotts Bluff	Nebraska
Platte River	Bone Creek	Bone Creek	Butler	Nebraska
Big Blue River	Wolf-Wildcat	Wolf Creek Wildcat Creek	Gage Pawnee	Nebraska
Little Blue River	Balls Branch	Rose Creek	Thayer Jefferson	Nebraska
Little Nemaha River	Upper Little Nemaha	Little Nemaha River	Lancaster, Cass, Otoe	Nebraska
Nemaha River	Turkey Creek	Turkey Creek	Pawnee Johnson	Nebraska
Nemaha River	Middle Big Nemaha	Nemaha River	Johnson	Nebraska
Missouri River	Roy's Creek	Roy's Creek	Brown	Kansas
Missouri River	Pony Creek	Pony Creek	Brown Nemaha	Kansas
Missouri River	West Fork Big Creek	West Fork Big Creek	Ringgold Decatur Harrison Daviess	Iowa Missouri
Missouri River	East Fork Big Creek	East Fork Big Creek	Decatur Harrison	Iowa Missouri
Big Horn River	McClellan Gulch	McClellan Gulch	Washakie	Wyoming

(Sediment yield from the Kaycee Bentonite Corporation Mine)

N. Platte	W. Fork Garden Cr.,	W. Fork Garden Cr.,	Natrona	Wyoming
N. Platte	Austin Creek	Austin Creek	Natrona	Wyoming

2. Reservoir Sedimentation Surveys

a. Reservoir sedimentation surveys were begun on the following:

Reservoir	County	State
Wilson Creek 5-H	Otoe	Nebraska
Oak-Middle 79-A	Lancaster	Nebraska
Big-Indian 13-B	Gage	Nebraska
Aowa Creek 63-1A	Dixon	Nebraska

b. Reservoir sedimentation surveys were completed on the following:

Reservoir	County	State
Bosserman	Golden Valley	North Dakota
Kropp Farms	Stutsman	North Dakota
Brockberg	Pipestone	Minnesota
Meike	Johnson	Wyoming
Ramsbottom	Johnson	Wyoming

Reports were completed on reservoir sedimentation surveys made on W-6 Reservoir in the Wray watershed, CB-1 Reservoir in the Coal Creek Watershed, and Reservoirs No. 1 and No. 2 on the Plains Conservation Center, all in Colorado. Reports were done on Meike Reservoir, and Ramsbottom Reservoir watersheds in Wyoming.

3. Special Studies

Erosion maps on 1/50,000 scale were prepared for the northern part of Elbert County, Colorado.

ARKANSAS WHITE RED REGION

BUREAU OF LAND MANAGEMENT

Oklahoma

The Bureau financed and completed suspended sediment data collection at 12 sites in eastern Oklahoma as part of the USGS Coal Hydrology Monitoring Program. Ten sites were sampled automatically by PS-69 samplers and two sites by observers. Stations were operated and data is reported by the USGS. Data was collected to characterize sediment relationships of the coal region. About 3 years of record are currently available; a regional report will be prepared in the near future.

Bureau of Reclamation

New area-capacity tables for Lake Meredith were published based on the 1980 sediment survey. The laboratory analysis of deposited sediment samples collected during the survey were completed and printed.

An analysis of the water surface elevations and scour depths for the three major crossings of Muddy Boggy Creek by the McGee Creek Aqueduct was completed using the 100-year peak flood discharges. Scour may be controlled by bedrock as observed in preliminary geologic cross sections. Results follow in tabular form.

Crossing No.	100-Yr Flood discharge m^3/s (ft^3/s)	Water depth m (ft)	Scour Depth (or to rock) m (ft)
1	1,355 (47,900)	12.3 (40.3)	2.6 (8.6)
2	192 (6,800)	5.3 (17.4)	1.6 (5.1)
3	1,639 (57,900)	12.9 (42.3)	3.0 (9.9)

ARKANSAS - WHITE - RED REGION

CORPS OF ENGINEERS

Southwestern Division

Albuquerque District

Sedimentation Resurveys. No reservoir sedimentation resurveys were conducted in 1981, however, the system of degradation ranges below John Martin Reservoir were resurveyed in February 1981. Disturbed or missing range monuments were reestablished.

Sediment Load Measurements. Suspended sediment measurements were made at two stations (Arkansas River below John Martin Reservoir and Purgatoire River near Trinidad) in this region.

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

Little Rock District

Sedimentation Surveys. Sediment ranges in Ozark Lake, Lake Dardanelle, the Entrance Channel, and Pools 7, 8, and 9 were resurveyed with Motorola automated hydrographic survey equipments.

Sediment Load Measurements. 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, and Little Red River.

Tulsa District

Sedimentation Surveys. Original surveys of Clayton and El Dorado Lakes have been completed and pole monument installation at Clayton will be initiated in January 1982. The original survey of Copan was initiated in January 1981 and will continue through 1982. Reconnaissance surveys to determine deposit depths and grain sizes were conducted at Ft. Supply and Heyburn Lakes. These data will be used to update elevation-area-capacity tables and inflowing sediment deposition rates. Detailed resurveys were performed at Bardwell Lake, Ft. Worth District, and Jemez Canyon Dam and Reservoir, and Cochiti Lake, Albuquerque District. All resurvey data was obtained hydrographically using Motorola Mini Ranger III and Ratheon DSF-600 surveying equipment.

Sediment Load Measurements. The suspended sampling program consists of 51 stations. Presently, there are 38 stations in the Arkansas River Basin and 13 stations in the Red River Basin in operation. Two stations, Kanawa, Texas on Little Pine Creek and Carl, Oklahoma on Elm Fork of North Fork Red River were deleted as cost reduction measures.

Other Investigations. Drafts of Reservoir Sediment Data Summaries (ENG Form 1787) were submitted for review to Southwestern Division on John Redmond Dam and Reservoir. Robert S. Kerr Lock and Dam 15, Keystone and Toronto Lakes, and Webbers Falls Lock and Dam 16. The Reservoir Sediment Data Summary for John Redmond Dam and Reservoir has been approved. Clayton Lake, Design Memorandum No. 15, Sedimentation and Degradation Ranges was revised and submitted to Southwestern Division.

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

ARKANSAS-WHITE-RED REGION

Ouachita National Forest

Fourteen acres of severely eroding lands were rehabilitated. This resulted in an annual sediment reduction of about 700 tons.

Turbidity was monitored at two stations. These data are in "Storet."

Ozark and St. Francis National Forests

National Forest personnel rehabilitated 123 acres of severely eroding lands which resulted in an estimated annual sediment reduction of 6,000 tons. The rehabilitated acres included 100 acres following a severe wildfire.

Personnel monitored stream turbidity or suspended sediment on three projects. These data are in "Storet."

Kisatchie National Forest

National Forest personnel rehabilitated 16 severely eroding acres which resulted in an annual sediment reduction of about 800 tons.

ARKANSAS-WHITE-RED REGION

GEOLOGICAL SURVEY

Upper White Subregion

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

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

Upper Arkansas Subregion

1. Suspended-sediment data are being collected on a twice monthly basis at Arkansas River at Portland, Colo., in cooperation with the U.S. Bureau of Reclamation, Lower Missouri River Basin Region.

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

3. Suspended-sediment data are being collected on a daily basis at Purgatoire River below Trinidad Dam, Colo., in cooperation with the U.S. Corps of Engineers, Albuquerque District.

4. Suspended-sediment data were collected on a daily basis in cooperation with the U.S. Bureau of Land Management:

   Apishapa River at Aquilar, Colo.
   MFK Purgatoire River at Stonewall, Colo.
   Molino Canyon near Weston, Colo.
   Sarcillo Canyon near Sequndo, Colo.
   Purgatoire River at Madrid, Colo.
   Mulligan Canyon near Boncarbo, Colo.
   Reilly Canyon at Cokedale, Colo.
   Carpios Canyon near Jansen, Colo.

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, Kans.
   Whitewoman Creek near Leoti, Kans.
   Mulberry Creek near Dodge City, Kans.
   Arkansas River near Kinsley, Kans.
   Pawnee River near Larned, Kans.
   Walnut Creek at Albert, Kans.
   Rattlesnake Creek near Macksville, Kans.
   Cow Creek near Claflin, Kans.
   Cow Creek near Lyons, Kans.
   Arkansas River near Hutchinson, Kans.
   Little Arkansas River at Alta Mills, Kans.

North Fork Ninnescah River above Cheney Reservoir, Kans.
South Fork Ninnescah River near Pratt, Kans.
South Fork Ninnescah River near Murdock, Kans.
Ninnescah River near Peck, Kans.
Slate Creek at Wellington, Kans.
Whitewater River at Towanda, Kans.
Arkansas River at Arkansas City, Kans.
Walnut River at Winfield, Kans.

Upper Cimarron Subregion

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

Lower Cimarron Subregion

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

Arkansas-Keystone Subregion

1. Suspended-sediment data are being collected at Arkansas River near Ponca City, Okla., and at Salt Fork Arkansas River Near Jet, Okla, in cooperation with the U.S. Corps. of Engineers (COE).

2. Suspended-sediment data are being collected on a monthly basis at Arkansas River at Ralston, Okla., as a part of NASQAN, and in cooperation with the COE.

Neosho-Verdigris Subregion

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

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

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

Upper Canadian Subregion

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

Una de Gato Creek near Raton, N. Mex. (semiannual)
Vermejo River near Dawson, N. Mex. (monthly)
Cimmaron River below Eagle Nest, N. Mex. (annual)
Cimmaron River near Cimmaron, N. Mex. (semiannual)
Ponil Creek near Cimmaron, N. Mex. (monthly)
Rayado Creek near Cimmaron, N. Mex. (monthly)

Mora River at La Cueva, N. Mex. (monthly)
Ute Reservoir near Logan, N. Mex. (annual)
Revuelto Creek near Logan, N. Mex. (monthly)

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

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

Lower Canadian Subregion

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

2. Suspended-sediment data are being collected at Canadian River at Bridgeport, Okla., in cooperation with the U.S. Bureau of Reclamation.

3. Suspended-sediment are being collected at Canadian River at Calvin, Okla., as a part of NASQAN and in cooperation with the U.S. Corps of Engineers.

4. Suspended-sediment are being collected at the following sites for use in the BLM-EMRIA project (Discontinued September, 1981):

Blue Creek Tributary near Blocker, Okla.
Blue Creek near Blocker, Okla.
Mathuldy Creek near Blocker, Okla.
Taloka Creek at Stigler, Okla.
Taloka Creek Tributary near Stigler, Okla.
Taloka Creek Tributary near Stigler, Okla.
Jackson Creek near Stigler, Okla.

5. Suspended-sediment data are being collected at the following sites for use in the Coal Monitoring Project:

Brushy Creek near Haileyville, Okla. (discontinued September, 1981)
Peaceable Creek near Haileyville, Okla. (discontinued September, 1981)
Ti Creek near Blanco, Okla.

North Canadian Subregion

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

2. Suspended-sediment data are being collected at the following site in cooperation with the U.S. Corp of Engineers:

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

3. Suspended-sediment data are being collected at Deep Fork near Beggs, Okla., for NASQAN and in cooperation with the U. S. Corps of Engineers.

Lower Arkansas Subregion

1. Suspended-sediment data are being collected on a monthly basis at Arkansas River at Tulsa, Okla., and on a bimonthly basis at Arkansas River at Dam 13 near Van Buren, Ark., and at Arkansas River at David D. Terry Lock and Dam below Little Rock, Ark., as a part of NASQAN.
2. Suspended-sediment data are being collected at the following sites for use in the BLM - EMRIA project (discontinued September, 1981):
   - James Fork near Hackett, Ark.
   - James Fork near Williams, Okla.
   - Brazil Creek near Red Oak, Okla.
   - Rock Creek near Red Oak, Okla.
   - Brazil Creek near Walls, Okla.
   - Brazil Creek near Lodi, Okla.

3. Suspended-sediment data are being collected at the following sites for use in the Coal Monitoring project (discontinued September, 1981)
   - Coal Creek near Spiro, Okla.
   - Fourche Maline near Wilburton, Okla.
   - Red Oak Creek near Red Oak, Okla.
   - Caston Creek at Wister, Okla.
   - Morris Creek at Howe, Okla.
   - Sugarloaf Creek near Monroe, Okla.
   - Owl Creek near McCurtain, Okla.
   - Holi-tuska Creek near Panama, Okla.

4. Suspended-sediment data are being collected at Illinois River near Tahlequah, Okla., in cooperation with the COE.

Red Headwaters Subregions

1. Suspended-sediment data are being collected on a monthly basis at North Fork Red River near Headrick, Okla., at Salt Fork Red River near Elmer, Okla., at Prairie Dog Town Red River near Wayside, Tex., and at Prairie Dog Town Fork Red River near Childress, Tex., as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at the following sites in cooperation with the U.S. Corps of Engineers:
   - Little Red River near Turkey, Tex. (disc daily operation Sept. 30, 1981)
   - Jonah Creek at Weir, near Estelline, Tex.

3. The collection of suspended-sediment data on a daily or more frequent basis began Feb. 1, 1979, at Little Red River near Turkey, (discontinued September 30, 1981) in cooperation with The University of Texas at Austin.

Red-Washita Subregion

1. Suspended-sediment data are being collected on a monthly basis at Red River near Burkburnett, Tex., at Red River at Denison Dam near Denison, Tex., at Red River near Gainesville, Tex., and at Washita River near Diskson, Okla. as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at the following sites in cooperation with the U.S. Corps of Engineers:

Red River near Quanah, Tex.
Middle Pease River near Paducah, Tex.
Pease River near Childress, Tex.
North Wichita River near Truscott, Tex.
Red River near DeKalb, Tex.

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

Red-Sulphur Subregion

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

2. Suspended-sediment data are being collected at Coal Creek near Lehigh, Okla., for use in the BLM - EMRIA project (discontinued December, 1981)

3. Suspended-sediment data are being collected at Muddy Boggy Creek at Atoka, Okla., for use in the Coal Monitoring project (discontinued September 30, 1981).

4. Suspended-sediment data are being collected on a bimonthly basis at McGee Creek near Farris, Okla., in cooperation with the U.S. Bureau of Reclamation

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

6. Suspended-sediment data are being collected bimonthly basis at Twelvemile Bayou near Dixie, La., as a part of NASQAN.

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

8. Suspended-sediment data are being collected on a daily basis at Loggy Bayou near East Point, LA as a part of a lignite study in cooperation with the Louisiana Office of Public Works.

Laboratory Activities

1. The Geological Survey sediment laboratory located in Baton Rouge, La., analyzed suspended-sediment and/or bed-material samples collected by the U.S. Corps of Engineers at the following locations:
Red River at Fulton, Ark.
Red River at Shreveport, La.
Red River at Colfax, La.

For additional information about 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
1950 Avenue A - Campus West
University of Kansas
Lawrence, KS 66045

District Chief, WRD
U.S. Geological Survey
P.O. Box 66492
6554 Florida Boulevard
Baton Rouge, LA 70896

District Chief, WRD
U.S. Geological Survey
P.O. Box 26659
815 Western Bank Building
505 Marquette, NW
Albuquerque, NM 87125

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

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

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

ARKANSAS-WHITE-RED REGION

SOIL CONSERVATION SERVICE

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

a. Public Law-566

Major Drainage	Watershed	Stream	County	State
Neosho River	South Fork	Cottonwood River	Butler Greenwood Chase	Kansas
Arkansas-White-Red	Dirty Creek	Dirty Creek	Muskogee and McIntosh	Oklahoma
Cimarron River	Campbell Cr.	Campbell Cr.	Kingfisher	Oklahoma
Cimarron River	Turkey Creek	Turkey Elm Sand Dry Hell Gone Buffalo Dry Salt	Garfield Major Kingfisher Alfalfa	Oklahoma
Deep Fork Canadian River	Dry Creek	Dry Beaver Shiny N. Branch Chuckaho Dosie	Lincoln	Oklahoma

2. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
Mill Creek, Site No. 17	Johnston	Oklahoma
Wildhorse Creek, Site No.1	Garvin	Oklahoma
Wildhorse Creek, Site No. 33	Stephens	Oklahoma
Big Wewoka Creek, Site No. 34	Hughes	Oklahoma
Uncle John Creek, Site No. 7	Canadian	Oklahoma
Fort Carson, Site FC-1	Pueblo	Colorado
Fort Carson, Site FC-2	Pueblo	Colorado
Fort Carson, Site FC-3	Pueblo	Colorado
Fort Carson, Site FC-4	Pueblo	Colorado
Fort Carson, Site FC-5	El Paso	Colorado

3. Special Studies

Erosion maps on 1/50,000 scale were prepared for Custer County, Pueblo County, and the southern part of Elbert County, Colorado.

TEXAS-GULF REGION

Bureau of Reclamation

Section profiles for 34 reservoir sediment ranges were prepared using 1977 original survey data. The sediment ranges are divided with 14 on the Navidad River mainstem and 20 on several tributaries to the reservoir.

TEXAS - GULF REGION

CORPS OF ENGINEERS

Southwestern Division

Fort Worth District

The second resurvey of Bardwell Lake, river mile 5.0 on Waxahachie Creek, Richland-Chambers Creeks Watershed, Trinity River Basin, Texas was conducted during July and August of 1981 using hydrographic survey equipment owned by the Tulsa District. The report of the second resurvey will be completed when funds are made available.

Galveston District

Two hundred eleven (211) inplace samples were obtained from thirteen (13) 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 the number of samples taken are as follows:

Navigation Project	No. of Samples Taken
Gulf Intracoastal Waterway	70
Matagorda Ship Channel	24
Sabine-Neches Waterway	23
Houston Ship Channel	20
Corpus Christi Ship Channel	17
Brazos Island Harbor	16
Texas City Channel	9
Trinity River and Tributaries	8
Galveston Channel	8
Cedar Bayou	7
Double Bayou	5
Corpus Christi Inner Harbor	3
Nueces Bay	1

Forest Service

TEXAS GULF REGION

National Forests in Texas

Thirty acres of severely eroding lands were rehabilitated. This resulted in an annual sediment reduction of about 1,500 tons.

Forest personnel monitored turbidity on two projects. These results are ir "Storet."

TEXAS-GULF REGION

GEOLOGICAL SURVEY

Sabine Subregion

1. Suspended-sediment data are being collected at Sabine River near Ruliff, Tex., 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. and Bayou San Patricio near Benson, LA. as a part of a lignite study for the Louisana office at Public works.

Neches Subregion

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

Trinity Subregion

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

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

3. Suspended-sediment data are being collected on a daily or more frequent basis at Trinity River near Oakwood, Tex., in cooperation with the U.S. Corps of Engineers. (Discontinued September 30, 1981)

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

Galveston Bay - San Jacinto Subregion

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

Middle Brazos Subregion

1. Suspended-sediment data are being collected at Double Mountain Fork Brazos River at Justiceburg, Tex., and at Stinking Creek near Aspermont, Tex., as a part of the Federal CBR program.

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

Lower Brazos Subregion

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

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

3. Suspended-sediment data are being collected on a periodic basis at Berry Creek near Georgetown, Tex., as a part of the Federal CBR program.

4. Suspended-sediment data are being collected on a weekly or more frequent basis at Navasota River near Bryan, Tex., in cooperation with the U.S. Corps of Engineers. (Discontinued September 30, 1981)

5. Suspended-sediment data are being collected on a monthly basis at Brazos Little River near Cameron, Tex., as a part of NASQAN.

Upper Colorado Subregion

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

Lower Colorado-San Bernard Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Walnut Creek at Webberville Road, Austin, Tex., and at Onion Creek at US Hwy 183, Austin, Tex., as a part of the Federal CBR program.

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

3. Suspended-sediment data are being collected on a daiy basis at Concho River at Paint Rock, Tex. and at Colorado River at Ballinger, Tex., in cooperation with Texas Department of Water Resources. (Discontinued November 30, 1981)

Central Texas Coastal Subregion

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

Nueces-Southwestern Texas Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Atascosa River at Whitsett, Tex., (Discontinued September 30, 1981) and at San Miguel Creek near Tilden, Tex., as a part of the Federal CBR program.

2. Suspended-sediment data are being collected on a monthly basis at Nueces

River near Three Rivers, Tex., and at Los Olmos Creek near Falfurrias, Tex., (Discontinued September 30, 1981) as a part of NASQAN.

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

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

SOIL CONSERVATION SERVICE

1. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
Site 1, Green Creek	Erath	Texas
Site 1, East Keechi Creek	Jack	Texas
Lake Pat Cleburne	Johnson	Texas
Site 1, San Diego-Rosita Creeks	Duval	Texas

RIO GRANDE REGION

Bureau of Reclamation

A hydrographic survey was conducted on Elephant Butte Reservoir in selected areas in order to (1) answer questions raised during the Safety Evaluation of Existing Dams examination concerning the elevation and disposition of sediment deposits in the vicinity of the outlet works and (2) to provide data on the longitudinal sediment profile through the Narrows portion of the reservoir for use in planning maintenance on the Rio Grande Convergence Channel. In the area near the dam, a series of eight lines were run 15 meters (50 feet) apart, parallel to sediment Range 90, and offset from that line from 229 to 335 meters (750 to 1,100 feet). The Motorola Mini-Ranger III positioning system and Raytheon 719B fathometer were used in making the survey. For profiling this line through the Narrows area the position of the boat was determined in the channel by placing floating buoys at mid-channel on established range lines. By proceeding upstream at a constant speed while a continuous depth recording was being made the position was fixed on the sonar chart as the boat passed adjacent to the buoys.

A hydrographic resurvey of Caballo Reservoir was completed to be used to determine the volume of sediment accumulation and the new area-capacity relationships. Thirteen range lines were surveyed hydrographically. The position of the boat along range lines was determined using a Motorola Mini-Ranger III positioning system which employs the range-range method for position fixing. Depth was determined along each range line using a Raytheon 719B fathometer.

Analyses of 1980 resurvey data for Elephant Butte Reservoir was completed and new area-capacity tables were prepared for publication.

A field inspection was made of the Low-Flow Conveyance Channel on the Rio Grande from the Tiffany Junction to the "Narrows" of Elephant Butte Reservoir. Sediment deposition was observed in the conveyance channel above the Tiffany Junction as well as in the lower reaches in the vicinity of Nogal Bridge. It was agreed that work should continue on cleaning these sediments from the channel so that it could once again become operative. In those areas where a dragline operation is difficult, the use of a dredge such as that made by National Car Rental should be considered. The subangular graded rock being used provides good protection for the conveyance channel banks. Jacks are still effective for protection against bank erosion either for the conveyance or the Rio Grande and can be made from wood posts to reduce costs.

A special underwater sounding was made to obtain profile data in the Narrows area of Elephant Butte Reservoir. The data included one to five sections profiled in each of 13 areas for use in determining the most advantageous areas for disposing of materials to be dredged from the main channel through the Narrows.

Bureau of Reclamation

A review of maintenance was made of the San Juan-Chama and Middle Rio Grande channelization programs. The stream channels were found to be in generally good condition. A report covering the review was published.

Area and capacity tables and a sediment distribution study were prepared for specification designs of Brantley Dam and Reservoir. The distribution study provided for both the 1981 and 2081 sediment condition within the reservoir. A total 100-year sediment quantity of 143.5 x 10^6 m^3 (116,300 acre-feet) was distributed in the reservoir below elevation 998.3 meters (3275.1 feet) to represent 2081 conditions.

RIO GRANDE REGION

CORPS OF ENGINEERS

Southwestern Division

Albuquerque District

Sedimentation Surveys.

1. Sedimentation resurveys of Cochiti Lake and Jemez Canyon Reservoir were completed in October 1981. These surveys were performed in order to document reservoir sedimentation which occurred as a result of above normal annual inflows in 1979 and 1980. The data collected at Cochiti Lake will also determine what adjustments in permanent pool elevation will be required to reestablish the authorized 1200 surface acre recreation pool which has been reduced due to sedimentation. The survey of Cochiti Lake consisted of hydrographic surveying of permanent sedimentation ranges plus photogrammetrically established topography for the portion of the reservoir between the permanent pool (elevation 5321.4) and the spillway crest (elevation 5460.5).

2. Fifty-one sedimentation ranges and fourteen degradation ranges at Jemez Canyon Reservoir were surveyed with a combination of hydrographic and photogrammetric surveying procedures. In addition to determining changes in overall reservoir storage, these data will provide evidence of the effectiveness of a 2000 acre-feet permanent pool that was established at Jemez Canyon in 1979 for the purpose of increasing the project's sediment trap efficiency.

3. The reports describing and analyzing these two reservoir sedimentation resurveys are scheduled for completion in May 1982.

Sediment Load Measurements. Suspended sediment measures were made at five stations in the Rio Grande Region. These stations are located on Rio Chama above Abiquiu Dam, below Abiquiu Dam, near Chamita, NM and 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 D-49 according to flow conditions.

Other Investigations.

1. A sediment investigation of the Rio Grande Basin from Elephant Butte Reservoir to Cochiti Lake was completed in 1981. The work was performed for the Albuquerque District by Simons, Li and Associates of Fort Collins, Colorado. The study ascertained the long-term effects of the existing flood and sediment control projects and the projected effects of controlling the sediment delivered to the Rio Grande from the Rio Puerco and Rio Salado. The results of this study are documented in a series of nine reports and computer model user's manuals. Of general interest is a computer model which considers reservoir trap efficiencies by size fractions,

distribution of sediment by the Empirical Area-Reduction Method, and compaction of deposits over time. Two main stem sediment and water routing models were developed for the Rio Grande system. GENRES (General System Response Model) simulates long-term responses by considering sediment transport, sediment supply, water discharge, channel geometry and armoring. QUASED (Quasi Dynamic Sediment Routing Model) simulates short-term responses to floods occurring on the Rio Puerco and Rio Salado and their effects on the Rio Grande. QUASED routes sediment by size fractions and is used to estimate the general scour and deposition as a function of time and discharge. The sediment transport rates are computed utilizing the Meyer-Peter, Muller bed-load equation and the Einstein suspended load equation.

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

Sediment stations information is available through the National Water Data Exchange (NAWDEX) program from OWDC, USGS.

RIO GRANDE REGION

GEOLOGICAL SURVEY

Rio Grande Headwaters Subregion

1. Suspended-sediment data are being collected on a monthly basis at Rio Grande near Lobatos, Colo., 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, N. Mex. and Embudo Creek at Dixon, N. Mex., in cooperation with the New Mexico Interstate Streams Commission (NMISC).

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

3. Suspended-sediment data are being collected on a daily basis at Rio Grande at Otowi Bridge near San Ildefonso, N. Mex., and at Rio Grande near Albuquerque, N. Mex., 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, N. Mex., in cooperation with the COE.

5. Suspended-sediment data are being collected on a daily basis at Arroyo Chico near Guadalupe, N. Mex., in cooperation with the U.S. Bureau of Land Management (BLM).

6. Suspended-sediment data are being collected on a daily basis at Rio Puerco near Bernardo, N. Mex., in cooperation with the COE and BLM.

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

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

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

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

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

12. Suspended-sediment data are being collected on a bimonthly basis at Rio Grande below Elephant Butte Dam, N. Mex., as a part of NASQAN.

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

14. Suspended-sediment data are being collected at Pecos River above Santa Rosa Lake, N. Mex. (monthly) and Pecos River near Acme, N. Mex. (bimonthly), in cooperation with NMISC.

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

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

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

18. Suspended-sediment data are being collected on a monthly basis at Pecos River at Red Bluff, N. Mex., at Rio Grande at El Paso, Tex., and at Rio Grande at Fort Quitman, Tex., as a part of NASQAN.

19. Suspended-sediment data are being collected on an intermittent basis at Rito de los Frijoles in Bandelier National Monument, N. Mex., in cooperation with the National Park Service.

Rio Grande - Amistad Subregion

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

Rio Grande Closed Basins Subregion

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

Lower Pecos Subregion

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

Rio Grande - Falcon Subregion

1. Suspended-sediment data are being collected on a monthly basis at Rio

Grande at Laredo, Tex., as a part of NASQAN.

Lower Rio Grande Subregion

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

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

Special Studies

A water quality monitoring plan for the Rio Grande and Red River in Taos County, N. Mex., was initiated in October 1978 by the U.S. Bureau of Land Management. The study objectives are to monitor long-term changes in water quality (chemical and sediment) at 14 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
Box 25046, Mail Stop 415
Denver Federal Center
Lakewood, CO 80225

District Chief, WRD
U.S. Geological Survey
P.O. Box 26659
815 Western Bank Building
505 Marquette, NW
Albuquerque, NM 87125

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

RIO GRANDE REGION

SOIL CONSERVATION SERVICE

1. Reservoir Sedimentation Surveys

Reservoir sedimentation surveys were made in the following reservoirs:

Reservoir	County	State
Site 6, Olmitos and Garcias Creeks	Starr	Texas

UPPER COLORADO REGION

Bureau of Land Management

Utah

Stream Gauges

The coal management program for the Unita Southwestern area includes collecting water resource data of which suspended sediment is included in the contract with USGS for operation of nine stream guages.

Vernal District

A study is being conducted on Boulevard Ridge which is a pinyon-juniper woodland.

The primary objectives of this investigation are (A) to determine the hydrologic effects of converting pinyon-juniper woodland to grassland on soil erosion. This includes rates of upland soil movement, changes in channel geometry and sediment yield; and (B) to determine the effect of conversion on water yield. Secondary objectives of the project are to define the runoff and erosion characeristics of the pinyon-juniper type, and to develop hydrologic and ecologic data that will be useful for making land-management decisions within the pinyon-juniper type.

Data are available in the Vernal District Files.

Red Creek

Utah and Wyoming BLM are developing a joint watershed plan on Red Creek Drainage. Vernal District has sedimentation data gathered under an agreement with USGS on Red Creek along with other water data.

Moab District

Sager's Wash is a potential Salinity Control project. It is estimated that sediment yeild in the Sager's Wash Basin average 6 tons/acre/year. It is recommended that data collection and pretreatment monitoring on Sager's Wash be initiated concurrently with the development of a preliminary watershed activity plan.

UPPER COLORADO REGION

Bureau of Land Management

Utah

Price Basin Rainfall Simulation Study: Infiltration, runoff, and water quality (salt, sediment) were examined on three soil-landform types in the Mancos Shale Formation. Sediment accumulations were determined for 12 small check basins.

Price Basin Trampling Study: This study was completed under contract to Simons, Li and Associates. The effects of vegetational cover and livestock on runoff and water quality (salt, sediment) were examined for Mancos Shale-derived soils.

Further Information: Bill Jackson, Hydrologist
Bureau of Land Management (D-470)
Denver Federal Center, Bldg. 50
Denver, CO 80225

UPPER COLORADO REGION

BUREAU OF LAND MANAGEMENT

Wyoming

Fifteenmile Creek Drainage--A cooperative plan has been developed with Wyoming Department of Environmental Quality to pursue recommendations of the 208 water quality plan to reduce sedimentation from Fifteenmile Creek to the Big Horn River. Accomplishments have included maintenance of existing detention dams for continued flood and sediment storage, and initiation of a research proposal by the University of Wyoming on the effects of grazing on channel morphology, and riparian vegetation on ephemeral stream channels.

Red Creek Drainage--Completion of a joint Wyoming/Utah watershed management plan. Sediment control investigations identified in the plan will continue. Two sediment control structures (gabions) will be installed along with several culvert replacements during the FY 1982 field season.

Green river--Cooperating with Western Wyoming College on phosphorus loading levels due to sediment moving into the Flaming Gorge reservoir.

UPPER COLORADO REGION

Bureau of Reclamation

An estimate was made of the quantity of sediment that would be deposited in front of the moss screen structure proposed for Stage I of the Government Highline Canal. Using 14 suspended samples collected from the canal throughout the irrigation season for the analyses, the amount of sediment to be deposited annually in front of the structure was estimated to be 3.950 m^3 (3.2 acre-feet) using settling basin design procedures.

UPPER COLORADO REGION

GEOLOGICAL SURVEY

Colorado Headwaters Subregion

1. Suspended-sediment data are being collected on a daily basis at Parachute Creek at Parachute, Colo., and at Roan Creek near Debeque, Colo., as a part of Federal sedimentation study in oil shale areas.

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

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, Colo., as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at the following sites as a part of the USGS Coal Hydrology program:
   Anthracite Creek near Somerset, Colo.
   Spring Creek near Beaver Hill, Colo.
   Spring Creek near Montrose, Colo.

Upper Colorado-Dolores Subregion

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

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

3. Suspended-sediment data are being collected on a monthly basis at Beaver Creek near Norwood, Colo. and San Miguel River at Naturita, Colo., as a part of the USGS Coal Hydrology program.

Great Divide-Upper Green Subregion

1. Suspended-sediment data are being collected on a storm-event basis at Bitter Creek near Bitter Creek, Wyo., as a part of the Federal Energy program.

2. Suspended-sediment data are being collected on a daily basis at Green River near Green River, Wyo. as a part of the Federal Energy program.

3. Suspended-sediment data are being collected at the following sites on a monthly and storm-event basis in cooperation with the Wyoming State Engineer:
   Green River near LaBarge, Wyo.
   Big Sandy River near Farson, Wyo.

Big Sandy River below Eden, Wyo.
Hams Fork near Granger, Wyo.
Blacks Fork near Little America, Wyo.
Blacks Fork near Lyman, Wyo.

4. Suspended-sediment data are being collected at the following sites on a monthly and/or storm-event basis in cooperation with the U.S. Bureau of Land Management:

Little Sandy Creek above Eden, Wyo.
Bitter Creek above Salt Wells Creek, near Salt Wells, Wyo.
Dry Canyon near South Baxter, Wyo.
Little Muddy Creek near Glencoe, Wyo.
Muddy Creek near Hampton, Wyo.
Vermillion Creek near Hiawatha, Colo.
Separation Creek near Riner, Wyo.

5. Suspended-sediment data are being collected on a daily basis at Salt Wells Creek near Salt Wells, Wyo., and Salt Wells Creek near South Baxter, Wyo., in cooperation with the U.S. Bureau of Land Management.

6. Suspended-sediment data are being collected on a monthly basis at Vermillion Creek at Ink Springs Ranch, Colo., as a part of the USGS Coal Hydrology program.

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

White-Yampa Subregion

1. Suspended-sediment data are being collected on a monthly and storm-event basis at Little Snake River near Dixon, Wyo. in cooperation with the Wyoming State Engineer.

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

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

4. Suspended-sediment data are being collected at several sites in the coal mining region of the Yampa River basin. Two stations are equipped with pumping samplers and where the flow is continuous, daily samples are collected. The following stations are operated at the indicated frequencies:

Middle Creek near Oak Creek, Colo.	Monthly
Foidel Creek near Oak Creek, Colo.	Monthly
Foidel Creek at mouth near Oak Creek, Colo.	Daily
Jubb Creek near Axial, Colo.	Monthly
Taylor Creek at mouth near Axial, Colo.	Monthly
Watering Trough Gulch near Hayden, Colo.	Monthly
Hubberson Gulch near Hayden, Color.	Monthly
Wilson Creek above Taylor Creek near Axial, Colo.	Daily
Stokes Gulch near Hayden, Colo.	Daily

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

5. 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. All stations are equipped with pumping sediment samplers and where the flow is continuous, daily samples are collected. Intermittent stations are designed to sample all significant peaks and low flow samples are collected when possible. The following stations are operated at the indicated frequency:

Piceance Creek below Rio Blanco, Colo.	Daily
Stewart Gulch above West Fork, Colo.	Daily
Piceance Creek tributary near Rio Blanco, Colo.	Peaks
Scandard Gulch at mouth, Colo.	Peaks
Willow Creek near Rio Blanco, Colo.	Daily
Piceance Creek above Hunter Creek, Colo.	Daily
Black Sulfur Creek near Rio Blanco, Colo.	Daily
Piceance Creek below Ryan Gulch, Colo.	Daily
Piceance Creek at White River, Colo.	Daily
Corral Gulch below Water Gulch, Colo.	Peaks
Dry Fk. near Rangely, Colo.	Peaks
Tributary to Box Elder Gulch near Rangely, Colo.	Peaks
Corral Gulch near Rangely, Colo.	Daily
Yellow Creek near White River, Colo.	Daily

These stations are operated in cooperation with the Colorado River Water Conservation District.

6. Suspended-sediment data are being collected on a monthly basis at White River below Meeker, Colo., and White River above Rangely, Colo., in cooperation with the U.S. Bureau of Reclamation

7. 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.

8. Suspended-sediment data are being collected on a comprehensive level at White River near mouth near Ouray, Utah, in cooperation with the U.S. Bureau of Land Management.

9. Suspended-sediment data are being collected on a monthly basis at Yampa River below Diversion, near Hayden, Colo., in cooperation with the Environmental Protection Agency

10. Suspended-sediment data are being collected on a periodic basis at Horse Draw near Rangely, Colo., and at Horse Draw at mouth, near Rangely, Colo., in cooperation with the U.S. Bureau of Mines.

Lower Green Subregion

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

2. Sediment accumulation in Scofield Reservoir near Scofield, Utah, was surveyed as part of the Coal Hydrology program in cooperation with the U.S. Bureau of Land Management.

Upper Colorado - Dirty Devil Subregion

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

San Juan Subregion

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

2. Suspended-sediment data are being collected on a comprehensive level at Fremont River near Cainville, Utah, in cooperation with the Utah Department of Natural Resources.

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

4. Suspended-sediment data are being collected on a daily basis at Chaco River near Waterflow, N. Mex. and San Juan River at Shipreck, N. Mex., as a part of the USGS Coal Hydrology Program.

5. 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 USGS Coal Hydrology Program.

6. Suspended-sediment data are being collected on a monthly basis at San Juan River near Bluff, Utah, as part of NASQAN.

Special Studies

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 U.S. Bureau of Land Management funds.

As part of the Federal program for the determining baseline conditions in the areas of potential oil-shale development in the White River basin, Utah, 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
301 West Congress Street,
Box FB-44
Tucson, AZ 85701

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 26659
815 Western Bank Building
505 Marquette, NW
Albuquerque, NM 87125

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
J. C. O'Mahoney Federal Center
Room 5017
2120 Capitol Avenue
Cheyenne, WY 82001

District Chief, WRD
U.S. Geological Survey
Rm 1016 Admin. Bldg.
1745 West 1700 South
Salt Lake City, UT 84104

LOWER COLORADO REGION

BUREAU OF LAND MANAGEMENT

New Mexico

An areal study of sediment yield in Grant, Hidalgo and Luna Counties, New Mexico, was completed under contract during 1981 as part of a general water resource inventory. Total sediment yields were classified using the Pacific Southwest Inter-Agency Committee's (1968) method. This information is being used for general land management planning purposes and environmental impact statements.

Arizona

Water quality data acquisition on the Burro Creek Watershed, a tributary to the Bill Williams River, began September 30, 1981 under contract with the Arizona Department of Health Services, Bureau of Water Quality Control.

The principal purpose of this study is to examine existing hydrologic and water quality data, develop a sampling scheme to identify source areas of toxic materials and develop strategies for water quality enhancement. An intensive survey will be conducted over a two-year period which includes monitoring suspended and total dissolved solids.

LOWER COLORADO REGION

Bureau of Reclamation

A siphon scour study was prepared for the Gila River crossing of Reach 4 of the Salt-Gila Aqueduct. The 100-year flood peak of 2,188 m^3/s (77,300 ft^3/s) was analyzed using the Blench and Lacey regime equations and the effective bed material size. The streambed material was collected and sized to a depth of 5.8 meters (19 feet). The resulting estimated scour depth was 3 meters (10 feet) and it was recommended that the siphon be placed to that depth all the way across the valley alluvium.

A reanalysis of the scour estimate for the Salt River in the vicinity of the Salt River Siphon of the Granite Reef Aqueduct was made using the new 100-year flood peak discharge of 6,226 m^3/s (220,000 ft^3/s for three construction alternatives. For the alternative of locating a weir type control structure within the right-of-way of the Salt River Siphon, the scour immediately downstream was estimated to be 8.8 meters (29 feet). For the second alternative of capping the siphon, a scour depth of 6.7 meters (22 feet) immediately downstream from the siphon was estimated. The recommended depth to lower the pipe to protect it from scour was estimated at 6.1 meters (20 feet).

A review of operation and maintenance for channelization of the Colorado River provided an opportunity to observe river conditions for comparison with previous inspections. The conditions of riprap looked good with continued need for a better graded rock. Additional riprap is being added along with raising of the levee in the Cibola and Mohave Valley Divisions. No major problems were noted on sediment inflow from tributaries. Movement of sediment to the downstream reaches of the river continues with erosion of the streambed and banks especially in the Parker Division. In reviewing the sediment sampling and analysis of samples, some changes were recommended when encountering sands and gravels intermixed at a station. If sufficient quantities of gravels are mixed with sands then, the laboratory will separate the sample and run two size analyses.

A sediment study for Waddell Reservoir and proposed New Waddell Damsite was prepared. The yield of 205.7 $m^3/km^2/year$ (0.432 acre-feet/mi^2/year) was used to project future conditions. The calculated sediment depth at New Waddell Damsite is 11.9 meters (39 feet) or up to elevation 447 meters (1467 feet) m.s.l. for a 100-year sediment deposition of 84.86 x 10^6 m^3 (68,800 acre-feet). Breaching of Waddell Dam at the existing sediment level of 456 meters (1496 feet) m.s.l. or 461.5 meters (1514 feet) m.s.l. would result in the same 11.9 meters (39 feet) of deposition at New Waddell Damsite.

A hydrographic survey of Roosevelt Lake on the Salt River in Arizona was completed. Thirty-two sediment ranges were surveyed, 28 of which were resurveys of ranges established prior to 1946, and 4 which were newly established. The original data was based on 1915 topography and 1916 cross section plots. The survey was accomplished using a Motorola Mini-Ranger III system for positioning and a Raytheon 719B fathometer

Bureau of Reclamation

for determining depth. The deposited sediment was sampled at 28 locations in the reservoir using a gravity core sampler. The samples will be used to determine size gradation and density of sediment deposits. In the 72.4 years since closure of the dam, a total of 239.3 x 10^6 m^3 (194,000 acre-feet) of sediment has accumulated below spillway crest elevation. The sediment yield rate for the contributing drainage area of 14,786 km^2 (5,709 mi^2) is 223.4 m^3/km^2/year (0.469 acre-feet/mi^2/year). The 1981 reservoir capacity is 1.649 x 10^9 m^3 (1,336,700 acre-feet). New area-capacity tables were published.

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, Nev.
   Muddy River above Lake Mead near Overton, Nev.

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

3. Suspended-sediment data are being collected monthly at Las Vegas Wash near Henderson, Nev., and twice-monthly at Las Vegas Wash near Boulder City, Nev., in cooperation with the U.S. Bureau of Reclamation.

Little Colorado Subregion

1. Suspended-sediment data are being collected on a daily basis in cooperation with the U.S. Corps of Engineers at Little Colorado River near Joseph City, Ariz.

2. Suspended-sediment data are being collected on a flow event basis at Leroux Wash near Holbrook, Ariz. in cooperation with the U.S. Corps of Engineers.

3. Suspended-sediment data are being collected on a monthly basis at Little Colorado River at Cameron, Ariz., as a part of NASQAN.

4. Suspended-sediment data are being collect on a monthly basis at Zuni River above Black Rock Res., N.Mex., in cooperation with the U.S. Bureau of Reclamation and at Rio Puerco at Gallup, N.Mex., 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, Ariz.
   Bill Williams River near Planet, Ariz.

Upper Gila Subregion

1. Suspended-sediment data are being collected on a monthly and storm-event basis at Mongollon Creek near Cliff, N. Mex. 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, N. Mex., as part of NASQAN, and monthly at San Francisco River near Glenwood, N. Mex. in cooperation with NMISC.

3. Suspended-sediment data are being collected on a monthly basis at Gila

River at Calva, Ariz., as a part of NASQAN.

Middle Gila Subregion

1. Suspended-sediment data are being collected on a monthly basis as a part of NASQAN at:
   - San Pedro River below Aravaipa Creek, near Mammoth, Ariz.
   - Gila River at Kelvin, Ariz. (Discontinued September 30, 1981)
   - Santa Cruz River near Laveen, Ariz. (Discontinued September 30, 1981)

2. Suspended-sediment data are being collected on a monthly basis at Gila River at Kelvin, AZ., incooperation with the U.S. Bureau of Reclamation.

Salt Subregion

1. Suspended-sediment data are being collected on a monthly basis at Wet Bottom Creek near Childs, Ariz., as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a monthly basis as a part of NASQAN at:
   - Gila River above diversions, at Gillespie Dam, Ariz.
   - Gila River near mouth, near Yuma, Ariz.

Sonora Subregion

1. Suspended-sediment data are being collected on a daily basis at San Simon Wash near Pisinimo, Ariz., in cooperation with the U.S. Bureau of Indian Affairs (discontinued Sept. 30, 1981).

2. Suspended-sediment data are being collected on a monthly basis as a part of NASQAN at:
   - Vamori Wash at Kom Vo, Ariz.
   - Whitewater Draw near Douglas, Ariz. (Discontinued Sept. 30, 1981)

Special Studies

Sediment data were collected during periods of flow at two small water-sheds in the area of strip mining along Coal Mine Wash and Coal Mine Wash at mouth near Kayenta, Ariz., as part of a study pertaining to the effects of strip mining and rehabilitation of spoil piles on the sediment yield. (Discontinued Sept. 30, 1981)

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

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

District Chief, WRD
U.S. Geological Survey
Federal Building, Room 227
705 North Plaza Street
Carson City, NV 89701

District Chief, WRD
U.S. Geological Survey
P.O. Box Box 26659
815 Western Bank Building
505 Marquette, NW
Albuquerque, NM 87125

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

LOWER COLORADO REGION

SOIL CONSERVATION SERVICE

1. An erosion and sediment working paper was completed for the following:

   a. River Basin Investigation

Major Basin	Basin Reported	State
Lower Colorado	Little Colorado River	Arizona

GREAT BASIN REGION

Bureau of Land Management

Nevada

Saval Ranch Project: The project objective is to evaluate the hydrologic effects of intensive livestock management. During 1981, suspended sediment sampling continued at key locations. Soil loss was measured from rainfall simulation plots as part of a vegetational cover study. A channel survey was completed to document erosion and depositional processes as a function of several causative factors. A relationship was developed between sediment yield and snowmelt period peak streamflow.

Further Information: Steve A. Loomis, Hydrologist
Bureau of Land Management (D-470)
Denver Federal Center, Bldg. 50
Denver, CO 80225

GREAT BASIN REGION

GEOLOGICAL SURVEY

Bear Subregion

1. Suspended-sediment data are being collected on a monthly and storm-event basis at Twin Creek at Sage, Wyo., in cooperation with the U.S. Bureau of Land Management.

2. Suspended-sediment data are being collected on a bimonthly basis at Bear River at Border, Wyo., as a part of National Stream-Quality Accounting Network (NASQAN).

3. Suspended-sediment data are being collected on a monthly basis at Bear River near Corinne, Utah, as a part of NASQAN.

Great Salt Lake Subregion

1. Suspended-sediment data are being collected on a monthly basis at Red Butte Creek at Fort Douglas, near Salt Lake City, Utah, as part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a monthly basis at Weber River near Plain City, Utah and at Jordan River at Salt Lake City, Utah, as a part of NASQAN.

Escalante - Sevier Lake Subregion

1. Suspended-sediment data are being collected on a monthly basis at Sevier River near Lynndyl, Utah and at Beaver River at Adamsville, Utah, 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, Nev.
   - Humboldt River near Rye Patch, Nev.
   - Quinn River near McDermitt, Nev.

Central Lahontan Subregion

1. Suspended-sediment data are being collected bimonthly at the following sites as part of NASQAN:
   - Walker River near Wabuska, Nev.
   - Carson River near Churchill, Nev.
   - Truckee River near Nixon, Nev.

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, Calif.
   - Martis Creek Lake near Truckee, Calif.
   - Martis Creek near Truckee, Calif.

Central Nevada Desert Basins Subregion

1. Suspended-sediment data are being collected monthly at Steptoe Creek near Ely, Nev., and South Twin River near Round Mountain, Nev. as part of the National Hydrologic Benchmark Network and bimonthly at Chiatovich Creek near Dyer, Nev. as part of NASQAN.

Special Studies

1. A two-year study of the relationships between fluvial-sediment transport and planned erosion-control measures in Edgewood Creek, Lake Tahoe Basin began in October 1980. Data include streamflow, sediment, and plant nutrients.

2. A two-year study of the relations between fluvial-sediment transport and engineered rehabilitation of erosion in the First Creek basin of Incline Village, north Lake Tahoe, was begun in October 1979. Numerous data are being collected to evaluate effects of planned erosion-control measures in this urbanized basin. Data include sediment and nutrient concentrations and particle-size distribution of transported sediment.

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

District Chief, WRD
U.S. Geological Survey
Federal Building, Room 227
705 North Plaza Street
Carson City, NV 89701

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
J. C. O'Mahoney Federal Center
Room 5017
2120 Capitol Avenue
Cheyenne, WY 82001

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

1. Sediment yield studies were continued in the St. Johns Irrigation Company Project.

Major Drainage	County	State
Little Malad River	Oneida	Idaho

PACIFIC NORTHWEST REGION

BUREAU OF LAND MANAGEMENT

Idaho

Sediment criteria technical advisory committee: This committee was set up by the State of Idaho to establish sediment criteria and possibly Statewide standards. The BLM has had a major role in developing sedimentation criteria for wildland watersheds. A report has been completed and is available from the Idaho Department of Health and Welfare, Division of Environment.

Road erosion technical advisory committee: This committee was set up to evaluate road construction, operation, and maintenance in order to develop best management practices for reducing erosion. The BLM supplied an extensive literature review for this project. Products of the committee will include a practice manual and possibly State regulations. The final report will be released in July of 1982.

Remote sensing to identify erosion areas: The Idaho State Office of the BLM is experimenting with various scales of photography for using density analysis to determine eroding areas. The project is also attempting to assess vegetative cover measurement methodologies important in estimating erosion and sedimentation. Several field plots have been examined along with the step-point transect, tape-point transect, and ocular methods for estimating cover. Findings are expected to be submitted for publication in the latter part of FY 1982.

Livestock-aquatic assessment methodology: This study is being conducted by the USFS Forest and Range Experiment Station funded by BLM. The objectives are to determine what characteristics will provide a reasonable assessment of livestock impacts on the aquatic system. Among the characteristics being evaluated are sediment measurements, stream sediment yield, and stream stability. This year's work includes describing the usefullness, validity, measurement error,and capability of standarization for 19 characteristics commonly collected in hydrologic and aquatic studies. Most of the characteristics relate to sedimentation. Results of the first phase of the work is available. Further results of the study will be available in mid-1983.

Pending Publications: Johnson, Clifton W. and Karl A. Gebhardt 1981, "Predicting Sediment Yields from Sagebrush Rangelands." Proceedings of the workshop on rangeland soil loss and sediment yield. Tucson, Arizona, March 3-5, 1981.

Gebhardt, Karl A. 1981, "Use of Erosion Models on Western Rangelands." Proceedings of the workshop on rangeland soil loss and sediment yield. Tuscon, Arizona, March 3-5, 1981.

Reynolds Creek Experimental Watershed: This is a cooperative research project near Nampa, Idaho, between BLM and the USDA Science and Education Administration. This representative rangeland watershed is used to develop and/or test improved procedures for predicting the effects of livestock grazing management and range improvement practices on rangeland resources and hydrologic response, as well as establishing a complete data base of the watershed's basic resources. There are five major subprojects ongoing: (1) precipitation, (2) vegetation, (3) runoff, (4) erosion and sediment, and (5) water quality.

During FY 82, SEA is continuing sediment data collection at four sites within the Reynolds Creek Watershed. Work is being done during FY 82 on evaluating the Universal Soil Loss Equation (and modification thereof) and the Pacific Southwest Interagency Sedimentation Committee (PSIAC) Method. Efforts are underway to extend the runoff and sediment yield relationships developed at Reynolds Creek to other gaged and ungaged areas within the State of Idaho and the Columbia Plateau Province.

Much valuable work has been completed assessing sediment yield from various subwatersheds of Reynolds Creek. Annual progress reports are available as well as numerous publications by the various SEA scientists associated with various aspects of the project. The project is in the fourth year of the current 5-year contract.

Big Lost River Water Quality Improvement Project: Project is underway on the Big Lost River in Idaho's Salmon District for the purpose of reducing sedimentation and bank erosion. The BLM has provided aerial photography, intepretation, erosion transect data, and has helped install demonstration projects. The cooperative project has various Federal, State, local agencies and private landowners involved. Sedimentation studies are also underway under the direction of the USGS-WRD, Boise, Idaho.

PACIFIC NORTHWEST REGION

BUREAU OF LAND MANAGEMENT

OREGON

Streamflow and chemical and physical properties, including sediment, are collected at 11 sites in cooperation with county watermasters. These sites are equipped with automatic samplers. Additional data are being collected at four gaged and numerous ungaged sites by Bureau personnel.

The BLM is working closely with the State's 208 programs in development of rangeland BMP's and in the identification of nonpoint pollution sources.

Additional work was completed on Coal Mine Creek in the Malheur River drainage to control gully development and improve ground cover. Increased emphasis has been placed upon design of stockwater reservoirs to reduce downstream sedimentation which has resulted from inadequate spillway design.

PACIFIC

Bureau of Reclamation

A review of the proposed loc
and Ellisford Pumping Plants
point, the intake structure
placed at about 25 meters (8
edge. The relocated Tonaske
located at about 15 meters (
location for Ellisford Pumpi
35 meters (115 feet) from th
currence interval design flo
crossing or siphon at the sa

PACIFIC NORTHWEST REGION

CORPS OF ENGINEERS

North Pacific Division

Portland District

Sedimentation Ranges

Project:	Applegate Reservoir
Activity:	Installing monuments and surveying sedimentation ranges. All 24 designated ranges have been surveyed. Report in progress.
Purpose:	Initial survey of reservoir and upstream and downstream channels for later evaluation of aggradation, degradation, and siltation.
Type of Survey:	Range Survey
Elements Measured:	Position of monuments, profile of ground surface and river sections.
Equipment Used:	Survey scope

Sediment Sampling. For post-impoundment purpose, samplings were conducted daily on Rogue River at Lost Creek Damsite. Types of records maintained are: suspended sediment, dissolved solids, temperature, turbidity, conductivity, pH, dissolved oxygen. For planning and design purpose, samplings were conducted weekly on Applegate River at Applegate Damsite, and intermittently on Cowlitz River at Kelso and Toutle River at Hwy. 99 bridge. Types of records maintained are: suspended sediment, bed load, dissolved solids, temperature, etc.

Synopsis - Mt. St. Helens Sedimentation Activities (Cowlitz and Toutle Rivers). In Water Year 1981 a sediment study was developed for the Cowlitz and Toutle Rivers in the aftermath of the eruption of Mt. St. Helens. The objective was to provide estimates of sediment yield at various locations in the study area and amount and location of scour and deposition. The study is funded through FY 1982.

In Water Year 1981, 17 million cubic yards of sand-size and larger material were calculated to have been delivered to the Cowlitz by the Toutle. Amount dredged from the Cowlitz in Water Year 1981 was 36 million cubic yards. The delivery of sand-and-larger size material from the Cowlitz to the Columbia was estimated to have been 5 M.C.Y.

Reports by Portland District on the sedimentation project are listed below:

Advance Measures 10, July 1981.
Long-term Program for Cowlitz and Toutle River Basins, July 1981.
Mt. St. Helens Sedimentation Study FY 1981 Status Report, November 1981.
A 1982 year-end report will be published in September 1982.

Walla Walla District

The following sedimentation surveys were conducted during calendar year 1981.

1. Range Surveys. Lower Granite Reservoir annual sediment range survey was started in the fall of 1981. There were only six ranges surveyed on the Snake River and the three ranges on Asotin Creek were surveyed. The surveys were accomplished by the use of a boat with electronic positioning equipment and an echo sounder. These surveys were conducted to determine the amount of deposition at the specific ranges. The remainder of the Lower Granite Reservoir ranges will be surveyed during the first quarter of 1982. Survey data should be reduced and plotted in cross-section format by the end of the third quarter of 1982. The survey is being used to monitor the sediment buildup in the Lower Granite Reservoir.

2. Topographic Surveys. Topographic surveys were conducted at three locations in the Lower Granite Reservoir. The purpose of the topographic surveys was to determine the location and quantity of sediment buildup. The locations of the topographic surveys were: Clearwater River from River Mile 0 to River Mile 2, Snake River from River Mile 142.7 to River Mile 143.7, and Hellsgate Marina on the Snake River. The survey data have been reduced and plotted. The equipment used in gathering these data was a boat equipped with an electric positioning device and an echo sounder.

3. Spot Surveys. The USGS sampled approximately 140 locations on the Clearwater River from River Mile 0.67 to River Mile 2.89 and the Snake River from River Mile 108.31 to River Mile 144.73. The samples were taken with a BM-54 bed sampler. The purpose of the sampling was to determine the characteristics of the deposited sediment. The samples were taken at established sediment ranges. The sampling was accomplished by positioning the boat on the sediment range and using a transponder to obtain the distance from the shore to the point being sampled. The samples were analyzed for gradation and will be used in conjunction with the Lower Granite sediment model calibration.

Sediment load measurements have not changed since the 1980 annual report.

Littoral sediment transport was investigated at Charbonneau Park approximately 1.5 miles upstream of Ice Harbor Lock and Dam on the Snake River. The study suggested a combination of a breakwater and jetty would reduce the sediment being transported into the boat basin. The breakwater and jetty combination has been constructed but to date the boat basin has not been dredged to the required elevation. Once the basin is dredged topographic soundings will be taken and the basin will be observed for the effects of sediment buildup.

Sediment range monuments were replaced in both the Lower Granite Reservoir and the McNary Reservoir.

Forest Service

PACIFIC NORTHWEST REGION

Northern Region (R-1)

Two erosion and sedimentation publications have been prepared:

1. Analysis of Erosion and Sediment Control Measures on Lolo Creek Watershed, Snake River Basin, Idaho.

2. List of Selected References, Erosion and Sediment Publications, Montana Timber - Water Cooperative Study.

Intermountain Region (R-4)

The Forest Service is continuing to monitor suspended sediment as part of the water quality monitoring programs of all National Forests in Region 4. Selected management activities, such as timber sales, range allotments, mining activities, and road construction, are monitored to evaluate compliance with Best Management Practices. All stations and data are stored in the EPA's STORET computer system. Region 4 data can be retrieved for each of the major basins by specifying agency code 113FORS4. Major river basins in which this sediment data is collected include the Upper Colorado, Great Basin, and Pacific Northwest Regions.

In the Pacific Northwest Region, suspended sediment and bedload data are being collected to evaluate the impacts timber harvesting has on anadromous fisheries watersheds. Data analysis is also underway to attempt to determine if sediment yields correlate with dominant landforms in the area. These efforts are primarily underway on the Boise and Payette National Forests.

A sediment yield prediction procedure has been developed by the Northern and Intermountain Regions of the Forest Service. The procedure is primarily applicable to forested watersheds in or generally associated with the Idaho Batholith. The model produces quantified estimates of sediment yields prior to management, and sediment yields in response to various management scenarios for any number of years. Types of management activities modeled are roading, logging, and fire. The model estimates on-site erosion for a given management activity, modifies the amount of erosion according to general land unit characteristics, delivers the eroded material to the stream system, and routes it through the watershed to a critical stream reach where interpretations are made concerning impacts on fisheries. The model is used for project and land management planning. The model is written up in the following document: "Guide for Predicting Sediment Yields from Forested Watersheds."

For additional information, contact Pete Stender, Regional Hydrologist, Soil and Water Management, 324 25th Street, Ogden, Utah 84401.

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, Wash., as a part of the National Stream Quality Accounting Network (NASQAN).

2. Suspended-sediment data are being collected on a daily basis at Kootenai River near Copeland, Idaho, as part of the U.S. Geological Survey waterways-treaty program.

3. Suspended-sediment data are being collected on a periodic basis from Big Creek near Calder, Idaho, and Gedney Creek near Selway Falls, Idaho, as part of a study to assess the effects of ash from the Mt. St. Helens eruption.

Upper Columbia Subregion

1. Suspended-sediment data are being collected on a periodic basis at Columbia River at Northport, Wash., at Columbia River at Vernita Bridge, near Priest Rapids Dam, Wash., and at Okanogan River at Malott, Wash., as a part of NASQAN.

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

3. Bimonthly suspended-sediment data are being collected at the following sites as part of NASQAN:

Clark Fork below Missoula, Mont.
Flathear River at Flathead, British Columbia, Canada
Flathead River at Columbia Falls, Mont.

4. Suspended-sediment data are being collected on a quarterly basis at Columbia River at Richland, Wash., in cooperation with the U.S. Department of Energy.

5. Suspended-sediment data are being collected on a daily basis from irrigation-return flows at three sites and from periodically irrigation delivery flows at 22 sites on the Royal Slope in Washington, as part of a study of best-management practices in cooperation with the Washington State University.

Yakima Subregion

1. Suspended-sediment data are being collected periodically at Yakima River near Union Gap, Wash., and at Yakima River at Kiona, Wash., as part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis from irrigation-return flows at four sites near Sunnyside, Wash., in cooperation with the Washington State Department of Ecology.

Upper Snake Subregion

1. Suspended-sediment data are being collected on a monthly basis at Cache

Creek near Jackson, Wyo., as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a monthly basis and at Snake River near Heise, Idaho, as a part of NASQAN.

3. Suspended-sediment data are being collected on a periodic basis at Blackfoot River above reservoir near Henry, Idaho, Blackfoot River near Blackfoot, Idaho, and at Portneuf River at Pocatello, Idaho, in cooperation with the Idaho Department of Water Resources.

Middle Snake Subregion

1. Suspended-sediment data are being collected at various flow rates at Snake River at King Hill, Idaho, as a part of NASQAN.

2. Suspended-sediment data are being collected on a monthly basis at Big Jacks Creek near Bruneau, Idaho, as a part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a periodic basis at Mores Creek near Arrowrock Dam, Idaho, and at Weiser River near Weiser, Idaho, in cooperation with the Idaho Department of Water Resources.

4. Suspended-sediment data are being collected on a monthly basis at Weiser River near Cambridge, Id., Weiser River below Lake Weiser near Cambridge, Id., and Crane Creek at mouth nr Weiser, Id., in cooperation with the Idaho Department of Water Resources.

Lower Snake Subregion

1. Suspended-sediment data are being collected on a monthly basis at Salmon River near White Bird, Idaho, and Clearwater River at Spalding, Idaho, as part of NASQAN

2. Suspended-sediment data are being collected on a periodic basis at Lapwai Creek near Lapwai, Idaho, and at Palouse River near Potlach, Idaho, in cooperation with the Idaho Department of Water Resources.

3. Suspended-sediment data are being collected at Snake River at Burbank, Wash., as a part of NASQAN.

4. Suspended-sediment data are being collected on a periodic basis from Minam River at Minam, Oreg., as a part of the National Hydrologic Benchmark Network, and from Owyhee River near Owyhee, Oreg., 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, Oreg., at Klickitat River near Pitt, Wash., and at Deschutes River near Biggs, Oreg., as a part of NASQAN.

2. Suspended-Sediment data are being collected on a daily basis at White River below Tygh Valley, Oreg., in cooperation with Northern Wasco County Peoples

Utility District.

Lower Columbia Subregion

1. Suspended-sediment data are being collected on a periodic basis at Columbia River at Warrendale, Oreg., and monthly at Lewis River at Ariel, Wash., and at Cowlitz River at Kelso, Wash., as a part of NASQAN.

2. Suspended-sediment data are being collected on a daily basis at Bull Run River near Multnomah Falls, Oreg., South Fork Bull Run River near Bull Run, Oreg., North Fork Bull Run River near Multnomah Falls, Oreg., and at Fir Creek near Brightwood, Oregon, in cooperation with the city of Portland, Oreg., to provide some information needed 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, Oreg., and at Willamette River at Portland, Oreg., as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis from Tualatin River near Dilleg, Oreg., in cooperation with the U.S. Bureau of Reclamation.

Oregon-Washington Coastal Subregion

1. Suspended-sediment data are being collected on a periodic basis at Rogue River near Agress, Oreg., Umpqua River near Elkton, Oreg., Siuslaw River near Mapleton, Oreg., Alsea River near Tidewater, Oreg., Nehalam River near Foss, Oreg., Chehalis River at Porter, Wash., Willapa River near Willapa, Wash., and at Queets River near Clearwater, Wash., as a part of NASQAN.

2. Suspended-sediment data are being collected at North Fork Quinault River near Amanda Park, Wash., as part of the National Hydrologic Benchmark Network.

3. Suspended-sediment data are being collected on a biweekly basis from Applegate River near Copper, Oreg., in cooperation with the U.S. 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, Wash., Skagit River near Mount Vernon, Wash., Snohomish River near Monroe, Wash., and at Puyallup River at Puyallup, Wash., as a part of NASQAN.

2. Suspended-sediment data are being collected during selected storm-runoff periods at three sites in the Bellevue Urban Study area in cooperation with the City of Bellevue, Wash.

Oregon Closed Basins Subregion

1. Suspended-sediment data are being collected on a periodic basis at Donner and Blitzen River near Frenchglen, Oreg., as a part of NASQAN.

Special Studies

1. During 1981, suspended-sediment data were collected on several streams in the vicinity of Jackson, Wyo., to determine sediment yield characteristics of small basins pursuant to an Environmental Impact assessment of the Cache Creek-Bear thrust area of concern. Daily suspended-sediment data and periodic bedload data are being collected at Little Granite Creed near Bandurant, Wyo., in cooperation with the U.S. Forest Service.

2. Bedload and suspended sediment data were collected during April thru July at five sites on the Big Lost River in Battle County, Id. The primary objective of this interagency one-year study is to assess past and present channel change and to estimate the probable response of this river system to planned artificial influences. Agencies involved were U.S. Geological Survey, U.S. Bureau of Land Management and U.S. Soil Conservation Service with participation by Battle County Soil Conservation District and Idaho Department of Health and Welfare.

3. Collection of suspended-sediment data in streams near Mount St. Helens has continued since May 1980. Sediment data are presently collected at 3 sites in the Toutle River Basin, 4 in the Lewis River Basin, and 1 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 with conventional sampling equipment.

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

District Chief, WRD
U.S. Geological Survey
Box 036
Federal Building, Room 365
550 West Fort Street
Boise, ID 83724

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

District Chief, WRD
U.S. Geological Survey
830 Northeast Holladay Street
Portland, OR 97232

District Chief, WRD
U.S. Geological Survey
1201 Pacific Avenue, Suite 600
Tacoma, WA 98402

District Chief, WRD
U.S. Geological Survey
P.O. Box 1125
J. C. O'Mahoney Federal Center
Room 5017
2120 Capitol Avenue
Cheyenne, WY 82001

PACIFIC NORTHWEST REGION

SOIL CONSERVATION SERVICE

1. Sediment yield was investigated for the following:

a. River Basin Investigations

Major Basin	Basin Reported	Study Area	State
Columbia	Upper Snake River	Hazelton Butte	Idaho
		Summit	Idaho
		Big Lost River	Idaho
Columbia	Middle Snake River	Little Valley	Idaho
Columbia	Lower Snake River	Thorn Creek	Idaho
Columbia	Lower Snake River	Walla Walla, Columbia, Garfield, Asotin, Franklin, Adams, Whitman Counties	Washington

2. Sedimentation Surveys

Watershed reports including reservoir sedimentation accumulation data were completed for the following:

Reservoir	Drainage	County	State
Plat I	Sutherlin Creek	Douglas	Oregon
Cooper Creek	Cooper Creek	Douglas	Oregon

3. Nonpoint Pollution Studies (PL-208)

The study of sediment damages and determination of sediment yields was continued in the following areas:

a.

Subregion	Counties	State
Mid-Columbia	Wasco, Sherman Gilliam, Morrow Umatilla	Oregon

This is an ongoing study to evaluate the impact of sedimentation on water quality in the five-county area. The report completion date is scheduled for April 1982.

b.

Subregion	County	State
Lower Columbia	Columbia	Oregon

RCWP - Solutions to Environmental and Economic Problems - STEEP (PL-208)

A cooperative study between Oregon State University and the Soil Conservation Service was initiated in Columbia County, Oregon to evaluate the effects of tile drainage systems on erosion and sediment yield from croplands.

c. Subregion	County	State
Lower Snake	Malheur	Oregon

A grant was applied for to set up demonstration plots to study erosion and sediment yield from furrow irrigated croplands in Malheur County, Oregon. The grant has been awarded and implementation of the study is in progress. Some background data has been collected. Cooperating agencies include Malheur County Court, County ASC Committee, SWCD, ASCS, OSU Extention Service, SCS, and the Malheur Experiment Station. Also, the University of Idaho and Snake River Conservation Research Center at Kimberly, Idaho are expected to be cooperators.

d. Subregion	County	State
Coastal	Tillamook	Oregon

RCWP - Tillamook Bay Drainage Basin (PL-208)

Effects of Best Management Practices (BMPs) are being monitored and evaluated for the basin.

e. Subregion	County	State
Mid-Columbia	Morrow	Oregon

A map showing Water Erosion Hazards on Potential Cropland for Morrow County, Oregon was prepared by the Soil Scientist's staff of Oregon.

CALIFORNIA REGION
BUREAU OF LAND MANAGEMENT

Bakersfield District: A study was initiated to monitor the erosion problems related to ORV use of the Clear Creek area. The problem is compounded by the fact that the highly erosive serpentine soils contain high levels of asbestos fibers.

Susanville District: As a part of the Tuledad/Homecamp Grazing Management Program bank erosion control structures were installed along Bare Creek. In addition, sediment accumulations in stockpond reservoirs are being monitored to improve the predictive capabilities of the USLE. Also as a part of monitoring the clay minerology of suspended sediments in streams is being used to aid in identifying the sources of sediments within the watersheds.

Redding District: Two sedimentation measurement projects were completed in the Mt. Dome Planning Unit which indicated no significant problems. Three additional sediment collection dams were installed below fuel break prescribed burns in the Four Rivers Resource Area and measurements have been taken for two years.

Fifty erosion control structures were installed on low-standard roads within the Ishi and Four Rivers Resource Areas.

Ukiah District: Prescribed burn plans were developed for Cow Mountain to reduce sedimentation from wildfire and fire suppression activities. Burn plans for other chaparral areas in the District are being prepared.

The District is an active participant in watershed restoration efforts in the Mattole River Basin. Work during CY 1981 centered on the Nooning Creek watershed in the King Range National Conservation Area with tree and shrub planting of barren and riparian areas. In addition, on-the-ground examinations of logged over areas in upper Bear Creek were conducted to develop Best Management Practices (BMPs).

California Desert District: Activity plans for Areas of Critical Environmental Concern are being developed for many areas within the California Desert District. Most of these plans will address reduction of soil erosion and sedimentation as well as soil rehabilitation and revegetation efforts.

CALIFORNIA REGION

Bureau of Reclamation

Sediment transport studies were completed for the Trinity River. These studies were made to examine the alternative of making flushing releases to clear the fish spawning gravels below Lewiston Dam. Data were collected to calibrate the PSEUDO model and water surface profiles were computed for discharges up to 283 m^3/s (10,000 ft^3/s). The hydraulic properties determined from the computed profiles were used with collected suspended sediment and bed material data to compute sediment transport capabilities with the Velocity-Xi adaptation of the Einstein Bedload function. The quantity of material in the study reach after various periods of sustained discharge was then computed for various sand size fractions. It was concluded that:

1. Releases can be made that will flush sand deposits.

2. The larger the discharge, the more efficient the flushing action is in terms of water released.

3. There is an imbalance in transport capability in the sub-reaches making up the 9.25 kilometer (5-3/4 mile) study reach. Consequently, some areas will be swept clear of sand deposits while others still retain significant quantities of material.

Flood peak estimates were prepared for the 25-, 50-, and 100-year floods at four drainage crossings of the Pacheco Conduit and the scour depth was estimated for the 100-year flood event at three of the crossings. The recommended scour depth for the Pacheco Creek, Elephant Head Creek, and Harper Canyon Creek crossings were 1.40 meters (4.6 feet), 0.91 meters (3.0 feet), and 0.91 meters (3.0 feet).

A sediment survey of Twitchell Reservoir was completed and analyzed. A total of 18.75 x 10^6 m^3 (15,200 acre-feet) of sediment has accumulated in the 22 years of reservoir operation. Sediment yield rate is 285.8 m^3/km^2/year (0.60 acre-feet/mi^2/year). The present elevation of sediment at the dam is 155.8 meters (511 feet) which is the inlet elevation to the outlet works. New area capacity tables were published.

CALIFORNIA REGION

CORPS OF ENGINEERS

South Pacific Division

Los Angeles District

Reservoir Sedimentation Data Summary Sheets for 23 basins are completed. These basins are: Hansen and San Antonio Flood Control Basins and Aliso, Big Dalton, Bradbury, Childs, Deer, Elmwood, Golf Club Drive, Kinneloa, Las Flores, La Tuna, Little Dalton, Pickens, Rowley, Schoolhouse, Spinks, Stough, Sullivan, Sunset (Lower), Sunset (Upper), Wildwood, and Zachou Debris Basins.

Sacramento District

Routine samples of lake outflows were collected and analyzed for suspended sediment at Black Butte, Pine Flat, Kaweah, Success, and Isabella Lakes.

Samples for suspended sediment were collected from the Sacramento River at Bend Bridge.

Samples for suspended sediment were collected at various sites in the Cottonwood Creek Basins.

San Francisco District

Sedimentation activities in the District during 1981 consisted of obtaining water turbidity data in connection with one completed project and one project under construction and obtaining and analyzing sediment transport data related to the project under construction. These activities are summarized below:

Sedimentation Studies for Water Resources Projects.

1. Three sediment sampling stations, operated for the District by the U.S. Geological Survey, were active in calendar year 1981. Data from these stations, all in the Russian River basin, are being used to prepare a report evaluating the effects of Coyote Dam (Lake Mendocino) and Warm Springs Dam (Lake Sonoma) on sedimentation and the sediment-transport characteristics of Dry Creek and the Russian River. The report is scheduled to be completed in calendar year 1982.

2. A program designed to monitor the turbidity of the inflow to and outflow from Lake Mendocino on the Russian River has been in operation since March 1973. Measurements are made bi-weekly by reservoir-operations personnel. The data are published in the USGS Water Supply Papers.

3. Water turbidity is also measured periodically on Dry Creek below Warm Springs Dam, a Corps of Engineers project under construction on a tributary of the Russian River.

Forest Service

CALIFORNIA

Pacific Southwest Region (R-5)

Region 5 restored 1,842 acres of damaged watersheds. This consisted of gully restoration, and closure of unneeded roads and abandoned log landings. A total of 486 acres of fish habitat improvement, which consists of improvement of spawning beds and some channel bank stabilization, was also accomplished in calendar year 1981.

CALIFORNIA REGION

GEOLOGICAL SURVEY

Klamath Northern California Coastal Subregion

1. Lumbering and sawmill operations at the preriphery of Redwoods National Park, Calif., may load the streams entering the park with sediment and unwanted nutrients. A study is being made to determine the present rates of sediment transport, the chemical quality, and the level of nutrients of the streams at the periphery and within the park, and to provide an overall appraisal of water resources in the park. Two data releases covering the period September 1, 1973 through September 30, 1975, have thus far been published. The study will aid the National Park Service in developing and protecting the water resources and ecological system in the park. Work is being done in cooperation with the National Park Service.

2. The Grass Valley Creek project is a continuing total-load data-collection program in cooperation with the California Department of Water Resources. The study was begun in 1976 to determine the amount of sediment contributed by Grass Valley Creek to the Trinity River below Lewiston Dam.

Sacramento Subregion

1. The Cottonwood Creek project is a continuing total-load data-collection program for the U.S. Corps of Engineers. Sediment data are being collected to determine sediment discharge at two dam sites and at a site near the mouth of Cottonwood Creek.

2. The Sacramento River Bank Stabilization Project is a data-collection program for the U.S. Corps of Engineers. The purpose of the study is to determine sediment sources and sinks and modes of transport for the Sacramento River and major tributaries of the Sacramento. Total-load data were collected at 13 sites and suspended-load data were collected at five sites. In addition, one data set was obtained for the Bend Study, a program designed to provide velocity-vector data at a river bend for the U.S. Corps of Engineers.

3. The Delta Turbidity Project is a continuing data-collection program in cooperation with the California Department of Water Resources. The purpose of the project is to determine suspended-sediment discharge and turbidity for the Sacramento and San Joaquin Rivers near their mouths.

4. The Peripheral Canal Sediment Project is designed to provide sediment-transport information in the vicinity of the proposed Peripheral Canal Diversion site near Hood, California. Periodic data were obtained to determine the vertical and lateral variability in velocity, suspended-sediment concentration, and percentage of sand in suspension. The study was made in cooperation with the California Department of Water Resources.

5. The Mt. Shasta Hydrologic Hazards project is a two year study using Federal funds to develop preeruptive baseline information on water resource and geomorphic features of the area and assess potential hazards associated with postulated eruptions and hydrologic events. Sediment data are being collected to determine sediment concentrations and discharge on selected streams on the flanks of Mt. Shasta

San Francisco Bay Subregion

1. The Cull Canyon Project is a data-collection program to determine major sources of sediment upstream from Cull Canyon Reservoir. The study is beirg made in cooperation with the Alameda County Flood Control and Water Conservation District.

2. The Lake Temescal Project is designed to determine sediment yield from various upper-basin sources and major tributaries upstream from Lake Temescal. The study is being made in cooperation with the East Bay regional Park District.

Central California Coastal Subregion

1. A study to determine the effect of the Marble Cone Fire (August 1977), rear Big Sur, Calif., on sedimentation in Los Padres Reservoir near Carmel Valley, Calif., is underway. Reservoir surveys were made in November 1977 and September 1978. Surveys will be continued on an annual or biannual basis to monitor future changes in storage capacity. This study was made in cooperation with the Monterey Peninsula Water Management District and the U.S. Forest Service.

2. The Carmel River Valley study is designed to document the changes in channel morphology and to provide sediment-transport information. Hydrologic data are being collected at three main stem sites and at miscellaneous sites on three Carmel river tributaries. An estimate of total-sediment discharge will be made at the main stem sites. This work is being done in cooperation with the Monterey Peninsula Water Management District.

Southern California Coastal Subregion

1. The project, "Effects of river modifications and control structures in the Santa Clara River Basin, Ventura and Los Angeles counties, California," is in progress. The study will document the effects of river control structures and of sand-and-gravel mining on streamflow, phreatophyte growth, channel morphology, and sediment transport in the Santa Clara River basin. Sediment delivery to the shoreline and sediment size, quantity, and relation to beach stability will also be examined.

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

District Chief, WRD
U.S. Geological Survey
2800 Cottage Way
Sacramento, CA 95825

CALIFORNIA 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
Callequas Creek	Revalon Slough and Beardsley Wash	Revalon Slough and Beardsley Wash	Ventura	California

A Geology and Sedimentation Report was published as an information document for planners, designers, and interested groups since the project outlets to the environmentally sensitive Mugu Lagoon.

b. River Basin Investigations

Major Basin	Basin Reported	State
Sacramento River	Pit River	California

Estimates of sediment yield to Fall River near Fall River Mills.

ALASKA REGION

BUREAU OF LAND MANAGEMENT

Erosion and reclamation of past fireline construction and ORV trails have been monitored by photo points for a number of years. From these observations, it is concluded that reclamation of most disturbed areas, by replacing the organic mat, revegetates repidly and provides an effective cover along with adequate water bars to control erosion. Reclamation of disturbed areas by replacing the organic mat has been more successful in most cases than by seeding and fertilizing.

Disturbance by mining in some areas is being monitored for erosion and sedimentation damage. Stream sampling for water quality and quantity analyses are being conducted.

A Technical Report, "Fireline Reclamation on Two Interior Fire Sites" by Larry Knapman, has been completed.

ALASKA REGION

CORPS OF ENGINEERS

North Pacific Division

Alaska District

The ongoing sediment transport study for the Tanana River near Fairbanks, Alaska, was continued for 1981. This study is being coordinated and documented by the Cold Regions Research and Engineering Laboratory (CRREL) and be funded by the Alaska District. Annual reports of the monitoring effort will be prepared by CRREL.

The Bradley Lake hydroelectric project sedimentation program was continued in 1981. This data and all other sediment data collected through the Cooperative Stream Gaging Program will be reported in the USGS publication, Water Resources Data for Alaska.

ALASKA REGION

GEOLOGICAL SURVEY

Arctic Slope Subregion

1. Suspended-sediment data are being collected on a periodic basis at the Kuparuk River near Deadhorse, Alaska, as part of the National Stream Quality Accounting Network (NASQAN). Suspended-sediment data are being collected infrequently at Colville River near Nuigsut, Alaska, as part of NASQAN.

Northwest Alaska Subregion

1. Suspended-sediment data are being collected on a periodic basis at Kobuk River near Kiana, Alaska, as part of NASQAN.

Yukon Subregion

1. A cooperative study with U.S. Corps of Engineers to collect and evaluate sediment-transport and river hydraulic data in the Tanana River near Fairbanks, Alaska, was continued in 1981. Suspended-sediment and bedload data are being collected in the Tanana River at six sites near Fairbanks, Alaska. The Corps of Engineers will use these data in the design and operation of engineering structures on the Tanana River and the regulation of the quarrying of gravel from the river in the vicinity of Fairfbanks, Alaska.

Report: Burrows, R. L., Parks, B., Emmett, W. W., 1977-78, Sediment Transport in the Tanana River in the Vicinity of Fairbanks, Alaska, 1979; U.S. Geol. Survey, open-file report 79-1539, 37 p.

Report: Burrows, R. L., 1979, Cross-section, velocity, and bed-load data at two sites on the Tanana River near Fairbanks, Alaska, U.S. Geol. Survey, open-file report 80-699, 32 p.

Report [in Preparation] Burrows, R. L., Parks, B., Emmett, W. W., 1977-79, Sediment Transport in the Tanana River near Fairfbanks, Alaska, 1981; U.S. Geol. Survey, open-file report 81-20..., 56p.

Report [in Preparation] Burrows, R. L., 1980-81, Sediment Transport in the Tanana River near Fairbanks, Alaska, 1982, U.S. Geological Survey, open-file report 82-...., p.

2. As part of the Federal Program Energy Water Resources Division, a study to determine the Concentration and distribution of trace metals in the Healy Creek and Lignite Creek basins began in 1981. Suspended-sediment and bed-material samples are being collected at the following sites:

Healy Creek near Usibelli, Alaska
Healy Creek 0.1 mile above French Gulch near Usibelli, Alaska
Healy Creek near Suntrana, Alaska
Sanderson Creek 0.8 miles above Lignite Creek near Usibelli, Alaska
Frances Creek 100 feet above Lignite Creek near Suntrana, Alaska
Lignite Creek 0.5 miles above mouth near Healy, Alaska

Report: [in Preparation] Wilcox, D. E., Occurrence, Distribution, and Sources of Trace Metals in Surface Waters and Stream Sediments of Healy and Lignite Creek Basins, Alaska, U.S. Geological Survey, WRI.

3. Suspended-sediment data are being collected on a periodic basis at the Yukon River at Pilot Station, Alaska, as a part of NASQAN.

4. Suspended-sediment data are being collected periodically at the Fortymile River near Steele Creek, Alaska.

5. Suspended-sediment data are being collected periodically at the Tanana River at Nenana, Alaska, as part of NASQAN.

Southwest Subregion

1. Suspended-sediment data are being collected on a periodic basis at Nushagak River at Ekwok, Alaska, as a part of NASQAN.

2. Suspended-sediment data are being collected on a periodic basis at Kuskokwim River at Crooked Creek, Alaska, as a 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 1981. Suspended-sediment data are being collected on a periodic basis at Chulitna River near Falkectna, Alaska, at Susitna River near Denali, Alaska, at Susitna River near Gold Creek, Alaska, and at Susitna River at Sunshine, Alaska.

2. The cooperative program with the U.S Army Corps of Engineers was continued through 1981. Suspended-sediment data were collected on Katchemak Creek (entering Bradley Lake) near Homer, Alaska, and Bradley River (Bradley Lake outlet) near Homer, Alaska. These data are in support of a hydroelectric power study by the Corps and will be used in evaluating reservoir storage capacity and structure design.

3. As part of the continuing program with the Municipality of Anchorage, the collection of suspended-sediment samples was initiated in 1981 at the following sites:

South Fork Campbell Creek at canyon mouth near Anchorage, Alaska
North Fork Campbell Creek near Anchorage, Alaska
Little Campbell Creek at Nathan Drive near Anchorage, Alaska
Campbell Creek near Spenard

These data will be used in the identification of water-quality problems and calibration of existing water-quality runoff models which the Municipality of Anchorage developed during the "208" water quality management program.

4. The collection of suspended-sediment data on a periodic basis on the Kenai River at Soldotna, Alaska, was funded by the U.S. Army Corps of Engineers.

5. Suspended-sediment data are being collected on a periodic basis at Talkeetna River near Talkeetna, Alaska, as part of the National Hydrologic Benchmark Network.

6. Suspended-sediment data are being collected on a periodic basis at Susitna River at Susitna Station, Alaska, and at Copper River near Chitina, Alaska, as a part of NASQAN.

7. Suspended-sediment data are being collected on a miscellaneous basis at the following sites:

South Branch South Fork Chester Creek near East 20th Avenue at Anchorage, Alaska
Chester Creek at Arctic Boulevard at Anchorage, Alaska
Peters Creek (upper) near Peters Creek, Alaska
Peters Creek near Birchwood, Alaska
Little Peters Creek near Peters Creek, Alaska
Thunderbird Creek near Eklutna, Alaska
Eklutna River at New Glenn Highway near Eklutna, Alaska
Willow Creek near Willow, Alaska
Deception Creek near Willow, Alaska
Deshka River near Willow, Alaska
Skwentna River near Skwentna, Alaska
Yentna River near Susitna Station, Alaska
Susitna River Slough FG8A near Curry, Alaska
Susitna River Slough FG9 near Sherman, Alaska
Susitna River Slough FG16 below Indian Creek near Gold Creek, Alaska
Susitna River Slough FG19 4.5 miles above Gold Creek, Alaska
Susitna River Slough FG 21 6.7 miles above Gold Creek, Alaska
Upper Thumb River near Larsen Bay, Alaska
Russell Creek near Cold Bay, Alaska

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:

East Bradfield River near Wrangell, Alaska
Staney Creek near Craig, Alaska
Bonnie Creek near Klawock, Alaska
Perkins Creek near Metlakatla, Alaska
Old Tom Creek near Kasaan, Alaska
Big Creek near Point Baker, Alaska
Municipal Watershed Creek near Petersburg, Alaska
Hamilton Creek near Kake, Alaska
Rocky Pass Creek near Point Baker, Alaska
Nichols Creek near Angoon, Alaska
Stevens Creek near Angoon, Alaska
Greens Creek near Juneau, Alaska
Kadaskan River above Hook Creek near Tanakee, Alaska
Tonalite Creek near Tenakee, Alaska
West Fork Indian River near Tenakee, Alaska
Indian River near Tenakee, Alaska

2. The cooperative study with the Alaska Department of Environmental Conservation on the hydrology and water quality of the Keta River basin near Ketchikan was continued in 1981. Suspended-sediment data are being collected at the following sites:

Keta River below Red Creek near Ketchikan
Keta River above Hill Creek near Ketchikan
Hill Creek above White Creek near Ketchikan
White Creek near Ketchikan, Alaska.
Hill Creek near mouth near Ketchikan
Keta River near Ketchikan, Alaska,
Beaver Creek near Ketchikan

3. Suspended-sediment data are being collected on a periodic basis at the Stikine River near Wrangell, Alaska, and at Skagway River at Skagway, as part of NASQAN

4. A cooperative study with the Alaska Department of Natural Resources, to describe the hydrologic system of the Chilkat River basin near the Tsirkr River fan, was begun in 1981. Suspended-sediment samples are being collected at the following sites:

Chilkat River near Klukwan, Alaska
Klehini River near Klukwan, Alaska
Tsirken River below fan near Klukwan, Alaska

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

District Chief, WRD
U.S. Geological Survey
733 West 4th Avenue, Suite 400
Anchorage, AK 99501

HAWAII REGION

CORPS OF ENGINEERS

Pacific Ocean Division

Reservoir sediment accumulation survey on Kamooalii Stream near Kaneohe, Oahu was made in August 1980 based on soundings using lead line. Suspended sediment data are being collected on a daily basis at Kailua - Kaneohe Dam by the U.S. Geological Survey.

HAWAII REGION

GEOLOGICAL SURVEY

Hawaii Subregion

1. Suspended-sediment data are being collected on a monthly basis at Honolii Stream near Papaikou, Hawaii, as a part of the National Hydrologic Benchmark Network.

2. Suspended-sediment data are being collected on a daily basis at one site in the Wailuku River basin, Hawaii, in cooperation with the State of Hawaii, Department of Land and Natural Resources.

Maui Subregion

1. Suspended-sediment data are being collected on a monthly basis at Kahakuloa Stream near Honokohau, Hawaii, as a part of NASQAN.

Molokai Subregion

1. Suspended-sediment data are being collected on a monthly basis at Halawa Stream near Halawa, Hawaii, as a part of NASQAN.

Oahu Subregion

1. Suspended-sediment data are being collected at the following sites:

   (a) Waikele and Kalihi Streams, Hawaii, as a part of NASQAN.
   (b) Kamooalii Stream near Kanheohe, Hawaii, in cooperation with the U.S. Corps of Engineers.
   (c) Kipapa Stream and Moanalua Valley in cooperation with the State of Hawaii, Department of Land and Natural Resources.

Kauai Subregion

1. Suspended-sediment data are being collected on a monthly basis at Waimea River at Waimea, Hawaii, as a part of NASQAN.

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

District Chief, WRD
U.S. Geological Survey
P.O. Box 50166
300 Ala Moana Boulevard, Room 6110
Honolulu, HI 96850

Forest Service

CARIBBEAN REGION

Forest personnel rehabilitated 5 severely eroding acres. This resulted in an annual sediment reduction of about 250 tons.

CARIBBEAN REGION

GEOLOGICAL SURVEY

Puerto Rico Subregion

1. Suspended-sediment data are being collected on a bi-monthly basis when flow is above normal at 49 sites in cooperation with the Puerto Rico Environmental Quality Board.

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

   Rio de la Plata at Toa Alta, P.R.
   Rio Grande de Manati near Manati, P.R.
   Rio Grande de Anasco near San Sebastian, P.R.
   Rio Grande de Patillas near Patillas, P.R.
   Rio Fajardo near Fajardo, P.R.

3. Suspended-sediment are being collected on a daily basis at Rio Tanama near Utuado, P.R., in cooperation with the Puerto Rico Environmental Quality Board.

For additional information about 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

CARIBBEAN REGION

SOIL CONSERVATION SERVICE

1. Studies of erosion and sediment yield were made in the following watersheds:

   a. Public Law-566

Major Drainage	Watershed	Stream	State
Eastern Puerto Rico	Guayanes	Guayanes	Puerto Rico

2. Reservoir Sedimentation Surveys

A reservoir sedimentation survey was made on Lago Loiza Reservoir on the Rio Grande de Loiza near San Juan, Puerto Rico.

FOREIGN ACTIVITIES

Bureau of Reclamation

Presented the Bureau of Reclamation methods for studying and handling sediment problems associated with storage dams, diversion dams, and river channel stability problems to a delegation from the Peoples Republic of China.

A representative of the Sedimentation and River Hydraulics Section participated in a 10-man team review of the proposed Three Gorges Project on the Yangtze River in the Peoples Republic of China (PRC). The proposed project is a concrete gravity dam creating a reservoir of 70.4×10^9 m^3 (57 million acre-feet) of which 37.6×10^9 m^3 (30.5 million acre-feet) would be used for flood control. It is proposed that 25,000 megawatts of generating capacity be installed.

The hydrologic studies and preliminary designs are at a level that would be considered post feasibility level in this country. Economic evaluation and plan formulation procedures are not standard procedures in the PRC and the Ministry and Planning Office expressed a great deal of interest in those procedures.

The mean annual runoff of the Yangtze River at the Three Gorge site is 453×10^9 m^3 (367 million acre-feet) or approximately 6.4 times the proposed reservoir capacity. The estimated annual sediment inflow is 514×10^6 tonnes (566.6 million tons). This sediment inflow is not expected to impinge on the useable capacity of the reservoir for a long period (> 100 years) due to the large inflow to storage ratio and the proposed drawdown operations to flush sediment through the dam. The sediment is approximately 70 percent finer than sand with a D_{50} of 0.035 mm.

The sediment flushing analysis was done based upon sediment transport equations developed by the PRC engineers. These equations are based upon channel hydraulics and observed suspended sediment concentrations at various hydraulic conditions in the Yangtze River. The Chinese have had success with flushing sediment through storage reservoir on the Yellow River.

Sediment deposits in the reservoir will have a negative impact on navigation in the upper end of the reservoir. Dredging of harbors will be required and there may be an impact on maintaining a navigation channel.

At the request of the General Manager, Public Electricity and Water Corporation in Khartoum, Sudan, and US/AID Washington, DC, the Head, Sedimentation and River Hydraulics Section, was temporarily assigned to Sudan to assist in the sediment and debris disposal problems at Roseires Dam. The trip was made with a dredging expert from the Corps of Engineers. After discussions with representatives from the Ministry of Energy and Mining, Ministry of Irrigation, and US/AID Mission, and a visit to the dam, a concluding meeting was held in Khartoum on September 16-17, 1981, along with representatives from Sir Alexander Gibb and Partners. At this meeting a plan was adopted for solution of the sediment and debris problems at Roseires Dam. A detailed report describing the teams observations and conclusions was transmitted to US/AID Mission in Khartoum in

Bureau of Reclamation

October 1981. The solution calls for the purchase and utilization of a barge mounted dragline and suction dredge to remove sediment deposits from in front of the powerplant intake.

A representative participated in a training session sponsored by U.S. Geological Water Resources Division for two visiting Egyptian engineers. The discussions centered around measures to prevent the local scour occurring below the large barrage immediately downstream of High Aswan Dam, the problem of sediment deposition in the reservoir behind Aswan Dam, and measures for controlling vegetation in Nile Valley Canal systems.

ARIZONA

Research activities at the Southwest Rangeland Watershed Research Center in Tucson, Arizona included the following:

1. An erosion/sediment yield model for overland flow was developed and tested using data from rainfall simulator plots and small watersheds at Tombstone, Arizona. The procedure simulates rill and interrill detachment and transport in overland flow and includes sediment transport and deposition rates.

2. A transducer whose output is a function of impact energy was used to measure drop-size distribution of air-mass thunderstorms. The transducer output was calibrated against single drops in free fall under laboratory conditions and using an improved version of the flour pan method under two types of rainfall simulators having different drop-size distributions. A number of observations were taken under natural rainfall. The drop-size dis- tributions of the simulators have been calculated and compared with data in the literature and were found to fit well. The transducer output data are presently being processed and analyzed.

3. Experiments were initiated to determine the role of desert pavement on USLE parameters. Over 20 runs from this program, using the rotating-boom rain simulator, were analyzed to give the infiltration function under various initial moisture conditions. A non-linear regression program, developed for the Center's mini-computer, was used to test the data for goodness of fit to a modified Horton-type infiltration equation which is useful for evaluating soil crust properties, and a very good fit was found in most cases. The data are presently being tested similarly for fit to the Green-Ampt infiltration equation.

   Nearly 90 rainfall simulator runs were completed on the 10' x 35' USLE experiment plots. The collected erosion, runoff, and plot characteristic data have been tabulated and entered into the Center's mini-computer. Preliminary analyses of the data indicate that: (1) the standard fallow plot used to determine USLE soil erodibility (K) values may be inappropriate for rangeland soils that contain large amounts of rock and gravel; (2) sediment yield/liter-runoff decreased with plot wetness for the natural, tilled, and clipped plots but increased with wetness from the erosion pavement removed plots; (3) total sediment yield ranged from 0.003T/acre/R from the natural plots to 0.019T/acre/R from the erosion pavement removed plots; (4) runoff coefficient (runoff/precipitation) increased with plot wetness and ranged from an average of 0.2 for the tilled plots to 0.5 for the erosion pavement removed plots; (5) however, erosion pavement was positively correlated with runoff and negatively correlated with sediment yield/liter runoff; (6) runoff variability between treatment replicated plots was initially great but decreased with plot wetness; and (7) there was significantly more runoff from the plots during the fall simulator runs than during the spring simulator runs, which may be associated with surface disturbance from freeze- thaw situations followed by compaction with high intensity precipitation.

4. Work has continued on evaluating the accuracy and reproducibility of automatic equipment to measure particle size. The equipment utilizes a forward-scattering ruby laser beam and microcomputer to measure the particle-size distribution, specific surface area, and mean volume

diameter of soils, sediments, and water/sediment samples from streams or reservoirs. One paper was published comparing Microtrac size distributions with that from Pipette analysis for a number of soils. In another effort, prepared soil/sediment samples were analyzed for fine silt- and clay-size distributions using a Sedigraph, two Microtrac models (with different size ranges), and an Electrozone System and compared with the standard Pipette method. The work showed there are advantages and disadvantages to all methods, and particularly when large clay concentrations are involved. Some of the measuring instruments ignore or do not see all of the clay fractions. Cooperative work continues with the Soils, Water and Engineering Department at the University of Arizona, to compare the specific surface area of a variety of soils as determined with the Microtrac for comparison with the conventional EGME method.

5. Data available from sampling at both Walnut Gulch and in the Santa Rita Experimental Range prior to 1981 have generally been, for years, with below average runoff. In general, 1981 was dominated by a wet July, very dry August, and average September, with an overall average of about normal precipitation, runoff, and sediment yield. Since sampling was begun on Walnut Gulch and in the Santa Rita Range, dry years have dominated the data sets. It is well recognized that unusual (above average precipitation/runoff) years or events, or both, greatly affect average sediment yield. Therefore, the importance of the data sample problem cannot be over-emphasized. When the Walnut Gulch and Santa Rita short records are used to test some empirical formulae for estimating sediment yield, the formulae generally overpredict the observed data because of the nonrepresentative climatic sample.

6. There were almost 60 participants at the 3-day workshop entitled "Erosion and Sediment Yield from Rangelands", Tucson, March, 1981. The 23 papers submitted (240 pages) were sent to the Western Regional Information Office in August, 1981 for publication in the Agricultural Reviews and Manuals series and included four manuscripts from staff members at the Southwest Rangeland Watershed Research Center. Action agencies, as well as consultants, continue to cite problems of applying Universal Soil Loss Equation (USLE) and other erosion/sedimentation technology to rangeland situations. The workshop and the proceedings of it should assist with this pressing need and should be available in the summer of 1982.

7. A distributed hydrologic model for applicaton on small, semiarid watersheds was developed. The distributed model incorporates simplified routing schemes to include the influence of transmission losses on runoff. This model provides input to a sediment transport model which makes computations by sediment size fractions to compute transport capacity and sediment yield in noncohesive, alluvial channels. The sediment transport model uses a piecewisenormal hydrograph approximation technique to approximate the influence of spatially varied, unsteady flow upon sediment transport capacity. Total sediment yield is estimated by integrating sediment transport rates through the approximating hydrograph.

8. A study on the role of gully erosion on sediment production from rangeland watersheds was continued for 2 more years. Precise measurements were again made before and after the summer runoff season on several very small rangeland watersheds, and a major headcut on a larger watershed (2 km2) was resurveyed in the fall of 1981. Measurements will be made again in 1982, and a paper has been proposed on "gully migration," to be presented in January, 1983.

9. Sediment transport with spatially varied flow in the ephemeral streams of the southwestern United States results from spatial precipitation variability and flow losses in the norm- ally dry streambeds. Work on a contract with Dr. W. L. Graf at Arizona State University is now essentially completed, pending finishing the final report. A manuscript describing the comparisons of cross-sectional surveys from the General Land Office with those of the early 1960's has revealed major changes in the stream in the Walnut Gulch watershed. Much of the change is indicated to have occurred within a 15-year period commencing about 1930. During this major erosion episode, the rate of transport was speculated to be almost 30 times the rate after the episode. Unit stream power analysis indicates that minimums occur in the smallest and largest channels, with a maximum in mid-basin areas. Total available power at cross-sections increased in the downstream direction but varied according to input by tributary streams and output through transmission losses.

For additional information, contact Kenneth G. Renard, USDA-ARS, Western Region, 442 E. 7th Street, Tucson, AZ 85705.

GEORGIA

Research activities at the Southern Piedmont Conservation Research Center, Watkinsville, Georgia include the following:

1. Non-metric close range photogrammetric techniques have been developed for measuring stream channel erosion caused by storm runoff. Traditional methods of measurement have been used to measure erosion processes at seasonal or annual intervals, but are often cumbersome to implement and of insufficient accuracy to detect small changes resulting from a single storm. The close range photogrammetry, on the other hand, offers a means by which accurate and frequent measurements of a stream channel may be made. This study demonstrated the temporal changes in a dynamic stream system using a standard 35 mm camera. Employing positive film transparencies enlarged from the original negative and a standard cartographic digitizing system to derive the x,y image coordinates, adequate information was obtained for the analytical solution. Errors of 4 and 6 mm in planimetric (X,Y) and vertical (Z) terrain coordinates are typical of the results obtained with the methodology. As measurements from a single model can be completed by office personnel in 1 to 2 hours, it is envisioned that these procedures may be adopted by agencies interested in monitoring dynamic changes in the environment. If desired the X,Y,Z coordinates can be used with computer routines to rapidly generate graphics in the form of profiles and contour maps, or computations of changes in area and volume.

2. The effectiveness of double cropping under different tillage practices to control soil and water losses was evaluated for two small watersheds (1.26 and 1.38 ha). The effectiveness of reducing runoff and soil loss improved when the systems progressed from conventional-till to no-till to no-till, inrow chisel. The runoff was reduced significantly after one year of green manure winter crop associated with conventional-till soybeans and conventional-till corn. In these systems, sediment yields decreased significantly after two years with soybeans and one year with corn. For the conventional-till systems, the storms with the largest percent runoff occurred during March, May, June and July. For the no-till systems, these storms occurred during the winter and early spring. Most sediment yield occurred during May, June and July for the conventional-till systems. Insignificant amounts of sediment were measured for the no-till systems. Most of the runoff and sediment yield resulted from few storms.

For additional information contact Adrian W. Thomas, Research Leader, USDA-ARS, Southern Piedmont Conservation Research Center, P. O. Box 555, Watkinsville, Ga. 30677.

AGRICULTURAL RESEARCH SERVICE

IDAHO

Research at the Northwest Watershed Research Center, Boise, Idaho, includes the following:

1. Measured sediment yields from the Outlet and Tollgate stations on the Reynolds Creek Watershed in the 1981 water year were 15 and 27 percent, respectively, of long term yearly amounts. Precipitation was about 80 percent and runoff about 50 percent of normal during the year. Peak streamflow rates were below normal.

2. Sediment yield data from Reynolds Creek watersheds was analyzed by storm type to determine Modified Universal Soil Loss Equations (MUSLE) runoff volume and peak flow fitting coefficients. Resulting equations were different for rainfall, snowmelt, and combined events. Also, data showed that snowmelt runoff produced 66, 36, and 8 percent of long term sediment yield from watersheds with mean elevations of 6,800, 6,100, 4,900 feet, respectively. Combined rain and snowmelt, often with frozen soil, produced 34, 63, and 88 percent of long term sediment yields, respectively.

3. Photogrammetric measurements of soil loss from 60 percent slopes with heavy off-road vehicle use were from about 120 to 240 tons per acre per year. Short term measurements by rillmeter and visual evidence of erosion on selected trails agreed with photogrammetric data.

4. Potential soil loss from sagebrush rangelands, estimated by the Universal Soil Loss Equation (USLE), decreased about one-third from peak standing crop to the end of the grazing season, due mainly to the greater amount of litter on the ground. Litter averaged about 65 percent of total vegetation ground cover and carry-over from wet years provided protection against erosion in dry years. Vegetation cover and potential erosion change from year-to-year and site-to-site in response to weather and grazing use.

For additional information contact Clifton W. Johnson, Hydraulic Engineer, Suite 116, Patti Plaza, 1175 South Orchard, Boise, Idaho 83705.

INDIANA

Research activities at the National Soil Erosion Laboratory, Lafayette, Indiana include the following:

1. The USDA agencies Soil Conservation Service (SCS) and Forest Service (FS) heavily rely on the Agricultural Research Service for research on improvement of erosion prediction methods widely used by these agencies. Two significant accomplishments were made in this area. ARS scientists developed predictive methods to account for the effectiveness of deposition by terraces as a benefit for maintaining the soil resource. The results are now a part of SCS terrace standards. Also, ARS jointly with the FS and SCS developed procedures for estimating soil loss from forestland and published a guideline manual describing how the procedure can be used by field personnel. Both of these accomplishments were in response to needs stated by SCS and FS.

2. A mulch of crop residues was relatively more effective in reducing soil loss on smooth soil surfaces than on rougher ones and on longer slopes than on shorter ones. Corn residue was more effective for erosion control than soybean residue, and anchored residues were more effective than residue loose on the soil surface.

3. Size distribution of eroded aggregates in the absence of residue cover was D_{50} = 0.033, 0.032, 0.020, and 0.011 mm for chisel plow disk, moldboard plow plus disk, no till and chisel plow, respectively. With residue cover the D_{50} index was reduced to about 0.012 mm for all tillage systems. An increase in water flow velocity caused an increase in the percentage of eroded aggregates larger than 0.05 mm. Results are explained in terms of runoff transport capacity and sediment trapping capacity of the soil surface.

For additional information, contact Wm. C. Moldenhauer, Research Leader, USDA-ARS, North Central Region, National Soil Erosion Laboratory, Purdue University, West Lafayette, Indiana 47907.

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

IOWA

Research activities at the Watershed Research Program in Treynor, Iowa, and Columbia, Missouri, include the following:

1. Quantities of cesium 137 (n Ci/m^2) were determined along transects in the main waterways of two research watersheds. Cs 137 resulted from U.S. and Russian atomic bomb testing producing radioactive fallout in the 1950's and early 1960's. The surface soil with Cs 137 was removed in 1963 to shape the waterways so that the presence and depth of Cs 137 now indicate deposition occurring since 1963. Deposition in farmland adjacent to the main waterways was also determined by considering original Cs 137 quantitites less decay compared to present Cs 137 quantities. Using the Cs 137 data, deposition volumes were computed. These results were compared to deposition volumes determined from surveyed cross sections in 1963 and 1980. Deposition quantities estimated with Cs 137 techniques were 1700 and 3000 tons, compared to 1400 and 2500 tons as determined by surveying or about a 20 percent overestimate with the Cs 137 method. With additional sites and deeper sampling, the estimates could be improved.

2. K-values for the USLE for Monona and Ida loess soils were computed from the data collected during the 1980 rainfall simulation study. Relative erodibility values for the Ida soil were slightly higher than the 0.32 value commonly used. The erodibility value for Monona soil was considerably greater than the 0.32 value. Relative erodibility was much lower for dry antecedent moisture conditions and increased as antecedent moisture increased. The K-values for the rainfall simulations conducted during two succeeding summers showed large variations and may require another series of runs before results will provide meaningful K-values for these erodible loess soils.

3. The SEDLAB water and sediment routing model was adopted for simulation of selected runoff events on Watershed #1 near Treynor, Iowa. The model was used to predict runoff and sediment response from 24 storms which included a broad range in antecedent soil moisture contents, rainfall patterns, surface roughness conditions, and ground and canopy covers. Model parameters which describe infiltration and water routing were calibrated for each of the events on Watershed 1. One portion of the data set was used to calibrate sediment routing parameters in the SEDLAB model. The calibrated model was applied to the remainder of the data set to simulate event sediment hydrographs. Results of the model simulation indicate that measured versus predicted sediment hydrographs compare favorably for most of the events which occurred during the seedbed period. Simulation results were less satisfactory for those events which occurred when canopy and ground covers had a significant effect on runoff and soil erosion. The study indicates the need for improved techniques to predict infiltration, soil detachment in overland flow areas, and sediment transport in grassed waterways.

For additional information contact Allen T. Hjelmfelt, Acting Research Leader, USDA-ARS, North Central Region, 207 Business Loop 70 East, Columbia, MO 65201.

AGRICULTURAL RESEARCH SERVICE

MINNESOTA

1. Current research at the St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minnesota, is on the local scour caused by a cantilevered spillway or culvert pipe discharging onto a bed of cohesionless sand. Variables investigated are bed material size (d_{50} = 0.5, 1, 2, 4, and 8 mm), standard deviation of bed material size (1.2, 1.4, and 1.6), effect of pipe elevation relative to the tailwater elevation (-2, -1, 0, 1, 2, 4, and 8 pipe diameters), and effect of pipe slope. The temperature is maintained constant at 20° C. Dimensionless discharges $Q/(gD^5)^{0.5}$ are 0.5, 1, 2, 3, 4, and 5. (Q is the discharge, g is the acceleration due to gravity, and D the pipe diameter.) The flow was interrupted and the scour hole measured at 10, 31.6, 100, 316, 1000, 3162, and 10000 minutes after the beginning of each test.

2. Because the apparatus would otherwise have been idle for lack of a technician, one scour test was allowed to continue to see if it reached a limit. Sediment was still being carried from the scour hole after 14-1/4 months.

3. Current work is on data analyses of the 77 test series and nearly 525 scour holes. The analyses show that the scour hole contours, expressed as a percentage of the maximum depth of scour, can be reduced to a single set of elliptical contours for all 6 discharges, all 7 scour periods, all 5 sizes and 2 gradations of bed material, and all 7 pipe heights if suitable normalizing parameters are chosen. These analyses were limited to those data where the discharges were insufficient to cause "beaching," i.e., excessive widening of the surface of the scour hole. The normalizing parameters have been described mathematically. The developed relationships are being checked against the original data to see how well the mathematical model represents the data.

4. An analytical method has been developed that predicts the asymptotic dimensions of the scour hole, that is the scour hole dimensions at infinite time. A paper describing this method was published in the American Society of Civil Engineers Hydraulics Division Journal Vol. 107, No. HY3, March 1981, pp. 327-337.

5. To obtain the maximum disturbed dimensions of the scour hole, 47 tests were made for non-beaching flows in which the bed material suspended in the plume of the jet was removed. These scour holes are significantly larger than those holes in which the disturbed and suspended material was not removed.

6. Preliminary results of these tests are given in Paper 6-1A, "Erosion Control at Pipe Outlets," by Clayton L. Anderson, Proceedings of the Symposium on Surface Water Impoundments, June 2-5, 1980, Minneapolis, Minnesota, American Society of Civil Engineers, 1981, Vol. II, pp. 1076-1085.

For additional information contact Fred W. Blaisdell, Research Leader, ARS, USDA, St. Anthony Falls Hydraulic Laboratory, Third Avenue SE at Mississippi River, Minneapolis, Minnesota 55414.

MINNESOTA

The following research is being conducted at the NORTH CENTRAL SOIL CONSERVATION RESEARCH LABORATORY at Morris, Minnesota.

1. Mid-winter applications of liquid manure were continued on small watersheds having different tillage systems. Monitoring was also continued of runoff, soil loss, and nutrient losses from runoff events throughout the year. Liquid dairy manure was applied at the rate of 0.67 inch to the same four small watersheds as the preceding year. Each watershed represented a different fall tillage treatment. The four tillage treatments were conventional (plow, disk, and harrow), chisel plow, deep disk, and no-till. Due to an extremely low snowfall of 21.3 inches (19 inches below normal) there was insignificant snow cover and no measurable snowmelt runoff in the spring of the year. While total precipitation for the year was close to average, spring rainfall was well below normal. Most of the precipitation came later in the growing season when the soil was protected by a vegetative canopy. As a result, only two measurable runoff events occurred from rainstorms during the year, and there was no measurable soil loss. The experiment will be repeated again next year and the results of the study will be used to relate the effects of tillage treatment to runoff, erosion, and nutrient loss from snowmelt and rainfall events.

2. Detailed analyses of sediment particle sizes are done as an integral part of all erosion studies. This data, which is being 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. Accumulated data from exploratory studies on corn and soybeans was examined to determine if further study was warranted. Preliminary evidence suggests that soil aggregate stability is altered following soybeans or sunflowers when grown in normal rotation. Two sets of field plots have been established in which rotations of corn-soy-beans and wheat-sunflowers will be used to study the diversity of the microbial population, and the amount, type, and availability of soil organic matter. The available organic matter may differ from these crops which in turn may stimulate the activity of different microbial populations. Since organic matter contributes to aggregate stability, the transformations carried out by the microorganisms could profoundly affect soil erodibility. Some of the plots will also be subjected to simulated rainfall to induce soil loss and runoff from the different crops.

4. Verification of aggregate density values obtained with a Dynatrol density cell using a displacement technique was delayed due to difficulties in finding a suitable fluid for use in the Dynatrol density cell and to malfunctions in the operation of the cell. However, eroded aggregates of various sizes, collected during runoff events from field plots, have been separated into 7 size ranges, from less than 63µm to greater than 2000µm. The average density of each size group will be determined by passing through the density cell to determine the specific gravity of the aggregates. Aggregate density values will be used to update comprehensive erosion and chemical transport models which rely on particle and aggregate density estimations.

5. The stability of soil aggregates is a significant factor affecting soil erodibility. A method was developed to characterize the stability of soil aggregates under the forces of impacting water drops as compared to the forces of flowing water. The method involves subjecting soil aggregates of different size ranges to a known amount of water drop energy in a raindrop tower and measuring the change in aggregate size by a wet sieving procedure. An effort is now being made to correlate this aggregate stability with the rate of rill and interrill erosion of various soil types.

6. The specific nature of the processes responsible for the commonly observed reduction in erosion under a crop canopy are being investigated. High speed photography was used to study the impact of simulated raindrops on different types of vegetative canopy and the resulting changes in droplet velocity and kinetic energy. The effect of these changes on soil detachment and soil properties, such as infiltration rates and surface sealing are also being investigated. The work was done in the drop tower using a portion of a recently constructed portable infiltrometer system. Due to the loss of personnel, data collection was interupted but will be resumed in 1982.

For additional information contact G. R. Benoit, USDA-ARS, Morris, MN 56267

MISSISSIPPI

Research activities at the USDA Sedimentation Laboratory in Oxford, Mississippi include the following:

1. Soil loss data collected under simulated rainfall showed that erosion from slopes of less than 0.2% is less than half that predicted by the presently-used slope steepness factor of the Universal Soil Loss Equation (USLE). This discrepancy is due to the deeper surface water depths found on lower slopes during intense rainfall. Research is continuing to define the rainfall intensity effect on surface water depths as a correlation with the R factor used in the USLE. In the interim, an R factor coefficient to lower the USLE soil loss estimates on low slopes has been recommended.

2. Research has continued to determine in situ hydraulic conductivity for major soils in the Goodwin Creek Research Watershed. The data, obtained from drainage profiles, yielded an exponential hydraulic conductivity relationship for each horizon of each soil. Surface roughness measurements were initiated with a newly designed micro-relief meter. Initial activities involved surface relief measurements as a function of rainfall on a Cascilla soil for both bare and canopied surfaces.

3. A technique was developed to estimate size characteristics of sediment eroded from aggregated soils without extensive field experimentation. The laboratory procedure involves systematic wetting and agitation of soil samples collected from field sites. Sediment size distributions were determined by the same procedures used in the field. The technique was used to test 17 different soils. Results show that sediment size distribution curves generated in the laboratory compare favorably with curves prepared from field data during row-sideslope erosion experiments. Additional laboratory work has indicated that an agitation time determined by averaging the best recorded times for the various soils tested can be used to generate a satisfactory sediment size distribution for soils with an unknown field sediment size distribution.

4. Research on an Atwood soil indicated that a relatively high concentration of iron will reduce the interrill erodibility and result in a coarser size distribution for the resulting sediment. Other research with a new rill/row rainfall simulator indicated that a row-cropped soil will lose half or less sediment from the end of a row furrow of 0.5% gradient as from a row of 3.5% and that the sediment from the flatter furrow will be much finer.

5. Instrumentation of the Goodwin Creek Research Watershed has been completed. Instruments have been installed at 14 stream gauging stations in this 8 square mile North Mississippi watershed to measure precipitation, runoff, and sediment. Additional information on water, air, and soil temperature is being recorded at some of the stations. Solar radiation, relative humidity,

barometric pressure, and wind speed are being measured at a central climatological station. Most of the data from all stations in the Research Watershed are transmitted by VHF radio telemetry to a central receiving computer at the USDA Sedimentation Laboratory. Conventional chart records of precipitation, water stage, air temperature, and humidity are also being maintained. Automatic pumping-type samplers and hand samplers are being used to obtain suspended sediment samples at the various gauging stations in the Research Watershed.

6. Channel morphology in the intensive study area of Johnson and Goodwin Creeks, in Panola County, Mississippi is variable. Johnson Creek has two functional segments separated by a knickpoint. Channel width-to-depth relations are inconsistent downstream of the knickpoint, but the width-to-depth correlation is positive and significant at the 99% level upstream of the knickpoint. Consolidated sandstones do not crop out in these reaches of Johnson Creek and gravel bed material is uncommon upstream of the knickpoint. Consolidated sandstones do crop out in many reaches of Goodwin Creek, and gravel bed material is common. The sandstone outcrops and the gravel bed material evidently influence channel behavior. Knickpoint movement and entrenchment on Goodwin Creek have been minor relative to that on Johnson Creek. Also, Goodwin Creek has three functional channel segments with transition reaches less well defined than that on Johnson Creek. These transition reaches are characterized by a relatively small knickpoint separating the two downstream segments and by the presence of pre-Holocene bed and bank materials for the upstream-most segment. Width and depth are inversely related in the stream segments downstream of the knickpoint and upstream where bank and bed materials are pre-Holocene. Both of these regressions are significant at the 99% level. Depth is constant and independent of width for the middle segment where thalweg elevation is controlled by a massive silt unit and by outcrops of consolidated sandstone. These results established the nonalluvial character of these streams.

7. A cooperative study with the SCS has been initiated to evaluate relations between soil classification (weathering) units and valley-fill (depositional) units. The SCS has resurveyed the Johnson and Goodwin Creek valleys and is preparing revised soil maps. Also, nine pit profiles have been described and sampled. These profiles will be used as model profiles for continuing future studies of the distribution of valley-fill deposits and weathering profiles. Full definition of possible relations between the valley-fill and soil classification units will facilitate use of the latter as predictors for the deeper valley-fill deposits.

8. Electrical resistivity surveys covering 49 square miles have been completed covering the areas of Johnson, Goodwin, and Hotophia Creeks and the lower Tallahatchie River valley below Sardis Dam. Preliminary results of this subsurface investigation indicates (1) that relief on the Zilpha-Winona disconformity surface was caused

by more than one cycle of erosion, (2) that mean sea level elevations of the Zilpha-Winona surface are lower in the flood-plain position than in the terrace position, suggesting a Quaternary age scour of the present valleys, (3) topographic highs on the Zilpha-Winona surface in the valley position appear to have influenced behavior of the Tallahatchie River, and (4) older cycles of scour and fill are evidenced by buried valleys on this surface located out of present valley positions.

9. A simplified stability analysis precedure was used to determine stable bank height and angle using the soil strength properties previously measured by the Iowa borehole shear tester. Soil input data included the angle of internal friction, apparent cohesion, and bulk unit weight. Worst case bank conditions, representing prolonged wet periods, were the best predictors of critical bank height and angle. The procedure was tested using data from Hotophia Creek. Changes in channel cross-sections on Hotophia Creek from one year to another were used to determine if the bank had failed. Calculations of critical bank height, for the measured bank angle, were made for each of the 104 measured cross-sections. In only two cases out of 104, the calculations predicted stable banks where the banks were actually stable. Thus, the stability analysis procedure agrees very well with real cases.

10. A comprehensive and generalized hydraulic model study of low drop grade control structures was conducted. Generalized design criteria, in the form of universally applicable dimensionless equations, were developed to allow the design of the stilling basin and to determine the size and location of a baffle pier or plate for auxiliary energy dissipation. Observations showed that undulating waves are generated by flow over a low drop, whereas a direct hydraulic jump is formed by flow over a high drop. Thus, an engineering definition separating low and high drops was formulated. Since 1975, twenty-two field structures have been constructed. The hydraulic performance of several of these structures is being evaluated to verify results from the model study.

11. Vegetation projects on two channel bends were installed in early 1981. Bank forming and various vegetative materials in combination with structural materials are being evaluated for their effectiveness in erosion control. Research is continuing on the determination of economical methods of controlling erosion of streambanks in agricultural watersheds.

12. A four-year study revealed mean daily suspended sediment concentrations ranging from 200 to 1500 ppm in Bear Creek, a Mississippi Delta stream with a 440 square-kilometer drainage area. Nearly all of the sediment transported in this low-gradient delta stream is less than 16 microns in size, and 75 to 80% of the sediment is less than 2 microns. Estimates of annual sediment yields, based on mean daily concentrations and assumed runoff, ranged from 1 to 2 metric tons/hectare, a moderate amount for an intensively cultivated basin.

13. An advanced erosion/hydrology model has been developed by the USDA Sedimentation Laboratory. The model uses a computationally efficient solution of the kinematic wave equation for flow and sediment transport. It also predicts movement of sediment by particle size distribution. The model makes available an effective tool for predicting the sediment transport response of agricultural watersheds. This knowledge is important in formulating programs of treatment for agricultural watersheds and in estimating conditions of erosion from such watersheds.

14. Chemical transport modeling requires basic information on insecticide washoff from plant canopy to soil and its subsequent transport in runoff and sediments. Washoff of the organophosphate insecticide, methyl parathion (M), from mature cotton was evaluated under field conditions using a multiple-intensity rainfall simulator to apply the rainstorms. Only 57±9% of the applied MP (0.64 kg/ha by ground equipment) reached the upper part of the cotton canopy. Only 20±5% of the applied MP was present in the cotton canopy 2 hr after application. Thus, about 65±11% of the MP load on the cotton plants disappeared in the 2 hr before rainfall was initiated. The concentration and amount of MP washed off were independent of rain intensity when 24 mm simulated rain was applied at 11, 26, 52, and 111 mm/hr. About 88±32% of the MP load on the plants was washed off. Only rainfall amount affected MP washoff. This information greatly simplifies modeling the movement of MP from plant canopy to soil during natural storms when rain intensities vary greatly within storms and from storm to storm.

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

NEBRASKA

Research activities at the Watershed Research Program in Columbia, Missouri, include the following:

1. Valley bottom sediment deposition and valley bottom and valley head gullies continue to be active in the Medicine Creek drainage basin of western Nebraska. The smaller Dry Creek drainage area within the Medicine Creek basin was the site of an intensive channel erosion study in the 1950's. Original 1951 profiles and cross sections were resurveyed during 1981. Upstream advance of scarps in the main and tributary channels were determined. Surveyed cross sections provided volume determinations of recent gully erosion. Downstream cross sections showed significant valley bottom deposition. Measurements from recent aerial photographs will provide volumes voided by valley head gullies. These data will be used by a graduate student to establish a sediment balance and document the continuing deterioration of this rapidly eroding loess area in western Nebraska.

For additional information contact Allen T. Hjelmfelt, Acting Research Leader, USDA-ARS, North Central Region, 207 Business Loop 70 East, Columbia, MO 65201.

OHIO

Research activities at the North Appalachian Experimental Watershed near Coshocton, Ohio include the study of the impacts of surface mining on sediment concentration:

1. Preliminary analyses suggest that at the 36.8-acre Muskingum County, Ohio site, post reclaimed sediment concentrations and loads are at or below those of the watershed in its natural condition. This is due to the near 100% grassy vegetative cover on the surface established by the mining company No supporting erosion control practices, besides the placement of rip rap along a portion of the main stream channel, were employed. The reclamation technique included seeding, fertilizing and crimping straw mulch into the veneer of topsoil. The natural watershed cover was pasture.

2. Preliminary analyses suggest that at the 41.0-acre Coshocton County, Ohio site, past reclaimed sediment concentrations and loads are above (about 2 times) those of the natural condition. The reclamation technique included seeding, fertilizing, and mulching. Supporting erosion control practices included several diversions draining most watershed flow to the head of the basin into a rock chute. The flow from the rock chute and from other diversions entered a series of 3 tandem dry dams in the main channel. Most transported sediment was derived from the insufficiently protected rock chute and main stream channel. The natural watershed cover was forest and underbrush.

For additional information contact James V. Bonta, USDA-ARS, P. O. Box 478, Coshocton, Ohio 43812.

SCIENCE AND EDUCATION ADMINISTRATION

OKLAHOMA

Research activities at the Water Quality and Watershed Research Laboratory, Durant and Chickasha, Oklahoma, include:

1. Sediment discharge data from various unit source watersheds is being used to predict the transport of particulate P (sediment bound) in runoff. This prediction utilizes relationships between the enrichment of soil P in runoff and sediment discharge, developed from laboratory and field studies. The prediction of particulate P loss was good over a wide range of sediment discharge (2-900 kg/ha) and particulate P concentration (200-5100 mg/1).

2. The sorption of P by suspended sediment during transport in runoff under simulated laboratory and field conditions was investigated. A linear inverse relationship between soluble P and sediment concentration was significant over a wide range in sediment concentration (10-600 mg/1). Thus, for unfertilized and P fertilized watersheds suspended sediment may act as a P sink rather than a P source. This occurrence must be accounted for when modeling the input of soluble and particulate P to lakes and impoundments.

3. An experiment has been initiated to evaluate the effect of long-term erosion and deposition in a sloping wheat field on the variability and interrelations of soil physical properties, soil water storage, and crop production. Twenty neutron access tubes have been installed along the slope, and soil cores saved in 15-cm depth increments for measurements of color, bulk density, texture, organic matter content, pH, and soil water characteristic curves. Field soil moisture measurements will be made weekly. These data will be used to determine relationships between plant growth and yield.

4. Amounts of sediment in runoff from grassland watersheds in the Blackland Prairie, Reddish Prairie, and Rolling Red Plain land resource areas of Oklahoma and Texas were predicted using the modified universal soil loss equation (MUSLE). In this equation,

$$Y = 11.8(Qq_p)^{0.56} \text{ KCPSL}$$

   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 three to five years and included treatments involving grazing density, fertilization, cultivation, and burning. Over the range of watersheds, average 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.

5. A technique was developed to measure the rate at which an organism resuspends sediment. Burrowing mayfly nymphs were collected from a pond and brought into the laboratory. Resuspension measured with a dipping probe colorimeter, ranged from 2.4 to 13.0 mg/hr per individual during the first 24 hours of the test. After the first 24 hours the resuspension ranged from 1.8 to 2.3 mg/hr per individual for about 10 days. Water temperatures during the tests ranged from 20 to 25 ^{o}C.

6. Sediment deposition and benthic diatom collections were continued in two SCS flood retarding reservoirs in the Little Washita River Basin. The ash content of deposited sediment ranges from 70 to 90%, indicating that it is largely soil material. During periods of no runoff, much of the deposited material is apparently derived from shoreline wave action and resuspension of bottom sediments. During one year, from April 1981 through March 1982, the deposited sediment averaged 12 kg/m^2 in the more eutrophic pond (Site 23) and 2.6 kg/m^2 in the less eutrophic pond (Site 11). Approximately 1/4 of the sediment in Site 23 and 1/2 of that in Site 11 came from shoreline erosion or resuspended bottom sediments. After correction for organic matter deposited with the soil material, it was estimated that deposition of autochthonous organic matter for the year was 0.5 kg/m^2 in Site 23 and 0.18 kg/m^2 in Site 11.

7. Benthic diatoms have been identified and enumerated monthly in the two reservoirs in the Little Washita River basin. Species diversity was similar in both reservoirs except in the winter of 1981 when Site 23 had a lower diversity than Site 11. In both reservoirs the diversity at the inlet tended to be higher than at the outlet. Many freshwater species identified in this study are known to tolerate small amounts of salt and moderate amounts of nitrogen compounds from decomposing organic matter. With the data analyzed so far, the species in both reservoirs have similar tolerances.

8. Water quality parameters measured at the inflow to two SCS flood retarding reservoirs in the Little Washita River Basin correspond closely with those measured in outflow from unit sources within the watersheds of the reservoirs. This was true for concentrations of sediment, nitrate, Kjeldahl nitrogen, soluble phosphorus, and total phosphorus, although the watershed areas were 250 and 530 hectares for the reservoirs and ranged from 0.5 to 4 hectares for the unit sources. In contrast, concentrations of sediment and nutrients were much lower within the reservoir and in its outflow. These results indicate the size of watershed does not itself greatly influence water quality, but that reservoirs do have a large effect.

9. Research was continued on the Lake Chicot, Arkansas, restoration project. Routine data collection has been in progress since 1976. A process oriented mathematical model has been developed which predicts suspended sediment behavior in the lake and which has been verified with experimental data. Components of the model which will predict light penetration and primary productivity are nearing completion. The principal limitation to productivity of Lake Chicot is the normally large concentration of suspended sediment. Currently the development of a water

management diversion plan to restore and optimize the water quality of Lake Chicot and to significantly reduce the suspended sediment load in the lake is underway.

10. Studies comparing the very fine deposited sediments in lakes and reservoirs are continuing. Sediments from lakes and reservoirs in Mississippi, South Dakota, Oklahoma, and Arkansas have been collected and analyzed.

11. Collection of sediment yield and runoff data continued at two gaging sites on the Little Washita River in conjunction with the Model Implementation Project (MIP). After 18 years of data collection there apparently has been no change in the sediment yield after the watershed was treated with floodwater retarding reservoirs nor after the uplands received soil conservation treatments during the MIP. It is hypothesized that in this size watershed with a sizeable amount of alluvium and high erodible channels that it may take several decades before any effect can be detected at the watershed outlet.

12. For Southern Plains watersheds good correlations have been found between runoff and drainage density ($\gamma^2 = 0.88$) and sediment yield and drainage density ($\gamma^2 = 0.84$). A new, very detailed drainage density determination procedure was devised that produced this good correlation. Presumably the specific correlation will change with climate and physiographic region. These runoff and sediment yields vs. drainage density functions should be useful for prediction of runoff and sediment yield for ungaged watersheds when two or more watersheds in the area have gaged data.

13. During the late 1960's considerable velocity and sediment concentration distribution data was collected during higher flows at 5 gaging sites on the Washita River. This data has been compiled and will soon be published as a USDA Southern Region publication.

14. Data collection continued on 11 unit source and two main stem watersheds in the Little Washita watershed. These stations were instrumented in 1980, as part of a Model Implementation Project to study the effect of management practices on downstream water quality. The unit source watersheds were selected to represent various land use or sediment source areas including gullied and roadside areas within the Little Washita watershed. After 3 years of baseline data are obtained on the unit source watersheds, various management practices will be imposed (1983) on the watershed to determine the effect of selected management practices. Rainfall, runoff, and sediment and nutrient yields are being obtained. Particle size information is also being obtained on watershed soils and suspended sediment from selected events.

15. Soil and sediment characteristics, including fallout cesium-137, were used to evaluate upland erosion and deposition in impoundments. Studies conducted with the University of Wisconsin on erosion and deposition on White Clay Lake Watershed, Shawano Co., WI, were summarized and a report has been prepared. Erosion and sedimentation rates in the Allerton Lakes watershed, University of Illinois, were calculated and a report is being prepared. In cooperation with the Wisconsin Department of Natural Resources, sedimentation rates in four flowage

reservoirs were calculated using the cesium-137 technique. A sedimentation rate study of Wolf Lake, Yazoo Co., MS, was completed and a report is being published.

16. Algal-clay aggregates were formed when algal and clay suspensions were mixed in the presence of an electrolyte. The maximum ratio of clay to algae in the aggregates was 1.7, 0.2, 0.03 mg clay/mg algae (wet weight) for <u>Anabaena</u>, <u>Chlamydomonas</u> and <u>Chlorella</u> spp., respectively. The aggregates formed at Ca^{++} concentrations greater than 5×10^{-4} M or Na^{+} concentrations greater than 2×10^{-2} M.

17. Gullies, roads, and clean tilled wheat on the steeper slopes are high sediment producers in the Little Washita basin. Watershed sediment yields from gullies and roads averaged 41 and 61 T/A respectively. Data from a gullied watershed indicates that the gullied area, only 10% of the watershed, produced 93% of the measured sediment yield. Likewise, in the watershed where 8.5% of the area was in roads, 95% of the measured sediment yield from the watershed came from roadsides. The gullied areas of two watersheds produced an average of 390 T/A sediment and the road and borrow ditch areas of two watersheds produced an average of 748 T/A. Runoff from a clean tilled wheat watershed was 11.5 times greater than that from an adjacent idle watershed and the sediment yield of 10.5 T/A was in the order of .9 times higher.

18. The Lakes Larto and Saline studies in central Louisiana conducted cooperatively with the U.S. Army Corps of Engineers, Vicksburg District and Northeast Louisiana University were completed and reported. Studies on sedimentation rates in shallow lakes in North and South Dakota were conducted with the SCS and the South Dakota Department of Natural Resources. A cooperative study of the sedimentation rates in Lake Overholser and Northeast or Zoo Lake, Oklahoma City, are underway with the Oklahoma State Department of Pollution Control. Similar studies were conducted on Lake Atoka, Oklahoma, and Sardis Lake, Mississippi. Preliminary data from Lake Overholser and Zoo Lake indicate deposition rates of 1.75 and 2.05 cm/yr since 1964.

19. In 1980 a cooperative study with Southern Illinois University and Commonwealth Edison Co. was initated in Pool 14, Upper Mississippi River (near Clinton, Iowa). Sediment profiles were sampled in 1980 and 1981 in three backwater slough areas. The sedimentation rates in these backwater sloughs were less than previously reported in Pools 4 through 10. The sediments in Pool 14 contain considerably greater percentages of clay. Portions of the results were presented before the Mississippi River Research Consortium, La Crosse, WI, April, 1982, and are being published.

20. The CREAMS model was used to evaluate the chemical (pesticide) and sediment load reduction due to a land treatment program on a SCS Watershed Protection Project for West Franklin Watershed in Louisiana. Forty-seven Resource Management Systems were evaluated on three typical field size watersheds. Results of these evaluations were used to project the effectiveness of the land treatment on the Fishery of Turkey Creek Watershed. The watershed plan was accepted. Visits were made to the

Rural Clean Water Projects in Alabama and Tennessee at which time fields were selected for evaluation with CREAMS. Data are now being compiled to complete these applications. A User Guide was written to use in training workshops for SCS State Office personnel on the use of CREAMS model in each of the 11 states of the Southern Region, SCS.

21. The CREAMS model has been run on cropland watersheds located at Chickasha, Oklahoma, and on rangeland watersheds at Chickasha, Oklahoma, and Guthrie Oklahoma. Cropland evaluation using CREAMS proved successful in ranking land treatment effects of 47 Resource Management Systems including continuous cotton, continuous soybeans, and double cropping with soybean-wheat. Reduction of sediment loads and chemical loads of toxaphene and DDT residue were reduced by .70 by terracing and contouring a conventionally tilled, steep sloped (8-12%) continuous cotton field. Long term simulation of both Resource Management System (RMS) conventional and conventional with terracing showed a reduction from 1.8 in. average topsoil loss to .54 in. in a 20-year period. The model results showed that RMS could be ranked according to their effectiveness so that planners could use these rankings to devise combinations of management and treatment practices that would be economically acceptable to SCS sponsors and land owners.

For additional information contact J. Roger McHenry, Director, USDA, ARS, Southern Region, P.O. Box 1430, Durant, OK 74701.

OREGON

Research activities at the Columbia Plateau Conservation Research Center in Pendleton, Oregon include the following:

1. Numerous runoff and erosion events were observed on all plots at the permanent erosion site during five years of monitoring since 1977. A conditional distribution of runoff and soil loss events was approximated by a 3- parameter lognormal distribution. The probability of a single soil loss event from the continuous fallow plot in excess of the soil loss tolerance value of 11 tonnes/ha is only about 0.10. Also 50% of the soil loss events can be expected to yield less than 3 tonnes/ha. The total probability for the occurrence of a single event greater than 3 tonnes/ha during the period November through May is about 0.03. These low occurrence probabilities may explain the USLE overestimates of erosion at this site. The USLE estimate for the wheat-pea rotation is 15 tonnes/ha per year versus an observed 9 tonnes/ha per year. On continuous fallow, we have observed a soil loss of 18 tonnes/ha per year while the USLE estimates 38 tonnes/ha per year. The soil loss tolerance value of 11 tonnes/ha per year average has not been exceeded even with poor management (up and down slope tillage, low residues) on the wheat-pea rotation. November to May precipitation has been above normal for 3 years and normal one year.

2. Runoff and soil erosion data is being collected from farmer operated fields throughout the five northeastern Oregon counties in dryland wheat production. Relevant USLE parameters are also being measured. This project is in its third year of operation. In two complete erosion seasons, 23 runoff and soil loss events were observed. Fifteen of the 23 events (65%) involved frozen soils, 14 (61%) involved snowmelt and 12 events involved both. These runoff events were produced by specific combinations of several weather variables interacting with physiographic and soils factors. Frozen soils, snowmelt, and high dewpoint temperatures were the three key factors involved in large soil loss events. Rain or snow merely accelerated the loss when the other factors were present. The high dewpoint temperature liberates heat of vaporization at the snow-air interface and adds water from snowmelt to the water condensed at this cold interface.

3. Preliminary data from 2 field experiments conducted since 1979 indicates that standing wheat stubble and burned stubble produce significant differences in both diurnal freeze-thaw and extended freezing. Nocturnal frost penetrated into bare soil (burned stubble) approximately twice as deep as under standing stubble. During an extended period of freezing weather, frost penetrated to 30 and 20 cm on the burned and stubble-covered plots, respectively. Comparative radiation balances above the soil and straw showed a greater positive net radiation during the day on burned plots and a nearly equal nocturnal long-wave radiation during the freezing night. However, soil heat flux was largely positive (during the day) and negative (during the night) on the burned plots. Heat storage in the stubble cover may be causing the different response. It is anticipated that the measured components of the energy and radiation budgets, over various tillage and residue managements, will explain the role of residue as a mediator of radiative cooling of the soil surface.

4. Data from 3 widely scattered sites suggests that excessive soil compaction resulting from seeding or reseeding when the soil moisture is high, can greatly increase the potential for large soil losses.

5. A rapid method of measuring soil loss from rilling was developed. Measurements on 4 plots, where total erosion was known, indicated that rilling produced 96% of the total soil loss. Future modeling efforts for the Pacific Northwest dryland should concentrate on rill genesis and development.

For additional information contact John F. Zuzel or R. R. Allmaras, USDA-ARS, P. O. Box 370, Pendleton, OR 97801.

PENNSYLVANIA

Research activities at the Northeast Watershed Research Program in University Park, and Klingerstown, Pennsylvania include the following:

1. A rainfall simulator, sufficiently rugged and mobile to operate almost anywhere on a reclaimed mine and to apply artificial rain to small plots at a freshly mined and reclaimed site, has been constructed and tested. Tests have been initiated *in situ* and three additional sites (Karthaus, Kittanning and Friedens) have been chosen in 1982. Slope, slope length and erodibility data have been digitized for several counties in Central and Western Pennsylvania. A modeling effort to delineate source areas of runoff, erosion and deposition, has begun in cooperation with The Pennsylvania State University, Department of Civil Engineering. A field study, designed to experimentally measure the areas of erosion and deposition against the background information on antecedent water content, spoil subsidence, infiltration and bulk density, has been initiated. Greenhouse experiments have been started to determine species selection for optimum cover. Geostatistical techniques have been successfully applied to erosion problems.

For additional information contact A. S. Rogowski, Soil Scientist, USDA-APS, Northeast Watershed Research Center, 110 Research Building A., University Park, PA 16802.

TEXAS

Research activities at the Grassland Soil and Water Research Laboratory in Temple, Texas include the following:

1. The MUSLE was tested with data from 102 watersheds located throughout the U.S. These watersheds provided a wide range in watershed and climatic characteristics and management strategies. These watersheds represent a wide variety of conditions generally encountered in predicting sediment yield in the U.S. The MUSLE gave good results except for watersheds with very flat slopes. There was a tendency for MUSLE to overpredict small storms and underpredict large storms.

2. The first phase of a dynamic sediment detachment-transport model was developed and is operational. The dynamics of water and sediment transport are treated as a series of steady states to allow analytic solutions for sediment concentrations at any time and position on a plane. The processes simulated by the model include rainfall detachment, sediment deposition, and entrainment of sediment by runoff. Limited testing has shown promising results.

3. A model structure was developed for studying the effect of soil erosion on soil productivity. Processes simulated include hydrology, weather, erosion-sedimentation, soil properties, nutrient cycling, plant growth, and tillage. The model has been used on 11 test sites throughout the U.S.

For additional information contact Clarence Richardson, Research Leader, USDA-ARS, Southern Region, 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. A portable, photographically recording rill meter is being used to measure soil loss from rills from selected field sites at the end of the erosion season. The purposes of the study are to determine (1) the effect of slope length and steepness on soil loss, and (2) the variation of soil loss across the climatic belts of eastern Washington and northern Idaho. The results from this study, initiated in 1973, are being used in developing a second generation adaptation to the Pacific Northwest of the Universal Soil Loss Equation.

2. 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, phosphorous, and selected herbicides 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 meters to determine the effect of crop treatment on frost depth and subsequent runoff and erosion following periods of frozen soil.

3. A crop management factor evaluation model has been developed for use in the adaptation of the Universal Soil Loss Equation to the Pacific Northwest. The model considers such factors as surface residue, tillage operations, vegetative cover, and soil moisture content prior to and during the winter erosion season.

4. A sediment transport and delivery rate study was conducted on a 27.1 square mile watershed. A PS-69 automatic pump sampler, located near a USGS gaging station, was used to collect suspended sediment samples. Several channel cross sections were measured before and after the erosion season to estimate the amount of channel aggradation or degradation and are used with upland erosion and valley deposition measurements and estimates to calculate delivery ratio. Data from the study are also being used to determine sampling frequency requirements for streams in agricultural watersheds of the Palouse. The field study was concluded at the end of water year 1980 and data is being analyzed.

For additional information, contact Donald K. McCool, USDA, ARS, Agricultural Engineering Department, 219 Smith Engineering Building, Washington State University, Pullman, WA 99164-6120

LABORATORY AND OTHER RESEARCH ACTIVITIES

Bureau of Reclamation

A 1:8.25 scale model is being used to study the abrasion problem in the stilling basin of Mason Dam. The model will be used to study the nature of the rock migration into and its action within the basin. The possibility of flushing and preventing the migration will be studied.

A laboratory facility was used to test the first stage of a filter designed to prevent migration of very permeable silt through blanket material underneath riprap near Twin Lakes Dam. Piezometric heads and velocities were measured to determine permeability of the sand filter and the silt and to determine hydraulic gradients across the filter boundaries.

As part of the Grand Coulee Third Powerplant Riverbank Stabilization Program, clay erosion tests were performed to evaluate the stability of the Columbia River bed clay material in the channel downstream from Grand Coulee Dam. A new testing device was developed to model the erosion capability for the river bottom clays at Grand Coulee and determine the threshold of tractive shear at which erosion was observed. In order to develop uniform shear across the test flume width and especially the clay sample, a rectangular shaped flow duct 36 inches wide by 4 inches high was used. The clay sample was placed in a receiver box at the center area base of the flume and the clay was forced upward into the flow to the level of the flume bottom. The flume receiver box was designed to handle samples 1-foot square and up to 1-foot deep. USBR divers developed underwater clay sample acquisition techniques for extracting as undisturbed a 1-foot square sample inside a receiver box for flume testing. Although the flume sample receiver box was developed for samples to a depth of one foot, divers found they could successfully extract samples only up to about six inches keeping them undisturbed. The samples were carved and installed in the flume device maintaining proper moisture content by experienced field soils personnel. Geologists observed the sampling procedures and tractive shear testing. The flume calibration for tractive shear and threshold tractive shear determinations were completed by a hydraulic engineer. Modes of erosion were studied and measurements made documenting tractive shear at initiation of clay particle movement.

A general study is underway concerning scour caused by impinging jets in basins. The effects of orifice shape on pressures and velocity distribution are being studied. Results of this study will be used to estimate scour in basins of rock and cohesive clay.

Previous model study results were used to develop a successful technique of varying the elevation of the gravel cleaner gate for scouring spawning gravels with the baffle-gate gravel cleaner at the Tehama-Colusa Canal fish facility. The Fish and Wild Life Service had requested that the gravel mounds downstream of the artificial redds be smoothed to a flatter slope. A program for raising the gates versus movement of the machine was provided to USBR field office to smooth the mounds.

Bureau of Reclamation

A new bed material sampler (revised version of the clam shell) was field tested on the South Platte River below Chatfield Dam for the Federal Interagency Sediment Project Comments with suggested modifications to the sampler were transmitted to the project.

Development of the water-sediment routing model continued under contract with Colorado State University. The hydraulic computation portion of the model has been completed and tested. During the next year, sediment transport procedures will be added to the model in order that long term channel changes can be modeled. The model will be completed by January 1983.

CORPS OF ENGINEERS

Coastal Engineering Research Center

NUMERICAL MODELING OF COASTAL SYSTEMS. This study was initiated in 1976 to investigate the feasibility of developing a numerical model that would predict the response of a shoreline to changes in wave energy acting on it. Initial conclusions are that an approximate model suitable for use in planning studies can be developed that will provide estimates of the effects of various coastal structures on adjacent shorelines. A detailed literature survey of publications related to mathematical prediction of shoreline evolution was published in 1977 (MR77-10, "Mathematical Modeling of Shoreline Evolution" by B. LeMehaute and M. Soldate).

Current efforts are being directed toward the development of a numerical computer model based on the equations of longshore sediment transport and the mass balance equation for the sediment. Papers describing one-line mathematical models were published in 1979 and 1980 ("Predicting Beach Planforms in the Lee of a Breakwater" by M. Perling, Coastal Structures '79 proceedings published by the American Society of Civil Engineers, 1979; MR 80-6, "A Numerical Model for Predicting Shoreline Changes" by B. LeMehaute and M. Soldate, 1980). An additional contract report was published in 1980 (TR 80-2, "Transformation of Monochromatic Waves from Deep to Shallow Water" by B. LeMehaute and J. D. Wung). An n-line numerical model is being prepared under contract and will be published in 1982. Action has been initiated to obtain a one-line model developed for mini-computers at the Nearshore Environment Research Center in Japan. Development directed towards a fixed-grid numerical model is being coordinated with CERC's Working Group on a Nearshore Sediment Transport Model. Coordination has been initiated with Corps of Engineers Districts to determine their needs.

The eventual product will be a computer program that will permit preconstruction estimates of the effects of proposed coastal structures, the interaction among several coastal structures along a shoreline and a method of estimating the damages attributable to the construction of a given navigation project. The computer program may also provide estimates of the dispersion of sediment from proposed beachfills or nearshore deposition of dredged material.

WAVE-SAND INTERACTIONS IN A WATER TUNNEL. In a CERC-sponsored study, Karl Lofquist of the National Bureau of Standards has concluded data collection and analysis of oscillatory-flow energy loss due to naturally rippled sand beds. His first results and a simple interpretive model were reported in a paper titled "Measurements of Oscillatory Drag on Sand Ripples", published in the Proceedings of the 17th International Coastal Engineering Conference (Sydney, Australia). Full results will be documented in a report presently being prepared for CERC publication.

WEIR JETTY ORIENTATION AND ELEVATION. A three phase study to investigate the functional and hydraulic behavior of weir jetty systems was initiated in late 1976. The research study includes two sets of laboratory experiments and a prototype data collection program.

A series of movable-bed laboratory tests were done to quantify the distribution of sediment-transport across a weir section for various wave conditions. A second series of tests using tracer material in a fixed bed model determined relative volumes of sediment carried over the weir section and around the jetty and monitored the response of the updrift shore-line of a number of weir jetty systems to changes in wave direction. The prototype data collection program measured the distribution of sediment transported across the weir sections of currently existing systems. Reports on all three studies are in preparation. A special report on the design of weir jetty systems has been published.

Expected output from this study will permit designers to use the empirical data to evaluate proposed weir jetty system designs and to establish OPTIMUM weir crest elevation, orientation and length.

EVALUATION OF NAVIGATION AND SHORE PROTECTION STRUCTURES. Reports entitled "Wave Loading on Vertical Sheet Pile Groins and Jetties", "Guidelines for the Design of Weir Jetty Sand Bypassing Systems", "Hydraulics and Stability of Five Texas Inlets", "Analysis of Coastal Sediment Transport Processes from Wrightsville Beach to Fort Fisher, NC", and "Some Observations on the Economics of 'Overdesigning' Rubble-Mound Structures with Concrete Armor" and an ASCE Technical Note entitled "Stability of Rubble-Mound Break-waters" have been published. A report on the shore protection measures that have been taken on Tybee Island, Georgia, has been prepared under contract and is undergoing review. Monitoring programs are underway at Lakeview Park, Ohio (offshore breakwaters), Murrells Inlet, SC (weir jetty system), and Little River Inlet, SC (jetty system). Data sheets for inventory of low cost shore protection in the field have been developed and a publication intended to distribute an initial, limited inventory of sites is being prepared.

SHORE RESPONSE TO OFFSHORE DREDGING. This work unit addresses the problem of determining when offshore dredging is likely to adversely effect adjacent beaches. Data on recent nearshore dredging operations were collected from each of the Corps' coastal districts to indicate the present extent of the problem, and to form a basis for selecting project sites for follow-up study. Field studies were begun at two sites. A series of surveys were conducted to monitor the movement of sand dumped in the winter of 79/80 opposite St. Augustine Beach, and surveys were also made of the offshore borrow site at Redondo, CA to determine how much beachfill over the long term, was being washed back into the offshore borrow pit. Preliminary results indicate that Redondo's offshore borrow site is gradually filling with sand moving in from offshore. Though the beach sand moves on and offshore with the storm season, it does not move far enough seaward to get trapped in the offshore borrow pit. Early results were published in Shore and Beach. Analysis of sand samples will be done to identify sources, sinks, and paths of sediment transport. Continued remeasurement of reference rods will help quantify rates of filling of the offshore trench at Redondo.

Other promising field studies which have been identified include an evaluation of the sediments filling the Harrison Co., MS borrow site, possible CERC involvement in monitoring proposed offshore disposal sites in Georgia, and any extensions of navigation channels beyond the entrance bar and across the inner continental shelf.

VISUAL SURF AND NEARSHORE CURRENT OBSERVATIONS. The Littoral Environmental Observation (LEO) program is a cooperative effort carried out among Corps of Engineer District Offices, CERC, and volunteer observers. Currently, visual surf observations are being made in the Savannah, Los Angeles, Mobile and Galveston Districts. The parameters measured daily include: breaker height, period, direction and type; longshore current speed and direction; wind speed and direction; foreshore slope; rip current and beach cusp spacings. Beach sediment samples are also collected at some locations.

Yearly summaries are prepared and forwarded to appropriate Corps District Offices. A "Regional Data Summary" report is being prepared for Northern California area.

STORM EROSION STUDIES. The purpose of this study is to develop methods for predicting storm-induced beach changes. During the first phase of the study, measured beach changes will be empirically related to storm parameters. Available data include storm change surveys conducted by this study between November 1975 and March 1978, and similar data collected under CERC's Beach Profiling Program between 1962 and 1977. Included in the study are 11 east coast beaches located between Cape Cod and North Carolina. Wave data for the storms occurring before January 1976 have been obtained from the WES east coast wave hindcast model.

A new field study, which began in 1981, seeks to investigate nearshore changes due to storms. 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). Accurate position and elevation are determined with an electronic survey system. The data from the first year of surveys indicate that beach changes are small relative to offshore changes but that most changes occur in water depths less than 6 meters.

During the second phase of the study, a numerical model of nearshore sand movement will be developed, calibrated, and verified using data collected at CERC's FRF. This is a major effort aimed at understanding and predicting the physical processes which cause storm erosion.

LIMITING WATER DEPTH TO SAND TRANSPORT BY WAVES. "A Profile Zonation for Seasonal Sand Beaches from Wave Climate" appeared in the February 1981 issue of Coastal Engineering. Sand and annual wave characteristics permit calculating two water depths bounding a nearshore buffer zone where sand transport is neither strong nor negligible. This zonation has applications to research and engineering activities on sandy coasts. A parallel paper considering laboratory processes and the design of coastal models was submitted for publication in the ASCE-WW journal.

In the December 1981 issue of Sedimentology, a brief review developed simple equations for "Terminal Settling Velocity of Commonly-Occurring Sand Grains." Other papers on wave agitation and transport rates of sand are presently under review for possible publication.

BEACH PROFILE STUDIES. The objectives of these studies are to observe the response of beaches to waves and tides of specific intensity and duration and to develop predictive techniques for estimating storm-induced beach changes.

During the 1981 calendar year emphasis continued on the preparation of locality reports summarizing data collected since 1962.

The report "Beach Changes at Atlantic City, New Jersey (1962-73)" was published as CERC MR 81-3. This report documents the effectiveness of two beach-nourishment projects. Beach fill placed on the northeastern end of the island effectively nourished downdrift beaches for up to 5 years. This study also documents the effects of seventeen coastal storms of moderate intensity. Beach changes were found to be seasonal, with the greatest volume of sand above MSL from May to October.

A draft, eight-volume user's guide for a package of computer programs used to edit, analyze, and display beach profile data was completed and is being prepared for distribution as a CERC publication. The package, entitled The Beach Profile Analysis System, has been placed in a central computer, and is available to all Corps users.

Three reports have been completed, in draft form, that summarize beach changes at Holden Beach, North Carolina; Cape Cod, Massachusetts; and Misquamicut, Rhode Island. These are presently being prepared for CERC publication.

SCALE MODELING OF COASTAL SEDIMENT TRANSPORT. A tour of a number of foreign laboratories was conducted and literature review carried out to determine the state-of-the-art of movable-bed physical modeling. A research plan has been developed based on previous work and the first phase of this plan initiated. The first phase examines onshore/offshore sediment motion modeling using the fall velocity parameter, H_o' (W T), where H_o' is deepwater wave height, W the fall velocity of sediment and T the wave period. Tests conducted in the CERC Large Wave Tank and data collected at the Field Research Facility, Duck, NC are used as the prototype. Models at scales of 1/16, 1/30, 1/53, 1/77 and 1/106 of the Large Wave Tank have been conducted to date with a 1/15 initial slope and using fine sand as the model material. Both erosive and accretionary beaches have been modeled. Results to date indicate that models with scales larger than 1/60 can accurately model the rates of beach erosion and accretion.

BARRIER ISLAND SEDIMENTATION STUDY. There was continued effort on analysis and interpretation of high resolution seismic and sedimentary core data from Long Island Sound, Lake Erie, Southern California, and central New Jersey during 1981.

The data collection effort for southern California, from Oceanside to the Mexico border, was completed and a contract report containing final results and conclusions was prepared.

The field and office effort continued on various subject related to better understanding sedimentation processes along Barrier Island coasts. The six primary studies underway are described below and results are presented in CERC publications, abstracts of lectures given at professional meetings, and in scientific journals.

1. "Sources of B.I. Sediments" - Involves collecting sediment samples along the coasts and across the inner continental shelf, and using geophysical equipment to identify areas of erosion that might contribute to a coastal sand budget. Natural sediment tracers and side-scan sonar data used to determine onshore/offshore sediment transport.

2. "Back-barrier Marsh Sedimentation" - Involves coring and mapping to understand processes and environmental conditions needed to form and maintain biologically productive marshes. Results used to objectively evaluate impacts of engineering works on marsh processes.

3. "Formation and Evolution of Capes" - Involves analyses of historic charts and detailed sedimentological studies of cores to determine natural conditions needed for shoreline accretion to form capes.

4. "Nature of Marsh Boundaries" - Involves aerial surveys and mapping to inventory back-barrier marshes and identify if they are eroding, accreting or stable, and to determine primary reasons for each condition.

5. "Historic Shoreline Changes and Sea Level Effects" - Involves a coop study with NOAA-NOS to get maps showing very accurate changes in the shore position from Cape Henlopen, DL south to Cape Hatteras, NC over the past 130 years. Also using cores to learn how the shoreface has responded to past rises in sea level.

6. "Recent Changes in Sea Level Elevation" - Involves a thorough review of climatic and sea level literature world-wide over the past several decades to determine the changes in sea level elevation in the past several centuries.

BEACH FILL SEDIMENT CRITERIA.

1. Guidelines for the Design of Beach Fills. Guidance for fill specification, prediction of fill performance, borrow source and beach sampling, and granulometric description of sediments are provided by (1) CERC TM 60 "Techniques in Evaluating Suitability of Borrow Material for Beach Nourishment" by James, (2) CERC TP 77-6 "Review of Design Elements for Beachfill Evaluation" by Hobson and, (3) CERC CETA 79-7 "Meeting and Use of Phi Grade Scale" by Hobson.

2. Monitoring Beach Fill Performance. The first field monitoring study to test proposed beachfill models was completed at Imperial Beach, CA, and analysis of those data is nearing completion. Monitoring of the fill project at Surfside/Sunset Beach, CA was begun and a third monitoring site will be selected soon. These long-term projects will provide data for field validation and modification, if necessary, of the Renourishment and Fill Factor models presented in the Shore Protection Manual.

3. Evaluation of Potential Nearshore Borrow Sources. Offshore sand bodies may become an important future source for beach fill sediment. Ebb tidal delta complexes are commonly found along the East Coast and one such delta at New River, NC was core sampled and surveyed to generally assess its fill potential. Results from this study and from additional studies to be carried out at other "typical" sand bodies will provide a basis for generally evaluating the fill potential of these kinds of sand resources.

4. Handling Loss Experiments. Three experiments were conducted in North Carolina and New York to evaluate modifications to sediment texture caused by dredging and handling operations. Results from these experiments reported by R. D. Hobson at three engineering conferences were that winnowing losses generally improved the predicted performance of dredged sediments as beach fill, and that a mathematical model shows promise which estimates potential handling losses by comparing textural attributes of sedimentary materials.

5. Other Ongoing Studies. (A) Core sampling studies across the active profile are providing the depth component of beach sediment textural variability for use in improving beach sampling guidelines. (B) Analysis of sediments core-sampled from a sand trap feature at Channel Islands, CA provide data to estimate the winnowing function of the renourishment beach fill model, to document the textural filling history of the sand trap, and will serve as a basis for evaluating the relative merits of core sampling versus surface sampling of nearshore sediments. (C) Cores taken across the active profile of an East Coast barrier island (Topsail Island, NC) have documented the internal stoneface stratigraphy, provided modern and ancient equilibrium profile shapes and has shown the middle stoneface to be the active "cutting edge" of a migrating barrier island. (D) Multidisciplinary experiment at the CERC Field Research Facility, Duck, North Carolina, in fall of 1981 provided surface and cored sedimentologic data, longshore current measurements across the nearshore profile (including surf zone), degree of bottom sediment motion in response to individual waves, run up data sequences and, measures of bed term structures and bioturbation within the upper foot of surface sediment on beach profile. These data will provide a better understanding of nearshore process/response relationships with particular emphasis upon defining the active profile, establishing an offshore limit to sediment motion at Duck and reconstructing that barrier's recent migrational history.

CORPS OF ENGINEERS

The Hydrologic Engineering Center

Work at the Hydrologic Engineering Center (HEC) continued to focus on the maintenance and improvement of the mathematical model HEC-6, "Scour and Deposition in Rivers and Reservoirs."

Training Document No. 13, "Guidelines for the Calibration and Application of Computer Program HEC-6," (February 1981) is now available. This document describes methods and procedures for calibrating and applying computer program HEC-6 for river and reservoir sedimentation studies.

On July 7-9 1981, the HEC hosted a two-dimensional flow modeling seminar in Davis, California. The seminar provided a forum for evaluating and predicting the characteristics of two-dimensional flow in the horizontal plane. Papers and discussions emphasized model applications, features, performance and utility rather than recent research advances. Although the seminar focused on two-dimensional flow modeling, the necessity for having an accurate description of the hydrodynamics of a system was discussed with respect to conducting sediment transport studies and water quality simulations. The proceedings from this seminar will be available in April 1982.

Work was carried out with the Sacramento District, Corps of Engineers, with their "Sacramento River and Tributary Bank Protection and Erosion Control Investigation." The HEC also assisted the District with an evaluation of possible sedimentation problems associated with the Merced, California channelization and flood control project. Special Projects Memo No. 81-3, "Sediment Transport in the Bear Creek Basin, Merced County, California," (MacArthur, 1981), summarizes the HEC's evaluation of the current and anticipated sediment-associated problems in Merced County. This special projects memo was incorporated as part of Sacramento District's Phase II General Design Memorandum for the Merced project.

CORPS OF ENGINEERS

Waterways Experiment Station

Title of Study:

Sediment Traps for Reduced Shoaling

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

Sediment Traps for Reduced Shoaling study is a portion 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 methods that will allow effective sediment traps to be designed to reduce maintenance dredging in estuarine navigation channels and turning basins.

Accomplishments during Calendar Year 1981 include the following:

1. A draft annotated bibliography was completed.

2. A coastal district and division survey of current practice of using and designing sediment traps was begun.

Future work will include the continuing literature survey. Data analysis and conceptual model design will be undertaken. The technology transfer portion of the study will include a report on present sediment trap utilization and methods and a report with recommended sediment trap utilization.

Title of Study:

Offshore Dredging Systems

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

The Offshore Dredging Systems 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 develop preliminary engineering designs for new systems and existing equipment modifications for recovery of sand from offshore sources and placement on adjacent beaches.

Accomplishments during Calendar Year 1981 include updating of information on dredging systems to accomplish beach nourishment projects using nourishment materials located offshore.

Future efforts will include a study to determine which items of existing and proposed offshore dredging equipment will best suit the requirements of the 20 example projects.

Title of Study:

New Dredging Concepts

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

The New Dredging Concepts 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 develop procedures and techniques for applying recently developed dredging equipment to estuarine, riverine, and reservoir shoaling problems.

Accomplishments during Calendar Year 1981 include:

1. Completion of the first installment of an annotated bibliography of dredging-related literature.

2. Collection of test data on pipeline friction losses for the flow of high-density slurries.

3. Initiation of the evaluation of small, portable dredges.

Future work will include the following:

1. Continued work on an annotated bibliography of dredging-related literature.

2. Publication of report on pneuma dredge tests.

3. Evaluation of hydraulic pipeline dredges.

Title of Study:

Advance Maintenance for Entrance Channels

Conducted By:

U.S. Army Engineer Waterways Experiment Station

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., overwidth and/or overdepth 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.

Accomplishments during 1981 include the following:

1. The process of selecting channels having adequate data available for the analysis of the effectiveness of advance maintenance was continued.

2. The analysis of some site specific projects in the Portland District was continued.

3. An investigation of various modeling techniques for predicting the effectiveness of advance maintenance has been initiated.

4. An ETL draft on present practices has been completed.

Future work includes completion of the selection of advance maintenance entrance channels to be evaluated and analysis of the selected projects. An investigation into the feasibility of using physical, numerical, analytic, and empirical models to predict the effectiveness of advance maintenance in reducing dredging frequency and/or costs in entrance channels will be continued.

The final objective of the study is the publication of a series of technical reports and ETL on new estuarine procedures applied to entrance channels. These reports will (a) identify current and previous advance maintenance entrance projects and (b) evaluate the effect of advance maintenance on these projects through the use of an empirical technique based on historical dredging records.

Title of Study:

Definition of Cause of Navigation Channel Shoaling

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

The objective of this research is to develop a coherent approach for the solution of estuarine navigation channel shoaling problems. This is being accomplished by classifying estuarine shoaling problems and showing how these problems should be solved, detailing step-by-step procedures. Areas requiring further research have been identified. Literature surveys to isolate available information on the processes causing significant shoaling in navigation channels and ongoing research have been conducted. A detailed review of pertinent literature on 43 Corps projects was also initiated to determine characteristics and magnitude of dredging at these sites. The following have been defined as subtasks of this study:

1. Evaluation and extent of shoaling problem -- nationwide.

2. Survey and evaluation of shoaling volume determination.

3. Hydraulic research on causes of navigation shoaling.

4. Research on prediction of sediment transport, deposition, erosion and resuspension.

5. Research on techniques to reduce shoaling cost.

6. Data management.

The objective of each of these subtasks has been formulated. Information derived from these subtasks will be used to generate an instructional report which will describe how to approach and solve navigation channel sedimentation problems.

A detailed outline of a report was prepared, field studies were formulated for various Corps projects areas where research is needed were identified, all literature reviews previously completed were updated, and the planning phase for an instructional report for field offices to use in solving shoaling problems was initiated. A preliminary research plan addressing needs identified from the literature survey was formulated.

The preparation of the reports was initiated in 1981. Results will be used to revise EM 1110-2-1607, Tidal Hydraulics, and contribute to a new EM on channel design.

Title of Study:

Numerical Prediction of Navigation Channel Shoaling

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

Office, Chief of Engineers

Summary of Accomplishments:

A family of 1-, 2- and 3-dimensional computer codes is being created for simulating the movement of water and sediment. HEC-6 and the FLOWSED model (unsteady flow routing of water and sediment) are the 1-D codes being utilized. "Sediment Transport in Unsteady 2-Dimensional Flow, Horizontal Plane" is being developed and is driven by hydrodynamics from the RMA-2 finite element model. These 2-D codes are being modified into 2D/3D codes so study areas can be modeled by 3-dimensional computations in those areas where 2-D is inadequate. A computer code "Quasi 2-Dimensional Sediment Computations," HAD-1, has been developed from HEC-6 for studies in which current patterns are well behaved but expansions or islands interrupt the flow. A 2-dimensional, vertical plane model, LARM, will be modified to include a bed source term for sediment movement and bed change.

HEC-6 is operational. The 2-D horizontal plane codes are being utilized as part of final testing. The contractor has delivered the first version of the 2D/3D hydrodynamic code and is scheduled to deliver the sediment movement code later this year. HAD-1 is being applied in our Atchafalaya Delta study as part of final testing.

Title of Study:

Oregon Inlet Shore Processes Numerical Model

Conducted By:

U.S. Army Engineer Waterways Experiment Station

Conducted For:

U.S. Army Engineer District, Wilmington, N.C.

Water Resources Region:

South Atlantic - Gulf

Location:

Oregon Inlet, North Carolina

Summary of Accomplishments:

The purpose of this study is to develop state-of-the-art numerical models to simulate the shore processes in the vicinity of Oregon Inlet, North Carolina. The models will be used to evaluate the effects of proposed jetties for Oregon Inlet on the movement of littoral materials in the vicinity of the inlet. In addition, they will be used to evaluate the impact of various sand bypassing schedules on shore processes. The models will determine complete wave fields, water elevations and currents due to tides and storm surges, wave-induced currents (including littoral and rip currents), wave set-up, and littoral and onshore-offshore movement of sediment.

During CY 81 a wave propagation numerical model, a wave-induced current numerical model, and littoral and onshore-offshore sediment movement models were developed.

CORPS OF ENGINEERS, GEOLOGICAL SURVEY, FOREST SERVICE, BUREAU OF RECLAMATION, AGRICULTURAL RESEARCH SERVICE, FEDERAL HIGHWAY ADMINISTRATION, AND OFFICE OF SURFACE MINING

Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
University of Minnesota
Minneapolis, Minnesota

Research Activities. During the past three years a team composed of Sedimentation Project personnel and Geological Survey personnel (David Hubbell and Herbert Stevens) has been engaged in full-scale calibration of various types of bedload samplers. Prior to 1981, tests were conducted with bed material of a uniform particle size. During 1981 tests with a graded mixture were completed and then the calibration facility was dismantled and stored for possible future use. A summary of the test and data reduction procedures were summarized in the published report listed at the end of these notes.

A proposed standard for sampling sediment in motion was approved by the American Society for Testing and Materials. The document, which is a product of an interagency committee effort, is scheduled for publication in 1982.

A technique for the continuous measurement of sediment concentration was evaluated in a series of laboratory tests. Results were documented in a report which is currently in the technical review phase.

Apparatus was acquired to implement studies of an alternate method for sediment particle-size analysis. The procedure consists of measurement and analysis of pressure gradients created by sediment particles as they settle through quiescent water. As a first step a special sensor was modified to produce the required sensitivity.

Equipment Development and Supply Activities. To meet special requirements for sampling bed material in wadeable streams, two new hand-operated samplers were designed, tested, and have been stocked for supply. One sampler is designed for sampling deposits of noncohesive sediments. It incorporates a rotary bucket supported in a lightweight aluminum frame. The bucket rotates to collect the sample, then seals to prevent loss of fines while the sampler is being lifted through the flow. The other sampler is for collecting deposits of cohesive material that must be analyzed for trace metals.

A new suspended-sediment sampler was developed and is being evaluated in field tests. The sampler is intended for use in wadeable streams and will accept several different sample containers. All critical parts are of plastic, so that samples can be analyzed for trace-metal contamination.

A noncorrosive watertight enclosure was designed to permit submerged operation of peristaltic sampling pumps.

A bag-type sampler was developed and laboratory tested. The device simplifies the collection of point-integrated and depth-integrated samples. The report is in final-review status.

The following tabulation lists major pieces of equipment supplied to governmental and education institutions:

	Instrument	Sold since 1940	Sold during 1981	Inventory, Dec. 1981
DH-48	Hand sampler	3270	124	264
DH-75P	Hand sampler	139	15	9
DH-75Q	Hand sampler	128	4	25
DH-59	Hand-line sediment sampler	1375	116	23
DH-76	Hand-line sediment sampler	285	19	3
D-49	Depth-integrating sampler	900	0	0
D-74	Depth-integrating sampler	423	13	39
D-74AL	Depth-integrating sampler	145	6	7
P-61	Point-integrating sampler	279	18	17
P-63	Point-integrating sampler	44	0	7
P-72	Point-integrating sampler	60	14	22
BMH-53	Bed-material hand sampler	360	4	44
BMH-60	Bed-material hand sampler	283	6	36
BM-54	Bed-material sampler	221	9	5
SA	Particle-size analyzer	92	2	5
PS-67	Pumping sampler	42	0	0
PS-69	Pumping sampler	352	7	10
CS-77	Chickasha pumping sampler	39	4	0
SS-72	Sampler splitter	40	4	10
BP-76	Power supply	137	9	3

For the above equipment a catalog and manuals are available by request.

Status of Reports

"Recent Refinements in Calibrating Bedload Samplers" by David W. Hubbell, Herbert H. Stevens, Jr., John V. Skinner, and Joseph P. Beverage.	Published
Report W - "Test and Design of Automatic Fluvial Suspended-Sediment Concentration" by J.V. Skinner and J.P. Beverage.	Published
Report X - "A Fluid-Density Gage for Measuring Suspended-Sediment Concentration" by J.V. Skinner and J.P. Beverage.	Submitted for final approval
Report Y - "Bag-Type Suspended-Sediment Sampler" by J.J. Szalona.	Final review
Report Z - "Theory and Operation Manual of the Autopipet Semi-Automatic Pipet Withdrawal Apparatus" by J.P. Beverage.	Final rewrite

<u>Catalog</u> - "Instruments and Reports for Fluvial Sediment Investigations, Federal Inter-Agency Sedimentation Project," March 1981, by Corps of Engineers, St. Paul District.	Published
<u>ASTM</u> - "Proposed Standard Practice for Sampling Fluvial Sediment in Motion" to be published in the grey pages of "Water, Part 31."	Submitted tc ASTM Publications Staff

For additional information and copies of published reports contact:

Project Leader
Federal Inter-Agency Sedimentation Project
St. Anthony Falls Hydraulic Laboratory
Hennepin Island & Third Avenue, S.E.
Minneapolis, Minnesota 55414

U.S. ENVIRONMENTAL PROTECTION AGENCY

IMPLEMENTATION BRANCH

WASHINGTON, D.C.

EPA, through its Water Quality Management (WQM) Program is working cooperatively with other Federal agencies to control sediment and other nonpoint sources of pollution. Such sources, which are diffuse in nature and discharge polluting substances to water bodies through widely-dispersed pathways include man's agricultural, silvicultural, construction, urban runoff, and other activities.

Cooperative mechanisms involve Interagency Agreements and Memoranda of Understanding, exchange or detail of personnel between agencies, and the provision of funding for program needs. A brief summary of programs involving EPA and other agencies in sediment control are included below.

Rural Clean Water Program (RCWP)

This program was authorized in the Agriculture, Rural Development, Related Agencies Appropriations Act, fiscal year 1980 (P.L. 96-108). Its purpose is to provide financial and technical assistance to farmers to install Best Management Practices (BMP's) to control sediment and other nonpoint source pollutants. The Agricultural Stabilization and Conservation Service administers the program but must consult with EPA on project selection and obtain the Agency's concurrence of BMP's. EPA also furnishes information from the water quality management process to assist in the identification of critical problem areas for project applications and assists USDA in evaluating the effectiveness of the program in achieving water quality improvements.

During the first year of the program, $50 million was appropriated for 13 project areas and in 1981 $20 million was provided and 8 more projects approved. Most of the problems identified in project areas involve sediments. Other pollutants include pesticides, animal wastes, fertilizers, and sometimes toxic materials.

For additional information communicate with Robert E. Thronson, EPA, Water Planning Division (WH-554), Washington, D.C. 20460. Telephone (202) 755-6023.

Silvicultural (Forestry) Nonpoint Source Control Activities

Silvicultural practices have been shown to impact a forest's water quality through excess sediment loads, chemical introduction, nutrient enrichment, and temperature elevation. Silviculture includes activities such as harvesting and thinning, fertilization, pest control, reforestation, fire suppression, and road and trail building and maintenance.

The cost of not maintaining these high quality waters in forested areas can be measured in water supply treatment costs, and reduction of reservoir and transmission system capacity, as well as the value of trout and salmon fisheries, and recreational and aesthetic benefits.

EPA is now involved in a program designed to respond to the needs expressed by the States and to support Federal coordination efforts. The principal emphasis of the program is to complete and make available for loan a Nationwide Forestry Water Quality Management training package. This package involves three courses. Course A is designed to reach policy level individuals in both forestry and water quality organizations. Management level staff in both areas will be the target for Course B. Technical and financial assistance will be provided to the States to aid them in the development of Course C that will be directed at on-the-ground personnel such as forest operators, loggers, and landowners.

For additional information, communicate with Robert Dunn, EPA, Water Planning Division (WH-554), Washington, D.C. 20460. Telephone (202) 426-2474.

Appraisal of Agricultural Water Quality Efforts

A joint EPA-USDA National Water Quality Evaluation Project has been initiated at the North Carolina State University through a Memorandum of Understanding (MOU) between organizations in these agencies. The MOU defines the policies, administrative procedures, and participating agency commitments for the appraisal of agricultural water quality efforts. The project will be implemented by NCSU Cooperative Extension Service, in conjunction with participating agencies. Results of this project will allow EPA and USDA to focus their respective efforts, evaluate the success of all aspects of voluntary and incentive-based programs to control the runoff of sediment as well as other pollutants, and make recommendations for changes to existing programs.

For additional information, communicate with Robert E. Thronson, EPA, Water Planning Division (WH-554), Washington, DC 20460, Telephone (202) 755-6023.

EPA OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL RESEARCH LABORATORY
ATHENS, GEORGIA

EPA, Athens ERL, located in Athens, Georgia, has conducted the following activities for calendar year 1981.

1. Sediment Transport in Tidal Waters

An EPA-funded research project is underway at the University of Florida with two main objectives: (1) to carry out a comprehensive literature review of the state-of-the-science of fine sediment transport modeling; and (2) through additional experimental investigations and numerical modeling, to demonstrate the effects of salinity on fine sediment transport phenomena in estuaries. To accomplish the latter objective, erosion and depositional characteristics of fine sediment flocs at varying levels of salinity will be measured under both quiescent and controlled turbulent conditions in a rotating annular channel. The project will end in late 1982.

2. Field-to-Stream Transport of Agricultural Runoff

An EPA-funded study by Iowa State University has assembled a data base to help understand agricultural pollutant transport processes in the field, their possible chemical transformations and their ultimate concentrations in sediment and in the water column. The data base was assembled to aid in evaluating the effectiveness of various agricultural best management practices for improving water quality and in testing the validity of runoff and water quality models. A report will be developed to present field data for 1979 and 1980 on runoff and on sediment and chemical losses for three small watersheds, two mixed cover, intra-basin watersheds, and three stream stations, within the Four Mile Creek Watershed (about 20 square miles in area). Similar data from previous years have been reported.

3. Watershed Sediment Routing Model

An advanced physically based process model for rainfall-runoff, erosion and sediment routing by particle sizes, and hill and gully erosion has been developed for EPA by Colorado State University. This model, completed in 1981, can be applied to multiple subwatersheds, linked via channel routing components. The model treats hydrology with the flow resistance model PROSPER, with routines added for interception and interflow within storms. Runoff is handled by the kinematic wave approximation. Sediment generation is by detachment and scour, with size fractions routed separately. Pollutant loading is based on sediment yield in combination with detailed generation, transformation, and decay processes. Litter and soil layers are handled separately.

4. Center for Water Quality Modeling

The U.S. EPA has established the Center for Water Quality Modeling at the Athens ERL to maintain water quality model documentation and to support selected models. Among the sediment-based models supported are the Nonpoint Source (NPS) model and the Storm Water Management Model (SWMM-II). The NPS model is a continuous simulation model that can be used to assess loadings from large watersheds with mixed land use. The model predicts sediment using empirically derived process parameters and pollutants based on generated sediment. SWMM-II is a detailed engineering design model of urban runoff loads. It can be operated in a steady-state or time-variable mode. It treats hydrology using a mechanistic surface water balance, predicts sediment using empirical buildup-washoff parameters, and predicts pollutants based on generated sediment. The Center provides technical assistance and training on the use of these and other water quality models.

5. Instream Sediment and Contaminant Transport Modeling

Instream chemical migration and fate are simulated by the sediment-contaminant transport model, SERATRA, developed for EPA by Battelle NW Labs. SERATRA is a finite element model that predicts time-varying longitudinal and vertical distributions of sediments and contaminants. The sediment transport submodel simulates transport, deposition, and scouring for each size fraction (or sediment type) of both cohesive and noncohesive sediments. The transport of particulate contaminants is also simulated for those associated with each sediment size fraction. SERATRA also computes changes in river bed conditions for sediment and contaminants. Required input includes channel and sediment characteristics and adsorption/desorption properties of the contaminants. SERATRA can be run separately or as part of the Hydrologic Simulation Program--FORTRAN system, in a slightly more simplified form.

6. BMP Planning Manual

In 1981, Cornell University developed an agricultural BMP planning manual for EPA for the selection of practices to reduce edge-of-field losses for improving water quality. Selection criteria of environmental effectiveness and cost primarily are utilized for evaluating alternative structural, vegetative and management approaches for reducing sediment, nutrient, pesticides and salt loads to receiving water bodies.

For additional information contact Robert R. Swank, Jr., Chief, Technology Development and Applications Branch, Environmental Research Laboratory, College Station Road, Athens, GA 30613.

ENVIRONMENTAL RESEARCH LABORATORY
GULF BREEZE, FLORIDA 32561

The Environmental Research Laboratory, located in Gulf Breeze, Florida, has conducted research on the bioaccumulation of contaminants associated with bottom sediments.

Accumulation of PCBs, mercury, and cadmium by the sandworm (*Nereis virens*), the hard clam (*Mercenaria mercenaria*), and the grass shrimp (*Palaemonetes pugio*) exposed to contaminated sediments from four sites in New York Harbor was studied for a 100-day period. Of the three contaminants monitored, only PCBs were found to bioaccumulate above background (control) concentrations. Small increases in PCB body burden were detected in *M. mercenaria* and *P. pugio*, whereas higher concentrations were measured in *N. virens*. Uptake was affected by the organic content of the sediment. Bioaccumulation factors (concentration in tissue/ concentration in sediment) for *N. virens* ranged from 1.50 in a low organic sediment to 0.15 in a high organic sediment. Results from this study support the contention that sediment concentration alone does not reflect bioavailability and that bioassays remain the most direct method for estimating bioaccumulation potential of sediment bound contaminants at this time.

For additional information contact Norman I. Rubinstein, Environmental Research Laboratory, Sabine Island, Gulf Breeze, Florida 32561.

EPA-CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY

EPA, Corvallis Environmental Research Laboratory conducted the following sedimentation activities in Calendar Year 1981.

Sediment Bioassays

Toxic substances, especially those with low water solubility, are often found in the fine sediments of river and lakes. The biological significance of these sediment contaminants is not clear and there are no standard freshwater bioassay procedures available to assess their biological effect. In 1981 we began to evaluate different kinds of sediment toxicity tests to determine their sensitivities to sediment contaminants and also to relate laboratory bioassay responses to the condition of benthic communities in the field. Test organisms which are being evaluated in the sediment bioassays include the mayfly *Hexagenia*; the amphipods *Hyalella* and *Gammarus*; the midge, *Chironomus*; and the cladoceran, *Daphnia*. Both recirculating and static exposure systems are being used. Exposure times range from 48 hours for *Daphnia* to 10 days for the other test organisms. This work is continuing in 1982.

For additional information contact Jack Gakstatter, Team Leader, Corvallis Environmental Research Laboratory, USEPA, 200 S.W. 35th St., Corvallis, Oregon 97330.

EPA REGION I

WATER MANAGEMENT DIVISION

EPA, Region I, located in Boston, Massachusetts has conducted the following sedimentation activities for calendar year 1981. The Region has been working with SCS, ASCS, and the States on several RCWP Projects and BMP monitoring and evaluation. Region I has been assisting the New England States to develop statewide erosion and sediment control programs. These involve a combination of education and techical assistance through State Conservation Committees/Soil Conservation Districts/Soil Conservation Service and State and local development or building regulations.

St. Albans Bay RCWP

The St. Albans Bay RCWP project encompasses 33,344 acres of land adjacent to Lake Champlain in Franklin County, Vermont. Agriculture is the main economic enterprise in the watershed. There are some 98 dairy farms having an average size of 330 acres and 89 animal units located on moderate to steeply sloping land. The watershed drains into St. Albans Bay, Lake Champlain, where over the past decades severe problems of eutrophication resulting from sedimentation and high nutrient loading have seriously impaired recreational uses and aesthetic qualities of the Bay. The main objective of this $1.2 million 1980 RCWP project is to improve the water quality in tributaries to the Bay through the implementation of agricultural Best Management Practices. These practices will serve to improve erosion control and animal waste management and thereby reduce the amount of sediment and nutrients entering the streams. As the project enters its second year, over one third of the 67 farm contracts have been approved for implementation with a value of $552,000. This project was one of three selected for a Comprehensive Monitoring and Evaluation effort. Funded at a $1.5 million level, the monitoring program will be conducted throughout the life of the RCWP project by the University of Vermont. Objectives of the monitoring plan include documentation of changes in water quality of specific tributaries resulting from implementation of BMP's, measurement of changes in the amount of suspended sediment and nutrients entering St. Albans Bay, evaluation of trends in water quality in the Bay, and establishment of relationships between BMP's, water quality, and environmental impacts.

Little River/Muddy Brook Watershed

A monitoring project which will assess the effects of agricultural "best management practices" on stream water quality in a 30 square mile, rural watershed in Woodstock, CT, has been developed. Agriculture is the main contributor of sediment and nutrients to waterways in the watershed where agriculture and forest are the predominant land uses. Two farms have been selected as monitoring sites to test the effectiveness of the best management practices. Both sites are located in close proximity to streams; one site will implement an erosion control system; the other, an animal waste management system. Sampling has been conducted during storm events directly above and below each farm site to measure BMP effectiveness. Although sampling results are incomplete for nutrients, sample analysis for sediment and bacteria indicate that the current farm practices do have a significant effect on water quality.

New Hampshire Statewide Erosion and Sediment Control Program

The New Hampshire Water Supply and Pollution Control Commission has implemented amendments to the regulations on dredging and filling under the Water Pollution Control Statues (RSA 149: 8-a) adopted April 18, 1981. These were recommended under the Statewide Water Quality Management Program (208). These amended regulations require general permits for major construction and timber harvesting activities that significantly impact water quality. Anyone undertaking earth-disturbing activities must obtain a permit from the Commission for residential or commercial construction affecting over 100,000 square feet in or adjacent to the surface waters of the State. The permit includes a conservation plan, increasing in specificity as the potential impact increases. The Commission has been drawing upon the results of monitoring a model drainageway in Durham, New Hampshire, under the EPA National Urban Runoff Project (NURP). Using this experience, it has been working with builders and designers to refine the design criteria. Office of Coastal Zone Management grants will help to implement these regulations within New Hampshire's coastal zone. Under the forestry general permit, an operator acknowledges familiarity with BMP's to protect water quality in the New Hampshire's pocket-size handbook, "Timber Harvesting Practices for Controlling Erosion". State Foresters and Fish and Game Wardens will promote and advise operators on these practices. Only when these efforts fail, will the Water Supply and Pollution Control Commission issue cease and desist orders.

Massachusetts Wachusetts Reservoir Watershed Erosion and Sediment Control Program

Massachusetts, EPA, and the Boston area Metropolitan District Commission have been working with the two areawide planning commissions to help the watershed towns develop model erosion control ordinances, including subdivision regulations. These will help to protect the Wachusetts Reservoir. The Reservoir is a major "finish" water supply for the Greater Boston Region. These agencies are also consummating a Memorandum of Understanding for cooperation on agricultural and forestry practices in the watershed. Concurrently, the Federal Highway Administration, the EPA, and the State have been working together on erosion control measures during the construction of Interstate Highway I-190.

Massachusetts Soil/Erosion and Sediment Control Act - Massachusetts has developed a Statewide Soil Erosion and Sediment Control Act, with assistance from EPA and SCS. The legislation has been introduced with amendments and is pending before the Legislature. The proposed Act is patterned after the New Jersey Statewide law.

For additional information contact Mr. Bart Hague, Chief, Environmental Studies, Water Quality Branch, Environmental Protection Agency, JFK Federal Building, Boston, Massachusetts 02203.

EPA REGION II

COMMONWEALTH OF PUERTO RICO

EPA, Region II, located in New York City, New York, has funded the following sedimentation activities for calendar year 1981.

Using Section 208 fiscal year 1980 and Section 106 fiscal year 1981 funds, the Environmental Quality Board is engaged in studies to determine the relative sediment loadings of cropland, mining and construction activities in the Lake Loiza and Lake La Plata watersheds. These two lakes serve as the major sources (80%) of potable water for the San Juan metropolitan area, serving two million people. Lake Loiza has already lost 60% of its capacity due to upstream erosion and is projected to be completely filled by the year 2020. Lake La Plata, built nine years ago has been estimated to have a higher sedimentation rate than Lake Loiza. Sediment loadings from each of the major sources are being calculated to determine the control needs in each of the watersheds. Both loadings analysis methodologies and Best Management Practices will then be used in other problem watersheds on the island. Institutional implementation mechanism have already been developed through initial 208 planning.

For additional information contact Abraham Siegel, Nonpoint Source Coordinator, U.S. EPA Region II, 26 Federal Plaza, New York City, New York 10278.

EPA REGION IV

WATER DIVISION

EPA, Region IV located in Atlanta, Georgia has been involved in the planning and financial support of the following sedimentation activities for calendar year 1981. Studies are being conducted under the auspices of section 208 of the Clean Water Act PL 92-500.

1. North Carolina Water Quality Study

   A 12 month study was completed by the State of North Carolina on the quality of water in selected streams throughout the state. Three streams were selected in each major physiographic region. Attempts were made to select streams with watersheds of the following categories: natural or background with little erosion problem; watershed with major portion covered by conservation planning with practices applied and a watershed with erosion and sedimentation problems with few conservation practices applied. Water quality studies were performed including biological studies and suspended solids. Draft report is in review stage as of May 1, 1982. For additional information contact: Alan Klimek, NC Dept. of Natural Resources and Community Development, Division of Environmental Management, P.O. Box 27687, Raleigh, NC 27611.

2. Georgia Nonpoint Source Impact Assessment Study

   Georgia EPD is conducting a stream study of five "clusters" of 4 streams each similar to the North Carolina study mentioned above. Watersheds include natural background, agricultural, silvicultural and urban. Eighteen parameters are checked in both routine and storm flows. These parameters include stream flow, turbidity, total solids and suspended solids. The goal of this three year study is to provide, within the limits of available resources, an extensive evaluation of the impact of nonpoint sources on water bodies in rural areas in order to refine Georgia's nonpoint source management strategy. Interim draft report March 1, 1982. For further information contact: Buzz Napier, GA Dept. of Natural Resources, Environmental Protection Division, 230 Washington St., SW, Atlanta, GA 30334.

3. Mississippi Stream Assessment

   The agricultural element of the 208 State Water Quality Plan identifies the need for an assessment of stream quality. In an effort to identify sediment yield to streams in Mississippi a model will be developed using the existing data base for the state. Several agencies are cooperating in this endeavor including the Soil Conservation Service (SCS) and Economic Research Service (ERS). Input will include soils, landuse, degree of treatment and crops grown by watershed. With this information and by use of the Universal Soil Loss Equation (USLE) the model will predict sediment yield by land use and watershed. For further information contact: Robert Seyforth, MS Bureau of Pollution Control, P.O. Box 10385, Jackson, MS 39209

EPA REGION VI
WATER MANAGEMENT DIVISION

EPA, Region VI, located in Dallas, Texas, has conducted the following sedimentation activities for calendar year 1981.

Rockport Nutrient Study

The Coastal Bend Council of Governments, as part of its continuing water quality management work, studied the nutrient absorption capabilities of a wetland drainage channel. The purpose of the study was to determine the impact of nutrients supplied by the city of Rockport Wastewater Treatment Plant on the habitat of Little Bay. The main concern was possible eutrophication of the bay. It had been thought that the nutrients in the drainage channel were reduced by the metabolism of microorganisms in the channel and by absorption by plants growing along the channel. The study determined that some nutrients flow through the channel to Little Bay; some are removed by plants; and others move laterally from the channel into the groundwater and flow laterally to Little Bay. The nutrients do not appear to be approaching a level that will cause eutrophication. No new channel need be constructed.

Little Rock Erosion Study

Little Rock Arkansas was the subject of a Water Quality Management study performed by Metroplan, a regional planning agency, with EPA money. The major findings were that 1) Government projects, especially Federal projects, cause major erosion/sedimentation problems; 2) Most private projects surveyed do not have controls to reduce nonpoint runoff; 3) Since many contractors who do work for the government also work on private jobs, erosion control practices are similar for the public and private sector; and 4) Major projects (public and private) tend to be clustered around the same streams which have the least capacity for assimilating runoff, according to previous water quality assessments. Three categories of government projects cause problems: highways, buildings, and treatment plants (water/sewer). The largest construction projects in the area are interstate highway projects. Some controls are required on these projects by the Federal Highway Administration, but the application of BMPs is inconsistent. Drainage, road, and bridge projects involving city or county government, where no Federal money is involved, do not routinely utilize controls.

For additional information contact David Neleigh, EPA, Chief, Technical Section, Water Quality Management Branch, 6W-QT, 1201 Elm Street, Dallas, Texas 75270.

ENVIRONMENTAL PROTECTION AGENCY

REGION VII

Sediment and associated nutrients have been identified as the major water quality problems in many water bodies in EPA Region VII.

In cooperation with other local, state and federal agencies, EPA has instigated several projects to control sedimentation of lakes and streams.

IOWA

Prairie Rose Lake, a 204 acre state owned lake in the southwest quarter of Iowa, was constructed in 1962. Information on Prairie Rose Lake since impoundment has shown that the lake has been plagued with a high sedimentation rate which produces high inlake turbidity levels and high nutrient loadings to the lake. A comparison of bathymetric maps prepared in 1971 and 1979 show that all areas of the lake are filling with sediment, and over a nine-year period, a loss of 18.7% in the lake's volume has occurred. The sport fishery has been affected by sedimentation through a loss of fishery habitat area and the predominance of conditions favorable to rough fish. A total fishkill conducted as part of a fisheries renovation program in 1981 showed the overwhelming preponderance of rough fish. Studies conducted during periods of runoff on one of the lake's tributaries documented that high sediment and other pollutant loadings were being delivered to the lake. Pollutant concentrations entering the lake from a tributary exceeded the water quality standards for the lake during some of the runoff events. Implementation of watershed control practices in the Prairie Rose Lake watershed began in 1981, with funding being provided for this project through the U.S. Department of Agriculture's Rural Clean Water Program (RCWP). During the first year of the RCWP project, a monitoring program was implemented to collect water quality and water quality related information. The data collected through the monitoring program in 1981 will provide a basis upon which trends in lake water quality and lake uses can be measured throughout the life of the RCWP project.

KANSAS

The amount of sediment entering the Soldier Creek watershed has been monitored for three years under a special ACP project. The results of this monitoring are being compared with baseline study conducted in 1970 to determine the effectiveness of conservation practices installed during this time period. Also, three clean lakes projects have developed basin management plans to minimize sediment deposition. The State Construction Erosion Task Force has evaluated BMPs to minimize sediment runoff from developing areas.

NEBRASKA

The Long Pine Creek watershed was selected as a national Rural Clean Water Project by the USDA in 1981. Severe erosion of agricultural lands has contributed to degradation of the unique cold water trout habitat of Long Pine Creek. BMPs to control sedimentation are planned for the watershed and landowner agreements are being signed for their installation.

MISSOURI

Missouri Department of Natural Resources (MDNR), ASCS, SCS and EPA cooperatively undertook a special project on the Middle Fork of Salt River watershed in Monroe County. Land treatment cost shares are being provided from ASCS's Agricultural Conservation Program (ACP). Technical Assistance is provided by SCS through the Monroe County Soil Conservation District. EPA and MDNR are cooperatively evaluating water quality impacts of the project. Diminution of sediment delivery to streams and to the Clarence Cannon Reservoir is expected to be the primary water quality benefit of the project. Other projects involving demonstration of minimum tillage benefits are ongoing.

EPA Region VIII
Water Division

EPA Region VIII, Denver, Colorado, has conducted the following sedimentation activities for calendar year 1981.

1. Agricultural Nonpoint Source Monitoring and Evaluation in Snake Creek watershed, Utah

A Section 208 grant is being used to support monitoring and evaluation of agricultural best management practicies in the Snake Creek watershed of Wasatch County, Utah. A municipal water supply is adversely affected by bacteria, nutrients, and sediment from upstream dairies and irrigated agricultural areas. Best Management Practices are being implemented as part of the Snake Creek Rural Clean Water Project, and should be completed in 1982. For additional information contact Roger Dean, 8WM-SP, EPA Region VIII, 1860 Lincoln St., Denver, Colorado. 80295

2. Agricultural Nonpoint Source Monitoring and Evaluation in Lower Fourmile Creek Watershed, Colorado

Sediment from agricultural acivities has been identified as a principal pollutant on Lower Fourmile Creek in eastern Fremont County, Colorado. Participants in the EPA, SCS, and ASCS funded Grandview Ditch project have made an active commitment to employ best management practices or conservation practices on their lands to conserve water and protect the soil base. All cooperation has been voluntary and contracts with over 75 percent of the 35 landowners are in effect or are anticipated. The landowners have already lined better than nine thousand feet of ditch and have initiated other BMPs such as water measuring structures, conversion to drip or spray irrigation, irrigation water management, and seeding to permanent vegetation. The project has received considerable support and input from county ASCS committees and Soil Conservation Districts. For further information contact Rick Claggett, 8WM-SP, Water Division, Environmental Protection Agency, 1860 Lincoln Street, Denver, Colorado 80295.

3. <u>Agricultural Nonpoint Source Control Projects in Montana</u>

Remaining Clean Water Act Section 208 funds are being used to coordinate, monitor, implement, and evaluate various agricultural, forestry, and mining nonpoint source pollution control program. Among these are; the coordination and implementation of conservation district water quality management programs including special streambank stablization projects on Blue Creek, Pipestone Creek, Prickley Pear Creek and the Shields River; the assessement of farmland drainage and saline seep; the coordination of water quality management agreements with BLM and USFS: the continuation of a forestry watershed improvement program; the development of a program to evaluate the scope and impact of placer mining on stream quality; and an assessment of microhydro power generation projects on stream quality. Muddy Creek, in central Montana, has suffered from severe erosion problems since the development of a federally sponsored irrigation water development project in the early 1900's. The water quality degradation is caused by uncontrolled irrigation return flows and sudden releases of excess irrigation water from canals to the creek during rainfall events. EPA has served on multiagency local and national task forces which have prepared action plans for correcting the problem. The State of Montana has provided grant money and technical assistance to fund a Muddy Creek project coordinator and to further evaluate the problem and develop an implementation program. Since the problem is the result of a federal sponsored water project, federal assistance for correction has been solicited through Montana's congressional delegation. As of May 1982, three bills, including one for $19 million for canal surge flow relief construction, are being considered by Congress. In 1975 the Montana legislature passed the <u>Natural Streambed and Land Protection Act</u>. This bill allowed the local conservation districts to regulate stream construction projects of private parties, corporations, and irrigation districts. The expectation was to minimize the soil erosion and stream sedimentation that was occurring due to uncontrolled streambed and streambank construction activities. EPA has awarded a grant to the Montana Association of Conservation Districts (MACD) for the Association to develop a task force and conduct educational and information seminars throughout the State in 1982. The intent will be to evaluate the effectiveness of the existing law and to develop administrative and statutory revisions for consideration during the Legislative session of 1983. For additional information contact Steve Potts, EPA, Federal Office Bldg., Drawer 10096, 301 South Park, Helena, Montana 59626.

4. Agricultural Nonpoint Source Control Projects in North Dakota

Section 208 grants support monitoring and evaluation and watershed coordination for implemenation of agricultural best management practices in the following watersheds: Spiritwood Lake (Stutsman County) Sweetbriar Lake (Morton County), Brewer Lake (Cass County), and Edmore Coulee of Devil's Lake (Ramsey County). Sediment and associated nutrients are primarily from non-irrigated crop land where fall plowing and summer fallow are common practices. Special ACP and State Fish and Game funds are being used to implement BMPs such as conservation tillage, protective winter cover, and animal waste management systems. A Section 208 grant is also supporting a Cooperative Extension Service study of sedment/nutrient yields and crop yields under no till agriculture in five counties: Benson, Bottineau, McLean, Ransom, and Williams. Special ACP funds are used to cost-share no till equipment rental on some 5900 acres. For additional information contact Kenny Norman, 8WM-SP, EPA Region VIII, 1860 Lincoln St., Denver, Colorado 80295.

5. Agricultural Nonpoint Source Control Projects in South Dakota

Section 208 grants support monitoring and evaluation and watershed coordination for implementation of best management practices in the following watersheds: Lake Herman (Lake County), Mina Lake (Edmunds, Brown, McPherson Counties). Pierre Creek-Lake Hanson, Wall Lake (Minnehaha County), Lake Kampeska (Codington County) Big Stone Lake (Robert County), and Pickeral Lake (Day County). Sediment and nutrients cause widespread lake eutrophication and filling, and come primarily from non-irrigated crop land and livestock concentrations. Special ACP funds are targeted to certain lake watersheds, along with regular ACP and Great Plains Conservation Program fund for such BMPs as grassed waterways, conservation tillage, and terraces. Sediment/nutrient control structures have been funded in part by Clean Lakes Program grants. Monitoring results are furtherest along in the Lake Herman watershed, where BMP installation is nearly complete. The Oakwood-Poinsett Lakes (Brookings, Hamlin, Kingsbury Counties) RCWP project involves treatment of the watershed to restore the physical, chemical and biological quality of the area's interconnected aquifer and lakes. The primary objective is reduction of nutrients and pesticides going into lakes and eventually reaching the aquifer from dry-land farming. A secondary objective is control of sediment going into lakes from the same source. Because of hypereutrophic conditions, algal blooms, aquatic weeds, dissolved oxygen depletion and fish kills are common in these lakes. Some samples from the Big Sioux, the area's main domestic water supply, are showing toxic levels of nitrates. Project implementation is scheduled over a 10-year period, based on the necessity of contractual agreements, and monitoring and evaluations. Comprehensive monitoring and evaluation (CM&E) funds totalling $700,000.00 have been allocated to the study to determine BMP effectiveness. For additional information contact Roger Dean, 8WM-SP, EPA, Region VIII. 1860 Lincoln St., Denver, Colorado 80295.

6. Agricultural Nonpoint Source Control Projects in Wyoming

Section 208 grant supports planning, monitoring and evaluation of a sediment control program for the Fifteen Mile Creek watershed, Bighorn, Washakie, and Park Counties. The area encompasses 518 square miles of native rangeland, 83% public land administered by the Bureau of Land Management. Use is almost entirely livestock and wildlife grazing, except for one square mile of irrigated farmland. High sediment loads during storm events from Fifteen Mile Creek impair fishery and municipal uses of the Bighorn River. Joint project of BLM, USGS, EPA, Wyoming DEQ, and University of Wyoming with BLM implementing control measures (BMPs). Earlier treatment and improved grazing management (1950's and 60's) by BLM resulted in 25% reduction in sediment yield. Watershed needs further rehabilitation and maintenance. For additional information contact Kenny Norman, 8WM-SP, EPA Region VIII, 1860 Lincoln St., Denver, Colorado 80295.

EPA REGION 9

WATER MANAGEMENT DIVISION

EPA, Region 9, located in San Francisco, California, has conducted the following sedimentation activities for calendar year 1981.

State Water Resources Control Board (SWRCB)

1. High Sierra Resource Conservation District prepared a handbook of erosion control practices for developing areas of the Sierra Mountain foothills. Practices include short term temporary as well as permanent practices for land developers, small plot farmers and individual homeowners.

2. Central Valley Regional Water Quality Control Board (CVRWQCB) and the California Association of Resource Conservation Districts prepared maps of the Central Valley Region showing existing and potential erosion hazards. These maps will be used in water quality planning as well as water rights permit processing.

Association of Monterey Bay Area Governments (AMBAG)

1. Santa Cruz County has used 208 planning funds to develop an erosion control program. The County inventoried and prioritized erosion areas; established pilot control programs in the most needed areas; and developed an erosion control ordinance which was adopted September 2, 1980; prepared an erosion control training program for local developers; and compiled brochures and manuals on erosion control methods for public distribution.

2. Monterey County has used 208 planning funds to establish and implement an erosion control program for county roads. The County identified problem areas, devised stabilization measures, and tested the effectiveness of the control measures. The information gained from the project is being applied throughout the County.

Association of Bay Area Governments (ABAG)

1. ABAG has used 208 funds to develop an erosion control program for the cities and counties around the San Francisco Bay. ABAG developed two model ordinances for erosion control, established an erosion control training class for developers and local government staff, and assisted the counties in preparing erosion control plans and programs.

San Diego Association of Governments (SANDAG)

1. SANDAG developed a management plan for Penasquitos Lagoon. The plan recommends specific changes in the erosion control ordinances of jurisdictions in the watershed and proposes small upstream sediment/ retention basins be included in new developments.

Southern California Association of Governments (SCAG)

1. SCAG, working with local Resource Conservation Districts, has identified, mapped and prioritized erosion problems in a four county area. BMPs to address the problems were identified.

2. SCAG has completed the first part of a management plan for Upper Newport Bay. The plan has resulted in the construction of two upstream sediment basins, and has made recommendations for onsite control of farming and construction-related erosion.

EPA REGION 10
WATER DIVISION

EPA, Region 10, located in Seattle, Washington, submits the following notes on EPA supported sedimentation activities for the Calendar Year 1981 report:

The South Yakima Model Implementation Project (MIP) in Washington has accelerated the implementation of Best Management Practices that are reducing both runoff and erosion from agricultural lands. The project, a joint effort of EPA and USDA, has provided increased technical and financial assistance to the farmers. A significant reduction in the off-site sedimentation and water quality problems has been achieved in the project area. Probably the most significant accomplishment was the cooperative efforts that were developed by and between the farmers and the 15 various local, state, and Federal agencies involved. This project has shown that in order to achieve reductions in sediment and improvement in water quality, cooperation by all concerned, financial assistance, and technical assistance are needed.

Urban Erosion Control Project, King County Conservation District, Washington

The King County Conservation District is working with its county governmental units to reduce the production of sediment from existing and developing urban areas. The District has assisted with the strengthening of ordinances to control runoff and reduce erosion, and with the development of a new county drainage utility. The District initiated the preparation of Standards, Specifications and Recommended Practices for urban-sedimentation control being used by the county (also proposed as the minimum standards for the western part of Washington). A pocket edition for On-Site Erosion Control was prepared by the District for use by developers and contractors. The District has also prepared training programs and assisted with training of county staffs. Currently, the district is performing plot reviews for the county, assisting with the preparation of site plans, and assisting with inspection and compliance activities. Initially funded by EPA as a demonstration project, the county is now providing the District with funds for staffing. In the face of local funding deficits and county staff reductions, these funding actions indicate the programs value to, and acceptance by, the county government.

Imhoff Cone Water Sampling Project

Funded by EPA, the Washington Department of Ecology conducted a three year sampling program of irrigation return flows. The sampling was done on-farm using an Imhoff cone which measured the level of settleable solids contained in irrigation tailwater. The program was to determine if the Imhoff cone could be used as an inexpensive technique to detect trends in water quality improvement or degradation throughout a basin-wide area. Data collected through intensive surveys was compared to Imhoff cone data. Results show that the cone can be used effectively and efficiently on-site, by farmers, irrigation district personnel, and others, to quickly and accurately measure the amounts of sediment being carried from the fields in runoff. The personal involvement by farmers and irrigators and the graphic examples that they get measuring sediment in their own runoff has led to some substantial changes in irrigation practices, the reduction in sediment, and improved water quality.

For additional information contact Elbert Moore, Agricultural Specialist, Water Division, M/S 433, EPA, 1200 Sixth Ave., Seattle, WA 98101.

FEDERAL HIGHWAY ADMINISTRATION

The Federal Highway Administration (FHWA) concentrated its activities on five major areas: control of culvert outlet erosion, control of local scour around bridge piers, 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 (HP&R) and in the National Cooperative Highway Research Program (NCHRP).

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 (ODOT), on "Field and Laboratory Evaluation of Energy Dissipator for Culvert and Storm Drain Outlets." This study is directed toward two dissipator concepts that can be precast for culvert installations that do not require field concrete work. One is the modular basin which can be precast in components and assembled in the field by a maintenance crew; the other is the concrete pipe roughness ring which can also be precast and bolted into regular culvert sections. Another important aspect for this study is the evaluation of the ODOT procedures for providing channel protection for culvert outlets that do not require dissipators. The evaluation focused on the so-called "Cincinnati Method" for designing rip-rap protection and involved some 400 field sites. The final report was published.

   Sarikelle, S. and Simon, A. L., "Field and Laboratory Evaluation of Energy Dissipators for Culvert and Storm Drain Outlets. Volume 1 - Modular Energy Dissipators, Internal Energy Dissipators, Rock Channel Protection," University of Akron, Akron, Ohio 44325, December 1980.

B. Colorado State University completed the study, sponsored by FHWA, to investigate scour at culvert outlets in various bed material. The study includes four bed materials; a uniform sand, a uniform gravel, a sand-gravel mixture, and a sand-silt-clay mixture. The study includes tests with various culvert diameters ranging from 4 to 15 inches to test the adequacy of modeling assumptions in developing design guidelines for much larger field installations. Procedures for estimating culvert outlet acour in various bed material are being printed as a revised chapter for FHWA Hydraulic Engineering Circular No. 14.

Control of Local Scour Around Bridge Piers - The objectives of these studies are to investigate the mechanics of this dynamic process, the methods of accurate prediction of its magnitude, the adequate means of controlling its damaging effect to bridge piers, and the stream-related hazards to highways and bridge.

A. The Mississippi Highway Department cancelled the HP&R study to monitor scour around bridge piers at a Homochitto River crossing, because the instrumentation became inoperable.

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, the to provide guidelines for measures to mitigate stream instability at highway stream crossings.

A. The U. S. Geological Survey completed a research study for FHWA titled "Stability of Relocated Stream Channels." This study evaluates the channel stability or erosion associated with stream relocations done for the purpose of highway construction. The results indicated: where the stream channel is generally stable before highway construction, relocation does not significantly change stream length or channel slope, and sufficient time allows vegetation to reestablish along the constructed bankline or countermeasures are incorporated, channel relocation is a viable alternative which will not result in stream damage. The final report titled "Stability of Relocated Stream channels," FHWA report number FHWA/RD-80/158 was published in 1980. In addition to the final report a slide tape presentation depicting the major aspects of the research is being developed.

B. As a result of the "Countermeasures" study completed in 1978 protective measures were identified that could benefit from additional evaluation and laoratory testing. One of these protective measures was spur or dike constructed along stream banklines. Although spur have been applied nationwide there was no general guideline for their construction in application to protection of highway right-of-way. The Sutron Corp. in cooperation with the Pennsylvania State University continued the FHWA study titled "Flow Control Structures for Highway Stream Crossings." The research will evaluate present application of spur and conduct laboratory flume studies to refine design guidelines for use by highway engineers.

C. A key to the proper design of a highway crossing or utilization of protective measure is a clear understanding of stream stability. A stream classification scheme is provided in the FHWA research report titled "Countermeasures for Hydraulic Problems at Bridges," FHWA report number FHWA/PD-78/162. To make utilization of this stream classification scheme more readily usable by highway engineers, the USGS prepared a FHWA research report titled "Stream Channel Stability Evaluation for Highway Engineers," which will be published soon. The report idenfies in a step-by-step manner the operations necessary to make a good evaluation of stream stability and what this may mean in terms of highway design.

D. The USGS continued the FHWA 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 will be used to field validate methods of roughness coefficient estimation which have been developed theoretically and only laboratory tested. The study will strive to attain quantitative methods that are relatively simple to apply and result in accurate estimates; at a minimum it will provide comparative methods that will make present estimates more consistent.

E. The University of Akron completed an HP&R study for the Ohio Department of Transportation on "Roughness Characteristics of Rock Lined Channels." Based on approximately 100 field measurements, the investigators observed Manning's "n" values that ranged from 0.021 to 0.098. They recommended maximum design values of 0.04 for riprap in large channels and 0.06 for riprap in smaller channels. The final report was published.

Simon, A. L. and Sarikelle, S., "Roughness Characteristics of Rock-Lined Channels," University of Akron, Akron, Ohio 44325, December 1980.

F. Sponsored by FHWA, the USGS started 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.

Control of Sediment Produced by Highway Construction - This problem consists of two stages: during construction and just after construction.

A. It is important that during the construction of highways, the sediment produced by roadway excavation and embankment construction must be controlled so it will not pollute the natural streams. Sponsored by the Pennsylvania Department of Transportation, the Pennsylvania State University and the USGS completed the cooperative research study titled "Prediction of Sediment Flow from Proposed Highway Construction Sites." This study capitalized on the extensive work of others by utilizing modified Universal Soil Loss Equation which has incorporated a factor for surface runoff. The study produced a computer program that can be accessed from any of the State's district offices and allows the engineer to try numerous sediment control methods mathematically before attempting to use any measures in the field. The final report was published in 1981.

Miller, A. C., White, E. L., and Veon, W., "A Procedure to Predict Sediment Flow from Highway Construction Sites:
Volume I - Design Procedure
Volume II - Data Report
Volume III - Literature Review"
The Pennsylvania State University, University Park, Pennsylvania 16802, January 1981.

B. 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 in 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 being prepared.

C. The USGS District Office at Harrisburg, Pennsylvania completed a research project titled, "Field Evaluation of Erosion Control Measures used in Highway Construction" under the HP&R program. The object of this study is to evaluate different types of erosion and sediment control measures to determine the ability of each measure to prohibit sediment from entering a stream system, and to determine if sediment concentrations and discharges return to their preconstruction levels once the construction has ended. The study area consists of five basins. Sediment ponds build on and off streams, small rock dams, seeding, mulching, and erosion control measures used before the issuance of erosion-control guidelines were compared with the use of sediment and discharge measurements. Sediment load and turbidity were shown to be much higher in the drainage basin protected by the onstream ponds than that protected by the offstream ponds. The final report was published in 1981.

Hainly, R. A., "The Effects of Highway Construction on Sediment Discharge into Blockhouse Creek and Stream Valley Run, Pennsylvania," Pennsylvsnia Department of Transportation, Harrisburg, Pennsylvania 17120, November 1981. It is available through NTIS, PB 81221517.

D. The Virginia Highway Research Council continued work on "Efficiency of Erosion Control Practices" for the Virginia Department of Hifhways and Transportation (VDHT) under the HP&R program. Current VDHT erosion and sediment control proctices were evaluated. Optimum erosion and sediment control will be determined using the highest practical design and construction procedure and maintenance of control technology. An interim report was published in 1981.

Wyant, D. C., "Efficiency of Erosion Control Practices of the Virginia Department of Highways and Transportation," Virginia Department of Highways and Transportation, Richmond, Virginia 23219, February 1981.

E. A case study under the HP&R program was completed by South Carolina Department of Highways to determine the "Effects of Highway Construction on Stream Turbidity and Suspended Solids." Turbidity and suspended solids were monitored upstream and downstream of a highway project before, during, and after construction. These data were evaluated with construction schedules and practices. The final report was published in 1981.

Embler, P. F. and Fletcher, M. O., "Effects of Highway Construction on Stream Turbidity and Suspended Solids: A Case Study," South Carolina Department of HIghways and Public Transportation, Columbia, South Carolina 29202, December 1981.

F. 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 1981, 14 States were conducting studies designed to improve vegetation establishment techniques and subsequent management practices. The participating States were Alabama, California, Georgia, Indiana, Louisiana, Massachusetts, Missouri, New Jersey, North Carolina, Oklahoma, Rhode Island, Virginia, Washington, and West Virginia. Below are reports published in 1981.

Huffine, W., Reed, L., and Whitcomb, C., "Selection Establishment and maintenance of Roadside Vegetation," Oklahoma Department of Transportation, Oklahoma City, Oklahoma 73105, June 1981.

Wakefield, R. C., Sawyer, C. D., and Lowe, B. A., "Management and Renovation of Roadside Turfgrass," Rhode Island Department of Transportation, Providence, Rhode Island 02903, June 1981.

Conaway, M. and Thayer, R., "Evaluation of New Drought Tolerant Plants for Highways," California Department of Transportation, Sacramento, California 95814, January 1981.

Control of Highway Water Quality - The objectives of these studies are to monitor the highway water pollution parameters and to devise cost effective means to control them.

A. An FHWA study on pollutants in highway runoff was completed in 1979 by the Environmental Research Center at Rexnord, Milwaukee, Wisconsin 53214. For most study sites, more than 25 runoff events were monitored over a period of at least one year. The final report composed of six volumes were published by FHWA in February 1981.

Gupta, M. K., et el., "Constituents of Highway Runoff:
Vol. I. State-of-the-Art Report
(Report No. FHWA/RD-81/042. NTIS No. PB 81241895)
Vol. II. Procedural Manual for Monitoring of Highway Runoff
(Report No. FHWA/RD-81/043. NTIS No. PB 81241903)
Vol. III. Predictive Procedure for Determining Pollutant Characteristics in Highway Runoff
(Report No. FHWA/RD-81/044. NTIS No. PB 81241911)
Vol. IV. Characteristics of Runoff from Operating Highway. Research Report
(Report No. FHWA/RD-81/045. NTIS No. PB 81241929)
Vol. V. Highway Runoff Data Storage Program and Computer User's Manual
(Report No. FHWA/RD-81/046. NTIS No. PB 81241937)
Vol. VI. Executive Summary"
(Report No. FHWA/RD-81/047. NTIS No. PB 81241945)

B. The FHWA research study on "Sources and Migration of Highway Runoff Pollutants," was continued by the Environmental Research Center of

Rexnord, Milwaukee, Wisconsin 53214. Monitoring were completed in Milwaukee, Wisconsin; Sacramento, California; Harrisburg, Pennsylvania; and Effland, North Carolina.

C. The third phase of FHWA's research runoff quality to determine the impact of highway runoff on receiving waters was started in 1980 with the Engineering Research Center of Rexnord,Milwaukee, Wisconsin 53214. Monitoring was completed for two stream sites in Wisconsin and North Carolina, and is being initiated for a lake site in Wisconsin.

D. The California Department of Transportation completed the HP&R study on "Long Range Effects on Aquatic Ecosystems from Adjacent Highway construction." This study investigated the effects on the aquatic environment from channel alterations resulting from highway construction on perennial stream and evaluated selected mitigation techniques employed to minimize these impacts. The final report was published in 1981.

Winters, G. R. and Gidley, J. L., "Evaluation of Stream Channel Relocation Impacts and Mitigation Measures on Aquatic Biota," California Department of Transportation, Sacramento, California 95807, June 1981.

E. The Pennsylvania State University, sponsored by the Pennsylvania Department of Transportation, continued the HP&R study on "The Impact of Stream Relocation of Fish Populations - Bull Creek." This research studies fish populations, bottom fauna, and water quality in Bull Creek before, during, and after stream relocation for construction of the Allegheny Valley Expressway.

F. The California Department of Transportation is completing the HP&R study on "Modeling of Transportation Pavement Runoff." This study will use data developed on the completed California study "Water Pollution Aspect of Particles which Collect on Highway Surface."

G. The California Department of Transportation continued another HP&R study on "Mitigation of Highway Related Chemical Water Quality Pollutants." This study evaluates the effectiveness of three mitigation measures.

H. The University of Washington in Seattle is completing the HP&R study on "Highway Stormwater Runoff Quality" sponsored by the Washington Department of Transportation.

If more information is desired about these research studies, inquiries should be addressed to the sponsoring agencies.

MULTI-WATER RESOURCE REGIONS

Northeastern Area, State and Private Forestry

During 1981 a total of 78,300 woodland owners received technical assistance with a total of 1,220,570 acres of forest land being brought under proper management under ongoing and accelerated programs. Of this, roughly 35.5 thousand acres were attributed to watershed protection. This includes log road and skid trail layout and construction, critical area planting, and streambank protection on harvested areas. A distribution of acres receiving watershed protection by States is listed below.

We also have a cooperative project underway with the School of Forestry, University of Minnesota, to determine the economic impact of installing Best Management Practices.

WATERSHED

Connecticut	1,283
Delaware	980
Indiana	8,653
Maine	111
Maryland	78
Massachusetts	17,213
New Hampshire	1,638
New Jersey	98
New York	782
Ohio	1
Pennsylvania	3,600
West Virginia	117
Wisconsin	902
TOTAL	35,456

Forest Service

PUBLICATIONS AND SPECIAL STUDIES

Northeastern Forest Experiment Station

Durham, New Hampshire, project (NE-1601) has been documenting changes in stream chemistry that can be expected from contemporary clearcutting and stripcutting. Researchers have measured, gaged, and treated watersheds on the Hubbard Brook Experimental Forest (a Biosphere Reserve) on a yearly basis as well as on a storm basis. This work has led to a study of soil disturbance on the forest floor following clearcutting and whole tree harvesting.

Parsons, West Virginia, project (NE-1602) has been studying the effects of logging road construction on sediment production on the Fernow Experimental Forest. Road disturbance data are being collected on rates of growth, soil moisture regimes, surface runoff patterns, and any change in acidity or alkalinity of runoff water from the road area.

Intermountain Forest and Range Experiment Station

Boise, Idaho, project (RWU-1651) has a study in progress to evaluate the effects of road construction on erosion and sedimentation on granitic slopes in Idaho.

"Construction Phase Erosion From Forest Roads on Granitic Slopes in Idaho" by Walter F. Megahan, Kathleen A. Seyedbagheri, Timothy L. Mosko, Gary L. Ketcheson

Description of Study Area

A study is in progress to evaluate the effects of alternative timber harvest and road construction practices on erosion and sedimentation in the mountains of southwest Idaho. The study is located in the headwaters of the Payette River drainage on the Boise National Forest. Eight watersheds, ranging in size from 70 to 460 acres, are included in the study. Watershed slope gradients range from 40-80 percent and are covered primarily with ponderosa pine and Douglas-fir timber. The shallow, coarse-textured soils, are highly erodable and are typical of the granitic parent materials found in the 16,000 square mile Idaho Batholith. Annual precipitation ranges from about 25 inches at the lowest elevation (5,000 feet) to 45 inches at the highest point (7,000 feet). About 65 percent of the precipitation occurs as snowfall; the remainder is rain caused by summer convective storms and frontal storms in the spring and fall.

Forest Service

Road Construction

Three of the study watersheds were selected to evaluate the effects of alternative road construction practices. Four roads totalling 5.45 miles in length were constructed with a basic travel width of either 12 or 14 feet with additional widening of up to 10 feet for shoulders, turnouts, and curves as specified by the design engineer. A number of practices, including variations in alignment, embankment construction, surfacing, cut and fill slope construction, and drainage were utilized to evaluate the erosional consequences of alternative road design features. Road construction began in mid-June of 1980 and was completed by mid-November.

Data Collection

Long-term information is available on two of the three roaded watersheds to document predisturbance erosion and sedimentation conditions. Data collected include 15 years of streamflow and annual sediment yield, 5 years of instantaneous sediment discharge, 15 years of climatic data, and 7 years of channel survey data to document channel sediment storage. Except for streamflow, the same data are available on the third roaded watershed but only for a 2-year period prior to road construction. Additional data were collected to document the amount of erosion and sedimentation caused by construction activities. These include instantaneous sediment discharge above and below the road, a detailed survey of all sediment deposition on slopes below the road prism, and sediment accumulation in debris basins located in micro-watersheds through which the road was constructed.

Results

The construction phase erosion and sediment data indicate the susceptibility of a partially constructed road prism to erosion from thunderstorms. Nine storms affected the Silver Creek Study Area during the summer of 1980. The probability of receiving rainfall kinetic energy for these storms ranged from approximately 2-80 percent, indicating that at least some of the storms were relatively unusual.

Construction activities caused large increases in sediment concentration in streams immediately below the road, but not at the watershed outlets. Installation of a temporary log culvert during the initial crossing of Ditch Creek on July 1, 1980, caused a maximum sediment concentration of 17,000 parts per million (ppm). However, the corresponding sediment concentration at the watershed outlet, 2,000 feet downstream, was only 35 ppm. The summer thunderstorms had a much more pronounced effect on sediment production than did normal construction activities near live water. For example, the peak suspended sediment concentration at the mouth of Ditch Creek of 35 ppm caused by the temporary log culvert in the main channel compares to a peak concentration of 2,550 ppm caused by a thunderstorm late the next day. Total suspended sediment flux out of the watershed for this period (July 1-17, 1980) was 217 pounds. Only 1 percent of this flux is attributed to the pioneer crossing, whereas 92 percent was caused by the thunderstorm occurring on freshly exposed, erodible material. Other summer thunderstorms had similar effects on suspended sediment concentration.

Culvert failure can severely impact the stream channels. A culvert in a tributary to Ditch Creek failed on July 25, 1980, shortly after installation. The suspended sediment concentration out of the watershed went from 3 ppm to a peak of 1,900 ppm and remained at 1,000 ppm for nearly 24 hours. No precipitation occurred during this time. Peak concentrations up to 13,200 ppm were measured when the culvert was reinstalled on August 19-20, 1980.

A total of 20.9 tons of sediment were eroded per acre of road prism during the period July to mid-October 1980. This equates to 83.6 tons per-acre-per-year. A large percentage of the eroded material is presently in storage on slopes and in channels below the roads. The most reliable estimate of downstream sediment delivery for the construction period is about 11 percent. This figure could change in the future as stored material is moved downstream during high flows.

Erosion during construction causes a major portion of total road erosion. Future data collection will define how much, relative to the total erosion over the longrun. Road design had no effect on the amount of erosion during construction in spite of a variety of detailed practices included in the design to reduce erosion once the job was complete. Erosion was a function of the stage of construction at the time the storm hit and thus was unrelated to the completed design. Workable emergency erosion control practices incorporated into the road contract to provide for rapid contractor response to storms would go a long way toward preventing much of the problem.

Pacific Southwest Forest and Range Experiment Station

Glendora, California, Chaparral project (RWU-1652) currently maintains six gauged watersheds on the San Dimas Experimental Forest. Debris production is also monitored on four of these watersheds. The data is stored and maintained at the Glendora Office of PSW and available to the public.

In addition, there is an active research program in flooding and sedimentation within the project. Individual studies of the floods of 1978 and 1980 have been made and the project has actively supported and cooperated with a project of the California Institute of Technology, sediment management for southern California mountains, coastal plains and shoreline since 1977. In addition, research on post-fire erosion processes and sediment movements in small, low-order drainages is continuing.

Forest Service

Pacific Northwest Forest and Range Experiment Station

Corvallis, Oregon, project (RWU-1653) on Soil Stability, Streamflow Characteristics, and Introduced Chemicals.

Progress Report: Soil Erosion from Managed Forest Watersheds in the Western Cascade Range, Forestry Sciences Laboratory, Corvallis, Oregon

We summarized yields of suspended sediment from four watershed studies in the report submitted in 1978. Yields from the watersheds, while undisturbed, ranged from about 10 to 900 kg/ha according to the severity of storms, logging activities, and the process of erosion activity on the sites. Increases in mean periodic yields ranged from 0 to about 2,250 kg/ha.

We now have results from two additional sites within the H. J. Andrews Experimental Forest located about 50 miles east of Eugene, Oregon. Watersheds HJA-6 and 7 face south and span a 100-foot elevation zone above the gaging stations at 3,000 feet. Douglas-fir, age 120 years, was clearcut from HJA-6 and thinned to shelterwood density on HJA-7. The logs were removed from the sites by overhead cable methods. Ground disturbance was light as was the effect of the slash fire the following spring. On watershed 10 at lower elevation (1,500-3,200 feet) old-growth Douglas-fir was clearcut and the logs removed by skyline methods. The residue from the logging was left to decompose after removal of the large and merchantable material.

The yields of suspended sediment in kg/ha from the watersheds increased as a result of the logging.

Watershed	Pre-logging	Post-logging	Years since logging	Time control watershed
6	46	157	6	3.4
7	20	26	6	1.3
10	58	455	5	7.8

Increased yields ranged from slightly over 1 to nearly 8 times the yields predicted from the control watersheds. The lower yield from HJA-7 compared to HJA-6 is probably the result of the shelter stand. Of the two clearcut watersheds, the lower yield from HJA-6 compared to HJA-10 is probably the result of climate and geomorphic traits of the watershed. HJA-6 at higher elevation develops a snowpack in winter, is less steep, and has more stable channel banks and less frequent and intense storm peaks because of the snowpack. Conversely, HJA-10 experiences greater peak flows from rain at lower elevation and steep channel banks which are often rendered unstable by shifting debris in the channel that diverts stormflow against the banks.

Forest Service

Published Since Last Report

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Forest Service

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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 hydraulic 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.

FY-1981 Progress: Completed 1979-1980 field data collection on East Fork River as related to fluorescent tracer study. Daily bedload measurements at frequently spaced sections along a reach of river demonstrate significantly different relations of bedload to discharge from one section to another. Collected and overviewed collection of bedload data from a variety of rivers to provide data base necessary to evaluate universality of East Fork River behavior. Data reduction of 1979-1980 data to usable form is nearly complete.

FY-1982 Plans: Compile, publish, and release basic-data reports related to the 1979-1980 field effort on the East Fork River. In collaboration with L.B. Leopold, prepare comprehensive interpretative report related to the 1967-1980 period of study on the East Fork River. Sponsor Ph.D. dissertation related to fluorescent-tracer study on East Fork River.

Completed Reports:

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Emmett, W.W., 1979, A field calibration of the sediment trapping characteristics of the Helley-Smith bedload sampler: U.S. Geological Survey Open-File Rept. 79-411, 96 p.

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Burrows, R.L., Parks, Bruce, and Emmett, W.W., 1979, Sediment transport in the Tanana River in the vicinity of Fairbanks, Alaska, 1977-78: U.S. Geological Survey Open-File Rept. 79-1539, 37 p.

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CR79-252 Upper Platte River Study

WRD Project No.: CR79-252
Project Chief: Hadley, Richard F.
Headquarters Office: Lakewood, Colorado
Field Location: Platte River basin, Colorado, Wyoming, and Nebraska

PROBLEM: The Department of the Interior has specific responsibilities for implementing migratory bird treaties and the Endangered Species Act. Of special concern, in this respect, are the habitats of sandhill cranes, whooping cranes, and other migratory bird species found along the Platte River in central Nebraska. The channels of the Platte River and its major tributaries, the North Platte and South Platte Rivers have undergone major changes in hydrologic regime since the late 19th century. Information and data were needed on streamflow and sediment transport characteristics of the Platte River, how these are affected by upstream activities and ground-water withdrawals, and especially on the interrelationships between flow and wildlife habitat.

OBJECTIVES: Determine specific flow and channel characteristics for selected locations along the Platte River and tributaries; (2) establish statistical properties of streamflow; (3) determine channel-maintaining discharge characteristics; (4) analyze stochastic models for flow projection; (5) determine surface-ground water relationships to wet meadow environment and streamflow; (6) determine sediment-transport characteristics and bedform processes and morphology.

APPROACH: Basic data on streamflow will be compiled including station histories, computation of statistics, and establish of projections for future flows based on planned development. For selected reaches, channel changes will be documented by using aerial photographs, maps, reports, rating curves, flow-duration curves, and other available material. Sediment-transport characteristics will be determined at selected locations by measuring suspended-load, bedload, and bed material. The characteristics of channel morphology will be related to bed and bank material, flow dynamics, and riparian vegetation. Selected sites will be instrumented to determine the hydrologic effects of changing flows, ground water levels on selected wetland areas.

FY 1981 PROGRESS: Thirteen reports were completed in FY 1981 based on the data collected and field observations in the previous 2 years. Eleven of the reports were released to the open file and two reports were prepared for scientific journals. Interpretive reports were released on changes in streamflow and sediment transport, channel geometry and discharge required to maintain channel form, and the formation and movement of large-scale sedimentary bedforms in Platte River channels. A stochastic streamflow model for the reach of the Platte River from Cozad to Grand Island, Nebraska has been developed. Ground-water studies were completed that determine the effects of changes in streamflow and ground-water withdrawal on ground water levels in the Platte River valley from Cozad to Grand Island.

FY 1982 PLANS: The open-file reports will be published as chapters in a Geological Survey Professional Paper entitled "Hydrologic and geomorphic studies of the Platte River basin." The Geological Survey studies in the Upper Platte River basin will be combined with studies of the Fish and Wildlife Service and Bureau of Reclamation in a Department of the Interior report.

COMPLETED REPORTS:

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Petsch, H.E., Jr., Rennick, K.B., and Nordin, C.F., Jr., 1980, Statistical summaries of selected streamflow data: South Platte River in Colorado and Nebraska; North Platte and Platte Rivers in Nebraska: U.S. Geological Survey Open-File Report 80-679, 278 p.

Vecchia, A.V., Jr., 1981, Precipitation model for the Platte River valley from Gothenburg to Grand Island, Nebraska: U.S. Geological Survey Open-File Report 81-130, 44 p.

Vecchia, A.V., Jr., 1981, A streamflow model for the Platte River at Overton, Odessa, and Grand Island, Nebraska: U.S. Geological Survey Open-File Report 81-1188, 42 p.

GEOLOGICAL SURVEY

IL82-048 An Evaluation of Bedload Data in Illinois

WRD Project No.: IL82-048
Project Title: An Evaluation of Bedload Data in Illinois
Project Chief: Graf, Julia B.
Headquarters Office: Urbana, Illinois
Field Location: Illinois statewide

Problem: Erosion and sedimentation are major issues in Illinois, where loss of farmland through soil erosion is of great concern, and where sediment deposition adversely affects wildlife habitats and decreases useful life of reservoirs. Accurate measurement of sediment transported by streams is critical to the evaluation of these problems as well as of remedial measures. Although sediment data in Illinois is minimal, data collected since 1978 can provide a basis for development of bedload transport curves, for comparison with transport computed by indirect methods, and for evaluation of the suitability of bedload sampling sites.

Objectives: (1) To evaluate data collected at nine gaging stations in Illinois with the Helley-Smith bedload sampler. (2) To examine the possibility of supplementing bedload records by indirect methods. (3) To compare these data with data collected outside Illinois. (4) To evaluate the suitability of each bedload sampling station.

Approach: Bedload transport curves will be developed for the three stations for which sufficient samples have been collected. Indirect methods (Meyer-Peter Muller, Schoklitsch, and modified Einstein) will be used to develop transport curves for the six stations with only a few bedload samples. Bedload discharges computed by indirect methods will be compared to measured bedload discharges to evaluate the possibility of supplementing or extending curves developed from measured values. Data will be examined with respect to variables affecting transport, e.g., position with respect to the flood hydrograph, slope. Bedload samples collected outside Illinois will be compared to Illinois data through the relation between bedload transport and stream power. Examination of sediment data and station records will be made to evaluate the suitability of bedload sites.

FY-1982 Plans: The project will be completed in FY-1982. Data to be used in the analysis will be collected from files. Bedload transport-discharge curves will be developed for stations with sufficient data. Three indirect methods will be used to compute bedload transport for comparison to the measured transport. Bedload data from outside Illinois will be compared to Illinois data using some dimensionless measure of stream flow. Bedload data collection sites will be evaluated with respect to their suitability. A report summarizing the bedload data evaluation will be prepared.

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 relate 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-1981 Progress: Six versions of the Helley-Smith sampler were tested in the bedload sampler calibration facility at SAFHL under two different flow and transport conditions (runs) with 23-mm bed material and in four runs with bed material consisting of a mixture of particle sizes ranging from about 2 to 32 mm in diameter; completion of the two 23-mm runs brought the total of such runs to five. Average bedload transport rates for the mixture runs ranged from about 0.05 to 0.21 pounds per second per foot of width. A full-scale VUV bedload sampler also was tested during one of the high-flow mixture runs. In all runs, 60-80 samples were collected with each sampler and true bedload transport rates were measured continuously downstream at the bedload trap. Detailed hydraulic and sedimentologic data were obtained as an integral part of every run. To permit calibration curves for various particle-size ranges to be defined for each sampler from the mixture-run data, approximately 2000 individual samples collected with the test samplers and numerous representative samples of the material collected at the bedload trap must be analyzed to define their particle-size distribution. The initial design of a rapid-sieving device to expedite this effort was completed. The device will be capable of separating samples into six size fractions from 11.2 to 1.0 mm. An electronic scale interfaced to a microcomputer completes the system. It is anticipated that the system will be able to fractionate a typical sample and compute and record the particle-size distribution and other statistics in about 5 minutes.

FY-1982 Plans: Analysis of data from calibration runs with 2.1 and 23 mm bed materials will be continued to verify that the analytical procedure used to define calibration curves from the 6.5-mm run data is valid for all materials and to establish calibration curves for all tested samplers for those two particle sizes. Coordinately, particle-size distributions of samples from the mixture runs and other pertinent basic data will be defined and processed, and calibration curves based on transport rates of individual size fractions having mean diameters of approximately 2.1, 6.5, and 23 mm will be developed. The curves for each sampler pertaining to the different unigranular materials will be compared with equivalent curves based on size-fraction data from the mixture runs in an effort (1) to develop a generalized calibration curve for each sampler that is applicable for all conditions and materials, if that is possible, or (2) to understand reasons for the differences so that operational calibration curves can be provided for the most promising samplers.

Completed Reports:

Hubbell, D.W., Stevens, H.H., Jr., Skinner, J.V., and Beverage, J.P., 1981, Recent refinements in calibrating bedload samplers, *in* Water Forum '81: American Society of Civil Engineers, Proceedings of the San Francisco Specialty Conference, August 1981, p.128-140.

Project Title: Stream Channel Behavior in Relation to Channel Properties
WRD Project No: WR 76-153
Location: National
Project Chief: J. C. Brice
Headquarters Office: Menlo Park, CA

Problem: Channel behavior (defined as change in channel form or position with time) has not been systematically measured for many streams. Some channels are known to have slower rates of change than others, but little information has been assembled on rates and magnitude of change; nor has stability been related to channel properties. Assessment of behavior from channel properties has useful application to the planning of bridges and other works of man along streams.

Objectives: To measure and describe the properties and behavior, with particular regard to lateral erosion, of a wide variety of stream channels; to relate channel properties to genetic variables, including discharge, valley slope, and size of bed material; to classify channels on the basis of associations of properties; and to relate channel behavior to channel properties and types.

Approach: Information on channel properties and behavior has already been collected during prior phases of this project. Further information will be derived from measurement and interpretation of a large collection of time-sequential aerial photographs of streams, spanning a time period of about 45 years. Channels are classified on the basis of descriptive properties that have genetic significance. The relations of channel behavior to channel properties, and of channel properties to genetic variables, are to be analyzed by statistical methods.

Progress and Results, Calendar Year 1981: Geomorphic methods for stream channel stability assessment, adapted for the use of bridge and highway engineers, were presented in a report to be published by the Federal Highway Administration. For this report, lateral erosion rates were measured for 46 stream reaches in the United States, by comparison of time-sequential aerial photographs. Work was continued on the measurement of lateral erosion rates for an additional 200 stream reaches, for which time-sequential aerial photographs have been obtained.

Completed Report:

Brice, J. C., 1982, Stream channel stability assessment for bridge and highway engineers: Federal Highway Administration, Washington. D. C. , 42 p.

Project Title: Forest Geomorphology, Pacific Coast

WRD Project No.: WR74-089

Field Location: Forested Steeplands of the Pacific Coast

Project Chief: Janda, Richard J.

Headquarters Office: Menlo Park, CA

Problem: The rock types, topographic and tectonic settings, climates, and landuses in the geologically youthful mountains of the Pacific Coast are conducive to exceptionally rapid mass wasting and fluvial erosion. Types and rates of geomorphic processes are strongly influenced by living and dead vegetation and therefore readily modified by natural or management-related vegetation disturbance. Considerable public interest is focused on developing timber harvesting practices that will have minimal impact on water quality and aquatic habitat. Unfortunately, quantative knowledge of (1) hillslope erosion processes contributing to stream sediment loads, and (2) the influence of vegetation on both hillslope and channel processes is meager.

Objective: Study the manner in which different hillslope erosion processes influence stream sediment transport relationships and total sediment yield from small and intermediate sized forested basins. Study the ways in which living and dead vegetation influence erosion, transport, and deposition of sediment in forested environments.

Approach: Compile available stream sediment discharge data and attempt to relate various sediment discharge characteristics to basin parameters including dominant hillslope erosion processes, landuse, climate, and size. Study time-sequential aerial photographs to determine types and frequency of erosion processes. Map erosional landforms and monitor changes in landforms through repeated surveys of monumented cross sections, stake arrays, and bore holes. Collect auxiliary sediment discharge data for small basins where hillslope and channel processes are being intensively studied.

Progress and Results: Data collection at two complex earthflows in Northwestern California indicated that, although sediment yield from these features results from both mass movement and fluvial erosion, the majority of sediment is contributed to adjacent streams by mass movement activity. Seasonal movement rates, and therefore sediment yields, are highly variable and depend heavily upon the mass distribution within individual features. Sediment yields in excess of 24,000 $T/Km^2/yr$ have been monitored from these features. Monitoring of movement during the latter part of the 1981 calendar year documented upslope propagation of a mass imbalance at one site. It is believed that such upslope propagation occurs in the form of harmonic waves which are transmitted faster than the average speed of the moving mass.

Channel cross-section surveys and ground observations indicate that upper Redwood Creek has not yet recovered from a period of accelerated erosion induced by high intensity storms and massive clear-cutting between 1954 and 1972. The main channel of Redwood Creek showed pervasive aggradation in response to the relatively wet 1981 calendar year. Erosion and sediment transport which occurred during this period have apparently negated the recovery which occurred during the subsequent dry period between 1977 and 1980.

Channel cross-section surveys done between 1977 and 1981 in the Bull Run watershed have shown little change in channel geometries. These data suggest that major channel changes in this relatively stable, low sediment yield terrane occur during high magnitude, low frequency runoff events. Photo interpretive mapping of erosional landforms indicate little change in mass movement features between 1956 and the present. This observation suggests that major amounts of sediment transported by streams in this terrane result from in channel processes. Field mapping indicates that most sediment accessible to channels is stored in boulder-dominated riffles.

Continued observations in the Green River Basin indicate that most sediment deposited by the blast of Mount St. Helens, which was accessible to stream flow during 1981, has been removed from its original deposition site. It appears that much of the transported sediment has been redeposited in downstream, lower gradient, reaches. Localized deposits of cobble/boulder alluvium which resulted from outburst floods from behind blown down debris have remained essentially unmodified by subsequent flows. These deposits will presumably be long lasting features.

Completed Reports:

Janda, R.J., Scott, K.M., Nolan, K.M., and Martinson, H.A., 1981, Lahar movement, effects, and deposits: U.S. Geological Survey Professional Paper 1250, p. 461-478.

Voight, B., Glicken, H., Janda, R., and Douglass, 1981, Catastrophic rockslide avalanche of May 18: U.S. Geological Survey Professional Paper 1250, p. 347-378.

Nolan, K.M. and Janda, R.J., 1981, Sediment Discharge from Two Earthflows in Franciscan Terrane, Northwestern California: EOS, vol. 62, no. 45, p. 857.

GEOLOGICAL SURVEY

4753-27450 Geomorphic response, Toutle River

WRD Project No.: 4753-27450
Project Chief: Janda, Richard J.
Headquarters Office: Vancouver, Washington
Field Location: Toutle River basin, Washington

PROBLEM: The massive rockslide-avalanche, laterally directed blast, airfall, and lahars associated with the May 18, 1980 eruption of Mount St. Helens severly altered the hydrology and topography of the Toutle River basin. The Toutle River experienced the largest and most diverse impact of any stream draining the mountain. The immediate adverse economic consequences of the 1980 eruption of Mount St. Helens were enormous, but important hydrologic hazards remain. The initial volcanic events significantly increased storm runoff as well as the availability of readily erodible sediment, and thereby increased the threat of devastating floods in downstream areas. As the stream system becomes more integrated, flood surges of various sizes may be generated by the breaching of ponds and lakes on and adjacent to the avalanche deposit. The Toutle River studies will significantly expand understanding of geomorphic response to elevated sediment loads in general, because rapid landscape changes here enable one to carry out experiments in a matter of months that would ordinarily take years or decades to perform.

OBJECTIVE: The primary objective is to develop sediment budgets for various parts of the Toutle River Basin in order to identify the sediment storage sites and transport processes that most influence sediment discharge. Data collection will focus most heavily on determining changes in channel and near-channel sediment storage along third order and larger streams. The project will attempt to identify which drainage basin and site conditions most control channel response. A secondary objective is to describe changes in channel pattern, slope, and cross-sectional geometry that control hydraulics and aquatic habitat.

APPROACH: Output for the sediment budgets will be the total sediment discharge past 1) the distal end of the North Fork Toutle River debris avalanche deposit, 2) Green River, 3) North Fork Toutle River at Kid Valley, 4) South Fork Toutle River at Camp 12, 5) Toutle River at Tower Road, and 6) Toutle River at Highway 99. Changes in channel geometry and sediment storage will be determined through repeated surveys of monumented channel cross-sections, study of time-sequential aerial photographs, and comparison of photogrametrically-produced topographic maps. Greatest emphasis will be placed on the North Fork Toutle debris avalanche because sediment production there exerts a particularly profound influence on downstream areas. Grain-size distributions and other characteristics of the exported stream sediment and various sediment storage sites within the basin will be compared. In order to maximize potential benefits of the channel geometry studies, work will be carefully coordinated with ecologists studying dynamics of ripparian and aquatic populations and with hydraulicians developing sediment transport models.

FY-1981 Progress: About 150 monumented cross sections have been established, many of which have been resurveyed periodically between discharge events. Measurements of channel sediments and load have been carried out by periodic suspended sediement and bed material sampling, and annual channel pebble point counts. Photogrametrically produced topographic maps at a scale of 1:1200 and valley cross sections were obtained from July, 1980 aerial photography. Most of the monumented cross sections correspond to those produced photogrametrically.

FY-1982/83 Plans: Most of the field work will be involved with monitoring channel changes through resurveys of monumented cross sections. Through aerial photography interpretation changes in monumented cross section will be interpolated throughout the channels. Photogrametrically produced topographic maps showing the condition of the avalanche at the end of WY 1981 and WY 1982 will be produced. Compilation of data collected by Survey and other researchers will supply the rest of the needed data to complete the sediment budget. Report plans include the following: oral presentations at learned societies, annual interim reports in symposium proceedings volumes (and/or) USGS circulars, short journal articles on key topics, USGS Professional Paper -- Impact of the 1980 Eruption of Mount St. Helens on Stream Channels in the Toutle River Basin, Washington; completed by FY 1983, USGS Professional Paper -- Geomorphic response of the Toutle River to the 1980 Eruption of Mount St. Helens -- The First Three Years; completed by FY 1984.

Contribution to "Notes on Sedimentation Activities"
Calender Year 1981

WRD Project No.:	WA82-273
Project Title:	Rheological properties and initiating mechanisms of mudflows and debris flows
Project Chief:	Pierson, Thomas C.
Headquarters Office:	Vancouver, Washington
Field Location:	Mount St. Helens

Problem:

Hydraulics textbooks are filled with equations that can be used to accurately predict how water, a Newtonian fluid, will flow under specific sets of conditions, that is, equations that relate flow behavior to a set of internal and external independent variables. But there is very little quantitative information available for natural non-Newtonian slurry flows (mudflows and debris flows), that allows prediction of their flow behavior. It is also extremely difficult to predict the magnitude of such flows. Yet mudflows and debris flows are a much more frequent geologic process in steep terrain than has commonly been thought.

Objectives:

1) To develop empirical relationships between dependent variables (velocity, impact force, discharge) and independent variables (depth, channel gradient, channel sinuosity, particle-size distribution, water content, entrained-air content, temperature, and clay mineralogy) in natural slurry flow based on observed and measured flow behavior, so that the rheology of a wide range of mudflows and debris flows may be defined.
2) To identify the source of the liquid and solid components of a range of mudflows and debris flows, and to define the mechanisms by which the components are mixed and the flows mobilized under natural conditions.

Approaches

1) Direct observation and measurement of small channelized debris flows that occur periodically during the summer downstream from the Shoestring Glacier. Instrumentation will include vertical still photography (to obtain horizontal velocity distribution), 16 mm movie photography (to measure velocity of flow front over length of monitored reach), vertically mounted sonar rangefinders (to obtain debris flow hydrographs, average velocity of peaks, and peak attenuation), seismograph (to measure seismic energy generated), and a vertically erected 0.7 m high steel "post", anchored in bedrock in the center of the channel (to measure velocity head at three different depths with differential pressure transducers embedded in the leading edge and to collect samples, approximately one liter each, at the same three depths using collection chambers on the trailing edge that will be uncovered after the bouldery front passes). Observers will be on hand to collect surface samples, measure temperature, and measure entrained air.

2) Determination of flow behavior of large mudflows that moved down Pine Creek and Muddy River during the May 18, 1980 eruption. Velocities (minimum) will be computed at surveyed channel bends utilizing the principal of velocity controlled superelevation of fluid rotating in channel bends and from surveyed run-up elevations by assuming complete conversion from potential to kinetic energy. Channel parameters will be determined from field surveys, maps, and air photos. Material properties of peak flow deposits at different points along the flow paths will be determined in the laboratory.

3) Experimental testing of reconstituted mudflow slurries in the laboratory will be carried out to determine the effect of changing water and air content on the yield strength of slurries using a sensitive shear vane, a specially designed shear box, and a coaxial viscometer. Pore-water pressure gradients and decay curves will also be determined.

FY 1981 Progress:

The Shoestring debris-flow monitoring reach was partially instrumented, field procedures were established, and data on several small debris flows were obtained from the sonar rangefinders, movie footage, and surface samples. A prototype midchannel post could not withstand the impact forces and was lost, but this allowed a much better design to be created for the next model.

All field surveys and sample collection for the Pine Creek/Muddy River study were completed.

Fy 1982 Plans:

Installations at the Shoestring reach will be expanded to the full scope of the study, and based on last season's experience, a number of design and instrumentation modifications will be carried out. The site will be manned at least four days per week though the field season. Complete reduction of data for the Pine Creek/Muddy River study will be completed and at least a preliminary report written.

GEOLOGICAL SURVEY, CORPS OF ENGINEERS, FOREST SERVICE, BUREAU OF RECLAMATION, AGRICULTURAL RESEARCH SERVICE, FEDERAL HIGHWAY ADMINISTRATION, AND OFFICE OF SURFACE MINING

Federal Inter-Agency Sedimentation Project

Research Activities. During the past three years a team composed of Sedimentation Project personnel and Geological Survey personnel (David Hubbell and Herbert Stevens) has been engaged in full-scale calibration of various types of bedload samplers. Prior to 1981, tests were conducted with bed material of a uniform particle size. During 1981 tests with a graded mixture were completed and then the calibration facility was dismantled and stored for possible future use. A summary of the test and data reduction procedures were summarized in the published report listed at the end of these notes.

A proposed standard for sampling sediment in motion was approved by the American Society for Testing and Materials. The document, which is a product of an interagency committee effort, is scheduled for publication in 1982.

A technique for the continuous measurement of sediment concentration was evaluated in a series of laboratory tests. Results were documented in a report which is currently in the technical review phase.

Apparatus was acquired to implement studies of an alternate method for sediment particle-size analysis. The procedure consists of measurement and analysis of pressure gradients created by sediment particles as they settle through quiescent water. As a first step a special sensor was modified to produce the required sensitivity.

Equipment Development and Supply Activities. To meet special requirements for sampling bed material in wadeable streams, two new hand-operated samplers were designed, tested, and have been stocked for supply. One sampler is designed for sampling deposits of noncohesive sediments. It incorporates a rotary bucket supported in a lightweight aluminum frame. The bucket rotates to collect the sample, then seals to prevent loss of fines while the sampler is being lifted through the flow. The other sampler is for collecting deposits of cohesive material that must be analyzed for trace metals.

A new suspended-sediment sampler was developed and is being evaluated in field tests. The sampler is intended for use in wadeable streams and will accept several different sample containers. All critical parts are of plastic, so that samples can be analyzed for trace-metal contamination.

A noncorrosive watertight enclosure was designed to permit submerged operation of peristaltic sampling pumps.

A bag-type sampler was developed and laboratory tested. The device simplifies the collection of point-integrated and depth-integrated samples. The report is in final-review status.

The following tabulation lists major pieces of equipment supplied to governmental and education institutions:

Instrument		Sold since 1940	Sold during 1981	Inventory, Dec. 1981
DH-48	Hand sampler	3270	124	264
DH-75P	Hand sampler	139	15	9
DH-75Q	Hand sampler	128	4	25
DH-59	Hand-line sediment sampler	1375	116	23
DH-76	Hand-line sediment sampler	285	19	3
D-49	Depth-integrating sampler	900	0	0
D-74	Depth-integrating sampler	423	13	39
D-74AL	Depth-integrating sampler	145	6	7
P-61	Point-integrating sampler	279	18	17
P-63	Point-integrating sampler	44	0	7
P-72	Point-integrating sampler	60	14	22
BMH-53	Bed-material hand sampler	360	4	44
BMH-60	Bed-material hand sampler	283	6	36
BM-54	Bed-material sampler	221	9	5
SA	Particle-size analyzer	92	2	5
PS-67	Pumping sampler	42	0	0
PS-69	Pumping sampler	352	7	10
CS-77	Chickasha pumping sampler	39	4	0
SS-72	Sample splitter	40	4	10
BP-76	Power supply	137	9	3

For the above equipment a catalog and manuals are available by request.

Status of Reports

"Recent Refinements in Calibrating Bedload Samplers" by David W. Hubbell, Herbert H. Stevens, Jr., John V. Skinner, and Joseph P. Beverage.	Published
Report W - "Test and Design of Automatic Fluvial Suspended-Sediment Concentration" by J. V. Skinner and J. P. Beverage.	Published
Report X - "A Fluid-Density Gage for Measuring Suspended-Sediment Concentration" by J. V. Skinner and J. P. Beverage.	Submitted for final approval
Report Y - "Bag-Type Suspended-Sediment Sampler" by J. J. Szalona.	Final review
Report Z - "Theory and Operation Manual of the Autopipet Semi-Automatic Pipet Withdrawal Apparatus" by J. P. Beverage.	Final rewrite

Catalog - "Instruments and Reports for Fluvial Sediment Investigations, Federal Inter-Agency Sedimentation Project," March 1981, by Corps of Engineers, St. Paul District.	Published
ASTM - "Proposed Standard Practice for Sampling Fluvial Sediment in Motion" to be published in the grey pages of "Water, Part 31."	Submitted to ASTM Publications Staff

For additional information and copies of published reports contact:

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