



**Agricultural  
Research  
Service**

**United States  
Department of  
Agriculture**

## **National Sedimentation Laboratory**

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### **Technology Transfer**

**Manuscripts approved for publication, FY90**

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United States  
Department of  
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Agricultural  
Research  
Service

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December 11, 1990

SUBJECT: Technology Transfer - Papers Written and Approved  
for Publication in FY90

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FROM: C. K. Mutchler  
Laboratory Director *Cal*

One of our obligations as scientists is to publish our research and to help people use that research. As a collaborator with you in the Demonstration Erosion Control Project, we are especially obligated to transferring technology for use in solving DEC problems.

Numerous times we have been asked to pass on our research results at the earliest time possible. That is what this booklet attempts to do. Each page gives details about manuscripts approved in FY90 and describes the research with an Interpretive Summary and a Technical Abstract.

Some of these manuscripts are published quickly. Others may take a year or so to appear in print. Hopefully, the summary and abstract will allow you to decide if you wish to read the entire paper. Please contact me for copies of any interesting papers. If personal contact with authors is desired, please call them at 601-232-2900.

Enclosures

cc:  
NSL Scientists  
P. A. Putnam  
D. A. Farrell  
W. D. Kemper  
E. B. Knipling

1. Title of Manuscript: THE USE OF GRAPHICS TO PRESENT THE RESULTS OF EROSION MODELS
2. Authors: BINGNER, RONALD L.
3. Planned publication: APPLIED ENGINEERING IN AGRICULTURE
4. Date approved: August 1, 1990                      Date published: Pending
5. Interpretive Summary:

Computer programs that can predict the erosion from agricultural fields have been developed which can produce a great amount of data for analysis. A method has been developed to convert the output data into a visual display as data is computed by the programs. This will mean a faster method of understanding the data because visual displays can show much more data in a short period than any other method. The output data in the visual format can also be saved one picture at a time, thus saving storage space on a computer or the need to print the data on paper. This method of presenting output data can provide users with a "friendly" working atmosphere when using erosion models. Without a graphical solution to "see" data, some results may go unnoticed. The methods shown in this study can be used by any person using erosion models who have the appropriate computer equipment.

6. Technical Abstract:

The results from this study show how graphical representations of a watershed system can be used to analyze the runoff and sediment yield that may occur there. By combining much of the output data from an erosion model onto a single screen on a computer monitor as a rainfall event occurs, such a runoff, sediment yield, and particle size distribution of the eroded sediment, immediate appraisal of the event can be performed. These graphical interfaces provide users with a "friendly" working atmosphere when using the models and show much more data in a short period than any other method. With a graphical solution to present data, conservationists can use their experience to guide and assess the model solutions for the erosion problems. This study shows how the erosion models CREAMS and ANSWERS can be modified for simulations on small and large watersheds, using graphics to enhance the results.

1. Title of Manuscript: AUTOMATED ANALYSIS OF MEASURED TURBULENT BOUNDARY FLOWS
2. Authors: ADEFF, SERGIO E. (University of Mississippi), WANG, SHU-YI (University of Mississippi) and COLEMAN, NEIL L.
3. Planned publication: NATIONAL TECHNICAL INFORMATION SERVICE PUBLICATION
4. Date approved: October 13, 1989      Date published: Pending

5. Interpretive Summary:

This is a computer program development and users manual for a computer program for data acquisition during laboratory flume or field streamflow measurements in normal turbulent rough-boundary flows. It will help scientists by providing a computer method for concurrently collecting and analyzing data during experiments. A report of an example application is included, along with directions for using the computer program.

6. Technical Abstract:

A new computational procedure (VELMEAS) was developed as an accurate and expandable tool for analyzing boundary layer flows. The program is suitable for collecting any data set output in analog voltage form. Program components are included for statistical and regressive data analysis including virtual origin determination and definition of inertial-flow and wake-flow regions. Illustrative examples from flume experiments are included.

1. Title of Manuscript: A MODIFIED CEBECI-SMITH MODEL FOR  
SEDIMENT-SUSPENDING FLOW

2. Authors: COLEMAN, NEIL L.

3. Planned publication: JOURNAL OF HYDRAULIC RESEARCH

4. Date approved: August 23, 1990

5. Interpretive Summary:

A mathematical description of the flow speed in sediment-suspending flow has been developed to help scientists form theories about sediment transport in rivers. The description has proven to work well near channel beds, but not so well near the water surface.

6. Technical Abstract:

A modified Cebeci-Smith model for the velocity profile has been developed. Measured velocity profiles from two different data sets have been used to determine the degree of validity of the model. The model proves to be an asymptote toward which data trend for low values of elevation above the channel bed.

1. Title of Manuscript: A DISCUSSION: TURBULENT VELOCITY PROFILES FOR  
A SMOOTH AND ROUGH OPEN CHANNEL FLOW,  
by Salih Kirkgöz

2. Authors: COLEMAN, NEIL L.

3. Planned publication: JOURNAL OF HYDRAULIC ENGINEERING, ASCE

4. Date approved: August 20, 1990                      Date published: Pending

5. Interpretive Summary:

This is a discussion of a paper previously published by Salih Kirkgöz about velocity profiles in channels with smooth and rough beds. The purpose of this discussion is to call attention to research results partially overlooked by Dr. Kirkgöz, and to suggest alternative interpretations of his data. Open discussion and reply by the author is the formal method by which the scientific community criticizes itself and clarifies issues to propagate new ideas.

6. Technical Abstract:

The author interprets his data routinely in terms of the usual Karman-Prandtl velocity law combined with the Coles wake function. The curvilinearity of the plotted data presented by the author suggests that a power function velocity law combined with the Coles wake function may better represent the data. This is interesting, because the data are collected by a new noninvasive optical technique that apparently reveals new features of the near-bed velocity profile.

1. Title of Manuscript: A DISCUSSION: VELOCITY DISTRIBUTION IN OPEN CHANNEL FLOW, by Chao-Lin Chiu
2. Authors: WU, CHIA-CHUN (Univ. of Mississippi) and COLEMAN, NEIL L.
3. Planned publication: JOURNAL OF HYDRAULIC ENGINEERING, ASCE
4. Date approved: November 9, 1989                      Date published: Pending
5. Interpretive Summary:

This is a discussion of a paper previously written by Chao-Lin Chiu about velocity profiles in open channels. The purpose of this discussion is to call attention to an apparent error in Prof. Chiu's mathematical treatment of his subject. Open discussion and reply by the author(s) is the formal method by which the scientific community criticizes itself and eliminates error or clarifies issues.

6. Technical Abstract:

The velocity profile equation given by the author appears to be in error. By evaluating the derivative of the function at the coordinate of maximum velocity, the equation can be shown to be indeterminate. Therefore, it must be indeterminate at all points in the field.

1. Title of Manuscript: PERSISTENT ORGANIC CHLORINE AND CURRENT USE INSECTICIDE CONCENTRATIONS IN MAJOR WATERSHED COMPONENTS OF MOON LAKE, MISSISSIPPI, USA
2. Authors: COOPER, CHARLES M.
3. Planned publication: ARCHIV FUR HYDROBIOLOGIE
4. Date approved: February 18, 1990                      Date published: Pending
5. Interpretive Summary:

Use of persistent insecticides from the 1940's until the 1970's resulted in widespread contamination. Concentrations of many residual insecticides, such as DDT and toxaphene, increased in surface waters and bioaccumulated in fish and birds. Though spraying persistent pesticides stopped in 1972, what potential for contamination still exists? Are shorter duration replacement insecticides ever measurable? This study found that ten years after being banned, DDT was measurable in soil, wetland and lake sediments, surface water and fish in an intensively cultivated agricultural watershed. Banned persistent insecticides were still moving off cultivated fields with eroding soil in a predictable manner. With no further application, gradual degradation should reduce concentrations of these pesticides in all watershed components. Currently used insecticides were not detected in soils. They were occasionally found in other watershed components in low concentrations. Knowledge of insecticide accumulation can benefit action and regulatory agencies in decision-making.

6. Technical Abstract:

Concentrations of persistent insecticides DDT, DDD, DDE and toxaphene were compared with three currently used insecticides (fenvalerate, permethrin, and methyl parathion) in major watershed components of Moon Lake, Mississippi and its 166 km<sup>2</sup> watershed. Moon Lake (10.1 km<sup>2</sup>), an oxbow of the Mississippi River, receives drainage through a series of wetlands from farmland intensively cultivated in cotton, soybeans, and rice. All watershed components were contaminated by DDT. Ten years after being banned, DDT was present in soil, wetland and lake sediments, surface water, and fish. Residual insecticide concentrations were significantly higher in surface waters during the winter/spring wet season than during the dry season. This period of maximum runoff corresponded to minimum ground cover and maximum soil disturbance. Increased concentrations during periods of runoff emphasizes the magnitude of the DDT source that remains and indicates the importance of watershed management practices on long-term water quality. Current use insecticides were not detected in soils. In other watershed components, they were found less frequently and in lower concentrations than persistent insecticides. However, the detection of these acutely toxic insecticides, especially methyl parathion, in fish tissue showed that these insecticides have sufficient persistence for uptake and, perhaps, bioaccumulation.



1. Title of Manuscript: INSECTICIDE CONCENTRATIONS IN ECOSYSTEM COMPONENTS OF AN INTENSIVELY CULTIVATED WATERSHED IN MISSISSIPPI
2. Authors: COOPER, CHARLES M.
3. Planned publication: INTERNATIONAL JOURNAL OF ECOLOGY AND ENVIRONMENTAL SCIENCE
4. Date approved: September 10, 1990 Date published: Pending
5. Interpretive Summary:

Farmland and the streams and lakes that it drains into have historically had a problem of contamination from insecticide residues. This study examined three insecticides (fenvalerate, permethrin, and methyl parathion) that are commonly used in cotton and soybeans. It documents how long they persisted in different parts of the farmland drainage (soil, water, wetland and lake sediments, and fish). These three insecticides were found to disappear much more readily than organochlorine insecticides, which are no longer being used. Knowledge of insecticide disappearance or persistence is important to both action and regulatory agencies' roles in planning guidelines and operations in the Mississippi Clean Lakes Programs.

6. Technical Abstract:

Concentrations of three current use insecticides (fenvalerate, permethrin, and methyl parathion) were documented in major watershed components of Moon Lake, Mississippi and its 166 km<sup>2</sup> watershed over a three year period. Moon Lake (10.1 km<sup>2</sup>), an oxbow of the Mississippi River, receives flow through a series of wetlands from a flatland watershed intensively cultivated in cotton, soybeans, and rice. None of the three commonly used insecticides were detected in watershed soils, but they were found sporadically in wetland and lake sediments, water and fish. Twenty-six percent of the fish collected had measurable concentrations of the insecticides. Detection of all three insecticides, especially methyl parathion, in fish tissue showed that they have sufficient persistence for uptake and, perhaps, bioaccumulation to occur. Because of the acute toxicity of current use insecticides, their presence in aquatic ecosystem components is cause for concern. When compared with banned organochlorine insecticides, the three currently used compounds showed marked declines in persistence and environmental contamination. Ten years after being banned, DDT was present in soil, wetland and lake sediments, surface water, and fish. Increased concentrations during runoff emphasized the magnitude of DDT contamination that remains in soil (mean - 369.3 ppb) and indicated the importance of watershed management practices on long term water quality.

1. Title of Manuscript: USING DIGITAL DATA FROM LANDSAT TO MONITOR SURFACE SUSPENDED SEDIMENT IN INLAND WATER
2. Authors: RITCHIE, JERRY C. (ARS, Beltsville, MD), SCHIEBE, FRANK R. (ARS, Durant, OK) and COOPER, CHARLES M.
3. Planned publication: PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON REMOTE SENSING AND WATER RESOURCES, The Netherlands, August 20-24, 1990
4. Date approved: (Another Area) Date published: August 1990
5. Abstract:

The most visible indicator of water quality in lakes and reservoirs is suspended sediments in surface waters. Suspended sediments reduce water quality and transport chemicals that also affect water quality. Lakes and reservoirs having big surface suspended sediment concentrations are usually associated with drainage basins with soil erosion problems and high sediment delivery rates. An economical method for surveying the landscape to locate water bodies with significant suspended sediment concentrations could provide data for improved management of the landscape to reduce upland soil erosion and improve water quality. Satellite remote sensing is an efficient and economical method for monitoring large segments of the landscape frequently. This paper discusses laboratory, field, and Landsat studies using spectral radiance data to estimate surface suspended sediment concentrations of two lakes in the lower Mississippi River valley. These studies have shown that spectral radiance data, especially in the 0.6 to 0.8 micrometers wavelengths, can be used to estimate the surface suspended sediment concentrations in lakes and reservoirs. Using this remote sensing technology, it would be possible to survey large segments of the landscape economically and efficiently with spectral radiance data collected by satellite sensors to locate water bodies with significant suspended sediment concentrations. With better information on the location of basins with a high probability of surface soil erosion, more efficient and effective conservation assessments and plans could be made which would lead to improving surface water quality.

1. Title of Manuscript: AN INEXPENSIVE SAMPLER FOR OBTAINING BULK SEDIMENT CORES
2. Authors: COOPER, CHARLES M., SCHIEBE, FRANK R. (ARS, Durant, OK), and RITCHIE, JERRY C. (ARS, Beltsville, MD)
3. Planned publication: ENVIRONMENTAL GEOLOGY AND WATER SCIENCE
4. Date approved: June 28, 1990 Date published: Pending
5. Interpretive Summary:

Sediment cores from lake and reservoir bottoms are needed by scientists and environmental monitoring personnel. We designed a simple, low-cost sampler that will acquire more sediment than most samplers and has a built-in way to extract the sediment intact from the corer. An intact core of sediment allows the user to easily divide the sample into different layers. This sediment core sampler will allow other scientists and environmental quality field personnel to acquire needed samples more efficiently and can be built at a low cost.

6. Technical Abstract:

A large volume core sampler for sediment-muck substrates is described. The sampler can acquire a discrete sediment core of 5 cm in diameter and up to 1.5 m long. Such samplers are needed to collect the volume necessary for analysis of sediments for contaminants, bulk density, or radioactive dating. The sampler consists of a 1 to 2 m length of PVC pipe mounted below a threaded metal pipe air exhaust-intake assembly. This assembly is quick-connected to standard threaded lengths (300 cm) of water pipe (2 cm dia.) or electrical conduit so that bottom sediments in water depths of up to 10 m can be sampled. The core sampler is hand-operated and pushed into bottom sediments from a boat. It does not have to be triggered remotely because of the one-way modified check valve in the air exhaust-intake assembly. After the sampler is extracted from the sediment, the extension handle can be quickly removed for ease of sampler handling, and the core can be extruded from the PVC tube by air pressure.

1. Title of Manuscript: CASE STUDY OF A SEDIMENT-LIMITED LAKE
2. Authors: COOPER, CHARLES M., SCHIEBE, FRANK R. (ARS, Durant, OK),  
and RITCHIE, JERRY C. (ARS, Beltsville, MD)
3. Planned publication: FIFTH INTERAGENCY SEDIMENTATION CONFERENCE
4. Date approved: June 15, 1990                      Date published: Pending
5. Interpretive Summary:

Many lakes and reservoirs with large agricultural drainages have poor water quality because of non-point source pollution. This study examined how suspended sediments limited algae growth and impaired water clarity in a lake which had declined in water quality over a period of decades. It also examined how well a solution to the problem worked. The solution, a diversion of storm flow away from the lake, lowered levels of suspended clay, or turbidity, which limited aquatic life (algae and fish). Thus, the muddy condition of the lake was cleared for better recreation and water quality, and lake fisheries improved.

6. Technical Abstract:

Patterns of suspended sediments, biological productivity, and water quality were measured in Lake Chicot, Arkansas (19.3 sq. km) to determine (1) the effects of runoff from intensive agriculture on aquatic life and water quality, and (2) to measure ecosystem recovery after diversion of storm flows. Following watershed enlargement in 1927, a dike isolating the northern third of the lake was constructed above the major point of inflow. The catchment area of the larger south basin was channelized and converted from hardwoods to rowcrop agriculture while catchment for the isolated north basin was cleared but not enlarged. Chlorophyll concentrations showed that algal population density in the south basin was limited seasonally by suspended sediments. In comparison, algal density in the isolated north basin was significantly higher as a result of lower turbidity levels. In 1985, a pumping plant was completed on Connerly Bayou which allowed diversion of storm flows with large concentrations of suspended sediments into the Mississippi River. Without suspended sediment loading, water quality in the south basin improved and chlorophyll concentrations increased. Significant differences in productivity between the two basins disappeared as physical/chemical water quality parameters became more closely aligned.

1. Title of Manuscript: MANAGEMENT PRACTICES FOR PRACTICAL ENVIRONMENTAL CONSERVATION
2. Authors: DABNEY, SETH M.
3. Planned publication: LOUISIANA FORAGE AND GRASSLANDS COUNCIL
4. Date approved: February 10, 1990                      Date published: 1990
5. Interpretive Summary:

This paper is addressed primarily to farmers. It argues that they have a three-part environmental problem. One part, soil erosion, has been recognized for many years. Two new aspects, water pollution and public relations, have developed recently as people have come to fear that agricultural chemicals represent a threat to water quality or food safety. The paper discusses practices farmers may adopt to increase profitability and reduce adverse environmental impact. Conservation tillage is a best management practice (BMP) for erosion control but its effect on ground water pollution has been questioned due to heavier use of pesticides. Chemical use may be reduced if crops are planted in narrow rows to increase canopy competitiveness with weeds. Replacing soil-applied herbicides with selective herbicides applied soon after weeds and crops have emerged is also recommended for no-till systems. Grass filter strips, crop rotation, resistant varieties, integrated pest management, and band rather than broadcast herbicide applications are other examples of management practices with sound economic as well as environmental benefits. Farmers need to be responsible stewards of the environment. They should urge legislators to support increased research into practical management alternatives rather than enact rigid restrictions on farming activities.

6. Technical Abstract:

Farmers have a three-part environmental problem: soil erosion, water pollution, and public relations. Conservation tillage is a best management practice (BMP) for erosion control but not for ground water pollution because of heavier use of pesticides. Narrowing rows and relying more on early postemergence herbicide applications, if needed, may be more cost effective and more environmentally benign than relying on preemergence herbicides in no-till systems. Terraces can reduce soil erosion but are expensive. Grass filter strips are less effective than terraces but are cheaper and place fewer restrictions on equipment selection and operation. Research is underway to identify improved germplasm and management techniques for filter strips. Crop rotation, resistance varieties, integrated pest management, and band rather than broadcast herbicide applications are examples of management practices with sound economic as well as environmental benefits. Farmers need to act responsibly in their use of the environment, listen carefully to public concerns about food safety and environmental preservation, and speak up so that their elected representatives understand the importance of supporting research to find more practical solutions to crop production problems rather than legislating rigid restrictions on practices.

1. Title of Manuscript: APPARENT DEPOSITION VELOCITY AND COMPENSATION POINT OF AMMONIA INFERRED FROM GRADIENT MEASUREMENTS ABOVE AND THROUGH ALFALFA
2. Authors: DABNEY, SETH M. AND BOULDIN, DAVID R. (Cornell University)
3. Planned publication: ATMOSPHERIC ENVIRONMENT
4. Date approved: October 13, 1989                      Date published: 1990
5. Interpretive Summary:

This paper will be of value mainly to research scientists seeking to understand plant physiology, global element cycling, and atmospheric chemistry. Nitrogen is an important fertilizer nutrient for agriculture. Gaseous ammonia ( $\text{NH}_3$ ) is one of the most important atmospheric trace nitrogen gasses, while ammonium ( $\text{NH}_4$ ) is an important constituent of atmospheric particulates which cause hazy skies and acid rain. The difference in behavior of gaseous and particulate ammonia makes it important to distinguish between them. This study was conducted to measure how much ammonia an alfalfa field evolved or absorbed during its summer growth in central New York State. Concentrations of  $\text{NH}_3$  and  $\text{NH}_4$  were measured at different heights above the ground.  $\text{NH}_3$  concentrations were found to change more quickly than those of  $\text{NH}_4$ . Alfalfa leaves appeared to exchange  $\text{NH}_3$  with the air, tending toward levels of 4 to 6 ppb.  $\text{NH}_4$  levels were consistently highest during hazy days with winds from the SW. Acid particulates in the air may have been soaking up  $\text{NH}_3$  given off by plants, thus changing it to  $\text{NH}_4$ . The amount of  $\text{NH}_3$  alfalfa lost to the atmosphere was small from a fertilizer standpoint but could have a significant impact on the global environment.

6. Technical Abstract:

Flux densities of gaseous ammonia ( $\text{NH}_3$ ), particulate ammonium ( $\text{NH}_4$ ), and total ammoniacal nitrogen (AN) were measured using an aerodynamic method above an alfalfa (*Medicago sativa*, L.) canopy between April and July, 1981 at a rural location in central New York State. In clean air,  $\text{NH}_3$  and  $\text{NH}_4$  averaged 1.5 and 3.0 ppb (mole fraction), respectively, at 1 m above the crop. Ambient  $\text{NH}_4$  varied with synoptic air masses, being lowest (2.3 ppb) for clear NW and highest (6.4 ppb) for hazy SW flows. Gradients of  $\text{NH}_3$  were much steeper than those of  $\text{NH}_4$  within the canopy, but  $\text{NH}_4$  contributed 36% to above-canopy AN gradients. Ammonia compensation point values were determined by combining concentrations and gradient data with transport resistances. Gaseous gradients indicated and  $\text{NH}_3$  compensation point of 2 ppb, lower than previously published estimates. Conversion of  $\text{NH}_3$  to  $\text{NH}_4$  within the canopy air could have reduced  $\text{NH}_3$  gradients and caused a low estimate of the compensation point. Acidic aerosols, by keeping  $\text{NH}_3$  levels low, may compete with plants for  $\text{NH}_3$ . Future studies of ammonia exchange should distinguish between  $\text{NH}_3$  and  $\text{NH}_4$  if flux densities are to be related to ambient conditions since high AN was often associated with low  $\text{NH}_3$ , and  $\text{NH}_3$  is more surface reactive than  $\text{NH}_4$ .

1. Title of Manuscript: RESEEDING, BIOMASS AND NITROGEN CONTENT OF SELECTED WINTER LEGUMES IN RELATION TO GRAIN SORGHUM CULTURE
2. Authors: BOQUET, D. J. (Louisiana State Univ.) and DABNEY, SETH M.
3. Planned publication: AGRONOMY JOURNAL
4. Date approved: October 13, 1989                      Date published: Pending
5. Interpretive Summary:

The high costs of planting and killing winter legume cover crops deters their use by farmers. This research was conducted to determine the ability of five winter legumes to re-establish themselves in the fall without the need for replanting. The cover crops were sampled for dry-matter production and N content, then were killed with a herbicide on seven dates between March 20 and May 22, 1986. Populations of volunteer seedlings were measured the following fall. All covers accumulated enough N to satisfy the need of a following grain sorghum crop. Crimson clover, subterranean clover, and big flower vetch successfully reseeded when killed on or after April 21. Berseem reseeded only if killing was delayed until May 13, and arrowleaf clover did not reseed at all. To see if seed produced in 1986 would result in stand reestablishment for a second successive year, regrowth was killed prior to seed production in 1987. Only crimson clover and subterranean clover reseeded from carry-over seed. Crimson populations were higher than those of subterranean, but stands of both were less than in the first reestablishment year. Our results indicate that if growth termination can be delayed until late April, the cost of re-planting certain cover crops can be avoided. Of the species tested, crimson clover was best able to reseed itself.

6. Technical Abstract:

The use of winter annual legumes as green manure and cover crops in grain sorghum (*Sorghum Bicolor* L. Moench) production in the southern USA would be greatly facilitated by the availability of reseeding legume species. This study evaluated crimson clover (*Trifolium incarnatum* L.), berseem clover (*Trifolium alexandrinum* L.), arrowleaf clover (*Trifolium subterraneum* L.), and big flower vetch (*Vicia grandiflora* Scop.) for reseeding capability, biomass production and N content at seven growth termination dates (GTD) between March 20 and May 22, 1986. The field experiment was planted on October 15, 1985, on a silty clay in northeast Louisiana. Crimson clover, subterranean clover and big flower vetch successfully reseeded for GTD on or after April 21. Berseem clover did not reseed until the GTD was as late as May 13, and arrowleaf clover did not reseed at any GTD. When seed production was not allowed by the first-year reseeded crop, only crimson and subterranean clovers reseeded at all, and stands (72 and 21 plants m<sup>-2</sup>, respectively) were much thinner than in the initial reseeded year. Maximum N accumulation ranged from 80 to 203 kg ha<sup>-1</sup> and occurred prior to the date of reseeding for all five legumes. Thus, growth termination need not extend beyond the date of reseeding to realize all of the green manure benefits of a reseeding legume.

1. Title of Manuscript: PREPLANT-POSTEMERGENCE HERBICIDES FOR LEGUME COVER-CROP CONTROL IN MINIMUM TILLAGE SYSTEMS

2. Authors: GRIFFIN, JAMES L. (Louisiana Agricultural Experiment Station) and DABNEY, SETH M.

3. Planned publication: WEED TECHNOLOGY

4. Date approved: September 10, 1990 Date published: Pending

5. Interpretive Summary:

Winter cover crops and reduced-tillage planting systems assist in reducing soil erosion. Success with such systems requires effective control of cover-crop vegetation prior to planting the summer crop. Field studies were conducted to test the effectiveness of available (paraquat and glyphosate) and experimental (HOE-39866) herbicides for controlling winter legume cover crops prior to planting grain sorghum and soybeans in south Louisiana. Herbicides were applied in April and May of 1985 and 1986 to hairy vetch, crimson clover, and subterranean clover. Herbicide effectiveness was determined by comparing treated and untreated areas 2 weeks later. Sorghum was planted 2 to 3 weeks after the April treatments and soybeans 2 weeks after the May treatments. Normal preemergence residual herbicides (atrazine for sorghum and metribuzin for soybean) were applied after planting, and yields were compared with control plot yields where the cover crops were incorporated into the soil by tillage. The effectiveness of the herbicides in controlling legume cover crops ranked HOE-39866 > paraquat > glyphosate. Cover crop control was less complete in April than in May, and subterranean clover was the most difficult to control. Soybean stands were greatly reduced when planted following subterranean clover in 1985, possibly due to allelopathic effects. Otherwise, sorghum and soybean yields were not significantly influenced by cover crop or herbicide treatments. This lack of yield response despite differences in herbicide control was due to control of cover crops by the preemergence herbicides applied at planting. This research should help farmers in managing winter cover crops and indicates HOE-39866 will be useful in conservation tillage farming systems when fully labeled.

6. Technical Abstract:

Field studies were conducted in southern Louisiana during 1985 and 1986 to compare preplant-postemergence-applied paraquat, glyphosate, sulfosate (SC-0224), and glufosinate (HOE-39866) on subterranean clover, crimson clover, and hairy vetch cover crops. Subterranean clover control with paraquat applied at 1.1 kg ai/ha was approximately 80% and 100% when applied in early April and early May, respectively, regardless of spray volume (190 vs 370 l/ha). Glyphosate and SC-0224 at 1.7 and 2.8 kg ai/ha applied in April controlled about 53% of subterranean cover. Subterranean clover control with HOE-39866 at 0.8 kg ai/ha applied in April was excellent. Paraquat at 0.6 kg ai/ha and HOE-39866 at 0.8 kg/ha controlled both crimson clover and vetch regardless of application time. Grain sorghum and soybean yields following the legume cover crops were generally similar for the herbicide treatments. Nomenclature: Glyphosate, N-(phosphonomethyl) glycine; HOE-39866, [ammonium (3-amino-3-carboxpropyl-methylphosphinate)]; paraquat, 1, 1'-dimethyl-4, 4'-bipyridinium ion; SC-0224, trimethylsulfoniumcarboxymethylaminomethyl-phosphonate; crimson clover; *Trifolium incarnatum* L. #3 TRFIN; grain sorghum, *sorghum bicolor* (L.) Moench.; soybean, *Glycine max* (L.) Merr.; subterranean clover *Trifolium subterraneum* L. # TRFSU; hairy vetch, *Vicia villosa* Roth # VICVI.



1. Title of Manuscript: INSTRUMENTATION FOR UPLAND EROSION RESEARCH

2. Authors: GRISSINGER, EARL H. and MURPHREE, CARL E.

3. Planned publication: PROCEEDINGS OF THE 5th FEDERAL INTERAGENCY  
SEDIMENTATION CONFERENCE

4. Date approved: June 20, 1990                      Date published: Pending

5. Interpretive Summary:

The acquisition of gage data for natural rainfall/runoff events has always been a labor-intensive and expensive undertaking. Recent advancements in the capability and reliability of field computer systems, however, have created the opportunity to increase automation and accuracy while decreasing unit cost. This paper describes an automated system for data acquisition and runoff sample collection in current usage in the study of erosion control practices for loessial uplands in northern Mississippi. The authors believe this type of automation has application in many comparable and related studies.

6. Technical Abstract:

An automated system for data acquisition and runoff sample collection is being used in the recently implemented study of erosion control practices for loessial uplands in northern Mississippi. Runoff from standard size erosion plots and from field-sized watersheds is gaged using appropriately sized flumes equipped with FW-1 recorders with potentiometer output. Potentiometer voltage is converted to discharge via flow depth, and incremental discharge rates and cumulative discharge volumes are stored as separate data files. The runoff-plot data loggers interrogate all sensors every 30 seconds and "rest" until the next interrogation time. During events, rainfall and runoff values are logged every 30 seconds and written to data files every N minutes where N is an integer selected by the operator. Cumulative discharge volumes per runoff plot are used to control collection of discharge-weighted composite samples. Individual pump samplers are activated when the cumulative discharge volume equals or exceeds the program critical value for a plot. All calibration constants and critical program variables are easily accessible in the field using an internal calibrate subroutine. Advantages of this system include increased resolution of rainfall/runoff values, an accurate time base for all sites, and minimum labor for data reduction.

1. Title of Manuscript: GOODWIN CREEK BANK INSTABILITY AND SEDIMENT YIELD
2. Authors: GRISSINGER, EARL H., BOWIE, ANDREW J. and MURPHEY, JOSEPH B.
3. Planned publication: 5TH FEDERAL INTERAGENCY SEDIMENTATION CONFERENCE
4. Date approved: June 21, 1990                      Date published: Pending
5. Interpretive Summary:

The Demonstration Erosion Control (DEC) Project in the Yazoo Basin of northwestern Mississippi was organized as a interagency effort to develop systematic watershed and flood control programs for six bluff-line demonstration watersheds. The USDA-ARS National Sedimentation Laboratory is participating in this project in various ways, one of which is by documenting watershed conditions. This paper reports the amount of sediment from channel bank erosion. Results establish that about 85% of the total sediment from Goodwin Creek Watershed originates as channel and gully erosion and 15% from undeposited land erosion. Most of the bank erosion is along the downstream trunk channel and the gully erosion is in the upper end of the watershed.

6. Technical Abstract:

Goodwin Creek Experimental Watershed was instrumented in the early 1980's to study stream channel instability problems and remedial practices. The two downstream-most gaging sites in this watershed bracket a 1.96 mile length of channel with no major tributaries, making this an ideal reach for bank instability studies. Selected channel cross sections have been surveyed quarterly to document the magnitude of channel changes. This paper documents relations between the measured channel bank changes and sediment yield differences between these gaging sites. Results are based on fine sediments only since gage data are not complete for coarser fractions at all gaging sites. For the five year period from 11/82 to 10/87, bank erosion estimated by surveying totaled 50,200 tons. Differences in load between these gaging sites from 11/82 to 10/87 differed by only about 1% from the bank erosion survey data. A watershed sediment budget based on gaged sediment loads and on load estimates calculated from land use data, indicates that about three-fourths of the total fines load of the watershed originated from channel and gully erosion. This suggests that better than 85% of the total sediment yield for Goodwin Creek originates as channel and gully erosion.

1. Title of Manuscript: FISHES OF HOTOPHIA CREEK, MISSISSIPPI
2. Authors: KNIGHT, SCOTT S. AND COOPER, CHARLES M.
3. Planned publication: JOURNAL OF MISSISSIPPI ACADEMY OF SCIENCES
4. Date approved: June 19, 1990 Date published: Pending
5. Interpretive Summary:

Information on the fishes of Hotophia Creek, Mississippi is needed to evaluate planned and on going stream erosion control construction in the Demonstration Erosion Control Project (DEC) in the Yazoo Basin. This information, including types and numbers of fish and necessary requirements of life, will help the Corps of Engineers and the Soil Conservation Service evaluate potential effects of management practices on small streams and will allow fish habitat requirements to be incorporated into these projects. Including this information into stream erosion protection plans should improve stream habitat and benefit fish and other aquatic life in Mississippi streams. Recommendations from this project will also prove useful in managing streams on a national level.

6. Technical Abstract:

Fishes were collected from 11 sites on the main channel and major tributaries of a highly erosive stream which cuts through the loess hills of northern Mississippi. Collections were part of a study to document ecological and environmental conditions of Hotophia Creek before and during construction designed to control bank and channel instability and soil erosion. A total of 1863 specimens representing 31 species were collected during a three year period (1986 through 1988). *Notropis* was the dominant genus of fish and, when grouped with all other cyprinids, accounted for 45.5% of the total numbers collected. Collections included two undescribed species; the Yazoo darter, *Etheostoma (Ulocentra)* sp. and a shiner *Notropis* sp. cf. *longirostris*. The shiner was the most abundant of all fish collected, representing 28.9% of the catch by number. Hotophia Creek may represent the westward most extension of the Yazoo Darter range. By weight *Lepomis macrochirus* was the most important species, comprising 17.8% of the catch. With other members of the genus, it accounted for 32.2% of the total catch weight.

1. Title of Manuscript: EFFECTS OF BANK PROTECTION ON STREAM FISHES
2. Authors: KNIGHT, SCOTT S. AND COOPER, CHARLES M.
3. Planned publication: FIFTH FEDERAL INTERAGENCY SEDIMENTATION CONFERENCE
4. Date approved: June 20, 1990 Date published: Pending
5. Interpretive Summary:

Stone rip rap is one of the most common methods used to control bank erosion in the streams of the bluff line hills of northern Mississippi. Bank protection measures that smooth the bottom and banks of streams destroy fish habitat; methods of protection that create scour holes should provide better cover for fish. This study proved that small wing dikes that maintained small scour holes in the stream beds produced more and larger fish than other type of bank protection. This information is currently needed by the U.S. Army Corps of Engineers and USDA Soil Conservation Service to assist in planning and implementing their bank protection projects, nationwide.

6. Technical Abstract:

Streams of the bluff line hills of northern Mississippi share a common characteristic of unstable beds of clay or shifting sand with only the occasional fallen tree or log scouring a hole sufficiently deep to support larger fishes. Bank protection measures that limit shone line development adversely affect fish populations; however, those measures that promote the creation of scour holes should benefit fish. Stream bank protection techniques were evaluated for their impact on fishery characteristics on Batupan Bogue Creek near Grenada, Mississippi as a part of the Demonstration Erosion Control (DEC) Project in the Yazoo Basin. The three-year study examined 3 protection measures and a control: old lateral dike sections, new lateral dike segments, transverse dike sections and natural bank reaches. Catch per unit of effort was higher along transverse dikes than either type of the lateral dike but was not different from the natural bank controls. Total catch in both numbers and weight was greater around the transverse dikes. Poorest catches were associated with old lateral dikes with old lateral dikes with catch per unit of effort by number and weight being significantly lower along old lateral dikes than all other bank types. Since costs for transverse dikes and lateral dikes are the same, transverse dikes provide an environmentally sound way to protect and stabilize stream banks without affecting the cost.

1. Title of Manuscript: EVALUATION OF COMPONENTS OF VARIANCE FOR A STRATIFIED TWO-STAGE ROVING CREEL SURVEY DESIGN WITH IMPLICATIONS FOR SAMPLE SIZE ALLOCATIONS
2. Authors: MALVESTUTO, STEPHEN P. (Auburn University) and KNIGHT, SCOTT S.
3. Planned publication: PROCEEDINGS OF INTERNATIONAL SYMPOSIUM ON CREEL AND ANGLER SURVEYS
4. Date approved: September 10, 1990                      Date published: Pending

5. Interpretive Summary:

In order to suggest ways of improving fishing, biologists need information that can only be gotten from surveys of fisherman. The better the survey is the better the information is. This work shows how to "fine tune" a fisherman survey to get the most accurate information possible. Almost every federal and state wildlife and fishery agency uses fisherman surveys when making policy decisions. The methods presented here should be used for acquiring better survey-type information in a more efficient manner.

6. Technical Abstract :

Data from three recreational fisheries located on the Tallapoosa River in Alabama were surveyed from May 1988 to April 1989 using a stratified, two-stage roving creel survey design. The design model was subjected to ANOVA to evaluate the benefits associated with stratification of days into weekend days (Saturday and Sunday) and weekdays (day-types) and also to measure components of variance associated with sampling days (primary stage) as opposed to time periods within days (subsampling stage). Estimated components of variance allowed optimal sample size allocations to be determined on a seasonal basis. Stratification by day-type was found to significantly ( $P < 0.20$ ) improve the precision of estimates of fishing effort by 10.25%, but did not significantly improve estimates of harvest rate. Components of variance of fishing effort were relatively stable across seasons and fisheries, giving sample size allocations that favored increasing the number of days sampled each month at the expense of sampling time periods within days. Components of variance for harvest rate estimate showed no consistent trends across seasons of fisheries, and the patterns observed for harvest rate measured as numbers/hour (no/h) deviated from those observed for harvest rate measured as kg/h. The results for fishing effort may be generalizable to many recreational fisheries in the southeastern United States, but for harvest rate measures, variance pattern appear to be fishery specific. Overall, it may be difficult to successfully optimize two-stage sample size allocations to obtain the best estimates of both fishing effort and harvest rate simultaneously.

1. Title of Manuscript: BED LOAD TRANSPORT ON TWO SMALL STREAMS
2. Authors: KUHNLE, ROGER A.
3. Planned publication: PROCEEDINGS OF 5TH FEDERAL INTERAGENCY  
SEDIMENTATION CONFERENCE
4. Date approved: June 13, 1990                      Date published: Pending
5. Interpretive Summary:

The movement of coarse sediments from their sources (fields, gullies, upstream channels) to the site of their deposition (lakes, reservoirs, larger channels) is important because the deposited sediment can reduce the capacity of channels to carry flood water, reduce water storage in lakes and reservoirs, pollute surface waters, and initiate or enhance bank erosion. Yet a general method for determining the amount of sand and gravel movement in a channel is lacking. Data on the movement of sand and gravel from two similar small streams was collected and compared to each other. Sand and gravel were transported at different rates in the two streams for a given flow. The understanding of the causes of these differences in rates of sand and gravel movement will facilitate improvements in sand and gravel movement rate predictions.

6. Technical Abstract:

Bed load transport has been sampled on two small tributaries of Goodwin Creek using automatic continuously-recording samplers. The watersheds of the two gravel-bed streams are adjacent to each other and bed material size distributions and average bed slope of the two channels are similar. Since November of 1988 more than 2,000 bed load transport samples have been analyzed on each of the two streams. This data was used to calculate relations between mean bed load transport rate and mean boundary shear stress for the two streams. The transport relations show that one of the streams has a higher rate of dimensionless bed load transport for a given dimensionless bed shear stress. Several possible reasons for this difference are explored.

1. Title of Manuscript: FRACTIONAL TRANSPORT RATES OF BED LOAD ON GOODWIN CREEK
2. Authors: KUHNLE, ROGER A.
3. Planned publication: 3RD INTERNATIONAL WORKSHOP ON GRAVEL-BED RIVERS
4. Date approved: June 29, 1990                      Date published: Pending
5. Interpretive Summary:

The movement of coarse sediments is a difficult but important problem. Source areas of sand and gravel (fields, gullies, upstream channels) are often sites of unacceptable erosion, while the sites of their deposition (lakes, reservoirs, larger channels) can also cause problems. These problems include reducing the capability of channels to carry flood water, reducing water storage in lakes and reservoirs, polluting surface waters, and initiating or enhancing bank erosion. Despite these problems general methods for determining the amount of sand and gravel movement in a channel are lacking. A new technique for determining the amount of sand and gravel movement in streams is suggested. This technique separates the calculation of sand and gravel movement rates and has been shown to work well for Goodwin Creek data. The new technique shows promise for improving sand and gravel movement predictions on other streams and will aid in predicting where problems will occur due to coarse sediment erosion and deposition.

6. Technical Abstract:

Transport rates of eight size fractions of bed material were studied on Goodwin Creek from 1984-1988. It was found that the median size of the sediment in transport increased from 0.77 to 7.77 mm with increasing bed shear stress, the slopes of the dimensionless transport rates of individual size fractions versus dimensionless bed shear stress decrease with decreasing grain size, and reference bed shear stresses of individual grain sizes were dependent on relative size as well as absolute size. Agreement between mean measured transport rates from Goodwin Creek and several published transport relations was poor. A technique for calculating bed load transport separating the sand and gravel fractions is proposed.

1. Title of Manuscript: TRANSPORT OF SEDIMENT FROM SOILS OF DIFFERENT TEXTURES

2. Authors: LINE, DANIEL E. and MEYER, L. DONALD

3. Planned publication: TRANSACTIONS OF THE ASAE

4. Date approved: June 27, 1990                      Date published: Pending

5. Interpretive Summary:

Soil eroded from areas exposed to rainfall is transported off cropland fields as sediment in runoff that concentrates in furrows like miniature streams. This study was designed to examine the sizes of sediment transported to the ends of furrows on relatively flat and steep slopes for 3 very different soils. Results showed that on flat slopes the large aggregates were not transported to the end of the furrow and thus remained on the field. However, nearly all of the sediment on the steep slope was carried to the end of the furrow. Therefore, for soils that erode as relatively large aggregates, maintaining flat furrows may contribute greatly to preventing excessive soil loss from cropland.

6. Technical Abstract:

Runoff rates, soil loss rates, and the size distributions of sediment originating from interrill and rill areas were evaluated for three soils, one each relatively high in sand, silt, and clay. Interrill data were collected on row sideslope plots while rill data were obtained from 9.3-m long row furrows with gradients of 0.005 and 0.035. Comparisons of interrill and rill sediment showed that for the 0.005 gradient the overall size of the sediment from the high sand and high clay soils decreased much more during transport than did the sediment of the high silt soil. Data from rills with a 0.035 gradient indicated that nearly all the sediment leaving interrill areas was transported to the end of the rill.



1. Title of Manuscript: SEDIMENT TRAPPING EFFECTIVENESS OF GRASS STRIPS

2. Authors: LINE, DANIEL E.

3. Planned publication: PROCEEDINGS OF 5TH INTERAGENCY SEDIMENTATION  
CONFERENCE

4. Date approved: April 14, 1990                      Date published: Pending

5. Interpretive Summary:

Grass buffer strips are relatively narrow bands of close-growing grasses planted across sloping crop lands. Several thousand miles of these strips are being planned by SCS to bring erodible land into compliance with the soil conservation provisions of the 1985 Farm Bill. However, little information exists on the sediment-trapping effectiveness of strips of narrow widths, or on the sizes of sediment trapped as a result of the strip. This study was designed to determine the sediment-trapping effectiveness of experimental grass buffer strips 1.5, 3.0, and 6.1 m wide (in downslope direction) during intense simulated rainstorms. The average percent of incoming sediment trapped by the 1.5-m strips decreased from 80 to 40 and for the 3.0- and 6.1-m strips from 95 to 72 for increasing rates of runoff flowing through the grass. Most of this decrease in effectiveness was due to reduced trapping of sediment less than 0.13 mm in diameter.

6. Technical Abstract:

The sediment-trapping effectiveness of grass buffer strips was determined by sampling sediment-laden runoff above and below a bordered area of established ryegrass and fescue. Runoff rates between 11 and 55 l min<sup>-1</sup> per m of strip were studied for strip lengths of 1.5, 3.0 and 6.1 m (in downslope direction). Sediment and runoff were generated by applying simulated rainstorms (73 mm hr<sup>-1</sup>) to an area of tilled soil upslope of the grass. Results showed that the trapping effectiveness of the 1.5-m long grassed areas ranged from 0.80 to 0.40 while those of the 3.0- and 6.1-m long strips ranged from 0.95 to 0.72. Sediment size data established that at least 89 percent of all sediment larger than 250 um in diameter entering the grassed area was trapped within or just above the grass. In addition, results showed that the trapping effectiveness of strips decreased with increasing runoff rate due mainly to reduced trapping of sediment less than 125 um in diameter.

1. Title of Manuscript: EFFECTS OF TILLAGE WITH DIFFERENT CROP RESIDUES ON RUNOFF AND SOIL LOSS
2. Authors: MCGREGOR, KEITH C., MUTCHLER, C. K. and RÖMKENS, M. J.
3. Planned publication: TRANSACTIONS OF ASAE
4. Date approved: April 4, 1990                      Date published: Pending
5. Interpretive Summary:

Management of crop residue is probably the easiest and most effective way of controlling erosion. The purpose of this experiment was to measure and evaluate disking after harvest as a method of handling corn and wheat residue in conservation farming. Soil loss from harvested and disked wheat straw using simulated rainfall was about 16% of that from harvested and disked corn. However, wheat residue left after disking gave 79% cover and remaining corn residue gave 15% cover. When this residue cover was removed analytically, soil loss was about the same from all three treatments. The conclusion is that the residue from wheat and corn incorporated by two diskings had little or no effect on controlling erosion. Note that this residue was newly incorporated and time was insufficient for soil improvement by residue decay. These results can be used by the Soil Conservation Service in farm conservation plans, and by Erosion Modelers in soil loss prediction equations.

6. Technical Abstract:

Runoff and soil losses were measured from three replications of three treatments in a randomized block experiment in the summer of 1988 at Holly Springs, Mississippi. Treatments included tillage of two diskings on plots with corn residue, wheat residue and no-crop residue. Simulated rainfall at a rate of 64 mm/h was applied to 3.4 by 10.7-m plots during 60-min. initial, 30-min. wet and 30-min. very wet runs. The ratio of soil loss from wheat to that from fallow averaged 0.10, 0.11 and 0.11 and 0.10 for the initial, wet, very wet and combined runs, respectively; while the ratio of soil loss from corn to that from fallow averaged 0.60, 0.69, 0.63 and 0.63, respectively. Very low soil losses from wheat were attributed to insufficient tillage for incorporation of the straw residues; instead, wheat straw left on the surface provided about 79% ground cover on the soil surface as compared to only 15 and 0%, respectively, for corn and fallow. Results showed the erosion effectiveness of residues left on the surface. Removal of the effects of surface cover, using mulch factor ratios, resulted in very similar soil losses for all treatments, suggesting that incorporation of different amounts and kinds of residues had little effect on soil loss for recently incorporated residues.

1. Title of Manuscript: RAINFALL SIMULATORS FOR SOIL EROSION RESEARCH
2. Authors: MEYER, L. DONALD
3. Planned publication: ISSS BOOK CHAPTER: "SOIL EROSION RESEARCH"
4. Date approved: February 18, 1990                      Date published: Pending
5. Technical Abstract:

Rainfall simulators have become important research tools for obtaining data from many types of field and laboratory experiments. For those used in erosion research, various characteristics of natural rain need to be properly simulated, especially drop sizes, impact velocities, and intensities. Rainfall simulators use either nozzles or drip-type drop formers to produce simulated raindrops, but a wide range of mechanical and electrical components are employed to apply the drops to research areas. Research with rainfall simulators also requires several persons, considerable related equipment, an adequate water supply, and facilities to process the runoff samples. The research must select procedures that give desired data and must properly interpret the results. Rainfall simulators have both major advantages and disadvantages, but for many research projects, they are the only way to obtain needed data rapidly, efficiently, and with the control required to obtain desired information on hydrologic phenomena. This book chapter provides guidelines and information for researchers throughout the world who are planning or considering use of rainfall simulators in their research projects.

1. Title of Manuscript: PARTICLE SIZES OF SEDIMENT FROM CROPLAND SOILS
2. Authors: MEYER, L. DONALD, LINE, DANIEL E., and HARMON, WILLIAM C.
3. Planned publication: PROCEEDINGS OF 5TH FEDERAL INTERAGENCY  
SEDIMENTATION CONFERENCE
4. Date approved: June 12, 1990                      Date published: Pending
5. Interpretive Summary:

This research was conducted to determine the primary particles in different sediment size groups that eroded from a wide range of cropland soils. Results showed that a large percentage of the sediment from medium- to high-clay soils erodes as sand-sized aggregates which contain much of the eroded clay. In fact, these aggregates contain nearly the same content of clay as the soil from which they eroded. Therefore sediment-control practices, even those that only stop the coarser sediment, will trap much of the clay with its adsorbed nutrients and pollutants. The findings show the potential of control practices to reduce sediment losses from different soils and the importance of good soil aggregation in erosion control efforts. To better predict the aggregate content of sediment from different soils, a relationship between soil properties and the aggregated portion of coarse sediment was determined.

6. Technical Abstract:

Size characteristics of sediment that eroded from 24 intensively cropped soils were analyzed before and after dispersion to determine the extent of aggregation and primary particle composition. The undispersed sediment was often much coarser than the primary soil particles, but the size distributions of primary particles in the soil and the sediment were usually very similar. For soils with medium to high clay contents, about half of the sediment was sand sized and was dominantly in the form of aggregates. These coarse aggregates contained much of the eroded clay, so control practices that trap coarse sediment have a major potential to reduce losses of nutrients and pollutants associated with clay particles. For most soils, the sediment data indicated little evidence of clay enrichment from interrill erosion. However, some enrichment occurred if the sediment had an opportunity for deposition during transport. A relationship was determined that predicts the aggregated portion of sand-sized sediment using the clay and sand contents of the soil.

1. Title of Manuscript: NATIONAL HANDBOOK OF RECOMMENDED METHODS FOR WATER-DATA ACQUISITION, CHAPTER 3. SEDIMENT. REVISION OF SECTION 3.1. CHANNEL CHANGES
2. Authors: MURPHEY, JOSEPH B.
3. Planned publication: NATIONAL HANDBOOK FOR RECOMMENDED METHODS FOR WATER-DATA ACQUISITION
4. Date approved: June 13, 1990                      Date published: Pending
5. Technical Abstract:

Recommended methods are presented for collecting, preparing, analyzing and preserving data to document changes in stream channel systems. Criteria are given for the selection of a proper study reach on a channel. Basic procedures are then suggested for monitoring the channel changes which may occur. Recommended survey methods are given for establishing baselines, selecting and orienting representative cross section ranges, erecting or installing range monumentation and georeferencing all control points. Methods for the description of vegetative cover and sediment boundary materials are given. Degrees of accuracy are suggested for each phase of the surveys. Suggestions are made for formats of data storage and retrieval. A list is given for the data that should be included on any maps drawn of the study area. A recommended method for the computation of total channel volume is presented. Sufficient information is given for the user to evaluate the needs and requirements of their particular study. The methods suggested will assure greater comparability, compatibility, and usability of channel change data collected and analyzed by different agencies, thereby providing a coordination mechanism for water-sediment resources data acquisition.

1. Title of Manuscript: RUNOFF AND SEDIMENT YIELD FROM A FLATLAND WATERSHED IN SOYBEANS
2. Authors: MURPHREE, CARL E. and MCGREGOR, KEITH C.
3. Planned publication: TRANSACTIONS OF ASAE
4. Date approved: July 31, 1990                      Date published: Pending
5. Interpretive Summary:

This study was conducted to determine the runoff and sediment yield produced from a flatland Mississippi Delta watershed with clean-tilled soybeans. A typical sequence of field operations was: disk-hipp to form ridges in mid-April; disk and pulverize soil preceding planting in mid-May; cultivate for weed control in June; harvest soybeans in mid-October; and disk and chisel in November or December. Rainfall, runoff, and sediment yield data were examined by both annual and monthly intervals, and relationships between monthly runoff and monthly rainfall as well as between monthly sediment yield and monthly runoff were studied for different crop stages during a year. Runoff and sediment yield results from this soybean study illustrated the higher potential for erosion during the springtime period from the beginning of tillage at planting time through the early growing season. The 6-year (1979-1984) average annual rainfall, runoff, and sediment yield amounts were 1431 mm, 544 mm, and 11.1 t/ha, respectively. These results show that erosion problems are not limited to sloping upland areas, thus also supporting similar conclusions from an earlier 1974 through 1978 cotton study. Farmers and soil conservation personnel can use results of these studies to plan conservation measures that reduce erosion of agricultural land in flatland areas like those of the Mississippi Delta.

6. Technical Abstract:

Runoff and sediment yield data from a flatland watershed in the Mississippi Delta support results of earlier studies which conclude that erosion problems are not limited to steeply sloping upland areas. Average annual sediment yield from a 15.6-ha Mississippi Delta watershed in conventional-till soybeans during a 6-year (1979-1984) period was 11.1 t/ha. Cropland was land-formed to a furrow slope of 0.2% slope with rows in a north-south direction. Mean row length was 186 m. Conventional-till cotton had been grown on a watershed for many years preceding this study and it also produced high sediment yields. Sediment yield averaged 29.0 t/ha per year during a 2-year period (1972-1973) under conventional-till cotton under high rainfall and 13.9 t/ha per year for the succeeding 5-year period (1974-1978) under more normal rainfall.

1. Title of Manuscript: LABORATORY AND FIELD PLOTS FOR SOIL EROSION STUDIES
2. Authors: MUTCHLER, CALVIN K.
3. Planned publication: ISSS BOOK CHAPTER: "SOIL EROSION RESEARCH"
4. Date approved: April 8, 1990                      Date published: Pending
5. Technical Abstract:

Soil erosion prediction must be based on experimental results of some form. Three types of plots are useful for erosion research -- small plots used primarily for interrill erosion; USLE standard plots that include both rill and interrill processes; and the small, unit-source watershed that includes rill, interrill, deposition, and small channel processes. Procedures for using the different plots were proposed and discussed. The need for an organized research plan was emphasized because erosion research procedures tend to destroy the plot, or cause a long wait to re-establish the experimental conditions.

1. Title of Manuscript: RELATIONSHIP OF FE NODULE AND QUARTZ  
ACCUMULATIONS TO DEPTH AND SELECTIVITY OF PAST  
EROSION ON A FRAGIPAN SOIL
2. Authors: RHOTON, FRED E., MEYER, L. DONALD and MCCHESENEY, DANIEL S.
3. Planned publication: SOIL SCIENCE
4. Date approved: March 20, 1990                      Date published: Pending
5. Interpretive Summary:

Iron nodules accumulate on the surface of some loess soils in the lower Mississippi River Valley in amounts related to depth of past erosion. Analysis of soil samples showed that severely eroded soils contained approximately four times more of these materials than did slightly eroded soils. Results from a rainfall simulator study showed that the accumulation occurred because iron nodules were more resistant to disruption by raindrops than soil aggregates which were broken down and eroded offsite. Use of these data will permit a more accurate estimation of past erosion and potential soil productivity.

6. Technical Abstract:

Iron nodules are commonly observed on the surface of fragipan soils of the lower Mississippi River Valley, in amounts that appear to be related to degree of erosion. This study was conducted to determine if accumulations of Fe nodules or similar materials could be used as an estimator of amounts of past erosion between sites and to identify the process by which relatively dense soil materials become concentrated in Ap horizons. Soil samples were collected from three sites that had average soil depths above the fragipan of 59, 43, and 19 cm. Average Fe nodule concentrations in the >2.0 - 0.125 mm range for the three soil depths were 19.4, 36.9, and 76.0 g kg<sup>-1</sup>, respectively. Quartz concentrations in identical samples and size ranges were 21.4, 11.3, and 12.6 g kg<sup>-1</sup>. Rainfall simulator studies were conducted at these three sites plus a virgin site to determine the relative distribution of Fe nodules and quartz between soil surfaces and runoff sediment. The ratio of Fe nodules and quartz in runoff sediment to soils averaged 0.75 and 0.87, respectively. The concentration of Fe nodules gradually increases with depth of erosion, apparently due to selective erosion of smaller diameter particles, and appears to provide a reasonably accurate method of estimating relative amounts of past erosion.



1. Title of Manuscript: A SYSTEM OF COLLECTING UNDISTURBED CORES FOR MICRO-MORPHOLOGICAL ANALYSIS
2. Authors: RHOTON, FRED E. and MCCHESENEY, DANIEL S.
3. Planned publication: SOIL SCIENCE
4. Date approved: April 14, 1990                      Date published: Pending
5. Interpretive Summary:

In order to accurately evaluate changes in soil structure caused by reduced tillage farming practices, soil cores collected for analysis must be obtained with a minimal amount of disturbance. Use of most available soil coring devices results in unacceptable levels of disturbance as the core is removed from the sampler. We designed a core sampler and a sample handling system that greatly reduced the potential for disturbance from collection through the preparation stage. Adoption of these techniques can result in a more accurate assessment of changes in soil structural properties that influence runoff, and help identify the most suitable reduced tillage practice for a given soil.

6. Technical Abstract:

Intact soil cores are difficult to extract from reduced tillage plots using available equipment due to the tendency of cores to separate at planes of weakness. A split tube sampler was developed to minimize disruptions of the natural soil fabric that frequently occur as the core is removed from the sampling equipment. Construction details are provided that permit this equipment to be attached to standard hydraulically driven soil coring equipment. Use of this equipment, in conjunction with sample containers that are resistant to laboratory pretreatment procedures and impregnating resins, greatly reduced sample handling and the potential for creating structural anomalies.

1. Title of Manuscript: RAINDROP IMPACT PRESSURE ON ELASTIC SURFACES
2. Authors: PRASAD, S. N. (UNIV. OF MISSISSIPPI) and RÖMKENS, M. J.
3. Planned publication: PROCEEDINGS OF THE 5TH INTERAGENCY CONFERENCE ON EROSION AND SEDIMENTATION
4. Date approved: July 30, 1990                      Date published: Pending
5. Interpretive Summary:

Surface sealing and crusting is the process of soil matrix deformation under the influence of raindrop impact and other chemical and physico-chemical factors. Raindrop impact, often the principal cause of surface sealing, is a highly complicated process involving high normal stresses and tensile forces. Of those, the highly dynamic normal stresses are perhaps the major cause of changes in the soil matrix. These changes usually consist of a reduction in the porosity and permeability, leading to reduced infiltration and increased runoff. This article presents a theoretical analysis of the effect of drop impact on soil surface compaction during the early stages of the impact process. The analysis shows that the depth of drop penetration into the soil surface can be approximated by an explicit expression of raindrop and soil characteristics such as raindrop size, velocity, and certain soil mechanical properties.

6. Technical Abstract:

The purpose of the present study is to examine the role played by the characteristics of raindrop and soil as an elastic material in the soil erosion process due to raindrop impact. The initial, pressure build-up phase, is analyzed in detail and a closed-form solution is presented for the duration of impact and crater depth.

1. Title of Manuscript: RAINFALL SIMULATORS FOR WATER QUALITY RESEARCH
2. Authors: SCHREIBER, JONATHON D., DUFFY, PAUL D. (U. S. Forest Service) and SMITH, SAMMIE, JR.
3. Planned publication: PROCEEDINGS OF FIFTH FEDERAL INTERAGENCY SEDIMENTATION CONFERENCE
4. Date approved: July 31, 1990 Date published: Pending

5. Interpretive Summary:

Rainfall simulators have been used for many years to study infiltration, erosion, and sediment transport. These same processes, however, are important in the transport of plant nutrients and pesticides from agricultural watersheds to streams and lakes. Thus, rainfall simulators have been used in a variety of ways to study the environmental factors which influence agrichemical transport under controlled conditions. This manuscript, a review of the literature, gives many examples to demonstrate the use of rainfall simulators in water quality research.

6. Technical Abstract:

Although not as well-known, rainfall simulators have been used to study water quality as well as erosion and sediment transport. Simulators provide well-controlled experiments which increase understanding of basic processes of washoff of foliar applied pesticides, nutrient-sediment equilibria, leaching of nutrients from plants and residues in cropland and forests, and transport of nutrients and chemicals by water and sediment to streamflow. This report cites examples to demonstrate applicability of simulators to water quality research.

1. Title of Manuscript: EFFECT OF WEATHER VARIABLES ON METHYL PARATHION AND PERMETHRIN DISAPPEARANCE FROM COTTON FOLIAGE

2. Authors: WILLIS, GUYE H. (ARS, Baton Rouge, LA), MCDOWELL, LESLIE L., SMITH, SAMMIE and SOUTHWICK, LLOYD M. (ARS, Baton Rouge, LA)

3. Planned publication: TRANSACTIONS OF ASAE

4. Date approved: September 5, 1989 Date published: Pending

5. Interpretive Summary:

Foliar persistence times of pesticide residues affect insecticidal efficacy, potential for pollution of nontarget areas, and worker reentry times. Farmers and pesticide applicators are using various methods, including use of vegetable oils as carriers and controlled-droplet-applicators, to improve pesticide application efficiency and pest control efficacy. Weather and climatic factors are the most important variables that affect pesticide residues on plants. The reported research determined the effects of wind, air temperature, solar and net radiation, and relative humidity on the foliar persistence of methyl parathion and permethrin applied to cotton plants by conventional hydraulic nozzles and rotary atomizer controlled-droplet applicators with soybean oil, soybean oil plus water, or water as the carrier. Relative humidity was the overall best predictor for insecticide disappearance from cotton foliage regardless of application method or carrier. This information will be useful to modelers and regulators that must include the effects of weather variables in the development of pesticide management practices.

6. Technical Abstract:

Methyl parathion and permethrin were applied to mature cotton plants with conventional hydraulic nozzles and rotary atomizer controlled-droplet applicators with soybean oil, soybean oil plus water, or water as the carrier. Insecticide load on foliage and several weather variables were measured during the 49-h period following insecticide application. Cumulative rather than mean values for weather variables were used in regression analysis. Cumulative relative humidity was the overall best predictor for insecticide disappearance from cotton foliage.

1. Title of Manuscript: SAND TRANSPORT IN GOODWIN CREEK
2. Authors: WILLIS, JOE C.
3. Planned publication: PROCEEDINGS OF FIFTH FEDERAL INTERAGENCY  
SEDIMENTATION CONFERENCE
- 4: Date accepted: June 13, 1990                      Date published: Pending
5. Interpretive Summary:

Determining the amount of sand bed material transported past a given stream station is important from several viewpoints. First, it is the material that must be conveyed by flows in the local stream reach. Second, it is material that may affect the stability of downstream channels. And third, it represents material that has been eroded from the channels and watersheds upstream. Accurate determinations of the bed-material load is needed in planning the installation and maintenance of channel rectifications. Since the sand load is a highly variable quantity, statistical methods are used to obtain estimates of the expected average load as well as "best" determinations of the sand load from sediment samples during actual flow events. The annual transport of sands is found to be a highly variable quantity that is strongly influenced by the extreme flow events occurring during a particular time period such as a year.

6. Technical Abstract:

Stage frequency functions are developed for four consecutive water years for Goodwin Creek near Batesville, MS. These are used along with the average rating for the transport of sands to obtain estimates of the expected annual delivery of sands by the observed flows. Also, a shift factor to correct the rating for deviations of each ETR sample therefrom is used to obtain the best estimate of the "measured" sand delivery. The measured sand deliveries differ significantly from the expected for individual years. The differences in the average sand deliveries for the four years are primarily due to differences in the amount of rainfall. The sand-load frequency tends to increase rapidly with increasing stage at low stages and to approach a constant value at higher stages. This suggests that the extreme, but infrequent, flow events constitute significant contributions to the sand load.

1. Title of Manuscript: MAJOR SEDIMENTATION (EROSION) ISSUES AND ONGOING RESEARCH AND DEVELOPMENTS AT THE USDA-ARS
2. Authors: RENARD, K. G. (ARS, Tucson, AZ), WILLIS, JOE C. and FARRELL, D. A. (ARS, Beltsville, MD)
3. Planned publication: HYDRAULIC ENGINEERING PROCEEDINGS, 1990 NATIONAL CONFERENCE, HY DIV/ASCE
4. Date accepted: (Another Area) Date published: July-August 1990
5. Abstract:

The U. S. Department of Agriculture, Agricultural Research Service (ARS) has research programs designed to produce technology with which to predict, measure, and control erosion and sedimentation associated with U. S. agriculture. Begun in the 1920's, the work now differs greatly from the beginning. This paper identified key issues associated with the many facets of the program, describes what is currently being investigated, and enumerates some research issues for the future.

6. Introduction:

Erosion and sedimentation research in ARS began in the Soil Erosion Service of the U.S. Department of Interior and transferred to the USDA Soil Conservation Service (SCS) in 1935 where it remained until ARS became a separate USDA agency in 1954. Water erosion and sedimentation research is being conducted at 13 locations in the U.S.: (Tifton and Watkinsville, GA; Oxford, MS; W. Lafayette, IN; Morris, MN; Temple, TX; Tucson, AZ; Boise, ID; State College, PA; Ft. Collins, CO; Beltsville, MD; Durant, OK; and Columbia, MO). Special laboratories, instrumented watersheds, and rainfall simulators are used to produce information for the research. The programs involve fundamental and applied research on erosion and sedimentation, and incorporation of research findings into practices for present-day agriculture. Research is coordinated with the needs of SCS, the Corps of Engineers, the Environmental Protection Agency, and other federal and state agencies. The general principles of erosion and sedimentation are formulated with a mixture of laboratory, watershed, and analytical experiments.

