October 1985 Volume 6, Number 7

Soil and Water Conservation News

United States Department of Agriculture
Soil Conservation Service

Soil and Water Conservation News is the official magazine of the Soil Conservation Service. The Secretary of Agriculture has determined that publication of this periodical is necessary in the transaction of public business required by law of the Department. Use of funds for printing *Soil and Water Conservation News* has been approved by the Director of the Office of Management and Budget through January 31, 1987. *Soil and Water Conservation News* (ISSN-0199-9060) is published 12 times a year. Postage paid at Washington, DC.

Magazine inquiries
Send inquiries to: the Editor, *Soil and Water Conservation News*, Public Information Staff, Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, DC 20013-2890.

Subscriptions
Send subscription orders to:
Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

Comments: *From the SCS Chief*

Managing Rangeland for Livestock and Wildlife

America's almost 1 billion acres of rangeland is an important asset to agriculture, to the economy, and to the quality of our environment. Sharing these vast rangelands with cattle, sheep, and goats are prized wildlife—antelope, deer, and elk.

The fact that more than half of the Nation's Federal and privately owned rangeland is in poor or fair condition is cause for great concern.

It's true that some of the low production of rangeland is caused by severe soil and climate problems, but the productivity of much of our rangeland can be improved through good management.

While some poorly managed rangeland is providing little forage for livestock and poor feed and cover for wildlife, other well-managed rangeland of similar quality is providing adequate forage for livestock and supporting healthy populations of wildlife. Wildlife can mean additional income for ranchers from daily fee hunting, shooting preserves, trapping, and leasing of hunting rights.

The number and variety of green plants determine the kinds and numbers of animals, livestock and wildlife, an area can support. Brush management, range seeding, deferred grazing, and proper grazing use are some range management practices that foster high quality forage growth and protect soil and water resources.

The Soil Conservation Service can help ranchers design and apply these and other practices to improve feed and cover for wildlife.

Proper grazing can provide adequate cover for ground-nesting birds and improve water quality and quantity. Patterned brush management provides more cover for wildlife and increases the variety of plants that will grow. Range seeding can include plants that are good for grazing wildlife and seed-eating birds.

Well-managed grazing systems can produce the most benefits for livestock and wildlife on both public and private lands. SCS, the Bureau of Land Management of the U.S. Department of the Interior, and USDA's Forest Service encourage ranchers to use planned grazing systems on all rangeland.

At the National Range Conference scheduled in Oklahoma City, Okla., November 6–8, rangeland and wildlife management scientists and ranchers will talk about the latest research in range management techniques and how these practices can be adapted to local conditions.

For many years, my family has managed our soil, water, and vegetation to benefit livestock and wildlife. From personal knowledge, this requires close management, but the benefits we receive are worth it. I sincerely believe in managing rangeland to produce feed and cover for both livestock and wildlife.

Cover: Agricultural Research Service technician Paul Van Holbert injects dye into water flowing from rain simulator as he studies sediment transport and deposition. The dye permits measurement of velocity changes along concave study area. Depth of sediment deposited is measured by computer every 10 minutes. This is part of the soil erosion research going on at the National Soil Erosion Laboratory of Purdue University, West Lafayette, Ind. (See article beginning on page 3.)

John R. Block
Secretary of Agriculture

Wilson Scaling, Chief
Soil Conservation Service

All programs of the U.S. Department of Agriculture are available to everyone without regard to race, creed, color, sex, age, or national origin.

Editor, Judith E. Ladd

Associate Editor, Paul D. Barker

Associate Editor, Nancy M. Garlitz

Editorial Assistant, Ann P. Serota

Design Consultant, Christopher Lozos

National Soil Lab Committed to Conservation

When a raindrop strikes bare soil, some of that soil is dislodged in a miniature explosion.

When enough raindrops collect for water to run off the surface, soil is also detached as water runs downhill. Unlike the action of a single raindrop, runoff water transports some of the loosened soil and deposits it someplace else.

Further, water rarely runs downhill in a uniform sheet, but wriggles into paths of least resistance, cutting little channels, or rills, into the soil. Inside the rill, the water flows with increased energy, cutting channels deeper and deeper.

These familiar, even mundane, effects of rainstorms on soil are a matter of intense interest to the scientists who staff the 3-year-old National Soil Erosion Laboratory on the campus of Purdue University at West Lafayette, Ind. A facility of USDA's Agricultural Research Service (ARS), the laboratory provides "a center and a focus" for the Department of Agriculture's soil erosion research in various sections of the country. The man who so describes the lab is its director, Harold L. Barrows, who says that his staff shares a deep commitment, not only to increasing fundamental knowledge about soil erosion, but also to the specific goal of reducing erosion on agricultural and other important lands.

At least one-third of the cropland in the United States, he points out, is currently eroding at rates faster than the soil can be replaced through natural processes of regeneration.

"In parts of Iowa," Barrows reports, "farmers are losing 2 bushels of soil for every bushel of corn they grow. Soil deficits of such magnitude can't be allowed to continue."

But he knows that farmers have to make a living and that they frequently can't afford to apply expensive conservation measures, like terraces.

"The typical farmer very much wants to protect his resources, but he's got to pay his bills, too," Barrows says. "It's up to us to help develop improved farming systems that protect soil and water without costing an arm and a leg—systems that also produce high yields for the farmer."

Barrows points out that scientists at the laboratory work closely with other ARS and State scientists, and it is this continued cooperative research effort that will eventually pay off in reduced erosion.

Revising the USLE

In 1965, some 17 years before the soil erosion lab was dedicated in January 1982, Walter H. Wischmeier, an ARS research statistician who worked on the West Lafayette campus, first published, along with D. D. Smith, the Universal Soil Loss Equation. It was based on data from runoff plots in 49 locations around the country. The USLE, as it is called by conservationists and scientists, has been modified from time to time, and it is still the primary tool for estimating erosion for the National Resources Inventory, a survey conducted periodically by USDA's Soil Conservation Service.

The USLE is used to estimate average annual soil erosion in a given field. Variables in the formula include the erodibility of the soil; erosivity of rainfall; length and steepness of the slope; and factors for cover, management, and any supporting conservation practices used, such as terracing or contouring. Developed for areas east of the Rocky Mountains, the USLE has proved a remarkably useful tool in estimating cropland erosion in the East and Midwest. It has not performed as well in the West, however, or on long, flat slopes of the Mississippi Delta.

"Some conditions were outside the range of data used to develop the USLE," says hydraulic engineer George R. Foster, who is helping coordinate an update of the USLE and a revision of the handbook on the USLE, *Predicting Rainfall Erosion Losses*.

Foster points out that scientists are using a combination of new theoretical and experimental approaches, better data, and computers to develop more sophisticated methods for predicting erosion under more varied conditions than the USLE.

The erosion prediction methods of the future, he adds, will look beyond a single land profile and permit a three-dimensional evaluation of soil erosion and movement on a whole field. Jai-Yai Lu, a hydraulic engineer who recently joined the soils lab, will devote his efforts to this work.

"A comprehensive new prediction

In West Tennessee, a gully forms on unprotected cropland after a brief, but heavy, rainstorm. Conservation tillage could help protect some fragile soils; other cropland should be put back into pasture.

formula is only 5 years away," says Foster, "and we hope it can be used in more parts of the world than the USLE has been."

"Just Another Material"

Teams of scientists representing several disciplines are using fresh approaches to study old questions.

One new approach is to study soil like any other engineering material. Soil scientists have long been interested in the origins of soils, in their chemistry, and in the rich microbial life in agricultural soils.

"The trouble is that these things don't tell you everything you need to know about a soil's erodibility," comments Mark Nearing, an agronomist with a graduate degree in geotechnical engineering. "There's another way to look at soil—a cold, practical way—as just another material, like steel or concrete. We are using standard testing procedures to determine the relative strengths of different soils. We can determine each soil's mechanical resistance to a force without knowing anything about its pedigree."

Nearing says that his group, which is headed by soil scientist Joe Bradford, wants to learn more about three phenomena: the resistance of soil to the impact of a single raindrop, resistance to surface flow of water, and resistance to a combination of the two erosive actions.

A Drop Falls

A single drop of water falls from a 40-foot tower and strikes a sample of soil in the basement of the laboratory. Soil displaced by the splash is trapped in a ring around the soil sample so that it can be weighed and the amount removed determined.

"On some soils, three times as many particles are detached as on others," says Nearing. "We're beginning to learn what makes one soil erode so much more than another."

Also under study is the formation of crusts on a soil's surface after a heavy rain. Crusts usually reduce erosion for a time, but they also cut down on the infiltration of water by sealing off pores in the soil and produce more surface runoff. This, in turn, can create more erosion.

In another approach to understanding erodibility, soil scientist Darrell Norton is exploring soil mineralogy. His staff dries soil samples in an oven and saturates them with epoxy resin so that they can later slice thin sections of undisturbed soil for Norton to study in an image analyzer.

Norton is also looking at the relation of soil erodibility to soil chemistry. It is known, for instance, that certain chemicals, like calcium, improve soil structure, while others, such as sodium, have a destructive effect.

Still another approach will be explored by Diane Stott, a soil microbiologist who recently joined the staff. She will be looking at the effect soil organic matter and biological activity have on soil erodibility.

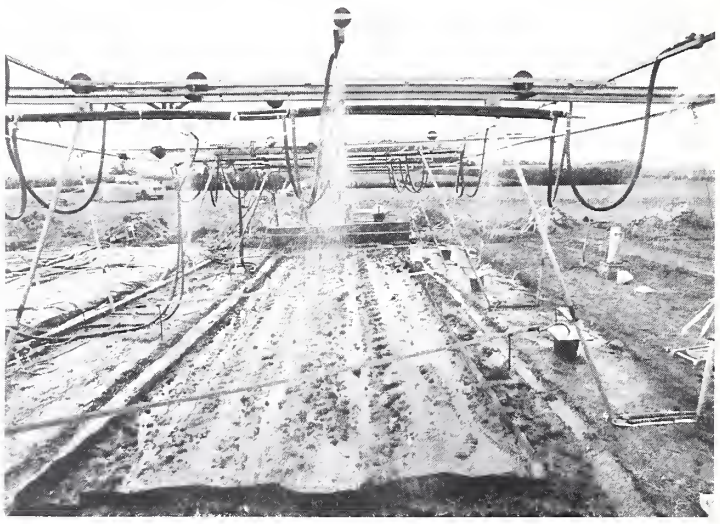
Simulating Rainfall

Most of the heavy volume of data used by the laboratory is produced from simulated rainfall on field test plots and on plots inside the lab. ARS researchers at Purdue built their first operational simulator in 1957, and it is still being used today. A modern version designed and built at the laboratory can reproduce rainfall intensities varying from 1 to 5 inches per hour.

A major user of the data is agricultural engineer Howard Neibling, who is leading research on the mechanics of soil transport and deposition by overland flow. This research requires thousands of observations and detailed analysis of the size and weight of soil particles moved by the runoff.

Many of Neibling's findings will be used to

At left, Mark Nearing, a scientist at the National Soil Erosion Lab, studies the resistance of soil to the impact of a single raindrop falling from a 40-foot-high tower. At right, early model rainfall simulator, built in 1957, is still used by scientists to collect data on soil losses under different conditions of slope and rainfall intensity and duration.



create improved mathematical/computer models of erosion.

Reducing Erosion Is Goal

Until his recent retirement, research leader William C. Moldenhauer was responsible for keeping the lab's diverse activities on track. One of the right tracks, he says, is to find more effective and economical ways to reduce soil erosion.

A longtime foe of the moldboard plow and clean-tilled fields, Moldenhauer is convinced that the most important single factor in bringing Corn Belt erosion under control is to leave enough residue from a previous crop on the surface of the soil to protect it.

For example, on soils with only a 2-percent slope, planted in continuous soybeans, Moldenhauer found that simulated rainfall produced soil losses from fall-plowed or chiseled areas that were three times as great as from no-till areas.

He also found that soils on a 2.5-percent slope eroded at rates 18 times higher under a plow disk tillage than under no-till.

"What counts most in the Midwest," he says, "is the amount of residue that remains after spring planting, because it is during the next 2 months that you get the most rain and the most intense rain."

How much residue? "The more, the better," says the scientist. "But even covering 30 percent of the surface of many soils can result in 60–70 percent less erosion than on soils with no mulch at all."

As Moldenhauer and his associates collect data on erosion rates for all kinds of tillage, there is little doubt that the least soil erosion occurs with no-till, in which a cover crop is killed by a herbicide and seed for the new crop is planted in the stubble and residue of the old.

Soybeans continue to be a problem crop, however. Compared with corn or wheat, soybeans leave little residue, and even that falls apart when disturbed. One answer, finds Moldenhauer, is to seed a cover crop into a soybean crop just before harvest to hold the soil down when the beans are gone. The cover crop, which may be legumes, grasses, wheat, or rye, is killed with a contact herbicide in the spring and the new crop planted into the residue.

"We are finding practical answers to erosion, and many enterprising farmers are finding answers, too," says the scientist. "What's more, we are discovering ways to make conservation tillage more efficient, and this will give a farmer an economic incentive to adopt these improved systems.

ARS technician Dan McCracken measures soil acidity as part of study to determine electrochemical properties of soil in relation to erodibility.

He's going to have to have systems that pay their way before he gets very enthusiastic.

Providing Technology "Packages"

The most promising medium of the future for communicating research findings to soil conservationists and farmers is the computer, says George Foster. "The Soil Conservation Service asks us for better models for predicting soil erosion and sediment yields," says Foster. "The trouble with better models, of course, is that they are also more complex than the old ones. They are harder for the field conservationist to apply. One good answer to *that* problem is to package the new erosion model in a computer program that is 'user friendly.' Another new employee, Charles R. Meyer, a computer specialist, will be working on this project.

"A computer program is an excellent way to transmit expanding technical information to technicians and lay people," Foster says. "Better yet, we can use computer graphics that will show a field man or a farmer the results of his actions—pictures of stunted cornstalks and inches of soil disappearing." He believes computer programs can prove much more exciting for the user than getting the same information from a handbook.

"We've got so much to tell people," he says. "The Agricultural Research Service has the best data base of any natural resource agency in the United States, and we need to be more creative in finding new ways to communicate that information to people who can bring erosion under control."

To help communicate research results, USDA's Soil Conservation Service has assigned agronomist Ernest A. Hintz to the erosion lab. Not only does Hintz pass on results of research to SCS, but he also relays the conservation agency's research needs to ARS scientists at the laboratory.

Hubert W. Kelley, Jr.,
director of information, Agricultural Research Service, Beltsville, Md

Paired Rows Push No-Till Grain Yields Up

A new method of planting wheat and barley promises to make conservation-tillage yields more competitive with conventional tillage yields in the Pacific Northwest.

Conservation tillage is a rapidly growing practice in which farmers reduce the amount of cultivation, leaving enough of the previous crop's residue on the surface to lessen soil erosion.

"Conservation tillage is gaining popularity throughout the country as a means of decreasing erosion," says Robert I. Papendick, research leader and soil scientist with the Agricultural Research Service at Pullman, Wash. "Conservation tillage also has potential for saving energy by reducing the number of times a tractor crosses a field."

The energy-saving possibility gave conservation tillage quite a boost in the seventies when diesel fuel prices were rising sharply, Papendick says. However, one thing that has held it back is that sometimes crops yield less with conservation tillage than with conventional methods.

For example, Papendick says, "In the past, wheat, barley, and other small grains have not yielded as well when planted with conservation tillage as when planted with conventional tillage or plowing. However, by combining the paired-row concept with conservation tillage, our test plots are yielding at least as much as conventionally tilled plots."

Paired-row planting places two seed rows 5 inches apart with a 15-inch separation between the row pairs. This contrasts with conventional grain plantings where rows are evenly spaced at about 7-inch intervals.

Preliminary test results indicate paired-row planting combined with conservation tillage controls soil erosion without sacrificing yields, says Papendick.

Papendick is using the USDA III No-Till Drill—an experimental seed drill—on the paired-row test plots. It simultaneously plants seeds and applies fertilizer in one pass across a field.

"The no-till drill allows us to get satisfactory penetration through thick crop residue, good seed-to-soil contact, and excellent fertilizer placement," says microbiologist Lloyd F. Elliott, also at Pullman.

The drill was developed cooperatively by ARS, Washington State University, and the Yielder Company of Spokane, Wash.

Elliott says, "During seeding, one set of double disks places fertilizer, such as aqua ammonia, in the middle of the 5-inch space between paired rows. At the same time, the disks cover the fertilizer with a layer of soil, which prevents the fertilizer from rapidly volatilizing. If necessary, the drill can apply small amounts of fertilizer with the seed.

"Paired-row planting offers possibilities for more efficient fertilizer use," says Elliott. He says that placing the fertilizer only between and under the seed rows—with no fertilizer in the 15-inch space between the pairs of rows—tends to "hide" the fertilizer from weeds.

Elliott says, "We don't know why, yet, but paired-row planting also appears to improve early seedling vigor."

Papendick says the Pacific Northwest is an ideal place for paired-row, conservation-tillage planting. "Annual soil erosion in this area can be held to less than 2 tons an acre with conservation tillage," he says. "This compares with a possible soil loss of 20 tons an acre or more from land planted with conventional tillage."

Papendick and his colleagues at Pullman are also testing a promising conservation-tillage implement developed in Great Britain in 1981. Known as the paraplow, it is actually not a plow but a series of staggered chisels mounted on a plow frame. Each chisel has a leg that goes straight down and then bends to the side at a 45-degree angle. When the chisels are pulled through the soil, soil flows over each bent wing, as air flows over an airplane's wings.

The paraplow lifts the soil just an inch or less, only slightly disturbing the soil surface. Elliott says the "really revolutionary thing" about the paraplow is that it eliminates smearing, a compacting of wet, clayey soils when a chisel presses against them. The winged design limits smearing to a 2-inch-wide knob at the tip of each wing. By staggering the chisels, even that smearing is undone by the next chisel.

Keith E. Saxton, an ARS hydrologist at Pullman, says, "The paraplow represents a major advance in soil-tillage equipment. It restores productivity in compact, eroded soils by breaking up dense soil layers, improving the rooting zone and the water intake."

Elliott modified the commercially built paraplow to dispense fertilizer at depths of 14 to 18 inches.

University of Idaho soil physicist John Hammel (right) and ARS microbiologist Lloyd Elliott are testing this British-designed paraplow on the fragile soils of the Palouse. Angled paraplow chisels restore productivity by loosening compacted soil.

"Deep fertilizer placement," says Elliott, "should encourage further rooting at greater depths and help restore soil productivity in marginal soils."

Papendick and his colleagues have used a paraplow for fall tillage before planting spring wheat and barley with the no-till drill.

Papendick says, "We need to see what effects paraplowing combined with conservation tillage will have on water infiltration on nonirrigated croplands. Water-use efficiency is the number one dryland farming problem worldwide. It is particularly acute on the dry, eroded hillsides of the Pacific Northwest and similar areas of the world."

Robert I. Papendick, Lloyd F. Elliott, and Keith E. Saxton are at the Land Management and Water Conservation Research Laboratory, Washington State University, Johnson Hall, Room 215, Pullman, Wash. 99164.

Winter Wheat Survives Despite Plowing

Chisel plowing to stop wind erosion in fields of young wheat seldom reduces yield, researchers report following a 5-year study of this emergency practice.

An average of about 6 million acres of the Great Plains have been chisel-plowed each of the last 14 years to control wind erosion, according to the Soil Conservation Service.

"Much of that land was in winter wheat," says Leon Lyles, Agricultural Research Service agricultural engineer, "and we needed to know what effect chiseling has on wheat yields."

In 5 years of tests at two sites, Lyles and John Tatarko, research assistant with the Kansas State University agronomy department, were surprised to find that wheat yields were significantly reduced by chiseling in only 1 year and at one location.

When vegetative cover is inadequate for wind-erosion control, the most common solution is emergency tillage, usually by narrow-point chisels to roughen the soil surface, Lyles says. Many farmers resist chiseling because they assume, quite logically, that yields will be hurt by the tillage activity.

"We conducted field experiments on a fine sandy loam soil at one site, and on a silty clay soil at another location, both in Finney County, Kans. We tilled some plots or test areas parallel to the wheat rows and some perpendicular to the rows," he said. "We also tested two chisel spacings, 30 and 60 inches, and tilled all of some plots and only half of the others in alternate strips."

In the 1 year that chiseling did depress yields, 1980, no rain occurred for 35 days after planting in September 1979, and low temperatures in November and December limited growth and encouraged early dormancy. When chiseling was done in March 1980, the wheat was hardly visible, consisting of single shoots about 1 inch tall. Plants did not survive in the tillage zones, and yields were reduced 27 to 56 percent. Apparently, soil thrown over small plants killed them. Tillage areas were also weed-infested at harvest time.

The results suggest that emergency tillage soon after emergence, before plants can make good top and root growth, would reduce yields, Lyles says.

Leon Lyles is located at USDA–ARS, Wind Erosion Research, Department of Agronomy, Kansas State University, Manhattan, Kans. 66506.

Slot Machine Pays Off

A newly developed mulching machine may protect erosion-prone farmland from water runoff that strips away topsoil and pollutes streams with sediment.

The machine is a slot mulcher—built on the oldtime farm philosophy of "that which is taken from the land should be returned to the land." In this case it is wheat and barley straw left after harvest that is returned to the land, according to the researcher who pioneered development of the machine.

Keith E. Saxton, hydrologist with the Land Management and Water Conservation Research Laboratory, Pullman, Wash., says that in tests with the slot mulching machine annual erosion from cropland was cut to 1 ton or less per acre. "This is a dramatic improvement for Washington's Palouse Hills region where soil losses often run 20 to 30 tons per acre with conventional tillage," he says.

Slot mulching is simple in principle, Saxton says. Small trenches or slots are cut into the field about 12 to 20 feet apart and tightly stuffed with straw. The slots follow the contour of the field so that rain or melting snow running off the field will cross them at right angles. Straw sticking up from the slot slows the water so that soil particles settle out and remain on the field.

Saxton says that compacting crop residues into slots pays off in other ways, too. Water can soak into the soil from the trench even if the ground surface is crusted or frozen. Excess plant residues are disposed of, making it easier to plant the next crop. And eventually the mulch decomposes to provide organic matter to the soil.

Saxton and soil physicist Gaylon S. Campbell of Washington State University's Department of Agronomy and Soils believe fields need only one slot mulching treatment per year. It will be effective until the tops of the slots are buried either by sediment or farm machinery, Campbell says. Slot mulching is usually done right after harvest when there is an ample supply of straw, he adds.

A mulcher using Saxton's concept is now being manufactured in Oregon by a private firm. The commercial machine uses a 4-foot-diameter trenching wheel to make 4-inch-wide by 10-inch-deep slots. A V-shaped arrangement of tined conveyor belts draws straw to a central hopper where it is compacted into the trench.

Although designed for soil conditions and rainfall patterns in the Pacific Northwest, slot mulching can be useful wherever hilly land is farmed, Saxton believes. The mulcher's knack of disposing of excess straw may also benefit farmers who need a clean seedbed to plant a second crop immediately after harvesting the first, he says.

Keith E. Saxton is located at ARS Land Management and Water Conservation Research Lab, Smith Engineering Bldg., Rm. 255, Washington State University, Pullman, Wash. 99164.

News Briefs

Emergency Aid Saves City's Water Supply

Fast action by local officials and the Soil Conservation Service helped prevent heavy April rains from destroying a water treatment plant in Waurika, Okla. Riprap was used to stabilize an eroding streambank that was threatening to bring the water plant toppling into a creek.

"It was an emergency situation. About 6,500 people were close to losing their water supply and fire protection," said Ceburn Lovett, mayor of Waurika. "Waurika is a small town, and we just didn't have the funds or the know-how to solve the problem."

The city contacted several agencies for help, but none was able to provide the money for the needed repairs. Mayor Lovett then discussed the problem with Stan Rice, SCS resource conservation and development coordinator, Duncan, Pa. Rice advised the mayor to make a request for emergency aid through the Jefferson County Conservation District. Within days, $51,000 was provided through the Emergency Watershed Protection (EWP) Program administered by SCS.

"I have never seen an agency act so fast," said Mayor Lovett. "We called them one day, they looked at the problem the next, and by the third day work had begun."

The EWP program allows SCS to hire contractors and purchase needed materials on the spot. Within a week, workers had cleared the uprooted trees and other debris and applied 3,000 tons of riprap. The area is now stable, and the water treatment plant is out of danger.

"All it took was a request from the city to the conservation district," said John Pewthers, SCS district conservationist at the Waurika field office. "We then checked with the SCS State office in Stillwater and with our National Headquarters in Washington, D.C., to make sure the money was available. This was an emergency situation that was getting worse by the hour. Without the emergency assistance, the plant would have fallen into the creek."

F. Dwain Phillips,
public affairs specialist, SCS, Stillwater, Okla.

When the Waurika, Okla., water treatment plant was built many years ago, it was about 25 feet from Beaver Creek. After heavy rains last April, erosion had eaten away at the nearby banks until a corner of the plant was hanging 20 feet above the creek (top photo). Rock riprap was placed in the washed out area to stabilize the bank (bottom photo).

Windbreak Symposium To Be Held

An International Symposium on Windbreak Technology will be held June 23–27, 1986, in Lincoln, Nebr. It is sponsored by the Great Plains Agricultural Council–Forestry Committee, the Soil Conservation Society of America, the Institute of Agriculture and Natural Resources–University of Nebraska, and USDA's Forest Service and Soil Conservation Service.

The sponsors have issued a call for papers in all areas of windbreak technology. Some topics of interest are:

- Structure and function of windbreaks;
- Windbreak microclimate;
- Windbreaks and soil erosion;
- Windbreaks and livestock;
- Windbreaks and crops;
- Snow distribution;
- Living snow fences;
- Windbreaks and water conservation;
- Windbreaks and wildlife;
- Landscape design and windbreaks;
- Farmstead windbreaks;
- Urban/residential windbreaks;
- Windbreaks in community planning;
- Planting and establishing windbreaks;
- Windbreak renovation;
- Insects and disease management; and
- Agro-forestry as it relates to windbreaks.

For more information, contact Dr. James R. Brandle, Symposium Co-chairperson, Department of Forestry, Fisheries, and Wildlife, University of Nebraska–Lincoln, Lincoln, Nebr. 68583–0814.

Michigan Developing County-Level GIS

A new soil survey is one of the catalysts for developing a computerized geographic information system (GIS) for Van Buren County, Mich.

The soil survey of the county is scheduled to be published by the Soil Conservation Service in 1986. The soils information in the survey will form the nucleus of a pilot GIS being developed by SCS; Cooperative Extension Service of Michigan State University (MSU); the Michigan Department of Natural Resources (DNR), Division of Land Resource Programs; and MSU's Center for Remote Sensing.

Much of the local leadership for the GIS project comes from Pete Vergot, county director of the Cooperative Extension Service. A microcomputer buff, Vergot realized he would be better able to assist the fruit growers and other farmers in the county to manage their soils if he could computerize the soils information in the soil survey. He then set out to raise the funding and support necessary to accomplish this goal.

At the same time Vergot was developing his project in Van Buren County, a consortium of interests was working on using soil survey data to develop a statewide GIS. A Soil Encoding Study Committee (SESC) recommended that DNR's Michigan Resource Inventory Program (MRIP) start and maintain a full-time soils-digitizing operation in conjuction with its ongoing land cover, base map, and other resource-data encoding.

The SESC also recommended that microcomputer-based soils-digitizing hardware and software be developed to allow soil survey field crews and interested local governments to encode soil surveys. Encoded surveys would then be transferred to the MRIP system for final editing and quality control.

To place the second recommendation into operation, the SESC needed a pilot county. Vergot offered Van Buren. At that time, he had obtained a $6,000 commitment from the county board of commissioners, $3,000 from the Van Buren County Soil Conservation District, and $6,000 from MSU's Cooperative Extension Service. These funds were equal to the SESC estimate for building the prototype.

It was agreed that Van Buren would serve as a pilot for the statewide GIS, and Vergot and his staff would do the digitizing of the soils sheets. The Van Buren County office of the Cooperative Extension Service, which already had a microcomputer, then ordered a 20 megabyte disk drive, digitizing table, plotter, printer, and the necessary graphics boards and supplies.

MRIP funded two contracts for the development of software. The MSU Center for Remote Sensing is writing codes to capture the line work and soil symbols off the soil survey and to computerize interpretive tables. The other contract provides for translating the microcomputer files to the MRIP minicomputer. The MRIP will edit the data to ensure statewide standards and then convert the files back into a microcomputer format for easier distribution and access.

SCS will monitor and review the project to see if the hardware and software can be used to reduce costs of future soil surveys. The system should allow soil survey crews to bypass some of the labor-intensive cartographic work by digitizing their field notes and using automated plotters to generate map overlays.

The MSU's Cooperative Extension Service will promote the project and co-host workshops on the GIS this fall with the Michigan Department of Agriculture.

Mike Scieszka,
program manager, Michican Resource Inventory Program, Division of Land Resource Programs, Michigan Department of Natural Resources, Lansing, Mich.

Conservation Is HOT in Mississippi

Balloons, clowns, streamers, and the happy faces of youngsters make a carnival. Bring these to the Environmental Study Site in Jackson, Miss., and you have a "conservation carnival."

For 3 days in May, this 140-acre facility was the site of a conservation carnival hosted by the Hinds County Soil and Water Conservation District. The carnival was attended by approximately 3,000 students from kindergarten through the ninth grade.

Festivities included clowns (played by district employees and volunteers) who led the students and their teachers to different study stops where resource specialists demonstrated soil and water conservation principles. Stops included areas of study in soils, wildlife, forestry, ponds, conservation farming, and farm animals.

At the pond stop, the students gazed excitedly at tadpoles, water turtles, and crawfish as they learned about the importance of a balanced ecosystem. At the farming stop, the students learned about growing cotton, soybeans, and corn and the

products made from these crops. They saw how terraces and farming on the contour can help save the topsoil. At the farm animal stop, the students fed the animals and learned how the animals depend on the soil for survival.

This carnival was actually a special field day designed to make young people aware of the importance of conserving natural resources. It is part of Mississippi's "Hold Our Topsoil" (HOT) campaign. HOT is a joint effort by more than 19 local, State, and Federal organizations, agencies, and educational institutions to teach farmers, landowners, and young people about conservation practices designed to control soil erosion, improve water quality, and maintain or improve farm production.

Recent studies by the Soil Conservation Service show that Mississippi cropland is eroding at a rate 1½ times the national average. On the average, more than 7½ tons of soil—enough to fill a dump truck 1½ times—erodes from each acre of Mississippi cropland each year. This rate is greater than the soil can tolerate and still be productive, and two-thirds of the topsoil on most of the hill cropland is already gone.

"We're talking about Mississippi's most valuable resource," said A. E. Sullivan, SCS State conservationist. SCS is an active participant in HOT.

In addition to damaging cropland, erosion also clogs and pollutes nearby streams with sediment laden with fertilizer and other chemicals. Many fishermen and hunters in Mississippi have noted reduced wildlife populations in areas where erosion is severe.

To increase public awareness of the erosion problem, the HOT campaign sponsors field days. HOT began in 1983 with a statewide field day at Bolton that was attended by more than 2,500 persons. The following year seven area field days were organized across the State by agricultural leaders in each area. Field days are scheduled this year for each of the State's 82 counties.

"The field days show efficient conservation practices to the farmers," said Jim Buck Ross, Mississippi agricultural commissioner and chairman of the statewide HOT steering committee. "Soil conservation's time has come. If we don't do something about it now, the whole State will wash away."

Nearly all of the demonstration farms toured on the field days feature terraces, water conservation and control, and proper planting techniques for crops, grasses, and trees. Emphasis is placed on the relationship between soil conservation and other environmental concerns.

More than 6,000 persons attended the area field days. Farmers were able to discuss their erosion problems with technical experts and to see how conservation practices can reduce erosion. The field days also attracted commercial exhibits of the latest farm equipment, chemicals, and agricultural products.

Secretary of Agriculture John Block spoke to 1,400 persons attending the area field day at the North Mississippi Branch Agricultural and Forestry Experiment Station at Holly Springs. Block stressed the urgency of reducing erosion problems across the country. "If we don't preserve our natural resources," he said, "our Nation will not survive."

In addition to the efforts of the participating agencies, countless other agencies and individuals have donated time, labor, supplies, equipment, services, and money to the campaign. Many of these are particularly concerned about teaching conservation values to young people.

M. P. Moore, of the Circle H Ranch in north Mississippi, donated to HOT a 2½-year-old Hereford bull that will be kept by the Future Farmers of America (FFA) on a farm in Grenada. The FFA members will care for and use the bull to improve their herd and make money by allowing other farmers to use the bull. Money raised with the bull will be given away as prizes to the winners of an essay contest sponsored by HOT for ninth-grade students in a nine-county area.

In 1986, HOT plans to help promote contests to determine the best conservation farmers. County winners will compete in each area, then area winners will compete statewide. The State winner will be nominated to compete at the national level for the National Conservation Farmers Award. This awards program is sponsored by the National Endowment for Soil and Water Conservation and the DuPont Company.

Chuck Jepsen,
public affairs specialist, SCS, Jackson, Miss.

Jeannine May,
public affairs specialist, SCS, Jackson, Miss.

At the "conservation carnival" last May, SCS Soil Conservationist Earl Nail tells students about the different kinds of soils found in Hinds County, Miss.

Oregon Coast "Stumps" Soil Surveyors

What was that thing on the beach? A monster?

Uncovered by erosive winter storms along the Oregon Coast, it stood in the silty mud before us like a creature out of the past. What was it? On closer examination, and after testing, it appears to be a tree stump from a prehistoric spruce forest that once flourished off the present coastline, on a shoreline that no longer exists.

For our soil survey party, this newly exposed stump was another piece in the puzzle of mapping and classifying soils for the soil survey of Lincoln County. We found it while looking for the source of wind-deposited silt that covers higher terraces along the coast. It may lead us to the source of the silt and, in the process, make us ask even more questions about the past.

Soils have their own places on the landscape. During mapping, however, we occasionally find a soil in a place where we don't expect it. When this happens, we re-examine our assumptions about the origin of that soil.

Such was the case when we mapped areas of Lint soils in Lincoln County. We found these smeary, silt loam soils on successively older marine (water-deposited) terraces up to 400 feet above sea level. Lint soils have the characteristics of soils no more than 4,000 years old, but the terraces we found them on are at least 10 times that age.

We normally expect to find such young soils only on younger, lower terraces. Clearly, the silty deposits that helped form the Lint soils came from somewhere else, but where? Were they alluvium (water-carried) or eolian (windblown)?

If the silt was deposited by water from the major drainages of the Coast Range prior to uplift, or during elevated sea levels between ice ages, then it should have been deepest near the source, the mouths of the major streams. We checked, but did not find this pattern.

The other possibility is that the silt was deposited by wind. The prevailing winds are westerly from the Pacific Ocean, and the only source for windblown material at the present time is a narrow strip of beach sand and intermittent sand dunes along the shore.

During the ice ages, however, there were enormous variations in sea level. When more of the Earth's water was on land in the form of ice, the sea level was lower. The shoreline moved with the advance and retreat of continental glaciers. Could higher sea levels since the last ice age—about 10,000 years ago—have flooded coastal terraces and left silty beach deposits?

We know that there are silty deposits beneath the sand. Sediment studies at the Oregon State University Marine Science Center in Newport indicate that the sand extends to a depth of 40 fathoms (1 fathom equals 6 feet). Below this, to a depth of 80 fathoms, there are deposits of silty mud and sandy silt. Could these buried deposits have been the source of the silt on the higher terraces?

Some experts believe that the lowered sea levels during ice cap advances exposed 20 to 40 miles of gently sloping continental shelf sediments to wind erosion. Wave notches (caused by wave erosion, an indication of a shoreline at sea level) near the outer edge of the continental shelf at a depth of 80 fathoms have been assumed by scientists to coincide with one of the major ice cap advances. According to theory, however, that extensive shoreline was again covered by higher sea levels long before the Lint soils formed. In fact, most scientists believe that variations in sea level have been minimal in geologically recent times (the past 10,000 years).

Where then, did the spruce trees grow? Radiocarbon dating tests indicate that the stump found by the soil survey crew is about 3,500 years old, about the same age as the Lint soils. If the spruce trees grew on silty mud flats, now buried by sand except where exposed by erosion, there must have been much lower sea levels during more recent times than previously thought.

What happened in those times when the stump was a growing tree and the wind was blowing silt to the east? Lack of a wave notch indicates that the terrace on which it grew was buried rather suddenly instead of being gradually worn away by a slowly rising sea level. Did Oregon's spruce-covered coast fall into the ocean? Was there a worldwide catastrophe, followed by adjustments in the Earth's surface? Is the Earth's surface really as old and stable as geologists believe?

When the Lincoln County Soil Survey is published by the Soil Conservation Service, the story of this ancient forest may only be a footnote, and our survey crew will be hard at work solving other soil puzzles on yet another soil survey. But now and then we'll remember . . . and wonder.

William R. Patching,
soil survey party leader, SCS, Newport, Oreg

Uncovered by erosive winter storms along the Pacific Coast, this stump of a prehistoric cedar tree helped surveyors to map and classify the soils of Lincoln County, Oreg

Moving?

Send present mailing label and new address including zip code to:

U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 2890, Room 6117-S
Washington, DC 20013-2890

Official Business
Penalty for private use, $300

New Publications

The Story of Land—Its Use and Misuse Through the Centuries

by the Soil Conservation Society of America

The most popular in a series of seven educational cartoon booklets, this booklet helps children in the upper elementary grades understand such terms and concepts as erosion, topsoil, crop rotation, and conservation. It traces mankind's use, misuse, and dependence upon land resources throughout history.

This is the booklet's first full-scale revision since it was originally published in 1955. The text has been updated and the artwork redone.

Single copies of *The Story of Land—Its Use and Misuse Through the Centuries* are available for 75¢ from the Soil Conservation Society of America, 7515 NE. Ankeny Road, Ankeny, Iowa 50021–9764. An accompanying teacher's guide is available for 50¢. Substantial discounts are available on quantity purchases of both.

Erosion and Productivity of Soils Containing Rock Fragments

by the Soil Science Society of America

This 103-page publication is the result of a symposium held at the Soil Science Society of America's annual meeting in November 1982.

As more prime farmland is taken out of production, agricultural producers are forced to look to less suited land that contains rock fragments. This publication presents current information on classification of soils containing rock fragments; their extent and distribution in the United States; effect of rock fragments on soil productivity, water movement, and available water; and effect on erodibility.

Each chapter of this book has been written by experts in their fields.

For a copy of *Erosion and Productivity of Soils Containing Rock Fragments* (SSSA Special Publication Number 13) send $12 to SSSA Headquarters Office, Book Order Department, 677 South Segoe Road, Madison, Wis. 53711.

Handbook of Applied Meteorology

Edited by David D. Houghton

Written specifically for professionals and technicians outside the meteorological profession, this guide covers every field in engineering and science where the use of meteorology is crucial.

The 45 articles, written by leading professionals in their fields, are organized into five main sections. Part I is an overview of fundamental principles. In Part II, the book surveys the latest in measurement technology, covering the field today and tomorrow, observing systems and networks, satellites, and regulatory criteria. The chapters in Part III focus on specific applications of meteorology in 25 areas, including agriculture, water management, erosion, forestry, air quality control, and solar and wind energy.

Some major impacts of meteorology on society are discussed in Part IV, and Part V summarizes the wide range of resources available for meteorological data and information.

The book is complete with a glossary of terminology, an appendix of climatic data and an index. This 1,461-page book is filled with easy-to-read tables and illustrations.

The *Handbook of Applied Meteorology* is available for $84.95 (plus postage and handling), from John Wiley & Sons, Inc., One Wiley Drive, Somerset, N.J. 08873.

Western Fertilizer Handbook

by the California Fertilizer Association

This seventh edition includes basic information on the properties of soil, water, and plants. Fetilizer products, their properties and management, are presented, as well as related information on soil amendments and irrigation water quality.

Although written specifically for western agriculture, most of the information would be useful to users of fertilizers everywhere.

This 288-page handbook contains helpful illustrations and a section of color photographs showing the effect of various nutrient deficiencies on different plants.

Copies of *Western Fertilizer Handbook* are available for $9.95 from The Interstate Printers & Publishers, Inc., 19–27 North Jackson Street, Danville, Ill. 61832–0594.

Agriculture and the Environment: An Examination of Critical Issues for Food Policy

Edited by John M. Sweeten and Frank J. Humenik

This is a major issues policy statement by the American Society of Agricultural Engineers Board of Directors. It identifies 12 major issues dealing with agriculture and the environment in the United States.

Years of study by some of the leading experts in environmental and agricultural issues have gone into this assessment of the key issues involved in the question of protection versus production. The implications and actions recommended are grouped under four related subject headings: the resource base, agricultural residue management, the interface with urban demands, and air quality.

Some of the issues addressed in this publication are the pros and cons of alternative energy sources; soil protection measures in areas where the rate of erosion is six times the rate of soil formation; managing the use and disposal of agricultural chemicals; and reclaiming orphaned and abandoned mine and drilling lands.

Copies of this publication are available for $65 from the American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, Mich. 49085–9659.

Hydrologic Modeling of Small Watersheds

Edited by C. T. Haan, H. P. Johnson, and D. L. Brakensiek

This monograph was developed following a suggestion that it would be desirable to have a textbook devoted to hydrologic modeling suitable for use in graduate courses. The goal was to collect in one volume some of the latest ideas on modeling various aspects of the hydrologic cycle on small watersheds.

The different chapters were written by leading hydrologists who have given years of study to the topics on which they write. Chapters include information on the modeling components of the hydrologic cycle on small watersheds; on how several different types of watershed models are structured by combining elements from various component models; and on selecting, calibrating, and using watershed models. The last chapter is a catalog of currently available models.

Graphs, charts, and equations are used extensively throughout.

The 533-page publication is available for $34.50 from American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, Mich. 49085-9659.

U.S. GOVERNMENT PRINTING OFFICE: 1985—460-944/20007