An SCS Environmental Qu[illegible] Aid

Control Sediment - Keep water clean

Reprinted from
Soil Conservation
MAGAZINE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

A part to play

We have met the enemy, and he is us.

This comment by Pogo in the comic strip so well fits the subject of the environment that it is a slogan of many activists today.

Every citizen—consumer and conservationist alike—has had a part in creating the kind of environment we all live in, and he has both the chance and the responsibility to help improve it.

Someone else said, "Why does it take less energy to form a Committee To Improve the Environment than it does to bend over to pick up a gum wrapper?" This suggests that positive action begins best at home.

More people need to stop harping about the environment and start helping. Their energies are needed for both litter-picking **and** committee work—and more. Their understanding is needed if concern is to be translated into meaningful action.

With the current emotional pitch of environmental concern in the United States, it is easy to forget that many people have worked most of their lives to improve the environment—and with significant results. Leaders of 3,000 local conservation districts, 2 million land owners and operators, and thousands of professional conservationists in SCS and many other agencies have been working together. In many areas, their efforts have made the water cleaner, the air fresher, the land better looking and more useful.

Conservation districts continue to broaden their programs to do a better job in environmental improvement. They continue to get more and more requests for help. They would welcome some new hands and new ideas.

The Soil Conservation Service and other agencies continue to adapt conservation measures to new environmental uses, to develop new conservation measures for specific environmental needs, and to give the best help possible in "traditional" conservation work that already has made a telling impact on environmental quality. We, too, welcome new hands and new ideas.

Conservation districts and agencies together have some challenges in their mutual efforts:

- To see that all conservation work is installed with full attention to its overall impact on the environment;
- To see that all conservation work is properly maintained so that its impact continues to be favorable;
- To see that all special-interest groups have the opportunity to participate—from the outset—in planning conservation projects;
- And perhaps most important of all, to help inform the public accurately about the state of the environment and alternatives for its improvement. Meaningful individual action and meaningful community planning come from understanding the facts about the condition and the potential of natural resources.

This Nation can gain a high standard of living for its citizens without losing those very resources that make this country a good place to live. We have the technology; there are growing indications that we have the will and the willingness to pay the cost of a high-quality environment. I am confident we will make it, if we individually and collectively work toward the goal.

Kenneth E. Grant

Conservation in a new town

By John N. Holeman and Elmer F. Sauer

Geologist and district conservationist, SCS, Hyattsville and Ellicott City, Md.

The Town Center beside Lake Kittamaqundi (lower left of aerial photo) and the village of Wilde Lake (upper right) are focal points of development in Columbia, Md. Residents can launch sailboats and canoes from the dock on the south shore of Wilde Lake.

Built-in conservation measures are taking their place with other advanced ideas of urban planning and land use in the rapidly developing "new town" of Columbia, Md.

Contour plowing may not be on the agenda, but by the time this totally planned community is completed in 1981, many other restyled farm practices will have been adapted and applied on thousands of homesites, streets, and open spaces.

Columbia is a developer's dream city about midway between Washington, D.C., and Baltimore, Md. Enticed by a design for an integrated community of 110,000 people, home-buyers, apartment-seekers, and industries are coming to this new urban center in the countryside rather than settling on the advancing fringes of the two larger cities.

Population has risen to almost 4,000 since the first home was sold in 1967. An attractive combination of tall office buildings, enclosed shopping malls, residential villages, and open space offers a unique mixture of metropolitan advantages and small-town comforts.

Building in conservation

Accepted practices of conservation farming that had been commonplace in agricultural Howard County before the new town was planned by a nationally famous land-developing organization are being called into play again.

Soil loss and sedimentation traditionally have been regarded as unfortunate but unavoidable side effects of urbanization. Builders in Columbia, however, are striving to minimize the usual damages. With counsel from the Howard Soil Conservation District and technical aid from the Soil Conservation Service, they are testing and using structures and methods to control runoff and erosion during construction and prevent permanent damage.

Columbia's creator, James W. Rouse, head of the Rouse Company, signed a cooperative agreement with the district in 1966. The Soil Conservation Service has worked with engineers in the Columbia Management and Maintenance Division since the first request for technical assistance came 3 years ago. Conservation and construction skills first joined forces to build a wildlife pond and stayed together for sediment control of ever-widening scope in the development.

Original plans for the 16,000-acre tract did not provide for soil protection and sediment control during construction. As mutual understandings with developer, builders, and

Trees (left) preserve the natural look and protect soil and neighbors' yards. Jute netting (above) stabilizes a steep slope.

bulldozer operators have improved, however, several SCS remedies for critical areas have gradually been incorporated into standard seeding and grading procedures. Emphasis is changing gradually from "cure and cleanup" to prevention and careful site preparation.

Protecting the cityscape

Trees, natural topography, and ground cover are retained wherever feasible for the beauty and protection of each subdivision. Columbia's deep, well-drained soils have few limitations for either residential and industrial buildings or sanitation systems. But the soil erodes readily when ground cover on slopes is disturbed.

Problems used to start when grading stopped. Now a simple addition to standard procedure keeps much of the soil in place and out of Columbia's lakes, streams, and streets.

After earth is reshaped for the installation of curved roads, 10-foot strips on each side are smoothed and seeded by a private contractor. The predominantly acid soils are limed and fertilized to suit soil test recommendations. Both hydroseeding and conventional methods have been used to put in annual ryegrass and a mixture of Kentucky 31 fescue and bluegrass.

Asphalt mulch (chopped straw sprayed with a tacking solution of asphalt emulsion) has proved effective and economical on areas where cover is being established.

Other manmade mulches are being evaluated on a roadside test strip. Asphalt and fiberglass alone and in combination with each other are being compared with excelsior netting and cellulose mat.

Stabilization techniques

Builders are urged to stabilize lots with at least partial seeding or sodding before turning them over to new owners. Residents may then arrange for final landscaping without unwittingly contributing additional sediment to the city's manmade lakes.

Erosion has been a problem on some of the original lots as well as in areas currently under construction. Diversion berms and other structures which slow and spread water were installed to restore stability. Jute is being used in swales and drainageways which conduct high velocity waterflows away from buildings and construction sites. Where proper measures have been taken, sediment production has been reduced 80 percent.

Columbia's subsurface utilities have also been a source of concern and sediment. Installation of underground lines for water, sewer, gas, electricity, and telephones has been difficult to coordinate. It is hoped that, with more experience and cooperation, utility companies can reduce sediment output from repeated excavations and numerous open, unprotected trenches.

Tailormade trap

Ditchbank erosion seems minor when compared with the sediment-production potential of a shopping center site or one of the other vast expanses of bare land visible in youthful Columbia. To make sure that Columbians don't sacrifice future water quality and lake capacity for the convenience of a town center, sediment basins have been installed below some large sites.

In major construction areas, all vegetation must be removed. Bare soil is exposed to the elements for months. Since mulches and seed cannot be applied until final grading is completed, indirect control seemed to be the only practical way to deal wth such critical sources of sediment.

A debris basin designed by the Soil Conservation Service and installed at the expense of the Rouse Company helps protect Lake Kittamaqundi from shopping center runoff. In a year, it has been necessary to clean out the settling basin

A concrete-lined drainageway (above). While grading is still underway (right), fescue protects soil.

three times. But the expense, effort, and frequency of dredging the lake have been reduced.

Because of the first basin's success 12 others have been put below other disturbed sites to trap sediment before it reachs streams. Periodic cleanout—particularly after intence storms—is an important part of the overall control program.

"We can't afford to keep stabilizing large graded areas while we're still working on the site," says Paul V. Robbins, manager of land-development construction for Rouse. "It is more practical and less expensive to trap sediment than to put on mulches and seed before the major earthmoving work is through."

Silt laden runoff collects in this debris basin below a large site being graded for a shopping mall. As water rises in and around the metal box (above) sediment drops out, dries up, and accumulates for future use. Gabions (below) line the banks of a creek below Wilde Lake Dam. The tightly packed rocks and wire netting might be mistaken for real walls from a distance.

Manmade lakes at work

Columbia's lakes were originally designed and located to help control sediment; yet their future depth and beauty are at stake, too. Sediment dredged out of these aquatic traps has been stockpiled, mixed with dry soil, and later used to fill low-lying areas throughout the development.

Beating bank erosion

Onsite erosion controls solve one type of problem while they may create another. Water concentrated by careful grading, temporary diversions, and other surface channels runs into streams and increases their erosive power. While carefully planted grass protects roadbanks, a nearby unprotected streambank may be gradually eaten away. Natural undergrowth has been left to protect many of Columbia's existing waterways.

Constructing small grade-stabilization structures, installing gabions and riprap on streambanks, and sloping and vegetating banks with mulch and seed are among measures being taken to control this type of erosion. Jute, fiberglass netting, paper weaves, organic sprays, and other soil stabilization aids are also being tried.

Excelsior netting (top) and fiberglass over asphalt emulsion (foreground) are two manmade mulches compared on a roadside test strip.

The cost of erosion and sediment-control measures has been estimated at one-third of 1 percent of each lot's value. At that rate, soil conservation may cost Columbia around $2.5 million over the next 10 years. Although a cost-benefit analysis for this program has not yet been made, it is apparent that it will cost far less to control erosion and sediment now than to dredge lakes and clean up open space and backyards in the future.

A universal antidote for sediment-producing areas is an impossible dream; but conservation consciousness is developing with Columbia. This "new town" with a new look owes some of its continuing beauty, stability, and livability to changes in attitude among its developers and builders.

It takes teamwork

Onsite controls require cooperation all the way down the line. The man on the bulldozer is just as important in some ways as the man at the top. Both of them must understand what needs to be done and the importance of doing it. They can't be forced to try new techniques; but encouragement, examples, and technical assistance are offered whenever possible.

For a development of Columbia's dimension and diversity, the chain of command is complex. The Rouse Company, on behalf of the local Columbia management, cleared all original building and sanitation plans as a unit with the county. Builders then assumed control of construction operations in each of three (eventually seven) complete villages within the city of Columbia.

Responsibility for sediment and erosion control, therefore, shifts from developer to builder to foreman and eventually to the homeowner. Awareness, understanding, and willingness to expend money and effort must go with that responsibility, or much unnecessary sediment may be washed into streams and lakes.

Sediment-control ordinance

Since July 1, a state law for sediment control in the Patuxent River watershed (which includes all of Columbia) has given the Howard Soil Conservation District legal leverage for its own sediment-control program. Urbanization problems and patterns stimulated the drive for legislation and enforcement long before Columbia's advent; but plans for the huge development hastened acceptance of proposed pre-grading controls in Howard County.

The law requires soil conservation district approval of all plans for earthmoving within the Patuxent River watershed except for dwellings, outbuildings, or agricultural structures on lots of 2 acres or more. State, county, and municipal governments as well as private persons and firms must comply or be subject to fine or imprisonment.

District has manager

The Howard Soil Conservation District has its own manager who assists with inspection and public relations programs for the legislation within the district. The county government is now considering extending similar controls to the remaining 15 percent of the county outside the Patuxent watershed.

Efforts to control sediment pollution in Columbia are now part of the developer's comprehensive program to make sure that residents will enjoy as good a quality of life here in 1980 as they do in 1969.

Protection of natural and manmade resources during construction has long-range benefits which make today's work worthwhile. ♦

Jute netting and straw cover a newly seeded slope. Retouching became necesesary when bare spots appeared in this recently established lawn.

Minimum tillage:

looks like a winner

by Vincent J. Price
Information Division, SCS
Washington, D.C.

It's called the tillage revolution. It's said to save the farmer time and labor. It's said to increase crop yield most of the time and to reduce soil erosion. It's said to conserve water and provide cover during winter.

Men who know farming speak of minimum tillage as perhaps the most important development in agriculture since hybrid corn. Some say that the American farmer can now throw away his moldboard plow.

Others are less certain.

A farmer in Woodford County, Illinois, looking over his field of soybeans—a field tilled according to the new method—expressed his personal doubts about minimum tillage as he winced from the glare reflecting off his combine. "You know," he said, "those old methods—plowing and discing and harrowing—I'm still not 100 percent away from them. Our fathers and grandfathers knew no other way."

Exactly what is minimum tillage? How has it revolutionized farming? In the Corn Belt minimum tillage often works like this:

After the harvest, the crop residue is chopped or shredded, and a chisel loosens and opens up the subsoil to create a series of rough ridges that help water to soak in and prevent soil blowing. The crop residue, which remains on top of the soil, protects the soil from wind and water erosion during the nongrowing seasons.

In the spring, the farmer uses no-till equipment to apply fertilizer and herbicides and plant all in one operation. The soil is disturbed as little as possible; under some practices, it is opened up only to a width of 2 or 3 inches. Much of the residue from the previous crop remains on the soil as a protective cover. A field that is plowed according to the old method can lose many tons of soil per acre because the protective cover is buried below the surface.

Minimum tillage has swept across the nation in the last 5 years. Today, it is used on 1 out of every 10 acres planted to corn, soybeans, or sorghum.

In 1967 in Illinois, the Soil Conservation Service, the Cooperative Extension Service, and the Agricultural Stabilization and Conservation Service, through the Illinois Conservation Practices Committee, launched a program to promote minimum tillage. First they settled on a name for the practice—conservation tillage. (The practice is known by several other names in different parts of the country.) They offered cost-sharing for the practice in 10 pilot counties. The immediate goal was to establish conservation tillage on 10 to 12 farms in each pilot county. It was hoped that the success of a dozen farmers would get the program off the ground.

Woodford County was one of the 10 pilot counties. Twelve farms began using conservation tillage in the county in 1967. Since then the practice has spread to more than 60,000 acres of county land.

Woodford County farmers who use conservation tillage do not all follow the same procedure. Do you have to shred the residue? What tillage implement should you use? Does it pay to further cultivate the soil after the original single tillage? Every farmer seems to have his own answers, and every farmer experiments.

"Last fall I chopped the stalks and put on fertilizer. I chisel plowed once. In spring I put on liquid fertilizer and herbicides;

then I planted with a no-till planter. I didn't do any cultivating after the planting." The speaker, Leland Klein, paused, and then continued, "I did cultivate some other fields, and it was cleaner where I cultivated."

Keeping his fields clean—preventing weeds from growing up around his crops—is important to Klein. There's some feeling that the undisturbed soil of conservation tillage is more amenable to weeds. And, as the SCS district conservationist in Woodford County, Henry Blunier, well knows, "If a farmer can't keep weeds out, he won't care about minimum tillage—he'll go back to plowing."

Most farmers in the county are satisfied with their weed control. Earl Bowald, for example, reported, "My tillage involves either shredding or discing stalks and chisel plowing in the fall. I get tremendous weedkill using this tillage system and chemicals."

A potentially more serious threat than weeds was posed in 1970 by corn blight. Would the 1970 corn residue infect the 1971 crop? "A lot of farmers were afraid it would, but it didn't," reported Blunier.

Other possible disadvantages of minimum tillage—increased insect pests and a cooler soil in spring—were not apparent in Woodford County.

There has been some question in the county about whether to shred or chop or merely chisel the residue. Running a chisel through a soybean field, it seems, is sufficient to break up residue, but some farmers feel that the heavier cornstalks should be shredded. Others have decided that shredding is an unnecessary expense.

Bob Kennell stated, "I used to shred but no more. It's not necessary." Leland Klein also is content to chop the stalks with a disc: "By spring the stalks pretty much break down into the soil."

Blunier and the county extension agent, W. M. Sager, suggested that even chopping might not be needed. Sager said, "It's not necessary to chop the residue, provided the chisel is adjusted so that it will not be clogged by stalks."

There is no question about the advantages of conservation tillage. The advantage most farmers talk about is increased yield. Blunier admitted, "If a farmer doesn't think he'll get at least as high a yield as he would with conventional plowing, he won't try it." But Woodford County farmers, for the most part, are satisfied with their yields.

"One farmer," related Blunier, "used conservation tillage on part of his land and, with everything else the same, increased his yield by 8 bushels per acre. Now, that's not true everywhere, but I'd rather have them get 8 bushels more than 8 bushels less."

A second advantage is the savings in time and labor. There are the expected benefits from decreased use of tractors and other machinery, and the unexpected benefits, such as Bob Kennell got through decreased erosion: "We saved ourselves a lot of maintenance work on our waterways. Since we started this tillage, they've stayed in fine shape. In 4 years, no erosion, no sediment."

The biggest advantage lies in the protection that minimum tillage gives the soil. Earl Bowald, looking over his farm, put it this way: "This field has lots of little ridges in it, so erosion has always been a problem. Now, with this tillage, I can get the erosion under control."

About 30 percent of Woodford County is under conservation tillage, which means that about 70 percent is not. "The methods our grandfathers used are strongly implanted in many men," said Sager, the extension agent. "To us this new tillage method is a technical change; to others it's a social change."

So there is doubt and speculation about minimum tillage mixed with appreciation and enthusiasm. But early returns are in, and they indicate an eventual landslide for this revolutionary practice. ♦

A choice: a plowed field (top, left) and the sheet erosion and soil blowing that invariably follow; or a minimum tilled field (top, right) and a soil protected by a cover of crop residue.
A chisel (left): it opens up and loosens the subsoil, yet protects the topsoil.
The harvest (bottom): minimum tillage increased a farmer's corn yield by 8 bushels per acre.

Mud and more mud . . .

Highway builders keep sediment on site during construction

By John Robb
Assistant state conservation engineer, SCS, Harrisburg, Pa.

Stemming the flow of mud from a major highway construction site during the bad weather of a mid-Appalachian winter is a problem to make engineers, contractors, and conservationists wonder if there aren't easier ways to make a living.

But when the people concerned with a project join their efforts in a common purpose they can greatly reduce erosion and sediment even as work progresses under the most difficult circumstances.

They did it on the 70-acre Campbells Run highway interchange near Pittsburgh, Pa. If it could be done there, it can be done elsewhere.

The project plan called for moving 6 million cubic yards of earth. Work started in the fall of 1969. When bad weather slowed construction, it was obvious that it did not slow erosion. Flood-control structures downstream and the growing public concern for the environment made it imperative that sedimentation be held to a minimum.

A meeting was arranged between the contractor, Glasgow Inc., of Glenside, Pa.; the resident engineer of the Pennsylvania Department of Highways, Jim Donovan; a representative of the Pennsylvania Department of Forests and Waters, Vernon T. Houghton, Jr.; and other concerned agencies, including the Soil Conservation Service. Together, they worked out methods of reducing erosion while work proceeded as well as while work was stopped by bad weather.

The deep, narrow valley of Camp-

Contractor, engineers, and conservation officials gave sediment control top priority in Campbells Run interchange.

Trees cleared from site helped check runoff.

bells Run makes installing of sediment-control measures unusually difficult. There is no room for conventional debris basins on the main stream, and the side tributaries are too steep for their use there. Since it was winter, seeding of temporary vegetation was impractical.

A series of horizontal benches and diversions, which would double for haul roads, were installed. They were laid out in broken patterns so no direct runoff would enter Campbells Run. The runoff water from the site was passed through a series of desilting basins.

An abandoned bridge near the lower end of the construction area was used to anchor a dumped-rock dam to trap and hold sediment. The basin will be cleaned when storage capacity is filled.

Burning of timber is not permitted in the Pittsburgh airshed area. To dispose of trees cleared from the site without causing air pollution, the contractor used the trunks to construct barriers upstream from the rock dam, thereby slowing the flow of runoff.

The limbs and brush were used to make additional barriers, which proved effective in removing sediment from the runoff of small storms.

Diversions which protect slopes from erosion also protect work areas where culverts are being formed and poured. They are relocated as necessary as the work progresses. Damage to control measures by unusually heavy storms is promptly repaired.

Campbells Run demonstrates that pollution and sedimentation can be controlled during construction even under difficult conditions. ♦

Soil and water conservation is big business

In numbers of machines, equipment hours, operator time, supplies, and quantities of earth moved, the magnitude of soil and water conservation action challenges the imagination.

Machines in any one year move 1 billion cubic yards of earth in installing the wide range of conservation practices required. This includes 258 million cubic yards for earth dams, 212 million for grassed waterways and channels, 82 million for terracing, and 352 million for land grading, leveling, and smoothing.

Other practices in conservation require additional amounts.

What does it take to move this mountain of earth each year? A survey completed in 1968 showed that conservation contractors, individual landowners and operators, and soil conservation districts own 457,000 pieces of equipment used primarily to install and maintain conservation work.

About 143,000 pieces of equipment are of the heavy construction type: Bulldozers, track-type tractors, heavy wheel-type tractor draglines, backhoes, motor graders, and tiling machines.

Remaining categories include carryalls, special plows, terracing machines, tree planters, special drills, and landplanes.

Into the conservation effort each year go 425,000 cubic yards of concrete, 3.9 million feet of corrugated metal pipe, 15 million feet of concrete pipe, 19 million feet of pipe of steel and other materials, 11 million feet of small-diameter water pipe, 120 million feet of tile, and 14 million feet of aluminum sprinkler pipe.

Getting vegetation on 4.3 million acres of pasture, critical erosion areas, and rangeland requires the spending of $111 million for seed, fertilizer, and lime.

For the protection and proper mangement of range, landowners install 14,000 miles of fence.—R. C. BARNES, *Engineering Division, SCS Washington, D.C.* ♦

"This is public land—your land and mine"

Road cuts and fills can be promptly stabilized with vegetation; in this case crownvetch was used.

Roadside erosion survey

Secondary roads account for most of sediment pollution coming from Wisconsin highways

By William M. Briggs
Conservation agronomist, SCS, Madison, Wis.

The eroding sections of Wisconsin roads, if joined end to end, would extend from the capital city of Madison to New York city, then back across the continent to Los Angeles.

This isn't to say that Wisconsin has more roadside erosion than any other state but that conservationists here have made a systematic survey of the situation and can name places and cite figures.

The inventory shows something more than 21,000 sediment-producing sites on the state's 87,000 miles of roads—a total of 3,711 miles of bare banks in an average of four locations in each mile. Figuring an average width of 16 feet, their combined area amounts to nearly 7,300 acres.

This is public land—your land and mine! Much of it drains directly into lakes and streams. For many years, students of sedimentation have recognized roadside erosion as one of the principal sources of the material progressively filling and fouling our surface waters. The survey gives a clear picture of the problem in this state. The inventory is believed to be the first of its magnitude in the Nation.

The Wisconsin Chapter of the Soil Conservation Society of America initiated this project in 1967. A subcommittee of the Natural Resources Council of State Agencies drew up procedures for a 100 percent inventory of all rural roads in Wisconsin.

Each county organized a local committee. Participating personnel and agencies included the Soil Conservation Service, Extension Service, Forest Service, Wisconsin Department of Natural Resources, Wisconsin Department of Transportation, Wisconsin Department of Local Affairs and Development, soil and water conservation district supervisors, County Agricultural Stabilization and Conservation Service committees, and county officials of Farmers Home Administration. Other local, state, and federal agency people frequently helped. The SCS district conservationist generally served as chairman. A number of county Technical Action Panels

Roadside Erosion and Control Needed in Wisconsin

Control needed	Town Acres	Roads Percent	County Acres	Roads Percent	State Acres	Roads Percent	All Acres	Roads Percent
Fertilize, seed, and mulch	2,640	50	1,130	64	150	69	3,920	54
Slope, fertilize, seed, and mulch	2,140	40	490	28	50	22	2,680	37
Structure, slope, fertilize, seed, and mulch	520	10	150	8	20	9	690	9
Totals	5,300	100	1,770	100	220	100	7,290	100

(TAPs) chose this as a special project.

Tabulations for each eroding area included length, width, and total area in square feet. Surveyors marked each location in a plat book now filed in SCS work unit offices. Compilations by townships were sent to the state committee for checking, then the information was summarized on a county and state basis.

Town and county roads account for 97 percent of all roadside erosion. Nearly three-fourths (73 percent) occurs along town roads; one-fourth (24 percent) along county roads; and the remaining 3 percent along state roads. Vegetation along state roads generally rates excellent.

The published report gives a state summary and a breakdown of the findings by counties. Tables include extent of erosion along roads—town, county, and state. One table ranks the 15 counties with the most erosion. It shows that one-third of all roadside erosion is found in six counties, and more than half occurs in 15 counties.

Persons making the inventory indicated the control needed on each eroding site. Total figures show that more than half (54 percent) of the sites could be controlled by fertilizing, seeding, and mulching. More than one-third (37 percent) requires sloping, fertilizing, seeding, and mulching. The balance or nine percent needs "the works" including structures, sloping, fertilizing, seeding, and mulching.

Only areas of more than 100 square feet were recorded. The figures, therefore, do not represent all of the roadside erosion. The committee prepared individual county supplements for town and county officials. These tabulate erosion along town, county, and state roads on a legal township basis.

Local news media publicized the survey widely and created an awareness of the problem. People and organizations have started an "action" program. Soil and water conservation districts are recognizing roadside erosion in their work plans. Districts and counties are purchasing hydroseeders and mulchers. Several counties and townships are developing policies for proper control of roadside erosion.

The report, distributed widely, urges local, county, and state officials to take corrective action as soon as possible. Recommendations include:

(1) Develop action programs giving consideration to adopting timetables for achieving adequate control.

(2) Consider purchase and use of specialized seeding and mulching equipment.

(3) Within the next 5 years, control every site reported that is a major source of sediment in Wisconsin's surface waters.

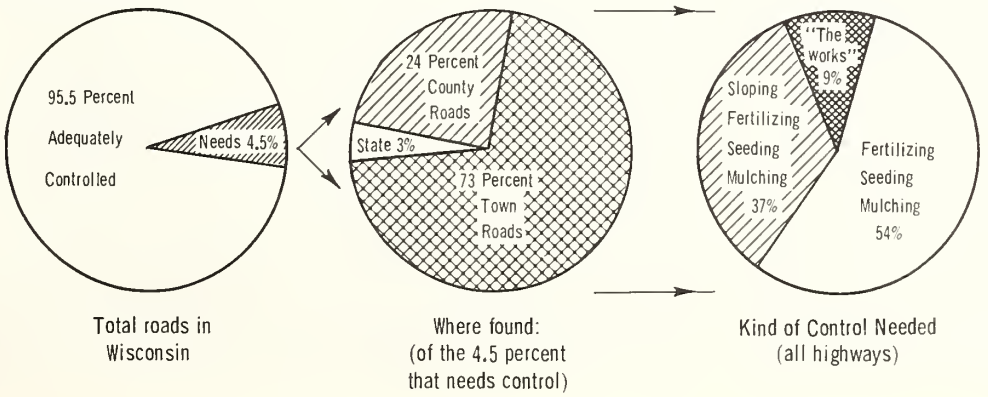
(4) Consider incentive funds of some sort, including any available for public works, as a way to help speed up roadside-erosion control.

(5) Establish vegetation on all newly constructed road cuts and fills. Waiting for natural seeding is too slow. Provisions should be made to secure wider rights-of-way where needed.

(6) Build sediment-retention structures as a part of all new construction. Maintain them until permanent structures and vegetation achieve adequate control.

The time of gathering data proved opportune to collect other pertinent information. Local committees outlined selective brush management sites suitable for maintaining highway rights-of-way in native shrubs. They also recorded unsightly conditions, including dilapidated buildings, auto graveyards (three or more cars), and dumping grounds. These items were reported separately.♦

IN A NUTSHELL:



Streambank erosion

A widespread problem too big for a landowner to handle alone

By R. C. Barnes, Jr.
Agricultural engineer, SCS, Washington, D. C.

Streambank erosion is a major problem along many miles of the Nation's rivers and streams.

It is estimated that there are 300,000 miles of streambanks in the United States subject to erosion and producing about 500 million tons of sediment each year.

Removal of sediment from stream channels, harbors, and reservoirs is costing about $250 million a year. Loss of land adjacent to stream channels is valued at about $11 million annually.

Streambank erosion is a continuous problem on constantly flowing streams, although it may vary in intensity throughout the year. On intermittent streams, erosion occurs each time floodwater flows down the stream channel.

Damage is increased by waterborne ice or debris. The problem is aggravated by poorly placed manmade structures, overgrazing, and other factors that affect runoff and streamflow.

The damage is evident in many ways: in undercut streambanks, caving and sloughing of adjacent land, and loss of crops and of buildings, fences, and other physical improvements. It shows in the raw scars left to mar the beauty of the surrounding landscape.

An expensive problem

One of the end products, and a costly one to man, is the sediment produced by streambank erosion. This sediment fills streams, waterways, and harbors; increases flooding; smothers crops; and spoils the habitat for fish and wildlife.

Sediment affects municipalities by increasing the cost of filtering and processing water for municipal and industrial use, causing extra wear on pumping equipment, and creating the need for extra maintenance of roads, bridges, parks, and related facilities.

A survey report, "Conservation Treatment of the Dry Creek Watershed, Sonoma and Mendocino Counties, California," estimates that the sediment produced from streambank erosion in the 313 miles of tributaries in the watershed, with a drainage area of 130 square miles, amounts to about 164,000 tons annually. It is further estimated that, with proper treatment of the streambanks where needed, this amount could be reduced by 74 percent to about 39,000 tons a year.

Streambank erosion - control methods must vary with different conditions. In humid areas, control of live streams is mainly by the use of vegetation supplemented by mechanical measures. In semiarid and arid areas, protection is primarily by mechanical means.

Control methods

Mechanical erosion-control measures usually fall into two general classes: (1) Those which retard flow along the bank and promote

With the bank sloped and the lower part protected by rock riprap, this section of Buffalo Creek in New York is being stabilized with vegetation. The costly effects of streambank erosion are illustrated (opposite page) on a farm in Louisiana where the Red River cuts away a strip of land 200 feet wide in 3 weeks.

Group projects and cost-sharing get the job done

deposition, and (2) those which form a cover and protect the bank from direct action of the current.

Permeable jetties constructed of piling, rock, trees, or other materials are examples of protection causing deposition. Jetties may be designed either to deflect the current away from the bank or to reduce its velocity adjacent to the bank to a degree that erosion is halted.

Living vegetation, brush matting, rock riprap, concrete, and asphalt linings are examples of protective bank cover.

Streambank-erosion control usually requires group action by the landowners affected, since the problem extends beyond any one owner's control.

The Soil Conservation Service provides limited technical assistance through soil and water conservation districts for streambank-erosion control as a part of regular conservation operations.

SCS also provides technical and financial assistance to individuals and groups of landowners to treat streambanks in approved watershed projects. The Buffalo Creek Project in western New York is an example of what can be done with adequate planning and installation through project action.

Project action

Buffalo Creek watershed covers an area of 437 square miles. The problem was mainly erosion of roads and farmland and of streambanks. The resulting sediment was being deposited in Buffalo Harbor where it interfered with shipping and had to be removed at great expense. This public damage justified Buffalo Creek as one of 11 flood-prevention watersheds authorized by the Flood Control Act of 1944. The sponsor was the Joint Board—Erie Wyoming Soil and Water Conservation District.

Stabilization work on Buffalo Creek consisted generally of bank-sloping, riprapping the lower toe of the slope, and planting the upper bank to adapted grasses and shrubs. Some 59 miles of channel were treated.

A study by the Agricultural Research Service showed that the amount of sediment that had to be removed from Buffalo Harbor was reduced by 24 percent by 1963, when 75 percent of the project was completed. Studies are continuing since completion of the project.

Teamwork by landowners

The teamwork approach in stabilizing streambanks is also being used by landowners using their own funds supplemented by cost-sharing from other sources. For example, cooperators of the Little Snake River Soil and Water Conservation District, Wyoming, are making use of technical help from the Soil Conservation Service and financial aid from the Agri-

Rock riprap is being laid at the base of a section of Buffalo Creek, N. Y., after bank sloping (upper). Vegetation alone has stabilized the sloped banks of Stillwater Creek in Kentucky (middle).

cultural Stabilization and Conservation Service. Timely streambank-protection measures there averted serious damage to irrigation canals that carry water to about 60 ranches in the valley. Blankets of trees or rocks and rock jetties were used to keep erosive currents away from the banks.

The Agricultural Stabilization and Conservation Service gave financial assistance to 3,623 streambank-stabilization projects in 1966. SCS reports indicate that treatment was accomplished on 469 miles of eroding streambanks.

When compared with the total job to be done, the rate of accomplishment is much too slow.

At the present rate of treatment, it will require some 600 years to treat the Nation's eroding streambanks. Methods of controlling streambank erosion are known. The costs are high and generally beyond the means of individuals or groups. Broad public interest is involved where erosion occurs along streambanks. This problem requires additional governmental action in cooperation with private landowners if it is to be solved. ♦

A combination of heavy boulders and vegetation (right) were used to tame a cutting bend in a western stream, the White River in Rio Blanco County, Colo.

Erosion-control program comes to rescue of housing project

By Moses Taylor
Soil conservotionist, SCS, Moundsville, W. Va.

Children in the Moundsville Housing Development, Moundsville, W. Va., used to be able to play house in backyard gullies. But their housing situation changed after concerned citizens and officials moved in to control erosion.

Fescue and crownvetch now cover most of the 20 to 30 percent slopes in the 10-acre public housing project. For 3 years, the tract was a critical sediment source. Mud holes, craters, and gullies scarred the site soon after building first exposed the highly erodible silt loam soil in January 1966.

By June 1966—more than 6 months before the project was completed—people began to move in. Their traffic added to the disturbance initiated by bulldozers. All 75 apartments were occupied a year later when erosion was at its worst. Because of limited funds, landscaping and the roof drain system could not be completed. Erosion eventually ruined final grading on 5 acres of bare soil around buildings and streets after construction was completed in January 1967.

Alarmed by conditions during and after construction, the Moundsville Housing Authority and the Northern Panhandle Soil Conservation District joined in two erosion-control projects.

The first was begun in the fall of 1967. Plans for grading, adding topsoil, and seeding the site were prepared by the Soil Conservation Service and the county extension agent. The city of Moundsville loaned earthmoving equipment. Organic matter was donated by the local mushroom plant. Six teenage boys from the local Neighborhood Youth Corps put in 240 man-hours hand seeding some of the lawns in the development.

The pilot project convinced local officials that the job could and should be done, but that it would take more than volunteer help and a few dollars' worth of seed. After another series of meetings, action began again in September 1968.

The housing authority contracted to have the site regraded and the drainage system completed. Then a district labor crew, headed by District Supervisor Hubert L. Mason, spent 431 man-hours carrying out a plan developed and supervised by the Soil Conservation Service. It took 500 pounds of seed; 33 tons of lime; 2,500 pounds of fertilizer; 1,500 cubic yards of topsoil; 600 bales of straw; and 500 yards of fiber netting.

Today only minor maintenance is needed to keep the stabilized slopes in good condition. Determined to avoid similar problems in the future, the Marshall and Ohio County planning commissions have established cooperative relations with the Northern Panhandle Soil Conservation District to make soil surveys and other technical information available in advance of starting new developments. ◆

Froncis Kolz, district crew member (left), ond Moses Toylor, SCS soil conservotionist, loy netting over o criticol oreo seeded ond mulched in November 1968. Below, Kolz looks over o finished job consisting of strow mulch, Bemis netting, ond 2 by 4 plonks set into o steep slope.

An "ounce of prevention" can prevent wind damage

By Deane Meredith
District conservationist, SCS, Bay City, Mich.

The year 1965 was one of considerable loss for ill-prepared producers of sugar beets in some areas of Michigan.

Some 8,000 acres of sugar beets were literally blown out by wind.

It was the year, too, when a growing number of Michigan farmers began work on measures to protect land and crop from a repetition of the loss.

Conditions are ripe for a repeat performance in the beet-growing areas of the state. Fields are larger. Bigger equipment makes it possible to have more land ready to blow at a time. About 2,000 acres in Bay County are tiled for drainage each year. And more farmers are growing crops such as beets and beans which return less protective residue to the soil than grain or hay.

In setting out to prevent a recurrence of the 1965 setback, the beet grower usually inventories his land, identifying those areas with a tendency to blow. Next, the farmer plans for protection as a part of a crop rotation, not something to be done if time permits.

Wind-erosion control is accomplished by (1) providing a protective condition on the surface of the soil or (2) reducing the wind velocity to a nonerodible rate.

One practice which will do the job and provide more permanence than annual measures is a tree or shrub windbreak. A windbreak will protect an area of 15 to 20 times its height. The protection it gives more than pays for its cost in taking up productive land. The Soil Conservation Service at its Rose Lake Plant Materials Center has many varieties of plants on trial to find those best suited for windbreaks.

Because of the time it takes before a tree windbreak offers adequate protection, temporary practices must be put on the land. Strips of grain such as oats planted in spring or rye planted in fall give protection to the beet crop. Generally these strips are planted at a rate of 2 bushels an acre, every other row of beets.

Buffer strips of rye, 7½ feet wide and spaced not more than 75 feet apart, will lower the wind velocity and trap moving particles. The open area can be reduced to less than 75 feet. The grain strip should be 10 percent of the open areas. These buffer strips can be planted the preceding fall or left when plowing a rye cover crop in spring.

Ridging the soil or leaving it in rough condition will lower the surface velocity of the wind. If soil lumps are doubled in size, it takes a wind eight times stronger to cause the same erosion.

A promising practice being used by an increasing number of farmers is fall-seeded oats. After working the land in the fall, oats are sown at a rate of 2 to 3 bushels an acre, depending on the soil and time of planting. On lighter soils beets then are planted the following spring through the oats with no previous tillage. On heavier ground, tillage may be necessary to prepare a good seedbed. Weeds are controlled with carefully applied herbicides.

Practices such as farming north and south, leaving residues on the surface, and keeping the soil in a rough condition can be done with little change in the accustomed farming operation.

Most farmers are aware of the crop damage and soil loss caused by wind erosion. If the wind carries away a layer of soil the thickness of a sheet of paper, the loss is equivalent to 3 tons an acre. Some effects of the erosion are less readily apparent, such as reduced soil fertility. Soil samples taken 8 feet above the ground during a duststorm showed a fertility level of 2½ times greater than the field from which the soil came, indicating that the wind sorts and carries away the most fertile soil particles.

Another loss that can be reduced by slowing the wind velocity is related to moisture. A study in Nebraska showed that per-acre yields for sugar beets increased from 21.0 tons to 26.5 tons when the beets were planted between double rows of corn spaced 50 feet apart. ♦

A row of rye between every other sugar beet row cuts wind erosion.

erosion controlled on carlot

By Raymond E. Bryant
District conservationist, SCS
Morristown, Tenn.

In spring 1969, Lon F. Price of Morristown, Tenn., moved his automobile dealership to a new location. Along the edge of a newly paved parking lot was a steep bank that had been neglected during construction. The bank began to erode under spring rains, and soon large gullies appeared. Within a few weeks the lot was being washed away.

After seeking advice from many sources, Price went to the Hamblen County Soil Conservation District and the Soil Conservation Service for technical help. The SCS district conservationist visited the site and recommended protective vegetation and concrete waterways to carry runoff safely from the lot.

In 6 months, part of the area had been stabilized by sodding, and the rest had been smoothed and seeded.

Price has been an affiliate member of the Hamblen County District for several years. Until his erosion and sediment problems came up, there had been no occasion to ask for help. "I appreciate the help and professional advice I received," said Price.

Price has set an example for

others in commercial, industrial, and urban areas by stopping ugly and expensive erosion. He also has added to the beauty of his property and of the surrounding area. The entire community benefits from this kind of conservation work. ♦

Erosion had been eating away at the parking lot before the steep banks were stabilized and seeded. The asphalt-paved drop chutes and the concrete waterway (above, left and right) carry runoff safely off the lot. (Right) Kentucky 31 fescue and ryegrass keep the soil on the slope and out of sewers, storm drains, and streams.

A new look at sediment control

by David G. Unger
Assistant executive secretary
National Association of Conservation Districts
Washington, D.C.

Last summer, Governor Robert Docking of Kansas called together 150 of the state's leaders in agriculture, conservation, land development, and local, state, and federal government. The occasion was the Governor's Conference on Sediment Control —the first in a series of institutes to be held in most of the states by the end of 1973.

The purpose of these conferences is to examine anew the problem of erosion and sedimentation, explore programs underway in several states to intensify sediment control work, and encourage action by all the states. State associations of conservation districts and state soil and water conservation agencies are sponsoring the institutes, with help from the National Association of Conservation Districts (NACD), the Environmental Protection Agency (EPA), and others.

Among the key topics of discussion at these institutes are recent federal proposals, which if enacted, would require the states to establish mandatory sediment control programs. Another is a model state act for soil erosion and sediment control in both rural and urban areas prepared by the Council of State Governments.

The decision in Kansas was to appoint a task force responsible for recommending legislative and other actions that can be taken to strengthen that state's work in this field. Similar actions are expected to result from institutes that have been held in Oklahoma, Louisiana, Oregon, West Virginia, Montana, and Minnesota and from others that will soon be held in other states.

The idea for the conferences goes back to the National Conference on Sediment Control held in 1969 in Washington, D.C., by NACD, the Soil Conservation Society of America, and the National Association of Counties. It received further impetus from educational meetings on sediment control held in Michigan, South Carolina, and North Carolina. Let's review some of the history behind the concept.

During the past decade, those of us engaged in conservation have witnessed a re-interpretation of some basic concepts. One of

David G. Unger was one of the speakers at the first conference on sediment control, which was held last summer in Salina, Kansas. Lyle Bauer, treasurer of the National Association of Conservation Districts, is seated on the left, and D. D. Holland, an SCS geologist, is on the right.

the results of this re-interpretation is that today we are concerned more directly with "sediment control" rather than "erosion control."

Back in February 1937, when President Franklin Roosevelt wrote to the governors of all the states encouraging them to support legislation to create soil conservation districts, he said:

"The dust storms and floods of the past few years have underscored the importance of programs to control soil erosion. I need not emphasize to you the seriousness of the problem . . . The nation that destroys its soil destroys itself."

Today, when we talk about sediment control, we are describing essentially the same problem, but we are approaching it from a different direction. We are looking at it not so much from the standpoint of how the soil is washed away, but how it affects people on the way downstream and where it comes to rest.

Sediment control is not a new topic to conservation districts. It has been a principal concern of ours for 35 years. What *is* new is that today when we consider sediment control we deal with it in terms of pollution control as well as the preservation of soil as a productive resource.

Sediment has been declared the nation's greatest pollutant of our streams and lakes, by volume. The USDA Agricultural Research Service estimates that 4 billion tons of soil materials are washed into tributary streams in the United States each year. The storage capacity of manmade reservoirs in this country is being reduced at the rate of about 1 million acre-feet each year. The material being dredged annually from waterways of all kinds is estimated at three-quarters of a billion cubic yards.

What are the consequences? First, there is the irreparable loss of soil at the source, soil that has usually taken many thousands of years to form. Second, sediment and the pesticides, plant nutrients, and other materials that are carried with it pollute streams

and impair the processes of water purification and distribution. And third, sediment causes damage where it comes to rest, detracting from recreation, damaging fish and wildlife habitat, and making necessary large public expenditures for its removal.

What has been happening in recent years to deal with the problem? First, there has been action by municipal and county governments. In many places across the country, local governments have enacted ordinances requiring builders and developers to reduce erosion on construction sites in cooperation with conservation districts.

Second, the Federal Highway Administration has issued standards which require use of various erosion prevention techniques in the construction of new federal-aid highways.

And third, several states have enacted laws providing for various kinds of accelerated and intensified sediment control programs, all of them to be carried out with the assistance of soil and water conservation districts and their cooperating agencies. Maryland, South Carolina, Ohio, and Iowa have passed such laws, along with the Virgin Islands. Similar laws have been drafted and are being considered in other states including Virginia, New York, and Washington.

There are three trends exemplified in these legislative approaches. The first is that soil and water conservation districts are given greater authority to deal with the problem. The second is that although the early laws deal primarily with construction-type erosion, the newer laws are concerned with erosion from farm and forest lands as well. And the third trend is toward an increasing degree of mandatory control in comparison to voluntary action.

Slowly but surely, soil erosion is becoming illegal in this country.

Over the years, conservation district leaders have been proud that 2 million land owners and operators have voluntarily agreed to establish conservation measures that benefit themselves and the public as well. At the same time, we've been aware that increasingly the public has asserted its right to compel those who own and manage resources to do so in a manner that minimizes harm to others and to society at large.

Sediment control, it appears, may well be the testing ground on which this issue is first confronted by soil and water conservation districts.

This is exactly what is happening.

In March 1972, the Environmental Protection Agency and the Council of State Governments prepared to develop a model state sediment control law for submission to the state legislatures.

Here is where NACD entered the picture. Our Special Committee on District Outlook had its own plans to develop model legislation in this field. We joined with EPA and the Council of State Governments in an environmental legislation symposium and hammered out a set of principles to guide the development of model legislation. We persuaded EPA that conservation districts and the state soil and water conservation agencies were by law and experience the appropriate agencies to do the job of sediment control.

Next, we helped put together a task force representing the Department of Agriculture, EPA, state governments, and the NACD to draft a model law.

The model law is premised on two basic recommendations:

"1. Responsibility for an erosion and sediment control regulatory program should be placed in the conservation districts which have the responsibility under the laws of all fifty states for the control of erosion and sediment deposition. This responsibility would be in conjunction with, but would not replace, those state and local regulatory programs concerned with the quality of soil and water resources and pollution abatement activities.

"2. Suggested state erosion and sediment control legislation should be drafted in the form of an amendment to existing conservation districts' enabling laws."

In carrying out its mandate, the task force critically reviewed each provision of the model law from the standpoint

of practicality and efficacy in achieving the desired objective of the legislation. Recognizing that any model act must be tailored by each state to comply with its constitutional and statutory requirements, the task force endeavored to set down in as clear and straightforward a manner as possible the essential requirements of an effective soil erosion and sediment control law.

Principal authorities and requirements of the model law include:

1. Establishment of a comprehensive state soil erosion and sediment control program applicable to different types of land use and soil conditions, with identification of areas having critical soil erosion and sediment problems; and adoption of statewide guidelines including conservation standards for the control of erosion and sedimcnt resulting from land disturbing activities.

2. Establishment of district soil erosion and sediment control programs and conservation standards consistent with the state program and guidelines.

3. Prohibition of certain land disturbing activities unless conducted in accordance with approved soil erosion and sediment control plans with special requirements applicable to land disturbing activities resulting from normal agricultural and forestry activities.

4. Use of existing regulatory mechanisms, such as building, grading, and other permits applicable to land disturbing activities to implement erosion and sediment control plan requirements.

5. Inspection, monitoring, and reporting requirements. Provision for modification of approved plans by mutual agreement.

6. Penalties, injunctions, and other enforcement provisions.

7. Provisions for cost-sharing.

8. Appropriations to carry out the act.

Dale Cochran, minority leader of the Iowa Legislature and a strong supporter of the conservation district program, presented the model law to the Council of State Governments. It was accepted unanimously and has been distributed to the state legislatures—along with other environmental legislation.

The next step is up to the conservation districts of this country. They need to decide how important sediment control is in their districts, what needs to be done about it, and whether this law—or a variation of it—is a good approach. The time is ripe for districts and state soil and water conservation agencies to exercise their authorities and responsibilities in this field.

To help explore this question in every state, NACD has secured a contract from the Environmental Protection Agency to help sponsor the sediment control institutes. These are bringing together district officials, county and municipal officers, state legislators, farm organizations, builders and developers, and representatives of state and federal agencies and organizations to discuss the problem of sediment control, the action that has been taken in other states, and the model legislation.

All indications are that the public will demand that sediment, like other pollutants, be controlled. Regulatory programs in this field are inevitable, and this is borne out by the actions being taken in states that have legislated in this area. The questions that remain are who will carry out these programs, and how.

This complex and significant issue of sediment control is sure to dominate discussion in the soil and water conservation movement for some time to come. Its resolution should constitute one of the major developments in the history of conservation districts. ♦