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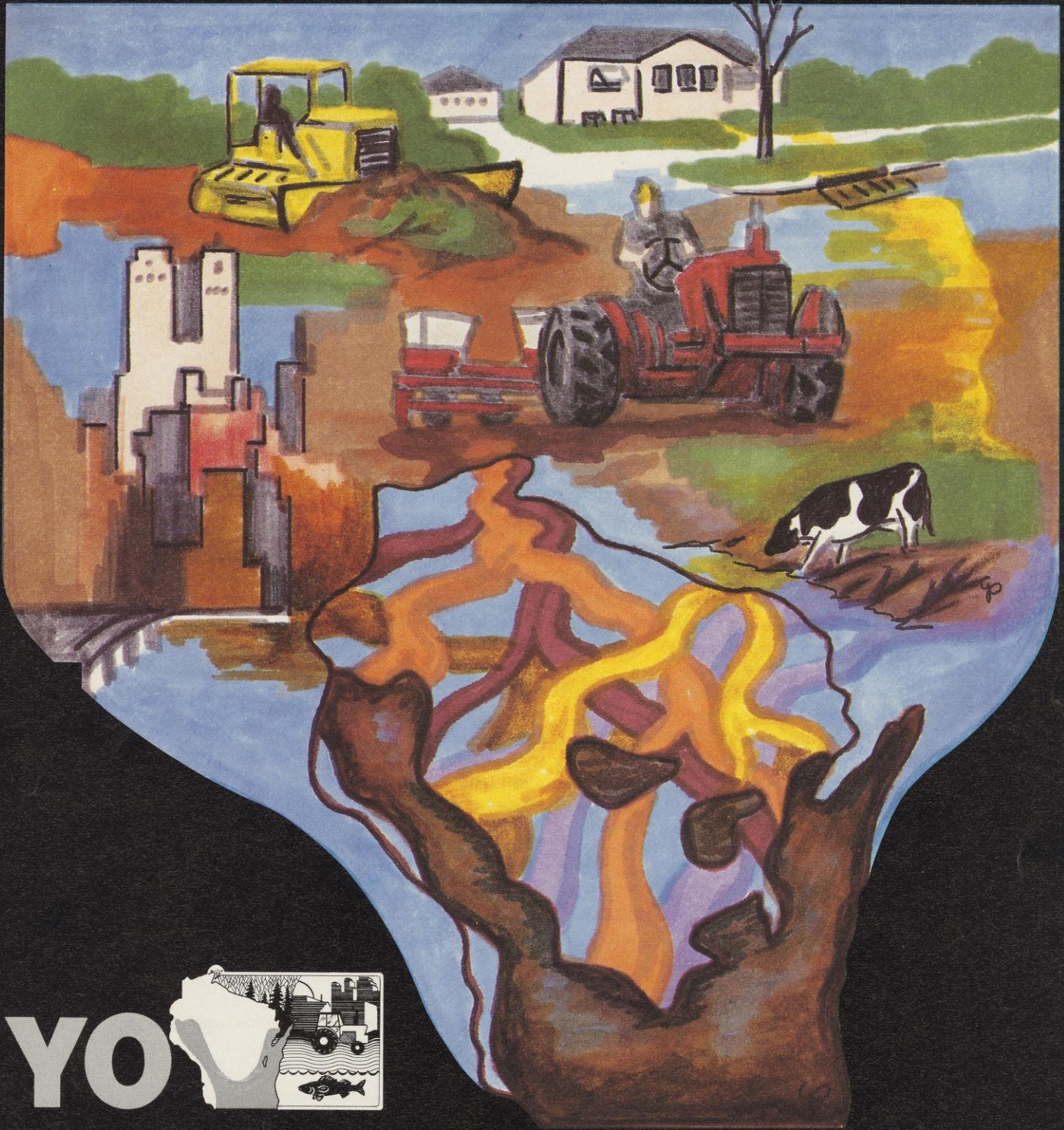
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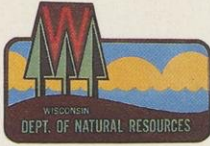
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All riled up

Nonpoint source pollution: The point of no return



can clean it up



The nonpoint "U" and you

Silt and pollutants carried in runoff from Wisconsin's cities and farms are irretrievably mucking up some of Wisconsin's most valuable recreational lakes and streams.

The shape of the problem forms a "U" on the map and emphasizes the fact that "YOU" are the one who has to do something about it, if things are to get better. The endless tons that drain from croplands, barnyards, stream banks, construction sites, city streets and other places originate in so-called "nonpoint pollution sources." Unlike sewage plants, factories or other "point sources," they are diffuse, widespread and tricky to track down or clean up.

A recent DNR report identified the places where lake and stream damage from nonpoint sources threaten most. This critical "U"-shaped swath tracks along the state's western, southern and eastern borders.

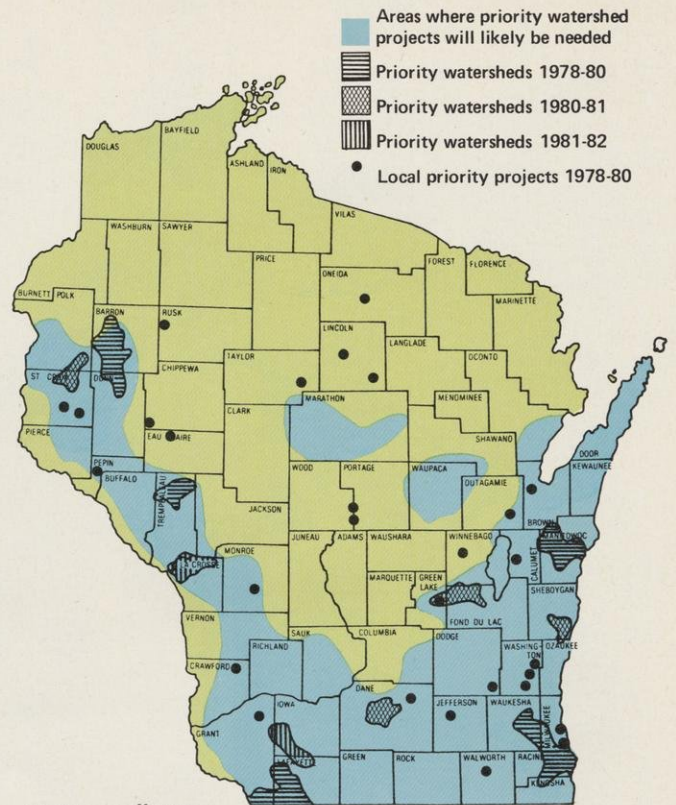
The "U" begins on the west in Polk County along the Mississippi River where many deep, high-quality lakes are dumped on with pollutants from dairy farms. It sweeps down through the Mississippi River counties, where agricultural runoff chokes trout streams, millponds and backwaters, then hooks east and north.

In some of the driftless counties — Grant, Lafayette, Iowa and Green — the nonpoint pollution load has all but smothered many once-famous smallmouth bass streams. Waters that teemed with healthy fish only 15 years ago contain few or none today.

Farther east, the "U" takes in lakes around Madison and tributaries of the Rock River where monitoring reveals generally poor water quality. The "U" dips into cornland counties along the Illinois border and includes some of the most-productive and most-erodible land in the state.

Also hurting are Wisconsin's large glacial lakes in the southeast. And Lake Michigan itself! All the way from Kenosha County north to the Door Peninsula.

Outside the "U," Marathon and Waupaca County



waters suffer too.

Overall, 130 of Wisconsin's 330 watersheds fall inside the "U"-shaped danger zone. It contains more than 120 deep-water lakes, about 3,500 miles of prime Class I and II trout streams (40% of the state's total), more than 1,600 miles of smallmouth bass streams, the harbors and shoals of Lake Michigan and the backwaters of the Mississippi River.

Within this nonpoint-polluted "U," the nuisance weeds and algae choking the life from your lakes are often pretty obvious. But just as often, the impact is inexorably subtle and gradual. It may take a decade or two for the change to become apparent. Fish populations slowly decline and harbors and shallow lakes fill up with sediment. Over the long run, use of the waters is severely impaired; will perhaps be irreversibly lost.

Without some speedup in the state's commitment to water quality, a massive nonpoint muck-up is in the offing. YOU can help prevent it.

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When a watershed is gripped by nonpoint source pollution

DALE MARSH, DNR Watershed and Land Resources Specialist

To preserve a river, it is necessary to protect small streams. From this simple fact the Wisconsin watershed approach to nonpoint source water pollution abatement was born. The "care and feeding" of water, which is to say the management of water quality, begins while the raindrops are still overhead, and continues until the water is free of man's influence — if, indeed, escape is ever possible.

To begin with, the raindrop must be clean. It must be uncontaminated with airborne acids, dust and other foreign substances. This need is entrusted to air pollution control. Thus, it is clear that all fundamental environmental concerns are related to each other in a complex pattern of finality. It is imperative to understand and control the weave of that pattern if we expect to bequeath a healthy productive land to our children.

Barring failure to control pollution of atmospheric water, the next concern in water quality management is for the raindrop to light on a cushioned surface so that its kinetic energy is dissipated without blasting soil particles loose. The most perfect, freely provided surface cushion is natural native vegetation. Natural vegetation is characterized by the fact that every niche in the landscape is occupied by something that shields the soil. Therefore, a basic tenet of water management is to preserve as much protective vegetation over the watershed as practical, particularly on the steeper, highly erodible slopes. Regrowth of forests and protection from grazing may be pivotal needs in reversing an adverse water quality



pattern. And although Wisconsin's famous north woods are a classic example of forest restoration, the security of water quality lies equally in the fate of the state's southern woodlots.

In modern times, the human population is so large that vast tracts of the earth's surface must be devoted to food-producing monocultures. For example, the US, which is a nation of moderate population growth, had 140 million people at the time of WW II. Today there are 220 million. Simultaneously, cropland monocultures here increased by 80 million acres. These monocultures of corn, wheat, beans, cotton and other crops are altogether inferior for soil protection. Lands in annual crops are vulnerable to the blasting raindrop throughout most of

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A basic tenet of water management is to preserve as much protective vegetation as practical, particularly on erodible slopes.

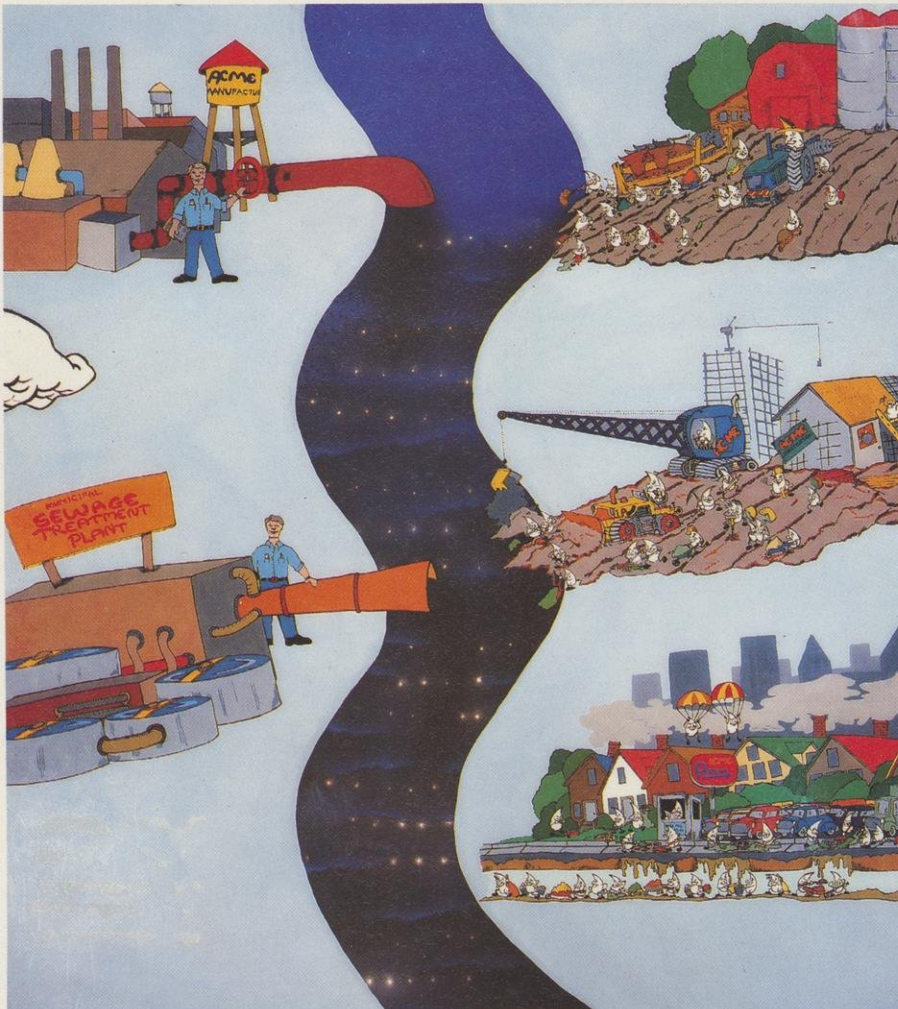
DNR photo



Need a consistent,
quicker cleanup

The turning point for nonpoint source pollution

Point source



Nonpoint source

*JOHN KONRAD, Chief, DNR
Nonpoint Source Section*

Wisconsin's Nonpoint Source Water Pollution Abatement Program was created in 1978. It works on the land through so-called "Priority Watersheds" in which educational, financial and technical assistance is given to individual property owners, cities and villages. The objective is to reduce soil erosion, manage manure and control stormwater runoff, all of which cause water quality problems. There are also smaller "local priority projects." In these, water quality damage done by nonpoint sources covers only limited areas of about five to 10 square miles, as compared to a complete watershed which is 100 to 150.

To date, because of limited dollars, it's been possible to start only 11 of the big projects. These were selected between 1979 and 1981, based on the severity of water deterioration and the extent of local enthusiasm to do something about it. The smaller projects now total 28, of which five have been completed.

While this is a good start, it's a dangerously slow one. At the current rate of three or four projects a year, lakes and streams we're trying to save could be a lost cause before they ever get attention. Right now, of Wisconsin's 330 watersheds, lakes and streams in 130 are seriously degraded or threatened and in desperate need of help. Without more money sooner, the wait in line for improvement may be 35 to 45 years. By that time, the recreational use of many will be either severely impaired or down the tubes forever. And neglect will make the costs of rehabilitation unbearable because the worse the degradation, the higher the fixup price.

To prevent this dismal scenario, a long term commitment like the one made to municipal sewage treatment is needed. The citizens of Wisconsin and the Legislature must endorse a strategy that speeds up the number of new priority watersheds started annually. DNR recommends a schedule

The dollar commitment to point source cleanup will soon peak and start to decline. Nonpoint sources are equally damaging and an equal commitment to their cleanup is needed if state lakes and streams are to survive.

Artwork by Zdzislaw Sikora

that will complete work on the 130 critical watersheds in 25 years rather than 45, which is the present timetable. If set out in an orderly, systematic fashion, the speedup will allow local units of government to anticipate and plan for the new projects without difficulty.

Costs under this strategy will reach approximately \$18 million annually by 1993. (These are 1981 dollars.) To put this in perspective, \$18 million today will buy a single sewage treatment plant for a medium sized city. Invested in nonpoint, however, it will pay for a year's worth of cleanup work on many, many watersheds in different locations around the state. Put another way, the total cost of the point source cleanup in Wisconsin will be nearly \$1½ billion. Nonpoint source cleanup, on the other hand, will cost less than a fourth of that — \$280 million. But it is equally essential! Sewage treatment plants alone won't do the job. Water pollution abatement is not an either-or proposition. Goals can be met only if both point and nonpoint sources are controlled. Wisconsin taxpayers, however, will not be forced to bear the entire burden of the two cleanups simultaneously. Control programs for most point sources in the state will have been initiated by 1983. Thus,

funding needs for the one will phase out while the other phases in.

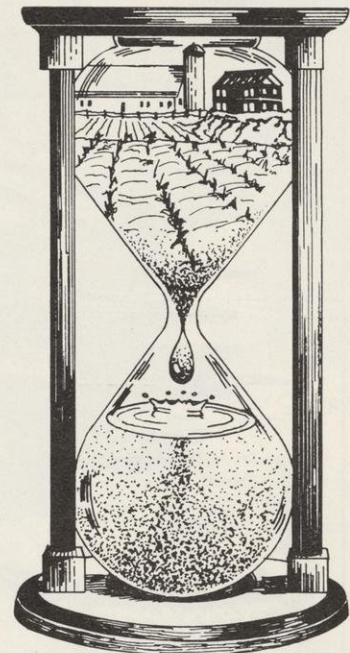
The working framework for the nonpoint program has two main features:

1. A coordinated approach to water quality management. This means that municipal, industrial and septic system sources will all get the attention they need, along with nonpoint sources, to achieve cleanup. It also means that objectives for agriculture, fish, forestry, wildlife, wetlands, flood control and other water-related programs will be woven into the planning process. Money, too, will be coordinated. It will come not only from the Wisconsin Fund, but also from other sources. These include the US Soil Conservation Service and the Agricultural Stabilization and Conservation Service.

2. Local implementation achieved in rural areas through the Soil and Water Conservation Districts. The districts run the cleanup and work closely with landowners, county boards and other agencies. In urban areas, each city and village is in charge of the project within its boundaries. Education and peer pressure help get programs going.

In any priority watershed, certain specific areas called "priority management areas" generate the most pollu-

TOO LATE



45 YEARS

11 Lonesome Projects

Watershed	Total Cost	Projected State Cost	Allocated So Far	Estimated Landowner Share***
Galena	\$10,700,000	\$ 4,800,000	\$1,208,250	\$ 670,000
Root	5,600,000	2,800,000	977,500	335,000
Elk	4,200,000	1,600,000	1,600,000	740,000
Onion	3,150,000	1,250,000	450,000	39,000
Sixmile-Pheasant Branch	3,100,000	1,550,000	550,000	8,300
Upper W. Br. Pecosonica**	3,000,000	750,000	350,000	—
Lower Manitowoc*	2,500,000	315,000	315,000	155,000
Upper Willow	2,100,000	950,000	250,000	—
Hay	1,525,000	900,000	850,000	290,000
Green Lake	1,300,000	650,000	250,000	50,000
	\$37,175,000	\$15,565,000	\$6,800,750	\$2,287,300

* Also funded through federal Rural Clean Water Program

** Also funded through federal Small Watershed Program (PL-566)

*** Includes cash and in-kind contributions

Financial data for Lower Black River project unavailable at this printing.



Cartoon by Virgil Beck, Box 1548, Wausau, WI 54401

Wisconsin nonpoint source pollution

A creature from the land.

tion and become special targets for cleanup. In these trouble spots, a special effort is made to install so-called "best management practices." These consist of a whole array of techniques that can control nonpoint pollution in the most practical and economical way.

Since landowner participation is voluntary, financial incentives are important. Cost sharing rates vary from 50% to 70% per best management practice, with no limitation on maximum amounts except for manure storage facilities. With supplemental county funds added in, the total cost share can reach 90% for certain practices.

Getting the landowner to use best management practices in critical areas is essential if pollution from nonpoint sources is to be controlled. While experience shows participation may reach 75% in some priority watersheds, the figure is often a lot lower, sometimes in spots where it's most needed. In many cases those farmers who don't sign up grow cash grain crops, graze woodlands or keep livestock near lakes and streams. And in urban areas, not so many builders participate in places where intensive construction is underway. Something may have to be done to make sure these critical nonpoint pollution

sources are controlled.

In priority watersheds where dairy farms predominate, a participation level of about 75% can be expected. However, where cash grain predominates, places like the Root or Galena River watersheds, participation isn't expected to top 30% or 40%. This isn't high enough to clean things up, so a special monetary incentive is being tried in hopes of encouraging grain farmers to start minimum tillage. Payments will amount to \$45 per acre over a three year period and should pay for the needed equipment.

In urban areas, local ordinances are generally recognized as the most effective way to control soil erosion, sedimentation and increased stormwater runoff generated by construction. Although local governments in Wisconsin have a variety of statutory authorities to choose from, few have actually used their option to develop appropriate ordinances.

Undoubtedly, voluntary participation by 75% of the landowners or municipalities in a watershed will improve water quality. However, success of the cleanup might be in doubt if the worst nonpoint sources don't volunteer.

In fact, this very thing has been happening. If the trend continues, control of all nonpoint sources, but

especially of livestock waste, may have to be achieved through regulation. One way would be to set rules for all of the state's 76,000 livestock operators. Another would be to regulate only large herds in watersheds that drain to recreational waters like trout streams and high quality lakes. About 25% of the livestock operations in Wisconsin fit this category.

Another problem that should be addressed as part of any regulatory package is groundwater contamination associated with manure storage pits. Many pits now in existence are faulty because of bad design. It is an absolute must that manure storage pits be constructed to specifications that will protect groundwater. Regulation may be the only way to make sure.

And finally, it is important to note that putting emphasis on water quality and priority watersheds in no way hinders the broader battle for erosion control on farms in Wisconsin. Given limited dollars, the best strategy is to spend the first ones on water quality because in the priority watersheds, soil saving and clean water happen together. It means no slowdown whatever in the fight against soil depletion. This simultaneous effort reflects the equal importance of agriculture and recreation in the state's economy. They go hand in hand. ■

Social and economic aspects

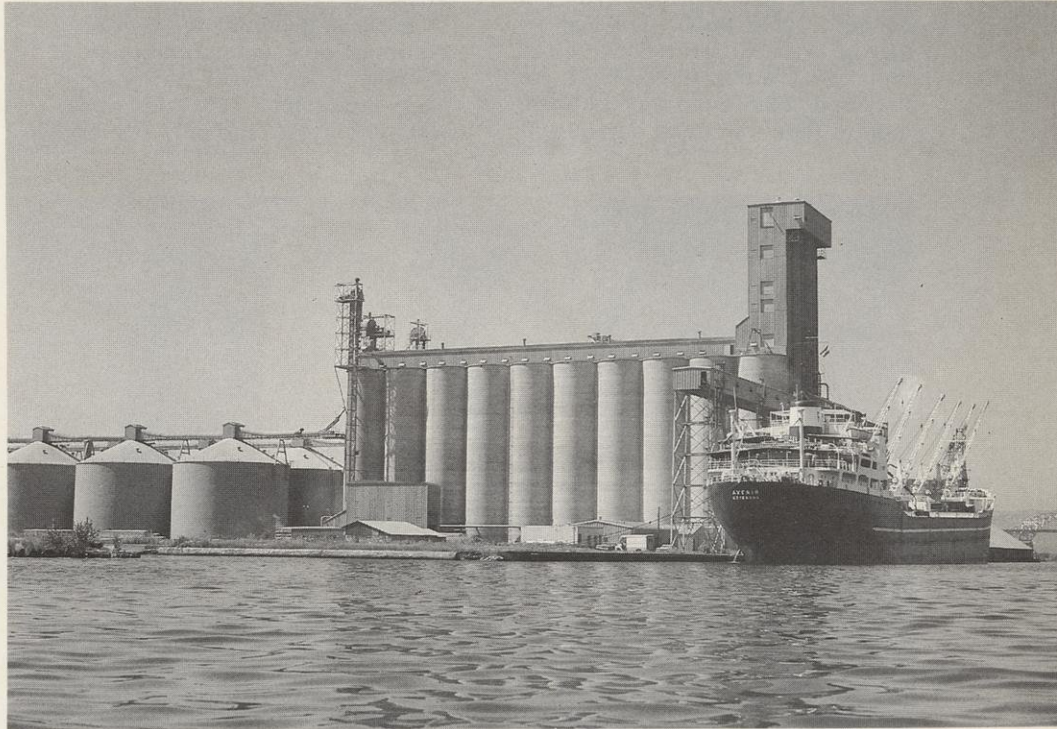
TOM HOBAN, DNR Water Quality Planner

The technology to control erosion and nonpoint source pollution is old hat. The "how to" of it has been known by farmers for years and is accepted and understood. They take erosion seriously. Government and taxpayers do too. In the past 50 years, they've spent \$15 billion on control. But the problem is still there. Why?

Traditionally the effort has all been voluntary. Education and cost-sharing are relied on to do the job. Farmers who are unable or unwilling to control erosion don't have to. Today this traditional approach is under fire and there's a call for stronger policies.

But, though we may or may not agree, farmers have their reasons. To understand why some do and some don't adopt conservation practices, the social and economic factors that influence their decisions need to be understood. And this understanding needs to be built into public policy. Neil Sampson, an expert on the problem puts it this way: "Public programs don't save soil or manage water. Farmers do. They manage those resources as part of the day-to-day work of their private business. In soil conservation, as in crop, livestock or family financial management, they will do what they have the knowledge and skill to do and the equipment to carry out. They will do what seems, in their own private calculation of costs and benefits, to be the 'right' thing to do."

A decision on whether to put in a conservation practice involves a melding of personal, social, economic, ecological and institutional factors. The special characteristics of the particular farm are also an influence. At the rational level, a farmer weighs the benefits and costs of erosion versus conservation. However at the same time, personal values, beliefs, attitudes, neighborhood social pressures and tradition greatly influence the decision.



Overseas grain shipment has boosted prices and production, but hurts good soil management.

For example, part of the tradition of agricultural fundamentalism says that farmers have an inviolate, God-given right to use their own land as they please with little or no government interference. There may be a strong tie to old traditional farming practices at odds with the new conservation.

On the other hand, agrarian fundamentalism also has a strong belief in stewardship with the farmer obliged to protect the land for future generations. Soil erosion control and conservation practices tie in with this.

My own research has tried to uncover some of the key factors which influence a farmer's choice between erosion and conservation. In a telephone survey of 160 farmers in Lafayette County and a review of several other studies, I found out why some do and some don't sign up.

Farmers are more likely to adopt conservation practices if economic incentives are part of the package.

They are concerned with short-term economic gain, even at the expense of long-term soil productivity.

A large number feel some conservation practices are not compatible with modern, efficient production methods necessary to make a profit.

Since few of the soil-saving methods produce immediate returns, many farmers believe the real beneficiaries are not themselves but someone else downstream or off somewhere in the future. They contrast this with their out-of-pocket cost which is immediate and significant.

If a farmer is principally motivated by economic gain he is less likely to adopt conservation practices.

Outside forces beyond a farmer's control (markets, government programs) are often critical in any decision on conservation. These forces probably explain why many who are truly concerned often feel powerless to act. Pressures to exploit the land in order to survive financially are strong.

There's also the feeling that a conservation way of farming limits options as to land use and which crops can be grown — makes it difficult to respond to changing markets or programs.

The cost of installing and maintaining the practices are also a concern. While public cost-sharing may be available, farmers often feel their own share is still too high. And they don't like to put up their own money, then wait to be reimbursed.

Much research wonders whether farmers perceive soil erosion to be a serious problem. They do! But most tend to downplay the severity of the problem on their own farms. Many feel that it's the "other guy" who has bad erosion.

In my Lafayette County research, 63% said erosion was a very serious problem, 32% said "somewhat" and less than 5% of the farmers felt erosion was no problem at all. However, when asked about their own farms, less than 10% said erosion was very serious, 57% said "somewhat" and 34% reported no problem at all.

But they generally agree that soil conservation is an important part of farming. In my survey, 83% called it "very important," 15% said "somewhat important" and only 2% thought

Most farmers oppose mandatory regulation, but some recognize the need for a stronger approach if erosion and nonpoint pollution are to be controlled. Those who feel they are doing a good job are generally more willing to accept regulation. One idea that's been getting a favorable response from farmers is so-called "cross-compliance." This would require that acceptable conservation practices be a prerequisite for eligibility in government benefit programs — like low interest loans, price supports and others. In my survey, 75% felt this would be fair. Studies in eight other states also show that more farmers would favor mandatory cross-compliance than oppose it.

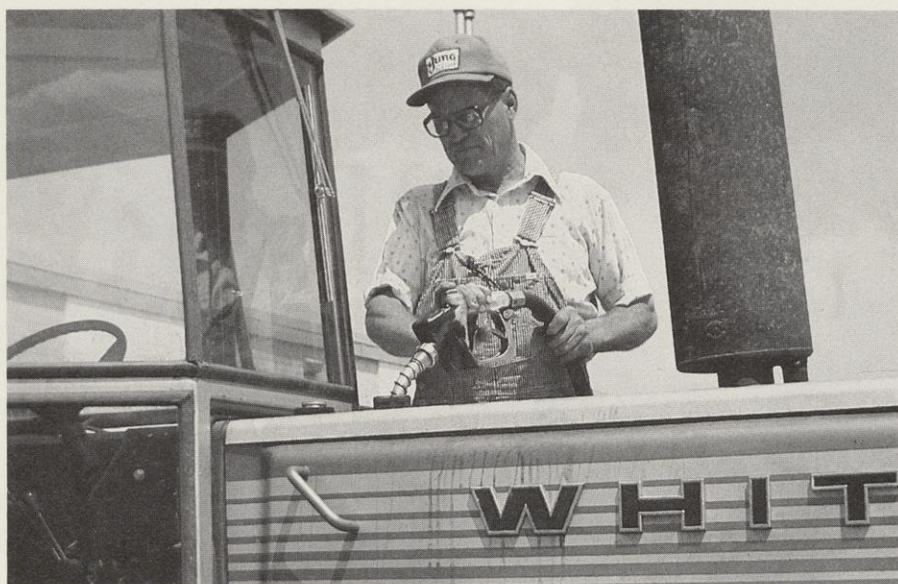
Local control is another big point. Farmers want local people to be in charge of conservation programs but want funding provided by state and federal governments. This is pretty much how it works in Wisconsin now. They also want better economic incentives like low-interest loans, tax credits and additional cost-sharing.

Farmers have a definite preference for certain kinds of conservation practices. Generally, they like the ones that offer flexibility and improved or stable yields. Because of its economic benefits, conservation tillage is becoming the most popular practice. Crop rotation is very acceptable to those who raise livestock, but seems useless to cash-grain farmers. Many are no longer very impressed with structural practices like terraces and contour strips. They are willing to work on the contour, but find the strips hard to handle with large, modern equipment.

Contrary to popular opinion, farmers with big operations are more likely than small ones to adopt conservation practices. This is because the big farms are generally more profitable and can better afford to invest in conservation practices. Often they're better managed and know how to use conservation practices more effectively. On the other hand, cash-flow problems that usually beset small farms mean that fewer dollars are left free for conservation.

In general, the most worrisome operation is the large cash grain farm. It is profit-oriented and often finds conservation practices incompatible. Unfortunately, continuous grain operations are exactly the ones most likely to have serious erosion problems.

Whether a farmer owns or rents is also a factor. Not unexpectedly, research shows that farmers are more likely to practice conservation on land they own, due in part, to a greater sense of stewardship. Other studies



No-till farming saves fuel.

For a farmer heavily in debt, the extra outlay for conservation is often just too much to bear. High prices and high interest rates for land, buildings, machinery and production supplies (seed, fertilizer, chemicals and fuel) have recently coincided with steady or falling farm income. This cost-price squeeze limits the dollars available for investment in conservation practices.

Net income is also significantly related to conservation. If it's high, a farmer is much more likely to participate. So, too, if income is increasing. If it's declining, no go. And unfortunately, that's how it is for farmers today. Availability of credit and capital are also influences. The more there is, the more likely that conservation practices will be adopted.

it unimportant. Other studies show most farmers believe their operation could actually be improved by soil erosion control. And many are aware of the specific practices they should use to do it.

They are much more concerned about the effects of erosion on soil productivity than they are about nonpoint source pollution. They recognize that agriculture affects water quality but, once again, usually feel it's the "other guy" who has the worst pollution problem.

In regard to government and its soil conservation programs, the farmer's attitudes can be summarized in this way: They want everything—the technical help, generous financial aid and participation to be strictly voluntary.

show that the renter-owner relationship also puts conservation at a disadvantage. The owner and farmer often have little contact and the rental agreement probably includes no conservation provisions.

Farmers who operate at the urban fringe are also very unlikely to adopt conservation practices. Often the land is held on speculation, soon to be sold for development. The motive is to get as much out of it as possible before development.

Other studies show that the odds are better for adopting conservation practices if a farmer:

- Has a good education.
- Is young.
- Has children who plan to continue farming the land.
- Has a lot of contact with soil conservationists and extension agents.
- Is willing to take risks and favor change.
- Is a new owner or operator.
- And is already practicing some conservation.

While research confirms that awareness and concern are prerequisite to adopting erosion control practices, it also shows that economic and social forces really decide the issue. The next step is to take all four into consideration and mold a program that will be acceptable to both farmers and other citizens. It will take that kind of approach to improve water quality and save soil. ■■■



What farmers think about erosion control*

When asked:	They answered (%):		
	Yes	No	Undecided
Does government have the right to require soil conservation practices?	32	61	6
Should landowners who allow excess soil erosion be fined?	30	57	13
Should landowners be required to practice soil conservation to be eligible for such things as government loans, price supports, and other benefits?	76	20	4
Is foreign demand for grain one reason for increased soil erosion?	62	35	3
Do high interest rates or lack of credit make soil conservation investments more difficult?	61	35	3

*From a 1982 telephone survey of 160 Lafayette County, Wisconsin, farmers.

For more information: The University of Wisconsin-Extension offers movies and slide sets. They include:

Save Our Soil . . . Save Our Streams

Discusses the problem of soil erosion and how local government, landowners and conservation groups can work together to stop it. (20 minutes, 16 mm color/sound.)

Runoff . . . Land Use and Water Quality

Details the effects of rainfall on undisturbed forests, strip-mined hills, freshly plowed fields and city streets. Explores how land use affects water quality. (21 minutes, 16 mm color/sound.)

Construction Site Erosion . . . Costs and Solutions

A slide set that examines construction sites erosion, its causes and solutions. Illustrates how several Wisconsin counties and communities have successfully dealt with the problem. (15 minutes, 80 35-mm slides.)

To obtain contact your county extension agent, or write:

University of Wisconsin-Extension
Bureau of Audio-Visual Instruction
P.O. Box 2093 Madison, WI 53701

the year. Therefore, artificial arrangements must be substituted for the nonexistent natural cushion. For this need we rely on the wisdom and techniques of soil conservation.

The wisdom of soil conservation is very old as evidenced by the remnants of ancient earth and stone terraces to hold the soil in place. These are found in the Middle East dating to the dawn of civilization, and in China and in Peru where 1,000-year-old terraces still perform like new. History also shows that if soil conservation practices are not an integral part of agriculture, this leads inexorably to soil exhaustion and the demise of societies dependent on farming for subsistence. The earliest developed continents are littered with man-made wastelands which are proof that, for some reason, the principle of soil conservation did not survive. These wastelands, that might otherwise afford space and food for today's poorly fed societies, are essentially unredeemable. But history is not the only evidence for soil destruction. Right now in Australia, North Africa, Brazil, on the American Great Plains and even in the hills of southwestern Wisconsin new wastelands are forming in the wake of exploitive agricultural practices.

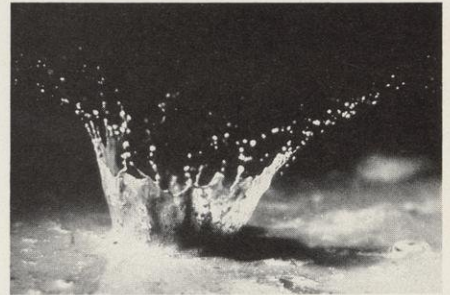
The central theme of soil conservation is to provide a functional, if artificial, moisture cushion. It must assure that the agricultural enterprise can be maintained indefinitely on a rejuve-

nating soil base and constantly renewable cycle of water. Unavoidably, on fields of annual crops, the raindrop will light on bare earth and dislodge soil particles. Soil conservation seeks to minimize the blast affect and hold as much dislodged soil as nearby as possible. Simultaneously the water is given every opportunity to percolate through the soil layers to a place of storage in the underlying water table. Uncontrolled runoff — water in its villainous form — is the hazard to be avoided. Crop rotations, permanent vegetated strips on the contour and stubble mulching are conservation techniques designed to substitute for the natural cushion.

Nevertheless, runoff is not to be defeated quite so easily. At times and in places the bare soil will be sufficiently bombarded to be surface liquified. When this occurs the suspended sediment plugs the soil pores making water percolation impossible. Instead of water being absorbed and the soil resettled in place, overland runoff ensues carrying topsoil with it. "Sheet" erosion (a uniform thin skin of soil becomes mobile) commences and flooding begins. All crop fields on sloping land, even if the slope is only slight, are vulnerable to extreme soil loss once absorption is defeated. Fortunately, as the flood mounts, other more sophisticated soil conservation practices are still possible. The purpose of these practices, which may include diversion terraces and vege-

tated waterways, is to collect the runoff before it gains velocity and then guide it off the cropfield through a network of erosion resistant channels. Failure to install these structures where needed guarantees the runoff will cut its own channels through the delicate topsoil. The result in this case is "rill" erosion.

Rills appear as shallow, squiggly troughs incised in the topsoil. When rills occur, a minimum of 15 to 20 tons of topsoil per acre are being transported in the runoff. In some cases a single storm can flush as much as 40 tons per acre from fields no steeper than a ranch house roof. Take an average case and imagine that you hauled 20 pickup loads of topsoil from each cropland acre and deposited them over low lying pasture lands — or even worse, dumped half the loads directly into a nearby stream? Actually, because of improper land management, this scenario is repeated



The raindrop must fall on a cushioned surface so that its kinetic energy is dissipated without blasting soil particles loose. Photo by UW-Ag Journalism



Sheet erosion occurs when a uniform thin skin of soil becomes mobile. Sediment plugs the soil pores and water percolation is impossible.

Photo by James Baumann

each year on many Wisconsin farms. Yet even so large an annual soil loss represents only 1/10 inch of soil depth — hardly a noticeable amount in any single year. And therein lies a sort of deceit — the reason for apathy about sheet and rill erosion. One cannot see the soil mantle shrink. It takes 100 years for nature to recreate 1/10 inch of topsoil, but we are lured into believing that because the eyes cannot detect a century of nature's accomplishment, no permanent harm is done. There is added deceit in the fact that annual therapeutic doses of commercial fertilizer mixed with the thinner topsoil and sterile subsoil continues to produce crops. However the gamble becomes less tenable because commercial fertilizer (like nitrogen from natural gas) grows more expensive.

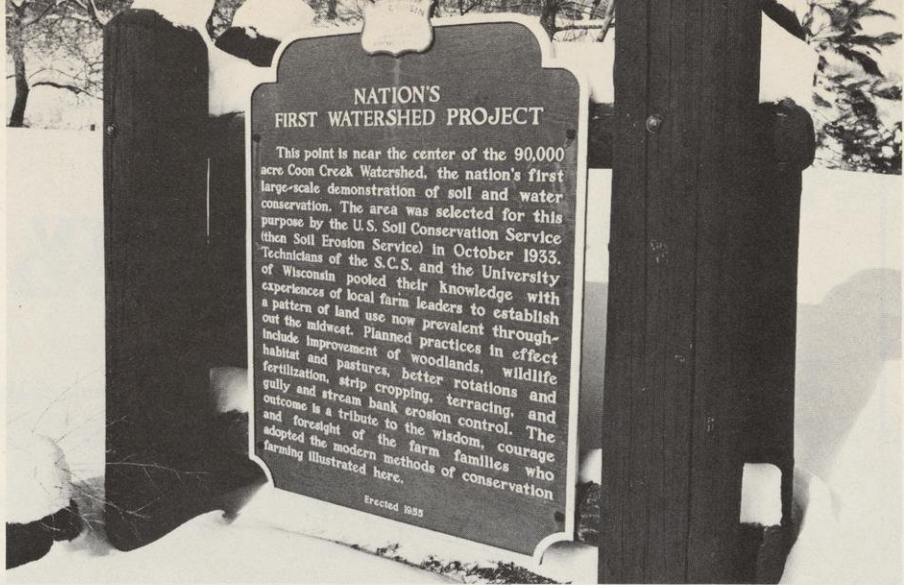
Downslope, as runoff becomes more concentrated, velocity increases sufficiently to gouge deeper troughs which, if unchecked over a period of years, enlarge to gully-size and then to ravines. The prevention of gullies

begins, as this discussion began, at the top of the slope by encouraging water absorption and discouraging flow concentration, and then downslope by maintaining vegetative cover at all probable concentration points and channels. Failing timely prevention of gullies, it becomes necessary to install expensive check dams with the hope of halting catastrophic ravine cutting. Many such check dams were installed in southwestern Wisconsin in the 1930's by the Civilian Conservation Corps with good success. Fortunately! Today excellent dairy farms, models of land rehabilitation, exist on sites formerly devastated by gullies. Unlike sheet and rill erosion, gully formation is spectacular and it prompted a public outcry for erosion control, which during the Great Depression fell on sympathetic government ears.

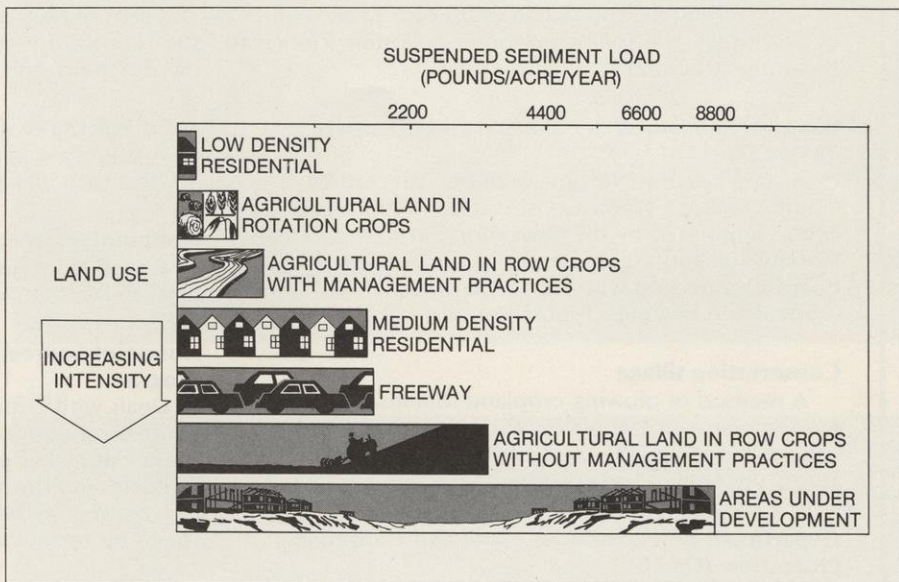
Nevertheless, despite the best watershed preparation, a major storm will bring on sizable stream flooding and some erosion. If upland conservation practices are adequate the watershed is still way ahead, since storm damage will be 80% less than if it's mismanaged. Flood peaks will be lower avoiding costly road, bridge and farmstead damage, and sediment deposits will be minimal, well within nonpoint source pollution requirements. In addition, if the tributary streams are maintained in an essentially natural state, their shorelines will be adequately armoured for rapid recovery back to a normal, healthy condition. This is true because in centuries past the configuration of the floodplain and the native vegetation has adjusted to long term flood conditions. On the other hand, if man alters the floodplain shape or replaces shoreline perennials with annual crops, then unpredictable channel movement is the rule.

During catastrophic floods the floodwater itself provides a type of floodplain armour allowing the natural streambed to emerge unscathed. As the oxbows and wetlands are inundated, they store vast quantities of floodwater. The greater bulk of this gentle water buffers the vegetation and the submerged shoreline, preventing destructive undercutting. This emergency storage of floodwater in the floodplain and its slow release back to the original channel is the natural means of flood mitigation. A properly functioning watershed should remain essentially unchanged over thousands of years.

Typically though, watershed management is faulty. If there is accelerated runoff and excessive erosion, if shoreline vegetation is



Wisconsin has a long history of erosion and runoff control. Coon Valley Watershed was a nationally acclaimed demonstration area 50 years ago. UW-Ag Journalism photo



extensively depleted and the wetlands filled in, then the flood peak will be high, the currents rampant and the stream channel destabilized. Furthermore, the resulting deposits of sediment in the channel assure a continuous source of water pollution long after the flood recedes. Once the watershed is critically damaged by runoff, it remains extremely vulnerable to more erosion and flooding even though succeeding storms may be only of the semi-annual variety.

Ironically, as floods become more common, the watershed actually becomes drier. Groundwater levels drop because little surface water is absorbed on the uplands for recharge. Springs dry up. The exposed subsoil contains insufficient organic matter to sponge up water for crops in the periods between rainfalls. Ultimately, perhaps in the passage of a mere century, a desert landscape begins to unfold. The land is abandoned to weeds and briars which may yet be

hardy enough to survive on the skeletonized soil.

Once flooding and soil erosion becomes a routine occurrence in the watershed, the aquatic ecosystem is in a fatal state of degradation. Riffles and pools are smothered in sediment from the upland erosion and fish habitat is nonexistent. In fact, much of the drainage system's biotic life is killed outright by the abrasive turbulent sand, or buried, or washed downstream to uninhabitable regions. The river channel is now wide, the water shallow and the flow fluctuates markedly. In the summer the water temperature soars and the dissolved oxygen pitches below life-sustaining levels except for the most pollution resistant organisms.

The trademark of *Nonpoint Source Water Pollution* is stamped all over the watershed. Such is the certain history and deplorable state of a river whose small streams are not protected.

Glossary

Agricultural Stabilization and Conservation Service (ASCS)

The financial wing of the US Department of Agriculture. In many priority watershed projects ASCS assists Soil and Water Conservation districts in fiscal management. ASCS administers a number of cost-sharing programs such as the Agricultural Conservation Program (ACP) which allocates cost-sharing funds to each county.

Best Management Practices

The techniques and practices for effectively and economically controlling nonpoint pollution. They may be either structural or nonstructural.

Board of Soil and Water Conservation Districts (BSWCD)

A state board with some members elected by County Soil and Water Conservation Districts and others appointed by the Governor. Purpose is to assist County Soil and Water Conservation Districts. The board is associated with the Department of Agriculture, Trade, and Consumer Protection.

Conservation tillage

A method of plowing cropland that leaves a maximum amount of plant debris on the surface to reduce runoff erosion. Also requires fewer "passes" across the field, thus saving time and fuel.

Department of Agriculture, Trade and Consumer Protection (DATCP)

The state farm agency. Among other activities, administers the Farmland Preservation and Pesticide Regulation Program.

Department of Natural Resources (DNR)

State agency responsible for maintaining the quality of Wisconsin lakes and streams. Administers the Wisconsin Nonpoint Source Water Pollution Abatement Program. Develops plans for Priority Watersheds jointly with Soil and Water Conservation Districts and cities. Makes grants for implementation of Priority Watershed projects.

Designated Management Agency

The local agency best able to coordinate a nonpoint cleanup project. Soil and Water Conservation Districts and county boards are most often designated for rural areas, city governments for urban areas.

Detention basin

A shallow depression used to catch urban or rural runoff. Sediments are deposited and water seeps slowly into the ground or runs off slowly without causing damage.

Gabion

A technique that uses wire baskets filled with rocks to protect stream banks.

Infiltration

Movement of water from the land's surface into the soil.

Local Assistance Aids

One of three separate budgets for the nonpoint source control program. Under it, money goes to Designated Management Agencies in Priority Watersheds to pay for stepped up technical assistance, fiscal management, and farmer education.

Local Priority Project

A priority watershed project on a small scale. Generally less than 10 square miles in size.

Nonpoint Source Pollution

Runoff from rural or urban lands that carries pollutants to lakes and streams.

Nonpoint Source Water Pollution Abatement Program

Deals with critical water quality problems by controlling nonpoint sources. DNR is the administering agency. It makes grants to Designated Management Agencies in Priority Watersheds. They use the money for cost sharing best management practices and to speed up technical and educational activity.

Priority Management Area

The portion of a Priority Watershed where nonpoint pollution is most serious and where best management practices will show the greatest results.

Priority Watershed Project

A watershed selected for cleanup under Wisconsin's Nonpoint Source Water Pollution Abatement Program. Generally about 100 to 150 square miles in size.

Rill erosion

Erosion where very small gullies start to form.

Riprap

Rocks of assorted sizes used to protect a stream bank.

Rural Clean Water Program

A federal nonpoint source control program for rural areas administered by the Agricultural Stabilization and Conservation Service (ASCS). The Lower Manistowoc River is the only project in Wisconsin. No funds were appropriated for 1982.

Continued on page 255

Subdivision ordinance saves \$\$\$

ANNE WEINBERG, DNR Planning Analyst

"It's a lot cheaper to prevent erosion problems caused by construction activities in the beginning than to correct damage after its been done." Those are the words of Tom Nelson, assistant zoning administrator in St. Croix County, where a new runoff and erosion control section has been added to the subdivision ordinance.

Says Nelson, "The damage that can be created by neglect is far more costly than preventative measures." Cleaning up sediment-laden lawns, ditches, culverts and storm sewers is expensive. Less obvious are other costs such as reduced water quality and increased flooding.

St. Croix County, which is adjacent to Minneapolis-St. Paul, amended its subdivision ordinance after heavy development caused severe runoff and soil erosion problems that were expensive to correct.

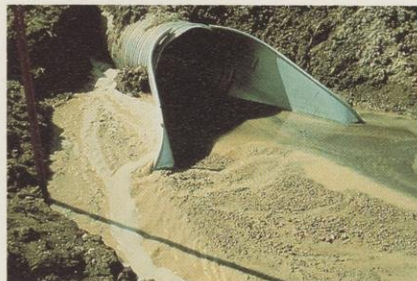
Developers now must submit control plans to the St. Croix County Soil and Water Conservation District (SWCD). While final approval for subdivision plats rests with the county zoning department, SWCD advice and assistance on runoff and erosion plans has an important influence on the decision.

In St. Croix and many other counties, SWCDs are partners with county planning and zoning departments in administering construction runoff and erosion control ordinances. Such "partnerships" exist in Calumet, Dane, Dodge, Fond du Lac, La Crosse, Oneida, Ozaukee, Pierce, Rock, Sheboygan, St. Croix, Washington and Waukesha counties. Many Wisconsin towns, villages and cities have also adopted ordinances.

DNR offers help to local governments that want to control runoff and erosion caused by construction. Model ordinances and consulting services plus information and education materials, including slide shows are available. For assistance, contact the water quality planner in any DNR district office.



Preplanning and early installation of utilities avoids continual exposure of raw ground, cuts down on sediment and runoff.



Sediment from an uncontrolled construction site. Cleanup can be expensive.

Photo by William Lane, Dane County Regional Planning Commission

An ordinance that provides for early installation of drainageways will save dollars in the long run.

Photo by William Lane, Dane County Regional Planning Commission



Urban: Best Management Practices



1

Preventing urban nonpoint pollution involves a multi-pronged attack. One effort cleans up the source of urban pollutants by doing such things as sweeping streets, collecting leaves and pesticides. Another manages the land to limit runoff. A few cities have already taken this step, and have passed ordinances that require erosion and runoff control plans for new construction or development. It's a lot cheaper to put in controls before, rather than after everything is built. Stormwater detention and protection that increase groundwater infiltration are also important. Detention basins hold sediment and pollutants while infiltration cuts down runoff and recharges groundwater.

Another incursion against urban nonpoint involves protection of existing drainageways and their ability to move stormwater. Often natural stream corridors can serve as parks or open space and give cities the advantage of both recreational land and good natural drainage. Where runoff already exceeds a stream's capacity, supplemental protection such as riprap, channel lining or other structures may be necessary.



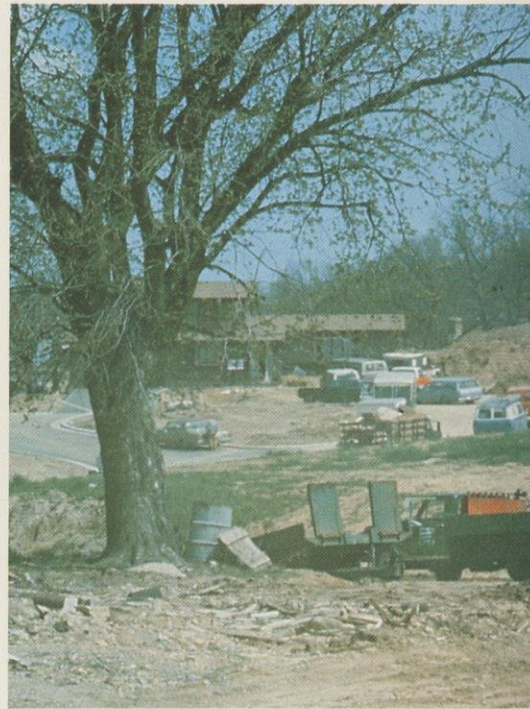
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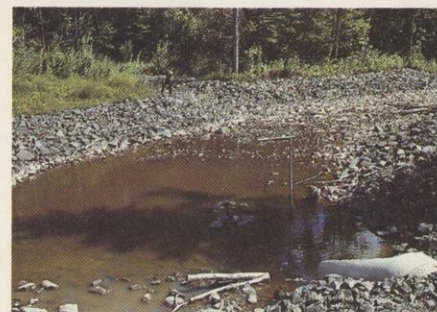
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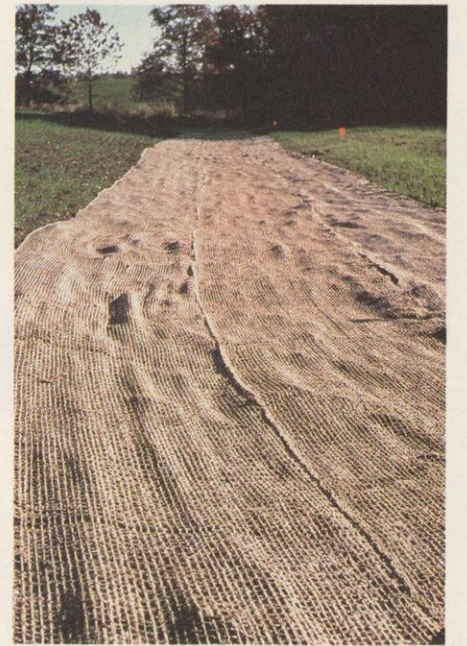
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9

1. A best management practice. Sod should be pegged in place where water flows fast.
2. After development, detention basins that catch sediment add amenities, double as recreational ponds.
Photo by Paul Johnson
3. A temporary straw dam collects construction site sediment before it runs into lakes and streams.
Photo by Paul Johnson
4. Low density residential areas produce only small amounts of runoff. But it contains lead, leaves and other contaminants. When bad enough, storage and treatment is necessary.
5. New plat developments without erosion control cause heavier sediment loads than any other watershed activity.
6. Riprap protects streambanks from erosion.
Photo by John Konrad
7. Mulching absorbs the energy of raindrops, saves seed and soil.
Photo by James Baumann
8. Paved waterways keep runoff in safe channels, away from the soil.
Photo by Paul Johnson
9. Jute matting holds new grass in place, prevents washouts.
Photo by Anne Weinberg



Farm: Best Management Practices

◀ A Wisconsin farm landscape with best management practices. The painting shows a fenced streambank and cattle crossing, grassed waterways, contour strips, paved barnyard, minimum-till tractor unit and other practices that control nonpoint source pollution. It contrasts with all-too-common scenes in the photos below. Watercolor by Artist Bert A. Krawczyk, 5317 South Lake Drive, Cudahy, WI 53110



Stream bank erosion on the Hay River. Riprapping or some other protection would help.
Photo by James Baumann



Plowed furrows on the hillside ignore the contour and aggravate sheet erosion in the foreground.



Poor barnyard and feedlot management are common sources of nonpoint pollution.
Photo by James Baumann



Manure output from farms exceeds everything handled by Wisconsin's elaborate municipal sewage treatment systems. Its proper handling and use is essential to clean water in the state.



More and more farmers are turning away from the moldboard plow to save soil and energy.



A sight so common in Wisconsin it hardly raises a stir. But erosion and turbidity caused by cows, plus their fecal wastes, can wreck a stream.
Photo by UW-Ag Journalism

First step after a priority watershed is selected is a plan to control erosion and runoff. Local soil conservation officials look at cropping patterns, judge the steepness of slopes, calculate current soil losses and figure out best management practices for each farm. They look over every barnyard and determine which ones need manure runoff control. Landowners who then implement the planned procedures are reimbursed by the state for 50 to 70% of the cost. So-called "in kind" contributions count as part of the farmer's share. It includes the value of his labor, equipment and materials so the actual out of pocket expenses can be minimal.



Can recognize the farmer's good works

Nonpoint source pollution:

An agricultural view



Donald Haldeman

DONALD HALDEMAN, President Wisconsin Farm Bureau Federation *

Clean water — it's a resource that in the past was taken for granted. However, we know the sparkling stream that meanders through our pasture or the fresh-tasting water from our well may not always be that way unless we take some responsibility.

Farmers have a stake in keeping Wisconsin's rivers, streams, lakes and groundwater clean and healthful. Most are dependent on private wells for drinking and other water uses. For example, to maintain their status as grade-A milk producers, a safe water sample is required of dairy farmers at regular intervals. It's also possible that certain pollutants in irrigation water

might be detrimental to a crop. Farmers care about the quality of Wisconsin's water not only because it makes good sense from a health and safety standpoint, but because it makes good business sense as well.

Agriculture has been active in water pollution abatement for many years. It's been half a century since farmers started working with Soil Conservation Districts, the US Department of Agriculture and DNR to protect soil and water. For them, control of nonpoint source water pollution is not new.

Wisconsin's livestock farmers have been instrumental in keeping large amounts of cropland in soil-covering crops such as alfalfa. As new equipment becomes available, farmers rapidly adopt conservation tillage. Chisel plowing, which leaves some

*Haldeman is also a member of the Wisconsin Natural Resources Board



▲ Strip cropping on the contour and grassed waterways that save soil are common practices on many Wisconsin farms.
Photo by UW-Ag Journalism

Soil-saving no-till planting methods are beginning to replace the erosion-prone moldboard plow.
UW-Ag Journalism photo



◀ A small lagoon catches barnyard runoff where wastes settle out and are filtered.

crop residue on the soil surface, and no-till planting, which eliminates plowing entirely, are both growing in popularity.

Responsible farmers are good stewards of the state's land and water and conduct their business with an eye to the future because most farms will be passed on to sons and daughters. Like all parents, they want to leave their children a clean and healthy environment.

Because of the enormous cost, farmers realistically approach the issue of nonpoint source pollution control from a business standpoint. Cost sharing through the Wisconsin Fund and other government sources needs to be continued to provide an economic incentive for all landowners to participate. Public expenditures are legitimate because when a farmer

does something to clean up water leaving his property, the benefit accrues to everyone.

Current programs stress voluntary participation and must be kept this way to be successful. Farmers have a distaste for government regulation and can be expected to resist any effort to make cleaning up state waters mandatory. Conservation programs such as strip and contour cropping which were implemented in the 30's and 40's were successful without government regulation. Nonpoint source pollution control programs will be successful too if they follow that lead.

The biggest incentives to agriculture have been cost sharing and technical assistance. While many farmers install and pay for conservation methods that cleanup water entirely

on their own, financial incentives need to be continued because not everyone can afford the burden.

Any program to control nonpoint source pollution should also include education on management practices and economic benefits.

In summary, the best way to work with agriculture on nonpoint source pollution is to:

- Continue the present voluntary program.
- Continue financial incentives in the form of cost sharing.
- Give technical assistance.
- And provide information on economic benefits.

Reasonable and progressive farmers understand that clean water, soil conservation and the future of agriculture go hand in hand. They will continue to work toward these goals. ≡



Infra-red photo highlights sediment deposited in Lake Mendota from Pheasant Branch Creek. The color green shows up as red.

Channel erosion at Lakeview Park in Middleton along Pheasant Branch Creek.

Photo by William Lane, Dane County Regional Planning Commission



The urban cleanup

A priority watershed in action. The first step is a plan.

*WILLIAM N. LANE, Director
 Environmental Planning
 Dane County Regional Planning
 Commission*

In 1980, the Sixmile-Pheasant Branch Watershed was selected as a priority project for nonpoint source pollution abatement under the Wisconsin Fund. Its 93 square miles represents about 45% of the Lake Mendota drainage area. More than half the sediments and nutrients that load the lake originate here. About 20 square miles is urban and includes the City of Middleton, plus large parts of Madison. While this urban land makes up only 20% of the watershed, it accounts for nearly half the discharge of sediment and phosphorus.

Established urban areas in the watershed generate about the same amount of sediment and nutrients per acre as agricultural lands. Subdivisions and other construction sites account for about 60% of the urban nonpoint source pollution.

First step in the nonpoint cleanup at Sixmile-Pheasant Branch was preparation of a detailed watershed management plan to handle both rural and urban lands. Everybody helped: DNR, the Dane County Soil and Water Conservation District, Dane County Regional Planning Commission and local units of government, including Middleton and Madison.

The plan identifies specific projects and management practices that will reduce nonpoint source pollution. It recommends that urban areas:

- Adopt comprehensive erosion and runoff control ordinances. (The City of Middleton has already done so.)
- Maintain high levels of street sweeping to include large commercial parking lots.
 - Improve leaf collection.
 - Construct stormwater detention basins in several locations and include infiltration measures where possible.
 - Construct a porous pavement demonstration project.
 - Encourage downspout redirection and infiltration.

Before:



After:



Volunteer workers terrace an eroded slope to control runoff.

Photos by the Dane County Regional Planning Commission

- Delineate and protect a system of environmental corridors.
- Stabilize drainageways and stream banks.

The total cost of urban management practices for the Sixmile-Pheasant Branch Watershed is about \$1,300,000. Slightly more than half will go for stabilization of the bank

and stream bed in Pheasant Branch Creek. And since the creek carries a heavy load of eroded soils detention basin construction will also be a major expense.

Implementation of the plan started this year with completion scheduled for 1989.



And "how to" in
the watersheds

The local view



Sharon Gayan, Root River watershed,
Racine

"Dairy farmers are long-term thinkers, cash croppers are shorter term - they see water moving across their fields but they don't see that it's bad."

LAURIE MANN, DNR Water Quality Planner

Of, by, and for local people. That's the Wisconsin Fund. All of its legislation, codes and guidelines carefully favor local management, local benefit. In practice it works out that way too. But things can be tough.

Sharon Gayan manages the Root River project in Racine County, one of the "old" original projects selected in 1979. The Root is a kind of "worst case" test. There are 22 different management agencies involved. If local design works here, it will work anywhere. The Racine County Soil and Water Conservation District (SWCD) is the lead agency and Sharon Gayan is the project's driving force.

Good ideas usually succeed because special individuals make an effort. On the Root, if there hadn't been a Sharon Gayan the project may never have gotten off the ground.

"The problem," says Gayan "is that it's a very, very large watershed — 150,000 people, urban and rural — two different types of audiences to concentrate on. Each management agency has a different set of problems, some more severe than others. But definitely it's a local problem. We make all the decisions we can. It's the only way."

Tom Ward, who manages the Manitowoc River watershed, agrees. At first, money for the Manitowoc project came from the Wisconsin Fund. Today it comes from the federal Rural Clean Water Program. Tom prefers the Wisconsin Fund because he thinks it responds more quickly to local needs. His feeling is that "The Wisconsin Fund is very flexible and can accommodate specific management needs of each individual watershed. It is truly a local program."

But on the Black River Watershed in La Crosse County, where a project has just begun, Don Franke thinks there may be too much politics in selecting the watershed to be worked on. He claims it's too easy to get a

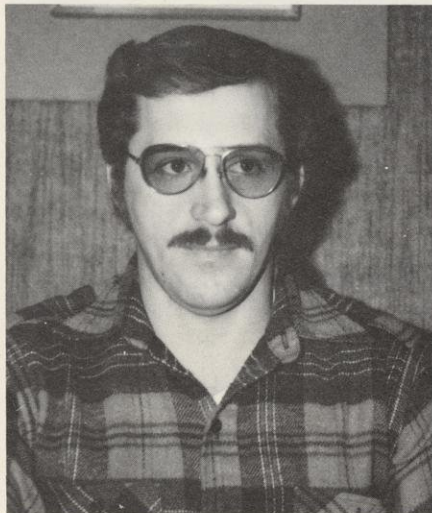
"good score." The process requires Regional Committees to pick "most-likely-to succeed" watersheds from a DNR list of those where nonpoint pollution is severe. Then a State Coordinating Committee considers these regional favorites and makes recommendations to DNR, which has the final say. The idea is to use technical water quality criteria at step one, local preference at step two, and state priority at step three. But Franke thinks the process comes down to politics — "Whoever puts the big push on, has the glossiest package, [gets picked]."

According to Franke, there isn't very much scientific information on exactly how bad the water quality really is, "so decisions are made on the basis of people like me who do their best to sell the watershed."

But politics also make nonpoint pollution control go. Sharon Gayan says the local SWCDs that manage the projects are ineffective if they do not have widespread political strength. "It takes plenty of support for SWCDs to come in with a million dollar program. Politically, we don't have it." Her feeling is that local leaders — county executives for example — don't know enough about nonpoint control and what it involves.

Gayan has 22 different management agencies in her watershed and knows better than anyone else that political entities abound in the Wisconsin Fund. With so many, it's hardly surprising that controversy crops up sometimes. Statewide, the average is three or four local designated management agencies per project. And beyond these, the work must mesh with ideas and requirements of state and federal agencies.

Some watersheds, for example, contract for technical guidance with the US Department of Agriculture-Soil Conservation Service (SCS); others contract for fiscal management with the US Department of Agriculture-Agricultural Stabilization and Conservation Service (ASCS). Madison-based University of Wisconsin-Exten-



Tom Ward, Manitowoc River watershed

"The Wisconsin Fund is truly a local program. I don't think we could find a better way to get money into a problem area."

sion staff are often advisors on education. Tom Ward says it's all worked fine on the Manitowoc. "All the agencies — they're response was just great. We had to break new ground, so there was a sense of loneliness, but I could see a lot of concern. We got all the support we could use."

Steve Elbert manages the Hay River Watershed in Barron and Dunn counties. He finds few problems. "Overall DNR management has been very good." But he thinks he could have received more help from some other agencies.

Clarence Keleher, manager of the Galena Watershed project in Lafayette County wants counties to manage program finances themselves — without any coordination by a federal agency. He also likes the old system under which the State Board of Soil and Water Conservation Districts managed technical assistance funds. Last year the legislators assigned this function to DNR because of DNR's clean water responsibilities. But Keleher thinks this requires too much administration at the local level.

Don Franke believes giving DNR the responsibility "just adds another layer of bureaucracy — too much paper." He also worries about resistance to change because cost-sharing conservation practices had traditionally been the domain of the ASCS and the SCS, and landowners are used to the old way.

But if the program's durability depends on resolving political problems, its purpose has little to do with politics. It is first and foremost a water quality program. Its ultimate reason for existence is a healthy water resource.

However, people fighting to clean things up are sometimes handicapped by lack of complete water quality data on every watershed. Without good scientific data on in-stream conditions, it's hard to really prove that expensive land management practices are making things better. As Franke expresses it, "without specific information on water quality, how are we going to know whether we've improved it?"

DNR program managers are quick to agree that most watersheds have not been analyzed in detail. But DNR has developed techniques which relate land use activities to water quality. These techniques are based on more than \$6-million in nonpoint source monitoring studies in Wisconsin since 1974. They make it possible to predict how water quality will improve if certain practices are followed. DNR doesn't think expensive monitoring is necessary in every

watershed. The money can be better spent on cleanup.

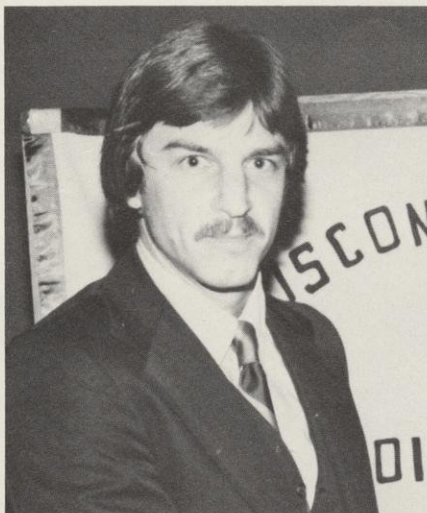
Demonstrating concretely the direct water quality benefit of nonpoint source pollution control will take years of data gathering. Keleher in the Galena thinks it's essential. "If DNR does a good job of monitoring, I feel it's a worthwhile project." And nearly all the watershed managers are convinced that, despite the lack of absolute proof, water quality is surely — if slowly—improving. Says Keleher, "In those areas where we're getting 75% [landowner] participation, there's no question we're getting improved water quality."

Pat Miles is project manager for the Onion River Watershed — one of the newer projects, selected in 1980. Though they're just beginning to put in control practices, Miles is

confident. "In eight years we'll see a noticeable improvement."

In the Hay Watershed, where the project has had a few years to prove itself, manager Steve Elbert says definitely "you can see" the water quality improvement. Especially in the streams where 60,000 feet of fencing has eliminated the severe bank erosion that watering cattle had caused!

But Elbert has a deep concern about the landowner who refuses to participate. Presently, just one individual can destroy the water quality all his neighbors worked hard to improve. There have been many suggestions that regulation in such cases may be the best answer. DNR suggested it in a report to the Legislature on nonpoint pollution. As Elbert puts it: "The report hit it right on the



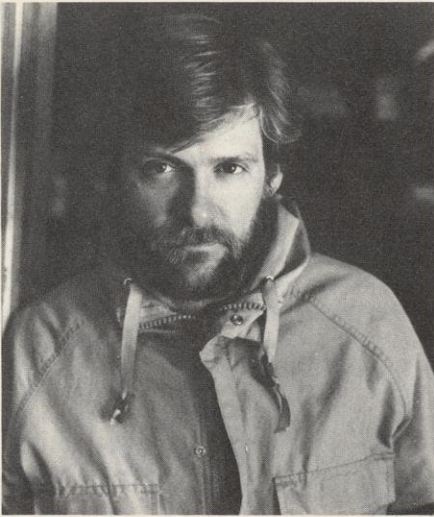
Don Franke, Black River watershed, La Crosse County

The trick is "getting the farmer to know us personally."



The Galena River in steep, far-southwestern Lafayette and Grant counties is polluted by manure runoff and cropland erosion. Watershed managers hope soil conservation practices will restore smallmouth bass to the Galena's degraded upper reaches.

Photo by Anne Forbes



Steve Elbert



Clarence Keleher

Far left: Steve Elbert, Hay River watershed, Barron and Dunn counties

"Conceptually the program is marvelous. But even when you achieve your goals in four or five areas, one rotten apple spoils the barrel."

Clarence Keleher, Galena River watershed, Lafayette County

"In those areas where we're getting 75% landowner participation, there's no question we're getting improved water quality."

Research at White Clay Lake in Shawano County helped establish facts about the value of nonpoint cleanup. Here, a line of sandbags is used to control water flow and assure accurate measurements.
Photo by Fred Madison ▼

head. Conceptually the program is marvelous. But even when you achieve your goals in four or five areas, one rotten apple spoils the barrel." Just one dairy farmer who won't pay his share for a manure storage facility can wreck things. His manure-laden runoff alone can keep water downstream polluted, despite good intentions and heavy investments by all around him. "We may have to regulate," says Elbert. "Right now it's our ace in the hole."

Regulation, of course, is the quintessential opposite of the current program — and — a concern of many landowners. Even though the program is now voluntary, Elbert says the threat of eventual regulation moves many landowners to participate. "I've tried to teach the benefits [of conservation] — in terms of pure economics," Elbert explains. But he believes it's the fear of regulation that often swings the balance.

In the newer Onion River watershed, Pat Miles is optimistic about voluntary participation. "Landowners aren't aware of their soil loss problems or our program; but once they realize we exist, they'll know where to come and get what they need."

From the Galena, Manager Keleher says, "Number one . . . is somehow making landowners aware they are losing their soil. Continuous row croppers don't realize they are losing 20-plus, even 40 tons, per acre. Some have only the short-term gain in mind — and they're struggling for survival."

Sharon Gayan in the Root agrees. She notes especially the difference between dairy farmers and cash croppers. "Dairy farmers are more long-term thinkers — they need different crop rotations from year to year; they change breeding every several years;



their investment may be larger. Cash croppers are shorter term. They sometimes don't think far enough ahead. They see water moving [across their fields] but they don't see that it's bad. A young farmer might say 'my father farmed this land and I'm getting better production than he did.'" Gayan says they don't stop to realize that increased use of fertilizers and pesticides is offsetting the effect of the lost soil. The net productivity may be more now, but what about 10 years from now?

"What happens," she explains, "is that, where the land is in competition for urban development, there's the pressure of taxes. The land value is higher. So these farmers have to produce as much off the land as possible." The farmers resist conservation practices like grassed waterways because they take land out of production. They resist practices like terracing because they're so expensive — up to \$800 per acre. "They don't see that it's necessary," says Gayan. But unlike Elbert, she's reluctant to favor regulation. Gayan thinks that because the sign-up period isn't over yet, it's too early to tell whether most landowners will participate.

"They should give us the four years down here before they suggest regulation."

But even in four, six or eight years, how can project managers convince reluctant landowners to improve water quality by signing up for cost-share money from the Wisconsin Fund?

On the Black River, manager Franke says the trick is "getting the farmer to know us personally. The county has a local streambank project and you've got to start somewhere. We've made a lot of personal contacts, and we're running our conservation classes — one night a week for seven weeks. Participating farmers are very satisfied."

Other watersheds use demonstration projects. On the Root, for example, the Conservation Tillage 500 club got 18 landowners to lend 500 acres for a demonstration of effective conservation tillage. The club found an implement dealer who planted the acres free. When farmers see a neighbor's good results with conservation tillage, they're more likely to try it themselves.

Manager Ward on the Manitowoc also holds out for personal contact as

the best way to get participation. "We hired a person to make contacts and yesterday he contacted five farmers. Three signed up."

So questions arise about how to run the program and people have different opinions. Should it be backed by regulation or be strictly voluntary? Must it yield scientifically proven water quality benefit or is a reasonably deduced benefit enough? Should it be locally or state managed? All these are "how-to" questions — means to an end. But overshadowed by something substantially more important:

Wisconsin Fund dollars go only to areas where problems are critical, control practical and benefit likely. The principle of priority problem solving — so essential in times of multiple resource problems and tight money — now has a firm foothold in nonpoint source control. As Tom Ward puts it: The Wisconsin Fund program "has put meaning to priority planning. I don't think we could find a better way to get money into a problem area. I've seen real direction in resource management."

A program to solve tough environmental problems could hardly get better praise. ■

Glossary, *Continued from page 125*

Sheet erosion

Soil dislodged in a uniform layer over a wide area.

Small Watershed Program (PL. 83-566)

A former federal flood control program now being revamped to concentrate on nonpoint source pollution. It is administered by the Soil Conservation Service. In Wisconsin it is sharing expenses with DNR for a project on the Upper West Branch of the Pecatonica River.

Soil and Water Conservation Districts (SWCD)

A county agency. Policy for it is set by a committee of the county board. Provides technical design and installation assistance to landowners. Helps extension agents with farmer education. Serves in rural areas as the Designated Management Agency to activate nonpoint sources control in Priority Watersheds.

Soil Conservation Service (SCS)

The technical arm of the US Department of Agriculture. Helps Soil and Water Conservation Districts (SWCDs) provide technical assistance to landowners and administers the Small Watershed Protection Program, a federal effort very similar to the state priority watershed program.

State Nonpoint Source Coordinating Committee

Advisory to DNR on the nonpoint source control program. Helps pick priority watersheds. Members come from federal, state, and local agencies plus farm and city interest groups.

Stream corridor

Generally includes the stream and lands immediately adjacent to the stream.

University of Wisconsin-Extension (UW-EX)

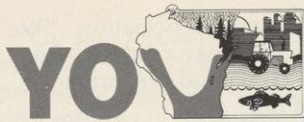
County extension agents are supported through a joint arrangement between the county, university and US Department of Agriculture. They carry out many educational activities in Priority Watershed projects.

Watershed

All areas that drain to a specific lake or stream.

Wisconsin Fund

A package of environmental protection programs. It includes funds for wastewater treatment plants, nonpoint source control, septic system improvements, and county solid waste management planning.



Can listen to the
farm leaders

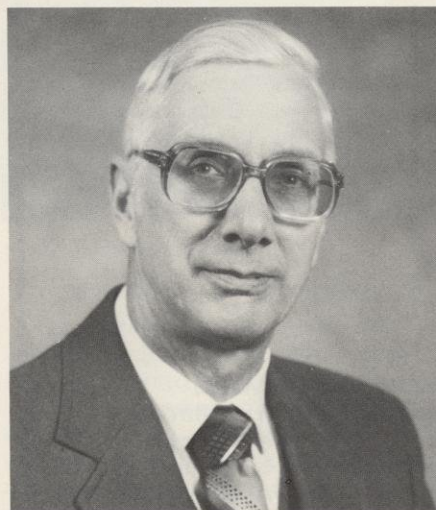
Should it be voluntary?

SUSAN BERGQUIST, DNR
Nonpoint Source Specialist



Clifton Maguire, State Conservationist, Soil Conservation Service

"I am not an advocate of regulation."



Dr. Gale Vandenburg, State Director of Cooperative Services, UW-Extension.

"Before society can consider erosion and runoff regulations, we need more research. I wouldn't go to regulation except in extreme cases, like constructions sites and large livestock operations."

Back in the 1930's, years of depression, a decade of drought and a century of soil neglect came together to produce a literal and figurative cloud over Washington, DC. The cloud was real enough — it obscured the sun over the nation's capitol for days. It was also figurative in that it created a pall that sent the country's senators and congressmen scurrying for a solution.

The result was an alphabet soup of federal erosion-control programs still in effect today. Their emphasis varies. Some rely on education, some on technical help, others on the government sharing part of the cost. But regardless of method, federal programs to control soil erosion share one thing in common — they are all strictly voluntary. The same is true for state programs in Wisconsin. Landowners, except in very extreme cases, are not regulated and can treat their land and the lakes and streams nearby pretty much as they please.

Today, the control programs devised in the '30's are being reviewed. Both agricultural practices and economic conditions have changed drastically. Monocropping, massive equipment, unchecked inflation, increased costs, falling crop prices and export demands all take their toll. Meanwhile, the farmer faces conflicting government policies — some agencies advocate soil conservation while others promote greater production. The result is ever-increasing pressure to farm marginal, more erodible areas and eliminate existing conservation practices. In addition, many of the old effective practices are being priced out of reach. And not only that! Dollars available today have been cut back to even less than during the Great Depression — fewer dollars — and those there are, hit by inflation. To illustrate: USDA's Agricultural Conservation Program (ACP) was funded to the tune of \$500-million in 1930 as compared to only \$190-million in 1982.

Clifton Maguire is one who has witnessed these changes and knows the shortcomings. Maguire is Wisconsin's state conservationist

within the US Department of Agriculture's Soil Conservation Service (SCS). For more than 30 years, says Maguire, the SCS has had difficulty "convincing landowners that it is to their benefit and the country's to adopt conservation practices."

Likewise, Kieran Powers, State Executive Director of the federal Agricultural Stabilization and Conservation Service (ASCS), admits that he, too, is "frustrated with the lack of critical participation" by farmers.

But most agricultural leaders still cling to the voluntary way. They put their faith in education, technical services, local control, youth programs, cost sharing, low-interest loans, tax credits and research. While most agricultural agency heads have heard persistent voices calling for regulation to control destructive runoff, SCS's Maguire flatly states, "I am not an advocate of regulation."

He suggests increased financial assistance instead. However, Maguire also admits that in states such as Iowa and Ohio, mild forms "of regulations on the books or only covering certain areas . . . have been very persuasive . . . tools in getting some things to happen that were not happening before."

LaVerne Ausman, Secretary of the Wisconsin Department of Agriculture, Trade and Consumer Protection is equally opposed to enforced erosion control. Ausman says he's discussed the issue with farm leaders across Wisconsin and the Midwest and "the general consensus is that regulatory efforts result in a standoff." He believes that telling farmers what to do only hardens their legendary independence.

Other agriculture leaders however, believe that someday, under some conditions, it may be necessary to regulate some landowners.

"Before society can consider erosion and runoff regulations, we need more research," says Dr. Gale Vandenburg, State Director of Cooperative Services for UW-Extension. But even with adequate research, Vandenburg says, he "wouldn't go to regulation except in extreme cases," like construction sites and large livestock operations. Even then he would tie it in with a very strong educational effort.

"Some things can be accomplished



LaVerne Ausman, Secretary, Wisconsin Department of Agriculture, Trade and Consumer Protection.

"The general consensus is that regulatory efforts result in a standoff."

by regulation if there is widespread understanding among those who are to be regulated," he says.

Dr. Stephen Smith, Dean of the UW School of Natural Resources, feels that if anybody's going to do any regulating, it should be done at local levels. Because Wisconsin is so diverse, he feels that the state should grant local communities the persuasion or enforcement powers they need to deal with major community erosion and runoff problems. Critics of the local approach, however, say local governments have long had regulatory authority but are reluctant to use it.

There'll be "instant objection to it in some areas," says ASCS State Executive Director Kieran Powers. "It's going to be distasteful to some people, but to me it is becoming a necessary fact. It's just a matter of making up our minds that we're going to do it."

Along with any enforced erosion control should go increased incentives, says Powers, because "regulation without cost sharing or other compensation would be totally unfair." He adamantly believes that if preserving soil and maintaining water quality is vital to the public interest, then society should share the responsibility for ensuring their protection.

Eugene Savage feels many landowners increasingly support some type of regulation as a means of achieving conservation. Savage is Executive Secretary of the State Board of Soil and Water Conservation Districts, whose local county-level units advise and assist farmers in the field. He cites a recent opinion survey

by the Wisconsin Agriculturist in which readers voted two to one in favor of regulation to achieve conservation. Says Savage, "Bureaucrats . . . working in the [soil] conservation field are more afraid of regulation than landowners because it obviously isn't going to be the most popular thing for them to have to carry out." He points out that many other businesses have already accepted regulation to control water-pollution.

Another state agricultural leader who has taken a stand in favor of regulation to control soil loss and water degradation is Leo Walsh, Dean of the University of Wisconsin College of Agricultural and Life Sciences. At a recent Governor's Conference on Agriculture, Walsh said landowners who allow severe erosion and runoff don't deserve protection from the law.

"For persistent soil abusers, we ought to stop kidding ourselves," said Walsh. "These people have not responded to voluntary programs for the past 40 years and they are not likely to in the future. They either lack basic abilities or suffer from callous disregard for agriculture and the rest of society. Some kind of mandatory soil and water conservation regulations may be the only way to reach them."

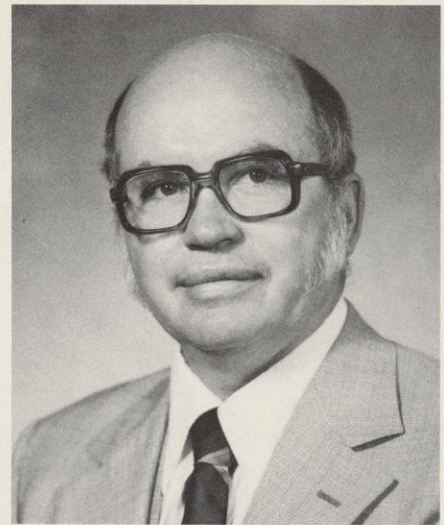
"Controlling one person's right to abuse the soil may give another person the right to fish a trout stream, swim in a clean lake, be protected from flooding . . . or to be free from hunger in the 21st Century," Walsh told the conference.

Despite his strong stand, Walsh is



Eugene Savage, Executive Secretary, State Board of Soil and Water Conservation Districts

"Bureaucrats working in the [soil] conservation field are more afraid of regulation than landowners, because it obviously won't be the most popular thing to carry out."



Leo Walsh, Dean, UW-Madison College of Agriculture and Life Sciences

"For persistent soil eroders, we ought to stop kidding ourselves. These people have not responded to voluntary programs for the past 40 years and they are not likely to in the future."

nonetheless a strong proponent of increased financial incentives to control erosion and runoff — things like tax credits and cross-compliance. But "some people simply don't respond to incentives or to educational programs," he says. We "probably are entering an era in which we will see some regulations . . . developed for some of the flagrant violators."

Chronic eroders, says Walsh, make up only 10% of all farmers yet they are responsible for the bulk of erosion and runoff problems. At the other end of the spectrum are another 10% who are superb stewards, conserving soil faithfully in good times and bad.

In between are the middle 80%, what Walsh calls "the sometime soil-managers," who can be reached with a combination of financial incentives and peer pressure from their neighbors. "Even with the bad press" these Wisconsin farmers get, says Walsh, "we are still much better stewards of the soil than most of our neighbors are." He also cautions that dictatorial laws or laws passed but not enforced would just get farmers' dander up and be "counterproductive".

"We can't implement regulations that put [Wisconsin farmers] at an extreme economic disadvantage with farmers in other parts of the Midwest or we will legislate our people right out of business."

Is Walsh right? Will the day come when society finds it necessary to pass laws that prevent this minority of landowners from flagrant abuse of land and water resources? It is time to give the idea some thought.

The brown plague

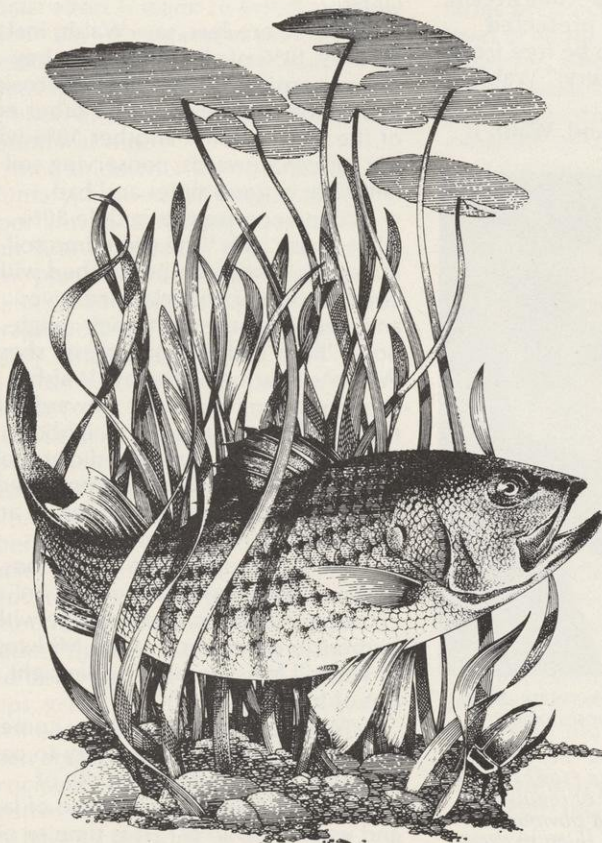
FRANCIS D. HOLE, Geological and Natural History Survey, Soil Section, UW-Extension

People-accelerated soil erosion is a "brown plague." It is a disease of those who live off the land and has ravaged the human race since agriculture began 10,000 years ago. Unlike the "Black Death," that wiped out 25 million Europeans (one-quarter of the population) during a great epidemic in the 14th century, the "brown plague" has had a continual and less dramatic history. But no less deadly.

Only where gullies eat up land before our very eyes do we cry alarm, and too late. Less noticeable, more widespread, people-accelerated erosion colors water brown, snow brown, air brown and even human lungs brown. It removes the base of food produc-

tion and thereby condemns to death not only many children and adults today, but also unnumbered people yet to come. Accelerated erosion is not an "act of God" toward which we must assume a posture of submission, such as survivors adopted toward the Black Death. We human beings, the world over, would do well to commit ourselves on a Pentagon-scale, a soul-sized scale, to the defense of the soil resource. War times have been special soil-depletion times. Beating swords into ploughshares is a step toward beating ploughshares into minimum tillage implements.

It is possible that we too will someday "not learn" soil erosion any more. Then we will be truly civilized and eliminate the "brown plague" from the face of the earth.



Manure kills stream

A DNR fish manager and warden investigated a Southwest Wisconsin fish kill last March. The following details are taken from their report:

The river was frozen over at the point where we first reached it. But a half-mile upstream we came to a series of deep holes where the river was basically ice-free. A considerable number of dead fish littered this stretch—brook and brown trout, creek chubs, stonerollers, dace and shiners. There were upwards of 1,000 dead trout. The only living fish observed were a handful of creek chubs.

Continuing upstream, we found a few more dead fish, but after another quarter-mile or so, were unable to find any fish at all, dead or alive. Throughout this section the bottom is covered with a layer of decaying organic matter. There was no fish kill here because none exist to kill. A cattle feedlot near the headwaters continuously discharges high volumes of animal waste into the river leaving the upper reach unable to support fish life of any kind.

It appears that the feedlot is also responsible for the fish kill observed further downstream. A late-February thaw, two or three weeks before our investigation, melted snow from the south-facing feedlot and sent a concentrated dose of manure and urine into the creek.

This is not a one-time occurrence. The situation created by this feedlot has existed on this stream over an extended period of time.

The other 95% of us

ROBIN J. IRWIN, Editorial Assistant

"Smallmouth black bass from Wisconsin's 'Quick Creeks' always remind me of a runty, red-eyed lumberjack who stomped on men twice his size just to show how tough he was. Then, for the final humiliation, he would spit tobacco juice into their eyes. Pound for pound, there wasn't a meaner man. And, pound for pound, there isn't a more ornery fresh-water fish."

Mel Ellis, *Field and Stream*, June 1968

Field and Stream's analogy may be somewhat overblown, but the gist of the story is clear. The small "Quick Creeks" of Wisconsin's Driftless Region are smallmouth bass territory, home to some of the scrappiest fishing around.

Or, that is, they used to be, once.

Livingston Branch is one of the little streams that flow between the steep ridges of the state's southwest corner. It's a small, but major tributary of what's called the Upper West Branch of the Pecatonica River. In all, the Pecatonica and its tributaries drain 77 square miles in parts of Iowa, Grant and Lafayette counties.

Although narrow and only eight miles long, Livingston Branch was considered one of the best small-mouth bass streams in southwestern Wisconsin 10 or 15 years ago. DNR fish sampling surveys in the 1960's found good populations — especially in 1965, when over 1,000 of the scrappy lightweights were found per mile. The little stream was a virtual smallmouth factory, but that was over a decade ago.

Today, there are almost no small-mouth in Livingston Branch. At first, decline was slow, probably unnoticed, but then major fish kills in '78, '79 and '81 all but wiped them out. A fish



The other 95%. They want nonpoint source pollution to stop.
Painting by Greg Hargreaves, Milwaukee, courtesy Wisconsin Telephone Company

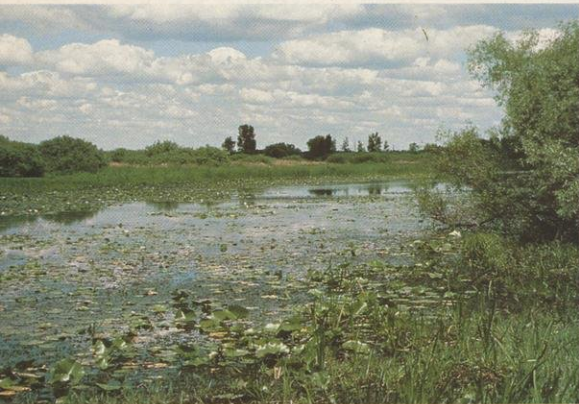
survey last fall discovered only four per mile in the same stretch where hundreds were found 20 years ago. A DNR report refers to them as "a remnant population." It seems an understatement.

The hidden killer in Livingston Branch is a phenomenon called nonpoint pollution. But to name the culprit only tells a small part of the story. Studies of Livingston Branch diagnose a very sick stream indeed. Periodically, levels of dissolved oxygen in the water are low enough, deadly ammonia high enough, to kill bass. The bottom of the stream, in its upper reach, is coated with a thick layer of organic matter. The little tributary's

symptoms point to reasons for the illness — manure running off frozen fields and barnyards, sediment from eroding croplands and pesticides.

Perhaps the passing of Livingston Branch wouldn't be so tragic if its sickness represented only an isolated outbreak. But the disease has become epidemic in other streams throughout the driftless-country and across the state — little streams with idyllic names like Hackett Branch and Boice Creek, Blakes's Fork and Rattlesnake Creek, all feeder streams of the Grant River in south central Grant County.

The land along these streams is steep. The soils are highly erodible, fine-grained silt loams. Annual soil



Cropland and barnyard runoff pump more sediment and nutrients into small lakes and streams than they can absorb. The result is great for water weeds and algae, but not for fish or people.

loss on some fields averages an incredible 30 to 40 tons per acre, approximately 10 times faster than new soil is produced. One year, tests on the Grant River showed sediment loads up to 704 tons per mile of stream, highest in the state. When this hits the water in spring, it sometimes buries the gravel fish need for spawning. Flash floods that start on the unprotected hillsides flush away the nests. If a few fry hatch, they may not find food in the murky water. In the last six years, only during the drought year of 1976 has a decent hatch of smallmouth come off in Rattlesnake Creek and other Grant River tributaries.

But the litany of deterioration doesn't stop there. The nonpoint source pollution epidemic is sickening or killing hundreds of miles of small-

oped in the watershed contribute "large" amounts of sediment to the river. The Racine County Soil and Water Conservation District has identified 44 livestock operations on the Root with less than adequate manure management. About 80% of its farmlands are losing soil at more than the allowable five tons per acre, especially the two-thirds in row or vegetable crops. Water quality in the Root River is classified as "very poor."

Statistics like these don't tell the whole story — the story of how erosion hurts the 95% of us who aren't farmers. The story of a stream that becomes little more than a ditch, worthless for fishing, boating, swimming or any other recreational use.

In fact it becomes even less than worthless because nonpoint source



Not so long ago, Livingston Branch supported more than 1,000 smallmouth bass per mile. Today it contains almost none, a victim of nonpoint pollution.

Photo by Anne Forbes

mouth bass and trout streams all across southern Wisconsin. They have names like Bailey, Blockhouse, Blue, Bois, Leggett, Plattes, Skinner, Story, Sugar, Fever, Otter, Wolf, Woods and Yellowstone.

Such rural erosion is bad enough, but the developing urban fringe gets a double whammy. The Root River watershed in Milwaukee and Racine counties for example, is one of these rural-going-urban areas.

The Root doesn't bear up very well under its soup of pollutants from city runoff, fortified by the heavy dose of agricultural erosion from farms waiting to be gobbled up by urban sprawl. Its waters regularly transport up to four times more than the safe levels for coliform bacteria, large amounts of phosphorus and more than 38,000 tons of sediment annually. About 50% of the subdivisions being devel-

pollution carries hidden costs that devour taxpayer's money.

The US Army Corps of Engineers spent nearly \$4 million last year alone to dredge tons of sediment just from the Wisconsin-Minnesota segment of the Mississippi River navigation channel. This year, dredging Wisconsin's five or six major Great Lakes ports will cost more than \$3 million. But these are only debits on the balance sheet of the present. There is a much more insidious threat waiting.

In 1977, a survey of Wisconsin's county soil and water conservation supervisors uncovered disturbing trends. Supervisors in almost every agricultural county reported that farmers were abandoning tried and true soil conservation methods. More farmers were selling off their livestock, giving up crop rotation and switching



Clean water is part of the Wisconsin lifestyle. Often, when runoff pollution dirties it, those who had little to do with making the mess bear the brunt and pay the cost.

to continuous cash-crop farming. In 13 counties, conservation supervisors reported a trend to more grain farming on marginal land with steep slopes. Sixteen county officials expressed concern over removal of contour strips, waterways, terraces, crop rotations and windbreaks. The obvious implication is that soil erosion — the problem we thought we'd licked in the 30's — was on the rise again in Wisconsin.

And not just in a few scattered counties, or just here in Wisconsin. Soil erosion is epidemic almost everywhere agriculture is dominant — in Indiana, Illinois, Missouri and Iowa. It's "alarmingly high" in Tennessee, Mississippi, Texas, Colorado and many other states. The nation has already witnessed the loss of one-third of its total topsoil supply.

The implications for agriculture are obvious. The implications for water quality are devastating. Unless an adequate nonpoint pollution control program for Wisconsin is put in place soon, the other 95% of us may be up to our necks in mud someday when all we wanted to do was go swimming. ☐

Trout Unlimited Speaks Out

Trout Unlimited members consider themselves the volunteer guardians of all Wisconsin lakes and streams, not just the 3,500 miles of prime trout stream that still survive. Abuse in the past has wiped out thousands of miles of excellent trout and bass habitat and is one of the reasons anglers must finance an expensive stocking program to maintain many fisheries. Erosion and pollutants in runoff from agriculture and storm sewers are an insidious threat. Groundwater pollution from nonpoint sources can contaminate springs. Trout Unlimited takes a strong stand in favor of immediately stopping this damage in whatever way is necessary.

To inch along with the cleanup for 45 years, which is the rate we're going now, is unthinkable. By then, many of the lakes and streams we love will be barren. The program for cleanup in the watersheds has been tested and works. Let's get on with it! If rules are needed to make landowners stop polluting, they should be enacted. No one should be allowed to destroy a trout stream or any other body of water.

Ronald L. Ahner,
State Chairman



A message from DNR Secretary Buzz Besadny about Nonpoint Source Pollution control

You can put the task before us several ways: Water cleanup can never be more than half done unless we tackle runoff pollution. Or, runoff (nonpoint) pollution and soil loss represent the two major unmet challenges in our environment. Or, state government has lent a hand to the city folks to clean up municipal wastewater discharges — now it's time to help those living in the countryside.

Any way you put it, though, the task of controlling and reducing runoff pollution faces Wisconsin right now. Statistics show that various contaminants and sediment are entering our lakes and streams at alarming levels. And as we achieve greater pollution control from industrial and municipal dischargers, the nonpoint problem is magnified. In some areas, of course, it is the only source of water pollution, a problem many trout anglers recognize.

How do we tackle this problem? The same way we went about cleaning up the sewage discharge from our cities. Define the problem; involve local and state leaders; set the priorities; authorize state-assisted measures to tackle the source of the problem. We have tested our approach and it works. With a continuing commitment in Madison, with continuing and sustained local involvement and landowner interest, and with interagency cooperation we can produce real and measurable results. And 25 years from now, our children and grandchildren will thank us — not only for cleaning up the water, but for saving the soil as well.